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# Fish and invertebrate bycatch and discards in New Zealand orange roughy and oreo trawl fisheries from 2001–02 until 2014–15

New Zealand Aquatic Environment and Biodiversity Report No. 190

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TABLE OF CONTENTS

# EXECUTIVE SUMMARY

**Anderson, O.F.; Ballara, S.L.; Edwards, C.T.T. (2017). Fish and invertebrate bycatch and discards in New Zealand orange roughy and oreo trawl fisheries from 2001–02 until 2014–15.**

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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 orange roughy and oreo target trawl fisheries for each fishing year from 2001–02 to 2014–15. Separate estimates, along with estimates of precision, were made for three broad categories of catch and discards; all QMS species combined, all non-QMS species combined, and all invertebrate species combined. In addition, separate estimates were made of the annual bycatch for several smaller species groupings: sharks, slickheads, morid cods, rattails, spiny dogfish, protected coral species, and Schedule 6 species. Component species of the QMS species group were adjusted for each year to match the year-of-entry of individual species in the QMS system.

A ratio estimator, based on the observed bycatch or discards per tow, was used to calculate bycatch and discard rates by area and catch category for each fishing year. These rates were then multiplied by the total number of unobserved tows in each stratum, as determined from commercial catch-effort data, and added to observed amounts to estimate the annual bycatch and discard levels in the overall target orange roughy and oreo fisheries. Multi-step bootstrap methods, considering the effect of auto-correlation between tows for the same observed vessel and area stratum, were used to quantify variability and calculate confidence intervals around annual bycatch and discard estimates. In addition to the ratio-based estimates, a statistical model incorporating the same covariates (area and fishing year) was used to provide independent estimates of bycatch and discard levels for each species category.

The level of observer coverage in the orange roughy and oreo target trawl fisheries over the 14-year period has averaged 38% and 29% for the orange roughy and oreo target trawl fisheries respectively to the total estimated target species catch. The observed number of tows accounted for more than 10% of total tows in each year, for both target fisheries. The observer coverage in the orange roughy target fishery was well spread over the fishery parameters examined, however observer coverage in the oreo target fishery was low in some months in recent years, and for smaller vessels.

Since 2001–02, orange roughy have accounted for about 85% of the total estimated catch weight recorded by observers in the target trawl fishery. The remainder of the (observed) catch comprised mainly the commercial species smooth oreo (7%), black oreo (1.6%), hoki (0.6%) and cardinalfish (0.3%), plus a range of non-commercial species including various species of deepwater dogfishes, rattails, morid cods and slickheads. Non-QMS invertebrate species made up only a very small fraction of the overall catch, with warty squid and corals the main groups caught. 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 ratio-based method and the statistical model produced very similar estimates of bycatch in each of the species categories examined, with the main difference being the slightly smaller confidence intervals obtained using the statistical model. Total annual bycatch in the orange roughy fishery between 2001–02 and 2009–10 ranged from 3093 t to 6075 t per year, but then declined following the declining catch in this fishery, and was less than 1100 t in each of the five following fishing years (2010–11 to 2014–15). QMS species comprised a larger proportion of the bycatch than non-QMS species in all years, and both these species groups showed the same trend as the total bycatch. Most of the decreasing trends were statistically significant. Total annual discards also decreased over time, from about 2117 t in 2001–02 to about 184 t in 2013–14 and 346 t in 2014–15, and were almost entirely non-QMS or invertebrate species. Discarding of orange roughy and other commercial species, more prevalent early in the period, was often due to fish lost from torn nets during hauling. The main species discarded since 2001–02

were rattails, shovelnose dogfish, and other deepwater dogfishes, all of which were discarded at a rate of 50% or more.

Since 2001–02, oreos (five species codes combined) have accounted for about 95% of the total estimated catch weight recorded by observers in the oreo target fishery. The remainder of the (observed) catch was mainly orange roughy (1.9%), hoki (0.4%) and pale ghost shark (0.3%), plus non-commercial species of deepwater dogfish, rattails, morid cods and slickheads. Non-QMS invertebrate species made up only a very small fraction of the overall catch (less than 0.1%), corals and warty squid the main species. Most of the remaining observed species or species groups each accounted for 0.01% or less of the observed catch during the period.

Total bycatch in the oreo fishery has fluctuated with higher levels between 2001–02 and 2009–10 (range 579–1575 t), and lower levels after 2010–11 (352–535 t). The decrease in landings of oreos since the peak in 1996–97 is only weakly matched by decreasing total bycatch. Total discards showed a slow decrease, with the 14 t estimated for 2014–15 the lowest for 14 years. In the oreo fishery, total discards were mostly composed of non-QMS species. Discards of oreo species were generally low, at about 0–73 t per year, and showed no clear trend. Discards of non-QMS species were variable and showed a decreasing trend, and annual discards of invertebrates showed no clear trend, and were low. The decline in total annual discards in the oreo fishery roughly tracked the decrease in landings from 2001–02 (and therefore effort) in this fishery. The main species discarded were rattails, Baxter's dogfish and other deepwater dogfish species.

The bycatch fraction (kg of bycatch/kg of target species catch) declined throughout the period examined in both fisheries, from 0.02–0.04 to 0.01–0.02 in the orange roughy fishery and from 0.7–0.12 to 0.04 in the oreo fishery, indicating that restricting the catch to the target species has improved over time. The discard fraction (kg of discards/kg of target species catch) in the orange roughy fishery ranged from 0.02 in 2013–14 to 0.13 in 2001–02, with an overall value for the 14-year period of 0.07. Although variable, the annual discard fraction has tended to be lower in recent years. The annual discard fraction in the oreo fishery was generally much lower than in the orange roughy fishery and also declined over time, with an overall value for the 14-year period of 0.01. This fraction is similar to that seen in the southern blue whiting fishery, and lower than in all other offshore fisheries for which estimates are available (Ministry for Primary Industries 2016a).

The annual catch of the 133 and 61 most commonly caught individual bycatch species in the orange roughy and oreo target trawl fisheries, respectively, were estimated using the same procedures (ratio method) as for the combined species categories, and trends examined. In the orange roughy fishery, two species showed a significant decreasing trend in total bycatch over time and four species showed an increasing trend. In the oreo fishery, two species showed a significant decreasing trend and three species an increasing trend in total bycatch. Some of these significant changes are likely caused by the use of more specific reporting codes over time.

# 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 project addresses this management objective by quantifying the level of bycatch of species or groups of species not managed separately in the Quota Management System (QMS). The first five years of the programme have produced assessments of the scampi (*Metanephrops challengeri*), arrow squid (*Nototodarus* spp.), hoki/hake/ling trawl fisheries (Anderson 2012, 2013, Ballara & O'Driscoll 2015), the ling (*Genypterus blacodes*) bottom-longline fishery (Anderson 2014), jack mackerel (*Trachurus* spp.) (Anderson et al., 2017), and the ling (*Genypterus blacodes*) bottom-longline fishery (Anderson 2014). The orange roughy (*Hoplostethus atlanticus*) and oreo (primarily smooth oreo (*Pseudocyttus maculatus*) and black oreo (*Allocyttus niger*)) target trawl fisheries, are the subject of this report.

Orange roughy are found throughout the New Zealand EEZ (Exclusive Economic Zone), mostly in depths of 700–1100 m (Anderson et al. 1998). The main fisheries are on the Chatham Rise (in Quota Management Area ORH 3B), along the east coast from East Cape to Banks Peninsula (ORH 2A, ORH 2B, ORH 3A), and on the west and northeast coasts of the North Island (ORH 1). Smaller fisheries operate in the southern parts of ORH 3B, including around the Pukaki Rise. Several fisheries occur in the High Seas regions (ET) outside of the EEZ, including on the west Norfolk Ridge and Lord Howe Rise (HOWE), northwest Challenger Plateau (NWCH), and Louisville Ridge (LOUI) (Figures A1 and A2). Fishing takes place year around but there is an emphasis in the winter months of June and July on orange roughy spawning aggregations, particularly on the Chatham Rise and in the east coast fisheries. About half the catch is landed unprocessed, mainly by ice-boats, and most of the remaining catch is landed in the 'dressed' state by factory trawlers (Ministry for Primary Industries 2016b).

The oreo fishery catches two main species, smooth oreo and black oreo, as well as small amounts of spiky oreo (*Neocyttus rhomboidalis*) and low numbers of warty oreo (*Allocyttus verrucosus*). The two main oreo species have a similar depth and geographical distribution to orange roughy, although they are not generally found north of East Cape or on the Challenger Plateau (Anderson et al. 1998) (Figures B1 and B2). Spawning for both black and smooth oreo occurs from late October to December, mainly on the south Chatham Rise. The oreo fishery operates mostly on the south Chatham Rise (OEO 3A, OEO 4), along the east coast of the South Island (OEO 1), around the northern fringes of the Campbell Plateau and Bounty Plateau, and the northern end of the Macquarie Ridge (OEO 6) (Ministry for Primary Industries 2016b). This fishery therefore has a strong spatial and temporal overlap with the orange roughy fishery, with the same fleet of vessels, and with the trips that frequently target and catch a mixture of these species. As with orange roughy, about 40–50% of the catch is landed unprocessed, mainly by ice-boats, and the remainder is landed in the 'dressed' state by factory trawlers (Ministry for Primary Industries 2016b).

The orange roughy and oreo fisheries are commercially and ecologically significant New Zealand fisheries. Total reported trawl catches in 2014–15 were 8209 t of orange roughy and 11 059 t of oreos (Ministry for Primary Industries 2016b), and since 2001–02 the total number of bottom trawls targeting these species has ranged from about 3600 to 10 800 per year. Vessels fish for these species exclusively by bottom trawling, and have generally used a robust 'roughy trawl' with ground gear comprising rockhopper rollers or steel bobbins. Bottom trawling on this scale has the potential to encounter and catch large amounts of non-target fish species, or target species that are of an unwanted size, or are damaged. The trawls also can have an impact on fragile invertebrate fauna including habitat forming protected coral groups.

Several earlier analyses of bycatch and discards have been made for these fisheries, including: for both fisheries, from 1994–95 and 1995–96 (Clark et al. 2000); for orange roughy, from 1990–91 to 1998–99 (Anderson et al. 2001); for oreos, from 1990–91 to 2001–02 (Anderson 2004); for orange roughy from 1999–2000 to 2004–05 (Anderson 2009a); and for both fisheries 1990–91 until 2008–09 (Anderson 2011).

These studies have shown that the main fish bycatch species in these two fisheries were hoki (*Macruronus novaezelandiae*), deepwater dogfishes (Squalidae), black cardinalfish (*Epigonus telescopus*), rattails (Macrouridae) and slickheads (Alepocephalidae). Total estimated annual bycatch was estimated to range from 2300 t to 27 000 t in the orange roughy fishery and from 270 t to 2200 t in the oreo fishery. Estimated bycatch has been slowly decreasing in the orange roughy fishery since the early 1990s, but peaked in the late 1990s in the oreo fishery, and then decreased (Anderson 2011).

Total annual orange roughy discards were also shown to have decreased over time, from about 3400 t in 1990–91 to about 300 t in 2007–08. Since around 2000, discards have almost entirely comprised non-commercial, non-QMS species. Discarding of orange roughy and other commercial species, more prevalent early in the period, was often due to fish lost from torn nets during hauling (Anderson 2011). Discards in the oreo fishery remained relatively stable over time, ranging from about 260 t to 750 t per year, with higher levels in the late 1990s than in the early 1990s or 2000s (Anderson 2011). The annual variation in discard levels mirrored that of bycatch in the oreo fishery (i.e., the proportion of the bycatch that was discarded remained relatively constant), but in the orange roughy fishery a greater proportion of bycatch was discarded in more recent years. The reason for this change appeared to be that vessels had increased trawl lengths to maintain catch rates, leading to higher catches of non-commercial species (Anderson 2011). In the most recent studies, the annual discard fraction in the oreo fishery for 2002–03 to 2008–09 ranged from 0.024 kg to 0.030 kg per 1 kg of oreo caught; the annual discard fraction in the orange roughy fishery, for 2005–06 to 2008–09, was about 0.025–0.062 kg of discarded fish for every 1 kg of orange roughy caught (Anderson 2011).

This report was prepared as an output from the MPI project DAE201504 ‘Bycatch monitoring and quantification of deepwater stocks’, which has the following objectives.

**Overall objective**
To estimate the level of non-target fish catch and discards of target and non-target fish species in identified New Zealand deepwater fisheries.

**Specific objectives**

1. To estimate the quantity of non-target fish species caught, and the target and non-target fish species discarded in the orange roughy and oreo trawl fisheries using data from Ministry for Primary Industries 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 orange roughy and oreo fisheries.

After subsequent discussions between project and MPI staff the following refinements and extensions to the objectives were agreed:

a. To update estimates of bycatch and discards for both the ratio-based and statistical-based methods for the fishing years since 2001–02. This date coincides with the introduction of observer logbooks (and the possibility to re-assign discard information to individual tows) and finer resolution MPI 3-letter taxon codes, and also marks the period of greater stability of fleet composition.
b. The estimator used for all analyses will be catch per tow (rather than catch per distance or catch per target species catch).
c. In addition to the species groups QMS, non-QMS and INV (see Section 2.1.1 for definitions), separate estimates will be made for Schedule 6 species, spiny dogfish, sharks, slickheads, morid cods, rattails and protected coral species.
d. The QMS species group will be adjusted to match the year-of-entry of individual species in the QMS system (see Section 2.1.1 for species lists as provided by MPI).
e. For both ORH and OEO use standard areas (including Westpac Bank in WCSI area), with the inclusion of out-of-zone areas North West Challenger (NWCH), Lord Howe Rise (HOWE), and Louisville Ridge (LOUI).

f. Additional analyses for management purposes: Calculate bycatch and discards for: an ORH target analysis splitting the Chatham Rise by the northwest Chatham Rise (NWCR) and east and south Chatham Rise (ESCR); an OEO target analysis splitting the Chatham Rise by OEO 3A and OEO 4; and an ORH and OEO combined target analysis for a Marine Stewardship Council (MSC) Unit of Certification (UoC) region for orange roughy (see https://www.msc.org/, Figure 1d).
g. For the ratio method, explicitly deal with low data strata as per the analysis (and plotting) approach settled on for the ling longline fishery analysis (Anderson 2014).

**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 *oreo and orange roughy trawl fisheries* are defined as all fishing using trawling methods where the target species was recorded as orange roughy (ORH) or oreos (smooth oreo, SSO; black oreo, BOE; spiky oreo, SOR; warty oreo, WOE; or unspecified oreo, OEO). Data are analysed by fishing year (1 October to 30 September), occasionally referred to in shorthand in this report as, for example, 1991 for the 1990–91 fishing year.

**Tables and figures**
Tables and figures that relate to both orange roughy and oreo fisheries are referred to as, e.g., Figure 1 or Table 1 in the text and are included after the references. Those figures or tables that apply just to the orange roughy fishery are located in Appendix A and those that apply just to the oreo fishery are located in Appendix B and are referenced as, e.g., Table A1 or Figure B1.

# 2. METHODS

## 2.1 Observer data

Government observers have been making detailed tow by tow records of catch by species or species groups for a portion of the orange roughy and oreo trawl fleet in each year since 1990–91. The allocation of observers on commercial vessels considers 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 area (see Section 3.1 for more details).

There is nevertheless a considerable amount of observer data available for this analysis, with about 450–2200 observed trawls annually in the orange roughy fishery, and 30–1000 observed trawls annually in the oreo fishery. Some changes in recording and data basing of observer data also occurred in the early 2000s, at about the same time that the fleet shrank to its current size and composition, 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 lower level resolution 3-letter MPI codes along with various identification guides. For these reasons, it was agreed to restrict the calculation of bycatch and discards to the 2001–02 to 2014–15 period, as this corresponds to a period of greater consistency in fishery characteristics and fishery data.

### 2.1.1 Data preparation and grooming

For the analysis of the orange roughy and oreo trawl fisheries, a dataset was prepared from the MPI observer database *COD*, based on all observed trawls targeting orange roughy or oreo for the entire period from 1990–91 to 2014–15. 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; specifically seaweed, birds, marine mammals, reptiles and rubbish.

All records in the *COD* data extract 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 50 km, approximately the 99$^{th}$ 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 fishing speed values and speeds less than 1 knot or greater than 6 knots (about 1.3% of the records) were substituted with values estimated by median imputation. The top 1% longest duration trawls (over 10 h) were replaced by values calculated from trawl distance and fishing speed where the two values differed by more than 50%.

Fishing depth was calculated from the average of the recorded start and finish net depths where possible. Unusually shallow fishing depth and bottom depth values were set to the average value for other trawls within 1 n.mile where possible, and otherwise trimmed to a minimum of 100 m and a maximum of 2000 m. For records where one or both values was not recorded, bottom depth was taken from the remaining value or from the seabed depth, if recorded. Less than 1% of trawls were recorded as not always being on the seabed, and less than 0.1% were coded as midwater or a combination of midwater and bottom trawling. Most trawls (59%) were on features such as ‘pinnacles’ or recorded as a ‘straight line’ (38%).

Losses of fish from the net can occur through a mixture of factors including burst cod ends, 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 estimates would sometimes differ if fish were lost from the net, either at or below the surface, or 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 this dataset, occurring in only 349 observed tows. This represents less than 1% of the total estimated greenweight at the surface, with an average of just under 6 t of lost fish per tow for these tows, and an overall average of 120 kg per tow for all tows including tows with no losses. There is no indication in the data that levels of fish loss have changed over time, although large losses of fish were frequent in the early years of these fisheries as indicated by adjustments to annual catch figures in, e.g., the ORH 3B orange roughy stock assessment (Ministry for Primary Industries 2016b). The criteria used to identify erroneous records across a range of fields, and their frequency in the observer data, are given in Table 1.

Observer data were available from 88 vessels, which ranged in length from about 21 to 105 m. No fishing vessel or fishing company is identified in this report.

To create the dataset used to estimate discards, the weights of each species retained and discarded in each ‘processing group’ were obtained from the observer database tables. The processing group is the level at which observers record information on the processing of fish on board, including those discarded. Although these groups are usually represented by a single trawl, processing data from two or more trawls are frequently combined into one processing group. This grouping stems from the difficulty of keeping track of the catch from individual trawls in the factory or processing areas of a vessel. To be able to use the discard information from processing groups comprising more than one tow in the analyses, the species discard weights in these groups were distributed among the component tows in proportion to the recorded catch of the species in the tows.

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 orange roughy or oreo species depending on the target fishery. The composition of this category expanded over time as species were added to the QMS; observers recorded 118 QMS species in these fisheries, excluding orange roughy and oreo species.
- Non-QMS: All non-QMS species combined, excluding invertebrates (INV). The composition of this category contracted over time as species were added to the QMS; observers recorded 388 species that 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; observers recorded 317 INV species or species groups in total.
- SPD: spiny dogfish (*Squalus acanthias*).
- Schedule 6: 12 Schedule 6 species: RSK, SCH, SPO, SSK, BWS, MAK, POS, SPD, KIN, PTO, STN, SWO. These species can be returned to the sea under certain circumstances (see the Fisheries Act 1996 for more details).
- Shark: 9 shark species codes: ETB, DWD, OSD, SND, CYP, BSH, LCH, PLS, CSQ.
- Slickhead: 9 slickhead species codes: BAT, BSL, REU, RGN, RTT, SBI, SLK, SSM, TAL.
- Morid: 23 morid species codes: BRC, DCO, GGC, GGL, GNO, GRC, GRG, HJO, LAE, LEG, LEV, LPI, LPS, MOD, PCO, PLU, PTH, RCO, RIB, ROC, SBR, SMC, VCO.
- Rattail: 64 rattail species codes: BAC, BJA, CAS, CBA, CBI, CBO, CCO, CCR, CCX, CDX, CEX, CFA, CFE, CFX, CGX, CHY, CIN, CIX, CJX, CKA, CKE, CKX, CLE, CMA, CMI, CMU, CMX, COL, COM, CPI, CRD, CSE, CSL, CSP, CSU, CTH, CTR, CVY, CXH, GAO, GRV, HAN, HYM, JAV, MCA, MHO, MLA, MRC, NBU, NES, NNA, NPU, NZC, NZK, OMU, PIN, RAT, SQM, TRX, TVI, VNI, WGR, WHR, WHX.
- Coral: 55 protected coral species codes: ATP, BOO, BTP, CAY, CBR, CHR, CIR, CLG, CLL, COB, COF, COO, COR, CRE, CRY, CTP, CUP, DDI, DEN, ERO, ERR, FUG, GDU, GOC, IRI, ISI, JAA, LEI, LIL, LLE, LPP, LPT, LSE, MIN, MOC, MTL, NAR, OVI, PAB, PAN, PLE, PLL, PML, PMN, PRI, PTP, SIA, STI, STL, STP, STS, SVA, THO, TPT, TRH.

The above abbreviations (QMS, non-QMS, INV, Schedule 6, Shark, Slickhead, Morid, Rattail and Coral) 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 for SPD.

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 10536. The extract comprised all fishing and landing events associated with a set of fishing trips that reported a positive catch or landing of orange roughy or oreo species (MPI codes ORH, OEO, BOE, SSO, SOR or WOE) between 1 October 1989 and 30 September 2015. 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 (HTCEPRs and/or HCELRs). 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 (Tables 2 and 3). These records, representing 603 058 tows, were assigned to the various area definitions, as illustrated in Figure 1, using the recorded position coordinates.

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 as, 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, does not support the use of this approach. The ling 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 fully estimate the bycatch of individual species or groups of species.

## 2.3 Stratification

In addition to providing estimates of total annual bycatch and discards for each of the major offshore fisheries, it is becoming increasingly useful for these analyses to also provide breakdowns of total annual bycatch and discards for a set of standardised fishery areas. Area as a predictor variable has proven to be an important driver of bycatch and discard rates in each of the offshore fisheries examined and therefore we selected fishing year and area as the primary strata for these analysis, based on the standardised area stratification defined in the 2015 Aquatic Environment and Biodiversity Annual Review (Ministry for Primary Industries 2016a). This stratification was adjusted slightly to include the Westpac Bank straddling stock orange roughy fishery within the WCSI area for that fishery, and to add three areas that lie outside the New Zealand EEZ: NWCH, HOWE and Louisville Ridge (LOUI) (Figure 1a).

Separate breakdowns of analyses and results were also made specifically for the Chatham Rise region to inform current management issues as follows:

- Orange roughy: northwest Chatham Rise (NWCR) and east and south Chatham Rise (ESCR) management areas (Figure 1b)
- Oreo fishery: OEO 3A and OEO 4 management areas (Figure 1c)
- Orange roughy and oreo combined fishery: MSC orange roughy UoC region (Figure 1d).

Each record in the observer and commercial effort datasets was assigned to the sets of areas described above and shown in Figure 1. Final stratification of the analysis comprised only the main fishery areas: for the orange roughy fishery these were CHAT, COOK, EAST, NORTH, PUYS, AUCK, STEW, SUBA, WCNI, WCSI, NWCH, HOWE and LOUI; and for the oreo fishery CHAT, COOK, EAST, LOUI, PUYS, AUCK, STEW and SUBA. To allow a complete estimation of bycatch and discards, all records from outside of the main fishery areas were combined into a single ‘Other’ category. The number of observed trawls in each area over the 14 years examined is shown in Tables A4 and B4.

## 2.4 Calculation of bycatch and discards

### 2.4.1 Ratio method

For each target fishery and species category, the observed weights of catch and discards were summed within each stratum. From this, the discard rate, $\widehat{DR}$, and bycatch rate, $\widehat{BR}$ were derived, with the following forms,

$$\widehat{DR}_s = \frac{\sum_{i=1}^{m_s} d_i}{m_s} \qquad \text{and} \qquad \widehat{BR}_s = \frac{\sum_{i=1}^{m_s} b_i}{m_s}$$

where $m$ tows were sampled from stratum $s$, $b_i$ is the weight of the catch from the $i$th tow sampled, $d_i$ the weight of the discarded catch from the $i$th tow sampled.

Using this rate estimator, estimates of $\widehat{BR}_s$ and $\widehat{DR}_s$ were derived for each stratum in each fishing year and variances were estimated by a multi-step bootstrapping procedure that allowed for correlation between tows within individual vessels. Specific rates were calculated for each fishing year/strata with 25 records or more. For strata with fewer than 25 records in the year, additional records were taken from the adjacent two years (the previous and subsequent year) or single year if at the start or end of the series. If there were still fewer than 25 records the next two adjacent years were included, and this process was continued until 25 records or more were available. For minor fishery areas where fewer than 25 observer records were available from the entire time series, annual rates were calculated using records from all areas. The rate calculated was then multiplied by the total number of unobserved tows in that fishing year and stratum from commercial catch records for the target fishery, to estimate total unobserved bycatch $\hat{B}$ and discards $\hat{D}$.

$$(1) \qquad \hat{B} = \sum_j \widehat{BR}_j \times M_j \text{ and } \hat{D} = \sum_j \widehat{DR}_j \times M_j$$

where $M_j$ is the number of unobserved tows in fishing year/strata cell $j$.

The total unobserved bycatch and discards was then added to the observed amounts to obtain total values for the entire target fishery. To obtain a 95% confidence interval for the unobserved bycatch and discards that considers vessel to vessel differences, variability in the total amount of fishing effort between vessels, and allows for correlation between tows by the same vessel, 1000 bootstrap samples were generated from the tows within each cell using a three-step sequential sampling procedure.

First a vessel was chosen at random, then a bootstrap sample was taken of the tows from that vessel that were in the cell. These steps were repeated until the effective number of tows was approximately equal to the effective number of observed tows for the cell. The effective number of vessels in the bootstrap sample was then calculated. If this was within 5% of the effective number of observed vessels in the cell, then the bootstrap sample was accepted. Otherwise a new bootstrap sample was drawn until 1000 samples in all had been accepted.

The effective number of tows and the effective number of vessels were calculated from the effort (number of tows) and reflected the contributions to the variance of the bycatch/discard rate from the variance of the bycatch/discards and the covariance between pairs of bycatch/discard values for the same vessel and cell. Matching a bootstrap sample to the cell on these criteria ensured that the variation in the bootstrap sample estimate matched the sampling variation of $\hat{B}$ or $\hat{D}$. An empirical distribution for the total was obtained by summing the bootstrap estimates across all strata within a fishing year, and the 95% confidence interval was obtained from the 2.5% and 97.5% quantiles.

Bootstrapping procedures were carried out in R (R Core Team 2016).

### 2.4.2 Statistical model method

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 $\beta_0$ and $\gamma_0$, and coefficient vectors $\boldsymbol{\beta}$ and $\gamma$, for observed values $y$ and design matrix row vector $x_i$. Only year and area coefficients were estimated, and so in this case the design matrix was the same for both model parts. The log-normal standard error term σ was also estimated, and when sufficient data allowed, an interaction between year and area was also included. Bayesian estimation was performed in the R-package **rstan** (Stan Development Team 2016), with the following priors on estimated values:

$$\{\gamma_0, \beta_0\} \sim U(-10, 10)$$

$$\{\boldsymbol{\gamma}, \boldsymbol{\beta}\} \sim N(0, 1)$$

$$\sigma \sim U(0, 10)$$

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 strata $a$ 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:

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

from which the total catch could be calculated:

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

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:

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

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 were plotted for the 14-year time series. Locally weighted regression lines were calculated and shown on the plots 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 log-normal 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.

## 2.6 Annual bycatch by individual species

Annual bycatch rates for individual QMS and non-QMS species (fish and invertebrates) in the target orange roughy or oreo trawl fisheries were calculated from observer records for the period 2001–02 to 2014–15 for species with at least 1 t of bycatch in at least one year. For orange roughy these included the top 10 QMS species, top 35 non-QMS species and the top 14 invertebrate species. For oreos these included the top 16 QMS species, the top 81 non-QMS species, and the top 35 invertebrate species, by recorded weight. For this exercise, non-informative species codes (e.g., FIS, unidentified fish; UNI, unidentified; and MIX, mixed fish) were ignored (the total observed catch assigned to these codes during the period was small – 830 kg in the orange roughy fishery and 125 in the oreo fishery).

Annual species-specific bycatch rates were multiplied by the annual effort (number of tows) in the fishery to produce estimates of total annual bycatch in the same way as described for the combined species categories (QMS, non-QMS, and INV) in Section 2.4. Precision was estimated using the same bootstrapping procedure and stratification used for the combined species categories also as described in Section 2.4.

An indication of whether the bycatch of each species increased, decreased, or stayed relatively unchanged over time was calculated in the form of a slope coefficient for a loglinear regression fitted to the data. These slopes are provided only as a simple indicator of general changes over time, as the relationships may be non-linear and some trends may be strongly influenced by changes in observer recording of species over time.

# 3. RESULTS

## 3.1 Distribution and representativeness of observer data

For the 14-year period there has been a large amount of observer data collected in these two fisheries, representing nearly 25 700 tows targeting orange roughy (71%) and oreos (29%), by 32 vessels. This period has seen a steady increase in observer coverage up to a level of 25–50% since 2005–06 in the orange roughy fishery, and 25–44% in the oreo fishery between 2005–06 and 2010–11 (Tables A5 and B5).

The observed number of tows accounted for more than 10% of the total in all years for orange roughy and oreo target trawls. The annual number of observed trawls in the orange roughy fishery ranged from 617 to 1934, and exceeded 1000 trawls in 11 of the 14 years (Table A5). In the oreo fishery the number of observed trawls ranged from 211 to 1011 with over 300 tows in all years up to 2011–12 (Table B5). There were 8–16 and 2–11 vessels observed annually in the orange roughy and oreo fisheries, respectively, the fraction observed increasing in more recent years in the orange roughy fishery as the fleet size has steadily contracted, with lower fractions in the 2000s. The amount of fishing effort by vessels that have never hosted an observer was generally less than 10% in the main fisheries, although it was notably higher in the NWCH orange roughy fishery (33%) (Tables A6 and B6). The fraction of trips observed each year also increased over time, especially since 2006–07 for orange roughy trips. This fraction is not presented, however, 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. Although coverage relative to the estimated catch was higher in recent years compared with the 1990s, for orange roughy this was mainly due to the decreasing annual catch limits rather than increasing observer effort (Anderson 2011).

The spatial distribution of target trawl fishing effort for orange roughy and oreo fisheries between 1 October 2001 and 30 September 2015 is shown for all commercial tows and all observed tows in Figures A1, A2, B1 and B2. For the 14-year period, observer coverage was spread across the entire spatial extent of the orange roughy fishery, with only a few small gaps noticeable, specifically in parts of the NWCH (ORH 7A), EAST (ORH 2A/2B), and LOUI (ET) fisheries. Some of the regions with apparently unobserved groups of trawls are likely to be the result of inaccurate recording of locality data, especially in earlier years (Figure A2) before or during the introduction of GPS navigation (Anderson 2011). There was also none to low observer coverage from 2010–11 to 2012–13 in the northwest of CHAT as it was voluntarily closed, and NWCH (ORH 7A) to 2008–09 as the TACC was set at 1 t (Ministry for Primary Industries 2016b). In the oreo target fishery, fishing effort and observer coverage was more focused on the South Chatham Rise and areas further south (Figure B2, Table B6). Within these regions, few locations were not covered by observers during the 14 years plotted, but in the smaller fisheries, on the northern CHAT, LOUI, NWCH, COOK, and the EAST, coverage was minimal.

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 A3 and B3). For orange roughy (Figure A3) the spread of observed trawls over the longitudinal and latitudinal extent of the fishery closely matched overall effort throughout much of the last 14 years. Considering separate time periods, coverage in 2002–05 was relatively uneven on the NWCH (about 37–39°S), and from 2005–06 onwards the distribution of commercial effort became more stable although observer effort remained out of synch in some regions, especially in 2005–06 and 2006–07 when the north CHAT was oversampled and the southeast CHAT undersampled. Spatial coverage was almost ideal in 2007–08 and 2008–09, although oversampling of the (mainly ORH 1) northern fisheries was apparent. Since 2010–11, EAST, NORTH, PUYS and AUCK were undersampled, and out-of-zone areas NWCH, HOWE and LOUI oversampled (but note that vessels fishing outside of the EEZ are required to carry an observer).

For oreos (Figure B3), the match of observer coverage to commercial effort has in general been more even than for orange roughy. Examination of coverage in 4-year blocks shows a relatively constant distribution of the fishery over time and a consistently well-matched spread of observer coverage, although targeting of oreos along the east coast was more prevalent during the middle period (2002–05). This even coverage continued from 2009–10 to 2011–12, but became patchier in subsequent years. Undersampling on south CHAT occurred in some periods, e.g., 2002–05 and 2012–13, and there was moderate oversampling in some southern fisheries, e.g., in 2012–13 and 2014–15. Elsewhere though, and at other times, coverage was close to ideal and this is clearly shown in the plot for all years combined, in which the two lines are mostly overlapped.

Comparisons made between vessel sizes in the commercial fleets and the observed portion (Figures A4 and B4) showed that the full range of vessel sizes was covered by observers in both fisheries. The vessel effort formed roughly into six size groups between about 300 t and 3000 t. Commercial effort in the orange roughy fishery was mostly by vessels of less than about 1000 t, in two modes at about 300 t and 800 t. While commercial effort was mostly in the 300 t mode, observer coverage was more focused on vessels in the 800 t mode. Observer coverage was relatively well spread over the larger size vessels, all oversampled to a degree due to the undersampling of the 300 t mode. The pattern was similar in the oreo fishery, with undersampling of the vessels less than 1000 t (mainly in the 300 t mode) balanced by oversampling in the main larger vessel modes at about 1400 t and 1900 t. The main difference between the two fisheries, in terms of vessel sizes, was in the greater amount of relative effort in the oreo fishery by vessels in the 1400 t mode.

Vessel size is linked to fishing area, especially in the orange roughy fishery in which smaller vessels operated in the ET fisheries and the EAST fishery. Although the ET fisheries have a high level of coverage due to tighter requirements for observers in these fisheries, the EAST fishery lacked observer coverage in some years, probably due to the various difficulties in placing observers on smaller vessels. It is useful to note, however, that unobserved vessels in these fisheries have a relatively low contribution to the overall catch; although half of all vessels operating in these fisheries between 1990 and 2008 never hosted an observer, these vessels accounted for only about 9% (orange roughy fishery) or 7% (oreo fishery) of the total catch of the target species during that time (Anderson 2011).

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 A5 and B5). Commercial fishing in the orange roughy fishery occurred throughout the year over the entire 14-year period (Figure A5), with consistently higher effort during June and July (when orange roughy spawn), usually followed by a tapering off of effort through to the end of the fishing year. There was also in most years a period of low effort in some months from September to May. Although observer effort was also spread throughout the year, there were periods during most years when there was little or no observer coverage, e.g., 2005–06, and in some years the observer coverage was compressed into short periods poorly related to the pattern of commercial effort, e.g., 2003–04. In other years, however, e.g., 2009–10 observer coverage was more consistent and closely matched the commercial fishery. In recent years there has been long periods of low observer effort: from December to May in 2011–12; from October to April, and September in 2012–13; and from October to January and March to May in 2013–14. For all years combined, the spread of observer effort was relatively well matched to the spread of commercial effort for orange roughy, although the spawning months tended to be oversampled.

Commercial fishing in the oreo fishery also took place throughout the year over the 14 years examined, but with a slightly different and somewhat complementary pattern to that of orange roughy (Figure B5). When vessels were focusing on the orange roughy spawning fisheries in June and July, targeting of oreos was relatively low, but with orange roughy effort subsequently tapering off, effort in the oreo fishery increased and was generally at its highest level between September and December, coinciding with the black and smooth oreo spawning period. At other times of the year effort was variable, both within and between years. Observer effort was spread less evenly in the oreo fishery than in the orange roughy fishery, due mostly to the historically smaller size and wide temporal spread of the fishery (Anderson 2011). In most years, however, the spawning period was relatively well covered by observers and other times of the year were covered in a seemingly random fashion. Since 2011–12 there have been substantial periods of relatively low observer effort in some months: January, February and April to August in 2011–12; December to August in 2012–13; December to March, and June in 2013–14; and October and February to April in 2014–15. In some of these time periods substantial commercial catches were taken. For all years combined, the spread of observer effort closely matched the spread of commercial effort, with only slight undersampling between January and April, and slight oversampling in October and May.

## 3.2 Selection of ratio estimators

In earlier reviews of bycatch and discards in these fisheries (Anderson 2004, 2009a), a trawl duration-based ratio estimator was used for calculations of bycatch and discards, after comparisons of bootstrap estimated c.v.s from various sets of trial data. The most recent review (Anderson 2011) trialled a ‘per trawl’ ratio estimator for the orange roughy and oreo fisheries along with the target species catch and trawl duration forms of the estimator. Although these trials resulted in very small c.v.s for each form of the estimator, the ‘per trawl’ form produced slightly lower c.v.s overall for bycatch and very similar c.v.s overall to the trawl duration-based estimator for discards (Anderson 2011). The Aquatic Environment Working Group has since agreed to use the ‘per trawl’ form of the ratio estimator for all discard and bycatch calculations, and as such was applied in this analysis.

## 3.3 Bycatch data

### 3.3.1 Overview of raw bycatch data

**Orange roughy fishery**

More than 700 bycatch species or species groups were identified by observers in the orange roughy target trawl fishery, most being non-commercial species including invertebrate species caught in low numbers (see summaries in Tables A1–A3). Orange roughy accounted for about 85% of the total estimated catch from all observed tows targeting orange roughy between 1 October 2001 and 30 September 2015. Much of the remainder of the total catch (around 10%) comprised mainly smooth oreo (7.1%), black oreo (1.6%) and hoki (*Macruronus novaezelandiae*) (0.6%) (Figure A6). Rattails (various species, 0.7%) and shovelnose dogfish (*Deania calcea*, 0.6%) were the species more adversely affected by this fishery, with over 50% discarded. Other species frequently caught and usually discarded included: slickheads (family Alepocephalidae); deepwater dogfishes (family Squalidae), particularly *Etmopterus* species, the most common of which is likely to have been Baxter's dogfish (*E. baxteri*); and morid cods, especially Johnson's cod (*Halargyreus johnsonii*) and ribaldo.

Squids (mostly warty squid, *Onykia* spp.) were the largest component of the invertebrate bycatch, followed by various groups of protected corals, echinoderms (primarily starfish) and crustaceans (mainly king crabs, family Lithodidae). Many invertebrates, in particular corals, echinoderms and crustaceans, were identified to species, especially in the more recent records. This is due to the efforts to continuously improve knowledge of the New Zealand marine invertebrate fauna, both in general and more specifically by fisheries scientists and observers, and the availability of high-quality invertebrate identification guides (e.g., Tracey et al. 2011, Tracey et al. 2014, Opresko et al. 2014, Williams et al. 2014). See Tables A1 and A2 for a list of the main observed bycatch species and Table A3 for a summary by higher taxonomic group.

**Oreo fishery**

More than 500 bycatch species or species groups were identified by observers in the oreo target trawl fishery, most being non-commercial species, including many invertebrate species caught in low numbers (see summaries in Tables B1–B3, and Figure B6). Combined oreo species accounted for about 95% of the total estimated catch from all observed tows targeting oreos between 1 October 2001 and 30 September 2015. Orange roughy (1.9%) accounted for most of the remainder, with other species or group of species accounting for less than 0.6% of the total catch. Baxter's dogfish and rattails comprised the next most common bycatch species, and these were all frequently discarded. These were followed by hoki, unspecified oreo species, and ridge-scaled rattails (*Macrourus carinatus*), all of which had low or zero discard rates. Slickheads were frequently recorded, as were deepwater dogfish (comprising an even mixture of unspecified species, seal sharks (*Dalatias licha*) and *Etmopterus* species), and basketwork eels (*Diastobranchus capensis)*. As in the orange roughy fishery, numerous invertebrates were identified, including corals (especially *Solenosmilia variabilis* and bushy hard coral (*Goniocorella dumosa*)), and squids (especially warty squid). Corals were a substantial part of the bycatch, accounting for almost 0.1% of the total catch in this fishery (see Table B2 for a list of the main observed invertebrate bycatch species).

**Orange roughy and oreo fishery combined**

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, target species, freezer vessel and meal processing plants (Figures 2–4). Plots were prepared for the fishing years 2001–02 to 2014–15 and species category (QMS species, non-QMS species, and ALL species). Because of the similarity of the orange roughy and oreo fisheries in terms of, for example, vessels, depth, location and timing, initial plots made separately for each fishery showed similar results and so combined plots only are presented here.

Total bycatch per tow was highly variable between trawls, ranging from 0 to 75 t (Figure 2). Total bycatch per trawl increased with increasing trawl duration. Most tows were less than 6 h in duration but longer tows were frequent and some were longer than 10 h. Trawling was mostly carried out at bottom depths of 800–1200 m but some trawls were shallower than 600 m and a few deeper than 1400 m. Total bycatch decreased very slightly with increasing bottom depth, from about 1065 kg per trawl at depths less than 700 m to about 260 kg per trawl at depths greater than 1400 m. There was no obvious change in total bycatch per tow from year to year through the series and only small variations in bycatch from month to month, although low median values in July and August were followed by slowly increasing values in successive months until January. There were some large differences in bycatch levels between the areas examined, although the higher values shown for COOK were based on a relatively small number of records. In areas represented by larger numbers of trawls, median bycatch was lowest in LOUI and NORTH, and highest in CHAT. There were large differences in bycatch between the 12 vessels represented by more than 500 records before tows with no bycatch were removed, with medians ranging from about 40 kg per trawl to about 120 kg per trawl. Russian vessels had slightly lower rates than New Zealand vessels with most records coming from these domestic vessels. Target species had little influence on bycatch, with very similar medians shown for all five target species codes. There was a slightly higher median total bycatch for factory vessels with freezers and factory vessels with a meal plant.

Patterns of bycatch for QMS species in relation to these variables (Figure 3) were similar to those for total bycatch except that: variability between fishing years was greater for QMS bycatch; target orange roughy and smooth oreo showed higher median QMS bycatch; and there were higher bycatch rates of QMS species in CHAT relative to COOK. Bycatch of non-QMS species show similar patterns to QMS species except that there were higher bycatch rates of non-QMS species in COOK compared to CHAT, and the small amount of targeting of spiky oreo resulted in lower median non-QMS bycatch than for other target species (Figure 4).

## 3.4 Discard data

### 3.4.1 Overview of raw discard data

**Orange roughy fishery**

The bycatch species most affected by discarding in the orange roughy fishery was the shovelnose dogfish, the most commonly caught single species after orange roughy and oreos, and of which over 50% was recorded as discarded (Table A1, Figure A6). As a group, rattails made up a larger fraction of the bycatch but they will have comprised many species and were frequently not fully identified by observers. Based on catch records from research surveys for orange roughy (e.g., Tracey et al. 1997), these are likely to have been mainly species of *Coryphaenoides*, especially the serrulate rattail (*C. serrulatus*), the four-rayed rattail (*C. subserrulatus*), and the notable rattail (*Coelorinchus innotabilis*), but also would have included several other species in these and other genera. Morid cods, especially Johnson's cod, were also a significant part of the discarded catch, as were basketwork eels and javelinfish (*Lepidorhynchus denticulatus*, the latter a readily identified rattail species). Of the invertebrate species caught, only king crabs (Lithodidae), managed under the QMS since 2004, were not predominantly discarded (see Table A2). Other invertebrates were caught in relatively small amounts, with species such as jellyfish (3.6 t, <0.01% of the total catch) shown to have been discarded at a level of 44%, but in reality this figure would most likely have been 100%, as jellyfish have no commercial value. This assumption of a 100% discard level applies also to other species of invertebrates that have no commercial value (including being used in fish meal), where observers recorded the catch but occasionally did not record the discards.

**Oreo fishery**

In the oreo fishery, shovelnose dogfish were considerably less vulnerable than in the orange roughy fishery, appearing much further down the list of bycatch species, but they were still generally discarded (see Table B1). This may be because of the somewhat less complete spatial overlap of the distribution of this species with that of oreo species compared to orange roughy (see Anderson et al. 1998, McMillan et al. 2011). Dogfishes in general, however, especially *Etmopterus* species, comprised a large part of the discards. Rattails were again, as a group, caught in the greatest amounts in this fishery, and generally discarded. The relatively large ridge-scaled rattail (*Macrourus carinatus*) is an anomaly, being the most significant non-QMS bycatch species by total weight, but not discarded. Slickhead species and basketwork eels also contributed substantially to the discarded catch in this fishery.

**Orange roughy and oreo fishery combined**

The variability in the level of discards per tow for QMS species, non-QMS species and all species combined, with respect to some of the available variables are explored in Figures 5–7. The level of total discards was highly variable, ranging from 0 to 33 t per tow (Figure 5). As was shown for bycatch in these fisheries, the quantity of discards tended to increase with increasing trawl duration (as may be expected), from a median of about 19 kg for a less than 5 minute trawl, to about 870 kg for a duration greater than 8 h trawl. Discard levels varied little with depth, with total discards of 30–58 kg per trawl across the entire depth range of these fisheries. Discards were highly variable between the 12 vessels with more than 500 records before tows with zero discards were removed; and showed a gradual decrease during the period 2005–06 to 2012–13. Discard levels also varied among fishery areas, with the lowest values recorded in HOWE, LOUI and NORTH, and the highest values in CHAT, COOK, STEW and NWCH. Discards were similar throughout much of the year, although during July and August median levels slightly lower than in other months, and were similar among observed nationalities. As for bycatch, median discard levels were lower for the spiky oreo target species category, although this species is rarely targeted. There was also little discernible difference in bycatch rates between freezer vessels and ice boats and, surprisingly, slightly higher discard levels for vessels with a meal plant.

Patterns of bycatch for QMS species in relation to these variables were mostly similar to those for total discards for the 1990–91 to 2014–15 period (Figure 6) except that: there was more variability between fishing years; Russian vessels showed much lower QMS discards than New Zealand vessels; and median QMS discards were higher when targeting orange roughy or smooth oreos. QMS discards were also more variable, with lower discards from November to February and higher more variable discards during August and September, and also in NORTH, NWCH and PUYS compared to other areas. Discards of non-QMS species showed similar patterns to QMS discards although there was less difference between New Zealand and Russian vessels (Figure 7).

## 3.5 Estimation of bycatch

### 3.5.1 Bycatch rates

Bycatch rates by area and year were calculated for each species category from the observer data. For the ratio method the variance associated with these estimates was calculated using the bootstrap procedure described in Section 2.4. Average bycatch rates across all areas in each year were calculated to apply to the small amount of fishing effort outside of the main areas.

These calculations can provide some insight as to how bycatch rates vary between the different regions of the orange roughy and oreo trawl fisheries. Limitations in the data, especially in the spread of observer effort across areas in each year, meant that calculation of bycatch ratios for several year/area combinations borrowed data from adjacent years, as described in Section 2.4.

The total number of years of data required for each stratum is shown in Tables A7 and B7. For the orange roughy target fishery there was sufficient observer data available from the CHAT and WCNI fisheries to not require combining any additional data from adjacent years. This however was not the case in other areas, where records from multiple years were frequently required to be combined, and due to very low coverage in areas COOK, STEW and Other in all years, annual rates in these cases were based on data from all areas. For the oreo target trawl fishery, there was only sufficient observer data from individual years for the CHAT fishery, with additional data from adjacent years required for areas PUYS, AUCK, STEW and SUBA, and data from all areas used to produce annual rates for the COOK, EAST, LOUI and Other areas.

**Orange roughy fishery**

Median bycatch rates of QMS species were highest in AUCK, PUYS and CHAT with levels consistently over 500 kg/tow. In other areas bycatch rates were generally below 500 kg/tow, especially in the ET regions NWCH, LOUI and HOWE, but also inside the EEZ in WCNI, WCSI and EAST (Figure A7). Bycatch rates of non-QMS species were generally similar to those of QMS species but with a smaller range, only exceeding 500 kg/tow in one or two years in CHAT and NWCH. In other areas bycatch rates were mostly below 300 kg/tow. Bycatch rates of invertebrate species were low (generally less than 50 kg/tow) in most years in most areas but were substantially greater in LOUI in 2003–04 and PUYS in

2001–02 and 2002–03. For completeness, median bycatch rates are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish (Figure A7).

**Oreo fishery**
Median bycatch rates of QMS species were mostly below 500 kg/tow in most areas. Exceptions to this included AUCK, where rates increased throughout the period, especially after 2008–09 when they reached 2000–2500 kg/tow, and CHAT, where rates were variable but were at or above 500 kg/tow in several years (Figure B7). Bycatch rates of non-QMS species were at a similar level to those of QMS species overall, but were never greater than 600 kg/tow in any year or area; rates were greatest in STEW and CHAT and lowest in PUYS and AUCK. Invertebrate species bycatch rates were mostly less than 50 kg/tow, but exceeded this in LOUI and PUYS in some years. For completeness, median bycatch rates are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish (Figure B7).

### 3.5.2 Annual bycatch levels

Total estimated annual bycatch in each species category and for estimation method is shown in Tables A8–A11 and Figure A8 (orange roughy fishery), and Tables B8–B11 and Figure B8 (oreo fishery). Overall the estimated bycatch for both methods were similar, although more often than not the statistical model method estimates were lower than the ratio method estimates, and the confidence intervals tended to be smaller for the statistical model method. These smaller confidence intervals are due to the better ability of the statistical model to deal with outliers in the input data, as it utilises the whole dataset to inform individual strata coefficients, thus diminishing the influence of large values.

Visual inspection of the MCMC traces was used to assess convergence for estimated parameters, and were acceptable in all cases. Example MCMC traces of the derived predicted bycatch are shown in Figures A9 and B9. Convergence is demonstrated in all cases, which is consistent with convergence for the individual component parameters of the model.

Negative slopes in the linear regressions on bycatch levels over time (based on the ratio method) indicate that the bycatch of most species categories has generally decreased over time in both fisheries with the exception of morid and slickhead species in the oreo fishery, which increased (significantly for morids) over time (Tables A12 and B12). The decreasing trends were also significant, except for rattails in the orange roughy fishery and QMS and shark categories in the oreo fishery.

The following summaries focus on the results of the ratio method. The trends described are common to both methods, but the estimated amounts differ to varying degrees and are noted where they are more substantial.

**Orange roughy fishery**
The estimated annual bycatch of QMS species ranged from a low of 364 t (in 2012–13) to a high of 4197 t (in 2003–04). The bycatch of QMS species fluctuated considerably between years, most likely due to occasional large catches of oreos or other deepwater quota species, but has decreased since 2001–02 and remained relatively steady at 364–772 t per year since 2010–11 (Table A10, Figure A7). Bycatch of QMS species was consistently highest in CHAT (about 212–3034 t), and lowest in WCNI, WCSI, NWCH, HOWE and LOUI (Tables A8a and A9a, Figure A8).

The estimated annual bycatch of non-QMS species was much lower than that of QMS species in each year, ranging from 249 t (in 2013–14) to about 2539 t (in 2001–02), and like QMS species also decreased from 2001–02, remaining stable over the last 5 years at 249–427 t. Bycatch of non-QMS species by area was highly variable, ranging from 0.1–1483 t, and highest in CHAT, EAST and NWCH (Table A8b).

Invertebrate species were only a very small component of the total annual bycatch, amounting to less than 300 t in all but one year. The 2003–04 fishing year was an exception to this, with an estimated 503 t of invertebrate species caught. Inspection of the raw observer data shows that this high level of invertebrate catch stems from several observations of large catches of coral in CHAT in 2004–05 in very short tows.

Notably, the statistical model estimate for this year was not strongly influenced by these outliers (Table A9c,d). Bycatch of invertebrate species by area was generally less than 50 t in most years and areas except for CHAT in 2003–04 to 2007–08 and LOUI in 2003–04 (Table A8c).

Additions of species to the QMS (Table F1) during the period examined (1 October 2001 to 30 September 2015) are unlikely to have made any discernible difference to the patterns of bycatch in any of the three affected catch categories (QMS, non-QMS, and Invertebrate), as additions were mainly limited to minor bycatch species. The most relevant of these were smooth skate (introduced into the QMS on 1 October 2003), along with spiny dogfish, lookdown dory (*Cyttus traversi*, LDO), and king crabs (Lithodidae, KIC) (all introduced into the QMS on 1 October 2004), but none of these were in the top 50 bycatch species (see Tables A1 and A2).

Total bycatch is composed mostly of QMS and non-QMS species and so follows a similar pattern of higher levels (3093–6075 t per year) before 2009–10, and decreasing levels since then of 706–1080 t, in line with decreasing orange roughy landings (Table A10, Figure A8). Total bycatch is weakly correlated with both orange roughy landings and effort, as may be expected with effort having decreased in this fishery since 2010–11. The total bycatch estimates of Anderson (2011) are similar to the current estimates for the overlapping period (2001–02 to 2008–09), but with wider confidence intervals (Figure A8). Annual bycatch estimates by area and in total are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish in Tables A8 to A11, and Figure A8.

Total annual bycatch calculated directly from commercial catch records (by summing the difference between the recorded total catch and orange roughy catch for each trawl (TCP and TCE type forms) or group of trawls (CEL type forms) was lower than the observer data-based estimate in 11 of the 14 years examined, and higher in the remainder, but most values were within the 95% confidence intervals of the observer data-based estimates (Table A13, Figure A10). In the last 5 years the two estimates have become closer. Overall, the total catch record-based annual bycatch for the 14-year period was between 59 and 127% of the observer data-based bycatch.

**Oreo fishery**

In the oreo fishery, the estimated annual bycatch of QMS species ranged from about 158 t (in 2007–08) to a high of 866 t in 2002–03 (Table B10, Figure B8). Although QMS bycatch was variable from year to year, there was a slight increasing trend up to 2004–05, followed by a decrease, with estimates after 2009–10 lower and stable at 147–264 t. Bycatch of QMS species was consistently higher in CHAT (generally over 50 kg per year, and ranging 19–450 kg per year), and also high in some years in PUYS, STEW and SUBA (Table B8a). Estimates from the statistical model method tended to be lower and tighter, especially in the early part of the period (Tables B9a and B11).

The estimated annual bycatch of non-QMS species was lower than that of QMS species in 8 out of the 14 years, ranging from 167 t to over 420 t (in 2001–02, 2002–03, 2005–06 and 2009–10), and showed a decrease throughout the series with lower bycatch levels of 167–257 t from 2010–11 (Table B10). Bycatch of non-QMS species was generally highest in CHAT, STEW and SUBA (Table B8b).

Invertebrate species were only a very small component of the total annual bycatch, amounting to less than 40 t in all but 4 years (Table B10). By area, bycatch of invertebrate species was low (generally below 10 kg) in most years and areas, but was higher in CHAT, PUYS and SUBA in some years (Tables B8c). Inspection of the raw observer data in 2001–02 and 2002–03 shows that this high level of invertebrate catch stems from several observations of large catches of coral. Estimates from the statistical model method of invertebrates tended to be lower and tighter (Tables B9c and B11).

As with the orange roughy fishery, additions of species to the QMS between 1 October 2001 and 30 September 2015 (Table F1) are unlikely to have made any discernible difference to the patterns of bycatch in the QMS, non-QMS, and Invertebrate catch categories, as additions were mainly limited to minor bycatch species. None of the recently added species were in the top 30 bycatch species (see Table B1).

Total bycatch in the oreo fishery has fluctuated over time with higher levels from 2001–02 to 2009–10 (ranging 579–1575 t), and lower levels since 2010–11 (352–535 t) (Table B10). Estimates from the statistical model method tended to be lower, especially in the early part of the period (Table B11). Estimates of total bycatch from the previous review were similar to current estimates for most years although with wider, strongly overlapping confidence intervals. The decrease in effort and landings of oreos since the peak in 1996–97 are only weakly matched by decreasing total bycatch (Figure B8). Annual bycatch estimates are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish in Tables B8 to B11, and Figure B8.

Total annual bycatch calculated directly from commercial catch records differed from the observer-based estimates more than for the orange roughy fishery (Table B13, Figure B10). As in the orange roughy fishery this estimate generally improved over time, with similar values in most of the last 6 years, but in general it seems to be a less reliable alternative estimate for the oreo fishery. This may be due to discrepancies between vessel and observer recording of target species, particularly if the discrepancy is due to a large catch of, e.g., orange roughy when nominally targeting oreos.

## 3.6 Estimation of discards

### 3.6.1 Discard rates

Discard rates by area and year were calculated for each species category from the observer data. For the ratio method the variance associated with the discard estimates was calculated using the bootstrap methods described in Section 2.4; average bycatch rates across all areas in each year were calculated to apply to the small amount of fishing effort outside of the main areas. As with bycatch, the limited spread of observer effort required discard rates for several year/area combinations to include data from adjacent years, as described in Section 2.4 and detailed in Tables A7 and B7.

**Orange roughy fishery**

Median discard rates of ORH were generally very low, less than 20 kg/tow, but were occasionally higher in LOUI, HOWE, EAST and WCNI, to a maximum of about 120 kg/tow (Figure A11). Median discard rates of QMS species were similarly low, generally less than 10 kg/tow, but were at times above 30 kg/tow in NWCH. Non-QMS discard rates were much higher, frequently above 100 kg/tow in many areas, particularly NWCH, CHAT and AUCK. Invertebrate discard rates were similar to catch rates, as most were discarded. As with bycatch, patterns of invertebrate discard rates may have been influenced partly by changes in observer recording practices over time. For completeness, median discard rates are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish in Figure A11.

**Oreo fishery**

Median discard rates of oreo species were variable but generally very low, less than 20 kg/tow in most areas and years. Occasionally they were higher than this, notably in SUBA, LOUI, Other, COOK, EAST and PUYS (Figure B11). Discard rates of QMS species were lower still, less than 2 kg/tow in most cases and close to zero in each area after 2007–08; one large rate (about 8 kg/tow) was associated with CHAT in 2007–08. Much higher discard rates were seen for non-QMS species, especially before 2007–08 when rates were 50–250 kg/tow in all areas, and highest in CHAT and STEW. Non-QMS discard rates declined generally over time, however, and were generally less than 50 kg/tow in each area after 2006–07. Invertebrate discard rates were similar to catch rates, as most were discarded, and were generally close to zero, especially after 2003–04. As with bycatch, these patterns of invertebrate discard rates may have been partially influenced by changes in observer recording practices over time. For completeness, median discard rates are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish in Figure B11.

### 3.6.2 Annual discard levels

Total estimated annual discards in each species category are shown in Tables A14–A17 and Figure A12 (orange roughy fishery), and Tables B14–B17 and Figure B12 (oreo fishery). Overall the estimated discards for both methods were similar, although frequently the statistical model method estimates were lower than the ratio method estimates, and the confidence intervals tended to be smaller for the statistical model method (as seen for bycatch estimates, see Section 3.5.2), especially in the earlier years of the time series.

Negative slopes in the linear regressions on discard levels over time indicated that discards of the target species and most of the other species categories in each fishery generally decreased, with the exception of morid cod and slickhead species in the oreo target fishery (Tables A18 and B18). Most of these trends were significant.

Visual inspection of the MCMC traces was used to assess convergence for estimated parameters, and were acceptable in all cases. Example MCMC traces of the derived predicted discards are shown in Figures A13 and B13. Convergence is demonstrated in all cases, which is consistent with convergence for the individual component parameters of the model.

**Orange roughy fishery**

Total estimated annual discards in each species category are shown in Tables A14 to A17 and Figure A12. Discards of orange roughy were generally low, with a range of 5–122 t per year, and highest in 2003–04 and no trend over time is obvious (Table A16, Figure A12). Most estimates were lower than estimates calculated for equivalent years in Anderson (2011), and estimates from the statistical model were lower again, due to different methods of treating outliers (both within the grooming procedures and modelling methodology). Within individual areas, discards of orange roughy were generally less than 10 t per year, although occasionally higher in some areas (Table A14a). Discards of QMS species were variable – higher early in the series (2001–02 to 2005–06, range 20–47 t), but thereafter not exceeding 15 t until 2014–15 – but overall showed a decreasing trend (Table A16). By area, QMS species discards ranged from close to zero in all areas, to a maximum of about 44 t per year, and were highest in the ET area NWCH (Table A14b). Annual discards of non-QMS species were much higher than QMS discards, 715–1970 t from 2001–02 to 2006–07, 126–419 t thereafter, and showed a decreasing trend (Table A16). By area, non-QMS species discards were less than 50 t in most areas and years, but sometimes higher in CHAT, EAST, SUBA, NWCH and LOUI mainly in the earlier years. The highest non-QMS discard levels, over 1000 t, were seen in CHAT in 2005–06, and in NWCH in 2001–02 (Table A14c). Annual discards of invertebrates showed a similar trend to QMS and non-QMS species with higher discards up until 2005–06 (101–490 t) then lower thereafter (6–65 t) (Table A16). The high level of invertebrate discards in 2003–04 (490 t) are due to a few large catches of coral in CHAT in 2003–04. By area, discard for invertebrates were generally less than 10 t per year but sometimes higher in CHAT, PUYS, NWCH and LOUI, especially in earlier years (Table A14d).

Estimates of total annual discards showed a similar, decreasing trend to QMS, non-QMS, and INV species discards. Up until 2006–07 total annual discards were relatively constant and high, ranging from 792–2116 t, then lower subsequently (184–496 t) (Table A16). This decline in discards roughly tracked the decrease in landings (and therefore effort) in the orange roughy fishery (comparing Figures A12 and A8). The estimates for 2001–02 to 2008–09 match closely to those of Anderson (2011) for the same years, with strongly overlapping confidence intervals (Figure A12), except for 2004–05 (higher) and 2005–06 (lower). Estimates from the statistical model are generally lower than those from the ratio method, especially in earlier years, although confidence intervals mostly overlap. Annual discard estimates are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish in Tables A14–A17 and Figure A12. Regression analysis showed negative slopes in annual discards for all species categories, statistically significant except for rattails (Table A18).

**Oreo fishery**

In the oreo fishery, discards mostly comprised non-QMS species (Tables B14–B17, Figure B12). Discards of oreo species were generally low (0–73 t per year) and showed no clear trend, with the highest levels in the middle of the period (2004–05 and 2006–07) (Table B16). Most estimates were considerably lower than estimates calculated in Anderson (2011) (a possible result of removal of some of the large outliers (lost fish) during the grooming process), but generally similar to those from the statistical model. By area, oreo discards were generally less than 10 t per year, although higher in some cases, e.g., 43 t in SUBA in 2004–05 (Table B14a). Discards of QMS species were low, 6 t or less in each year, and showed no trend over time. By area, QMS species discards were less than 1 t per year in all areas and years except for 2007–08 where they were 4.5 t in CHAT (Table B14b). Discards of non-QMS species were variable and showed a decreasing trend, with a range of 220–431 t per year until 2006–07, and 7–99 t per year since (Table B16). By area, discards of non-QMS species were generally less than 50 t per year but occasionally higher, with a maximum of about 115 t in 2005–06 in SUBA, and other high values in CHAT and STEW in some years (Table B14c). Aside from a few high values, there was no obvious overall difference in discards between areas, although higher values tended to be in earlier years. Annual discards of invertebrates showed no clear trend, and were below 30 t per year except in 2001–02 (107 t per year) and 2002–03 (222 t per year) (Table B16). By area, discards for invertebrates were low, generally less than 10 t per year, although higher in CHAT and PUYS in some years (Table B14d).

Total discards slowly decreased over time, with the 14 t estimated for 2014–15 the lowest in the whole series (Table B16). Estimates from the previous review were higher than the current estimates in all years except for in 2002–03 (perhaps a result of removal of some of the large outliers (lost fish) during the grooming process), and estimates from the statistical model were consistently lower than those from the ratio method (Figure B12). The decline in total annual discards in the oreo fishery roughly tracked the decrease in landings in 2001–02 (and therefore effort) in this fishery (see Figure B8). Annual discard estimates are also provided for corals, morid cods, rattails, slickheads, sharks, Schedule 6 species and spiny dogfish in Tables B14–B17 and Figure B12. Regression analysis showed negative slopes in annual discards for all species categories except for morid and slickhead species, and were statistically significant except for QMS, shark and slickhead species (Table B18).

### 3.6.3 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 Catch Landing Return (CLR) forms. To assess the extent of discarding reported in this way, an examination of CLR data was made, based on all fishing trips that mainly targeted orange roughy or mainly targeted oreos (defined for this purpose as greater than 50% of tows/days). This showed that, in both the orange roughy and oreo fisheries, 26 t of observer authorised discards were recorded in 2014–15, but none were recorded in 2012–13 or 2013–14.

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 would be difficult.

Observer authorised discarding clearly has the potential to bias estimation of discards that 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 infer zero discarding of (non-Schedule 6, or fish smaller than MLS) QMS species in the unobserved portion of the fishery. The annual QMS species discard estimates presented in this report therefore make the assumption 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 orange roughy and oreo trawl fisheries

Annual bycatch and discard estimates in the orange roughy and oreo 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 A19 and B19, Figures A14 and B14). 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 the majority of the catch), in a form that can easily be compared across any fishery. This measure may be influenced not only by changes in targeting accuracy but also by the abundance of bycatch species, and these effects are difficult to separate. 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.

In the orange roughy fishery, the bycatch fraction dropped from about 0.2–0.4 between 2001–02 and 2009–10 to a level of about 0.1–0.2 thereafter. Although variable from year to year, the discard fraction also showed a general decline over time, from a high of 0.13 in 2001–02 to a low of 0.02 in 2013–14, with an overall value for the 14-year period of 0.07 (Table A19). Total discards were considerably less than total bycatch in each year but discards as a fraction of bycatch has been highly variable over time, from about 0.2–0.5 up to 2006–07, dropping to 0.1–0.2 for the following four years, then increasing to 0.2–0.3 in the last three years up to 2014–15.

For the oreo fishery, the discard fraction was much lower than in the orange roughy fishery, declining from 0.03–0.05 at the start of the period to less than 0.01 in the last three years, with an overall value for the 14-year period of 0.01 (Table B19). The bycatch fraction was between 0.04 and 0.12 throughout the period, also steadily decreasing over time. Total discards as a fraction of bycatch was higher overall than in the orange roughy fishery, but declined strongly over time from 0.51 in 2001–02 to 0.03 in 2014–15, indicating an increasing utilisation of bycatch over time in this fishery.

## 3.8 Annual bycatch by individual species in the orange roughy and oreo trawl fisheries

Annual bycatch estimates for the most commonly caught individual species (those with at least 1 t of bycatch in at least one year, comprising: the top 16 QMS, top 81 non-QMS, and top 35 invertebrate species observed in the orange roughy fishery; and the top 10 QMS, top 35 non-QMS, and top 14 invertebrate species observed in the oreo fishery), along with regression slopes indicating general trends in abundance, are presented in Tables A20 and B20.

Based on these estimates, for the orange roughy target fishery, the most commonly caught bycatch species over the entire commercial fishery were (in decreasing order): combined oreo species (OEO, SSO, BOE, SOR and WOE); rattails (RAT); slickhead species (SLK); shovelnose dogfish (SND); hoki (HOK); morid cods (MOD); and seal sharks (BSH) (Table A20, Figure A15). Of the 133 bycatch species examined, 32 have shown a significant decrease in catch over time, and 7 an increase in catch over time (the remaining species showing no change at the 1% level of significance) (Table A20). Among the species showing significant declines were oreos, black cardinalfish and rattails (RAT); species showing significant increases included Plunket sharks (*Proscymnodon plunketi*, PLS), leafscale gulper sharks (*Centrophorus squamosus*, CSQ), and smooth skin dogfish (*Centroscymnus owstoni*, CYO) (Table A20). Importantly, however, these increases in individual shark species bycatch occurred alongside decreasing bycatch of sharks recorded under the generic code DWD (deepwater dogfish) and are likely to be at least partly the result of a steady improvement in identification of sharks over time. A switch from the generic code RAT to specific rattail species codes is not the cause of declining bycatch for that species group however, as catches of the main rattail species (javelinfish (JAV), white rattail (WHX) and unicorn rattail (WHR)) have also decreased.

For the oreo target trawls, the most commonly caught bycatch species over the entire commercial fishery were (in decreasing order): orange roughy (ORH); Baxter's lantern dogfish (ETB); rattails (RAT); hoki (HOK); *Etmopterus* spp. (ETM); coral unspecified (COU); seal sharks (BSH); and slickhead species

(SLK) (Table B20, Figure B15). Of the 61 bycatch species examined, 6 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). Among the species showing significant declines were rattails (RAT), deepwater dogfish (DWD), and coral unspecified (COU); the 2 species showing significant increases were longnose velvet dogfish (*Centroscymnus crepidater*, CYP) and smallscaled brown slickheads (*Alepocephalus antipodianus*, SSM) (Table B20, Figure B14). In this fishery too, trends in shark catches may be an artefact of observers increasingly using the specific shark code CYP at the expense of the generic DWD code and the use of the generic 'coral unspecified' code (COU) may have declined over time in favour of more specific codes. Where these and other species codes are considered to have been inconsistently used over time, this is indicated in Tables A20 and B20.

### 3.9 Additional analyses for specific spatial management requirements

The following additional analyses were conducted for management purposes:

1) Calculation of bycatch and discards for the orange roughy fishery for current management areas on the Chatham Rise (NWCR and ESCR)
2) Calculation of bycatch and discards for the oreo fishery for QMA management areas on the Chatham Rise (OEO 3A and OEO 4)
3) Calculation of bycatch and discards for the combined orange roughy and oreo fisheries for the Marine Stewardship Council orange roughy Unit of Certification (UoC) area.

Results of these additional analyses are reported in Appendices C, D and E.

## 4. SUMMARY AND DISCUSSION

**Observer coverage**

The annual estimates of bycatch and discards for the entire orange roughy and oreo 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 38% and 29% of the total estimated target species catch in the orange roughy and oreo target trawl fisheries, respectively. Coverage in the orange roughy fishery was over 29% from 2004–05, and over 50% in some years, and over 20% in the oreo fishery from 2004–05 to 2010–11, and in 2013–14. In comparison, for approximately the same period, annual observer coverage was 10–95% in the jack mackerel fishery, 35–40% in the southern blue whiting fishery, 30–35% in the arrow squid fisheries, and at lower levels in the hoki/hake/ling trawl fishery (22%), ling longline fishery (11%), and scampi fishery (10%) (Anderson 2009b, 2011, 2012, 2013, Anderson et al. 2017, Ballara & O'Driscoll 2015).

Overall, the distribution of observer effort has been highly representative of total commercial effort across the range of available fishery parameters (e.g., area, vessels, time of year). The major orange roughy fisheries on the Chatham Rise, east coast North Island, sub-Antarctic, Northland, and ET fisheries to the west and east of New Zealand were all well sampled by observers in most years; the main oreo fisheries on the South Chatham Rise, Southland, and in the sub-Antarctic were also consistently well covered. The main vessels and vessel sizes operating in both fisheries received appropriate levels of coverage, although the smallest vessels were somewhat under-represented, notably in the oreo fishery, but also in the east coast orange roughy fisheries. Other variables examined, such as the seasonal and latitudinal and longitudinal spread of observer effort, were also well matched to the total commercial effort, especially when considering all years of coverage combined, if not always so much within individual years or blocks of years. The orange roughy fishery is by far the most widespread of any New Zealand fishery and achieving even observer coverage across its entire extent is challenging. Only about 7% of the observed trips examined in this study predominantly targeted oreos, and about 67% of the sampled trawls in the oreo fishery were from trips that predominantly targeted orange roughy, therefore achieving an even spread of observer coverage by month in this fishery is also difficult.

**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 standardised areas did not match the current management divisions in the orange roughy and oreo fisheries, separate analyses conducted for critical management areas on the Chatham Rise will be useful for informing specific management decisions in those regions.

One of the advantages of the model-based method is that it allows for a natural inclusion of other covariates. More specifically with regards to this point, a model-based approach: provides 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.

The results presented here show that when the same model covariates are used (namely time and area) the ratio- and model-based methods give similar predictions of the bycatch, although the statistical model method deals better with outliers. Where confidence intervals (CIs) are large for the ratio method due to occasional large bycatch or discard values, the statistical model method tends to produce lower point estimates and tighter CIs.

Estimation of bycatch and discards focused on three broad categories of catch; QMS species, non-QMS species, and 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 analysis of the jack mackerel fishery, Anderson et al. 2017). Here for the first time 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 orange roughy and oreo fisheries with those from the current study to estimates of *total* bycatch and *total* discards, and discards of the target species, for the eight years in which the studies overlap. The updated estimates of total annual bycatch and discards for these eight years (for both the ratio and the statistical model method) were however similar to the earlier estimates in most cases. The small differences seen in some cases are likely to be due to slight differences in data grooming methods and the revised procedure used in our analyses for dealing with data-poor strata. The largest discrepancy between studies was for target species and total discards in the oreo fishery. In this case the lower values estimated here were likely to have been partly due to a more stringent treatment of records of lost fish from damaged nets, with some large losses disregarded where strong corroborative evidence was lacking.

**Composition and level of bycatch and discards**

Since 2001–02, orange roughy have accounted for about 85% of the total estimated catch weight recorded by observers in the target trawl fishery. The remainder of the (observed) catch comprised primarily smooth oreo (7%), black oreo (1.6%), hoki (0.6%) and black cardinalfish (0.3%), plus a range of non-commercial species including various species of deepwater dogfishes, rattails, morid cods and slickheads. Non-QMS invertebrate species made up only a very small fraction of the overall catch, with warty squid and corals the main groups caught. 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 orange roughy fishery from 2001–02 to 2009–10 ranged 3093–6075 t per year, but declined over time with the decline in catch in this fishery and was 1100 t or less in each of the five most recent fishing years (2010–11 to 2014–15). QMS species comprised a larger proportion of the catch than non-QMS species, particularly after the introduction of key bycatch species into the

QMS early in the time series, and both species categories showed the same declining trend as for total bycatch. Total annual discards also decreased over time, from a high of 2117 t in 2001–02 to a low of 184 t in 2013–14, and comprised almost entirely non-QMS and invertebrate species. Discard levels of orange roughy and other commercial species, higher early in the 14-year period, was at least partly due to fish lost from torn nets during hauling. The main species discarded since 2001–02 were rattails, shovelnose spiny dogfish, and other deepwater dogfishes, all of which were discarded at a rate of 50% or more.

Since 2001–02, oreos (all four species combined) have accounted for about 95% of the total estimated catch weight recorded by observers in the target trawl fishery. The remainder of the (observed) catch comprised mainly orange roughy (1.9%), hoki (0.4%) and pale ghost shark (0.3%), plus non-commercial species of deepwater dogfish, rattails, morid cods and slickheads. Non-QMS invertebrate species made up only a very small fraction of the overall catch (less than 0.1%), with corals and warty squid being the main species. Most of the remaining observed species or species groups each accounted for 0.01% or less of the observed catch during the period.

Total bycatch in the oreo fishery has fluctuated with higher levels from 2001–02 to 2009–10 (ranging 579–1575 t), with lower levels of bycatch from 2010–11 (352–535 t). The decrease in landings of oreos since the peak in 1996–97 is only weakly matched by decreasing total bycatch. Total discards showed a slow decrease, with the 14 t estimated for 2014–15 the lowest for 14 years. In the oreo fishery, total discards were mostly composed of non-QMS species. Discards of oreo species were generally low, at about 0–73 t per year, and showed no clear trend although estimates for the last three years of the series were zero. The statistical-based modelling method could have been used to calculate separate estimates of smooth and black oreo discards, but due to time constraints this was not done. Discards of non-QMS species were variable and showed a decreasing trend, and annual discards of invertebrates were low, also with a decreasing trend. The decline in total annual discards in the oreo fishery roughly tracked the decrease in estimated target fishery catch (and effort) from 2001–02 in this fishery. The main species discarded were rattails, Baxter's dogfish, and other deepwater dogfishes.

The most commonly observed non-QMS bycatch species/species groups in the orange roughy fishery were rattails (0.68% of the total observed catch), shovelnose dogfish (0.55%), slickheads (0.47%) and Baxter's dogfish (0.37%). These were all fairly insignificant relative to the total catch in this fishery, nevertheless, despite being of low economic value, close to half the catch was recorded as retained, probably due to the use of meal plants in this fishery. Separate estimates of annual bycatch and discards for rattail and slickhead species showed that retention was not even over time, with much lower levels of discarding between 2007–08 and 2009–10 than outside of this period, for both groups.

Baxter's dogfish and rattails were also the most commonly observed non-QMS bycatch species/species groups in the oreo fishery (0.37% and 0.55% of the total observed catch, respectively), followed by ridge-scaled rattails (0.19%) and slickheads (0.14%). Again, a substantial amount of the catch of these species was recorded as retained, especially ridge-scaled rattails (over 98%). Although these figures are easily influenced by errors in coding or recording of the processing data, or the species code, due to the small quantities involved, retention of this rattail species is likely to be real (with landings coded as RAT), as this species was also rarely discarded in the orange roughy fishery. Separate estimates of annual bycatch and discards for rattail and slickhead species confirm retention of these species, more so later in the time series.

Invertebrate catch in both fisheries primarily comprises squids, corals and echinoderms, but all are a relatively minor part of the catch in terms of weight, with none representing more than 0.2% of the total target catch in each fishery. The separate estimates of annual bycatch and discards of protected coral species confirms this, and these showed less than 5 t of coral catch in all but two years in the orange roughy fishery and lower amounts in the oreo fishery.

Trends in bycatch and discards of QMS species and non-QMS species are difficult to interpret due to the requirement that these categories take into account the date of entry into the QMS, but in the orange roughy fishery bycatch and discards of both species categories, as well as of total bycatch and each of the other categories examined, declined over time – in most cases significantly. The same is largely true for the oreo fishery, except that bycatch of slickheads increased slightly over time and discards of morid cods and slickheads also increased over time.

For the orange roughy fishery, total bycatch determined from commercial catch-effort records was quite similar in recent years to the observer-based estimates, and generally showed a similar decreasing trend, but was much lower in the early years of the series. The two estimates were also much closer in recent years than for earlier years in the oreo fishery, and both showed a variable, declining trend with the catch-effort records-based estimates consistently lower than the observer-based estimates.

The estimation of bycatch levels for a wide range of individual species in the orange roughy and oreo 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 inferring a change in abundance.

**Discards relative to target catch**

The discard fraction (kg of discards/kg of orange roughy catch) ranged from 0.02 in 2013–14 to 0.13 in 2001–02, with an overall value for the 14-year period of 0.07. Although variable from year to year, the discard fraction has tended to be lower in recent years (mean of 0.09 for 2002–08, and 0.04 for 2009–15). The equivalent fractions of discarded fish in the oreo fishery was much lower than in the orange roughy fishery, and relatively steady at about 0.01–0.05 for the whole period, with an overall value for the 14-year period of 0.01. The oreo discard fraction has also tended to be lower in recent years (0.03 for 2002–08, and 0.01 for 2009–15). This current rate is greater than recent average rates in the southern blue whiting (0.005 kg) and jack mackerel (0.007) fisheries, but similar to those in the arrow squid (0.06 kg) and hoki, hake, ling (0.06 kg) fisheries, and less than those in the scampi trawl fishery (4.2 kg) and in the ling longline fishery (0.3 kg) (Anderson 2009b, 2011, 2012, 2013, 2014, Anderson et al. 2017, Ballara & O'Driscoll 2015).

## 5. ACKNOWLEDGMENTS

We would like to acknowledge the fisheries 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 Di Tracey (NIWA) and members of the Aquatic Environment Working Group for their reviews of the analysis and report. This work was funded by the Ministry for Primary Industries project DAE2015/04.

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# 7. TABLES

**Table 1: Criteria used to identify likely errors in the observer data, and the number of records that met those criteria for target orange roughy or oreo trawls for 1991–2015 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 | 45 044 |
| Missing/outlying start longitude (< 157° E or < 167° W) | 4 198 |
| Missing/outlying end longitude (< 157° E or < 167° W) | 4 317 |
| Missing/outlying start latitude (58° S) | 26 |
| Missing/outlying end latitude (58° S) | 137 |
| Calculated distance missing or > 50 km | 242 |
| Missing/outlying start gear depths ( 2000 m) | 856 |
| Missing/outlying start bottom depth ( 2000 m) | 5 057 |
| Missing/outlying fishing duration (>15 h) | 54 |
| Missing/outlying fishing speed ( 6 knots) | 602 |
| Fish lost at subsurface missing | 768 |
| Fish lost at surface missing | 771 |

**Table 2: Details of data corrections by record removal during the grooming process of commercial data. 'Records' is the number of unique records; 'Trips' is the number of unique trips; and 'Catch' is the total greenweight of all species remaining in the effort and landings datasets after each step in the grooming process. The bottom row shows those data used in subsequent analyses in this report.**

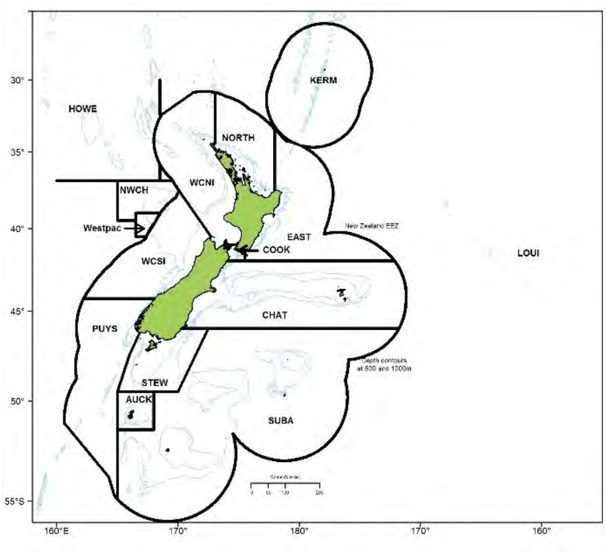
| | | | Effort | | | Landings |
|---|---|---|---|---|---|---|
| Step | Records | Trips | Catch | Records | Trips | Catch |
| Original extract | 603 058 | 14 801 | 3 411 712 | 603 058 | 14 801 | 3 411 712 |
| Remove invalid start date | 597 185 | 14 711 | 3 377 758 | 597 185 | 14 711 | 3 377 758 |
| Trawl (MW and BT) only | 593 523 | 14 401 | 3 374 040 | - | - | - |
| Target ORH/OEO only | 240 612 | 10 505 | 964 162 | - | - | - |
| Fishing years 1991–2015 only | 231 599 | 10 002 | 908 655 | - | - | - |
| Fishing years 2002–2015 only | 93 651 | 3 564 | 378 859 | - | - | - |

**Table 3: Criteria used to identify likely errors in the commercial effort data for target orange roughy or oreo trawls for 2002–15 fishing years by form type.**

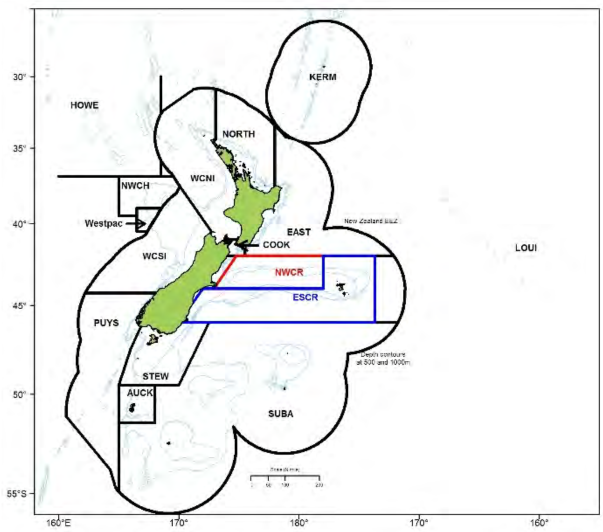
| Field (range) | CEL | TCE | TCP | HCE | HTC |
|---|---|---|---|---|---|
| All rows | 1 393 | 1 056 | 74 492 | 89 | 16 268 |
| Missing/outlying start longitude (< 157° E or < 167° W) | 1 249 | - | 1 866 | - | 4 549 |
| Missing/outlying end longitude (< 157° E or < 167° W) | 1 393 | 1 056 | 1 876 | 89 | 4 554 |
| Missing/outlying start latitude (58° S) | 1 249 | - | 40 | - | 185 |
| Missing/outlying end latitude (58° S) | 1 393 | 1 056 | 50 | 89 | 190 |
| Calculated distance missing or > 50 km | 1 393 | 1 056 | 341 | 89 | 237 |
| Missing/outlying gear depths (2000 m) | 1 393 | - | - | 89 | 4 |
| Missing/outlying bottom depth (2000 m) | 1 393 | - | - | 89 | 4 |
| Missing/outlying fishing duration (>15 h) | 107 | 2 | 26 | 37 | 39 |
| Missing/outlying fishing speed (6 knots) | 1 393 | - | - | 89 | - |

## 8. FIGURES

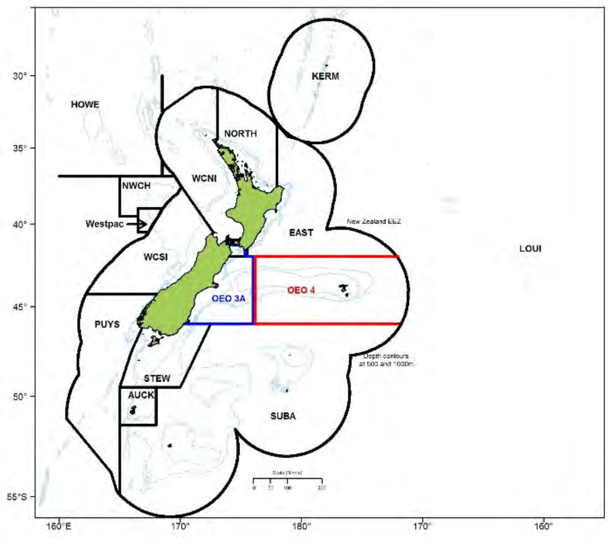
**(a) Standardised assessment areas**




**(b) ORH area splits**




**(c) OEO area splits**




**(d) UoC region**

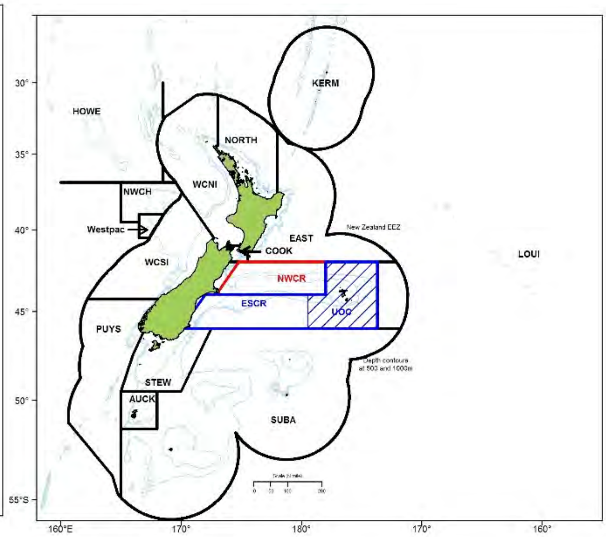



**Figure 1: (a) Standardised assessment areas for estimation of total non-protected fish and invertebrate bycatch in offshore fisheries, with the out of EEZ areas HOWE (Lord Howe Rise), NWCH (North West Challenger), and LOUI (Louisville Ridge) added. Westpac Bank has been added into the WCSI fishery area. (b) Includes the orange roughy Chatham Rise areas NWCR (northwest Chatham Rise) and ESCR (east and south Chatham Rise). (c) Includes oreo Chatham Rise areas OEO 3A and OEO 4. (d) Includes Chatham Rise Marine Stewardship Council (MSC) Unit of Certification (UoC) area splits.**

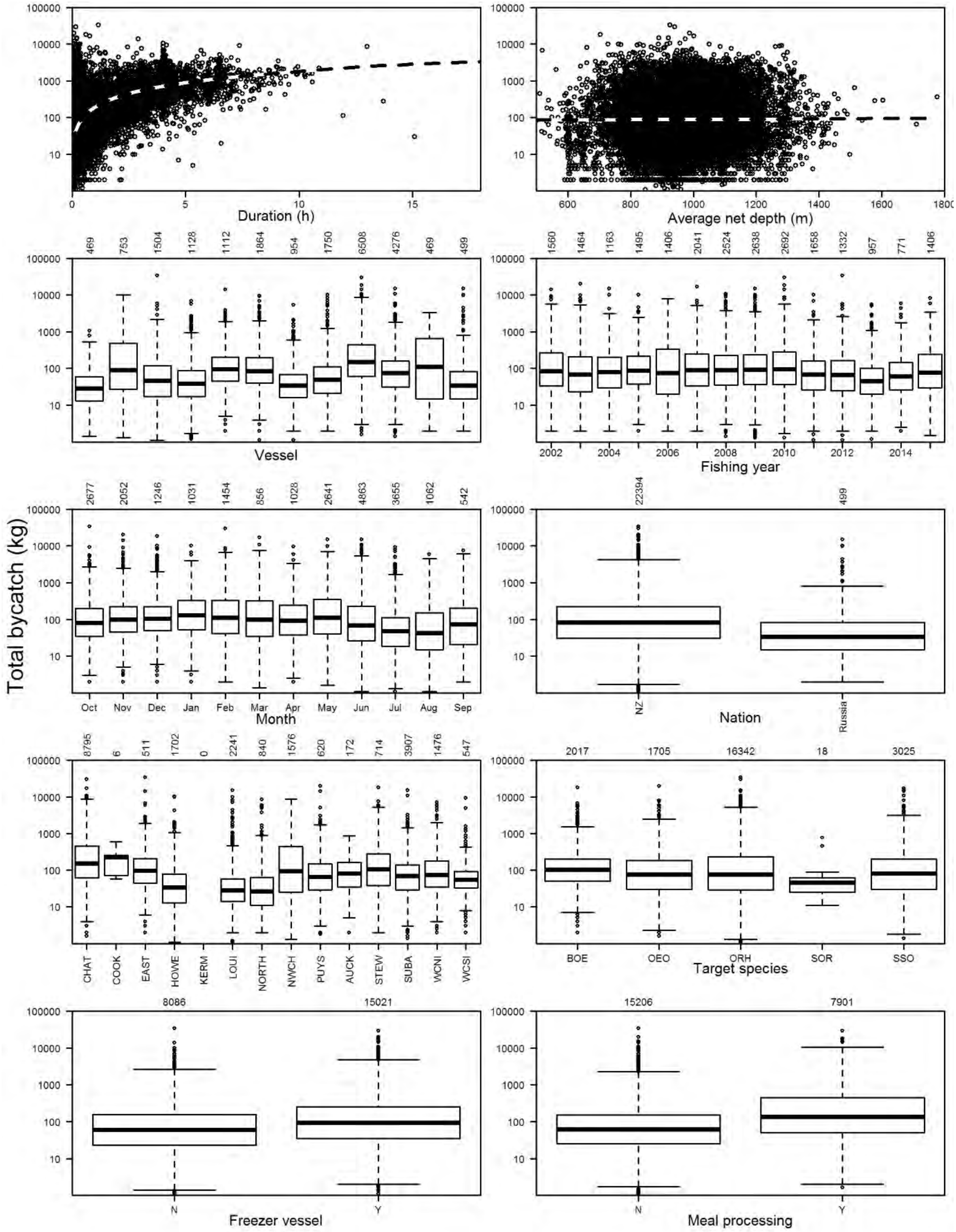



**Figure 2: Total observed bycatch (all species) per tow (kg), plotted against selected variables in the orange roughy and oreo trawl fisheries for the fishing years 2002–15, on a log scale. The dashed lines in the top panels represent mean fits (using a locally weighted regression smoother) to the data. The box and whisker plots show medians and lower and upper quartiles in the box, whiskers extending up to 1.5x 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 (only those with >500 records shown). Average depth is the average of the start and finish depths of the tow. See Figure 1 for area codes.**

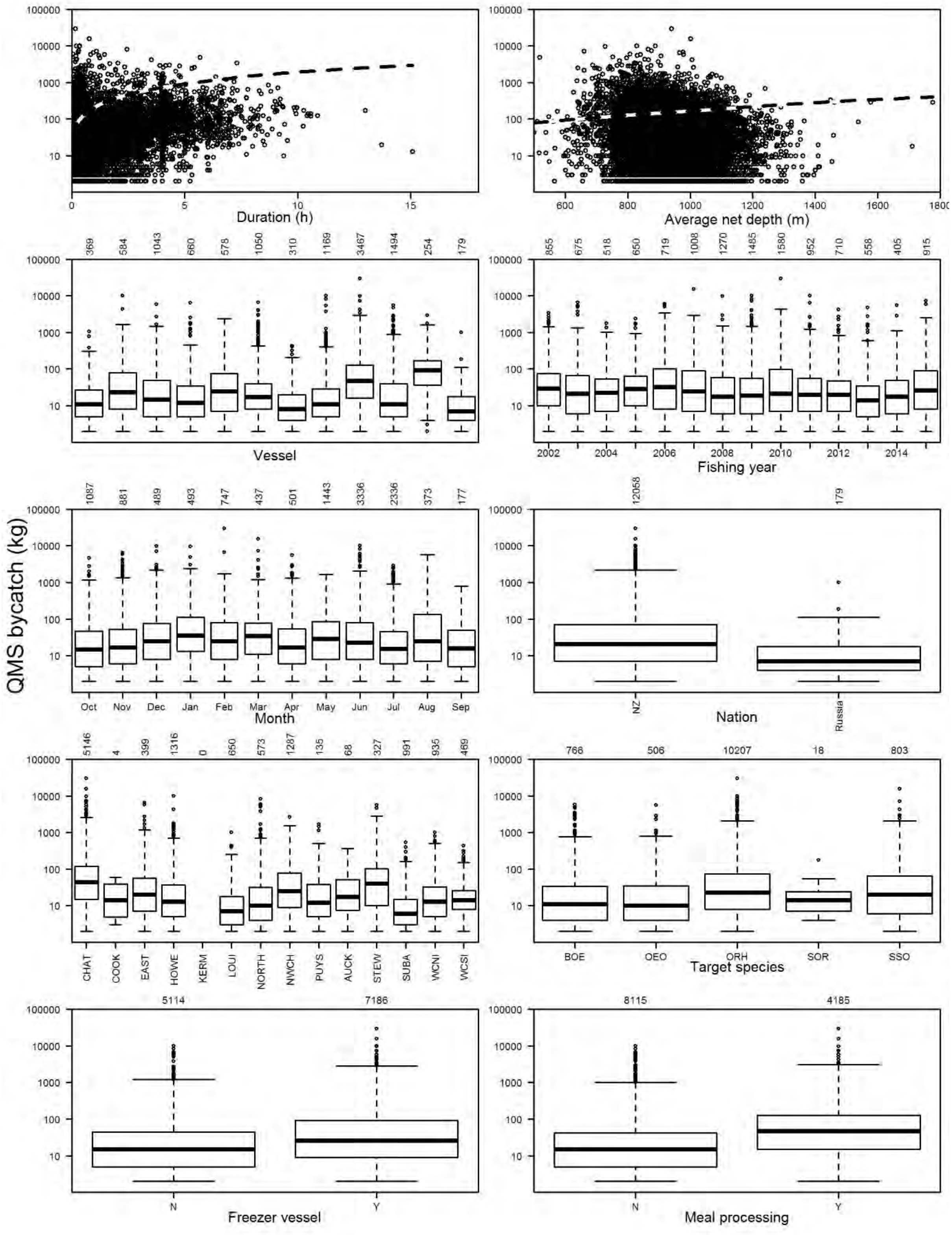



**Figure 3: QMS species bycatch per tow (kg) plotted against selected variables in the orange roughy and oreo trawl fisheries for the fishing years 2002–15, on a log scale. See Figure 2 for further details.**

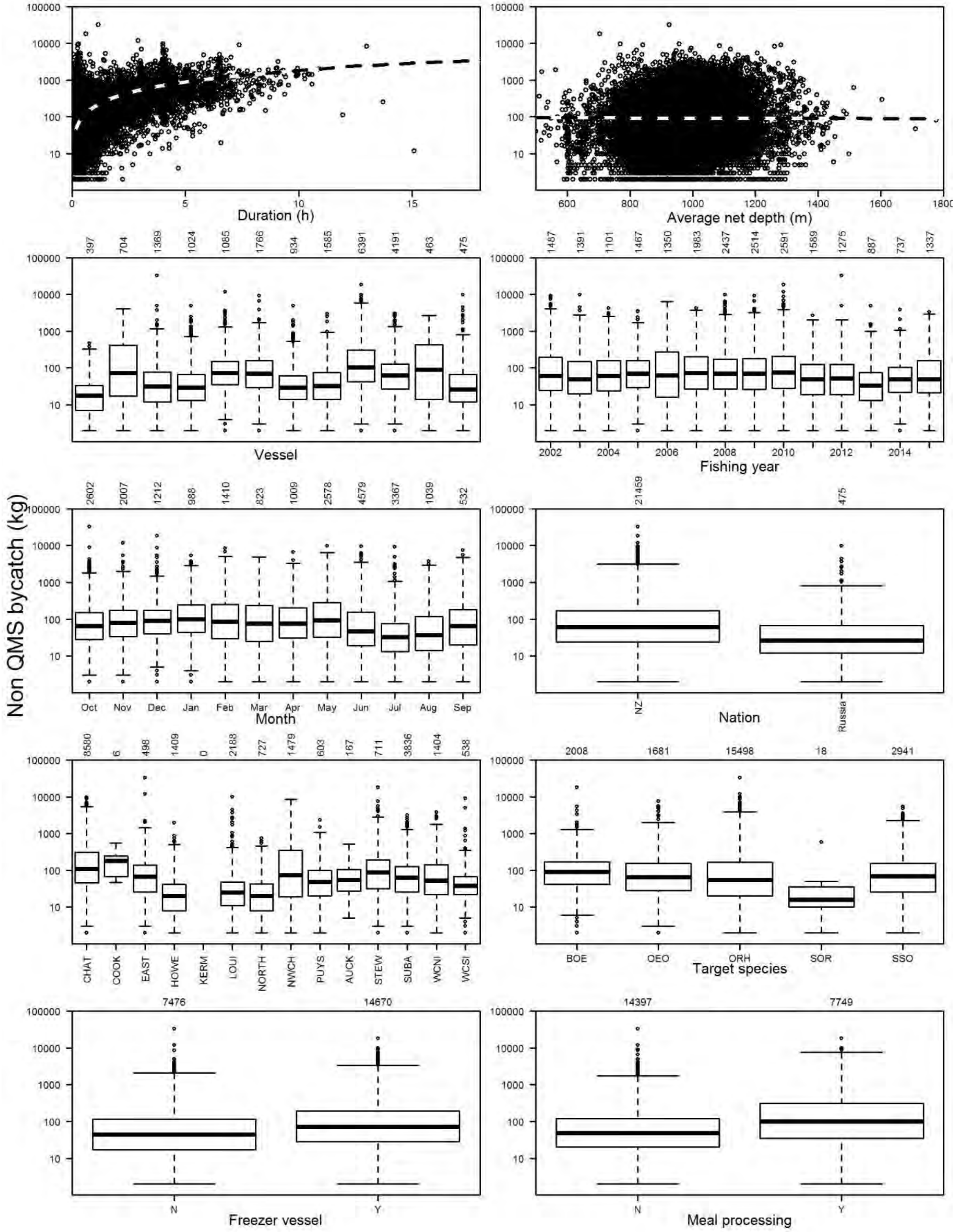



**Figure 4: Non-QMS species bycatch per tow (kg) plotted against selected variables in the orange roughy and oreo trawl fisheries for the fishing years 2002–15, on a log scale. See Figure 2 for further details.**

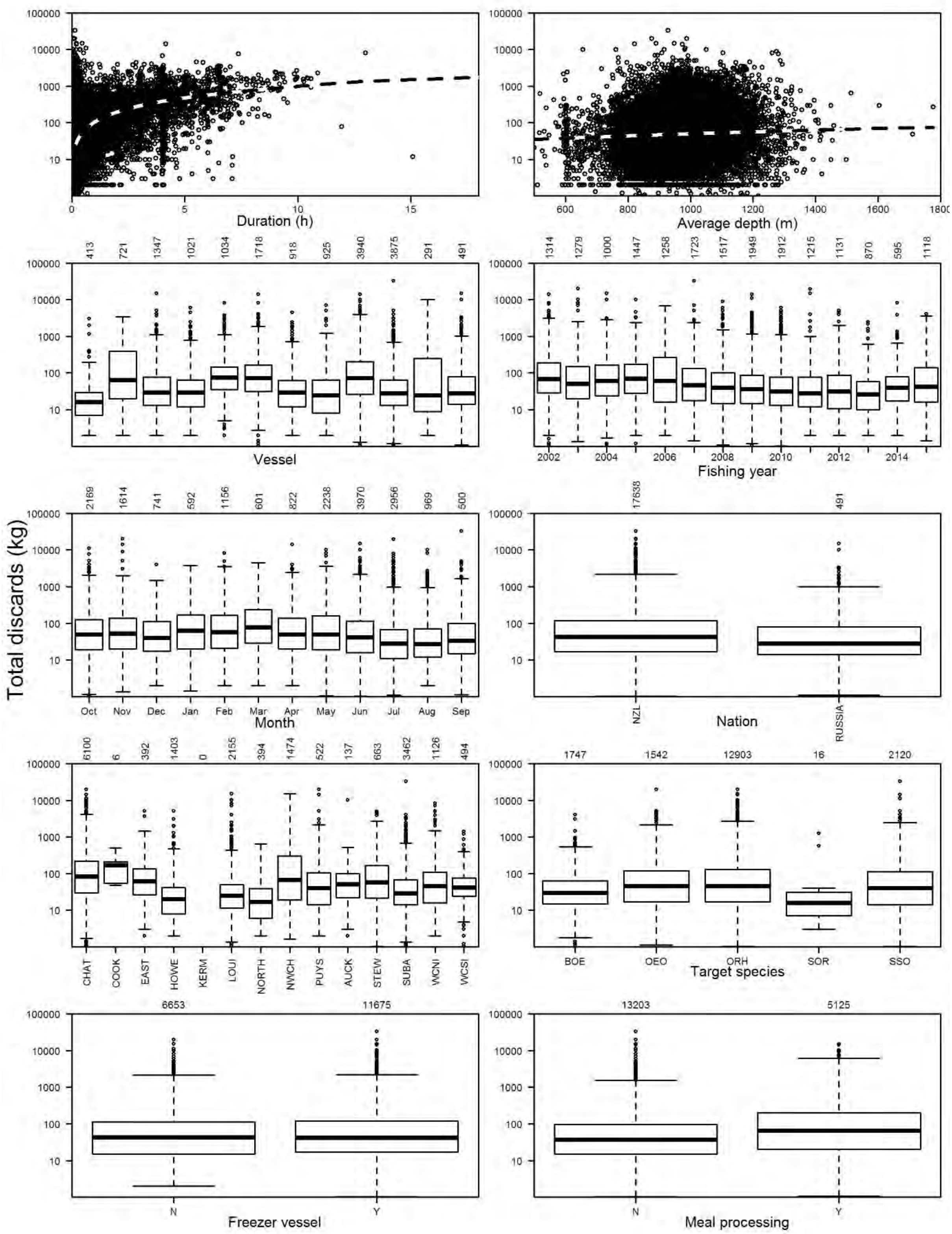


**Figure 5: Total observed discards (all species) per tow (kg) plotted against selected variables in the orange roughy and oreo target trawl fisheries for the fishing years 2002–15, on a log scale. See Figure 2 for further details.**

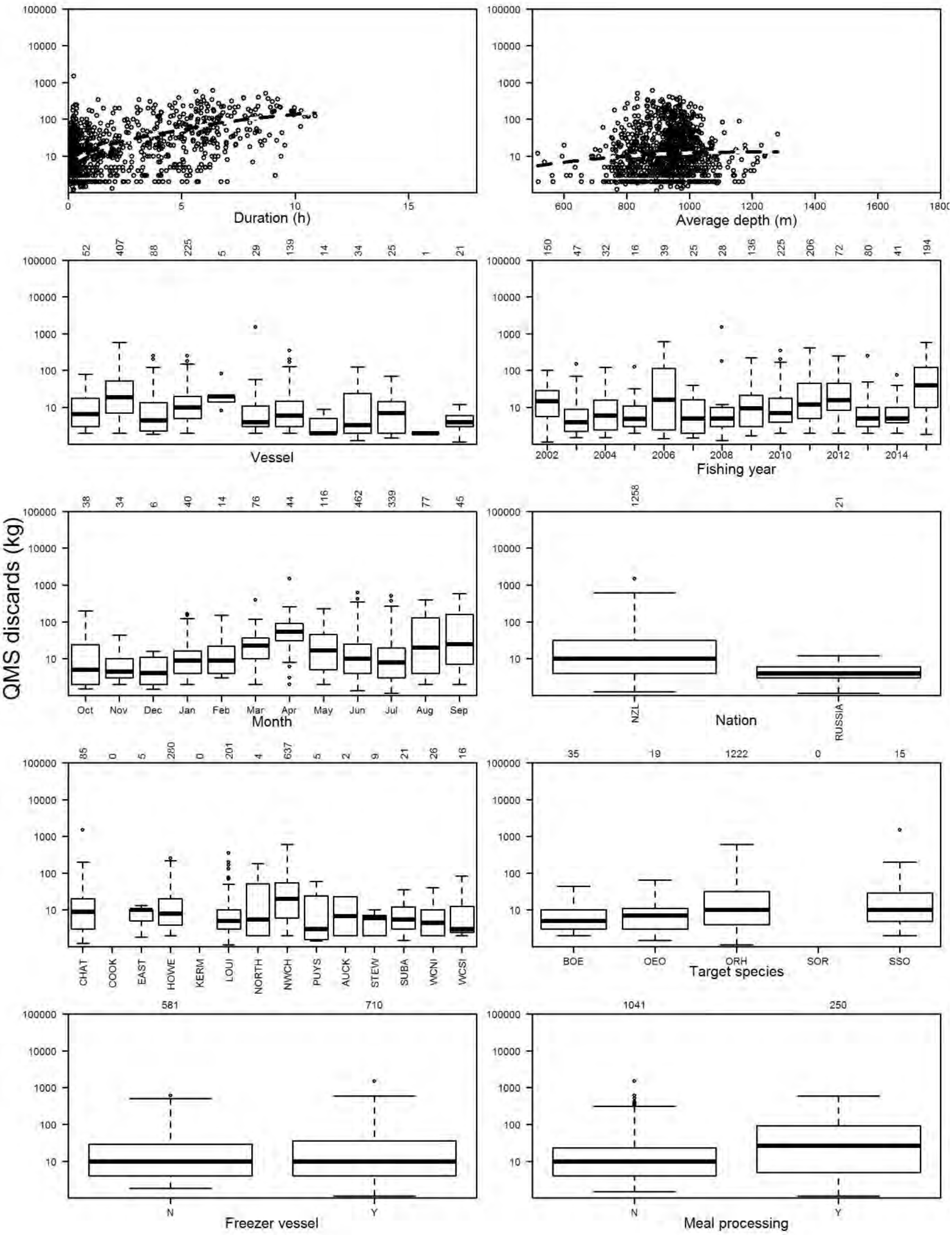



**Figure 6: QMS species discards per tow (kg) plotted against selected variables in the orange roughy and oreo target trawl fisheries for the fishing years 2002–15, on a log scale. See Figure 2 for further details.**

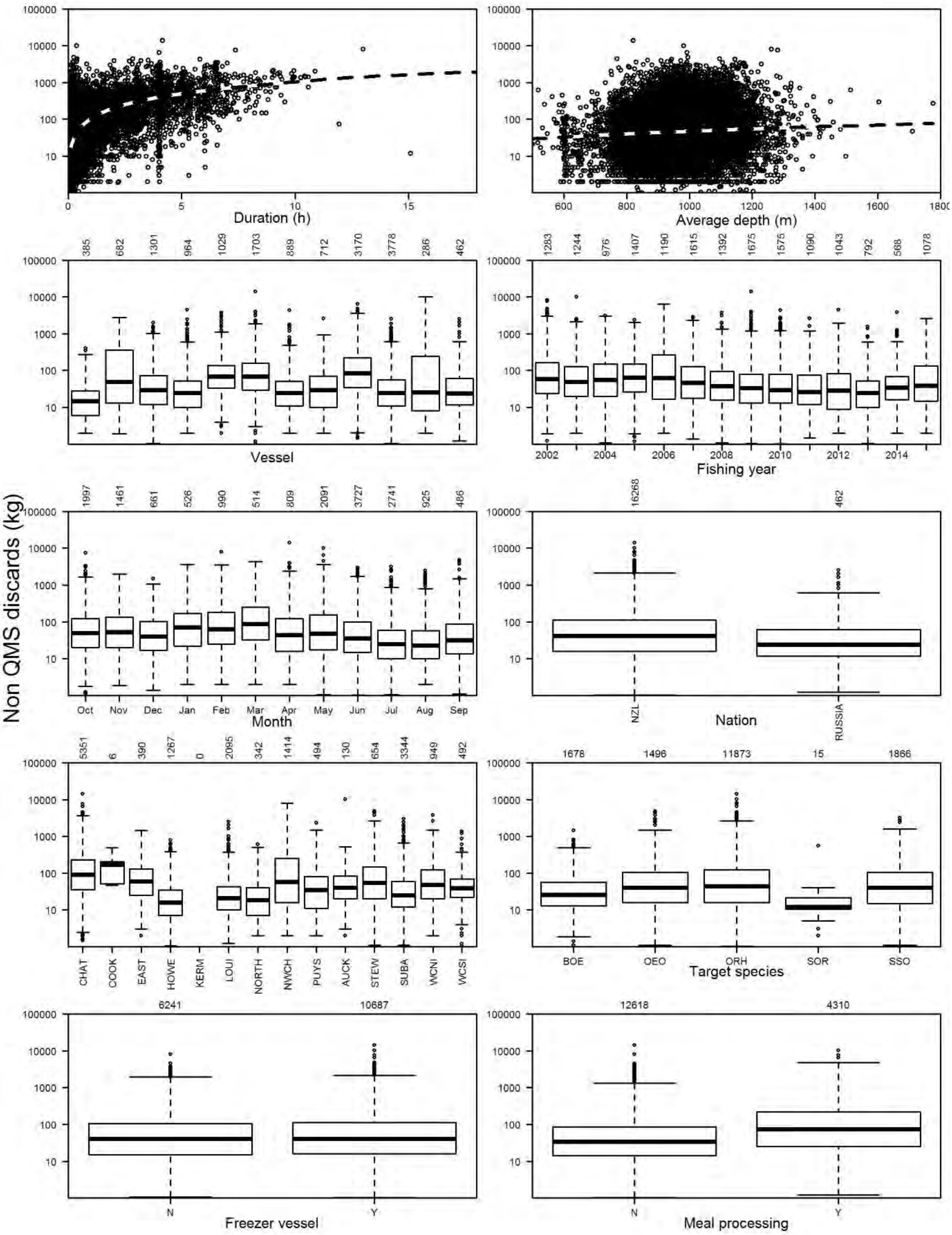



**Figure 7: Non-QMS species discards per tow (kg) plotted against selected variables in the target orange roughy and oreo trawl fisheries for the fishing years 2002–15, on a log scale. See Figure 2 for further details.**

## APPENDIX A: SUMMARY DATA TABLES FOR THE ORANGE ROUGHY FISHERY

**Table A1: Observed FISH catch and discards for target orange roughy 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 orange roughy trawl fishery from 1 Oct 2001 to 30 Sep 2015. Records are ordered by decreasing percentage of catch. Codes in bold are QMS species (as of 1 October 2016); codes in italics are Schedule 6 QMA species (can legally be returned to the sea). [Continued on next page]**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| **ORH** | Orange roughy | *Hoplostethus atlanticus* | 61 286.3 | 85.04 | 0.07 |
| **SSO** | Smooth oreo | *Pseudocyttus maculatus* | 5 092.0 | 7.07 | 0.04 |
| **BOE** | Black oreo | *Allocyttus niger* | 1 178.5 | 1.64 | 0.96 |
| RAT | Rattails | Macrouridae | 487.7 | 0.68 | 54.12 |
| **HOK** | Hoki | *Macruronus novaezelandiae* | 421.2 | 0.58 | 0.39 |
| SND | Shovelnose dogfish | *Deania calcea* | 399.5 | 0.55 | 53.95 |
| SLK | Slickhead | Alepocephalidae | 337.9 | 0.47 | 61.59 |
| ETB | Baxter’s lantern dogfish | *Etmopterus baxteri* | 266.2 | 0.37 | 54.22 |
| **RIB** | Ribaldo | *Mora moro* | 244.6 | 0.34 | 11.98 |
| MOD | Morid cods | Moridae | 227.8 | 0.32 | 41.79 |
| DWD | Deepwater dogfish | - | 218.1 | 0.30 | 52.59 |
| **CDL** | Cardinalfish | Epigonidae | 214.4 | 0.30 | 1.37 |
| HJO | Johnson’s cod | *Halargyreus johnsonii* | 189.9 | 0.26 | 47.99 |
| BSH | Seal shark | *Dalatias licha* | 170.8 | 0.24 | 68.68 |
| **SOR** | Spiky oreo | *Neocyttus rhomboidalis* | 151.9 | 0.21 | 8.23 |
| OSD | Other sharks and dogs | Selachii | 119.5 | 0.17 | 44.61 |
| **BYS** | Alfonsino | *Beryx splendens* | 114.4 | 0.16 | 0.42 |
| LCH | Long-nosed chimaera | *Harriotta raleighana* | 100.9 | 0.14 | 38.25 |
| BEE | Basketwork eel | *Diastobranchus capensis* | 93.0 | 0.13 | 60.80 |
| CYP | Longnose velvet dogfish | *Centroscymnus crepidater* | 92.7 | 0.13 | 46.99 |
| JAV | Javelin fish | *Lepidorhynchus denticulatus* | 77.4 | 0.11 | 77.34 |
| ETM | | *Etmopterus* spp. | 72.3 | 0.10 | 74.65 |
| WHX | White rattail | *Trachyrincus aphyodes* | 44.7 | 0.06 | 91.25 |
| **HAK** | Hake | *Merluccius australis* | 36.9 | 0.05 | 3.17 |
| PLS | Plunket's shark | *Proscymnodon plunketi* | 31.0 | 0.04 | 71.64 |
| **OEO** | Oreos | *P. maculatus, A. niger, & N. rhomboidalis* | 29.6 | 0.04 | 4.19 |
| CSQ | Leafscale gulper shark | *Centrophorus squamosus* | 27.8 | 0.04 | 67.72 |
| VCO | Violet cod | *Antimora rostrata* | 27.6 | 0.04 | 23.10 |
| **GSP** | Pale ghost shark | *Hydrolagus bemisi* | 27.4 | 0.04 | 12.59 |
| CYO | Smooth skin dogfish | *Centroscymnus owstoni* | 25.5 | 0.04 | 68.16 |
| CYL | Portuguese dogfish | *Centroscymnus coelolepis* | 17.3 | 0.02 | 93.13 |
| RCH | Widenosed chimaera | *Rhinochimaera pacifica* | 14.9 | 0.02 | 93.02 |
| SSM | Smallscaled brown slickhead | *Alepocephalus antipodianus* | 9.4 | 0.01 | 83.63 |
| **WOE** | Warty oreo | *Allocyttus verrucosus* | 9.3 | 0.01 | 21.94 |
| WHR | Unicorn rattail | *Trachyrincus longirostris* | 8.8 | 0.01 | 55.56 |
| MCA | Ridge-scaled rattail | *Macrourus carinatus* | 8.7 | 0.01 | 35.31 |
| SNR | Rough shovelnose dogfish | *Deania histricosa* | 7.7 | 0.01 | 92.59 |
| RHY | Common roughy | *Paratrachichthys trailli* | 7.7 | 0.01 | 5.32 |
| SOP | Pacific sleeper shark | *Somniosus pacificus* | 6.9 | 0.01 | 71.01 |
| APR | Catshark | *Apristurus* spp. | 6.1 | 0.01 | 44.52 |
| SBI | Bigscaled brown slickhead | *Alepocephalus australis* | 6.1 | 0.01 | 83.38 |
| **BYX** | Alfonsino & long-finned beryx | *Beryx splendens & B. decadactylus* | 6.0 | 0.01 | 0.65 |
| EPR | Robust cardinalfish | *Epigonus robustus* | 5.9 | 0.01 | 91.95 |
| PSK | Longnosed deepsea skate | *Bathyraja shuntovi* | 5.4 | 0.01 | 24.01 |
| BSL | Black slickhead | *Xenodermichthys* spp. | 5.2 | 0.01 | 89.37 |
| **BNS** | Bluenose | *Hyperoglyphe antarctica* | 4.8 | 0.01 | 0.37 |
| TOA | Toadfish | *Neophrynichthys* sp. | 4.8 | 0.01 | 40.08 |
| SCM | Largespine velvet dogfish | *Centroscymnus macracanthus* | 4.5 | 0.01 | 50.82 |
| ETL | Lucifer dogfish | *Etmopterus lucifer* | 4.3 | 0.01 | 87.65 |
| EPL | Bigeye cardinalfish | *Epigonus lenimen* | 4.3 | 0.01 | 90.20 |

**Table A1 [Continued]:**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| **SPE** | Sea perch | *Helicolenus* spp. | 4.2 | 0.01 | 26.10 |
| CHI | Chimaera spp. | *Chimaera* spp. | 4.0 | 0.01 | 50.36 |
| DWE | Deepwater eel | - | 3.6 | <0.01 | 68.06 |
| **GSH** | Dark ghost shark | *Hydrolagus novaezealandiae* | 3.4 | <0.01 | 6.05 |
| CSU | Four-rayed rattail | *Coryphaenoides subserrulatus* | 2.9 | <0.01 | 4.70 |
| CHG | Giant chimaera | *Chimaera lignaria* | 2.8 | <0.01 | 71.89 |
| ***SSK*** | Smooth skate | *Dipturus innominatus* | 2.8 | <0.01 | 48.78 |
| SMC | Small-headed cod | *Lepidion microcephalus* | 2.8 | <0.01 | 52.61 |
| IBR | Cookiecutter shark | *Isistius brasiliensis* | 2.7 | <0.01 | 22.31 |
| **LIN** | Ling | *Genypterus blacodes* | 2.6 | <0.01 | 1.48 |
| LEG | Giant lepidion | *Lepidion schmidti & Lepidion inosimae* | 2.5 | <0.01 | 77.48 |
| SHA | Shark | - | 2.4 | <0.01 | 43.23 |
| WIT | Witch | *Arnoglossus scapha* | 2.3 | <0.01 | 26.26 |
| CHP | Chimaera, brown | *Chimaera* sp. | 2.2 | <0.01 | 81.89 |
| DSK | Deepwater spiny skate (arctic skate) | *Amblyraja hyperborea* | 2.1 | <0.01 | 53.04 |
| BTH | Bluntnose skates deepsea skates | *Notoraja* spp. | 1.9 | <0.01 | 75.17 |
| ROC | Rock cod | *Lotella rhacinus* | 1.8 | <0.01 | 89.48 |
| TRS | Cape scorpionfish | *Trachyscorpia eschmeyeri* | 1.7 | <0.01 | 95.25 |
| SSI | Silverside | *Argentina elongata* | 1.6 | <0.01 | 0.06 |
| SKA | Skate | Rajidae Arhynchobatidae (Families) | 1.6 | <0.01 | 29.65 |
| GRC | Grenadier cod | *Tripterophycis gilchristi* | 1.6 | <0.01 | 2.29 |
| EEL | Eels, marine | - | 1.6 | <0.01 | 50.12 |
| SRI | | *Scymnodon ringens* | 1.6 | <0.01 | 99.56 |
| SQA | | *Squalus* spp. | 1.6 | <0.01 | 100.00 |
| CBO | Bollons rattail | *Coelorinchus bollonsi* | 1.5 | <0.01 | 100.00 |
| OFH | Oilfish | *Ruvettus pretiosus* | 1.4 | <0.01 | 49.55 |
| PDG | Prickly dogfish | *Oxynotus bruniensis* | 1.4 | <0.01 | 40.59 |
| RUD | Rudderfish | *Centrolophus niger* | 1.3 | <0.01 | 85.77 |
| CHX | Pink frogmouth | *Chaunax pictus* | 1.3 | <0.01 | 93.56 |
| HYD | | *Hydrolagus* sp. | 1.2 | <0.01 | 76.96 |
| ***SCH*** | School shark | *Galeorhinus galeus* | 1.2 | <0.01 | 96.93 |
| ZAS | Velvet dogfish | *Zameus squamulosus* | 1.2 | <0.01 | 92.89 |
| MST | Melanostomiidae | *Melanostomiidae* | 1.2 | <0.01 | 66.02 |
| OSK | Skate other | Rajidae | 1.2 | <0.01 | 31.13 |
| **EPT** | Black cardinalfish | *Epigonus telescopus* | 1.2 | <0.01 | 13.81 |
| PSY | Psychrolutes | *Psychrolutes microporos* | 1.1 | <0.01 | 50.17 |
| SOM | Little sleeper shark | *Somniosus rostratus* | 1.1 | <0.01 | 100.00 |
| COD | Cod | - | 1.0 | <0.01 | 64.55 |
| DSS | Deepsea smelt | *Bathylagus* spp. | 1.0 | <0.01 | 99.81 |
| LAN | Lantern fish | Myctophidae | 1.0 | <0.01 | 65.42 |
| BSK | Basking shark | *Cetorhinus maximus* | 1.0 | <0.01 | 99.40 |
| RAG | Ragfish | *Pseudoicichthys australis* | 1.0 | <0.01 | 78.02 |
| LPS | Giant lepidion | *Lepidion schmidti* | 0.9 | <0.01 | 73.88 |
| SYN | Synaphobranchidae | Synaphobranchidae | 0.9 | <0.01 | 89.41 |
| CON | Conger eel | *Conger* spp. | 0.9 | <0.01 | 71.86 |
| UFISH | Unidentified | - | 0.8 | <0.01 | 59.93 |
| SRH | Silver roughy | *Hoplostethus mediterraneus* | 0.8 | <0.01 | 75.15 |
| WPS | White pointer shark | *Carcharodon carcharias* | 0.8 | <0.01 | 100.00 |
| MAN | Finless flounder | *Neoachiropsetta milfordi* | 0.8 | <0.01 | 16.48 |
| BJA | Black javelinfish | *Mesobius antipodum* | 0.7 | <0.01 | 63.31 |

**Table A2: Observed INVERTEBRATE bycatch and discards for target orange roughy 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 orange roughy trawl fishery from 1 Oct 2001 to 30 Sep 2015. 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).** **[Continued on next page]**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| WSQ | Warty squid | *Onykia spp.* | 110.3 | 0.15 | 78.68 |
| COU | Coral (unspecified) | Alcyonacea, Scleractinia, Antipatharia (Orders) & Stylasteridae (Family) | 86.7 | 0.12 | 97.61 |
| CBB | Coral rubble | - | 45.4 | 0.06 | 76.27 |
| SIA | Stony corals | Scleractinia | 25.9 | 0.04 | 10.72 |
| GDU | Bushy hard coral | *Goniocorella dumosa* | 24.3 | 0.03 | 52.07 |
| COR | Hydrocorals | Stylasteridae | 6.3 | 0.01 | 99.59 |
| HTH | Sea cucumber | Holothurian unidentified | 5.5 | 0.01 | 42.54 |
| **SQU** | Arrow squid | *Nototodarus sloanii & N. gouldi* | 5.4 | 0.01 | 67.65 |
| NEB | Brodie's king crab | *Neolithodes brodiei* | 4.5 | 0.01 | 2.38 |
| MOC | Madrepora oculata | *Madrepora oculata* | 4.3 | 0.01 | 0.23 |
| ONG | Sponges | Porifera | 3.7 | 0.01 | 28.46 |
| JFI | Jellyfish | - | 3.6 | <0.01 | 44.51 |
| SFI | Starfish | Asteroidea & Ophiuroidea | 3.6 | <0.01 | 83.77 |
| ERO | Deepwater branching coral | *Enallopsammia rostrata* | 3.6 | <0.01 | 0.51 |
| DDI | cup coral | *Desmophyllum dianthus* | 3.5 | <0.01 | 0.48 |
| ACS | Smooth deepsea anemones | Actinostolidae | 3.2 | <0.01 | 20.31 |
| BRG | Brisingida (Order) | Brisingida | 2.9 | <0.01 | 62.50 |
| SVA | | *Solenosmilia variabilis* | 2.8 | <0.01 | 9.84 |
| TAM | Tam O shanter urchin | Echinothuriidae & Phormosomatidae | 2.5 | <0.01 | 64.98 |
| ***KIC*** | King crab | *Lithodes murrayi, Neolithodes brodiei* | 2.2 | <0.01 | 4.33 |
| MIQ | Warty squid | *Onykia ingens* | 2.0 | <0.01 | 88.31 |
| GLS | Glass sponges | Hexactinellida | 2.0 | <0.01 | 6.62 |
| VSQ | Violet squid | *Histioteuthis* spp. | 1.9 | <0.01 | 86.96 |
| PAB | Bubblegum coral | *Paragorgia* spp. | 1.7 | <0.01 | 62.68 |
| BOO | Bamboo coral | *Keratoisis* spp. | 1.5 | <0.01 | 1.63 |
| ANT | Anemones | Anthozoa | 1.4 | <0.01 | 61.86 |
| URO | Sea urchin other | - | 1.4 | <0.01 | 87.10 |
| GSQ | Giant squid | *Architeuthis* spp. | 1.3 | <0.01 | 83.24 |
| CRB | Crab | - | 1.3 | <0.01 | 90.54 |
| COB | Black coral | Antipatharia | 1.2 | <0.01 | 67.16 |
| TSQ | | *Todarodes filippovae* | 1.1 | <0.01 | 72.65 |
| DHO | Sea urchin | *Dermechinus horridus* | 0.9 | <0.01 | 100.00 |
| HYA | Floppy tubular sponge | *Hyalascus* sp. | 0.9 | <0.01 | 36.39 |
| OCT | Octopus | *Pinnoctopus cordiformis* | 0.8 | <0.01 | 31.05 |
| RSQ | | *Ommastrephes bartrami* | 0.8 | <0.01 | 85.42 |
| GOU | Cidarid urchin | *Goniocidaris umbraculum* | 0.7 | <0.01 | 0.14 |
| GRM | Sea urchin | *Gracilechinus multidentatus* | 0.7 | <0.01 | 87.82 |
| CBD | Coral rubble - dead | | 0.7 | <0.01 | 96.07 |
| DWO | Deepwater octopus | *Graneledone* spp. | 0.7 | <0.01 | 58.01 |
| PSQ | Large red scaly squid | *Pholidoteuthis massyae* | 0.6 | <0.01 | 78.77 |
| PMO | | *Pseudostichopus mollis* | 0.5 | <0.01 | 2.66 |
| OPI | Umbrella octopus | *Opisthoteuthis* spp. | 0.4 | <0.01 | 96.29 |
| VIT | Deep sea spider crab | *Vitjazmaia latidactyla* | 0.4 | <0.01 | 60.57 |
| LMU | Murray's king crab | *Lithodes murrayi* | 0.4 | <0.01 | 3.34 |
| EEX | | *Enypniastes eximia* | 0.3 | <0.01 | 59.12 |
| SOT | | *Solaster torulatus* | 0.3 | <0.01 | 86.41 |
| GOR | | *Gorgonocephalus* spp. | 0.3 | <0.01 | 80.78 |
| TDQ | Dana octopus squid | *Taningia danae* | 0.3 | <0.01 | 95.65 |
| ISI | Bamboo corals | Isididae | 0.3 | <0.01 | 34.01 |
| SPI | Spider crab | - | 0.2 | <0.01 | 80.99 |

**Table A2 [Continued]:**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| ***CHC*** | Red crab | *Chaceon bicolor* | 0.2 | <0.01 | 26.69 |
| EPZ | | *Epizoanthus* spp. | 0.2 | <0.01 | 3.85 |
| ZOR | Rat-tail star | *Zoroaster* spp. | 0.2 | <0.01 | 100.00 |
| HTR | Trojan starfish | *Hippasteria phrygiana* | 0.2 | <0.01 | 71.28 |
| PAO | | *Pillsburiaster aoteanus* | 0.2 | <0.01 | 82.50 |
| OPH | Ophiuroid (brittle star) | - | 0.2 | <0.01 | 95.49 |
| HMT | Deepsea anemone | Hormathiidae | 0.2 | <0.01 | 14.50 |
| MSQ | | *Mastigoteuthis* sp. | 0.2 | <0.01 | 100.00 |
| GOC | Gorgonian coral | *Gorgonacea* | 0.2 | <0.01 | 100.00 |
| ICQ | Whip-lash squid | *Idioteuthis cordiformis* | 0.2 | <0.01 | 49.37 |
| MSL | Starfish | *Mediaster sladeni* | 0.2 | <0.01 | 96.08 |
| FAR | Lacey honeycomb sponge | *Farrea* spp. | 0.2 | <0.01 | 8.00 |
| SAR | | *Squilla armata* | 0.1 | <0.01 | 100.00 |
| PED | Scarlet prawn | *Aristaeopsis edwardsiana* | 0.1 | <0.01 | 64.94 |
| LLE | Bamboo coral | *Lepidisis* spp. | 0.1 | <0.01 | 0.79 |
| STP | Solitary bowl coral | *Stephanocyathus platypus* | 0.1 | <0.01 | 100.00 |
| CHR | Golden coral | *Chrysogorgia* spp. | 0.1 | <0.01 | 65.47 |
| PRA | Prawn | - | 0.1 | <0.01 | 100.00 |
| FMA | | *Fusitriton magellanicus* | 0.1 | <0.01 | 91.53 |
| ECN | Echinoid (sea urchin) | - | 0.1 | <0.01 | 77.34 |
| ***SCC*** | Sea cucumber | *Stichopus mollis* | 0.1 | <0.01 | 81.90 |
| LSE | | *Leiopathes secunda* | 0.1 | <0.01 | 28.88 |
| PSI | Geometric star | *Psilaster acuminatus* | 0.1 | <0.01 | 46.01 |
| SLG | Sea slug | *Scutus breviculus* | 0.1 | <0.01 | 90.43 |
| THO | Bottlebrush coral | *Thouarella* spp. | 0.1 | <0.01 | 3.39 |
| ACN | Bushy bamboo coral | *Acanella* spp. | 0.1 | <0.01 | 100.00 |
| MRQ | Warty squid | *Onykia robsoni* | 0.1 | <0.01 | 51.72 |
| BSQ | Broad squid | *Sepioteuthis australis* | 0.1 | <0.01 | 53.49 |
| ERE | Basket-weave horn sponge | *Euplectella regalis* | 0.1 | <0.01 | 1.31 |
| CHQ | Cranchiid squid | Cranchiidae | 0.1 | <0.01 | 12.00 |
| CPA | Pentagon star | *Ceramaster patagonicus* | 0.1 | <0.01 | 81.97 |
| OPO | | *Octopoteuthis* spp. | 0.1 | <0.01 | 100.00 |
| BTE | | *Benthoctopus tegginmathae* | 0.1 | <0.01 | 95.89 |
| CBR | Stony branching corals | Dendrophylliidae, Oculinidae (Families) and some spp. in Caryophyllidae (Family) | 0.1 | <0.01 | 100.00 |
| BOC | Deepsea anemone | *Bolocera* spp. | 0.1 | <0.01 | 100.00 |
| ASR | Asteroid (starfish) | - | 0.1 | <0.01 | 24.29 |
| ATR | Sea anemones | Actiniaria | 0.1 | <0.01 | 100.00 |
| HDR | Hydroid | Hydrozoa | 0.1 | <0.01 | 22.26 |
| PSE | Sea urchin | *Pseudechinus* spp. | 0.1 | <0.01 | 100.00 |
| DMG | | *Dipsacaster magnificus* | 0.1 | <0.01 | 66.78 |
| ODT | Pentagonal tooth-star | *Odontaster* spp. | 0.1 | <0.01 | 89.66 |
| CJA | Sun star | *Crossaster multispinus* | 0.1 | <0.01 | 74.34 |
| TLO | Encrusting long polyps, coral | *Telesto* spp. | 0.1 | <0.01 | 75.81 |
| ***SUR*** | Kina | *Evechinus chloroticus* | 0.1 | <0.01 | 98.18 |
| GRE | Curling stone sponge | *Geodia regina* | 0.1 | <0.01 | 100.00 |
| PLY | Polychelidae | *Polycheles* spp. | 0.1 | <0.01 | 33.77 |
| GAS | Gastropods | Gastropoda | 0.1 | <0.01 | 86.96 |
| SEN | Sea anemone | *Actinia* spp. | <1 | <0.01 | 95.92 |
| TTL | Bristle ball sponge | *Tetilla australe* | <1 | <0.01 | 100.00 |
| LHC | Long-handed masking crab | *Leptomithrax longimanus* | <1 | <0.01 | 100.00 |

**Table A3: Observed bycatch by species group for target orange roughy trawls. Estimated catch, percentage of total catch, and overall percentage discarded from observer records for the orange roughy trawl fishery from 1 Oct 2001 to 30 Sep 2015.**

| Group | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|
| **Fish** | | | |
| Orange roughy (target) | 61 286 | 84.59 | 0.07 |
| Fish (other) | 7 318 | 10.10 | 0.88 |
| Sharks & dogfish | 1 590 | 2.19 | 55.99 |
| Morid species | 701 | 0.97 | 32.67 |
| Rattails | 634 | 0.88 | 59.33 |
| Slickhead species | 359 | 0.50 | 62.96 |
| Eels | 102 | 0.14 | 61.59 |
| Chimaeras | 57 | 0.08 | 44.29 |
| Rays & Skates | 16 | 0.02 | 42.18 |
| **Invertebrates** | | | |
| Cnidaria | 142 | 0.20 | 87.04 |
| Squid | 124 | 0.17 | 78.49 |
| Protected coral species | 76 | 0.11 | 37.49 |
| Echinoderms | 22 | 0.03 | 70.87 |
| Crustacea | 10 | 0.01 | 25.83 |
| Sponges | 7 | 0.01 | 24.61 |
| Octopuses | 2 | <0.01 | 56.93 |
| Other molluscs | <1 | <0.01 | 95.30 |
| Polychaetes | <1 | <0.01 | 100.00 |

**Table A4: Number of observed trawls targeting orange roughy by area (see Figure 1 for area boundaries) and fishing year.**

| Fishing year | CHAT | COOK | EAST | NORTH | PUYS | AUCK | STEW | SUBA |
|---|---|---|---|---|---|---|---|---|
| 2002 | 473 | - | 27 | 72 | 19 | 6 | 1 | - |
| 2003 | 620 | - | 37 | 132 | 3 | 4 | - | 9 |
| 2004 | 517 | - | - | 59 | - | 6 | - | 45 |
| 2005 | 760 | - | 9 | 24 | 18 | 2 | - | 164 |
| 2006 | 494 | - | - | 119 | 71 | - | - | 60 |
| 2007 | 521 | - | - | 156 | - | - | - | 170 |
| 2008 | 1 081 | 3 | 45 | 154 | - | 3 | 2 | 114 |
| 2009 | 994 | - | 6 | 81 | 9 | 4 | - | 27 |
| 2010 | 787 | - | 49 | 31 | 7 | 23 | - | 39 |
| 2011 | 142 | 1 | 122 | 69 | - | 10 | - | 14 |
| 2012 | 122 | - | 70 | 25 | 1 | 2 | - | 5 |
| 2013 | 43 | - | 12 | 7 | - | - | - | - |
| 2014 | 128 | - | - | 21 | 7 | - | - | - |
| 2015 | 309 | 2 | 139 | 18 | 31 | 35 | - | - |

| Fishing year | WCNI | WCSI | NWCH | HOWE | KERM | LOUI | SPRFMO other | Total |
|---|---|---|---|---|---|---|---|---|
| 2002 | 137 | - | 181 | 156 | - | 155 | - | 1 227 |
| 2003 | 77 | - | 8 | 39 | - | 352 | - | 1 281 |
| 2004 | 106 | - | 13 | 26 | - | 123 | - | 895 |
| 2005 | 57 | 73 | - | - | - | 35 | - | 1 142 |
| 2006 | 114 | - | 66 | 45 | - | 199 | - | 1 168 |
| 2007 | 296 | - | - | 23 | - | - | - | 1 166 |
| 2008 | 126 | - | 22 | 184 | - | - | - | 1 734 |
| 2009 | 144 | 78 | 147 | 444 | - | - | - | 1 934 |
| 2010 | 83 | 93 | 330 | 193 | - | 264 | - | 1 899 |
| 2011 | 58 | 75 | 244 | 244 | - | 223 | - | 1 202 |
| 2012 | 134 | 78 | 158 | 128 | - | 281 | - | 1 004 |
| 2013 | 32 | 91 | 177 | 218 | - | 288 | - | 868 |
| 2014 | 63 | 11 | 62 | 64 | - | 261 | - | 617 |
| 2015 | 120 | 58 | 257 | 113 | - | 210 | - | 1 292 |

**Table A5: Summary of effort and estimated catch in the target trawl fishery for orange roughy, for observed tows and overall, by fishing year. Trips include those with any recorded targeting of orange roughy.**

| Fishing year | Number of trawls | | Number of vessels | | Number of trips | | Orange roughy target catch (t) | | Percentage observed (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Observed | All | Observed | All | Observed | All | Observed | All | Catch | Trawls |
| 2002 | 1 227 | 8 442 | 14 | 40 | 21 | 349 | 3 726 | 16 879 | 22.1 | 14.5 |
| 2003 | 1 281 | 7 990 | 16 | 41 | 22 | 341 | 4 028 | 16 134 | 25.0 | 16.0 |
| 2004 | 895 | 7 340 | 8 | 39 | 19 | 339 | 1 803 | 14 332 | 12.6 | 12.2 |
| 2005 | 1 142 | 7 204 | 10 | 38 | 17 | 339 | 4 753 | 16 153 | 29.4 | 15.9 |
| 2006 | 1 168 | 6 330 | 11 | 32 | 20 | 264 | 5 244 | 15 794 | 33.2 | 18.5 |
| 2007 | 1 166 | 4 642 | 11 | 26 | 30 | 209 | 6 378 | 13 521 | 47.2 | 25.1 |
| 2008 | 1 734 | 3 914 | 10 | 16 | 26 | 154 | 6 813 | 12 613 | 54.0 | 44.3 |
| 2009 | 1 934 | 4 192 | 10 | 17 | 25 | 167 | 6 162 | 11 186 | 55.1 | 46.1 |
| 2010 | 1 899 | 3 809 | 10 | 15 | 30 | 155 | 5 898 | 9 870 | 59.8 | 49.9 |
| 2011 | 1 202 | 2 600 | 12 | 14 | 29 | 147 | 3 539 | 6 713 | 52.7 | 46.2 |
| 2012 | 1 004 | 2 195 | 13 | 16 | 27 | 164 | 2 736 | 6 078 | 45.0 | 45.7 |
| 2013 | 868 | 2 310 | 10 | 12 | 16 | 132 | 2 093 | 6 201 | 33.8 | 37.6 |
| 2014 | 617 | 2 433 | 8 | 15 | 16 | 146 | 3 079 | 7 863 | 39.2 | 25.4 |
| 2015 | 1 292 | 2 920 | 10 | 16 | 26 | 151 | 5 033 | 8 596 | 58.6 | 44.2 |
| All years | 17 429 | 66 321 | 32 | 59 | 320 | 3 037 | 61 286 | 161 932 | 37.8 | 26.3 |

**Table A6: Summary statistics for the target orange roughy trawl fishery, by area, including observer coverage and aspects of data quality for fishing years 2002–15 (e.g., number of tows with positional data).**

| | | Total effort | | | |
|---|---|---|---|---|---|
| Area | Median vessel length (m) | Number of tows | % of tows observed | % of tows with position data | % of tows by vessels never observed |
| CHAT | 42.5 | 28 407 | 24.6 | 98.9 | 3.9 |
| NWCH | 34.3 | 8 140 | 20.3 | 0.3 | 32.8 |
| EAST | 36.6 | 6 278 | 8.2 | 100.0 | 6.5 |
| LOUI | 43.7 | 6 123 | 38.9 | 29.2 | 14.6 |
| HOWE | 37.0 | 3 922 | 46.7 | 0.3 | 7.3 |
| WCNI | 43.7 | 3 505 | 43.9 | 99.8 | 4.4 |
| NORTH | 42.8 | 2 861 | 33.4 | 100.0 | 5.8 |
| Other | 27.1 | 2 351 | 0.0 | 0.0 | 71.8 |
| WCSI | 42.5 | 1 693 | 32.7 | 93.1 | 5.7 |
| SUBA | 65.7 | 1 663 | 38.8 | 100.0 | 0.3 |
| PUYS | 42.5 | 613 | 26.9 | 100.0 | 0.7 |
| COOK | 36.6 | 377 | 1.6 | 97.1 | 11.4 |
| AUCK | 65.7 | 371 | 25.3 | 100.0 | 0.8 |
| STEW | 64.0 | 15 | 20.0 | 100.0 | 0.0 |
| KERM | - | - | - | - | - |

**Table A7: Number of years of observer data required to provide more than 25 records for bycatch and discard rate calculations for the target orange roughy fishery. * = fewer than 25 records for the entire period combined, annual rates calculated using data from all areas. [Continued on next page]**

| Fishing year | CHAT | COOK | EAST | NORTH | PUYS | AUCK | STEW |
|---|---|---|---|---|---|---|---|
| 2002 | 1 | * | 1 | 1 | 4 | 9 | * |
| 2003 | 1 | * | 1 | 1 | 4 | 9 | * |
| 2004 | 1 | * | 3 | 1 | 5 | 9 | * |
| 2005 | 1 | * | 5 | 3 | 3 | 9 | * |
| 2006 | 1 | * | 5 | 1 | 1 | 7 | * |
| 2007 | 1 | * | 3 | 1 | 3 | 7 | * |
| 2008 | 1 | * | 1 | 1 | 5 | 5 | * |
| 2009 | 1 | * | 3 | 1 | 7 | 3 | * |

**Table A7 [Continued]:**

| Fishing year | CHAT | COOK | EAST | NORTH | PUYS | AUCK | STEW |
|---|---|---|---|---|---|---|---|
| 2010 | 1 | * | 1 | 1 | 9 | 3 | * |
| 2011 | 1 | * | 1 | 1 | 9 | 3 | * |
| 2012 | 1 | * | 1 | 1 | 7 | 5 | * |
| 2013 | 1 | * | 3 | 3 | 5 | 5 | * |
| 2014 | 1 | * | 3 | 3 | 3 | 3 | * |
| 2015 | 1 | * | 1 | 2 | 1 | 1 | * |

| Fishing year | SUBA | WCNI | WCSI | NWCH | HOWE | LOUI | Other |
|---|---|---|---|---|---|---|---|
| 2002 | 3 | 1 | 7 | 1 | 1 | 1 | * |
| 2003 | 3 | 1 | 5 | 3 | 1 | 1 | * |
| 2004 | 1 | 1 | 3 | 5 | 1 | 1 | * |
| 2005 | 1 | 1 | 1 | 3 | 3 | 1 | * |
| 2006 | 1 | 1 | 3 | 1 | 1 | 1 | * |
| 2007 | 1 | 1 | 5 | 3 | 3 | 3 | * |
| 2008 | 1 | 1 | 3 | 3 | 1 | 5 | * |
| 2009 | 1 | 1 | 1 | 1 | 1 | 3 | * |
| 2010 | 1 | 1 | 1 | 1 | 1 | 1 | * |
| 2011 | 3 | 1 | 1 | 1 | 1 | 1 | * |
| 2012 | 5 | 1 | 1 | 1 | 1 | 1 | * |
| 2013 | 7 | 1 | 1 | 1 | 1 | 1 | * |
| 2014 | 9 | 1 | 3 | 1 | 1 | 1 | * |
| 2015 | 11 | 1 | 1 | 1 | 1 | 1 | * |

**Table A8: Estimates of annual bycatch (t) in the target orange roughy trawl fishery, by species category and standard area, based on the RATIO model. 95% confidence intervals in parentheses. [Continued on next pages]**

**(a) QMS**

Ratio model

| | CHAT | COOK | EAST | NORTH | PUYS | SQUAK | STEW |
|---|---|---|---|---|---|---|---|
| 2002 | 1 742.6 ( 991.2–2 987.1) | 9.5 (3.5–16.7) | 19.2 (9.8–32.8) | 8.2 (3.7–14.3) | 148.5 ( 105.5–224.4) | 102.0 (31.7–224.9) | 1.7 (0.7–2.9) |
| 2003 | 2 086.7 (1 188.4–3 185.9) | 10.2 (4.1–17.0) | 41.8 (19.5–76.7) | 28.6 (9.3–59.0) | 84.0 (56.5–126.5) | 51.8 (15.9–108.2) | 0.0 (0.0–0.0) |
| 2004 | 3 033.8 (1 870.3–4 164.1) | 6.0 (3.3–9.0) | 42.2 (20.1–72.2) | 4.4 (1.2–11.2) | 89.9 (59.5–129.0) | 38.2 (11.5–86.8) | 0.7 (0.4–1.0) |
| 2005 | 1 971.1 (1 507.1–2 482.9) | 12.0 (8.7–16.3) | 58.5 (29.2–99.8) | 13.1 (3.9–27.6) | 46.9 (30.5–69.1) | 7.8 (2.4–17.4) | 0.0 (0.0–0.0) |
| 2006 | 1 032.2 ( 579.9–1 926.3) | 11.2 (4.1–19.7) | 62.8 (22.6–116.7) | 8.7 (0.9–21.1) | 16.1 (8.5–25.7) | 0.0 (0.0–0.0) | 1.5 (0.5–2.7) |
| 2007 | 1 215.7 ( 900.1–1 613.5) | 6.4 (3.8–9.4) | 66.6 (35.9–116.0) | 1.5 (0.6–3.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 1 376.8 (1 184.8–2 680.3) | 25.4 (15.0–45.0) | 69.4 (34.7–115.2) | 2.0 (0.9–3.8) | 17.0 (9.8–25.7) | 52.6 (6.5–139.8) | 0.6 (0.4–1.1) |
| 2009 | 1 602.2 (1 037.7–1 867.7) | 28.4 (11.8–49.0) | 85.4 (42.6–137.8) | 14.1 (2.5–36.9) | 36.8 (22.7–58.2) | 27.0 (3.4–67.8) | 0.0 (0.0–0.0) |
| 2010 | 1 024.6 ( 844.1–1 248.2) | 12.4 (9.5–16.9) | 72.2 (34.8–119.0) | 0.8 (0.3–1.4) | 24.4 (15.2–37.6) | 5.2 (0.7–13.2) | 0.0 (0.0–0.0) |
| 2011 | 362.2 ( 195.0–547.0) | 6.1 (3.4–9.8) | 76.3 (37.8–141.0) | 11.1 (7.1–15.8) | 27.9 (11.5–48.3) | 26.4 (4.0–70.7) | 0.0 (0.0–0.0) |
| 2012 | 380.6 ( 244.4–563.2) | 3.3 (1.5–5.6) | 12.0 (5.2–25.8) | 10.8 (7.5–15.3) | 25.1 (10.3–45.9) | 6.2 (0.9–16.5) | 0.0 (0.0–0.0) |
| 2013 | 212.7 (63.8–447.1) | 1.6 (1.0–2.3) | 20.4 (10.4–43.0) | 3.8 (2.1–5.9) | 2.8 (1.1–5.2) | 5.8 (2.6–10.2) | 0.0 (0.0–0.0) |
| 2014 | 321.7 ( 191.8–547.2) | 4.2 (1.8–8.4) | 34.0 (16.6–63.6) | 5.0 (2.6–9.0) | 41.8 (12.2–83.9) | 22.8 (2.5–68.6) | 0.0 (0.0–0.0) |
| 2015 | 271.3 ( 157.7–414.2) | 5.3 (2.3–9.2) | 12.4 (6.2–24.4) | 4.4 (2.3–7.9) | 27.4 (8.3–52.2) | 27.4 (2.9–81.5) | 0.2 (0.1–0.4) |

**(a) QMS, *continued.***

Ratio model

| | SUBA | WCNI | WCSI | NWCH | HOWE | LOUI | Other |
|---|---|---|---|---|---|---|---|
| 2002 | 26.2 (11.4–46.7) | 3.9 (2.1–7.2) | 1.4 (0.8–2.1) | 91.7 (55.9–134.9) | 5.5 (3.6–8.3) | 15.0 (8.3–24.3) | 184.8 (73.6–310.6) |
| 2003 | 51.4 (22.7–92.9) | 12.5 (7.0–20.9) | 0.9 (0.6–1.4) | 83.3 (50.1–130.5) | 2.8 (1.3–6.1) | 14.7 (4.8–26.1) | 124.6 (45.3–208.2) |
| 2004 | 43.7 (11.2–96.0) | 7.0 (5.2–9.3) | 0.5 (0.3–0.7) | 57.7 (27.1–111.8) | 10.0 (3.7–18.5) | 44.7 (16.0–98.8) | 208.2 ( 115.2–306.9) |
| 2005 | 25.5 (2.1–63.6) | 3.9 (2.3–6.3) | 0.0 (0.0–0.0) | 137.4 (85.0–211.3) | 26.3 (16.1–38.7) | 14.3 (7.6–23.4) | 407.2 ( 302.3–539.3) |
| 2006 | 164.7 (75.3–269.9) | 5.2 (3.1–7.9) | 5.2 (3.3–8.1) | 50.9 (30.9–75.2) | 21.5 (8.6–37.8) | 61.3 (29.2–103.7) | 124.6 (43.3–232.4) |
| 2007 | 10.3 (6.8–15.1) | 0.4 (0.3–0.6) | 0.8 (0.5–1.2) | 9.9 (6.2–14.9) | 9.6 (6.0–13.9) | 40.9 (18.3–69.8) | 57.0 (33.9–83.5) |
| 2008 | 11.5 (5.2–24.1) | 2.7 (1.2–4.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.9 (0.5–1.4) | 0.0 (0.0–0.0) | 0.6 (0.4–1.1) |
| 2009 | 26.8 (4.2–70.8) | 1.6 (0.9–2.6) | 0.1 (0.0–0.2) | 0.4 (0.1–0.8) | 3.3 (1.5–7.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 50.1 (22.2–84.5) | 2.0 (1.0–3.9) | 0.0 (0.0–0.0) | 2.8 (1.9–3.8) | 1.8 (1.0–4.2) | 4.0 (1.9–8.1) | 1.6 (1.2–2.3) |
| 2011 | 26.6 (14.3–41.7) | 2.1 (1.4–2.8) | 2.8 (1.6–4.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 2.8 (0.9–6.6) | 0.5 (0.3–0.9) |
| 2012 | 4.0 (2.0–6.4) | 1.6 (1.1–2.3) | 3.7 (1.3–7.1) | 0.8 (0.3–1.3) | 0.4 (0.3–0.6) | 0.6 (0.3–0.9) | 0.1 (0.1–0.2) |
| 2013 | 0.0 (0.0–0.0) | 17.7 (1.7–42.4) | 6.8 (4.5–9.9) | 0.6 (0.3–1.1) | 1.1 (0.6–1.7) | 1.2 (0.5–2.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 3.5 (1.8–6.8) | 9.3 (6.5–12.7) | 0.0 (0.0–0.0) | 0.5 (0.3–0.8) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 1.7 (0.9–3.0) | 35.1 (26.2–46.9) | 0.0 (0.0–0.0) | 0.6 (0.4–0.9) | 0.2 (0.0–0.4) | 2.6 (1.2–4.3) |

**Table A8 [Continued]:**

**(b) NON-QMS**

Ratio model

| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 522.3 | ( 340.5–784.4) | 6.4 | (3.2–12.0) | 30.6 | (7.8–74.1) | 1.0 | (0.4–1.9) | 21.1 | (10.2–39.4) | 14.8 | (3.6–37.0) | 1.1 | (0.5–2.1) |
| 2003 | 451.7 | ( 316.1–688.0) | 3.5 | (2.3–5.2) | 102.8 | (61.3–175.5) | 7.0 | (3.5–9.9) | 11.7 | (5.9–22.6) | 7.5 | (1.8–18.4) | 0.0 | (0.0–0.0) |
| 2004 | 512.1 | ( 304.7–690.9) | 1.3 | (0.9–1.6) | 101.5 | (59.0–159.2) | 4.2 | (1.8–9.4) | 7.3 | (5.3–10.5) | 5.7 | (1.3–14.2) | 0.1 | (0.1–0.2) |
| 2005 | 415.9 | ( 366.8–496.7) | 2.7 | (2.4–3.3) | 135.6 | (84.3–210.2) | 3.3 | (2.4–4.7) | 3.8 | (2.7–5.9) | 1.1 | (0.3–2.8) | 0.0 | (0.0–0.0) |
| 2006 | 1 289.9 | (1 039.3–1 609.3) | 7.2 | (3.0–12.0) | 66.0 | (40.2–133.7) | 1.4 | (1.0–1.8) | 1.0 | (0.8–1.2) | 0.0 | (0.0–0.0) | 1.0 | (0.4–1.6) |
| 2007 | 765.5 | ( 605.6–898.3) | 4.8 | (3.0–7.6) | 68.7 | (44.9–136.5) | 2.2 | (1.7–2.8) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2008 | 510.8 | ( 450.8–577.5) | 10.4 | (9.0–14.0) | 69.6 | (44.6–145.2) | 2.1 | (1.6–2.6) | 1.0 | (0.8–1.3) | 1.6 | (1.1–2.3) | 0.3 | (0.2–0.4) |
| 2009 | 488.2 | ( 433.4–552.7) | 9.2 | (7.2–12.2) | 154.4 | (69.3–370.3) | 4.5 | (2.8–6.5) | 2.2 | (1.8–2.7) | 0.8 | (0.5–1.1) | 0.0 | (0.0–0.0) |
| 2010 | 584.2 | ( 517.1–658.0) | 7.5 | (6.6–9.7) | 228.1 | (87.9–470.1) | 2.7 | (1.2–4.9) | 2.5 | (1.9–4.8) | 0.2 | (0.1–0.2) | 0.0 | (0.0–0.0) |
| 2011 | 91.7 | (63.9–134.5) | 3.3 | (2.4–4.7) | 50.5 | (39.2–68.2) | 8.6 | (6.1–11.7) | 4.1 | (2.8–5.3) | 1.1 | (0.7–1.4) | 0.0 | (0.0–0.0) |
| 2012 | 151.2 | (61.9–300.8) | 3.4 | (1.8–6.2) | 100.7 | (15.5–352.9) | 12.6 | (9.3–16.4) | 3.7 | (2.6–4.9) | 0.2 | (0.2–0.3) | 0.0 | (0.0–0.0) |
| 2013 | 82.8 | (42.0–163.5) | 0.9 | (0.6–1.4) | 171.3 | (28.2–589.5) | 9.0 | (3.3–16.4) | 0.5 | (0.3–0.6) | 0.9 | (0.7–1.1) | 0.0 | (0.0–0.0) |
| 2014 | 92.7 | (67.5–132.2) | 2.8 | (1.6–4.8) | 30.0 | (22.5–39.8) | 7.2 | (3.8–11.7) | 7.3 | (5.1–9.4) | 3.5 | (1.8–5.0) | 0.0 | (0.0–0.0) |
| 2015 | 60.9 | (46.2–85.9) | 4.0 | (1.7–7.3) | 10.3 | (7.7–13.8) | 4.2 | (2.1–8.0) | 2.0 | (1.2–3.0) | 3.9 | (2.0–5.9) | 0.2 | (0.1–0.3) |

**(b) NON-QMS, *continued.***

Ratio model

| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 6.8 | (5.2–8.8) | 10.8 | (7.6–16.2) | 1.7 | (1.4–2.2) | 1 483.1 | ( 375.4–3 210.1) | 21.4 | (16.8–27.4) | 23.9 | (16.5–35.8) | 117.6 | (60.6–223.5) |
| 2003 | 13.4 | (10.1–17.3) | 28.6 | (20.6–39.3) | 1.2 | (1.0–1.5) | 1 298.4 | ( 274.9–3 091.6) | 26.0 | (12.6–43.7) | 37.8 | (13.2–78.6) | 42.8 | (28.4–60.3) |
| 2004 | 18.6 | (13.9–24.4) | 17.3 | (13.9–21.6) | 0.6 | (0.5–0.8) | 464.6 | ( 141.9–1 048.3) | 12.4 | (2.8–22.0) | 65.0 | (36.1–116.2) | 45.4 | (31.2–58.6) |
| 2005 | 6.0 | (4.8–7.4) | 15.9 | (10.9–22.8) | 0.0 | (0.0–0.0) | 215.5 | ( 151.6–287.6) | 22.3 | (14.2–32.1) | 78.1 | (36.1–152.7) | 93.2 | (82.6–111.9) |
| 2006 | 31.1 | (19.8–46.5) | 20.1 | (14.6–26.8) | 6.7 | (5.2–8.4) | 72.7 | (50.3–99.1) | 15.6 | (7.5–27.4) | 6.1 | (4.8–7.5) | 82.9 | (33.1–137.6) |
| 2007 | 4.7 | (4.1–5.3) | 2.4 | (1.2–3.7) | 2.0 | (0.9–4.3) | 13.7 | (9.4–19.3) | 5.4 | (4.0–7.5) | 4.3 | (3.4–5.3) | 42.5 | (26.9–64.2) |
| 2008 | 9.2 | (7.3–12.2) | 10.9 | (3.5–18.0) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.4 | (0.4–0.5) | 0.0 | (0.0–0.0) | 0.3 | (0.2–0.3) |
| 2009 | 13.8 | (10.5–17.2) | 6.0 | (4.8–7.5) | 0.4 | (0.1–0.8) | 0.8 | (0.3–1.8) | 1.1 | (0.7–1.6) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2010 | 6.9 | (5.2–8.9) | 8.4 | (6.0–11.0) | 0.0 | (0.0–0.0) | 8.2 | (6.2–10.9) | 0.6 | (0.4–0.8) | 2.2 | (1.9–2.5) | 1.0 | (0.9–1.3) |
| 2011 | 4.0 | (3.3–4.9) | 5.5 | (3.6–8.6) | 1.7 | (1.3–2.3) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 1.4 | (1.0–1.8) | 0.3 | (0.2–0.4) |
| 2012 | 0.6 | (0.5–0.8) | 24.4 | (19.7–33.1) | 3.1 | (2.3–4.5) | 1.2 | (0.5–2.1) | 0.2 | (0.2–0.3) | 0.4 | (0.3–0.5) | 0.1 | (0.1–0.2) |
| 2013 | 0.0 | (0.0–0.0) | 20.8 | (16.0–25.9) | 9.6 | (4.8–18.4) | 0.5 | (0.3–0.9) | 0.3 | (0.1–0.4) | 0.4 | (0.4–0.5) | 0.0 | (0.0–0.0) |
| 2014 | 0.0 | (0.0–0.0) | 38.8 | (22.8–65.8) | 13.2 | (8.7–22.8) | 0.1 | (0.0–0.1) | 0.1 | (0.1–0.1) | 0.1 | (0.1–0.1) | 0.0 | (0.0–0.0) |
| 2015 | 0.0 | (0.0–0.0) | 11.8 | (7.5–20.0) | 53.7 | (34.4–87.0) | 0.0 | (0.0–0.0) | 0.5 | (0.2–1.2) | 0.1 | (0.1–0.1) | 1.9 | (0.8–3.6) |

**Table A8 [Continued]:**

**(c) INV**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 28.7 (8.4–63.9) | 0.4 (0.2–0.8) | 0.6 (0.3–1.0) | 0.0 (0.0–0.1) | 11.8 (0.5–32.6) | 0.3 (0.2–0.5) | 0.1 (0.0–0.2) |
| 2003 | 37.3 (20.5–57.4) | 0.5 (0.2–1.5) | 8.0 (4.1–14.1) | 0.8 (0.4–1.7) | 6.6 (0.3–18.1) | 0.2 (0.1–0.2) | 0.0 (0.0–0.0) |
| 2004 | 65.5 (28.6–124.2) | 0.4 (0.1–1.4) | 7.3 (3.7–12.2) | 0.2 (0.0–0.4) | 2.2 (0.4–5.7) | 0.1 (0.1–0.2) | 0.0 (0.0–0.2) |
| 2005 | 140.6 (84.9–233.0) | 0.8 (0.5–1.2) | 9.8 (5.2–17.1) | 0.2 (0.1–0.3) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 113.4 (67.6–171.9) | 0.7 (0.5–1.0) | 1.0 (0.6–1.5) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.1) |
| 2007 | 105.5 (51.6–187.5) | 0.7 (0.3–1.2) | 0.8 (0.6–1.5) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 50.3 (30.9–81.7) | 1.1 (0.7–1.8) | 0.8 (0.6–1.5) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) |
| 2009 | 45.4 (33.8–63.2) | 1.1 (0.7–2.0) | 0.7 (0.4–1.1) | 0.2 (0.1–0.3) | 0.1 (0.0–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2010 | 21.4 (18.3–24.9) | 0.3 (0.3–0.4) | 0.5 (0.3–0.8) | 0.3 (0.1–0.5) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 3.4 (2.0–5.1) | 0.2 (0.1–0.4) | 1.3 (0.8–2.0) | 0.6 (0.4–0.8) | 0.2 (0.1–0.3) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2012 | 6.0 (0.2–13.1) | 0.1 (0.1–0.2) | 0.5 (0.3–0.8) | 0.8 (0.5–1.0) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 11.2 (0.5–27.9) | 0.1 (0.0–0.1) | 0.9 (0.6–1.6) | 0.4 (0.1–0.9) | 0.0 (0.0–0.0) | 0.3 (0.1–0.8) | 0.0 (0.0–0.0) |
| 2014 | 5.8 (2.7–10.4) | 0.2 (0.1–0.3) | 0.8 (0.7–1.1) | 0.4 (0.1–0.8) | 0.3 (0.2–0.5) | 1.4 (0.3–5.0) | 0.0 (0.0–0.0) |
| 2015 | 3.0 (2.1–4.4) | 0.2 (0.1–0.3) | 0.3 (0.2–0.4) | 0.2 (0.1–0.5) | 0.1 (0.0–0.2) | 1.7 (0.3–5.7) | 0.0 (0.0–0.0) |

**(c) INV, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.2 (0.1–0.2) | 4.9 (0.6–13.4) | 0.0 (0.0–0.1) | 26.3 (10.4–45.5) | 1.6 (0.8–3.0) | 0.2 (0.1–0.4) | 8.3 (2.9–17.2) |
| 2003 | 0.3 (0.2–0.5) | 0.2 (0.2–0.4) | 0.0 (0.0–0.0) | 24.3 (8.3–45.1) | 3.2 (1.5–6.1) | 20.8 (3.8–62.0) | 6.5 (2.6–17.3) |
| 2004 | 0.4 (0.3–0.6) | 4.4 (0.9–11.6) | 0.0 (0.0–0.0) | 12.1 (5.2–19.7) | 1.2 (0.2–2.9) | 342.3 (28.2–779.2) | 17.0 (4.0–52.1) |
| 2005 | 0.1 (0.0–0.2) | 2.7 (0.7–6.5) | 0.0 (0.0–0.0) | 19.1 (13.0–27.1) | 3.9 (2.6–5.3) | 2.5 (1.1–4.5) | 26.1 (16.1–41.4) |
| 2006 | 0.5 (0.3–0.7) | 8.6 (1.6–22.4) | 0.1 (0.1–0.2) | 6.6 (4.4–8.9) | 3.5 (0.8–5.9) | 0.2 (0.2–0.4) | 8.3 (5.8–10.7) |
| 2007 | 0.4 (0.3–0.6) | 0.4 (0.0–1.4) | 0.0 (0.0–0.1) | 1.1 (0.8–1.8) | 0.9 (0.3–1.7) | 0.2 (0.1–0.3) | 6.2 (2.7–10.7) |
| 2008 | 0.7 (0.5–1.0) | 4.6 (0.5–11.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.9 (0.5–1.3) | 8.3 (2.5–18.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.4 (0.2–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.4 (0.3–0.6) | 1.1 (0.5–2.1) | 0.0 (0.0–0.0) | 0.4 (0.2–0.8) | 0.1 (0.1–0.1) | 0.6 (0.3–1.0) | 0.0 (0.0–0.1) |
| 2011 | 0.2 (0.2–0.3) | 5.2 (1.2–12.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 1.6 (1.2–2.1) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.9 (0.4–1.6) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 1.4 (0.7–2.8) | 0.7 (0.5–1.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.4 (0.2–0.6) | 4.4 (2.7–6.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |

**Table A8 [Continued]:**

**(d) Coral species**

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 19.1 (0.0–59.2) | 0.0 (0.0–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.1) |
| 2003 | 0.1 (0.0–0.4) | 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 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2004 | 0.1 (0.0–0.3) | 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 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2005 | 5.5 (0.0–23.5) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.5 (0.1–1.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 0.1 (0.0–0.2) | 0.1 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 16.6 (6.5–32.4) | 0.5 (0.2–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2009 | 12.3 (1.6–29.4) | 0.5 (0.1–1.3) | 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) |
| 2010 | 1.0 (0.4–1.8) | 0.1 (0.0–0.2) | 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 (0.0–0.0) |
| 2011 | 0.0 (0.0–0.1) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.2 (0.0–0.7) | 0.0 (0.0–0.0) |
| 2014 | 0.2 (0.0–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.2 (0.0–5.3) | 0.0 (0.0–0.0) |
| 2015 | 0.1 (0.0–0.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.4 (0.0–5.4) | 0.0 (0.0–0.0) |

**(d) Coral species, *continued.***

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 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) | 1.7 (0.0–6.4) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.5 (0.1–1.8) | 0.1 (0.0–0.5) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.2–0.6) | 1.3 (0.6–2.2) | 1.4 (0.4–3.0) | 1.2 (0.0–4.4) |
| 2006 | 0.0 (0.0–0.0) | 0.1 (0.0–0.4) | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) | 1.5 (0.2–3.0) | 0.1 (0.0–0.1) | 0.1 (0.0–0.2) |
| 2007 | 0.1 (0.0–0.2) | 0.4 (0.0–1.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.3 (0.1–0.6) | 0.0 (0.0–0.1) | 1.2 (0.0–4.9) |
| 2008 | 0.1 (0.0–0.2) | 4.5 (0.0–11.1) | 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 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.0) | 8.1 (2.0–18.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.7 (0.2–1.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.5 (0.2–0.9) | 0.0 (0.0–0.0) |
| 2011 | 0.0 (0.0–0.0) | 4.6 (0.7–11.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) | 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) |
| 2013 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 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) |
| 2014 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**Table A8 [Continued]:**

**(e) Morid species**

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 59.4 (23.2–100.2) | 0.8 (0.4–1.6) | 0.8 (0.4–1.2) | 0.5 (0.3–0.7) | 2.8 (0.2–4.8) | 0.6 (0.3–1.0) | 0.1 (0.1–0.3) |
| 2003 | 29.8 (8.0–59.3) | 0.2 (0.1–0.3) | 8.7 (5.6–12.4) | 0.9 (0.4–1.9) | 1.6 (0.1–2.6) | 0.3 (0.1–0.5) | 0.0 (0.0–0.0) |
| 2004 | 60.3 (28.4–104.2) | 0.1 (0.1–0.2) | 9.2 (6.3–12.6) | 0.5 (0.3–0.9) | 0.7 (0.2–1.1) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2005 | 77.5 (52.3–110.2) | 0.5 (0.3–0.6) | 12.5 (8.5–16.8) | 0.6 (0.4–0.8) | 0.1 (0.1–0.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2006 | 267.4 ( 190.0–346.1) | 1.5 (0.7–2.5) | 10.4 (2.9–27.4) | 0.4 (0.2–0.6) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) |
| 2007 | 193.8 ( 110.1–289.3) | 1.0 (0.5–2.1) | 10.4 (5.8–27.4) | 0.7 (0.4–1.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 99.2 (84.4–115.4) | 2.0 (1.7–2.8) | 10.4 (5.5–28.0) | 0.4 (0.2–0.8) | 0.0 (0.0–0.1) | 0.4 (0.1–0.7) | 0.0 (0.0–0.1) |
| 2009 | 90.3 (76.6–104.1) | 1.8 (1.5–2.4) | 15.8 (9.0–26.0) | 0.9 (0.5–1.4) | 0.1 (0.1–0.1) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) |
| 2010 | 149.3 ( 128.2–173.0) | 1.9 (1.6–2.5) | 18.3 (11.8–29.2) | 0.7 (0.2–1.3) | 0.4 (0.2–1.3) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2011 | 26.1 (13.4–61.8) | 1.4 (0.7–2.5) | 9.8 (7.7–12.3) | 4.1 (2.4–6.7) | 0.9 (0.5–1.3) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2012 | 29.2 (14.6–53.0) | 0.6 (0.3–0.8) | 2.7 (1.5–4.4) | 4.6 (3.1–6.6) | 0.8 (0.4–1.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2013 | 24.3 (14.3–38.4) | 0.3 (0.2–0.6) | 5.4 (3.3–8.1) | 1.7 (0.3–3.5) | 0.1 (0.1–0.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2014 | 73.2 (29.8–167.7) | 0.9 (0.4–1.9) | 6.7 (5.2–8.6) | 0.9 (0.2–2.0) | 1.6 (0.9–2.4) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) |
| 2015 | 63.1 (35.4–96.3) | 1.2 (0.5–2.1) | 2.4 (1.8–3.1) | 0.5 (0.1–1.5) | 0.1 (0.1–0.2) | 0.2 (0.1–0.3) | 0.0 (0.0–0.1) |

**(e) Morid species, *continued.***

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.1) | 0.3 (0.2–0.4) | 0.5 (0.4–0.6) | 213.0 (59.2–456.7) | 1.6 (0.8–3.1) | 8.0 (6.1–10.6) | 16.0 (7.4–31.5) |
| 2003 | 0.1 (0.0–0.2) | 1.9 (0.9–2.6) | 0.3 (0.2–0.5) | 185.5 (52.6–429.5) | 1.5 (0.1–4.0) | 1.5 (1.0–2.2) | 2.5 (1.3–4.1) |
| 2004 | 0.1 (0.1–0.3) | 1.9 (1.2–2.8) | 0.2 (0.1–0.2) | 90.7 (29.4–172.3) | 2.1 (0.3–4.8) | 9.7 (6.5–15.0) | 5.0 (2.8–7.9) |
| 2005 | 0.8 (0.5–1.4) | 1.5 (1.0–2.2) | 0.0 (0.0–0.0) | 128.1 (76.2–211.1) | 3.6 (2.4–5.4) | 4.5 (1.6–9.8) | 16.4 (11.3–22.2) |
| 2006 | 0.1 (0.1–0.2) | 1.9 (1.3–2.6) | 1.8 (1.3–2.5) | 47.7 (28.3–70.9) | 2.6 (1.6–4.0) | 1.6 (0.8–2.6) | 16.7 (7.1–27.0) |
| 2007 | 0.1 (0.1–0.2) | 0.2 (0.1–0.3) | 0.2 (0.2–0.3) | 8.9 (5.2–14.0) | 3.3 (1.9–5.6) | 1.1 (0.6–1.8) | 9.2 (4.1–18.0) |
| 2008 | 0.2 (0.1–0.2) | 0.5 (0.3–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.2–0.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2009 | 0.3 (0.1–0.4) | 0.4 (0.3–0.5) | 0.0 (0.0–0.0) | 0.1 (0.1–0.3) | 1.0 (0.8–1.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.3 (0.2–0.4) | 0.6 (0.4–0.9) | 0.0 (0.0–0.0) | 1.8 (1.2–2.5) | 0.6 (0.4–0.8) | 0.7 (0.5–1.0) | 0.2 (0.2–0.3) |
| 2011 | 0.1 (0.1–0.2) | 0.8 (0.5–1.3) | 0.5 (0.4–0.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) | 0.1 (0.1–0.2) |
| 2012 | 0.0 (0.0–0.0) | 1.9 (1.4–2.3) | 0.5 (0.4–0.7) | 0.4 (0.1–0.6) | 0.2 (0.1–0.3) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 2.0 (1.0–3.3) | 2.4 (1.8–3.0) | 0.2 (0.2–0.4) | 0.4 (0.3–0.5) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 3.2 (1.7–5.4) | 3.3 (2.0–4.1) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.6 (0.3–1.0) | 11.7 (8.4–16.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.6 (0.2–1.0) |

**Table A8 [Continued]:**

**(f) Rattail species**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 124.2 (55.8–198.0) | 1.5 (0.7–2.7) | 0.6 (0.2–1.0) | 0.0 (0.0–0.0) | 2.3 (1.1–3.6) | 1.4 (0.7–2.4) | 0.2 (0.1–0.5) |
| 2003 | 58.6 (20.7–129.3) | 0.4 (0.2–0.7) | 22.8 (10.9–40.0) | 0.9 (0.2–1.3) | 1.3 (0.6–2.1) | 0.7 (0.3–1.2) | 0.0 (0.0–0.0) |
| 2004 | 63.8 (19.9–103.3) | 0.2 (0.1–0.3) | 20.5 (10.1–36.8) | 0.5 (0.0–1.4) | 1.0 (0.8–1.3) | 0.5 (0.3–0.9) | 0.0 (0.0–0.0) |
| 2005 | 54.2 (35.5–76.3) | 0.4 (0.3–0.5) | 28.2 (13.7–48.6) | 0.3 (0.2–0.4) | 0.4 (0.3–0.6) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2006 | 357.5 ( 278.8–515.1) | 2.2 (0.5–4.2) | 7.5 (5.1–11.8) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.3 (0.1–0.5) |
| 2007 | 133.1 (84.4–187.2) | 1.1 (0.7–1.7) | 7.9 (5.3–12.8) | 0.4 (0.0–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 80.9 (60.3–113.8) | 1.8 (1.3–2.7) | 8.0 (5.5–12.4) | 0.2 (0.1–0.3) | 0.2 (0.1–0.2) | 0.4 (0.2–0.8) | 0.0 (0.0–0.1) |
| 2009 | 78.8 (57.8–96.6) | 1.4 (1.0–2.0) | 16.6 (11.7–21.6) | 0.5 (0.2–0.9) | 0.3 (0.2–0.4) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2010 | 117.5 (93.9–152.3) | 1.4 (1.1–1.8) | 23.2 (15.4–31.5) | 0.1 (0.1–0.1) | 0.6 (0.4–1.4) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2011 | 3.8 (2.5–5.6) | 0.6 (0.2–1.1) | 8.2 (6.2–10.8) | 4.3 (2.5–6.3) | 1.0 (0.6–1.2) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) |
| 2012 | 33.3 (2.8–136.0) | 0.5 (0.2–1.1) | 3.4 (2.4–4.5) | 4.6 (3.2–6.2) | 0.9 (0.6–1.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2013 | 7.2 (2.1–13.8) | 0.1 (0.0–0.1) | 6.4 (4.6–8.4) | 1.8 (0.6–3.4) | 0.1 (0.1–0.1) | 0.5 (0.3–0.7) | 0.0 (0.0–0.0) |
| 2014 | 18.3 (4.7–56.4) | 0.5 (0.2–1.1) | 6.2 (3.9–9.7) | 1.8 (0.5–3.6) | 1.8 (1.2–2.2) | 2.1 (0.7–3.5) | 0.0 (0.0–0.0) |
| 2015 | 6.1 (4.1–9.7) | 0.9 (0.2–2.0) | 2.1 (1.3–3.3) | 0.8 (0.3–2.2) | 0.1 (0.1–0.2) | 2.4 (0.8–4.2) | 0.0 (0.0–0.1) |

**(f) Rattail species, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 3.4 (2.4–4.8) | 2.4 (1.7–3.2) | 0.1 (0.1–0.2) | 381.0 ( 135.9–687.1) | 0.2 (0.1–0.3) | 3.1 (1.5–5.4) | 29.4 (13.1–54.1) |
| 2003 | 6.8 (4.5–9.5) | 12.3 (7.6–16.7) | 0.1 (0.1–0.1) | 326.8 ( 102.7–664.2) | 2.0 (0.1–6.8) | 0.9 (0.4–1.4) | 5.4 (2.6–9.1) |
| 2004 | 9.2 (6.0–13.2) | 3.2 (2.6–3.9) | 0.0 (0.0–0.1) | 119.4 (42.8–242.6) | 0.5 (0.0–1.1) | 2.7 (2.0–3.6) | 6.6 (3.7–100) |
| 2005 | 2.3 (0.7–3.8) | 1.2 (0.1–3.0) | 0.0 (0.0–0.0) | 63.0 (40.8–92.5) | 1.4 (0.9–2.1) | 4.4 (1.4–8.4) | 13.1 (9.3–17.5) |
| 2006 | 19.6 (10.1–32.5) | 9.4 (5.7–13.5) | 0.5 (0.3–0.7) | 22.1 (14.0–30.8) | 1.1 (0.3–2.2) | 0.4 (0.3–0.5) | 24.2 (6.2–46.4) |
| 2007 | 2.5 (2.1–3.1) | 0.9 (0.2–1.8) | 0.1 (0.1–0.1) | 4.0 (2.5–6.1) | 0.3 (0.1–0.5) | 0.3 (0.2–0.3) | 10.0 (5.8–15.5) |
| 2008 | 4.5 (3.4–7.3) | 4.5 (0.1–8.0) | 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 (0.0–0.1) |
| 2009 | 6.1 (4.4–8.2) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 3.1 (2.0–4.5) | 0.7 (0.3–1.1) | 0.0 (0.0–0.0) | 1.4 (1.0–1.9) | 0.0 (0.0–0.1) | 0.2 (0.2–0.3) | 0.2 (0.2–0.2) |
| 2011 | 1.7 (1.2–2.4) | 1.6 (0.9–2.9) | 0.2 (0.2–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.1) | 0.0 (0.0–0.1) |
| 2012 | 0.2 (0.2–0.3) | 3.7 (2.7–4.8) | 0.4 (0.3–0.5) | 0.3 (0.0–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 2.8 (1.5–4.5) | 0.8 (0.5–1.1) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 6.4 (3.0–11.5) | 1.5 (1.1–2.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 2.4 (1.4–4.0) | 8.7 (5.1–14.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.1–1.0) |

**Table A8 [Continued]:**

**(g) Slickhead species**

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 117.1 (5.9–292.8) | 1.4 (0.2–3.6) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 1.1 (0.5–1.8) | 0.2 (0.1–0.3) | 0.2 (0.0–0.6) |
| 2003 | 30.5 (7.6–71.8) | 0.2 (0.0–0.4) | 2.1 (0.6–5.0) | 0.5 (0.0–1.1) | 0.6 (0.3–1.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2004 | 36.5 (11.8–72.6) | 0.1 (0.0–0.2) | 1.9 (0.6–4.4) | 0.2 (0.0–0.4) | 0.7 (0.5–1.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2005 | 29.1 (21.2–45.1) | 0.2 (0.2–0.3) | 2.5 (0.8–6.0) | 0.1 (0.1–0.2) | 0.4 (0.2–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 89.7 (49.3–141.4) | 0.5 (0.3–0.8) | 14.7 (8.3–30.3) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2007 | 49.5 (36.9–62.0) | 0.3 (0.2–0.4) | 16.3 (9.1–34.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 51.4 (40.1–64.1) | 1.0 (0.8–1.5) | 16.1 (9.2–34.2) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2009 | 52.7 (32.1–81.1) | 1.0 (0.6–1.7) | 16.0 (9.4–25.8) | 0.2 (0.1–0.4) | 0.3 (0.2–0.5) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2010 | 81.6 (67.2–96.8) | 1.0 (0.9–1.3) | 12.4 (7.1–18.9) | 0.1 (0.0–0.2) | 0.3 (0.2–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 2.5 (0.4–5.8) | 0.2 (0.1–0.3) | 4.5 (2.9–6.5) | 0.5 (0.3–0.8) | 0.3 (0.2–0.5) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2012 | 9.3 (2.8–17.3) | 0.3 (0.1–0.5) | 0.6 (0.0–1.6) | 1.0 (0.7–1.4) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 35.0 (1.5–95.8) | 0.1 (0.0–0.2) | 1.3 (0.0–3.1) | 1.1 (0.5–2.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2014 | 1.7 (0.6–3.3) | 0.2 (0.0–0.4) | 1.5 (0.8–2.6) | 0.9 (0.3–2.0) | 0.6 (0.4–0.9) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2015 | 13.4 (6.0–33.7) | 0.6 (0.2–1.1) | 0.5 (0.3–0.8) | 0.5 (0.2–0.9) | 0.1 (0.0–0.2) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |

**(g) Slickhead species, *continued.***

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.8 (0.5–1.1) | 0.8 (0.6–1.2) | 0.0 (0.0–0.1) | 420.5 (23.4–914.9) | 0.4 (0.2–0.7) | 0.2 (0.0–0.4) | 27.0 (5.4–67.5) |
| 2003 | 1.6 (1.1–2.1) | 1.2 (0.6–2.1) | 0.0 (0.0–0.1) | 354.8 (24.4–992.2) | 2.3 (0.7–5.0) | 0.2 (0.1–0.2) | 2.0 (0.6–4.5) |
| 2004 | 2.5 (1.7–3.3) | 1.5 (0.9–2.5) | 0.0 (0.0–0.0) | 118.9 (9.4–346.2) | 1.1 (0.0–2.5) | 2.3 (1.2–3.9) | 3.4 (1.5–5.9) |
| 2005 | 1.0 (0.5–2.3) | 2.0 (1.3–2.8) | 0.0 (0.0–0.0) | 19.9 (10.2–32.4) | 1.1 (0.5–1.9) | 0.2 (0.0–0.8) | 7.0 (5.1–9.5) |
| 2006 | 3.0 (1.7–5.0) | 0.6 (0.3–0.9) | 0.1 (0.0–0.3) | 6.0 (3.1–100) | 0.4 (0.1–1.3) | 0.1 (0.0–0.2) | 6.1 (2.9–8.6) |
| 2007 | 0.2 (0.2–0.4) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 1.1 (0.6–1.8) | 0.2 (0.1–0.4) | 0.1 (0.0–0.2) | 2.5 (1.5–3.8) |
| 2008 | 0.7 (0.4–1.1) | 0.4 (0.2–0.6) | 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) |
| 2009 | 0.8 (0.4–1.2) | 0.4 (0.3–0.6) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 1.0 (0.4–1.7) | 1.3 (0.8–2.0) | 0.0 (0.0–0.0) | 1.3 (0.8–2.3) | 0.0 (0.0–0.1) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) |
| 2011 | 0.6 (0.4–1.0) | 0.8 (0.2–1.9) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2012 | 0.1 (0.0–0.2) | 5.8 (3.9–8.3) | 0.1 (0.1–0.2) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 1.7 (0.9–2.8) | 0.4 (0.2–0.6) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 2.8 (1.7–4.2) | 0.9 (0.5–1.8) | 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 | 0.0 (0.0–0.0) | 1.1 (0.6–2.0) | 7.0 (2.5–14.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.3 (0.1–0.5) |

**Table A8 [Continued]:**

**(h) Shark species**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 153.3 (95.5–230.6) | 2.0 (1.2–3.4) | 24.9 (3.1–66.3) | 0.5 (0.1–1.4) | 15.1 (5.5–33.6) | 12.8 (1.6–34.6) | 0.4 (0.2–0.6) |
| 2003 | 176.2 ( 142.2–212.7) | 1.4 (0.9–2.2) | 57.1 (31.4–103.8) | 4.0 (2.4–6.1) | 8.6 (3.1–19.1) | 6.3 (0.8–17.2) | 0.0 (0.0–0.0) |
| 2004 | 273.5 ( 177.1–380.5) | 0.6 (0.4–0.9) | 54.8 (31.5–95.5) | 1.2 (0.7–1.8) | 4.8 (3.1–7.9) | 4.9 (0.6–13.3) | 0.1 (0.0–0.1) |
| 2005 | 142.4 ( 119.3–170.0) | 1.0 (0.8–1.3) | 73.8 (42.0–129.4) | 1.5 (1.1–1.9) | 2.6 (1.6–4.3) | 1.0 (0.1–2.7) | 0.0 (0.0–0.0) |
| 2006 | 527.0 ( 423.6–678.8) | 3.0 (1.1–5.1) | 21.3 (13.4–39.3) | 0.9 (0.6–1.2) | 0.6 (0.4–0.8) | 0.0 (0.0–0.0) | 0.4 (0.1–0.7) |
| 2007 | 362.0 ( 298.4–439.7) | 2.2 (1.3–3.5) | 21.0 (14.0–40.3) | 1.2 (0.9–1.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 254.8 ( 226.6–287.1) | 5.2 (4.3–6.5) | 21.2 (13.5–41.5) | 1.6 (1.3–2.0) | 0.6 (0.4–0.8) | 0.7 (0.4–1.1) | 0.1 (0.1–0.2) |
| 2009 | 248.4 ( 219.1–279.4) | 4.8 (3.5–6.5) | 36.3 (23.7–52.6) | 2.6 (1.7–3.9) | 1.3 (1.0–1.8) | 0.3 (0.2–0.5) | 0.0 (0.0–0.0) |
| 2010 | 204.2 ( 181.5–227.6) | 2.8 (2.3–3.5) | 46.4 (27.4–74.9) | 2.2 (0.8–4.0) | 1.0 (0.8–1.5) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2011 | 55.6 (38.2–74.9) | 1.7 (1.2–2.5) | 19.7 (16.1–23.2) | 3.6 (2.6–4.5) | 1.7 (1.1–2.6) | 0.4 (0.3–0.6) | 0.0 (0.0–0.0) |
| 2012 | 81.6 (41.6–128.6) | 1.4 (0.9–1.9) | 11.2 (7.0–16.6) | 5.2 (3.9–7.0) | 1.6 (1.0–2.4) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) |
| 2013 | 33.5 (21.8–45.4) | 0.4 (0.3–0.6) | 20.1 (11.9–29.3) | 3.6 (1.2–7.2) | 0.2 (0.1–0.3) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) |
| 2014 | 52.3 (39.8–67.2) | 1.4 (0.9–2.6) | 14.5 (10.4–20.2) | 3.0 (1.5–5.1) | 3.0 (1.8–4.7) | 0.8 (0.5–1.2) | 0.0 (0.0–0.0) |
| 2015 | 30.5 (19.4–45.5) | 1.4 (0.8–2.2) | 5.1 (3.7–7.3) | 1.9 (0.6–4.2) | 1.6 (0.9–2.5) | 0.9 (0.6–1.4) | 0.1 (0.0–0.1) |

**(h) Shark species, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 1.6 (1.1–2.3) | 5.2 (2.9–9.3) | 1.3 (1.0–1.8) | 423.3 ( 161.3–812.7) | 12.7 (10.2–15.9) | 8.4 (6.8–10.3) | 38.0 (22.3–63.8) |
| 2003 | 3.1 (2.0–4.6) | 12.9 (8.9–18.7) | 0.9 (0.7–1.2) | 375.3 ( 132.1–760.2) | 17.7 (7.1–30.7) | 9.1 (3.6–14.5) | 17.1 (11.0–26.4) |
| 2004 | 4.8 (3.2–6.9) | 10.7 (8.1–13.9) | 0.5 (0.4–0.6) | 140.6 (60.2–267.6) | 8.7 (2.5–15.3) | 19.6 (14.2–26.7) | 23.2 (15.8–31.5) |
| 2005 | 1.5 (1.1–1.9) | 11.5 (7.9–15.7) | 0.0 (0.0–0.0) | 87.8 (54.0–124.0) | 12.4 (7.9–17.1) | 60.4 (23.1–128.5) | 35.3 (28.8–43.8) |
| 2006 | 4.9 (2.5–9.0) | 5.6 (3.8–7.9) | 5.0 (3.8–6.7) | 27.8 (18.9–38.8) | 7.1 (3.4–12.6) | 4.2 (3.3–5.4) | 33.7 (12.4–56.0) |
| 2007 | 0.9 (0.7–1.1) | 1.0 (0.6–1.7) | 1.7 (0.5–3.9) | 5.8 (3.9–8.1) | 3.3 (2.7–4.1) | 2.9 (2.3–3.7) | 19.5 (11.8–30.4) |
| 2008 | 2.5 (1.8–3.4) | 5.7 (2.9–9.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.3 (0.3–0.4) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) |
| 2009 | 5.9 (4.1–8.1) | 4.6 (3.8–5.4) | 0.3 (0.0–0.8) | 0.3 (0.2–0.6) | 0.6 (0.4–0.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 2.1 (1.6–2.7) | 5.6 (3.8–7.5) | 0.0 (0.0–0.0) | 3.5 (2.5–6.0) | 0.3 (0.2–0.6) | 1.3 (1.1–1.5) | 0.4 (0.3–0.4) |
| 2011 | 1.3 (1.0–1.7) | 2.2 (1.5–3.1) | 1.2 (0.9–1.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.0 (0.7–1.2) | 0.2 (0.1–0.2) |
| 2012 | 0.2 (0.2–0.2) | 11.3 (8.3–17.7) | 2.0 (1.3–3.6) | 0.5 (0.1–1.0) | 0.1 (0.1–0.2) | 0.3 (0.2–0.4) | 0.0 (0.0–0.1) |
| 2013 | 0.0 (0.0–0.0) | 12.8 (9.3–16.5) | 3.1 (1.9–4.9) | 0.2 (0.1–0.4) | 0.2 (0.1–0.3) | 0.3 (0.3–0.4) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 23.1 (11.8–43.3) | 5.3 (3.8–7.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 6.2 (4.0–10.2) | 28.3 (15.8–49.6) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.1) | 0.7 (0.4–1.0) |

**Table A8 [Continued]:**

**(i) Schedule 6 species**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 0.2 (0.0–1.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2003 | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.3 (0.0–0.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2004 | 0.4 (0.1–0.8) | 0.0 (0.0–0.0) | 0.2 (0.0–0.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2005 | 0.3 (0.0–0.6) | 0.0 (0.0–0.0) | 0.3 (0.0–1.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.4 (0.1–1.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 0.4 (0.0–0.9) | 0.0 (0.0–0.0) | 0.2 (0.0–0.5) | 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 | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.2 (0.0–0.5) | 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) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.2 (0.0–0.9) | 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) | 0.0 (0.0–0.0) |
| 2015 | 0.2 (0.0–0.4) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |

**(i) Schedule 6 species, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 4.9 (1.0–10.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.6) |
| 2003 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 6.1 (1.2–12.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2004 | 0.1 (0.0–0.1) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 3.0 (1.0–5.5) | 0.3 (0.0–1.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.4) |
| 2005 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 5.8 (2.0–10.4) | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.4 (0.5–2.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) |
| 2007 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 0.3 (0.0–0.7) | 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 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.0–1.5) | 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 A8 [Continued]:**

**(j) Spiny dogfish**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 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) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2003 | 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) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2004 | 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 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2005 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.2) | 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) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(j) Spiny dogfish, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.4 (0.0–5.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.5 (0.0–1.8) | 0.3 (0.0–1.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.9 (0.0–5.6) | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**Table A8 [Continued]:**

**(k) Total**

Ratio model

| | CHAT | COOK | EAST | NORTH | PUYS | SQUAK | STEW |
|---|---|---|---|---|---|---|---|
| 2002 | 2 293.5 (1 340.1–3 835.4) | 16.3 (6.9–29.5) | 50.4 (17.9–107.9) | 9.2 (4.1–16.3) | 181.4 (116.3–296.4) | 117.1 (35.4–262.4) | 2.9 (1.3–5.2) |
| 2003 | 2 575.7 (1 525.1–3 931.3) | 14.2 (6.7–23.7) | 152.6 (85.0–266.3) | 36.4 (13.3–70.5) | 102.3 (62.7–167.2) | 59.4 (17.8–126.8) | 0.0 (0.0–0.0) |
| 2004 | 3 611.4 (2 203.6–4 979.2) | 7.7 (4.3–12.0) | 151.0 (82.9–243.5) | 8.9 (3.0–21.1) | 99.4 (65.2–145.2) | 44.0 (12.9–101.2) | 0.9 (0.5–1.3) |
| 2005 | 2 527.7 (1 958.8–3 212.6) | 15.5 (11.6–20.8) | 203.9 (118.7–327.1) | 16.6 (6.5–32.5) | 50.8 (33.3–75.1) | 9.0 (2.7–20.3) | 0.0 (0.0–0.0) |
| 2006 | 2 435.4 (1 686.7–3 707.5) | 19.2 (7.6–32.7) | 129.8 (63.3–251.9) | 10.2 (2.0–23.0) | 17.1 (9.3–27.0) | 0.0 (0.0–0.0) | 2.6 (1.0–4.4) |
| 2007 | 2 086.7 (1 557.4–2 699.3) | 11.9 (7.1–18.2) | 136.2 (81.4–254.0) | 4.0 (2.3–6.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 1 937.9 (1 666.4–3 339.5) | 36.9 (24.6–60.8) | 139.8 (80.0–261.9) | 4.3 (2.6–6.8) | 18.0 (10.6–27.0) | 54.4 (7.6–142.3) | 0.9 (0.6–1.6) |
| 2009 | 2 135.8 (1 505.0–2 483.6) | 38.8 (19.7–63.2) | 240.5 (112.3–509.1) | 18.8 (5.4–43.7) | 39.1 (24.5–61.0) | 27.9 (4.0–69.0) | 0.0 (0.0–0.0) |
| 2010 | 1 630.2 (1 379.6–1 931.1) | 20.2 (16.4–27.1) | 300.9 (122.9–589.8) | 3.8 (1.7–6.7) | 26.9 (17.1–42.5) | 5.4 (0.9–13.5) | 0.0 (0.0–0.0) |
| 2011 | 457.2 (260.9–686.6) | 9.6 (5.9–14.9) | 128.1 (77.8–211.2) | 20.2 (13.5–28.3) | 32.2 (14.4–53.8) | 27.5 (4.7–72.2) | 0.0 (0.0–0.0) |
| 2012 | 537.8 (306.5–877.1) | 6.9 (3.4–12.1) | 113.2 (21.0–379.4) | 24.2 (17.4–32.7) | 29.0 (13.0–51.1) | 6.5 (1.1–16.8) | 0.0 (0.0–0.0) |
| 2013 | 306.7 (106.3–638.5) | 2.5 (1.6–3.8) | 192.6 (39.1–634.1) | 13.2 (5.5–23.3) | 3.3 (1.4–5.8) | 7.1 (3.4–12.2) | 0.0 (0.0–0.0) |
| 2014 | 420.3 (261.9–689.8) | 7.1 (3.5–13.5) | 64.8 (39.8–104.5) | 12.7 (6.5–21.4) | 49.4 (17.5–93.8) | 27.6 (4.6–78.6) | 0.0 (0.0–0.0) |
| 2015 | 335.2 (206.1–504.5) | 9.4 (4.1–16.8) | 23.0 (14.1–38.6) | 8.8 (4.5–16.4) | 29.5 (9.6–55.4) | 33.0 (5.2–93.1) | 0.4 (0.2–0.7) |

**(k) Total, *continued.***

Ratio model

| | SUBA | WCNI | WCSI | NWCH | HOWE | LOUI | Other |
|---|---|---|---|---|---|---|---|
| 2002 | 33.1 (16.7–55.7) | 19.7 (10.3–36.8) | 3.1 (2.2–4.4) | 1 601.1 (441.8–3 390.5) | 28.5 (21.2–38.7) | 39.1 (24.9–60.5) | 310.8 (137.1–551.3) |
| 2003 | 65.2 (33.1–110.6) | 41.4 (27.8–60.6) | 2.2 (1.6–3.0) | 1 406.0 (333.3–3 267.1) | 32.0 (15.4–55.9) | 73.2 (21.8–166.6) | 173.8 (76.3–285.8) |
| 2004 | 62.8 (25.3–120.9) | 28.7 (20.0–42.5) | 1.1 (0.8–1.5) | 534.4 (174.2–1 179.8) | 23.7 (6.6–43.3) | 452.1 (80.3–994.2) | 270.6 (150.4–417.6) |
| 2005 | 31.7 (6.9–71.3) | 22.4 (13.9–35.6) | 0.0 (0.0–0.0) | 372.0 (249.6–526.0) | 52.5 (32.9–76.1) | 94.9 (44.8–180.5) | 526.6 (401.0–692.6) |
| 2006 | 196.2 (95.4–317.2) | 33.9 (19.3–57.2) | 12.0 (8.5–16.7) | 130.2 (85.6–183.3) | 40.6 (16.9–71.1) | 67.7 (34.2–111.6) | 215.8 (82.2–380.8) |
| 2007 | 15.4 (11.1–21.0) | 3.2 (1.6–5.6) | 2.8 (1.4–5.6) | 24.8 (16.4–36.0) | 15.9 (10.4–23.1) | 45.4 (21.8–75.3) | 105.7 (63.4–158.5) |
| 2008 | 21.4 (13.0–37.2) | 18.1 (5.2–34.2) | 0.0 (0.0–0.0) | 0.1 (0.1–0.3) | 1.4 (0.9–2.1) | 0.0 (0.0–0.0) | 0.9 (0.6–1.5) |
| 2009 | 41.4 (15.2–89.3) | 15.9 (8.2–29.0) | 0.4 (0.2–1.0) | 1.2 (0.4–2.6) | 4.8 (2.4–10.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 57.5 (27.8–94.1) | 11.4 (7.5–17.0) | 0.0 (0.0–0.1) | 11.4 (8.3–15.5) | 2.5 (1.5–5.1) | 6.7 (4.1–11.6) | 2.6 (2.1–3.6) |
| 2011 | 30.9 (17.7–47.0) | 12.7 (6.2–23.6) | 4.6 (2.9–6.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 4.2 (2.0–8.7) | 0.8 (0.5–1.3) |
| 2012 | 4.6 (2.4–7.2) | 27.5 (22.0–37.5) | 6.9 (3.7–11.8) | 2.0 (0.8–3.4) | 0.6 (0.5–0.9) | 1.0 (0.6–1.5) | 0.3 (0.1–0.5) |
| 2013 | 0.0 (0.0–0.0) | 39.4 (18.2–69.8) | 16.7 (9.5–28.6) | 1.2 (0.6–2.0) | 1.5 (0.7–2.3) | 1.6 (0.9–2.6) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 43.7 (25.4–75.4) | 23.1 (15.6–36.7) | 0.1 (0.0–0.1) | 0.6 (0.3–1.0) | 0.3 (0.2–0.5) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 13.9 (8.6–23.6) | 93.2 (63.3–140.0) | 0.0 (0.0–0.0) | 1.1 (0.7–2.2) | 0.3 (0.1–0.5) | 4.5 (2.0–8.0) |

**Table A9: Estimates of annual bycatch (t) in the orange roughy target trawl fishery, by species category and standard area, based on the STATISTICAL model; 95% confidence intervals in parentheses. – is N/A; 95% confidence intervals in parentheses. [Continued on next pages]**

**(a) QMS**

Statistical model

| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 2 240 | (1 963–2 572) | – | – | 37 | (19–73) | 12 | (8–17) | 164 | (87–320) | 59 | (30–147) | 1 | (0–6) |
| 2003 | 2 549 | (2 274–2 868) | – | – | 62 | (37–105) | 29 | (25–35) | 21 | (5–97) | 16 | (6–48) | - | – |
| 2004 | 3 112 | (2 739–3 540) | – | – | – | – | 7 | (5–10) | – | – | 43 | (34–74) | - | – |
| 2005 | 2 339 | (2 141–2 583) | – | – | 86 | (26–300) | 13 | (8–25) | 99 | (62–180) | 15 | (12–29) | - | – |
| 2006 | 1 327 | (1 162–1 522) | – | – | – | – | 15 | (14–16) | 122 | (120–125) | – | – | - | – |
| 2007 | 1 685 | (1 490–1 915) | – | – | – | – | 5 | (4–6) | – | – | – | – | - | – |
| 2008 | 2 013 | (1 918–2 121) | 16 | (5–55) | 65 | (44–100) | 6 | (6–7) | – | – | 18 | (7–68) | 1 | (0–1) |
| 2009 | 2 362 | (2 243–2 498) | – | – | 67 | (18–249) | 16 | (15–19) | 9 | (5–21) | 17 | (13–30) | - | – |
| 2010 | 1 806 | (1 696–1 930) | – | – | 90 | (60–136) | 2 | (1–4) | 13 | (8–30) | 52 | (51–53) | - | – |
| 2011 | 327 | (270–404) | 14 | (4–65) | 81 | (65–103) | 21 | (16–28) | – | – | 14 | (8–28) | - | – |
| 2012 | 434 | (343–555) | – | – | 19 | (14–26) | 13 | (7–25) | 13 | (5–55) | 2 | (1–8) | - | – |
| 2013 | 200 | (127–323) | – | – | 39 | (16–97) | 4 | (1–10) | – | – | – | – | - | – |
| 2014 | 451 | (350–586) | – | – | – | – | 15 | (7–30) | 18 | (8–48) | – | – | - | – |
| 2015 | 440 | (389–505) | 20 | (7–78) | 27 | (25–31) | 8 | (4–16) | 62 | (56–72) | 38 | (29–53) | - | – |

**(a) QMS, *continued.***

Statistical model

| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | – | – | 10 | (8–12) | – | – | 246 | (192–319) | 14 | (10–18) | 17 | (13–24) |
| 2003 | 118 | (54–296) | 27 | (20–37) | – | – | 186 | (54–602) | 6 | (3–12) | 27 | (24–31) |
| 2004 | 31 | (25–43) | 20 | (15–26) | – | – | 98 | (42–230) | 19 | (10–37) | 42 | (31–58) |
| 2005 | 53 | (51–56) | 12 | (7–20) | 3 | (3–3) | – | – | – | – | 32 | (17–62) |
| 2006 | 118 | (103–143) | 12 | (8–17) | – | – | 41 | (31–57) | 33 | (20–54) | 63 | (55–74) |
| 2007 | 42 | (40–45) | 10 | (10–10) | – | – | – | – | 15 | (8–29) | – | – |
| 2008 | 23 | (20–29) | 8 | (6–9) | – | – | 1 | (1–2) | 7 | (7–7) | – | – |
| 2009 | 22 | (14–38) | 5 | (4–6) | 4 | (4–4) | 8 | (8–8) | 34 | (33–34) | – | – |
| 2010 | 47 | (35–67) | 5 | (4–7) | 1 | (1–1) | 28 | (27–28) | 18 | (18–19) | 31 | (31–32) |
| 2011 | 23 | (12–48) | 6 | (4–10) | 8 | (7–10) | 33 | (33–33) | 30 | (30–30) | 25 | (24–25) |
| 2012 | 4 | (2–12) | 5 | (4–6) | 12 | (10–13) | 17 | (16–17) | 5 | (5–5) | 11 | (11–11) |
| 2013 | – | – | 12 | (7–23) | 16 | (14–19) | 11 | (11–11) | 18 | (18–18) | 29 | (29–29) |
| 2014 | – | – | 8 | (5–13) | 4 | (1–11) | 2 | (2–2) | 6 | (6–6) | 18 | (18–18) |
| 2015 | – | – | 4 | (3–6) | 80 | (49–128) | 22 | (22–22) | 7 | (7–8) | 18 | (18–18) |

**(b) NON-QMS**

Statistical model

| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | – | – | 23 | (21–26) | – | – | 1 507 | (1 251–1 823) | 39 | (33–47) | 38 | (30–47) |
| 2003 | 14 | (7–30) | 44 | (36–56) | – | – | 178 | (64–511) | 30 | (20–48) | 59 | (55–62) |
| 2004 | 42 | (30–59) | 36 | (31–44) | – | – | 210 | (106–409) | 18 | (11–30) | 70 | (55–90) |
| 2005 | 22 | (20–25) | 28 | (21–39) | 4 | (4–4) | – | – | – | – | 92 | (59–148) |
| 2006 | 53 | (41–70) | 31 | (26–37) | – | – | 50 | (39–66) | 13 | (9–19) | 12 | (10–14) |
| 2007 | 22 | (21–24) | 52 | (52–53) | – | – | – | – | 13 | (7–25) | – | – |
| 2008 | 24 | (21–29) | 26 | (23–29) | – | – | 1 | (1–1) | 4 | (4–4) | – | – |
| 2009 | 28 | (18–46) | 18 | (16–20) | 14 | (14–14) | 15 | (15–15) | 11 | (11–11) | – | – |
| 2010 | 13 | (9–19) | 19 | (16–23) | 3 | (3–3) | 80 | (79–80) | 6 | (5–6) | 19 | (18–19) |
| 2011 | 9 | (4–18) | 12 | (9–16) | 6 | (5–7) | 50 | (50–50) | 9 | (9–9) | 13 | (12–13) |
| 2012 | 1 | (0–3) | 51 | (45–59) | 10 | (9–12) | 24 | (24–24) | 3 | (3–3) | 8 | (8–8) |
| 2013 | – | – | 35 | (22–56) | 24 | (21–27) | 9 | (9–9) | 5 | (5–5) | 11 | (11–11) |
| 2014 | – | – | 54 | (42–72) | 6 | (3–14) | 4 | (4–4) | 1 | (1–1) | 10 | (10–10) |
| 2015 | – | – | 25 | (22–29) | 65 | (47–92) | 132 | (132–132) | 5 | (5–5) | 10 | (10–10) |

**Table A9 [Continued]:**

**(b) NON-QMS, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SUBA** | | **WCNI** | | **WCSI** | | **NWCH** | | **HOWE** | | **LOUI** | |
| 2002 | – | – | 23 | (21–26) | – | – | 1 507 | (1 251–1 823) | 39 | (33–47) | 38 | (30–47) |
| 2003 | 14 | (7–30) | 44 | (36–56) | – | – | 178 | (64–511) | 30 | (20–48) | 59 | (55–62) |
| 2004 | 42 | (30–59) | 36 | (31–44) | – | – | 210 | (106–409) | 18 | (11–30) | 70 | (55–90) |
| 2005 | 22 | (20–25) | 28 | (21–39) | 4 | (4–4) | – | – | – | – | 92 | (59–148) |
| 2006 | 53 | (41–70) | 31 | (26–37) | – | – | 50 | (39–66) | 13 | (9–19) | 12 | (10–14) |
| 2007 | 22 | (21–24) | 52 | (52–53) | – | – | – | – | 13 | (7–25) | – | – |
| 2008 | 24 | (21–29) | 26 | (23–29) | – | – | 1 | (1–1) | 4 | (4–4) | – | – |
| 2009 | 28 | (18–46) | 18 | (16–20) | 14 | (14–14) | 15 | (15–15) | 11 | (11–11) | – | – |
| 2010 | 13 | (9–19) | 19 | (16–23) | 3 | (3–3) | 80 | (79–80) | 6 | (5–6) | 19 | (18–19) |
| 2011 | 9 | (4–18) | 12 | (9–16) | 6 | (5–7) | 50 | (50–50) | 9 | (9–9) | 13 | (12–13) |
| 2012 | 1 | (0–3) | 51 | (45–59) | 10 | (9–12) | 24 | (24–24) | 3 | (3–3) | 8 | (8–8) |
| 2013 | – | – | 35 | (22–56) | 24 | (21–27) | 9 | (9–9) | 5 | (5–5) | 11 | (11–11) |
| 2014 | – | – | 54 | (42–72) | 6 | (3–14) | 4 | (4–4) | 1 | (1–1) | 10 | (10–10) |
| 2015 | – | – | 25 | (22–29) | 65 | (47–92) | 132 | (132–132) | 5 | (5–5) | 10 | (10–10) |

**(c) INV**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **COOK** | | **EAST** | | **NORTH** | | **PUYS** | | **SQUAK** | | **STEW** | |
| 2002 | 23 | (19–28) | – | – | 2 | (1–4) | 0 | (0–0) | 11 | (7–18) | 0 | (0–1) | 0 | (0–0) |
| 2003 | 48 | (41–56) | – | – | 11 | (6–21) | 1 | (1–2) | 0 | (0–2) | 0 | (0–1) | – | – |
| 2004 | 51 | (44–61) | – | – | – | – | 1 | (0–1) | – | – | 0 | (0–1) | – | – |
| 2005 | 112 | (104–123) | – | – | 5 | (1–17) | 1 | (0–2) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 147 | (126–172) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 111 | (97–127) | – | – | – | – | 1 | (1–1) | – | – | – | – | – | – |
| 2008 | 65 | (62–68) | 0 | (0–2) | 2 | (1–3) | 1 | (1–1) | – | – | 0 | (0–1) | 0 | (0–0) |
| 2009 | 62 | (59–66) | – | – | 1 | (0–13) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 45 | (41–49) | – | – | 1 | (1–3) | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2011 | 5 | (4–7) | 0 | (0–1) | 2 | (2–3) | 1 | (1–1) | – | – | 0 | (0–0) | – | – |
| 2012 | 7 | (5–10) | – | – | 1 | (1–1) | 2 | (1–3) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2013 | 13 | (7–24) | – | – | 2 | (1–7) | 1 | (1–4) | – | – | – | – | – | – |
| 2014 | 6 | (5–9) | – | – | – | – | 0 | (0–1) | 1 | (0–3) | – | – | – | – |
| 2015 | 6 | (5–8) | 0 | (0–1) | 1 | (1–1) | 1 | (0–2) | 0 | (0–0) | 2 | (2–3) | – | – |

**(c) INV, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SUBA** | | **WCNI** | | **WCSI** | | **NWCH** | | **HOWE** | | **LOUI** | |
| 2002 | – | – | 7 | (7–8) | – | – | 52 | (39–70) | 2 | (2–4) | 1 | (0–1) |
| 2003 | 1 | (0–4) | 1 | (1–2) | – | – | 7 | (1–42) | 4 | (2–6) | 24 | (23–25) |
| 2004 | 1 | (1–2) | 5 | (4–6) | – | – | 9 | (4–21) | 2 | (1–5) | 48 | (44–54) |
| 2005 | 0 | (0–1) | 3 | (2–4) | 0 | (0–0) | – | – | – | – | 4 | (2–8) |
| 2006 | 1 | (1–1) | 8 | (7–9) | – | – | 7 | (5–11) | 5 | (3–9) | 1 | (0–1) |
| 2007 | 2 | (2–2) | 9 | (9–9) | – | – | – | – | 1 | (1–3) | – | – |
| 2008 | 2 | (1–2) | 7 | (7–8) | – | – | 0 | (0–0) | 1 | (1–1) | – | – |
| 2009 | 2 | (1–3) | 16 | (15–16) | 0 | (0–0) | 1 | (1–1) | 4 | (4–4) | – | – |
| 2010 | 1 | (1–2) | 5 | (5–6) | 0 | (0–0) | 3 | (3–3) | 1 | (1–1) | 4 | (4–4) |
| 2011 | 0 | (0–1) | 5 | (4–6) | 0 | (0–0) | 1 | (1–1) | 1 | (1–1) | 1 | (1–1) |
| 2012 | 0 | (0–0) | 4 | (3–5) | 1 | (0–1) | 0 | (0–0) | 1 | (1–1) | 0 | (0–0) |
| 2013 | – | – | 2 | (1–3) | 1 | (1–1) | 0 | (0–0) | 2 | (2–2) | 1 | (1–1) |
| 2014 | – | – | 2 | (1–3) | 1 | (0–4) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) |
| 2015 | – | – | 1 | (1–1) | 3 | (2–6) | 4 | (4–4) | 1 | (1–1) | 1 | (1–1) |

**Table A9 [Continued]:**

**(d) Coral species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **COOK** | | **EAST** | | **NORTH** | | **PUYS** | | **SQUAK** | | **STEW** | |
| 2002 | 4 | (4–5) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 4 | (4–6) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 1 | (1–2) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 1 | (1–2) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 11 | (11–12) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 11 | (11–12) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 3 | (3–3) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) | – | – |

**(d) Coral species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SUBA** | | **WCNI** | | **WCSI** | | **NWCH** | | **HOWE** | | **LOUI** | |
| 2002 | – | – | 0 | (0–0) | – | – | 0 | (0–1) | 0 | (0–1) | 0 | (0–1) |
| 2003 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–1) | 0 | (0–1) | 1 | (1–1) |
| 2004 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–1) |
| 2005 | 0 | (0–0) | 1 | (1–3) | 0 | (0–0) | – | – | – | – | 2 | (1–5) |
| 2006 | 0 | (0–0) | 1 | (1–1) | – | – | 0 | (0–0) | 1 | (1–1) | 1 | (0–1) |
| 2007 | 0 | (0–0) | 8 | (8–8) | – | – | – | – | 1 | (0–1) | – | – |
| 2008 | 0 | (0–0) | 6 | (6–6) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 14 | (14–14) | 0 | (0–0) | 0 | (0–0) | 2 | (2–2) | – | – |
| 2010 | 0 | (0–0) | 4 | (4–5) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 4 | (4–4) |
| 2011 | 0 | (0–0) | 3 | (3–3) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) |
| 2012 | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) | 0 | (0–0) |
| 2014 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) |

**(e) Morid species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **COOK** | | **EAST** | | **NORTH** | | **PUYS** | | **SQUAK** | | **STEW** | |
| 2002 | 131 | (115–150) | – | – | 13 | (11–16) | 2 | (1–2) | 2 | (2–3) | 0 | (0–1) | 0 | (0–0) |
| 2003 | 82 | (70–95) | – | – | 7 | (6–9) | 2 | (1–2) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2004 | 129 | (110–151) | – | – | – | – | 1 | (1–1) | – | – | 0 | (0–0) | – | – |
| 2005 | 144 | (130–160) | – | – | 15 | (13–19) | 1 | (1–2) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 245 | (219–272) | – | – | – | – | 2 | (1–2) | 0 | (0–1) | – | – | – | – |
| 2007 | 248 | (224–275) | – | – | – | – | 3 | (2–3) | – | – | – | – | – | – |
| 2008 | 145 | (139–153) | 1 | (0–2) | 10 | (9–12) | 2 | (1–2) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 143 | (136–151) | – | – | 14 | (12–17) | 2 | (2–2) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 208 | (200–218) | – | – | 22 | (19–26) | 2 | (2–2) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 58 | (52–65) | 1 | (0–3) | 20 | (17–23) | 4 | (4–5) | – | – | 0 | (0–0) | – | – |
| 2012 | 45 | (40–50) | – | – | 7 | (6–8) | 2 | (2–3) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 35 | (31–41) | – | – | 11 | (9–14) | 1 | (1–2) | – | – | – | – | – | – |
| 2014 | 69 | (60–80) | – | – | – | – | 2 | (2–3) | 2 | (2–2) | – | – | – | – |
| 2015 | 81 | (76–87) | 1 | (0–2) | 7 | (6–8) | 2 | (2–3) | 0 | (0–1) | 1 | (1–1) | – | – |

**Table A9 [Continued]:**

**(e) Morid species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 1 | (1–2) | – | – | 130 | (115–148) | 8 | (7–9) | 7 | (6–8) |
| 2003 | 0 | (0–0) | 2 | (2–2) | – | – | 51 | (42–62) | 4 | (3–5) | 3 | (3–3) |
| 2004 | 0 | (0–0) | 3 | (2–3) | – | – | 31 | (26–37) | 4 | (4–5) | 8 | (7–10) |
| 2005 | 2 | (2–2) | 3 | (2–3) | 1 | (1–1) | – | – | – | – | 6 | (5–7) |
| 2006 | 1 | (1–1) | 4 | (4–5) | – | – | 28 | (26–31) | 10 | (9–12) | 5 | (4–6) |
| 2007 | 1 | (1–1) | 5 | (5–5) | – | – | – | – | 8 | (7–10) | – | – |
| 2008 | 1 | (0–1) | 2 | (2–2) | – | – | 1 | (1–1) | 3 | (3–3) | – | – |
| 2009 | 1 | (0–1) | 2 | (2–2) | 1 | (1–1) | 3 | (3–3) | 10 | (10–10) | – | – |
| 2010 | 1 | (1–1) | 2 | (2–2) | 1 | (1–1) | 19 | (19–20) | 6 | (5–6) | 5 | (5–5) |
| 2011 | 0 | (0–1) | 3 | (2–3) | 2 | (2–2) | 27 | (27–27) | 8 | (8–8) | 2 | (2–2) |
| 2012 | 0 | (0–0) | 4 | (4–4) | 2 | (2–2) | 8 | (8–8) | 2 | (2–2) | 1 | (1–1) |
| 2013 | – | – | 5 | (4–6) | 5 | (4–5) | 5 | (5–5) | 6 | (6–6) | 2 | (2–2) |
| 2014 | – | – | 3 | (3–4) | 3 | (3–4) | 1 | (1–1) | 1 | (1–1) | 1 | (1–1) |
| 2015 | – | – | 3 | (3–3) | 21 | (18–25) | 19 | (19–19) | 2 | (2–3) | 2 | (2–2) |

**(f) Rattail species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 204 | (177–236) | – | – | 36 | (28–45) | 2 | (2–3) | 7 | (5–9) | 7 | (5–11) | 0 | (0–1) |
| 2003 | 107 | (94–122) | – | – | 15 | (12–18) | 2 | (2–2) | 2 | (1–2) | 2 | (1–3) | – | – |
| 2004 | 115 | (99–135) | – | – | – | – | 1 | (1–1) | – | – | 2 | (1–2) | – | – |
| 2005 | 62 | (56–69) | – | – | 11 | (9–14) | 1 | (0–1) | 1 | (1–1) | 1 | (1–1) | – | – |
| 2006 | 238 | (214–266) | – | – | – | – | 1 | (1–1) | 1 | (1–1) | – | – | – | – |
| 2007 | 153 | (136–172) | – | – | – | – | 2 | (1–2) | – | – | – | – | – | – |
| 2008 | 103 | (99–107) | 1 | (0–3) | 10 | (8–12) | 1 | (1–1) | – | – | 1 | (1–2) | 0 | (0–0) |
| 2009 | 92 | (88–97) | – | – | 14 | (12–18) | 1 | (1–1) | 1 | (0–1) | 1 | (1–1) | – | – |
| 2010 | 146 | (141–152) | – | – | 24 | (20–29) | 1 | (1–2) | 0 | (0–1) | 0 | (0–1) | – | – |
| 2011 | 23 | (20–27) | 1 | (0–3) | 16 | (14–19) | 3 | (3–4) | – | – | 1 | (1–2) | – | – |
| 2012 | 30 | (27–34) | – | – | 7 | (6–8) | 2 | (1–2) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2013 | 16 | (14–19) | – | – | 10 | (8–12) | 1 | (1–1) | – | – | – | – | – | – |
| 2014 | 33 | (28–38) | – | – | – | – | 1 | (1–2) | 1 | (1–1) | – | – | – | – |
| 2015 | 29 | (26–33) | 1 | (0–2) | 7 | (6–8) | 2 | (1–2) | 1 | (1–1) | 6 | (4–7) | – | – |

**(f) Rattail species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 7 | (6–8) | – | – | 222 | (191–262) | 2 | (2–3) | 10 | (8–12) |
| 2003 | 7 | (6–8) | 9 | (8–9) | – | – | 68 | (56–83) | 1 | (1–1) | 3 | (3–3) |
| 2004 | 12 | (11–14) | 5 | (4–6) | – | – | 31 | (25–38) | 1 | (1–1) | 8 | (6–9) |
| 2005 | 8 | (7–8) | 2 | (2–3) | 0 | (0–0) | – | – | – | – | 3 | (2–3) |
| 2006 | 25 | (22–28) | 12 | (11–13) | – | – | 26 | (22–30) | 2 | (2–3) | 4 | (4–5) |
| 2007 | 13 | (12–14) | 20 | (20–20) | – | – | – | – | 1 | (1–2) | – | – |
| 2008 | 13 | (12–14) | 7 | (7–8) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 9 | (8–11) | 2 | (1–2) | 1 | (1–1) | 1 | (1–1) | 1 | (1–1) | – | – |
| 2010 | 11 | (9–13) | 3 | (3–3) | 0 | (0–0) | 14 | (14–15) | 1 | (1–1) | 2 | (2–2) |
| 2011 | 5 | (4–6) | 3 | (3–4) | 1 | (1–1) | 12 | (12–12) | 1 | (1–1) | 1 | (1–1) |
| 2012 | 1 | (1–1) | 6 | (6–7) | 1 | (1–1) | 6 | (6–6) | 0 | (0–0) | 1 | (1–1) |
| 2013 | – | – | 6 | (5–7) | 2 | (2–2) | 1 | (1–2) | 0 | (0–0) | 1 | (1–1) |
| 2014 | – | – | 5 | (4–6) | 2 | (1–2) | 1 | (1–1) | 0 | (0–0) | 1 | (1–1) |
| 2015 | – | – | 6 | (5–6) | 14 | (12–17) | 39 | (39–39) | 0 | (0–0) | 1 | (1–1) |

**Table A9 [Continued]:**

**(g) Slickhead species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 146 | (122–176) | – | – | 11 | (8–16) | 1 | (1–2) | 4 | (3–6) | 1 | (0–1) | 0 | (0–1) |
| 2003 | 47 | (38–58) | – | – | 3 | (2–4) | 1 | (1–1) | 1 | (0–1) | 0 | (0–0) | – | – |
| 2004 | 79 | (64–96) | – | – | – | – | 1 | (1–1) | – | – | 0 | (0–0) | – | – |
| 2005 | 43 | (37–50) | – | – | 4 | (3–6) | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2006 | 100 | (87–117) | – | – | – | – | 0 | (0–1) | 1 | (1–1) | – | – | – | – |
| 2007 | 61 | (53–71) | – | – | – | – | 0 | (0–1) | – | – | – | – | – | – |
| 2008 | 66 | (62–71) | 2 | (1–6) | 5 | (4–6) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 71 | (66–77) | – | – | 7 | (5–9) | 1 | (1–1) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2010 | 123 | (115–132) | – | – | 14 | (11–19) | 1 | (1–2) | 1 | (0–1) | 0 | (0–0) | – | – |
| 2011 | 16 | (13–20) | 2 | (1–6) | 6 | (5–8) | 1 | (1–1) | – | – | 0 | (0–0) | – | – |
| 2012 | 26 | (21–32) | – | – | 4 | (3–5) | 1 | (1–2) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2013 | 15 | (12–18) | – | – | 4 | (3–5) | 1 | (0–1) | – | – | – | – | – | – |
| 2014 | 17 | (13–23) | – | – | – | – | 1 | (0–1) | 0 | (0–1) | – | – | – | – |
| 2015 | 32 | (28–37) | 2 | (1–6) | 3 | (2–3) | 1 | (1–1) | 1 | (0–1) | 1 | (0–1) | – | – |

**(g) Slickhead species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 4 | (3–5) | – | – | 149 | (126–176) | 2 | (2–3) | 2 | (1–3) |
| 2003 | 1 | (1–1) | 2 | (1–2) | – | – | 25 | (19–33) | 1 | (1–1) | 0 | (0–1) |
| 2004 | 3 | (2–4) | 3 | (3–4) | – | – | 18 | (14–23) | 1 | (1–1) | 2 | (1–3) |
| 2005 | 3 | (3–3) | 2 | (2–2) | 0 | (0–0) | – | – | – | – | 1 | (0–1) |
| 2006 | 4 | (3–5) | 3 | (3–4) | – | – | 9 | (8–11) | 1 | (1–2) | 1 | (1–1) |
| 2007 | 2 | (1–2) | 2 | (2–2) | – | – | – | – | 1 | (0–1) | – | – |
| 2008 | 2 | (2–3) | 1 | (1–2) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 3 | (2–4) | 2 | (2–2) | 0 | (0–0) | 2 | (2–2) | 1 | (1–1) | – | – |
| 2010 | 4 | (4–6) | 3 | (3–4) | 0 | (0–0) | 15 | (14–15) | 0 | (0–0) | 1 | (1–1) |
| 2011 | 1 | (1–2) | 2 | (2–2) | 0 | (0–0) | 4 | (4–4) | 1 | (1–1) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 8 | (7–9) | 1 | (0–1) | 3 | (3–4) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 4 | (3–5) | 1 | (1–1) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 2 | (2–3) | 0 | (0–1) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 4 | (3–4) | 5 | (4–6) | 20 | (20–20) | 0 | (0–0) | 1 | (1–1) |

**(h) Shark species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 350 | (318–383) | – | – | 35 | (30–40) | 3 | (3–4) | 11 | (9–15) | 2 | (2–3) | 1 | (0–5) |
| 2003 | 315 | (289–342) | – | – | 26 | (23–30) | 6 | (5–6) | 5 | (4–6) | 1 | (1–1) | – | – |
| 2004 | 392 | (357–431) | – | – | – | – | 3 | (3–4) | – | – | 1 | (1–1) | – | – |
| 2005 | 265 | (245–286) | – | – | 29 | (24–33) | 3 | (2–3) | 6 | (5–6) | 0 | (0–0) | – | – |
| 2006 | 416 | (387–450) | – | – | – | – | 3 | (3–3) | 5 | (5–5) | – | – | – | – |
| 2007 | 411 | (382–445) | – | – | – | – | 4 | (4–4) | – | – | – | – | – | – |
| 2008 | 417 | (401–433) | 5 | (2–13) | 32 | (28–37) | 5 | (5–6) | – | – | 1 | (1–2) | 4 | (3–4) |
| 2009 | 370 | (357–385) | – | – | 36 | (31–41) | 5 | (4–5) | 2 | (2–3) | 1 | (1–1) | – | – |
| 2010 | 325 | (314–338) | – | – | 43 | (38–49) | 4 | (3–4) | 2 | (1–2) | 0 | (0–1) | – | – |
| 2011 | 99 | (91–107) | 4 | (2–10) | 34 | (30–39) | 5 | (5–6) | – | – | 1 | (1–1) | – | – |
| 2012 | 90 | (83–99) | – | – | 15 | (14–17) | 4 | (4–5) | 2 | (1–2) | 0 | (0–0) | – | – |
| 2013 | 59 | (53–66) | – | – | 20 | (17–23) | 2 | (2–3) | – | – | – | – | – | – |
| 2014 | 124 | (110–139) | – | – | – | – | 4 | (3–5) | 3 | (3–4) | – | – | – | – |
| 2015 | 88 | (81–95) | 3 | (1–6) | 13 | (12–14) | 3 | (3–4) | 4 | (4–5) | 3 | (2–3) | – | – |

## Table A9 [Continued]:

**(h) Shark species, *continued.***

| | Statistical model | | | | | |
|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** |
| 2002 | – – | 13 (13–14) | – – | 210 (190–233) | 11 (10–12) | 26 (23–29) |
| 2003 | 2 (1–2) | 14 (13–15) | – – | 102 (88–117) | 5 (5–6) | 17 (16–19) |
| 2004 | 5 (4–6) | 16 (15–18) | – – | 53 (47–62) | 5 (4–5) | 37 (33–41) |
| 2005 | 5 (4–5) | 12 (11–13) | 3 (3–3) | – – | – – | 19 (18–21) |
| 2006 | 6 (5–6) | 15 (14–17) | – – | 26 (23–28) | 6 (5–7) | 13 (12–14) |
| 2007 | 5 (4–5) | 23 (23–23) | – – | – – | 5 (4–6) | – – |
| 2008 | 7 (7–8) | 15 (15–16) | – – | 1 (1–1) | 3 (3–3) | – – |
| 2009 | 6 (5–7) | 13 (13–14) | 12 (12–12) | 6 (6–6) | 6 (6–6) | – – |
| 2010 | 5 (5–6) | 12 (11–12) | 2 (2–2) | 35 (35–35) | 3 (3–3) | 11 (11–11) |
| 2011 | 3 (2–3) | 9 (8–10) | 4 (4–4) | 24 (24–24) | 6 (6–6) | 9 (9–9) |
| 2012 | 0 (0–0) | 19 (18–20) | 5 (4–5) | 11 (11–11) | 1 (1–1) | 5 (5–5) |
| 2013 | – – | 18 (16–20) | 7 (6–7) | 4 (4–4) | 3 (3–3) | 8 (8–8) |
| 2014 | – – | 19 (17–20) | 5 (4–6) | 2 (2–2) | 1 (1–1) | 6 (6–6) |
| 2015 | – – | 14 (13–15) | 28 (25–32) | 35 (35–35) | 1 (1–1) | 5 (5–5) |

**(i) Schedule 6 species**

| | Statistical model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 1 (0–1) | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) |
| 2003 | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – |
| 2004 | 1 (1–3) | – – | – – | 0 (0–0) | – – | 0 (0–0) | – – |
| 2005 | 0 (0–1) | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – |
| 2006 | 1 (0–1) | – – | – – | 0 (0–0) | 0 (0–0) | – – | – – |
| 2007 | 1 (0–1) | – – | – – | 0 (0–0) | – – | – – | – – |
| 2008 | 0 (0–1) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) |
| 2009 | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – |
| 2010 | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – |
| 2011 | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – | 0 (0–0) | – – |
| 2012 | 0 (0–1) | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – |
| 2013 | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) | – – | – – | – – |
| 2014 | 0 (0–1) | – – | – – | 0 (0–0) | 0 (0–0) | – – | – – |
| 2015 | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – |

**(i) Schedule 6 species, *continued.***

| | Statistical model | | | | | |
|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** |
| 2002 | – – | 0 (0–0) | – – | 6 (3–11) | 0 (0–0) | 0 (0–0) |
| 2003 | 0 (0–0) | 0 (0–0) | – – | 1 (0–3) | 0 (0–0) | 0 (0–0) |
| 2004 | 0 (0–0) | 0 (0–0) | – – | 3 (2–6) | 0 (0–0) | 0 (0–0) |
| 2005 | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – | – – | 0 (0–0) |
| 2006 | 0 (0–0) | 0 (0–0) | – – | 1 (1–2) | 0 (0–0) | 0 (0–0) |
| 2007 | 0 (0–0) | 0 (0–0) | – – | – – | 0 (0–0) | – – |
| 2008 | 0 (0–0) | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) | – – |
| 2009 | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | – – |
| 2010 | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) |
| 2011 | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) |
| 2012 | 0 (0–0) | 0 (0–0) | 0 (0–0) | 1 (1–1) | 0 (0–0) | 0 (0–0) |
| 2013 | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) |
| 2014 | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) |
| 2015 | – – | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) | 0 (0–0) |

## Table A9 [Continued]:

### (j) Spiny dogfish

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 0 | (0–1) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |

### (j) Spiny dogfish, *continued.*

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 0 | (0–0) | – | – | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–2) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 0 | (0–0) | 0 | (0–0) | – | – | 1 | (0–3) | 0 | (0–0) | 0 | (0–1) |
| 2005 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |

### (k) Total

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | AUCK | | STEW | |
| 2002 | 2 917 | (2 566–3 337) | – | – | 65 | (35–123) | 14 | (9–20) | 193 | (105–369) | 62 | (31–156) | 2 | (0–9) |
| 2003 | 3 265 | (2 922–3 660) | – | – | 182 | (116–288) | 41 | (35–51) | 27 | (7–118) | 20 | (7–61) | – | – |
| 2004 | 3 873 | (3 415–4 403) | – | – | – | – | 15 | (10–20) | – | – | 47 | (36–85) | – | – |
| 2005 | 3 134 | (2 873–3 450) | – | – | 168 | (59–506) | 23 | (13–44) | 112 | (71–199) | 16 | (13–34) | – | – |
| 2006 | 2 870 | (2 542–3 253) | – | – | – | – | 19 | (17–20) | 131 | (128–134) | – | – | – | – |
| 2007 | 2 944 | (2 615–3 324) | – | – | – | – | 13 | (11–15) | – | – | – | – | – | – |
| 2008 | 2 908 | (2 773–3 057) | 30 | (10–103) | 142 | (97–214) | 15 | (14–16) | – | – | 20 | (8–77) | 5 | (3–6) |
| 2009 | 3 204 | (3 044–3 386) | – | – | 142 | (46–465) | 26 | (23–32) | 10 | (6–24) | 20 | (14–37) | – | – |
| 2010 | 2 854 | (2 687–3 042) | – | – | 285 | (200–415) | 5 | (3–11) | 14 | (9–35) | 53 | (52–55) | – | – |
| 2011 | 458 | (377–567) | 20 | (5–98) | 169 | (137–214) | 40 | (31–53) | – | – | 17 | (10–33) | – | – |
| 2012 | 615 | (489–781) | – | – | 93 | (78–113) | 36 | (21–61) | 15 | (5–67) | 3 | (2–12) | – | – |
| 2013 | 314 | (203–496) | – | – | 82 | (37–193) | 16 | (7–43) | – | – | – | – | – | – |
| 2014 | 604 | (472–779) | – | – | – | – | 26 | (12–51) | 42 | (18–107) | – | – | – | – |
| 2015 | 553 | (488–635) | 23 | (8–90) | 54 | (49–61) | 16 | (8–31) | 68 | (61–80) | 50 | (38–70) | – | – |

**Table A9 [Continued]:**

**(k) Total, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 40 | (36–46) | – | – | 1 805 | (1 482–2 212) | 55 | (45–69) | 56 | (43–72) |
| 2003 | 133 | (61–330) | 72 | (57–95) | – | – | 371 | (119–1 155) | 40 | (25–66) | 110 | (102–118) |
| 2004 | 74 | (56–104) | 61 | (50–76) | – | – | 317 | (152–660) | 39 | (22–72) | 160 | (130–202) |
| 2005 | 75 | (71–82) | 43 | (30–63) | 7 | (7–7) | – | – | – | – | 128 | (78–218) |
| 2006 | 172 | (145–214) | 51 | (41–63) | – | – | 98 | (75–134) | 51 | (32–82) | 76 | (65–89) |
| 2007 | 66 | (63–71) | 71 | (71–72) | – | – | – | – | 29 | (16–57) | – | – |
| 2008 | 49 | (42–60) | 41 | (36–46) | – | – | 2 | (2–3) | 12 | (12–12) | – | – |
| 2009 | 52 | (33–87) | 39 | (35–42) | 18 | (18–18) | 24 | (24–24) | 49 | (48–49) | – | – |
| 2010 | 61 | (45–88) | 29 | (25–36) | 4 | (4–4) | 111 | (109–111) | 25 | (24–26) | 54 | (53–55) |
| 2011 | 32 | (16–67) | 23 | (17–32) | 14 | (12–17) | 84 | (84–84) | 40 | (40–40) | 39 | (37–39) |
| 2012 | 5 | (2–15) | 60 | (52–70) | 23 | (19–26) | 41 | (40–41) | 9 | (9–9) | 19 | (19–19) |
| 2013 | – | – | 49 | (30–82) | 41 | (36–47) | 20 | (20–20) | 25 | (25–25) | 41 | (41–41) |
| 2014 | – | – | 64 | (48–88) | 11 | (4–29) | 6 | (6–6) | 7 | (7–7) | 29 | (29–29) |
| 2015 | – | – | 30 | (26–36) | 148 | (98–226) | 158 | (158–158) | 13 | (13–14) | 29 | (29–29) |

**Table A10: Estimates of total annual bycatch, rounded to the nearest t, in the orange roughy target trawl fishery by species category and overall, based on the RATIO model; 95% confidence intervals in parentheses.**

| Fishing year | QMS | non-QMS | Invertebrate | Total bycatch |
|---|---|---|---|---|
| 2002 | 2 786 (2 006–4 066) | 2 539 (1 389–4 219) | 109 (69–149) | 5 434 (3 464–8 434) |
| 2003 | 3 156 (2 246–4 266) | 2 222 (1 192–4 012) | 142 (112–192) | 5 520 (3 550–8 470) |
| 2004 | 4 197 (2 987–5 347) | 1 375 (965–1 975) | 503 (203–933) | 6 075 (4 155–8 255) |
| 2005 | 3 486 (2 966–4 016) | 1 173 (1 053–1 323) | 260 (200–360) | 4 919 (4 219–5 699) |
| 2006 | 2 025 (1 565–2 965) | 1 896 (1 616–2 216) | 168 (128–228) | 4 089 (3 309–5 409) |
| 2007 | 1 758 (1 448–2 168) | 1 178 (1 008–1 328) | 157 (97–237) | 3 093 (2 553–3 733) |
| 2008 | 2 700 (2 480–4 020) | 1 070 (1 000–1 160) | 109 (89–139) | 3 879 (3 569–5 319) |
| 2009 | 3 177 (2 597–3 457) | 1 122 (1 012–1 362) | 116 (96–136) | 4 415 (3 705–4 955) |
| 2010 | 2 221 (2 031–2 441) | 1 461 (1 291–1 691) | 58 (48–58) | 3 740 (3 370–4 190) |
| 2011 | 772 (592–972) | 290 (260–340) | 18 (18–28) | 1 080 (870–1 340) |
| 2012 | 581 (441–771) | 427 (277–747) | 15 (5–25) | 1 023 (723–1 543) |
| 2013 | 364 (204–594) | 328 (178–768) | 14 (4–34) | 706 (386–1 396) |
| 2014 | 525 (375–745) | 249 (209–299) | 13 (13–23) | 787 (597–1 067) |
| 2015 | 705 (565–855) | 382 (352–422) | 20 (20–30) | 1 107 (937–1 307) |

| Fishing year | Coral species | Morid species | Rattail species | Slickhead species |
|---|---|---|---|---|
| 2002 | 24 (4–64) | 347 (177–597) | 605 (355–935) | 636 (186–1 216) |
| 2003 | 1 (1–1) | 251 (101–481) | 465 (225–825) | 410 (60–1 050) |
| 2004 | 0 (0–0) | 194 (124–284) | 249 (149–379) | 180 (60–400) |
| 2005 | 13 (3–33) | 280 (220–360) | 194 (154–234) | 73 (63–93) |
| 2006 | 0 (0–0) | 411 (341–501) | 534 (454–694) | 141 (101–191) |
| 2007 | 8 (8–18) | 285 (195–385) | 220 (170–270) | 85 (75–105) |
| 2008 | 40 (30–60) | 196 (186–226) | 179 (159–209) | 114 (104–134) |
| 2009 | 46 (36–66) | 196 (186–216) | 167 (147–187) | 117 (97–147) |
| 2010 | 6 (6–6) | 332 (302–352) | 265 (235–295) | 183 (163–203) |
| 2011 | 4 (4–14) | 91 (81–131) | 41 (41–51) | 18 (18–18) |
| 2012 | 1 (1–1) | 61 (51–81) | 71 (41–171) | 32 (22–42) |
| 2013 | 1 (1–1) | 57 (47–67) | 25 (15–35) | 45 (15–105) |
| 2014 | 0 (0–10) | 107 (67–197) | 49 (29–79) | 13 (13–13) |
| 2015 | 2 (2–12) | 146 (116–176) | 72 (72–82) | 52 (42–72) |

| Fishing year | Shark species | Schedule 6 species | Spiny dogfish |
|---|---|---|---|
| 2002 | 778 (508–1 168) | 11 (1–11) | 0 (0–0) |
| 2003 | 767 (517–1 157) | 10 (0–10) | 0 (0–10) |
| 2004 | 614 (464–784) | 0 (0–10) | 0 (0–0) |
| 2005 | 506 (426–606) | 10 (0–10) | 0 (0–10) |
| 2006 | 755 (655–915) | 0 (0–0) | 0 (0–0) |
| 2007 | 537 (477–617) | 0 (0–0) | 0 (0–0) |
| 2008 | 516 (496–556) | 0 (0–0) | 0 (0–0) |
| 2009 | 538 (508–568) | 0 (0–0) | 0 (0–0) |
| 2010 | 495 (465–535) | 0 (0–0) | 0 (0–0) |
| 2011 | 153 (133–173) | 0 (0–0) | 0 (0–0) |
| 2012 | 174 (134–214) | 1 (1–1) | 0 (0–0) |
| 2013 | 103 (83–113) | 0 (0–0) | 0 (0–0) |
| 2014 | 126 (106–156) | 0 (0–0) | 0 (0–0) |
| 2015 | 161 (141–181) | 1 (1–1) | 0 (0–0) |

**Table A11: Estimates of total annual bycatch, rounded to the nearest t, in the orange roughy target trawl fishery by species category and overall, based on the STATISTICAL model; 95% confidence intervals in parentheses.**

| Fishing year | QMS | non-QMS | Invertebrate | Total bycatch |
|---|---|---|---|---|
| 2002 | 2 824 (2 505–3 192) | 2 320 (2 051–2 650) | 99 (84–118) | 5 243 (4 640–5 960) |
| 2003 | 3 094 (2 725–3 642) | 1 136 (988–1 467) | 100 (87–136) | 4 330 (3 800–5 245) |
| 2004 | 3 388 (2 997–3 827) | 1 105 (963–1 322) | 118 (107–134) | 4 611 (4 067–5 283) |
| 2005 | 2 679 (2 443–2 995) | 937 (850–1 064) | 127 (116–142) | 3 743 (3 409–4 201) |
| 2006 | 1 735 (1 563–1 935) | 1 567 (1 423–1 731) | 170 (148–196) | 3 472 (3 134–3 862) |
| 2007 | 1 757 (1 562–1 990) | 1 244 (1 122–1 379) | 124 (110–140) | 3 125 (2 794–3 509) |
| 2008 | 2 169 (2 064–2 292) | 992 (944–1 051) | 78 (74–82) | 3 239 (3 082–3 425) |
| 2009 | 2 557 (2 414–2 767) | 958 (893–1 091) | 88 (83–99) | 3 603 (3 390–3 957) |
| 2010 | 2 101 (1 981–2 230) | 1 346 (1 264–1 446) | 62 (58–67) | 3 509 (3 303–3 743) |
| 2011 | 592 (521–686) | 342 (309–382) | 18 (16–20) | 952 (846–1 088) |
| 2012 | 539 (445–666) | 371 (333–417) | 15 (13–19) | 925 (791–1 102) |
| 2013 | 336 (251–467) | 243 (196–310) | 24 (16–36) | 603 (463–813) |
| 2014 | 527 (422–664) | 260 (220–312) | 12 (10–16) | 799 (652–992) |
| 2015 | 734 (663–828) | 399 (374–430) | 21 (19–24) | 1 154 (1 056–1 282) |

| Fishing year | Coral species | Morid species | Rattail species | Slickhead species |
|---|---|---|---|---|
| 2002 | 5 (4–7) | 295 (262–332) | 499 (435–577) | 321 (272–379) |
| 2003 | 2 (1–4) | 151 (129–175) | 215 (188–247) | 80 (65–100) |
| 2004 | 1 (0–2) | 176 (151–206) | 174 (150–204) | 106 (87–130) |
| 2005 | 8 (6–14) | 172 (155–192) | 87 (79–97) | 53 (46–62) |
| 2006 | 4 (3–5) | 295 (265–328) | 309 (280–346) | 120 (105–140) |
| 2007 | 10 (9–11) | 265 (239–293) | 189 (172–209) | 66 (57–76) |
| 2008 | 18 (18–19) | 165 (157–173) | 136 (131–143) | 78 (73–84) |
| 2009 | 28 (27–28) | 176 (167–186) | 123 (116–131) | 86 (79–94) |
| 2010 | 12 (12–13) | 267 (256–279) | 204 (195–214) | 163 (152–176) |
| 2011 | 5 (5–5) | 126 (117–135) | 68 (62–75) | 34 (29–41) |
| 2012 | 1 (1–1) | 71 (65–78) | 55 (51–60) | 44 (38–52) |
| 2013 | 3 (3–4) | 70 (63–78) | 37 (32–42) | 25 (20–30) |
| 2014 | 1 (1–1) | 83 (73–95) | 44 (38–51) | 22 (17–29) |
| 2015 | 3 (3–3) | 140 (132–150) | 104 (98–112) | 70 (64–78) |

| Fishing year | Shark species | Schedule 6 species | Spiny dogfish |
|---|---|---|---|
| 2002 | 665 (609–722) | 7 (4–12) | 0 (0–1) |
| 2003 | 492 (450–537) | 1 (1–3) | 0 (0–2) |
| 2004 | 512 (466–564) | 6 (3–9) | 2 (1–4) |
| 2005 | 341 (316–367) | 1 (0–1) | 0 (0–0) |
| 2006 | 489 (456–528) | 2 (1–3) | 0 (0–0) |
| 2007 | 448 (418–483) | 1 (1–2) | 0 (0–0) |
| 2008 | 491 (472–513) | 1 (0–1) | 0 (0–0) |
| 2009 | 457 (439–475) | 0 (0–0) | 0 (0–0) |
| 2010 | 442 (426–458) | 0 (0–1) | 0 (0–0) |
| 2011 | 198 (186–212) | 0 (0–1) | 0 (0–0) |
| 2012 | 153 (144–165) | 2 (2–3) | 0 (0–0) |
| 2013 | 120 (110–132) | 0 (0–0) | 0 (0–0) |
| 2014 | 163 (147–182) | 1 (0–1) | 0 (0–0) |
| 2015 | 199 (188–211) | 1 (1–1) | 0 (0–0) |

**Table A12: Summary of results of linear regression analyses for trends in annual bycatch in the orange roughy fishery between 2001–02 and 2014–15, by species category. 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** | **-0.179** | **0.003** |
| **NON-QMS** | **-0.116** | **0.014** |
| **INV** | **-0.209** | **0.003** |
| **Total** | **-0.166** | **0.001** |
| **Morid species** | **-0.207** | **0.002** |
| Rattail species | -0.025 | 0.743 |
| **Shark species** | **-0.210** | **0.001** |
| **Slickhead species** | **-0.200** | **0.003** |

**Table A13: Total annual bycatch estimates for the target orange roughy fishery, based on catch effort records, compared with the ratio method observer-based estimates. Estimates are derived by summing the difference between the recorded total catch and orange roughy 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 | 4 070 | 74.9 |
| 2003 | 4 340 | 78.6 |
| 2004 | 4 436 | 73.0 |
| 2005 | 3 931 | 79.9 |
| 2006 | 3 915 | 95.8 |
| 2007 | 3 193 | 103.2 |
| 2008 | 3 107 | 80.1 |
| 2009 | 3 301 | 74.8 |
| 2010 | 2 212 | 59.1 |
| 2011 | 1 062 | 98.3 |
| 2012 | 782 | 76.5 |
| 2013 | 620 | 87.8 |
| 2014 | 997 | 126.7 |
| 2015 | 1 250 | 112.9 |
| All years | 37 216 | 81.2 |

**Table A14: Estimates of annual discards (t) in the orange roughy target trawl fishery, by species category and standard area, based on the RATIO model; 95% confidence intervals in parentheses. [Continued on next pages]**

**(a) ORH**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 31.4 (0.0–134.5) | 0.0 (0.0–0.6) | 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) |
| 2004 | 0.1 (0.0–67.2) | 0.1 (0.0–0.5) | 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) |
| 2005 | 4.1 (0.0–26.5) | 0.0 (0.0–0.2) | 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) |
| 2006 | 27.1 (0.0–106.7) | 0.1 (0.0–0.5) | 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 (0.0–0.1) |
| 2007 | 0.0 (0.0–0.0) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 9.9 (0.0–28.6) | 0.5 (0.1–1.3) | 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) |
| 2009 | 13.8 (2.0–31.7) | 0.3 (0.1–0.6) | 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) |
| 2010 | 0.2 (0.0–0.6) | 0.1 (0.0–0.5) | 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) |
| 2011 | 2.4 (0.0–320.9) | 0.8 (0.0–3.4) | 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 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.2 (0.0–0.8) | 14.0 (0.0–63.2) | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 23.0 (0.0–101.9) | 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 | 0.0 (0.0–0.0) | 0.1 (0.0–2.0) | 7.1 (0.0–21.9) | 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 | 0.0 (0.0–0.0) | 0.2 (0.1–0.5) | 2.7 (0.0–10.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(a) ORH, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 3.4 (0.1–9.6) | 0.0 (0.0–0.0) | 0.7 (0.1–1.8) | 0.2 (0.0–0.6) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 2.6 (0.1–8.1) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 1.6 (0.0–8.4) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.9 (0.0–2.5) | 0.0 (0.0–0.0) | 98.2 (0.3–293.8) | 3.1 (0.0–18.4) |
| 2005 | 0.0 (0.0–0.1) | 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) | 1.0 (0.0–4.9) |
| 2006 | 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) | 0.0 (0.0–0.0) | 1.3 (0.0–5.9) |
| 2007 | 0.0 (0.0–0.0) | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 6.5 (0.0–23.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.9) |
| 2008 | 0.0 (0.0–0.0) | 0.0 (0.0–12.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.3 (0.2–3.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.5) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.4 (0.0–1.2) | 0.0 (0.0–0.0) | 0.7 (0.0–2.8) | 0.2 (0.0–0.8) | 0.1 (0.0–0.4) | 0.0 (0.0–0.1) |
| 2011 | 0.0 (0.0–0.0) | 0.1 (0.0–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) |
| 2012 | 0.0 (0.0–0.0) | 2.6 (0.0–7.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 21.8 (0.0–65.3) | 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) |
| 2015 | 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) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) |

**Table A14 [Continued]:**

**(b) QMS**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 1.1 (0.0–3.7) | 0.1 (0.0–0.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2003 | 5.0 (0.0–18.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.3 (0.0–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 0.9 (0.2–1.9) | 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) | 0.0 (0.0–0.0) |
| 2005 | 0.5 (0.0–1.4) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.4 (0.1–1.1) | 0.1 (0.0–0.3) | 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) |
| 2007 | 0.1 (0.0–0.3) | 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) | 0.0 (0.0–0.0) |
| 2008 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2009 | 0.2 (0.0–0.6) | 0.1 (0.0–0.2) | 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) |
| 2010 | 2.9 (0.0–8.7) | 0.1 (0.0–0.2) | 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) |
| 2011 | 0.0 (0.0–0.0) | 0.3 (0.1–0.7) | 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) |
| 2012 | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.1 (0.0–0.3) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.5 (0.0–1.7) | 0.2 (0.0–0.4) | 0.1 (0.0–0.5) | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 0.2 (0.0–0.3) | 0.0 (0.0–0.1) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.1 (0.0–0.7) | 0.4 (0.0–0.9) | 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) |

**(b) QMS, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 33.2 (15.9–51.7) | 0.1 (0.1–0.2) | 0.0 (0.0–0.1) | 1.4 (0.2–3.2) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 32.2 (16.0–51.9) | 1.5 (0.1–5.3) | 0.4 (0.1–1.3) | 0.4 (0.1–1.2) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 20.0 (9.5–37.2) | 0.3 (0.0–1.4) | 3.6 (2.0–5.7) | 0.3 (0.0–0.8) |
| 2005 | 0.4 (0.0–1.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 44.0 (21.6–69.7) | 0.7 (0.3–1.2) | 0.4 (0.1–0.8) | 0.3 (0.0–2.1) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 15.2 (7.6–24.7) | 0.5 (0.1–1.2) | 0.0 (0.0–0.0) | 0.8 (0.0–2.9) |
| 2007 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 2.7 (1.3–4.8) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) | 0.2 (0.0–0.3) | 0.8 (0.5–1.1) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.1 (0.1–0.3) | 0.0 (0.0–0.1) |
| 2012 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.2 (0.0–0.6) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.3 (0.1–0.6) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 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 | 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) | 0.0 (0.0–0.1) | 0.2 (0.0–0.4) |

**Table A14 [Continued]:**

**(c) NON-QMS**

| | Ratio model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 440.9 | (293.1–671.5) | 4.8 | (2.3–9.2) | 30.4 | (8.3–73.7) | 0.0 | (0.0–0.0) | 20.1 | (10.0–38.6) | 13.8 | (2.3–35.1) | 0.8 | (0.4–1.6) |
| 2003 | 410.6 | (281.7–628.5) | 2.4 | (1.3–3.9) | 0.0 | (0.0–0.0) | 3.2 | (0.9–5.2) | 11.1 | (5.2–22.0) | 6.8 | (1.1–17.7) | 0.0 | (0.0–0.0) |
| 2004 | 474.2 | (273.6–638.3) | 1.1 | (0.7–1.4) | 4.8 | (2.9–7.4) | 0.8 | (0.0–2.0) | 7.2 | (5.2–10.7) | 5.3 | (0.9–13.6) | 0.1 | (0.1–0.2) |
| 2005 | 377.5 | (331.7–447.6) | 2.5 | (2.2–3.0) | 6.4 | (3.7–9.9) | 1.1 | (0.8–1.5) | 3.8 | (2.6–5.8) | 1.1 | (0.2–2.7) | 0.0 | (0.0–0.0) |
| 2006 | 1 262.2 | (1 000.7–1 575.1) | 6.5 | (2.0–11.8) | 55.0 | (26.8–122.8) | 0.4 | (0.2–0.7) | 1.0 | (0.8–1.2) | 0.0 | (0.0–0.0) | 0.9 | (0.2–1.6) |
| 2007 | 452.2 | (88.4–710.2) | 2.8 | (2.1–4.1) | 58.2 | (35.0–128.8) | 0.8 | (0.3–1.2) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2008 | 97.9 | (81.4–123.7) | 2.3 | (1.1–3.8) | 58.5 | (34.4–136.2) | 0.6 | (0.3–0.9) | 1.0 | (0.8–1.2) | 0.6 | (0.4–0.9) | 0.1 | (0.0–0.1) |
| 2009 | 157.4 | (115.1–211.4) | 3.2 | (1.2–6.2) | 82.8 | (53.4–131.0) | 3.6 | (2.3–5.5) | 2.0 | (1.7–2.6) | 0.3 | (0.2–0.5) | 0.0 | (0.0–0.0) |
| 2010 | 60.8 | (34.3–105.0) | 1.8 | (1.2–2.4) | 99.5 | (67.5–140.9) | 0.0 | (0.0–0.0) | 2.4 | (1.8–4.7) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.0) |
| 2011 | 23.7 | (0.3–68.2) | 1.9 | (1.3–2.7) | 21.4 | (16.3–27.1) | 0.9 | (0.2–1.8) | 2.6 | (1.7–3.5) | 0.6 | (0.3–0.8) | 0.0 | (0.0–0.0) |
| 2012 | 110.8 | (4.4–245.0) | 2.1 | (1.2–3.2) | 17.7 | (13.0–23.8) | 5.9 | (3.4–9.1) | 2.4 | (1.5–3.1) | 0.1 | (0.1–0.2) | 0.0 | (0.0–0.0) |
| 2013 | 63.9 | (13.8–141.0) | 0.7 | (0.5–0.9) | 33.2 | (25.1–44.0) | 8.2 | (2.3–16.1) | 0.3 | (0.2–0.4) | 0.4 | (0.2–0.6) | 0.0 | (0.0–0.0) |
| 2014 | 16.4 | (0.0–40.6) | 2.0 | (0.9–4.2) | 29.0 | (21.8–38.2) | 6.2 | (2.8–10.6) | 4.8 | (2.9–6.3) | 1.3 | (0.0–3.0) | 0.0 | (0.0–0.0) |
| 2015 | 30.8 | (8.4–58.1) | 3.4 | (1.0–7.0) | 10.1 | (7.5–13.5) | 3.2 | (1.4–7.1) | 0.4 | (0.2–0.5) | 1.6 | (0.0–3.5) | 0.2 | (0.0–0.3) |

**(c) NON-QMS, *continued.***

| | Ratio model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | | Other | |
| 2002 | 6.8 | (5.2–8.7) | 2.5 | (1.8–3.2) | 1.7 | (1.4–2.1) | 1 110.7 | (258.7–2 452.1) | 7.7 | (5.1–10.4) | 19.7 | (13.5–32.3) | 89.5 | (43.2–172.9) |
| 2003 | 13.4 | (10.1–17.2) | 5.6 | (2.4–7.2) | 1.2 | (1.0–1.5) | 978.3 | (209.3–2 395.2) | 21.2 | (5.7–44.1) | 16.9 | (10.6–26.8) | 29.5 | (15.7–46.7) |
| 2004 | 18.5 | (13.5–24.2) | 2.7 | (1.4–5.2) | 0.6 | (0.5–0.8) | 334.3 | (74.2–776.5) | 2.1 | (0.4–6.0) | 61.3 | (31.6–110.8) | 37.6 | (25.1–50.6) |
| 2005 | 4.7 | (3.0–6.1) | 12.5 | (9.4–16.5) | 0.0 | (0.0–0.0) | 93.9 | (62.2–130.7) | 8.8 | (3.1–16.8) | 75.2 | (34.3–146.5) | 85.1 | (76.2–103.2) |
| 2006 | 26.8 | (17.0–39.9) | 2.6 | (1.8–3.5) | 6.6 | (5.2–8.2) | 28.9 | (18.0–40.9) | 9.1 | (2.0–23.8) | 4.3 | (3.4–5.5) | 74.1 | (22.4–132.0) |
| 2007 | 4.0 | (3.5–4.8) | 1.2 | (0.4–2.6) | 1.0 | (0.8–1.1) | 6.0 | (4.1–8.5) | 4.2 | (3.4–5.6) | 3.0 | (2.3–3.8) | 24.9 | (18.4–36.4) |
| 2008 | 3.6 | (2.6–4.7) | 7.9 | (0.0–14.0) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.1) | 0.4 | (0.3–0.5) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.1) |
| 2009 | 5.6 | (4.0–7.0) | 3.2 | (2.2–4.7) | 0.1 | (0.1–0.1) | 0.5 | (0.2–0.9) | 0.9 | (0.6–1.1) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2010 | 2.8 | (1.4–4.6) | 6.0 | (3.7–8.4) | 0.0 | (0.0–0.0) | 6.3 | (4.6–8.4) | 0.5 | (0.4–0.8) | 1.9 | (1.6–2.2) | 0.2 | (0.2–0.3) |
| 2011 | 1.7 | (1.0–2.5) | 3.7 | (2.0–6.4) | 1.7 | (1.3–2.3) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 1.0 | (0.8–1.4) | 0.2 | (0.1–0.2) |
| 2012 | 0.2 | (0.2–0.4) | 22.2 | (17.2–31.5) | 2.9 | (2.2–4.3) | 0.8 | (0.4–1.2) | 0.2 | (0.1–0.2) | 0.3 | (0.1–0.4) | 0.1 | (0.0–0.1) |
| 2013 | 0.0 | (0.0–0.0) | 20.5 | (15.3–25.9) | 6.2 | (4.3–8.7) | 0.4 | (0.2–0.6) | 0.3 | (0.2–0.4) | 0.4 | (0.3–0.4) | 0.0 | (0.0–0.0) |
| 2014 | 0.0 | (0.0–0.0) | 36.5 | (22.0–63.2) | 9.6 | (7.0–13.3) | 0.1 | (0.0–0.1) | 0.1 | (0.0–0.1) | 0.1 | (0.1–0.1) | 0.0 | (0.0–0.0) |
| 2015 | 0.0 | (0.0–0.0) | 9.8 | (6.0–16.2) | 44.6 | (25.1–75.7) | 0.0 | (0.0–0.0) | 0.2 | (0.2–0.4) | 0.1 | (0.1–0.1) | 1.6 | (0.5–3.3) |

**Table A14 [Continued]:**

**(d) INV**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 28.9 (8.0–65.8) | 0.4 (0.1–0.8) | 0.6 (0.3–1.0) | 0.0 (0.0–0.0) | 11.4 (0.5–32.4) | 0.2 (0.1–0.4) | 0.1 (0.0–0.1) |
| 2003 | 30.8 (13.9–48.5) | 0.5 (0.2–1.3) | 0.0 (0.0–0.0) | 0.7 (0.3–1.4) | 6.4 (0.3–17.5) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2004 | 62.7 (27.1–121.5) | 0.5 (0.1–1.4) | 0.2 (0.0–0.4) | 0.2 (0.0–0.4) | 2.1 (0.4–7.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.2) |
| 2005 | 137.7 (79.8–222.5) | 0.8 (0.5–1.3) | 0.2 (0.1–0.6) | 0.2 (0.1–0.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 109.4 (62.0–161.5) | 0.7 (0.5–0.9) | 0.5 (0.2–0.9) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.1) |
| 2007 | 39.2 (12.3–98.7) | 0.4 (0.1–0.8) | 0.4 (0.3–0.8) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 21.6 (4.5–51.6) | 0.6 (0.2–1.2) | 0.4 (0.3–0.9) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2009 | 23.5 (19.2–28.8) | 0.4 (0.3–0.6) | 0.2 (0.1–0.5) | 0.0 (0.0–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2010 | 12.0 (9.6–15.1) | 0.2 (0.1–0.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 3.1 (1.8–5.0) | 0.1 (0.0–0.1) | 0.2 (0.1–0.3) | 0.1 (0.0–0.2) | 0.2 (0.1–0.3) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2012 | 3.9 (0.2–12.0) | 0.1 (0.0–0.1) | 0.4 (0.2–0.9) | 0.3 (0.2–0.5) | 0.2 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 7.0 (0.3–14.8) | 0.0 (0.0–0.0) | 0.8 (0.4–1.6) | 0.4 (0.1–0.9) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2014 | 1.4 (0.0–4.6) | 0.1 (0.0–0.2) | 0.6 (0.4–0.8) | 0.4 (0.1–0.7) | 0.3 (0.2–0.5) | 0.3 (0.1–0.5) | 0.0 (0.0–0.0) |
| 2015 | 1.6 (0.6–2.8) | 0.1 (0.0–0.2) | 0.2 (0.1–0.2) | 0.2 (0.0–0.4) | 0.1 (0.0–0.2) | 0.4 (0.0–0.6) | 0.0 (0.0–0.0) |

**(d) INV, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.1 (0.1–0.2) | 4.7 (0.4–13.2) | 0.0 (0.0–0.1) | 25.8 (10.9–47.5) | 1.4 (0.5–2.7) | 0.1 (0.0–0.1) | 8.1 (3.0–16.1) |
| 2003 | 0.3 (0.2–0.4) | 0.6 (0.1–1.4) | 0.0 (0.0–0.0) | 23.4 (9.0–43.6) | 3.0 (1.3–6.0) | 21.0 (3.7–62.5) | 5.7 (2.0–17.9) |
| 2004 | 0.3 (0.2–0.4) | 4.0 (0.5–10.8) | 0.0 (0.0–0.0) | 11.6 (5.3–18.6) | 0.9 (0.0–2.8) | 344.8 (14.6–807.8) | 16.4 (3.9–49.6) |
| 2005 | 0.1 (0.0–0.1) | 2.5 (0.6–6.5) | 0.0 (0.0–0.0) | 18.6 (12.0–26.1) | 3.3 (2.2–4.6) | 1.6 (0.6–3.4) | 26.3 (16.0–42.7) |
| 2006 | 0.4 (0.2–0.5) | 8.6 (1.6–22.1) | 0.1 (0.0–0.2) | 6.4 (4.3–8.8) | 3.2 (1.1–5.1) | 0.2 (0.1–0.4) | 7.8 (5.4–10.5) |
| 2007 | 0.4 (0.2–0.6) | 0.4 (0.0–1.2) | 0.0 (0.0–0.1) | 1.1 (0.8–1.8) | 0.5 (0.2–1.0) | 0.2 (0.1–0.2) | 3.0 (1.1–7.1) |
| 2008 | 0.5 (0.4–0.7) | 4.8 (0.7–11.3) | 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) |
| 2009 | 0.8 (0.5–1.1) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.4 (0.2–0.6) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.4 (0.2–0.7) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 0.2 (0.1–0.3) | 0.1 (0.1–0.2) | 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) |
| 2012 | 0.0 (0.0–0.0) | 0.7 (0.5–1.0) | 0.1 (0.1–0.2) | 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 | 0.0 (0.0–0.0) | 0.4 (0.1–0.8) | 0.3 (0.2–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 1.1 (0.4–2.3) | 0.6 (0.5–1.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) | 3.8 (2.1–5.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |

**Table A14 [Continued]:**

**(e) Coral species**

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 19.3 (0.0–52.9) | 0.0 (0.0–0.3) | 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 (0.0–0.1) |
| 2003 | 0.1 (0.0–0.4) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 0.1 (0.0–0.2) | 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) | 0.0 (0.0–0.0) |
| 2005 | 5.9 (0.0–24.4) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.4 (0.1–1.0) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 0.1 (0.0–0.2) | 0.1 (0.0–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 7.7 (0.4–21.2) | 0.3 (0.0–0.7) | 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) |
| 2009 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(e) Coral species, *continued.***

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 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) | 0.9 (0.0–6.2) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.5 (0.0–1.9) | 0.1 (0.0–0.5) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.2–0.6) | 1.0 (0.5–1.8) | 1.3 (0.2–2.9) | 1.1 (0.0–4.0) |
| 2006 | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 1.1 (0.2–2.5) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) |
| 2007 | 0.0 (0.0–0.1) | 0.4 (0.0–1.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.5) | 0.0 (0.0–0.1) | 1.1 (0.0–4.8) |
| 2008 | 0.0 (0.0–0.1) | 4.2 (0.0–11.4) | 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 (0.0–0.0) |
| 2009 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**Table A14 [Continued]:**

**(f) Morid species**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 31.7 (7.9–79.2) | 0.6 (0.2–1.4) | 0.3 (0.1–0.6) | 0.0 (0.0–0.0) | 1.0 (0.2–2.5) | 0.2 (0.1–0.5) | 0.1 (0.0–0.2) |
| 2003 | 18.4 (5.2–34.1) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.5 (0.1–1.3) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) |
| 2004 | 51.2 (27.2–88.2) | 0.1 (0.0–0.2) | 1.1 (0.2–2.4) | 0.1 (0.0–0.4) | 0.4 (0.2–0.6) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2005 | 59.9 (40.6–84.6) | 0.3 (0.2–0.5) | 1.5 (0.3–3.2) | 0.1 (0.0–0.3) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 212.7 (137.9–286.8) | 1.1 (0.5–1.8) | 8.8 (1.3–25.5) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) |
| 2007 | 64.6 (20.3–98.3) | 0.3 (0.2–0.5) | 9.0 (4.0–27.9) | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 10.5 (5.5–20.3) | 0.2 (0.1–0.4) | 9.0 (4.7–27.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) |
| 2009 | 17.1 (9.3–25.8) | 0.4 (0.2–0.6) | 13.0 (6.0–24.0) | 0.2 (0.1–0.4) | 0.1 (0.1–0.1) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2010 | 10.7 (3.5–25.7) | 0.2 (0.1–0.4) | 15.5 (9.6–25.7) | 0.0 (0.0–0.0) | 0.4 (0.2–1.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 2.1 (0.0–41.4) | 0.4 (0.2–0.9) | 2.9 (2.0–4.0) | 0.0 (0.0–0.1) | 0.8 (0.5–1.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2012 | 18.0 (0.0–42.6) | 0.2 (0.1–0.4) | 1.5 (1.1–2.0) | 0.6 (0.3–1.0) | 0.8 (0.4–1.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 6.3 (1.3–15.9) | 0.1 (0.0–0.1) | 2.8 (2.1–3.7) | 0.9 (0.2–2.0) | 0.1 (0.1–0.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2014 | 7.2 (0.0–19.8) | 0.3 (0.1–0.6) | 4.5 (3.3–6.0) | 0.4 (0.1–1.0) | 1.6 (0.9–2.3) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) |
| 2015 | 2.0 (0.7–4.4) | 0.4 (0.1–0.9) | 1.6 (1.2–2.1) | 0.2 (0.0–0.5) | 0.1 (0.1–0.2) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) |

**(f) Morid species, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 205.3 (47.7–459.4) | 0.1 (0.0–0.1) | 4.4 (3.4–5.8) | 11.1 (2.8–28.1) |
| 2003 | 0.1 (0.0–0.2) | 0.5 (0.0–0.6) | 0.1 (0.0–0.2) | 179.4 (47.5–426.3) | 1.4 (0.1–3.9) | 0.4 (0.2–0.6) | 1.2 (0.4–2.2) |
| 2004 | 0.1 (0.1–0.3) | 0.2 (0.2–0.3) | 0.0 (0.0–0.1) | 69.5 (21.9–149.4) | 0.0 (0.0–0.0) | 2.9 (0.7–7.1) | 3.7 (2.0–6.2) |
| 2005 | 0.0 (0.0–0.0) | 0.2 (0.1–0.5) | 0.0 (0.0–0.0) | 49.2 (26.3–83.2) | 0.7 (0.1–1.4) | 0.1 (0.0–0.3) | 11.6 (8.2–15.6) |
| 2006 | 0.1 (0.0–0.2) | 0.0 (0.0–0.1) | 0.5 (0.2–0.9) | 18.1 (9.7–28.9) | 0.8 (0.1–2.1) | 0.2 (0.1–0.4) | 12.6 (5.0–19.2) |
| 2007 | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 3.2 (1.8–5.6) | 0.3 (0.1–0.6) | 0.2 (0.1–0.3) | 2.7 (1.8–4.2) |
| 2008 | 0.0 (0.0–0.1) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.1–0.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.2 (0.1–0.3) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.4 (0.3–0.7) | 0.1 (0.0–0.2) | 0.5 (0.3–0.7) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.2) | 0.1 (0.1–0.2) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.1) |
| 2012 | 0.0 (0.0–0.0) | 1.0 (0.6–1.2) | 0.1 (0.1–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 1.2 (0.4–2.4) | 0.7 (0.5–1.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 2.5 (1.1–4.6) | 1.0 (0.6–1.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.4 (0.2–0.8) | 3.2 (1.6–5.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.2 (0.0–0.4) |

**Table A14 [Continued]:**

**(g) Rattail species**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 121.8 (51.0–187.6) | 1.2 (0.4–2.4) | 0.6 (0.2–1.1) | 0.0 (0.0–0.0) | 2.3 (1.2–3.5) | 1.0 (0.2–2.6) | 0.2 (0.1–0.4) |
| 2003 | 57.6 (21.9–123.4) | 0.3 (0.1–0.6) | 0.0 (0.0–0.0) | 0.5 (0.0–1.2) | 1.3 (0.6–2.0) | 0.5 (0.1–1.3) | 0.0 (0.0–0.0) |
| 2004 | 63.1 (21.3–109.2) | 0.2 (0.1–0.2) | 0.3 (0.0–0.6) | 0.3 (0.0–0.7) | 1.0 (0.8–1.2) | 0.4 (0.1–1.0) | 0.0 (0.0–0.0) |
| 2005 | 53.0 (35.5–75.2) | 0.4 (0.3–0.5) | 0.4 (0.0–0.8) | 0.1 (0.1–0.2) | 0.4 (0.3–0.6) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2006 | 353.7 (284.5–500.0) | 1.9 (0.2–3.8) | 6.2 (3.7–10.7) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.2 (0.0–0.5) |
| 2007 | 111.8 (16.3–179.7) | 0.8 (0.3–1.2) | 6.7 (3.9–11.0) | 0.2 (0.0–0.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 7.2 (4.2–15.1) | 0.3 (0.1–0.7) | 6.6 (3.9–11.3) | 0.1 (0.0–0.2) | 0.1 (0.1–0.2) | 0.2 (0.0–0.3) | 0.0 (0.0–0.0) |
| 2009 | 25.2 (5.8–37.6) | 0.5 (0.1–1.1) | 14.9 (10.3–20.4) | 0.3 (0.1–0.5) | 0.3 (0.2–0.4) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2010 | 15.0 (4.7–34.2) | 0.4 (0.2–0.5) | 22.2 (14.7–30.7) | 0.0 (0.0–0.0) | 0.6 (0.4–1.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 0.2 (0.0–0.5) | 0.4 (0.1–0.7) | 3.7 (2.5–5.1) | 0.2 (0.0–0.5) | 0.9 (0.6–1.2) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2012 | 34.6 (0.0–123.8) | 0.4 (0.2–0.9) | 3.4 (2.3–4.5) | 1.3 (0.7–1.9) | 0.8 (0.5–1.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 6.4 (1.3–13.1) | 0.1 (0.0–0.1) | 6.3 (4.3–8.3) | 1.8 (0.6–3.3) | 0.1 (0.1–0.1) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2014 | 2.0 (0.0–6.3) | 0.4 (0.1–0.9) | 6.2 (3.8–9.4) | 1.7 (0.5–3.5) | 1.7 (1.1–2.2) | 0.9 (0.0–2.2) | 0.0 (0.0–0.0) |
| 2015 | 3.3 (1.0–7.0) | 0.8 (0.1–2.0) | 2.2 (1.3–3.3) | 0.8 (0.2–2.2) | 0.1 (0.0–0.2) | 1.1 (0.0–2.8) | 0.0 (0.0–0.1) |

**(g) Rattail species, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 3.4 (2.3–4.9) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) | 301.1 (57.8–708.4) | 0.0 (0.0–0.0) | 2.0 (1.1–3.3) | 23.2 (8.5–48.6) |
| 2003 | 6.8 (4.6–9.2) | 0.4 (0.0–0.6) | 0.1 (0.1–0.1) | 260.6 (47.4–675.9) | 2.0 (0.0–5.8) | 0.8 (0.4–1.3) | 3.5 (1.2–6.9) |
| 2004 | 9.2 (5.8–12.8) | 0.4 (0.3–0.6) | 0.0 (0.0–0.1) | 87.8 (16.5–213.2) | 0.0 (0.0–0.1) | 2.6 (1.8–3.5) | 5.8 (3.4–9.1) |
| 2005 | 2.1 (0.7–3.4) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 16.6 (8.5–27.7) | 0.4 (0.2–0.6) | 4.3 (1.5–8.5) | 12.8 (9.2–17.0) |
| 2006 | 15.2 (8.3–25.8) | 0.1 (0.0–0.1) | 0.5 (0.3–0.7) | 6.2 (3.5–9.7) | 0.4 (0.2–0.7) | 0.3 (0.2–0.4) | 21.0 (2.7–43.8) |
| 2007 | 2.1 (1.7–2.6) | 0.4 (0.0–1.1) | 0.1 (0.1–0.1) | 1.1 (0.6–1.9) | 0.2 (0.1–0.2) | 0.2 (0.2–0.3) | 6.9 (4.5–10.8) |
| 2008 | 1.8 (1.3–2.5) | 4.1 (0.0–17.2) | 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) |
| 2009 | 3.5 (2.1–5.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 1.2 (0.5–2.3) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 1.3 (0.9–1.9) | 0.0 (0.0–0.1) | 0.2 (0.2–0.3) | 0.0 (0.0–0.1) |
| 2011 | 0.6 (0.3–1.1) | 1.5 (0.7–2.6) | 0.2 (0.2–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.1) | 0.0 (0.0–0.1) |
| 2012 | 0.1 (0.0–0.2) | 2.6 (1.6–4.0) | 0.3 (0.2–0.4) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 2.8 (1.4–4.6) | 0.8 (0.5–1.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 6.6 (3.1–11.7) | 1.2 (0.8–1.7) | 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 | 0.0 (0.0–0.0) | 0.9 (0.3–1.8) | 5.3 (2.4–10.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.1–0.9) |

**Table A14 [Continued]:**

**(h) Slickhead species**

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | CHAT | COOK | EAST | NORTH | PUYS | SQUAK | STEW |
| 2002 | 123.6 (6.7–287.7) | 1.4 (0.2–3.3) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 1.1 (0.5–1.8) | 0.1 (0.0–0.2) | 0.2 (0.0–0.6) |
| 2003 | 31.1 (7.6–69.9) | 0.2 (0.0–0.4) | 0.0 (0.0–0.0) | 0.4 (0.0–1.0) | 0.6 (0.3–1.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2004 | 34.3 (11.0–70.8) | 0.1 (0.0–0.2) | 0.0 (0.0–0.2) | 0.1 (0.0–0.4) | 0.7 (0.5–1.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2005 | 28.9 (21.1–44.3) | 0.2 (0.2–0.3) | 0.1 (0.0–0.2) | 0.1 (0.0–0.1) | 0.4 (0.2–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 89.0 (48.8–141.1) | 0.5 (0.2–0.8) | 11.6 (5.4–26.6) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2007 | 31.9 (1.1–56.0) | 0.2 (0.1–0.3) | 13.3 (6.2–30.4) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 3.4 (1.6–9.0) | 0.1 (0.0–0.2) | 13.3 (6.3–30.4) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2009 | 22.0 (1.3–48.8) | 0.4 (0.1–1.2) | 13.1 (6.4–23.0) | 0.2 (0.1–0.3) | 0.3 (0.2–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 9.0 (3.1–19.1) | 0.3 (0.2–0.4) | 11.5 (6.3–17.6) | 0.0 (0.0–0.0) | 0.3 (0.2–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 0.0 (0.0–0.1) | 0.2 (0.1–0.3) | 2.0 (1.2–3.2) | 0.0 (0.0–0.2) | 0.3 (0.2–0.5) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2012 | 7.4 (0.0–15.9) | 0.3 (0.1–0.5) | 0.6 (0.0–1.4) | 0.7 (0.4–1.0) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 34.0 (0.0–83.8) | 0.1 (0.0–0.2) | 1.3 (0.0–3.1) | 1.1 (0.5–1.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2014 | 0.3 (0.0–1.3) | 0.1 (0.0–0.4) | 1.6 (0.8–2.5) | 0.9 (0.3–1.9) | 0.6 (0.3–0.9) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2015 | 8.7 (0.3–28.2) | 0.5 (0.1–1.1) | 0.5 (0.3–0.8) | 0.5 (0.2–0.9) | 0.1 (0.0–0.2) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |

**(h) Slickhead species, *continued.***

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | SUBA | WCNI | WCSI | NWCH | HOWE | LOUI | Other |
| 2002 | 0.8 (0.5–1.1) | 0.7 (0.4–1.1) | 0.0 (0.0–0.1) | 400.1 (8.7–1 051.1) | 0.5 (0.3–0.8) | 0.2 (0.0–0.4) | 27.9 (5.5–65.6) |
| 2003 | 1.6 (1.1–2.2) | 1.0 (0.5–1.7) | 0.0 (0.0–0.0) | 348.0 (9.8–993.3) | 2.1 (0.7–5.2) | 0.2 (0.1–0.2) | 1.9 (0.6–4.6) |
| 2004 | 2.4 (1.7–3.3) | 1.0 (0.4–2.0) | 0.0 (0.0–0.0) | 120.6 (7.8–336.9) | 0.5 (0.0–1.4) | 2.3 (1.1–3.8) | 3.1 (1.4–5.7) |
| 2005 | 1.0 (0.5–2.3) | 2.0 (1.4–2.8) | 0.0 (0.0–0.0) | 19.9 (9.8–31.0) | 0.6 (0.2–1.4) | 0.2 (0.0–0.7) | 6.9 (5.1–9.4) |
| 2006 | 3.0 (1.5–4.9) | 0.2 (0.1–0.4) | 0.1 (0.0–0.3) | 6.0 (3.1–9.8) | 0.4 (0.0–1.1) | 0.1 (0.0–0.2) | 6.0 (2.8–8.6) |
| 2007 | 0.2 (0.2–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.1 (0.5–1.7) | 0.2 (0.1–0.3) | 0.0 (0.0–0.1) | 1.5 (1.0–2.3) |
| 2008 | 0.6 (0.3–0.8) | 0.2 (0.0–0.4) | 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 (0.0–0.0) |
| 2009 | 0.7 (0.3–1.2) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.4 (0.2–0.6) | 1.0 (0.5–1.5) | 0.0 (0.0–0.0) | 1.2 (0.8–2.1) | 0.0 (0.0–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2011 | 0.4 (0.2–0.6) | 0.8 (0.2–1.9) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.1) | 5.6 (3.8–8.4) | 0.1 (0.1–0.2) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 1.7 (0.9–2.9) | 0.3 (0.2–0.5) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 2.8 (1.8–4.2) | 0.9 (0.5–1.9) | 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 | 0.0 (0.0–0.0) | 1.2 (0.6–1.9) | 6.9 (2.4–14.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.5) |

**Table A14 [Continued]:**

**(i) Shark species**

| | Ratio model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 117.4 | (87.6–153.7) | 1.1 | (0.7–1.4) | 24.5 | (3.1–65.6) | 0.0 | (0.0–0.0) | 14.3 | (4.5–33.8) | 12.1 | (1.0–33.5) | 0.2 | (0.1–0.2) |
| 2003 | 164.3 | (130.0–207.3) | 1.1 | (0.6–2.0) | 0.0 | (0.0–0.0) | 1.4 | (0.4–2.3) | 7.8 | (2.7–17.9) | 6.0 | (0.5–16.7) | 0.0 | (0.0–0.0) |
| 2004 | 259.0 | (157.7–357.6) | 0.5 | (0.3–0.8) | 3.1 | (1.6–4.7) | 0.1 | (0.0–0.4) | 4.7 | (3.0–7.8) | 4.7 | (0.4–12.8) | 0.1 | (0.0–0.1) |
| 2005 | 136.3 | (113.4–164.2) | 1.0 | (0.8–1.2) | 4.2 | (2.1–6.5) | 0.4 | (0.2–0.5) | 2.6 | (1.6–4.5) | 0.9 | (0.1–2.6) | 0.0 | (0.0–0.0) |
| 2006 | 514.4 | (408.9–680.6) | 2.6 | (0.6–4.9) | 17.8 | (8.8–34.5) | 0.2 | (0.1–0.3) | 0.6 | (0.4–0.8) | 0.0 | (0.0–0.0) | 0.4 | (0.1–0.6) |
| 2007 | 208.7 | (34.4–334.2) | 1.2 | (0.8–2.0) | 17.3 | (9.8–36.7) | 0.3 | (0.1–0.6) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2008 | 70.1 | (57.9–88.3) | 1.5 | (0.5–2.7) | 17.6 | (10.5–35.5) | 0.4 | (0.2–0.7) | 0.6 | (0.4–0.8) | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.1) |
| 2009 | 85.0 | (69.2–107.8) | 1.7 | (0.6–3.1) | 33.1 | (20.2–51.5) | 2.5 | (1.6–4.0) | 1.2 | (0.9–1.7) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) |
| 2010 | 18.3 | (10.3–27.9) | 0.7 | (0.4–1.1) | 46.4 | (26.2–75.3) | 0.0 | (0.0–0.0) | 1.0 | (0.7–1.5) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.0) |
| 2011 | 15.8 | (0.3–29.8) | 1.0 | (0.7–1.2) | 11.2 | (8.2–14.9) | 0.5 | (0.1–1.1) | 0.4 | (0.2–0.6) | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.0) |
| 2012 | 37.1 | (0.0–87.7) | 1.0 | (0.6–1.6) | 11.0 | (6.6–16.5) | 2.6 | (1.4–4.2) | 0.4 | (0.2–0.5) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.0) |
| 2013 | 14.8 | (8.2–21.4) | 0.4 | (0.3–0.5) | 19.1 | (11.5–28.5) | 3.2 | (0.6–7.8) | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) |
| 2014 | 4.0 | (0.0–8.9) | 1.0 | (0.5–2.1) | 13.9 | (10.0–19.6) | 2.4 | (0.8–4.3) | 0.7 | (0.4–1.1) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2015 | 13.3 | (0.9–32.2) | 1.2 | (0.5–2.0) | 5.0 | (3.6–7.1) | 1.2 | (0.1–3.5) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) |

**(i) Shark species, *continued.***

| | Ratio model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | | Other | |
| 2002 | 1.6 | (1.1–2.4) | 0.0 | (0.0–0.0) | 1.3 | (1.0–1.7) | 149.3 | (86.5–217.1) | 7.0 | (4.7–9.7) | 7.0 | (5.5–8.7) | 20.1 | (13.0–26.2) |
| 2003 | 3.1 | (2.0–4.5) | 3.6 | (0.9–4.9) | 0.9 | (0.7–1.2) | 140.2 | (80.9–213.1) | 14.9 | (2.9–31.1) | 8.0 | (1.6–14.6) | 13.6 | (7.3–22.1) |
| 2004 | 4.8 | (3.2–7.1) | 0.9 | (0.1–2.5) | 0.5 | (0.4–0.6) | 50.4 | (25.4–83.5) | 1.5 | (0.0–5.3) | 19.7 | (14.1–27.4) | 19.0 | (12.1–27.3) |
| 2005 | 1.2 | (0.8–1.6) | 9.3 | (6.0–12.9) | 0.0 | (0.0–0.0) | 26.7 | (11.4–44.9) | 4.9 | (1.6–9.2) | 62.1 | (22.1–148.3) | 33.8 | (26.6–42.0) |
| 2006 | 4.9 | (2.6–8.8) | 1.8 | (1.2–2.7) | 5.1 | (3.7–6.8) | 6.6 | (3.3–10.8) | 4.7 | (0.9–11.1) | 2.8 | (2.2–3.6) | 29.9 | (7.7–53.6) |
| 2007 | 0.7 | (0.6–0.9) | 0.6 | (0.2–1.3) | 0.6 | (0.5–0.7) | 2.0 | (1.1–3.2) | 2.9 | (2.2–3.7) | 2.0 | (1.5–2.5) | 10.9 | (7.5–16.2) |
| 2008 | 0.4 | (0.2–0.8) | 3.2 | (0.0–6.5) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.3 | (0.2–0.4) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) |
| 2009 | 0.5 | (0.3–0.9) | 2.2 | (1.6–2.8) | 0.1 | (0.0–0.1) | 0.3 | (0.1–0.5) | 0.5 | (0.4–0.6) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2010 | 0.5 | (0.2–1.0) | 4.8 | (3.0–6.7) | 0.0 | (0.0–0.0) | 2.4 | (1.6–4.2) | 0.3 | (0.2–0.5) | 1.1 | (0.9–1.2) | 0.1 | (0.1–0.1) |
| 2011 | 0.3 | (0.1–0.5) | 0.7 | (0.5–1.0) | 1.2 | (0.8–1.7) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.7 | (0.5–1.0) | 0.1 | (0.1–0.1) |
| 2012 | 0.0 | (0.0–0.1) | 10.9 | (8.1–16.8) | 1.9 | (1.2–3.3) | 0.4 | (0.1–0.8) | 0.1 | (0.0–0.1) | 0.2 | (0.0–0.3) | 0.0 | (0.0–0.1) |
| 2013 | 0.0 | (0.0–0.0) | 12.8 | (9.2–16.8) | 3.1 | (1.9–5.2) | 0.2 | (0.1–0.4) | 0.2 | (0.1–0.2) | 0.3 | (0.2–0.3) | 0.0 | (0.0–0.0) |
| 2014 | 0.0 | (0.0–0.0) | 21.3 | (11.0–43.7) | 5.0 | (3.1–7.6) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0.1 | (0.1–0.1) | 0.0 | (0.0–0.0) |
| 2015 | 0.0 | (0.0–0.0) | 6.0 | (3.8–10.1) | 23.6 | (12.3–46.1) | 0.0 | (0.0–0.0) | 0.1 | (0.1–0.2) | 0.0 | (0.0–0.1) | 0.6 | (0.2–1.0) |

**Table A14 [Continued]:**

**(j) Schedule 6 species**

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 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) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2003 | 0.1 (0.0–0.3) | 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 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2004 | 0.1 (0.0–0.3) | 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 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2005 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.2) | 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) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.2) | 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) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 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 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(j) Schedule 6 species, *continued.***

| | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 5.1 (1.0–10.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.6) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 6.3 (1.4–13.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 2.9 (1.1–5.3) | 0.3 (0.0–1.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 5.5 (1.8–10.3) | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.3 (0.4–2.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) |
| 2007 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**Table A14 [Continued]:**

**(k) Spiny dogfish**

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **NORTH** | **PUYS** | **SQUAK** | **STEW** |
| 2002 | 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) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2003 | 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) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2004 | 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) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2005 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.2) | 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) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(k) Spiny dogfish, *continued.***

| | Ratio model | | | | | | |
|---|---|---|---|---|---|---|---|
| | **SUBA** | **WCNI** | **WCSI** | **NWCH** | **HOWE** | **LOUI** | **Other** |
| 2002 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.5 (0.0–5.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.5 (0.0–2.0) | 0.3 (0.0–1.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.7 (0.0–5.4) | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2008 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

## Table A14 [Continued]:

**(l) Total**

| | | | | | | | | | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | | |
| 2002 | 470.9 | (301.2–741.0) | 5.3 | (2.4–10.2) | 31.0 | (8.6–74.7) | 0.0 | (0.0–0.1) | 31.5 | (10.5–71.0) | 13.9 | (2.4–35.5) | 0.9 | (0.4–1.8) | |
| 2003 | 477.7 | (295.6–829.6) | 3.0 | (1.5–6.0) | 0.0 | (0.0–0.0) | 4.2 | (1.2–7.6) | 17.5 | (5.5–39.5) | 6.9 | (1.2–17.9) | 0.0 | (0.0–0.0) | |
| 2004 | 537.9 | (300.9–828.8) | 1.6 | (0.8–3.3) | 5.0 | (2.9–7.8) | 0.9 | (0.0–2.5) | 9.3 | (5.5–17.8) | 5.4 | (0.9–13.8) | 0.2 | (0.1–0.4) | |
| 2005 | 519.8 | (411.6–698.0) | 3.3 | (2.7–4.5) | 6.7 | (3.8–10.5) | 1.3 | (0.9–1.8) | 3.8 | (2.7–5.8) | 1.1 | (0.2–2.7) | 0.0 | (0.0–0.0) | |
| 2006 | 1 399.1 | (1 062.8–1 844.4) | 7.4 | (2.5–13.5) | 55.5 | (27.0–123.7) | 0.4 | (0.2–0.8) | 1.0 | (0.8–1.2) | 0.0 | (0.0–0.0) | 1.0 | (0.3–1.8) | |
| 2007 | 491.4 | (100.7–809.1) | 3.2 | (2.2–5.0) | 58.6 | (35.2–129.6) | 0.9 | (0.4–1.5) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | |
| 2008 | 129.4 | (85.9–204.0) | 3.4 | (1.4–6.3) | 59.0 | (34.6–137.1) | 0.7 | (0.3–1.2) | 1.0 | (0.8–1.2) | 0.7 | (0.4–1.1) | 0.1 | (0.0–0.2) | |
| 2009 | 194.8 | (136.3–272.5) | 4.0 | (1.6–7.6) | 83.0 | (53.5–131.5) | 3.7 | (2.3–5.6) | 2.1 | (1.7–2.6) | 0.4 | (0.2–0.6) | 0.0 | (0.0–0.0) | |
| 2010 | 75.9 | (43.9–129.3) | 2.2 | (1.4–3.3) | 99.6 | (67.5–141.0) | 0.0 | (0.0–0.1) | 2.4 | (1.9–4.9) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.0) | |
| 2011 | 29.2 | (2.1–394.1) | 3.1 | (1.4–6.9) | 21.6 | (16.4–27.4) | 1.0 | (0.2–2.0) | 2.8 | (1.8–3.7) | 0.6 | (0.3–0.9) | 0.0 | (0.0–0.0) | |
| 2012 | 114.7 | (4.6–257.0) | 2.5 | (1.2–4.5) | 32.2 | (13.2–88.2) | 6.3 | (3.6–9.7) | 2.5 | (1.6–3.3) | 0.1 | (0.1–0.2) | 0.0 | (0.0–0.0) | |
| 2013 | 71.4 | (14.2–157.5) | 0.8 | (0.5–1.3) | 57.2 | (25.5–148.0) | 8.7 | (2.4–17.1) | 0.3 | (0.2–0.4) | 0.5 | (0.3–0.7) | 0.0 | (0.0–0.0) | |
| 2014 | 17.8 | (0.0–45.2) | 2.4 | (1.0–6.7) | 36.7 | (22.2–61.0) | 6.6 | (2.9–11.7) | 5.1 | (3.1–6.8) | 1.6 | (0.1–3.5) | 0.0 | (0.0–0.0) | |
| 2015 | 32.5 | (9.0–61.6) | 4.0 | (1.2–8.5) | 13.0 | (7.6–24.4) | 3.4 | (1.4–7.5) | 0.5 | (0.3–0.7) | 1.9 | (0.0–4.1) | 0.2 | (0.0–0.4) | |

**(l) Total, *continued.***

| | | | | | | | | | | | | | | | Ratio model |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | | Other | | |
| 2002 | 6.9 | (5.3–8.9) | 7.2 | (2.2–16.6) | 1.8 | (1.4–2.2) | 1 173.2 | (285.6–2 560.8) | 9.2 | (5.7–13.3) | 20.5 | (13.6–34.3) | 99.2 | (46.4–192.8) | |
| 2003 | 13.7 | (10.2–17.7) | 6.2 | (2.5–8.6) | 1.2 | (1.0–1.6) | 1 036.5 | (234.4–2 498.8) | 25.9 | (7.0–55.6) | 38.3 | (14.4–90.6) | 37.3 | (17.8–74.2) | |
| 2004 | 18.8 | (13.7–24.7) | 6.7 | (1.9–16.0) | 0.6 | (0.5–0.8) | 366.8 | (89.1–834.9) | 3.3 | (0.4–10.2) | 507.9 | (48.4–1 218.1) | 57.5 | (29.0–119.5) | |
| 2005 | 5.1 | (3.0–8.0) | 15.1 | (10.0–23.0) | 0.0 | (0.0–0.0) | 156.5 | (95.9–226.6) | 12.8 | (5.5–22.6) | 77.2 | (35.0–150.7) | 112.6 | (92.2–152.9) | |
| 2006 | 27.2 | (17.2–40.5) | 11.2 | (3.4–25.6) | 6.8 | (5.2–8.5) | 50.6 | (29.9–74.5) | 12.8 | (3.3–30.1) | 4.6 | (3.5–5.9) | 84.0 | (27.9–151.3) | |
| 2007 | 4.4 | (3.7–5.4) | 1.7 | (0.4–4.0) | 1.0 | (0.9–1.2) | 9.8 | (6.2–15.1) | 11.4 | (3.6–30.4) | 3.2 | (2.4–4.1) | 27.9 | (19.5–44.5) | |
| 2008 | 4.1 | (3.0–5.5) | 12.7 | (0.7–37.7) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 1.7 | (0.5–3.8) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | |
| 2009 | 6.3 | (4.5–8.2) | 3.2 | (2.2–4.8) | 0.1 | (0.1–0.2) | 0.6 | (0.2–1.6) | 1.2 | (0.6–2.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | |
| 2010 | 3.2 | (1.6–5.1) | 6.5 | (3.8–9.7) | 0.0 | (0.0–0.0) | 7.5 | (4.9–12.2) | 0.9 | (0.4–1.9) | 2.8 | (2.1–3.7) | 0.3 | (0.2–0.4) | |
| 2011 | 1.9 | (1.1–2.8) | 4.0 | (2.1–7.0) | 1.8 | (1.3–2.4) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 1.2 | (0.9–1.7) | 0.3 | (0.1–0.6) | |
| 2012 | 0.3 | (0.2–0.4) | 25.5 | (17.7–40.2) | 3.1 | (2.3–4.6) | 1.0 | (0.4–1.9) | 0.3 | (0.1–0.9) | 0.3 | (0.1–0.5) | 0.1 | (0.0–0.2) | |
| 2013 | 0.0 | (0.0–0.0) | 20.8 | (15.4–26.7) | 6.5 | (4.5–9.1) | 0.4 | (0.2–0.7) | 0.4 | (0.2–0.6) | 0.7 | (0.4–1.1) | 0.0 | (0.0–0.0) | |
| 2014 | 0.0 | (0.0–0.0) | 59.5 | (22.4–131.0) | 10.2 | (7.5–14.4) | 0.1 | (0.0–0.1) | 0.1 | (0.1–0.2) | 0.2 | (0.1–0.2) | 0.0 | (0.0–0.0) | |
| 2015 | 0.0 | (0.0–0.0) | 9.9 | (6.1–16.4) | 48.4 | (27.2–81.2) | 0.0 | (0.0–0.0) | 0.3 | (0.2–0.4) | 0.1 | (0.1–0.3) | 1.9 | (0.5–4.0) | |

**Table A15: Estimates of annual discards in the orange roughy target trawl fishery rounded to the nearest 1 t, by species category and standard area, based on the STATISTICAL model. - is N/A. [Continued on next pages]**

**(a) ORH**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 2 | (1–4) | – | – | 1 | (0–4) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 8 | (8–10) | – | – | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 7 | (4–11) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 4 | (3–5) | – | – | 1 | (0–4) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 5 | (5–6) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 1 | (0–4) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 21 | (14–35) | 0 | (0–2) | 8 | (1–41) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 14 | (12–16) | – | – | 2 | (0–10) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 1 | (1–3) | – | – | 1 | (0–8) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 21 | (20–22) | 0 | (0–0) | 1 | (0–7) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 1 | (0–2) | – | – | 6 | (5–8) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 0 | (0–0) | – | – | 0 | (0–1) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 3 | (1–7) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | 3 | (2–7) | 0 | (0–1) | 5 | (4–10) | 0 | (0–0) | 0 | (0–0) | 0 | (0–1) | – | – |

**(a) ORH, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 0 | (0–0) | – | – | 3 | (2–6) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | 0 | (0–0) | – | – | 1 | (0–2) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 0 | (0–0) | 0 | (0–0) | – | – | 2 | (1–3) | 0 | (0–0) | 10 | (10–11) |
| 2005 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0 | (0–0) | 1 | (1–1) | – | – | – | – | 0 | (0–0) | – | – |
| 2008 | 0 | (0–1) | 6 | (5–7) | – | – | 0 | (0–0) | 10 | (10–10) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 2 | (2–2) | 1 | (1–1) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | 8 | (8–8) | 2 | (2–2) | 1 | (1–1) |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 15 | (15–15) | 1 | (1–1) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 3 | (3–3) | 0 | (0–0) | 0 | (0–1) | 2 | (2–2) | 0 | (0–0) |
| 2013 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 8 | (8–9) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) |
| 2015 | – | – | 0 | (0–1) | 0 | (0–3) | 4 | (4–4) | 0 | (0–0) | 4 | (4–4) |

**(b) QMS**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 2 | (1–4) | – | – | 0 | (0–2) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 5 | (3–11) | – | – | 0 | (0–1) | 1 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 1 | (1–2) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 0 | (0–1) | – | – | 0 | (0–3) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 1 | (0–1) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–1) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0 | (0–0) | – | – | 0 | (0–3) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 3 | (3–5) | – | – | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 0 | (0–3) | – | – | 0 | (0–2) | 0 | (0–1) | – | – | – | – | – | – |
| 2014 | 0 | (0–1) | – | – | – | – | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2015 | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – |

**Table A15 [Continued]:**

**(b) QMS, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SUBA** | | **WCNI** | | **WCSI** | | **NWCH** | | **HOWE** | | **LOUI** | |
| 2002 | – | – | 0 | (0–0) | – | – | 52 | (39–69) | 0 | (0–1) | 0 | (0–0) |
| 2003 | 0 | (0–1) | 0 | (0–0) | – | – | 13 | (3–51) | 1 | (0–1) | 1 | (1–1) |
| 2004 | 0 | (0–0) | 0 | (0–0) | – | – | 10 | (4–23) | 0 | (0–2) | 4 | (2–6) |
| 2005 | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–1) |
| 2006 | 0 | (0–0) | 0 | (0–0) | – | – | 12 | (8–18) | 1 | (0–1) | 0 | (0–0) |
| 2007 | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–1) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) | 2 | (2–2) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 2 | (2–2) | 1 | (1–1) | 6 | (6–6) |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 9 | (9–9) | 2 | (2–2) | 1 | (1–1) |
| 2012 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 5 | (5–5) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) | 7 | (7–7) |
| 2014 | – | – | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 2 | (2–2) |
| 2015 | – | – | 0 | (0–0) | 0 | (0–1) | 17 | (17–17) | 0 | (0–0) | 3 | (3–3) |

**(c) NON-QMS**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **COOK** | | **EAST** | | **NORTH** | | **PUYS** | | **SQUAK** | | **STEW** | |
| 2002 | 440 | (382–507) | – | – | 28 | (15–52) | 1 | (0–6) | 14 | (8–24) | 3 | (1–10) | 0 | (0–2) |
| 2003 | 531 | (476–596) | – | – | 3 | (0–27) | 6 | (4–8) | 4 | (1–14) | 1 | (0–7) | – | – |
| 2004 | 587 | (520–669) | – | – | – | – | 2 | (1–3) | – | – | 2 | (1–7) | – | – |
| 2005 | 512 | (466–565) | – | – | 64 | (26–153) | 7 | (4–13) | 12 | (9–18) | 0 | (0–2) | – | – |
| 2006 | 1 239 | (1 100–1 390) | – | – | – | – | 1 | (1–1) | 4 | (3–4) | – | – | – | – |
| 2007 | 557 | (481–651) | – | – | – | – | 2 | (2–3) | – | – | – | – | – | – |
| 2008 | 187 | (173–204) | 10 | (3–34) | 65 | (41–104) | 2 | (1–2) | – | – | 1 | (0–7) | 0 | (0–0) |
| 2009 | 205 | (187–225) | – | – | 8 | (1–53) | 8 | (6–9) | 0 | (0–1) | 1 | (0–4) | – | – |
| 2010 | 98 | (88–112) | – | – | 144 | (101–209) | 0 | (0–2) | 1 | (0–1) | 1 | (1–1) | – | – |
| 2011 | 32 | (22–48) | 4 | (1–21) | 39 | (29–53) | 2 | (1–5) | – | – | 1 | (0–2) | – | – |
| 2012 | 87 | (68–114) | – | – | 36 | (27–47) | 18 | (12–30) | 1 | (0–4) | 1 | (0–3) | – | – |
| 2013 | 49 | (35–72) | – | – | 31 | (15–66) | 9 | (4–23) | – | – | – | – | – | – |
| 2014 | 25 | (17–38) | – | – | – | – | 5 | (3–11) | 18 | (8–42) | – | – | – | – |
| 2015 | 48 | (40–60) | 2 | (1–8) | 24 | (22–28) | 6 | (4–11) | 1 | (1–2) | 4 | (2–6) | – | – |

**(c) NON-QMS, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SUBA** | | **WCNI** | | **WCSI** | | **NWCH** | | **HOWE** | | **LOUI** | |
| 2002 | – | – | 5 | (5–7) | – | – | 994 | (814–1 224) | 11 | (8–16) | 7 | (3–16) |
| 2003 | 2 | (0–14) | 12 | (9–16) | – | – | 137 | (46–389) | 20 | (12–34) | 29 | (27–32) |
| 2004 | 16 | (9–35) | 5 | (4–7) | – | – | 112 | (52–232) | 4 | (2–10) | 49 | (37–64) |
| 2005 | 12 | (10–15) | 21 | (16–29) | 3 | (3–3) | – | – | – | – | 5 | (1–44) |
| 2006 | 42 | (32–57) | 6 | (4–8) | – | – | 26 | (19–36) | 6 | (4–9) | 7 | (6–9) |
| 2007 | 12 | (11–13) | 27 | (27–27) | – | – | – | – | 12 | (6–23) | – | – |
| 2008 | 7 | (6–9) | 18 | (15–24) | – | – | 1 | (1–1) | 3 | (3–4) | – | – |
| 2009 | 9 | (5–15) | 9 | (8–11) | 5 | (5–5) | 10 | (10–10) | 8 | (8–8) | – | – |
| 2010 | 5 | (3–8) | 15 | (12–20) | 0 | (0–0) | 59 | (59–60) | 5 | (5–5) | 15 | (15–16) |
| 2011 | 4 | (2–8) | 7 | (5–10) | 6 | (5–6) | 30 | (30–30) | 9 | (9–9) | 10 | (10–10) |
| 2012 | 0 | (0–1) | 44 | (39–50) | 8 | (7–10) | 16 | (16–16) | 2 | (2–2) | 5 | (5–5) |
| 2013 | – | – | 32 | (20–51) | 17 | (15–20) | 7 | (7–7) | 4 | (4–4) | 9 | (9–9) |
| 2014 | – | – | 48 | (37–64) | 6 | (3–15) | 4 | (4–4) | 1 | (1–1) | 10 | (10–10) |
| 2015 | – | – | 21 | (18–24) | 53 | (38–75) | 130 | (130–130) | 3 | (3–3) | 8 | (8–8) |

**Table A15 [Continued]:**

**(d) INV**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 19 | (15–23) | – | – | 1 | (0–2) | 0 | (0–0) | 10 | (7–14) | 0 | (0–1) | 0 | (0–0) |
| 2003 | 35 | (31–41) | – | – | 0 | (0–2) | 1 | (1–1) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2004 | 42 | (36–49) | – | – | – | – | 0 | (0–1) | – | – | 0 | (0–0) | – | – |
| 2005 | 100 | (93–107) | – | – | 2 | (1–9) | 1 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 123 | (106–142) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 34 | (29–40) | – | – | – | – | 0 | (0–1) | – | – | – | – | – | – |
| 2008 | 22 | (21–23) | 0 | (0–1) | 1 | (0–2) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 37 | (34–40) | – | – | 1 | (0–8) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 24 | (22–26) | – | – | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 4 | (3–5) | 0 | (0–1) | 0 | (0–1) | 0 | (0–1) | – | – | 0 | (0–0) | – | – |
| 2012 | 4 | (3–6) | – | – | 1 | (0–1) | 1 | (1–2) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2013 | 9 | (5–18) | – | – | 1 | (0–4) | 1 | (0–3) | – | – | – | – | – | – |
| 2014 | 2 | (1–4) | – | – | – | – | 0 | (0–1) | 1 | (0–2) | – | – | – | – |
| 2015 | 3 | (2–4) | 0 | (0–0) | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) | 1 | (1–1) | – | – |

**(d) INV, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 6 | (6–7) | – | – | 30 | (23–40) | 2 | (1–3) | 0 | (0–1) |
| 2003 | 1 | (0–3) | 1 | (0–1) | – | – | 2 | (0–22) | 3 | (2–5) | 24 | (23–25) |
| 2004 | 1 | (0–1) | 3 | (3–4) | – | – | 6 | (3–13) | 1 | (0–3) | 49 | (44–56) |
| 2005 | 0 | (0–0) | 2 | (2–3) | 0 | (0–0) | – | – | – | – | 2 | (1–3) |
| 2006 | 1 | (0–1) | 7 | (6–8) | – | – | 4 | (3–6) | 4 | (2–6) | 1 | (0–1) |
| 2007 | 1 | (1–2) | 9 | (9–9) | – | – | – | – | 1 | (0–2) | – | – |
| 2008 | 1 | (1–2) | 7 | (6–7) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 1 | (1–2) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 1 | (0–1) | 0 | (0–0) | 0 | (0–0) | 3 | (3–3) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 2 | (1–2) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 1 | (0–1) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 1 | (1–2) | 1 | (0–3) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 0 | (0–1) | 3 | (2–6) | 3 | (3–3) | 0 | (0–0) | 0 | (0–0) |

**(e) Coral species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 4 | (4–5) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 4 | (3–6) | – | – | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 1 | (0–2) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 1 | (1–2) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 8 | (7–8) | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |

**Table A15 [Continued]:**

**(e) Coral species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 0 | (0–0) | – | – | 0 | (0–2) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | 0 | (0–1) | – | – | 1 | (0–3) | 0 | (0–0) | 1 | (1–1) |
| 2004 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 1 | (0–2) | 0 | (0–0) | – | – | – | – | 1 | (0–2) |
| 2006 | 0 | (0–0) | 1 | (0–1) | – | – | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) |
| 2007 | 0 | (0–0) | 8 | (8–8) | – | – | – | – | 0 | (0–1) | – | – |
| 2008 | 0 | (0–0) | 6 | (6–6) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |

**(f) Morid species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 50 | (42–58) | – | – | 8 | (6–11) | 0 | (0–0) | 1 | (1–2) | 0 | (0–1) | 0 | (0–0) |
| 2003 | 23 | (19–27) | – | – | 3 | (2–4) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 54 | (45–64) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 69 | (62–76) | – | – | 10 | (8–13) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 132 | (119–148) | – | – | – | – | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 72 | (61–84) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 16 | (15–18) | 0 | (0–1) | 3 | (3–4) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 26 | (25–29) | – | – | 5 | (4–6) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 22 | (20–25) | – | – | 8 | (7–10) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 14 | (12–16) | 1 | (0–2) | 8 | (6–9) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 14 | (12–16) | – | – | 3 | (3–4) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 7 | (6–9) | – | – | 4 | (3–5) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 15 | (12–19) | – | – | – | – | 0 | (0–0) | 2 | (2–2) | – | – | – | – |
| 2015 | 13 | (11–15) | 1 | (0–2) | 4 | (4–4) | 0 | (0–0) | 0 | (0–0) | 1 | (0–1) | – | – |

**(f) Morid species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 0 | (0–1) | – | – | 86 | (75–99) | 2 | (2–3) | 5 | (4–6) |
| 2003 | 0 | (0–0) | 0 | (0–1) | – | – | 24 | (19–30) | 1 | (1–1) | 1 | (1–1) |
| 2004 | 0 | (0–0) | 1 | (1–1) | – | – | 21 | (17–27) | 1 | (1–2) | 6 | (5–7) |
| 2005 | 0 | (0–0) | 1 | (1–1) | 0 | (0–0) | – | – | – | – | 4 | (3–5) |
| 2006 | 0 | (0–0) | 2 | (1–2) | – | – | 20 | (17–23) | 4 | (4–5) | 4 | (3–5) |
| 2007 | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 2 | (2–3) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) | 2 | (2–2) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 5 | (5–5) | 1 | (1–1) | 4 | (4–4) |
| 2011 | 0 | (0–0) | 1 | (0–1) | 1 | (0–1) | 10 | (10–10) | 2 | (2–2) | 1 | (1–1) |
| 2012 | 0 | (0–0) | 2 | (1–2) | 0 | (0–0) | 2 | (2–2) | 0 | (0–0) | 1 | (1–1) |
| 2013 | – | – | 1 | (1–1) | 1 | (1–1) | 1 | (1–1) | 1 | (1–1) | 1 | (1–1) |
| 2014 | – | – | 1 | (1–2) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) |
| 2015 | – | – | 1 | (1–1) | 5 | (4–6) | 17 | (17–17) | 0 | (0–0) | 1 | (1–1) |

**Table A15 [Continued]:**

**(g) Rattail species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 108 | (95–123) | – | – | 23 | (17–29) | 1 | (1–2) | 5 | (4–7) | 2 | (1–4) | 0 | (0–1) |
| 2003 | 58 | (51–66) | – | – | 8 | (7–11) | 1 | (1–1) | 1 | (1–1) | 0 | (0–1) | – | – |
| 2004 | 74 | (64–87) | – | – | – | – | 1 | (1–1) | – | – | 1 | (1–1) | – | – |
| 2005 | 54 | (50–60) | – | – | 11 | (8–14) | 1 | (0–1) | 1 | (1–1) | 0 | (0–1) | – | – |
| 2006 | 163 | (149–179) | – | – | – | – | 1 | (1–1) | 1 | (1–1) | – | – | – | – |
| 2007 | 96 | (85–108) | – | – | – | – | 1 | (1–1) | – | – | – | – | – | – |
| 2008 | 14 | (12–15) | 0 | (0–1) | 4 | (3–5) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 32 | (30–34) | – | – | 6 | (5–8) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 25 | (23–27) | – | – | 11 | (9–13) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 8 | (7–10) | 1 | (0–2) | 9 | (7–11) | 0 | (0–1) | – | – | 0 | (0–1) | – | – |
| 2012 | 19 | (17–21) | – | – | 5 | (4–6) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 8 | (7–10) | – | – | 6 | (5–8) | 1 | (0–1) | – | – | – | – | – | – |
| 2014 | 18 | (15–23) | – | – | – | – | 1 | (1–1) | 2 | (2–3) | – | – | – | – |
| 2015 | 16 | (14–18) | 1 | (0–2) | 6 | (5–6) | 1 | (1–1) | 1 | (0–1) | 2 | (2–3) | – | – |

**(g) Rattail species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 2 | (2–2) | – | – | 176 | (152–205) | 3 | (2–3) | 9 | (8–11) |
| 2003 | 4 | (3–4) | 1 | (1–2) | – | – | 58 | (47–70) | 1 | (1–2) | 3 | (2–3) |
| 2004 | 9 | (8–10) | 2 | (2–3) | – | – | 32 | (26–40) | 1 | (1–2) | 9 | (7–10) |
| 2005 | 6 | (6–7) | 2 | (1–2) | 0 | (0–0) | – | – | – | – | 3 | (3–4) |
| 2006 | 16 | (14–18) | 4 | (3–5) | – | – | 21 | (18–25) | 3 | (2–3) | 4 | (4–5) |
| 2007 | 10 | (9–11) | 9 | (9–9) | – | – | – | – | 2 | (1–2) | – | – |
| 2008 | 4 | (3–4) | 6 | (6–6) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 4 | (3–5) | 0 | (0–1) | 1 | (1–1) | 1 | (1–1) | 1 | (1–1) | – | – |
| 2010 | 4 | (3–5) | 1 | (0–1) | 0 | (0–0) | 13 | (13–13) | 0 | (0–0) | 2 | (2–2) |
| 2011 | 2 | (2–3) | 2 | (1–2) | 1 | (1–1) | 9 | (9–9) | 1 | (1–1) | 1 | (1–1) |
| 2012 | 0 | (0–0) | 4 | (3–4) | 1 | (1–1) | 3 | (3–3) | 0 | (0–0) | 0 | (0–1) |
| 2013 | – | – | 3 | (2–3) | 2 | (2–2) | 1 | (1–1) | 0 | (0–0) | 1 | (1–1) |
| 2014 | – | – | 4 | (4–5) | 2 | (2–3) | 1 | (1–1) | 0 | (0–0) | 1 | (1–1) |
| 2015 | – | – | 3 | (2–3) | 13 | (11–16) | 39 | (39–39) | 0 | (0–0) | 1 | (1–1) |

**(h) Slickhead species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 96 | (80–113) | – | – | 11 | (7–18) | 1 | (1–1) | 4 | (3–6) | 1 | (0–1) | 0 | (0–1) |
| 2003 | 32 | (27–39) | – | – | 3 | (2–4) | 1 | (1–1) | 1 | (0–1) | 0 | (0–0) | – | – |
| 2004 | 51 | (42–61) | – | – | – | – | 1 | (0–1) | – | – | 0 | (0–0) | – | – |
| 2005 | 33 | (29–38) | – | – | 5 | (3–7) | 0 | (0–1) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2006 | 72 | (64–84) | – | – | – | – | 0 | (0–1) | 1 | (1–1) | – | – | – | – |
| 2007 | 27 | (23–33) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 6 | (5–7) | 2 | (1–5) | 2 | (2–3) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 27 | (26–29) | – | – | 3 | (2–4) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 20 | (17–22) | – | – | 6 | (5–9) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 6 | (5–7) | 3 | (1–7) | 4 | (3–5) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 13 | (11–16) | – | – | 3 | (2–4) | 1 | (1–1) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2013 | 8 | (7–9) | – | – | 3 | (2–4) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 10 | (7–14) | – | – | – | – | 0 | (0–1) | 1 | (1–1) | – | – | – | – |
| 2015 | 18 | (16–21) | 4 | (1–11) | 3 | (2–3) | 1 | (1–1) | 1 | (0–1) | 1 | (0–1) | – | – |

**Table A15 [Continued]:**

**(h) Slickhead species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 4 | (3–5) | – | – | 171 | (141–198) | 3 | (2–4) | 3 | (2–3) |
| 2003 | 1 | (1–2) | 2 | (1–2) | – | – | 36 | (28–48) | 1 | (1–1) | 1 | (0–1) |
| 2004 | 3 | (3–4) | 3 | (2–3) | – | – | 24 | (19–31) | 1 | (1–2) | 2 | (2–3) |
| 2005 | 3 | (3–3) | 2 | (2–3) | 0 | (0–0) | – | – | – | – | 1 | (1–1) |
| 2006 | 4 | (4–5) | 3 | (3–4) | – | – | 12 | (11–16) | 2 | (2–3) | 1 | (1–1) |
| 2007 | 1 | (1–2) | 1 | (1–1) | – | – | – | – | 1 | (0–1) | – | – |
| 2008 | 1 | (1–1) | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 2 | (1–2) | 1 | (1–1) | 0 | (0–0) | 2 | (2–2) | 1 | (1–1) | – | – |
| 2010 | 2 | (2–3) | 2 | (2–2) | 0 | (0–0) | 13 | (13–14) | 0 | (0–0) | 0 | (0–1) |
| 2011 | 1 | (1–2) | 1 | (1–2) | 0 | (0–0) | 4 | (4–4) | 1 | (1–1) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 7 | (7–8) | 1 | (0–1) | 3 | (3–3) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 2 | (2–3) | 1 | (1–1) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 3 | (2–3) | 0 | (0–1) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 3 | (3–4) | 6 | (5–7) | 20 | (20–20) | 0 | (0–0) | 1 | (1–1) |

**(i) Shark species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 162 | (144–181) | – | – | 24 | (20–28) | 1 | (1–1) | 6 | (4–8) | 1 | (1–2) | 0 | (0–1) |
| 2003 | 210 | (192–231) | – | – | 18 | (15–21) | 3 | (2–3) | 3 | (2–4) | 11 | (11–12) | – | – |
| 2004 | 274 | (246–304) | – | – | – | – | 2 | (1–2) | – | – | 1 | (1–1) | – | – |
| 2005 | 239 | (221–258) | – | – | 30 | (25–35) | 3 | (2–3) | 5 | (5–6) | 0 | (0–0) | – | – |
| 2006 | 320 | (294–348) | – | – | – | – | 1 | (1–1) | 5 | (5–5) | – | – | – | – |
| 2007 | 230 | (208–253) | – | – | – | – | 2 | (1–2) | – | – | – | – | – | – |
| 2008 | 128 | (120–137) | 3 | (1–7) | 18 | (15–21) | 1 | (1–1) | – | – | 0 | (0–1) | 0 | (0–0) |
| 2009 | 140 | (132–148) | – | – | 22 | (18–26) | 3 | (3–3) | 1 | (1–1) | 0 | (0–0) | – | – |
| 2010 | 58 | (52–64) | – | – | 23 | (20–27) | 1 | (0–1) | 1 | (0–1) | 0 | (0–0) | – | – |
| 2011 | 38 | (34–44) | 3 | (1–6) | 22 | (19–25) | 1 | (1–1) | – | – | 0 | (0–1) | – | – |
| 2012 | 44 | (39–50) | – | – | 12 | (11–14) | 2 | (2–3) | 1 | (1–1) | 0 | (0–0) | – | – |
| 2013 | 32 | (28–36) | – | – | 15 | (13–18) | 1 | (1–1) | – | – | – | – | – | – |
| 2014 | 68 | (57–80) | – | – | – | – | 2 | (1–2) | 2 | (2–3) | – | – | – | – |
| 2015 | 51 | (45–57) | 2 | (1–5) | 12 | (11–13) | 2 | (1–2) | 1 | (1–1) | 2 | (1–3) | – | – |

**(i) Shark species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 4 | (3–4) | – | – | 128 | (113–145) | 9 | (8–10) | 19 | (17–22) |
| 2003 | 1 | (1–1) | 7 | (6–8) | – | – | 96 | (84–111) | 7 | (6–8) | 16 | (15–18) |
| 2004 | 4 | (4–4) | 8 | (7–10) | – | – | 48 | (42–56) | 5 | (4–6) | 35 | (31–40) |
| 2005 | 4 | (4–4) | 12 | (11–14) | 3 | (3–3) | – | – | – | – | 21 | (19–23) |
| 2006 | 5 | (4–5) | 11 | (10–13) | – | – | 21 | (18–24) | 8 | (7–9) | 12 | (11–14) |
| 2007 | 3 | (3–3) | 14 | (14–14) | – | – | – | – | 5 | (4–6) | – | – |
| 2008 | 2 | (2–2) | 8 | (7–8) | – | – | 1 | (1–1) | 3 | (3–3) | – | – |
| 2009 | 2 | (1–2) | 6 | (6–7) | 3 | (3–3) | 6 | (6–6) | 5 | (5–5) | – | – |
| 2010 | 1 | (1–1) | 7 | (7–7) | 1 | (1–1) | 24 | (23–24) | 3 | (3–3) | 8 | (8–8) |
| 2011 | 1 | (1–1) | 4 | (4–5) | 4 | (4–4) | 12 | (12–12) | 6 | (6–6) | 6 | (6–6) |
| 2012 | 0 | (0–0) | 15 | (14–16) | 5 | (5–5) | 8 | (8–8) | 1 | (1–1) | 4 | (4–4) |
| 2013 | – | – | 12 | (10–14) | 6 | (6–7) | 4 | (4–4) | 2 | (2–2) | 7 | (7–7) |
| 2014 | – | – | 15 | (14–17) | 5 | (4–6) | 2 | (2–2) | 1 | (1–1) | 6 | (6–6) |
| 2015 | – | – | 11 | (11–12) | 31 | (27–36) | 35 | (35–35) | 1 | (1–2) | 5 | (5–5) |

**Table A15 [Continued]:**

**(j) Schedule 6 species**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 0 | (0–1) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–2) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |

**(j) Schedule 6 species, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SUBA | | WCNI | | WCSI | | NWCH | | HOWE | | LOUI | |
| 2002 | – | – | 0 | (0–0) | – | – | 8 | (4–17) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | 0 | (0–0) | – | – | 9 | (1–54) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 0 | (0–0) | 0 | (0–0) | – | – | 8 | (4–16) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–0) | 0 | (0–0) | – | – | 2 | (1–3) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–1) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |

**(k) Spiny dogfish**

| | Statistical model | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | NORTH | | PUYS | | SQUAK | | STEW | |
| 2002 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2004 | 0 | (0–2) | – | – | – | – | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2005 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | – | – | – | – | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – | – | – |
| 2014 | 0 | (0–0) | – | – | – | – | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |

**Table A15 [Continued]:**

**(k) Spiny dogfish, *continued.***

| | Statistical model | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **SUBA** | | **WCNI** | | **WCSI** | | **NWCH** | | **HOWE** | | **LOUI** | |
| 2002 | – | – | 0 | (0–0) | – | – | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | 0 | (0–0) | – | – | 1 | (0–6) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 0 | (0–0) | 0 | (0–1) | – | – | 2 | (1–5) | 0 | (0–0) | 0 | (0–1) |
| 2005 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2013 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | – | – | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) |

**Table A16: Estimates of total annual discards, rounded to the nearest t, in the orange roughy target trawl fishery, by species category, based on observed discard rates and using the RATIO model; 95% confidence intervals in parentheses.**

| Fishing year | ORH | | QMS | | non-QMS | | Invertebrate | | Total discards | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 5.0 | (1.6–11.1) | 39.6 | (21.8–58.2) | 1 970.5 | (1 049.9–3 335.0) | 101.7 | (66.9–151.2) | 2 116.8 | (1 140.2–3 555.5) |
| 2003 | 42.8 | (9.0–147.0) | 42.8 | (23.9–67.5) | 1 640.7 | (821.1–3 035.5) | 126.7 | (91.8–173.1) | 1 853.0 | (945.8–3 423.1) |
| 2004 | 122.7 | (15.0–357.3) | 26.2 | (15.5–43.3) | 1 058.0 | (691.4–1 515.6) | 490.8 | (169.0–963.7) | 1 697.7 | (890.9–2 879.9) |
| 2005 | 8.5 | (3.3–31.1) | 47.6 | (25.2–72.7) | 835.5 | (757.2–934.1) | 241.4 | (181.7–329.6) | 1 133.0 | (967.4–1 367.5) |
| 2006 | 32.9 | (5.0–113.2) | 20.6 | (12.6–30.4) | 1 742.2 | (1 467.3–2 061.4) | 164.9 | (114.7–221.2) | 1 960.6 | (1 599.6–2 426.2) |
| 2007 | 7.8 | (1.2–24.9) | 3.4 | (2.0–5.4) | 715.2 | (357.9–983.9) | 65.8 | (39.1–125.6) | 792.2 | (400.2–1 139.8) |
| 2008 | 39.3 | (26.6–60.1) | 0.5 | (0.3–0.7) | 276.6 | (246.9–358.4) | 53.4 | (34.6–82.8) | 369.9 | (308.5–502.1) |
| 2009 | 28.5 | (17.1–46.3) | 4.0 | (3.7–4.5) | 419.3 | (365.7–485.4) | 44.6 | (40.2–50.0) | 496.4 | (426.7–586.2) |
| 2010 | 13.6 | (12.3–16.0) | 14.9 | (11.8–21.0) | 330.5 | (287.7–385.4) | 27.7 | (25.1–30.9) | 386.6 | (336.8–453.2) |
| 2011 | 41.2 | (36.7–358.3) | 12.6 | (12.3–12.9) | 126.6 | (103.2–171.2) | 6.6 | (5.2–8.5) | 186.9 | (157.3–550.8) |
| 2012 | 24.5 | (10.3–73.5) | 5.9 | (5.6–6.4) | 247.4 | (148.6–385.5) | 8.4 | (4.5–16.4) | 286.3 | (169.1–481.9) |
| 2013 | 23.2 | (0.2–102.2) | 9.7 | (8.8–11.0) | 173.0 | (120.0–249.8) | 10.9 | (4.8–18.7) | 216.8 | (133.8–381.7) |
| 2014 | 32.2 | (8.7–88.4) | 3.1 | (2.9–3.4) | 142.4 | (116.2–179.5) | 6.2 | (4.3–9.5) | 184.0 | (132.1–280.8) |
| 2015 | 14.7 | (12.0–22.6) | 20.9 | (20.4–21.6) | 298.0 | (267.1–339.8) | 12.3 | (10.3–14.6) | 345.9 | (309.8–398.6) |

| Fishing year | Coral species | | Morid species | | Rattail species | | Slickhead species | | Shark species | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 24.3 | (4.1–58.5) | 283.1 | (117.7–539.2) | 502.6 | (227.2–905.1) | 621.4 | (182.5–1 287.9) | 403.1 | (320.0–498.0) |
| 2003 | 1.4 | (0.8–2.9) | 206.9 | (71.9–452.2) | 351.4 | (119.1–776.8) | 398.2 | (59.0–1 045.3) | 428.4 | (359.2–516.5) |
| 2004 | 0.2 | (0.0–0.4) | 141.5 | (83.3–224.8) | 185.6 | (91.0–319.6) | 176.0 | (50.7–396.7) | 424.2 | (322.5–533.8) |
| 2005 | 13.3 | (6.0–31.4) | 145.0 | (112.4–187.0) | 115.3 | (94.0–138.6) | 73.9 | (59.2–91.2) | 347.3 | (293.5–431.6) |
| 2006 | 2.4 | (1.3–3.9) | 300.3 | (222.6–378.3) | 478.8 | (407.5–623.9) | 139.3 | (95.8–192.3) | 697.7 | (586.6–872.0) |
| 2007 | 9.8 | (8.5–13.8) | 98.5 | (54.1–133.9) | 173.3 | (78.3–241.8) | 59.2 | (28.9–85.4) | 314.9 | (140.0–442.1) |
| 2008 | 25.1 | (16.2–39.8) | 30.5 | (22.7–51.4) | 34.2 | (27.5–47.3) | 23.7 | (15.4–40.4) | 162.5 | (147.4–188.3) |
| 2009 | 0.0 | (0.0–0.0) | 49.3 | (37.9–62.2) | 68.8 | (49.0–82.3) | 60.1 | (36.9–88.2) | 213.5 | (191.0–242.3) |
| 2010 | 0.0 | (0.0–0.0) | 48.4 | (38.0–66.4) | 70.8 | (57.2–92.3) | 47.4 | (38.5–58.5) | 135.5 | (113.5–165.3) |
| 2011 | 0.0 | (0.0–0.0) | 24.6 | (21.6–63.9) | 21.2 | (19.4–23.1) | 9.8 | (8.6–11.4) | 66.0 | (51.1–80.6) |
| 2012 | 0.0 | (0.0–0.0) | 30.8 | (13.3–55.4) | 60.4 | (25.7–149.4) | 26.9 | (19.4–36.2) | 106.1 | (69.5–156.1) |
| 2013 | 0.0 | (0.0–0.0) | 16.8 | (11.5–26.3) | 22.6 | (16.9–29.6) | 43.5 | (10.6–93.3) | 74.0 | (62.7–86.1) |
| 2014 | 0.0 | (0.0–0.0) | 22.6 | (14.0–35.5) | 27.4 | (21.7–33.9) | 10.2 | (8.3–12.1) | 67.1 | (53.2–90.8) |
| 2015 | 0.0 | (0.0–0.0) | 31.5 | (29.3–34.9) | 62.9 | (58.4–69.4) | 49.0 | (39.0–69.6) | 117.3 | (96.1–147.7) |

| Fishing year | Schedule 6 species | | Spiny dogfish | |
|---|---|---|---|---|
| 2002 | 5.9 | (1.8–10.9) | 0.1 | (0.0–0.2) |
| 2003 | 6.6 | (1.6–13.6) | 1.6 | (0.1–5.4) |
| 2004 | 3.6 | (1.7–6.1) | 1.1 | (0.3–2.9) |
| 2005 | 5.8 | (2.1–10.5) | 1.9 | (0.0–5.6) |
| 2006 | 1.8 | (0.8–3.0) | 0.0 | (0.0–0.0) |
| 2007 | 0.4 | (0.2–0.6) | 0.1 | (0.1–0.2) |
| 2008 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2009 | 0.2 | (0.1–0.3) | 0.2 | (0.1–0.3) |
| 2010 | 0.2 | (0.1–0.3) | 0.0 | (0.0–0.0) |
| 2011 | 0.1 | (0.1–0.1) | 0.0 | (0.0–0.0) |
| 2012 | 1.3 | (1.2–1.4) | 0.0 | (0.0–0.0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2015 | 0.4 | (0.4–0.4) | 0.0 | (0.0–0.0) |

Table A17: Estimates of total annual discards, rounded to the nearest t, in the orange roughy target trawl fishery, by species category, based on observed discard rates and using the STATISTICAL model; 95% confidence intervals in parentheses.

| Fishing year | ORH | | QMS | | non-QMS | | Invertebrate | | Total discards | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 7 | (4–13) | 55 | (42–72) | 1 507 | (1 315–1 745) | 69 | (59–80) | 1 631 | (1 416–1 897) |
| 2003 | 9 | (8–13) | 21 | (10–59) | 754 | (637–1 012) | 69 | (62–88) | 844 | (709–1 159) |
| 2004 | 19 | (16–26) | 16 | (10–29) | 785 | (689–926) | 102 | (93–114) | 903 | (792–1 069) |
| 2005 | 5 | (3–9) | 2 | (1–5) | 645 | (578–755) | 108 | (101–117) | 755 | (680–877) |
| 2006 | 5 | (5–7) | 13 | (9–20) | 1 333 | (1 192–1 485) | 139 | (122–159) | 1 485 | (1 323–1 664) |
| 2007 | 2 | (1–6) | 1 | (0–1) | 611 | (534–704) | 46 | (41–52) | 658 | (575–757) |
| 2008 | 46 | (33–83) | 1 | (1–2) | 298 | (265–344) | 31 | (30–33) | 330 | (296–379) |
| 2009 | 19 | (16–28) | 4 | (4–7) | 266 | (244–311) | 40 | (37–48) | 310 | (285–366) |
| 2010 | 15 | (13–21) | 13 | (12–15) | 345 | (299–409) | 29 | (27–32) | 387 | (338–456) |
| 2011 | 39 | (37–45) | 12 | (12–13) | 146 | (128–171) | 6 | (5–8) | 164 | (145–192) |
| 2012 | 12 | (11–15) | 6 | (6–7) | 221 | (198–252) | 9 | (7–11) | 236 | (211–270) |
| 2013 | 1 | (0–2) | 10 | (9–13) | 163 | (133–206) | 14 | (9–22) | 187 | (151–241) |
| 2014 | 12 | (10–17) | 3 | (3–5) | 121 | (100–151) | 6 | (5–9) | 130 | (108–165) |
| 2015 | 18 | (15–25) | 21 | (20–22) | 302 | (283–326) | 12 | (10–15) | 335 | (313–363) |

| Fishing year | Coral species | | Morid species | | Rattail species | | Slickhead species | |
|---|---|---|---|---|---|---|---|---|
| 2002 | 5 | (4–7) | 154 | (135–176) | 330 | (289–377) | 295 | (244–343) |
| 2003 | 3 | (1–5) | 53 | (43–63) | 136 | (118–158) | 78 | (62–97) |
| 2004 | 0 | (0–1) | 84 | (70–100) | 129 | (111–150) | 85 | (71–103) |
| 2005 | 7 | (5–11) | 85 | (77–95) | 78 | (72–87) | 45 | (40–51) |
| 2006 | 3 | (2–4) | 163 | (147–183) | 213 | (194–235) | 97 | (86–113) |
| 2007 | 10 | (9–11) | 75 | (64–88) | 117 | (106–130) | 30 | (26–36) |
| 2008 | 14 | (13–15) | 20 | (18–22) | 28 | (26–31) | 12 | (10–17) |
| 2009 | 0 | (0–0) | 36 | (33–39) | 46 | (43–50) | 36 | (33–39) |
| 2010 | 0 | (0–0) | 41 | (37–44) | 56 | (53–61) | 46 | (41–50) |
| 2011 | 0 | (0–0) | 37 | (34–41) | 35 | (31–38) | 21 | (17–25) |
| 2012 | 0 | (0–0) | 23 | (20–25) | 34 | (32–37) | 30 | (26–34) |
| 2013 | 0 | (0–0) | 17 | (15–20) | 22 | (19–25) | 15 | (13–18) |
| 2014 | 0 | (0–0) | 21 | (17–25) | 30 | (26–35) | 15 | (12–20) |
| 2015 | 0 | (0–0) | 44 | (41–47) | 82 | (77–87) | 58 | (52–65) |

| Fishing year | Shark species | | Schedule 6 species | | Spiny dogfish | |
|---|---|---|---|---|---|---|
| 2002 | 355 | (317–393) | 8 | (4–17) | 0 | (0–1) |
| 2003 | 374 | (341–411) | 10 | (1–56) | 1 | (0–7) |
| 2004 | 377 | (339–420) | 8 | (4–17) | 3 | (1–7) |
| 2005 | 317 | (293–343) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 383 | (352–417) | 2 | (1–4) | 0 | (0–0) |
| 2007 | 254 | (232–278) | 1 | (0–2) | 0 | (0–1) |
| 2008 | 164 | (153–176) | 0 | (0–0) | 0 | (0–0) |
| 2009 | 187 | (177–199) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 126 | (118–135) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 97 | (89–107) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 93 | (87–101) | 1 | (1–2) | 0 | (0–0) |
| 2013 | 80 | (72–88) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 101 | (88–115) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 154 | (144–165) | 1 | (0–1) | 0 | (0–0) |

**Table A18: Summary of results of linear regression analyses for trends in annual discards in the orange roughy fishery between 2001–02 and 2014–15, by species category. 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** | **-0.179** | **0.003** |
| **NON-QMS** | **-0.116** | **0.014** |
| **INV** | **-0.209** | **0.003** |
| **Total** | **-0.166** | **0.001** |
| **Morid species** | **-0.207** | **0.002** |
| Rattail species | -0.025 | 0.743 |
| **Shark species** | **-0.210** | **0.001** |
| **Slickhead species** | **-0.200** | **0.003** |

**Table A19: Estimated annual orange roughy catch (t), total bycatch (t), and total discards (t) in the target orange roughy target trawl fishery; discard fraction (kg of total discards per kg of orange roughy caught); and discards as a fraction of bycatch.**

| Fishing year | ORH estimated catch | Total bycatch | Total discards | Bycatch fraction | Discard fraction | Discards / bycatch |
|---|---|---|---|---|---|---|
| 2002 | 16 879 | 5 434 | 2 117 | 0.32 | 0.13 | 0.39 |
| 2003 | 16 134 | 5 520 | 1 853 | 0.34 | 0.11 | 0.34 |
| 2004 | 14 332 | 6 075 | 1 698 | 0.42 | 0.12 | 0.28 |
| 2005 | 16 153 | 4 919 | 1 133 | 0.30 | 0.07 | 0.23 |
| 2006 | 15 794 | 4 089 | 1 961 | 0.26 | 0.12 | 0.48 |
| 2007 | 13 521 | 3 093 | 792 | 0.23 | 0.06 | 0.26 |
| 2008 | 12 613 | 3 879 | 370 | 0.31 | 0.03 | 0.10 |
| 2009 | 11 186 | 4 415 | 496 | 0.39 | 0.04 | 0.11 |
| 2010 | 9 870 | 3 740 | 387 | 0.38 | 0.04 | 0.10 |
| 2011 | 6 713 | 1 080 | 187 | 0.16 | 0.03 | 0.17 |
| 2012 | 6 078 | 1 023 | 286 | 0.17 | 0.05 | 0.28 |
| 2013 | 6 201 | 706 | 217 | 0.11 | 0.03 | 0.31 |
| 2014 | 7 863 | 787 | 184 | 0.10 | 0.02 | 0.23 |
| 2015 | 8 596 | 1 107 | 346 | 0.13 | 0.04 | 0.31 |

**Table A20: Orange roughy target trawl fishery. Total annual bycatch estimates (t) (with estimated 95% CIs in parenthesis) for individual species (based on the top 16 QMS, top 81 non-QMS, and top 35 INV species observed, with at least 1 t of bycatch in at least one year). The slope of a regression through the data points is shown (in bold if significant) on the last line for each species code (see Table A1 for species code definitions). 0.0 is less than 0.1; - is NA. Note, bycatch trends in some cases may be due to inconsistent use of the code over time, e.g., the reducing use of generic codes such as DWD (deepwater dogfish) and increasing use of specific codes (e.g., PLS, plunket shark); the more likely cases are noted in the table. [Continued on next pages]**

| **Fishing** | | | | | | | | | | | | | | | | **Species** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **year** | | **OEO** | | **CDL** | | **HOK** | | **RAT** | | (see note) **DWD** | | (see note) **SLK** | | **SND** | | **RIB** |
| 2002 | 2 421.6 | (1 556.0–3 644.3) | 63.6 | (36.4–128.6) | 101.7 | (75.4–134.2) | 272.5 | (179.0–361.3) | 121.7 | (73.2–177.4) | 633.4 | (194.3–1 262.9) | 145.1 | (90.0–217.7) | 69.4 | (42.9–100.8) |
| 2003 | 2 782.2 | (1 913.7–3 815.9) | 128.2 | (80.8–235.0) | 99.1 | (76.7–129.8) | 217.8 | (134.3–337.9) | 65.9 | (21.2–100.6) | 399.7 | (62.1–1 075.0) | 156.3 | (109.2–210.0) | 48.3 | (36.1–63.9) |
| 2004 | 3 854.3 | (2 717.1–5 033.5) | 44.9 | (26.7–71.0) | 139.9 | (107.7–178.7) | 158.3 | (107.7–217.0) | 68.8 | (26.2–110.4) | 167.7 | (48.7–381.7) | 110.5 | (80.7–145.9) | 54.2 | (25.1–109.1) |
| 2005 | 3 110.4 | (2 606.1–3 668.3) | 84.1 | (63.1–108.3) | 94.1 | (70.7–129.2) | 124.1 | (99.4–157.4) | 173.4 | (113.8–255.6) | 75.7 | (61.5–96.6) | 129.5 | (104.7–155.0) | 147.6 | (103.8–214.5) |
| 2006 | 1 636.0 | (1 176.2–2 473.8) | 79.2 | (48.1–123.7) | 149.1 | (113.2–186.2) | 486.9 | (419.3–641.9) | 104.7 | (59.2–167.6) | 141.5 | (99.4–193.8) | 315.6 | (263.8–415.7) | 122.2 | (99.5–155.4) |
| 2007 | 1 401.4 | (990.1–1 854.1) | 45.6 | (24.0–76.3) | 236.9 | (164.4–317.7) | 150.6 | (122.9–182.6) | 77.1 | (27.3–110.7) | 82.7 | (68.9–102.8) | 193.0 | (154.9–234.4) | 68.6 | (57.7–84.2) |
| 2008 | 2 452.3 | (2 236.5–3 813.2) | 35.3 | (18.5–63.5) | 146.2 | (125.7–179.2) | 142.2 | (130.0–161.2) | 95.6 | (76.4–109.0) | 112.4 | (97.7–133.8) | 158.1 | (143.6–177.1) | 23.6 | (21.4–26.1) |
| 2009 | 2 815.4 | (2 254.5–3 097.3) | 97.7 | (67.2–139.9) | 199.3 | (169.4–243.0) | 123.4 | (112.5–135.0) | 123.3 | (106.7–139.0) | 100.7 | (86.6–116.6) | 83.5 | (70.5–99.3) | 31.4 | (28.1–35.8) |
| 2010 | 1 882.5 | (1 690.7–2 083.2) | 21.9 | (18.4–26.5) | 247.9 | (190.9–342.5) | 245.4 | (222.0–277.6) | 55.3 | (48.7–63.2) | 182.5 | (167.1–199.0) | 145.1 | (123.2–174.4) | 42.1 | (39.5–46.2) |
| 2011 | 589.6 | (418.0–787.4) | 60.5 | (34.5–113.3) | 53.2 | (34.5–80.9) | 36.4 | (33.0–40.1) | 3.0 | (2.1–4.4) | 16.6 | (13.7–20.4) | 27.5 | (24.7–31.1) | 54.9 | (49.1–61.8) |
| 2012 | 494.3 | (352.7–664.0) | 15.1 | (9.2–26.3) | 35.7 | (25.3–55.6) | 35.9 | (23.6–58.9) | 4.3 | (2.4–7.5) | 28.0 | (21.0–36.7) | 38.6 | (29.7–51.7) | 30.6 | (20.9–42.8) |
| 2013 | 239.8 | (102.1–439.8) | 33.1 | (10.7–62.7) | 32.4 | (15.8–74.8) | 16.2 | (11.3–23.7) | 1.6 | (1.0–2.3) | 42.3 | (10.3–97.1) | 18.2 | (9.8–29.5) | 36.2 | (26.5–49.4) |
| 2014 | 375.1 | (163.8–603.8) | 28.4 | (6.2–64.9) | 32.6 | (25.8–40.4) | 31.3 | (16.5–67.2) | 1.3 | (0.0–3.6) | 4.7 | (3.5–6.3) | 60.9 | (44.1–86.7) | 78.2 | (38.5–160.3) |
| 2015 | 457.2 | (329.2–635.9) | 27.4 | (19.7–39.8) | 59.2 | (45.6–78.3) | 46.2 | (41.6–52.8) | 3.2 | (2.4–4.7) | 29.6 | (21.9–48.5) | 46.5 | (42.0–52.7) | 117.3 | (89.2–148.8) |
| slope | **-0.19** | | **-0.10** | | -0.10 | | **-0.19** | | **-0.37** | | **-0.26** | | **-0.14** | | -0.02 | |

| **Fishing** | | | | | | | | | | | | | | | | | | **Species** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **year** | | (see note) **BSH** | | **ETB** | | **COU** | | (see note) **MOD** | | **BYS** | | **HJO** | | **BYX** | | **BEE** | | (see note) **OSD** |
| 2002 | 227.8 | (117.4–353.0) | 71.6 | (39.8–105.1) | 29.9 | (13.6–55.6) | 210.9 | (43.8–486.5) | 4.0 | (2.3–6.1) | 49.6 | (23.0–96.6) | 0.7 | (0.0–1.9) | 75.7 | (23.3–160.8) | 10.7 | (5.2–20.1) |
| 2003 | 300.6 | (190.6–446.2) | 8.1 | (2.8–17.5) | 43.4 | (25.9–64.6) | 167.0 | (20.1–419.8) | 87.2 | (45.8–157.2) | 20.0 | (7.9–34.9) | 1.3 | (0.0–5.1) | 79.3 | (26.7–168.5) | 55.1 | (11.7–120.1) |
| 2004 | 170.3 | (107.2–251.0) | 173.2 | (92.4–283.3) | 445.7 | (117.2–883.0) | 112.9 | (58.7–195.9) | 32.1 | (16.4–62.9) | 17.1 | (5.4–55.8) | 3.8 | (1.1–13.7) | 58.1 | (27.5–88.1) | 9.5 | (4.7–15.7) |
| 2005 | 97.3 | (68.0–139.5) | 25.7 | (20.2–32.5) | 81.8 | (42.4–162.3) | 106.3 | (84.8–133.2) | 26.9 | (11.0–61.8) | 16.4 | (12.3–23.3) | 0.3 | (0.0–1.2) | 46.5 | (41.7–52.7) | 13.9 | (10.5–17.9) |
| 2006 | 51.4 | (40.8–64.6) | 65.9 | (45.5–93.0) | 15.4 | (7.7–30.9) | 53.3 | (31.4–88.5) | 7.1 | (1.7–18.2) | 219.0 | (136.5–295.4) | 1.8 | (1.0–19.3) | 51.1 | (36.6–71.8) | 17.4 | (12.9–25.1) |
| 2007 | 46.1 | (28.5–63.9) | 98.8 | (75.6–125.3) | 0.5 | (0.2–1.1) | 198.7 | (118.7–267.5) | 10.7 | (4.1–20.3) | 17.2 | (10.6–34.7) | 1.0 | (0.1–3.0) | 52.6 | (38.9–74.1) | 20.6 | (6.3–38.2) |
| 2008 | 57.1 | (49.7–99.6) | 89.0 | (74.8–102.9) | 2.3 | (1.1–4.9) | 21.8 | (18.8–26.2) | 8.3 | (5.1–12.7) | 120.1 | (106.7–141.3) | 1.1 | (1.0–1.3) | 34.5 | (28.6–55.6) | 8.8 | (5.3–10.6) |
| 2009 | 68.9 | (59.9–77.5) | 132.0 | (114.0–184.7) | 0.0 | (0.0–0.1) | 67.7 | (60.4–76.3) | 76.2 | (11.0–330.6) | 71.3 | (58.9–85.5) | 0.0 | (0.0–0.1) | 34.2 | (29.0–45.2) | 19.1 | (16.7–22.0) |
| 2010 | 35.0 | (28.9–41.9) | 83.3 | (72.6–97.0) | - | - | 180.2 | (161.7–201.5) | 146.9 | (20.1–394.5) | 98.7 | (84.9–113.7) | - | - | 32.8 | (30.5–35.3) | 104.9 | (96.5–113.2) |
| 2011 | 15.6 | (13.7–17.6) | 42.1 | (31.1–57.9) | 0.1 | (0.0–0.2) | 12.5 | (9.9–16.3) | 13.1 | (5.5–33.6) | 21.6 | (11.7–63.3) | 0.4 | (0.0–1.1) | 5.4 | (4.6–6.2) | 43.3 | (29.9–65.3) |
| 2012 | 22.9 | (6.5–61.2) | 57.4 | (23.2–97.3) | 1.5 | (0.0–6.8) | 9.8 | (4.1–18.5) | 119.8 | (33.1–370.5) | 20.2 | (7.7–46.2) | 0.8 | (0.0–3.4) | 7.7 | (5.5–10.4) | 14.8 | (6.1–32.0) |
| 2013 | 5.5 | (4.2–7.3) | 35.2 | (24.8–48.9) | 0.0 | (0.0–0.1) | 4.6 | (2.4–8.7) | 152.9 | (1.1–560.2) | 11.0 | (7.0–19.3) | 2.2 | (2.0–2.5) | 4.7 | (3.0–7.7) | 9.9 | (5.4–16.7) |
| 2014 | 6.4 | (4.4–9.6) | 26.7 | (22.1–31.1) | 0.0 | (0.0–0.1) | 4.1 | (3.3–4.9) | 1.2 | (1.1–1.3) | 22.0 | (16.1–29.3) | 1.4 | (0.1–4.1) | 6.4 | (3.6–11.0) | 4.9 | (3.1–7.1) |
| 2015 | 8.4 | (6.6–10.8) | 31.0 | (28.0–36.4) | 0.0 | (0.0–0.1) | 6.8 | (5.4–9.4) | 5.5 | (5.2–6.3) | 16.6 | (14.7–19.2) | 1.6 | (1.1–2.8) | 4.2 | (3.7–5.0) | 32.2 | (16.4–54.8) |
| slope | **-0.29** | | -0.02 | | **-0.61** | | **-0.30** | | -0.01 | | -0.05 | | -0.01 | | **-0.25** | | 0 | |

## Table A20 [Continued]:

| Fishing year | | (see note) WSQ | | LCH | | (see note) ETM | | EPT | | JAV | | CYP | | HAK | | WHX | | (see note) PLS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 14.0 | (9.4–18.7) | 185.2 | (61.3–362.2) | 75.1 | (34.0–114.6) | 0.3 | (0.0–1.2) | 109.3 | (38.9–198.6) | 5.9 | (1.7–13.5) | 27.6 | (18.5–37.3) | 202.5 | (16.2–516.0) | 0.0 | (0.0–0.1) |
| 2003 | 20.2 | (12.7–28.8) | 145.2 | (35.2–312.8) | 116.9 | (29.9–237.4) | - | - | 62.0 | (17.5–134.0) | 0.2 | (0.1–0.2) | 20.0 | (12.2–29.2) | 163.9 | (9.6–478.9) | 0.2 | (0.0–1.0) |
| 2004 | 22.0 | (15.4–33.0) | 66.4 | (28.9–132.9) | 11.6 | (2.3–35.0) | - | - | 17.7 | (5.7–39.8) | 1.9 | (0.9–3.7) | 25.9 | (8.4–44.6) | 61.8 | (7.1–165.5) | 3.5 | (2.4–4.9) |
| 2005 | 124.8 | (96.0–160.1) | 38.0 | (27.4–49.7) | 122.4 | (96.7–173.7) | - | - | 49.2 | (34.1–66.9) | 13.0 | (10.3–18.2) | 10.7 | (7.8–14.2) | 20.1 | (11.8–32.3) | 1.7 | (1.2–2.5) |
| 2006 | 106.1 | (64.7–157.3) | 76.2 | (55.7–99.8) | 11.0 | (3.4–35.2) | - | - | 30.2 | (19.2–44.0) | 115.6 | (81.1–153.6) | 11.7 | (9.3–14.8) | 1.1 | (0.3–2.1) | 2.1 | (1.6–2.9) |
| 2007 | 65.5 | (27.8–108.4) | 18.9 | (14.2–24.0) | 5.6 | (4.8–6.5) | - | - | 36.6 | (23.9–55.1) | 73.4 | (28.3–109.8) | 11.3 | (6.6–20.0) | 29.1 | (10.7–44.9) | 0.8 | (0.2–1.6) |
| 2008 | 23.5 | (20.6–26.9) | 35.3 | (31.9–39.5) | 2.0 | (1.6–2.5) | - | - | 33.3 | (20.8–51.6) | 61.8 | (54.9–69.0) | 9.1 | (7.4–11.2) | - | - | 8.9 | (6.0–10.7) |
| 2009 | 48.3 | (44.1–53.2) | 29.5 | (26.2–33.3) | 0.3 | (0.0–1.3) | 0.0 | (0.0–0.1) | 13.0 | (10.5–16.3) | 32.8 | (28.1–39.6) | 9.5 | (6.9–13.1) | 1.0 | (1.0–1.1) | 15.8 | (13.7–18.2) |
| 2010 | 18.5 | (16.7–20.4) | 46.2 | (42.0–51.3) | - | - | - | - | 10.1 | (7.9–13.3) | 12.0 | (10.1–14.1) | 9.1 | (7.3–11.7) | - | - | 7.6 | (6.2–9.4) |
| 2011 | 4.5 | (3.3–5.9) | 5.0 | (4.3–5.7) | - | - | 0.0 | (0.0–0.1) | 3.0 | (2.4–3.7) | 3.4 | (2.6–4.9) | 3.4 | (2.8–4.1) | 0.1 | (0.1–0.3) | 1.9 | (1.3–3.7) |
| 2012 | 4.3 | (1.4–10.2) | 6.1 | (3.1–10.9) | - | - | - | - | 28.7 | (7.9–111.0) | 4.1 | (3.3–5.1) | 2.9 | (1.6–4.9) | 1.9 | (1.4–2.3) | 8.5 | (6.0–11.5) |
| 2013 | 8.4 | (1.9–15.3) | 2.8 | (0.5–6.6) | - | - | - | - | 2.3 | (0.9–4.2) | 5.1 | (3.8–6.7) | 5.3 | (2.2–11.1) | 3.8 | (2.6–5.3) | 10.6 | (6.5–15.7) |
| 2014 | 4.8 | (3.1–6.9) | 1.6 | (0.9–2.4) | - | - | 2.6 | (0.1–5.2) | 2.9 | (1.9–4.2) | 4.6 | (3.5–5.9) | 7.3 | (5.4–9.6) | 4.0 | (2.6–6.2) | 9.3 | (5.8–12.6) |
| 2015 | 5.9 | (4.9–7.5) | 8.6 | (7.6–9.9) | - | - | 0.7 | (0.3–1.5) | 2.7 | (2.1–3.4) | 8.7 | (6.3–12.1) | 14.8 | (11.8–18.2) | 20.3 | (18.2–22.7) | 7.1 | (5.7–9.6) |
| slope | -0.17 | | **-0.31** | | **-0.65** | | 0.10 | | **-0.26** | | 0.04 | | **-0.11** | | -0.31 | | **0.28** | |

| Fishing year | | CBB | | SHA | | SPD | | (see note) CSQ | | BNS | | GSP | | VCO | | ETL | | CYO | | SIA | | GDU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.3) | 2.8 | (1.3–6.4) | 31.5 | (9.3–61.2) | - | - | 0.1 | (0.0–0.2) | 1.3 | (0.0–4.1) | - | - | - | - |
| 2003 | 38.1 | (17.8–84.6) | - | - | 1.6 | (0.0–5.4) | - | - | 1.6 | (0.4–4.0) | 26.5 | (7.0–60.2) | 0.0 | (0.0–0.1) | 6.8 | (2.8–14.5) | 0.3 | (0.0–8.7) | - | - | - | - |
| 2004 | 28.5 | (6.7–71.4) | 0.1 | (0.0–0.2) | 1.0 | (0.1–2.4) | 0.1 | (0.1–0.2) | 5.4 | (2.3–11.9) | 12.3 | (5.1–24.1) | 0.1 | (0.0–0.1) | 3.7 | (1.6–7.6) | 0.8 | (0.1–2.1) | - | - | - | - |
| 2005 | 0.7 | (0.3–1.3) | 0.6 | (0.0–1.9) | 2.0 | (0.0–5.8) | 1.9 | (1.2–2.9) | 4.3 | (1.5–10.2) | 15.6 | (11.5–21.2) | - | - | 0.2 | (0.0–0.4) | 3.1 | (0.6–7.5) | - | - | 0.6 | (0.2–1.1) |
| 2006 | 0.2 | (0.1–0.3) | 3.3 | (2.2–4.7) | - | - | 6.2 | (3.7–10.0) | 0.6 | (0.2–1.1) | 8.0 | (5.9–10.7) | 1.7 | (0.7–3.1) | 0.1 | (0.0–0.3) | 15.0 | (5.4–28.2) | - | - | 1.1 | (0.1–2.2) |
| 2007 | 59.2 | (12.1–144.3) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.1) | 16.2 | (9.8–23.7) | 0.5 | (0.1–0.9) | 8.2 | (4.5–11.2) | 0.1 | (0.1–0.1) | 0.1 | (0.0–0.2) | 8.8 | (6.2–11.9) | - | - | 8.4 | (7.2–12.9) |
| 2008 | 27.2 | (12.2–52.7) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | 2.0 | (1.4–3.4) | 1.7 | (1.3–2.2) | 7.6 | (6.7–8.7) | 31.9 | (25.5–39.8) | - | - | 5.0 | (3.6–6.6) | 9.2 | (5.2–14.8) | 14.0 | (8.5–22.1) |
| 2009 | - | - | 1.5 | (1.0–2.6) | 0.1 | (0.0–0.2) | 5.2 | (4.5–6.1) | 0.8 | (0.2–1.7) | 6.9 | (6.0–7.9) | 22.5 | (18.3–26.5) | 1.2 | (0.3–2.8) | 3.7 | (3.1–4.7) | 18.6 | (13.1–28.3) | 10.2 | (5.4–20.5) |
| 2010 | - | - | - | - | - | - | 6.3 | (5.3–7.5) | 0.6 | (0.1–1.3) | 15.5 | (13.5–17.6) | 3.4 | (2.4–4.7) | 3.1 | (1.2–6.3) | 6.3 | (5.7–7.4) | 5.1 | (4.5–6.3) | 0.1 | (0.0–0.2) |
| 2011 | - | - | 0.0 | (0.0–0.1) | - | - | 6.4 | (5.6–7.4) | 0.2 | (0.1–0.4) | 2.7 | (2.3–3.2) | 1.1 | (0.9–1.2) | 0.4 | (0.0–1.3) | 4.3 | (3.6–4.9) | 1.1 | (1.0–1.3) | 5.7 | (2.5–12.1) |
| 2012 | 0.1 | (0.0–0.3) | 0.1 | (0.0–0.2) | - | - | 8.6 | (5.8–14.8) | 0.1 | (0.0–0.2) | 2.5 | (1.7–4.1) | - | - | 0.2 | (0.0–0.6) | 4.7 | (2.7–9.2) | - | - | - | - |
| 2013 | - | - | - | - | - | - | 7.4 | (6.1–9.1) | 0.2 | (0.0–0.6) | 0.5 | (0.3–0.8) | - | - | 0.1 | (0.0–0.2) | 3.0 | (1.9–4.4) | 1.0 | (1.0–1.1) | - | - |
| 2014 | 1.5 | (0.0–4.8) | - | - | - | - | 10.7 | (7.9–14.5) | 0.6 | (0.2–1.2) | 2.7 | (1.8–3.8) | 0.1 | (0.0–0.2) | 0.2 | (0.0–0.5) | 4.8 | (3.6–6.8) | 0.0 | (0.0–0.1) | 0.3 | (0.0–0.9) |
| 2015 | - | - | - | - | - | - | 9.5 | (7.8–11.3) | 0.3 | (0.1–0.6) | 5.4 | (4.5–6.8) | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.5) | 9.4 | (7.0–13.4) | 1.1 | (1.0–1.1) | - | - |
| slope | -0.28 | | -0.06 | | -0.16 | | **0.35** | | **-0.22** | | **-0.20** | | 0.02 | | -0.09 | | **0.14** | | 0.17 | | -0.01 | |

## Table A20 [Continued]:

| Fishing | Species | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| year | BSL | | (see note) CYL | | WHR | | SFI | | RCH | | GSH | | SBI | | EPL | | (see note) SSM | | SOP | | CHI | |
| 2002 | 1.4 | (0.0–5.5) | 5.1 | (1.0–13.0) | 22.1 | (9.9–38.5) | 9.7 | (3.1–20.7) | 0.3 | (0.0–1.1) | 0.8 | (0.1–2.3) | 0.4 | (0.0–1.4) | 0.0 | (0.0–0.1) | - | - | - | - | 1.0 | (0.4–1.8) |
| 2003 | 2.8 | (1.3–11.1) | - | - | 16.0 | (0.0–32.7) | 10.5 | (3.0–22.1) | 0.1 | (0.0–0.1) | 1.1 | (0.2–3.9) | 0.1 | (0.1–0.3) | 0.5 | (0.0–1.3) | - | - | 12.4 | (1.0–35.5) | 4.4 | (2.9–6.3) |
| 2004 | - | - | 0.6 | (0.1–1.7) | 10.4 | (4.6–16.8) | 2.4 | (0.4–5.7) | 0.2 | (0.0–0.7) | 0.3 | (0.1–0.6) | 1.3 | (0.5–2.4) | 25.6 | (2.4–74.6) | 2.5 | (1.2–4.2) | 10.2 | (0.0–30.5) | 4.1 | (2.7–6.0) |
| 2005 | 0.1 | (0.0–0.2) | 0.3 | (0.0–1.0) | 0.0 | (0.0–0.1) | 0.3 | (0.2–0.6) | 1.0 | (0.4–1.8) | 1.8 | (0.9–2.8) | 0.4 | (0.1–1.0) | 0.2 | (0.1–0.3) | - | - | 13.8 | (0.0–41.3) | 6.6 | (4.7–9.1) |
| 2006 | - | - | - | - | 0.4 | (0.0–1.0) | 0.3 | (0.2–0.5) | 0.7 | (0.2–1.3) | 0.9 | (0.5–1.4) | - | - | 0.1 | (0.0–0.3) | - | - | 10.5 | (2.0–28.8) | 2.4 | (0.3–5.8) |
| 2007 | 1.1 | (1.0–1.3) | 0.1 | (0.0–0.2) | 0.3 | (0.0–1.0) | 0.4 | (0.1–0.9) | 7.0 | (1.5–12.8) | 0.8 | (0.5–1.3) | - | - | 0.0 | (0.0–0.1) | - | - | - | - | 0.6 | (0.2–1.1) |
| 2008 | 0.1 | (0.0–0.2) | 0.4 | (0.1–0.8) | 0.3 | (0.0–0.9) | 0.2 | (0.0–0.7) | 0.3 | (0.0–0.7) | 0.8 | (0.5–1.3) | - | - | 0.1 | (0.0–0.1) | - | - | 2.3 | (1.0–4.8) | 0.4 | (0.2–0.7) |
| 2009 | 0.1 | (0.0–0.1) | 1.3 | (1.2–1.6) | 2.0 | (1.3–3.1) | 0.2 | (0.1–0.2) | - | - | 2.3 | (1.7–2.9) | - | - | 0.3 | (0.1–0.7) | - | - | 2.7 | (1.0–6.0) | 0.4 | (0.2–0.6) |
| 2010 | 0.2 | (0.1–0.3) | 4.0 | (3.5–4.6) | 2.3 | (2.1–2.6) | 2.2 | (1.7–3.0) | 1.1 | (1.0–1.2) | 1.6 | (1.2–2.3) | - | - | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.1) | 4.5 | (2.0–9.7) | 1.8 | (1.1–2.8) |
| 2011 | 0.1 | (0.1–0.2) | 0.1 | (0.0–0.1) | - | - | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | 0.1 | (0.1–0.2) | - | - | 1.0 | (0.3–2.2) |
| 2012 | 0.1 | (0.1–0.2) | 1.2 | (1.1–1.3) | - | - | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.4) | 0.1 | (0.0–0.3) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.4) | - | - | 0.4 | (0.2–0.7) |
| 2013 | 0.3 | (0.2–0.5) | 1.7 | (1.3–2.1) | 0.0 | (0.0–0.1) | - | - | 0.8 | (0.2–2.1) | 0.3 | (0.1–0.6) | 0.1 | (0.1–0.4) | - | - | 0.6 | (0.2–1.1) | - | - | 0.7 | (0.1–1.5) |
| 2014 | 0.4 | (0.2–0.6) | 1.0 | (0.6–1.6) | 0.5 | (0.0–1.4) | 0.5 | (0.1–1.4) | 0.5 | (0.3–0.7) | 0.1 | (0.0–0.1) | 1.5 | (0.5–3.2) | 0.2 | (0.0–0.5) | 2.2 | (1.4–3.4) | - | - | 0.1 | (0.0–0.5) |
| 2015 | 2.3 | (2.1–2.5) | 10.5 | (10.2–10.9) | 3.9 | (3.0–5.2) | 0.1 | (0.0–0.2) | 12.2 | (11.4–13.3) | 0.1 | (0.0–0.3) | 5.7 | (5.3–6.4) | 0.0 | (0.0–0.1) | 16.8 | (11.7–24.7) | - | - | 0.0 | (0.0–0.1) |
| slope | -0.02 | | 0.14 | | -0.22 | | **-0.28** | | 0.11 | | -0.18 | | 0.07 | | -0.14 | | **0.20** | | -0.31 | | **-0.24** | |

| Fishing | Species | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| year | SQU | | SNR | | MCA | | DWE | | RHY | | SPE | | SCM | | APR | | SMC | | COR | | LIN | |
| 2002 | 6.4 | (3.9–9.3) | 6.2 | (4.4–8.8) | 0.3 | (0.0–0.9) | 6.9 | (1.0–16.7) | - | - | 11.2 | (3.7–19.1) | 1.3 | (0.4–2.7) | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.2) | 24.8 | (4.1–61.9) | 1.5 | (0.5–3.1) |
| 2003 | 4.8 | (2.6–7.6) | 20.3 | (4.6–56.8) | 0.2 | (0.0–0.5) | - | - | 0.1 | (0.0–0.2) | 9.0 | (0.9–17.1) | 0.5 | (0.1–1.1) | 0.2 | (0.0–0.5) | 0.0 | (0.0–0.1) | - | - | 2.5 | (1.1–4.4) |
| 2004 | 5.0 | (2.5–8.8) | 2.8 | (0.0–7.8) | 0.3 | (0.2–0.4) | 0.5 | (0.0–11.1) | 0.0 | (0.0–0.1) | 3.4 | (1.0–6.3) | 2.3 | (1.6–3.3) | 0.1 | (0.0–0.1) | - | - | - | - | 1.3 | (0.7–2.0) |
| 2005 | 10.5 | (6.3–16.2) | 1.3 | (0.8–2.0) | 0.2 | (0.1–0.3) | 0.2 | (0.0–0.4) | 0.1 | (0.0–0.2) | 2.6 | (1.4–4.4) | 3.9 | (1.9–5.4) | 0.2 | (0.1–0.3) | 0.0 | (0.0–0.1) | 6.7 | (2.0–25.3) | 1.6 | (0.9–2.5) |
| 2006 | 4.9 | (3.3–6.7) | 0.0 | (0.0–0.1) | 8.1 | (3.2–18.5) | 1.8 | (0.8–3.3) | - | - | 1.2 | (0.6–1.9) | 0.6 | (0.0–1.5) | 7.6 | (1.5–22.7) | 0.5 | (0.0–1.7) | - | - | 1.2 | (0.8–1.7) |
| 2007 | 1.0 | (0.6–1.4) | - | - | 1.5 | (1.3–2.0) | 4.8 | (2.0–8.9) | - | - | 0.5 | (0.3–0.7) | 0.4 | (0.0–1.4) | 4.0 | (1.9–8.4) | 0.6 | (0.0–1.6) | - | - | 0.7 | (0.3–1.3) |
| 2008 | 0.2 | (0.1–0.3) | 0.1 | (0.0–0.1) | 4.1 | (3.4–5.2) | 1.8 | (0.9–3.1) | - | - | 0.1 | (0.1–0.2) | 0.3 | (0.0–0.6) | 2.0 | (1.7–2.5) | 0.6 | (0.0–1.6) | - | - | 0.1 | (0.0–0.1) |
| 2009 | 0.1 | (0.1–0.2) | - | - | 1.3 | (0.6–2.2) | 1.1 | (0.5–1.9) | 0.0 | (0.0–0.1) | 0.3 | (0.2–0.4) | 0.1 | (0.0–0.1) | 0.4 | (0.2–0.6) | 0.7 | (0.2–1.4) | - | - | 0.4 | (0.1–1.2) |
| 2010 | 0.3 | (0.2–0.4) | 0.2 | (0.1–0.3) | 2.5 | (2.2–3.0) | - | - | 4.5 | (2.0–9.6) | 1.7 | (1.3–2.4) | 2.1 | (1.6–2.6) | 3.9 | (2.6–5.8) | 0.8 | (0.3–1.6) | - | - | 0.4 | (0.0–1.1) |
| 2011 | 1.5 | (1.3–1.8) | 0.5 | (0.1–1.1) | 0.4 | (0.3–0.6) | 0.2 | (0.0–0.5) | 0.1 | (0.0–0.2) | 1.3 | (1.2–1.5) | 0.9 | (0.7–1.0) | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.5) | - | - | 0.1 | (0.0–0.3) |
| 2012 | 0.4 | (0.2–0.6) | - | - | 0.1 | (0.1–0.1) | - | - | 0.2 | (0.1–0.3) | 0.2 | (0.1–0.4) | - | - | 0.0 | (0.0–0.1) | 0.2 | (0.0–0.4) | - | - | 1.1 | (0.1–4.2) |
| 2013 | 0.2 | (0.0–0.8) | - | - | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.2) | 9.1 | (5.1–18.8) | 0.1 | (0.1–0.3) | - | - | 0.1 | (0.0–0.2) | 0.6 | (0.0–2.4) | - | - | 0.1 | (0.0–0.5) |
| 2014 | 0.3 | (0.2–0.5) | - | - | 0.1 | (0.1–0.2) | 0.0 | (0.0–0.1) | 4.0 | (0.0–11.9) | 0.4 | (0.2–0.6) | - | - | 0.2 | (0.2–0.3) | 1.0 | (0.5–1.4) | - | - | 0.4 | (0.1–0.8) |
| 2015 | 1.4 | (1.2–1.6) | - | - | 0.2 | (0.1–0.3) | 0.3 | (0.1–0.6) | 0.1 | (0.0–0.3) | 0.3 | (0.1–0.7) | - | - | 1.8 | (1.5–2.3) | 4.8 | (2.9–8.5) | - | - | 0.2 | (0.1–0.3) |
| slope | **-0.25** | | **-0.33** | | -0.09 | | -0.18 | | **0.21** | | **-0.28** | | **-0.22** | | 0.02 | | **0.20** | | -0.22 | | **-0.19** | |

**Table A20 [Continued]:**

| Fishing year | EPR | | PSK | | HTH | | TOA | | ONG | | NEB | | MIQ | | MOC | | LEG | | (see note) SKA | | (see note) SSK | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 0.1 | (0.0–0.2) | 1.8 | (0.2–4.9) | - | - | 0.7 | (0.2–1.6) | 0.4 | (0.2–0.7) | - | - | - | - | - | - | 4.8 | (0.8–8.5) | 14.3 | (2.2–31.7) | 6.3 | (2.5–11.6) |
| 2003 | 8.3 | (4.0–17.0) | 1.5 | (0.0–4.7) | 0.0 | (0.0–0.1) | 1.4 | (0.6–2.4) | 0.7 | (0.1–1.6) | - | - | - | - | - | - | 4.2 | (0.1–8.3) | 12.2 | (2.1–31.3) | 4.9 | (1.5–9.0) |
| 2004 | 1.0 | (0.0–2.9) | 0.5 | (0.0–1.6) | 0.1 | (0.0–0.1) | 1.1 | (0.6–1.7) | 0.4 | (0.0–1.2) | - | - | - | - | - | - | 2.6 | (0.8–5.3) | 4.3 | (0.8–11.2) | 3.2 | (1.8–5.1) |
| 2005 | 8.9 | (0.1–22.5) | 0.5 | (0.2–0.8) | 0.2 | (0.1–0.4) | 1.0 | (0.5–1.5) | 1.7 | (1.1–2.4) | 0.0 | (0.0–0.1) | - | - | - | - | 0.0 | (0.0–0.2) | 1.1 | (0.5–1.7) | 4.3 | (1.8–7.8) |
| 2006 | - | - | 0.1 | (0.0–0.3) | 5.7 | (4.3–7.9) | 4.1 | (2.7–6.1) | 1.3 | (0.6–2.1) | 0.4 | (0.2–0.7) | - | - | - | - | 1.0 | (0.3–2.0) | 0.1 | (0.0–0.2) | 2.1 | (1.1–3.5) |
| 2007 | - | - | 0.7 | (0.1–1.2) | 2.1 | (0.3–3.8) | 1.1 | (0.4–1.8) | 0.2 | (0.1–0.4) | 5.9 | (1.7–9.5) | - | - | - | - | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | 0.9 | (0.4–1.6) |
| 2008 | - | - | 4.1 | (3.3–5.1) | 3.0 | (2.5–3.5) | 0.4 | (0.2–0.5) | 0.2 | (0.1–0.4) | 2.3 | (2.1–2.7) | 2.5 | (1.2–3.1) | - | - | 0.0 | (0.0–0.1) | - | - | 0.3 | (0.1–0.6) |
| 2009 | - | - | 0.5 | (0.4–0.8) | 2.0 | (1.7–2.3) | 2.0 | (1.7–2.4) | 1.3 | (1.1–1.8) | 2.6 | (2.3–3.0) | 0.1 | (0.0–0.1) | 6.2 | (3.0–12.7) | 0.0 | (0.0–0.1) | - | - | 0.2 | (0.1–0.4) |
| 2010 | 1.5 | (1.3–2.0) | 6.1 | (5.2–7.2) | 4.0 | (3.5–4.5) | 5.0 | (4.2–5.8) | 0.1 | (0.1–0.2) | 2.3 | (2.0–2.7) | 0.3 | (0.0–0.7) | 0.2 | (0.0–0.5) | 0.2 | (0.1–0.4) | - | - | 0.2 | (0.0–0.4) |
| 2011 | - | - | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.1) | - | - | 0.1 | (0.0–0.1) | 0.8 | (0.3–1.6) | 2.1 | (1.0–4.3) | 0.1 | (0.0–0.3) | - | - | 0.1 | (0.0–0.2) |
| 2012 | - | - | - | - | 0.1 | (0.0–0.4) | 0.1 | (0.0–0.3) | 0.4 | (0.2–0.6) | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.2) |
| 2013 | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.2) | 0.0 | (0.0–0.1) | - | - | 0.3 | (0.0–0.7) | - | - | - | - | - | - | 0.1 | (0.0–0.5) | - | - | - | - |
| 2014 | 1.1 | (1.1–1.2) | 0.1 | (0.0–0.2) | - | - | 0.1 | (0.0–0.3) | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.1) | 0.3 | (0.0–0.8) | - | - | 0.1 | (0.0–0.2) | - | - | 0.5 | (0.1–1.2) |
| 2015 | - | - | - | - | - | - | 0.1 | (0.0–0.1) | 0.2 | (0.0–0.3) | 0.0 | (0.0–0.1) | 0.5 | (0.1–1.3) | - | - | 0.4 | (0.1–1.2) | - | - | 0.1 | (0.0–0.3) |
| slope | -0.15 | | -0.20 | | -0.05 | | -0.23 | | -0.11 | | -0.02 | | 0.10 | | 0.05 | | **-0.25** | | **-0.37** | | **-0.34** | |

| Fishing year | JFI | | RUD | | ERO | | DDI | | CHG | | ACS | | BSK | | CSU | | BRG | | SVA | | IBR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 0.7 | (0.1–1.8) | 0.8 | (0.1–2.4) | - | - | - | - | 0.5 | (0.2–0.7) | - | - | - | - | 0.0 | (0.0–0.1) | - | - | - | - | - | - |
| 2003 | 1.3 | (0.3–2.9) | 1.2 | (0.3–2.6) | - | - | - | - | 0.2 | (0.0–0.7) | - | - | 0.0 | (0.0–0.1) | - | - | - | - | - | - | - | - |
| 2004 | 0.7 | (0.2–1.4) | 1.1 | (0.4–2.1) | - | - | 0.0 | (0.0–0.2) | 0.4 | (0.1–0.9) | 0.4 | (0.0–1.2) | 2.2 | (1.0–28.3) | - | - | 0.0 | (0.0–0.1) | - | - | - | - |
| 2005 | 1.7 | (0.9–2.8) | 0.5 | (0.2–1.4) | - | - | 0.2 | (0.1–0.4) | 1.2 | (0.8–1.9) | 1.7 | (1.0–2.9) | - | - | - | - | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.1) | - | - |
| 2006 | 1.4 | (0.5–3.0) | 0.6 | (0.3–1.0) | 0.1 | (0.0–0.1) | 0.1 | (0.1–0.2) | 0.3 | (0.1–0.8) | 2.6 | (1.1–4.3) | - | - | - | - | 6.1 | (2.3–13.0) | 0.2 | (0.0–0.5) | 0.9 | (0.4–1.7) |
| 2007 | 0.2 | (0.1–0.3) | 0.3 | (0.1–0.4) | 0.1 | (0.0–0.1) | - | - | 1.1 | (0.5–2.1) | 0.8 | (0.5–1.3) | - | - | - | - | 0.8 | (0.1–1.4) | - | - | 0.1 | (0.0–0.3) |
| 2008 | 2.6 | (1.1–5.5) | 0.0 | (0.0–0.1) | - | - | 7.3 | (3.1–15.6) | 0.1 | (0.0–0.1) | 1.9 | (1.7–2.1) | - | - | - | - | 0.3 | (0.2–0.5) | 0.3 | (0.0–0.8) | - | - |
| 2009 | 0.3 | (0.2–0.4) | 0.1 | (0.1–0.2) | 6.4 | (3.1–13.0) | - | - | 0.1 | (0.0–0.2) | 0.5 | (0.4–0.6) | - | - | 6.5 | (3.0–13.6) | 0.6 | (0.4–0.8) | 4.2 | (2.5–7.2) | - | - |
| 2010 | - | - | 0.2 | (0.1–0.5) | 0.2 | (0.1–0.6) | - | - | 0.2 | (0.1–0.3) | 1.7 | (1.5–2.1) | - | - | - | - | 0.5 | (0.2–1.0) | 0.3 | (0.1–0.7) | - | - |
| 2011 | - | - | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.1–0.3) | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 8.9 | (2.6–20.9) |
| 2012 | - | - | 0.0 | (0.0–0.1) | - | - | - | - | 0.0 | (0.0–0.1) | 0.2 | (0.0–0.6) | - | - | 0.1 | (0.0–0.2) | 0.5 | (0.1–1.8) | - | - | - | - |
| 2013 | 0.1 | (0.0–0.3) | 0.1 | (0.0–0.3) | - | - | - | - | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.1–0.2) | - | - | 0.1 | (0.0–0.3) | - | - |
| 2014 | 0.5 | (0.0–1.6) | 0.2 | (0.0–0.4) | - | - | - | - | 0.9 | (0.5–1.4) | - | - | - | - | 0.2 | (0.0–0.4) | 0.1 | (0.0–0.3) | - | - | - | - |
| 2015 | 1.0 | (1.0–1.1) | 0.2 | (0.0–0.4) | 0.1 | (0.0–0.1) | 0.1 | (0.0–0.1) | 1.4 | (1.2–1.6) | 1.0 | (1.0–1.0) | - | - | 0.0 | (0.0–0.1) | 1.0 | (0.1–2.0) | - | - | - | - |
| slope | -0.13 | | **-0.18** | | 0.01 | | -0.02 | | -0.02 | | -0.03 | | -0.06 | | 0.03 | | 0.03 | | 0 | | 0.02 | |

**Table A20 [Continued]:**

| Fishing | | | | | | | | | | | | | | | | | | | | | | | | Species |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **year** | | **SHE** | | **OFH** | | **TAM** | | **CHP** | | **DSK** | | **KIC** | | **WIT** | | **ETP** | | **OPH** | | **PDG** | | **VSQ** | | **ROC** |
| 2002 | - | - | 0.6 | (0.0–1.5) | - | - | 1.0 | (0.0–4.4) | 1.8 | (0.8–3.3) | - | - | 0.0 | (0.0–0.1) | 0.5 | (0.0–2.3) | - | - | 0.3 | (0.0–1.0) | 0.3 | (0.1–0.5) | - | - |
| 2003 | 0.4 | (0.0–2.5) | 0.3 | (0.0–1.1) | - | - | - | - | 1.1 | (0.0–2.4) | - | - | 0.0 | (0.0–0.1) | - | - | - | - | 2.8 | (1.3–5.2) | 0.1 | (0.0–0.3) | - | - |
| 2004 | 0.1 | (0.0–0.2) | 0.9 | (0.1–2.7) | 0.1 | (0.0–0.4) | 0.8 | (0.2–2.0) | 0.4 | (0.0–0.8) | 0.1 | (0.0–0.3) | - | - | - | - | - | - | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.1) | 2.1 | (0.0–6.3) |
| 2005 | - | - | 0.5 | (0.0–1.6) | 0.6 | (0.3–0.9) | 0.4 | (0.2–0.7) | 0.1 | (0.0–0.3) | 0.7 | (0.4–1.0) | - | - | - | - | - | - | 0.3 | (0.1–0.5) | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.3) |
| 2006 | - | - | 0.2 | (0.0–0.8) | 1.8 | (1.4–2.5) | 0.2 | (0.0–0.5) | 0.2 | (0.0–0.6) | 2.4 | (1.8–3.3) | 1.1 | (0.8–1.7) | - | - | - | - | 0.3 | (0.1–0.6) | 0.2 | (0.1–0.3) | 7.6 | (5.5–10.7) |
| 2007 | - | - | 0.1 | (0.0–0.4) | 0.6 | (0.4–0.9) | - | - | 1.1 | (0.1–2.3) | 0.8 | (0.5–1.3) | 0.4 | (0.2–0.7) | - | - | - | - | 0.1 | (0.0–0.3) | 0.1 | (0.1–0.2) | 0.2 | (0.0–0.7) |
| 2008 | - | - | 0.0 | (0.0–0.1) | 1.8 | (1.6–2.1) | 0.1 | (0.0–0.2) | 0.1 | (0.1–0.2) | 0.3 | (0.1–0.6) | 1.7 | (1.5–1.9) | - | - | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.1) |
| 2009 | - | - | - | - | 0.3 | (0.2–0.6) | 0.3 | (0.1–0.5) | 0.2 | (0.1–0.3) | 0.4 | (0.2–0.7) | 0.3 | (0.2–0.4) | - | - | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.1) | - | - |
| 2010 | - | - | 0.0 | (0.0–0.1) | 1.8 | (1.5–2.5) | 1.3 | (1.1–1.5) | 1.9 | (1.7–2.3) | 2.7 | (2.4–3.1) | 2.4 | (2.0–2.7) | - | - | 0.2 | (0.0–0.6) | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.4) | - | - |
| 2011 | - | - | 0.4 | (0.0–0.9) | 0.1 | (0.0–0.1) | 0.1 | (0.0–0.1) | - | - | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | - | - | 0.0 | (0.0–0.1) | 0.0 | (-0.1–0.1) | - | - |
| 2012 | - | - | 0.2 | (0.1–0.5) | 0.3 | (0.1–0.6) | - | - | 0.1 | (0.0–0.2) | - | - | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | - | - | 0.3 | (0.1–0.4) | - | - |
| 2013 | - | - | 1.3 | (0.1–4.6) | 0.1 | (0.0–0.3) | 0.5 | (0.1–0.9) | - | - | - | - | - | - | - | - | - | - | - | - | 0.4 | (0.2–0.8) | - | - |
| 2014 | - | - | 0.6 | (0.1–2.1) | 0.1 | (0.0–0.3) | 0.4 | (0.2–0.6) | 0.2 | (0.0–0.7) | 0.0 | (0.0–0.1) | - | - | 0.0 | (0.0–0.1) | - | - | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.3) | - | - |
| 2015 | - | - | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.1) | 0.3 | (0.2–0.5) | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.1) | - | - | - | - | - | - | - | - | 0.1 | (0.0–0.2) | - | - |
| slope | -0.03 | | -0.03 | | -0.04 | | -0.02 | | -0.15 | | -0.06 | | -0.02 | | -0.05 | | 0 | | **-0.16** | | 0.03 | | -0.11 | |

| Fishing | | | | | | | | | | | | | | | | | | | | | | | | Species |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **year** | | **GLS** | | (note) **CRB** | | **EEL** | | **BTH** | | **SRH** | | **GSQ** | | **HYD** | | **TRS** | | **RSQ** | | **SSI** | | **BBE** | | **CBO** |
| 2002 | - | - | 10.4 | (1.4–22.8) | 4.1 | (1.3–9.4) | - | - | 0.1 | (0.0–0.3) | 0.3 | (0.1–0.9) | 0.3 | (0.0–1.2) | - | - | 0.0 | (0.0–0.1) | 3.9 | (1.0–31.2) | - | - | - | - |
| 2003 | - | - | 8.4 | (0.9–21.5) | 0.2 | (0.0–0.6) | - | - | 0.1 | (0.0–3.6) | - | - | 0.3 | (0.0–0.9) | - | - | 0.0 | (0.0–0.2) | - | - | 0.2 | (0.0–0.5) | - | - |
| 2004 | 0.0 | (0.0–0.1) | 3.5 | (0.8–8.5) | 0.3 | (0.0–0.6) | 0.2 | (0.0–0.7) | 0.1 | (0.0–0.4) | - | - | 0.1 | (0.0–0.3) | - | - | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.3) | 0.2 | (0.0–0.7) | - | - |
| 2005 | 0.2 | (0.1–0.4) | 1.2 | (0.6–2.1) | 0.1 | (0.0–0.2) | 1.0 | (0.6–1.7) | 0.5 | (0.3–0.8) | 0.3 | (0.0–2.4) | 0.2 | (0.0–0.5) | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.2) | 0.3 | (0.0–1.0) | - | - |
| 2006 | 0.1 | (0.0–0.4) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | 5.1 | (4.0–7.3) | 0.2 | (0.1–0.4) | 0.1 | (0.0–0.2) | 1.0 | (0.4–1.8) | 0.4 | (0.0–1.2) | 0.3 | (0.1–0.5) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.8) | - | - |
| 2007 | 0.2 | (0.0–0.6) | 0.1 | (0.0–0.3) | 0.2 | (0.0–0.7) | 1.3 | (0.7–2.1) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | 0.2 | (0.0–0.8) | - | - | 0.1 | (0.0–0.3) | - | - | 0.0 | (0.0–0.1) | - | - |
| 2008 | 0.2 | (0.1–0.5) | - | - | - | - | 0.3 | (0.1–0.4) | - | - | - | - | 0.0 | (0.0–0.1) | - | - | - | - | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - |
| 2009 | 1.6 | (1.4–1.8) | - | - | - | - | 0.2 | (0.1–0.4) | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.3) | - | - | - | - | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.2) | - | - |
| 2010 | 0.1 | (0.1–0.2) | 0.0 | (0.0–0.1) | 1.9 | (1.5–2.4) | 0.6 | (0.0–1.7) | - | - | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.1) | - | - | 1.1 | (1.0–1.1) | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.3) | - | - |
| 2011 | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.1) | - | - | 0.1 | (0.0–0.1) | - | - | - | - | - | - |
| 2012 | 0.0 | (0.0–0.1) | - | - | - | - | - | - | - | - | 0.3 | (0.1–0.7) | - | - | 0.1 | (0.0–0.1) | - | - | - | - | 0.3 | (0.0–1.3) | 0.0 | (0.0–0.1) |
| 2013 | - | - | - | - | - | - | - | - | - | - | 0.3 | (0.0–0.9) | - | - | 0.1 | (0.1–0.2) | - | - | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.2) |
| 2014 | - | - | - | - | - | - | - | - | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.3) | 0.0 | (0.0–0.1) | 0.2 | (0.2–0.3) | - | - | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.4) |
| 2015 | - | - | - | - | 0.0 | (0.0–0.1) | - | - | - | - | 0.1 | (0.0–0.1) | 0.1 | (0.0–0.1) | 1.5 | (1.2–2.0) | - | - | - | - | 0.0 | (0.0–0.1) | - | - |
| slope | -0.01 | | **-0.35** | | -0.13 | | -0.10 | | -0.03 | | 0.01 | | -0.10 | | 0.08 | | 0 | | -0.10 | | -0.03 | | 0.00 | |

**Table A20 [Continued]:**

| Fishing | | | | | | | | | | | | | | | | | | | | | | | | Species |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| year | PAB | | MOK | | GRC | | SRI | | CON | | SQA | | BOO | | URO | | CSH | | ANT | | CHX | | COD | |
| 2002 | - | - | - | - | 0.2 | (0.0–0.7) | 7.8 | (1.0–23.0) | 0.3 | (0.0–0.8) | - | - | 0.1 | (0.0–0.1) | 3.9 | (0.9–8.4) | - | - | 0.0 | (0.0–0.1) | 1.1 | (0.7–1.6) | - | - |
| 2003 | - | - | - | - | 0.3 | (0.0–1.0) | - | - | 0.4 | (0.1–0.9) | - | - | 0.0 | (0.0–0.1) | 7.2 | (3.5–13.6) | 0.1 | (0.0–0.1) | 0.3 | (0.0–1.2) | 1.5 | (0.7–2.8) | 0.0 | (0.0–0.8) |
| 2004 | - | - | - | - | 0.2 | (0.0–0.5) | 0.8 | (0.0–2.1) | 0.3 | (0.1–0.5) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | 2.3 | (1.2–4.1) | - | - | 0.3 | (0.1–0.8) | 1.0 | (0.4–2.4) | 0.0 | (0.0–0.2) |
| 2005 | 1.8 | (0.1–5.7) | - | - | 2.7 | (1.7–4.1) | 1.7 | (0.0–4.7) | 0.5 | (0.3–0.7) | 0.2 | (0.0–0.7) | - | - | 2.0 | (1.1–3.3) | 0.0 | (0.0–0.1) | 0.9 | (0.2–2.0) | 1.7 | (0.6–3.6) | 0.0 | (0.0–0.1) |
| 2006 | 0.3 | (0.0–1.0) | - | - | - | - | 0.9 | (0.5–1.4) | 0.8 | (0.3–1.9) | 7.1 | (3.7–11.4) | - | - | - | - | 0.0 | (0.0–0.1) | 5.3 | (4.0–7.7) | 0.5 | (0.3–0.9) | 0.8 | (0.0–2.3) |
| 2007 | 1.2 | (1.1–1.4) | 0.1 | (0.0–0.5) | - | - | 0.1 | (0.0–0.3) | - | - | - | - | - | - | - | - | 0.1 | (0.0–0.2) | - | - | 0.1 | (0.1–0.2) | 2.1 | (1.0–2.8) |
| 2008 | 0.0 | (0.0–0.1) | - | - | 0.2 | (0.0–0.5) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.1) | - | - | 0.4 | (0.0–1.3) | - | - | 0.1 | (0.0–0.1) | 1.0 | (0.0–1.7) |
| 2009 | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.2) | - | - | 0.2 | (0.1–0.5) | - | - | 0.1 | (0.0–0.2) | - | - | - | - | 0.1 | (0.0–0.1) | - | - | 0.6 | (0.0–1.5) |
| 2010 | 0.2 | (0.0–0.5) | - | - | 0.1 | (0.0–0.2) | - | - | 0.2 | (0.1–0.3) | - | - | 0.1 | (0.0–0.1) | - | - | 0.0 | (0.0–0.1) | 0.5 | (0.3–0.8) | - | - | 0.3 | (0.1–0.7) |
| 2011 | - | - | - | - | 0.1 | (0.0–0.3) | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | - | - | - | - | 0.0 | (0.0–0.1) | 0.4 | (0.1–0.8) |
| 2012 | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 0.0 | (0.0–0.2) | - | - | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.1) | - | - | - | - | - | - |
| 2013 | - | - | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 0.3 | (0.0–0.7) | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - |
| 2014 | - | - | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 1.2 | (0.0–5.3) | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - |
| 2015 | - | - | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 2.4 | (1.0–7.3) | - | - | 0.2 | (0.0–0.4) | - | - | 1.2 | (1.0–1.3) | - | - |
| slope | -0.07 | | 0.00 | | -0.11 | | **-0.23** | | **-0.13** | | -0.06 | | **0.17** | | **-0.32** | | 0.02 | | -0.12 | | -0.17 | | -0.02 | |

| Fishing | | | | | | | | | | | | | | | | | | | | | | | | Species |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| year | SCH | | COB | | RAG | | MST | | ZAS | | PSY | | OCT | | SYN | | OSK | | LAN | | TSQ | | SOM | |
| 2002 | - | - | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.2) | - | - | - | - | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.6) | - | - | - | - | - | - | - | - |
| 2003 | - | - | 1.8 | (1.2–3.2) | 0.2 | (0.1–0.4) | 0.1 | (0.0–0.2) | - | - | 0.1 | (0.0–0.2) | 0.4 | (0.2–0.6) | 3.5 | (1.0–8.0) | - | - | 0.1 | (0.0–0.3) | - | - | 0.5 | (0.0–1.7) |
| 2004 | - | - | 0.1 | (0.0–0.4) | 0.4 | (0.2–0.7) | 0.1 | (0.0–0.1) | - | - | 0.1 | (0.0–0.2) | 0.4 | (0.2–0.6) | - | - | - | - | - | - | - | - | - | - |
| 2005 | 0.0 | (0.0–0.2) | 1.8 | (0.6–3.4) | 0.2 | (0.1–0.3) | 0.1 | (0.0–0.2) | - | - | 0.2 | (0.1–0.6) | 0.8 | (0.4–1.2) | 1.3 | (0.5–2.5) | - | - | 0.2 | (0.0–0.4) | - | - | - | - |
| 2006 | - | - | 0.3 | (0.2–0.4) | 0.3 | (0.2–0.6) | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.3) | 0.1 | (0.0–0.2) | 0.4 | (0.0–1.1) | 0.5 | (0.2–0.9) | 0.7 | (0.2–1.4) | - | - | - | - |
| 2007 | - | - | 0.2 | (0.1–0.3) | 0.0 | (0.0–0.1) | 3.7 | (1.4–6.1) | - | - | 1.0 | (0.2–1.7) | 0.0 | (0.0–0.1) | 0.5 | (0.0–0.9) | 0.0 | (0.0–0.2) | 1.3 | (0.6–2.1) | - | - | - | - |
| 2008 | - | - | 0.1 | (0.0–0.1) | 0.3 | (0.1–0.6) | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.3) | - | - | 0.5 | (0.0–0.9) | 0.1 | (0.0–0.2) | 0.2 | (0.1–0.5) | - | - | 2.0 | (1.0–4.0) |
| 2009 | - | - | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | - | - | 0.6 | (0.3–1.0) | - | - | 0.3 | (0.0–0.8) | 0.5 | (0.2–0.8) | - | - | 0.4 | (0.3–0.6) | - | - |
| 2010 | - | - | - | - | - | - | 0.4 | (0.1–0.9) | 0.0 | (0.0–0.1) | 0.3 | (0.1–0.5) | - | - | - | - | 0.1 | (0.0–0.2) | 0.2 | (0.0–0.5) | 0.1 | (0.0–0.2) | - | - |
| 2011 | 0.0 | (0.0–0.2) | - | - | - | - | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.1) | - | - | 0.0 | (0.0–0.1) | - | - |
| 2012 | 1.1 | (1.0–1.2) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | 2.1 | (1.7–2.9) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - |
| 2013 | - | - | 0.0 | (0.0–0.1) | - | - | - | - | 0.1 | (0.0–0.5) | 0.1 | (0.0–0.2) | - | - | - | - | - | - | - | - | 0.1 | (0.0–0.1) | - | - |
| 2014 | - | - | - | - | - | - | - | - | - | - | - | - | 0.0 | (0.0–0.1) | - | - | - | - | - | - | 0.3 | (0.2–0.5) | - | - |
| 2015 | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.1 | (0.0–0.1) | - | - |
| slope | 0.04 | | -0.13 | | -0.07 | | -0.02 | | 0.05 | | -0.02 | | -0.09 | | -0.15 | | -0.01 | | -0.05 | | 0.03 | | -0.04 | |

## APPENDIX A [Continued]: ORANGE ROUGHY FIGURES

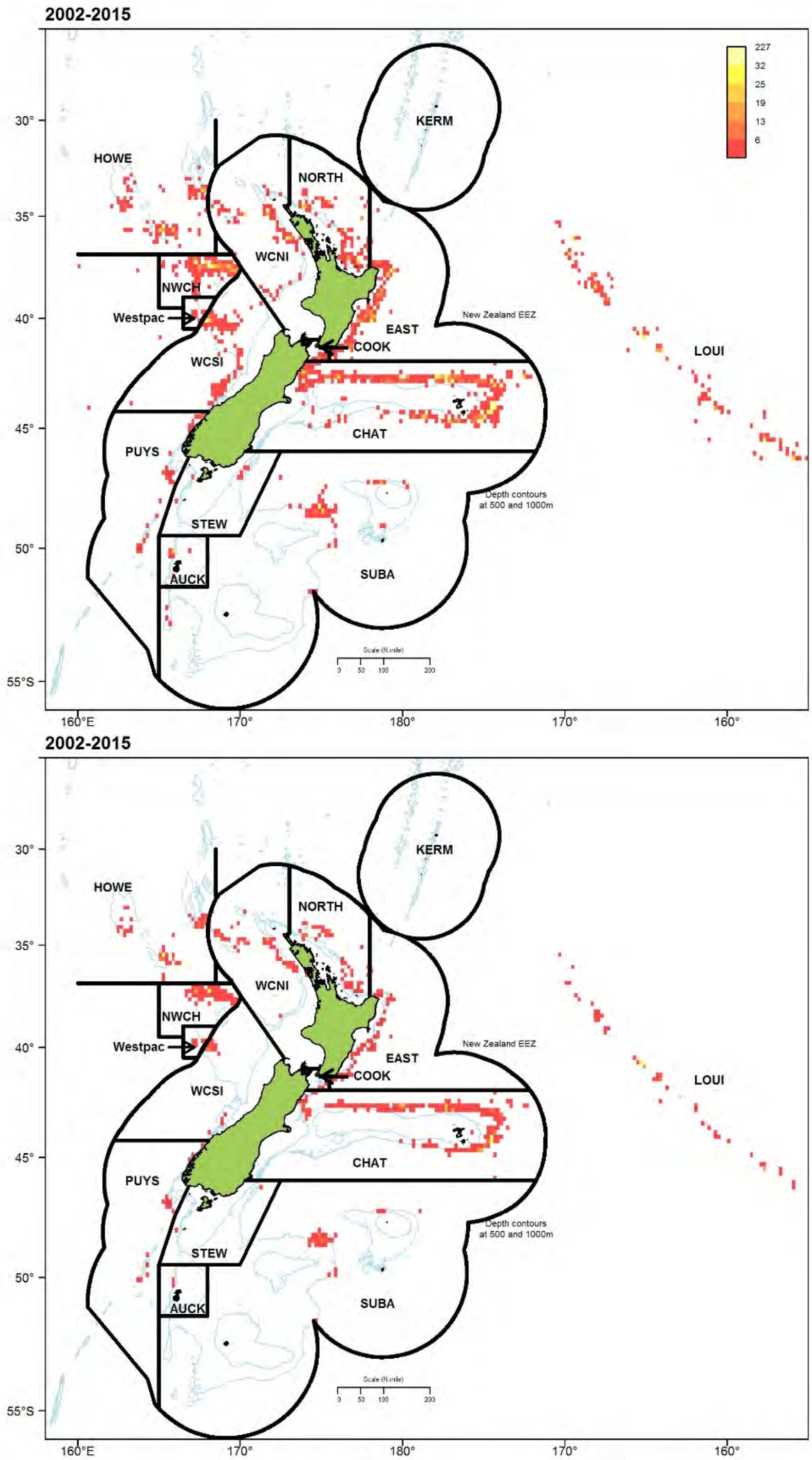



**Figure A1: Density plots showing the distribution of all commercial tows with recorded position data targeting orange roughy (top) and all tows recorded by observers on vessels targeting orange roughy (bottom), for fishing years 2002–15. The legend indicates the average number of tows per year in each 0.1˚ cell; solid lines mark the boundary of the EEZ and areas used in the analyses; dashed lines indicates the approximate 1000 m isobaths.**

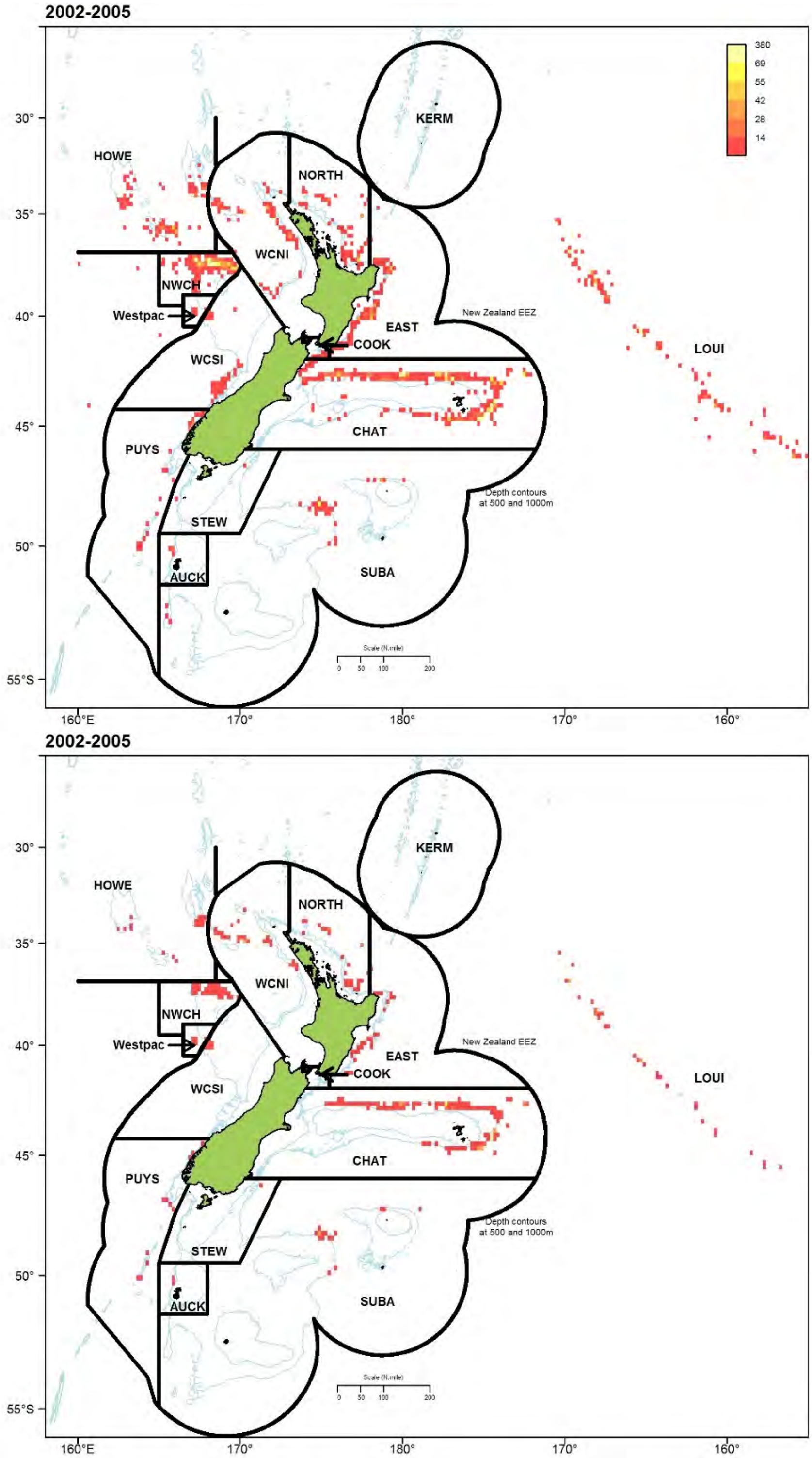
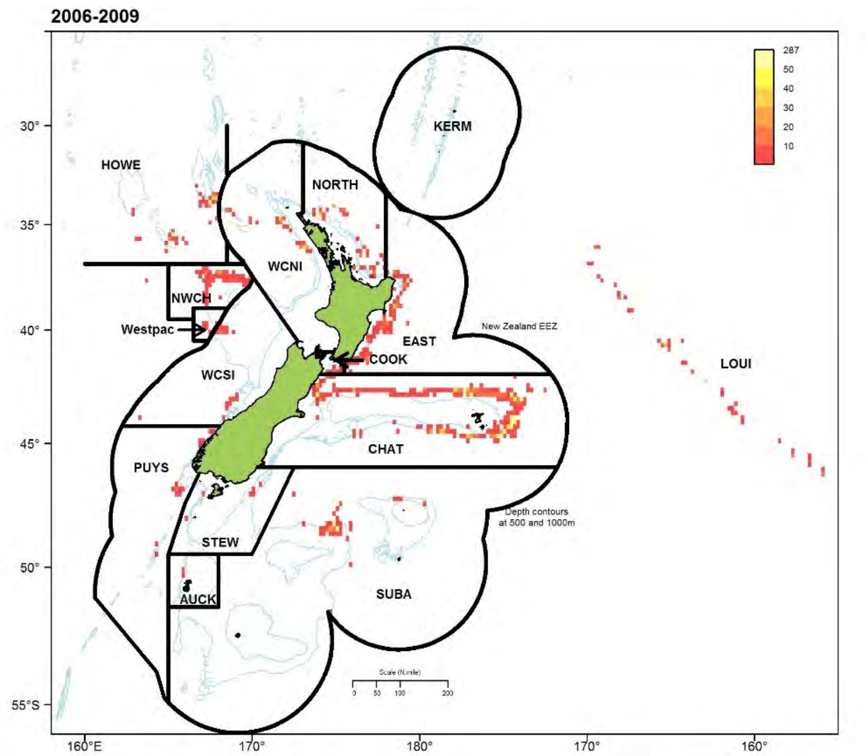



**Figure A2: Density plots showing the distribution of all commercial tows with recorded position data targeting orange roughy (top) and all tows recorded by observers on vessels targeting orange roughy (bottom), by blocks of years. The legend indicates the average number of tows per year in each 0.1° cell. See Figure 2 caption for more details. [Continued on next pages]**



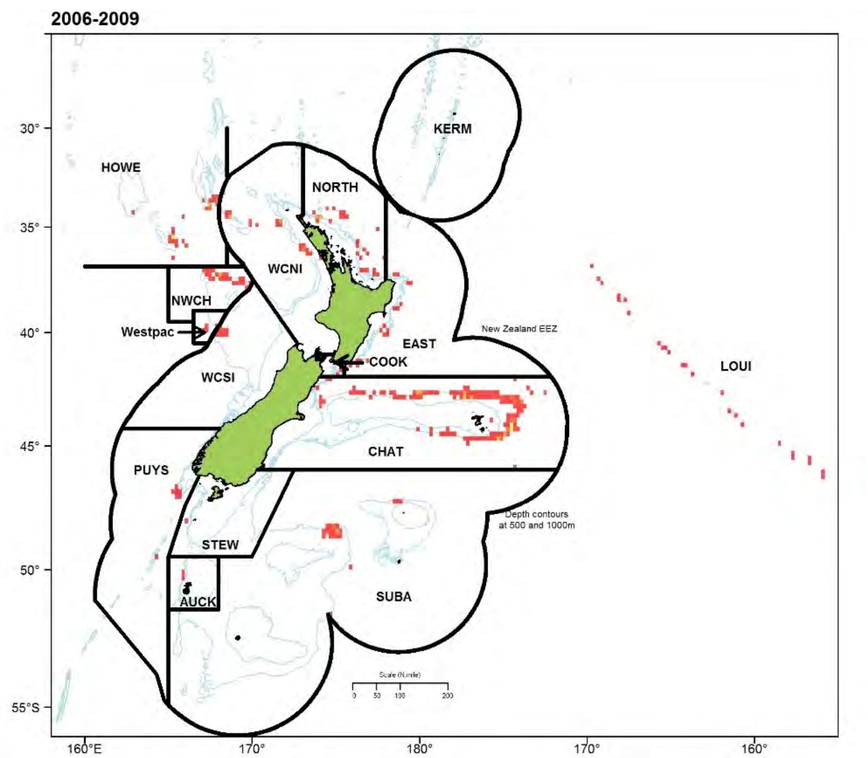
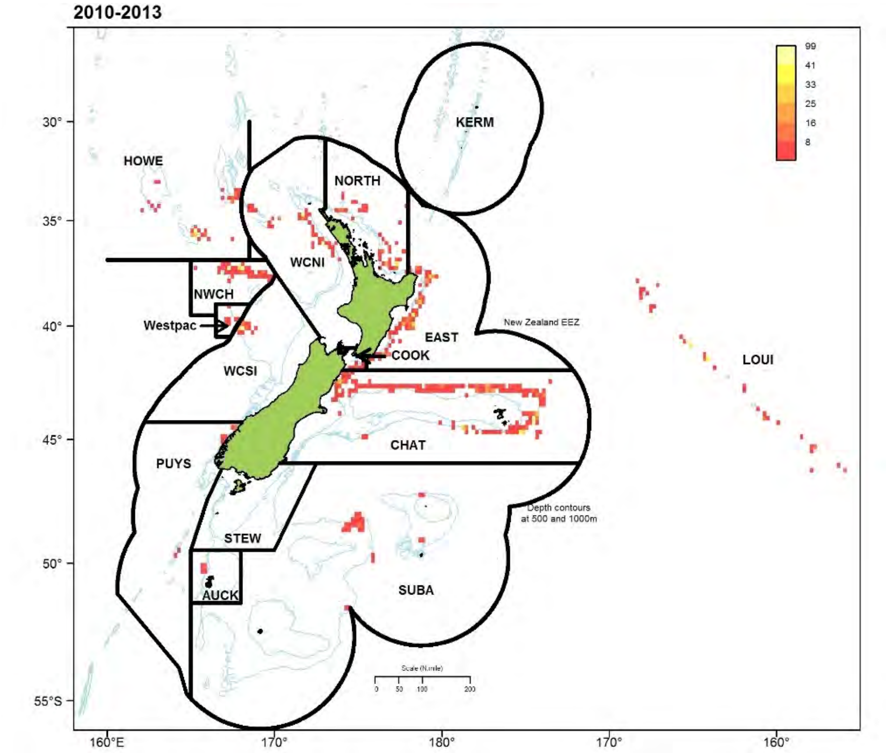




**Figure A2 [Continued]:**



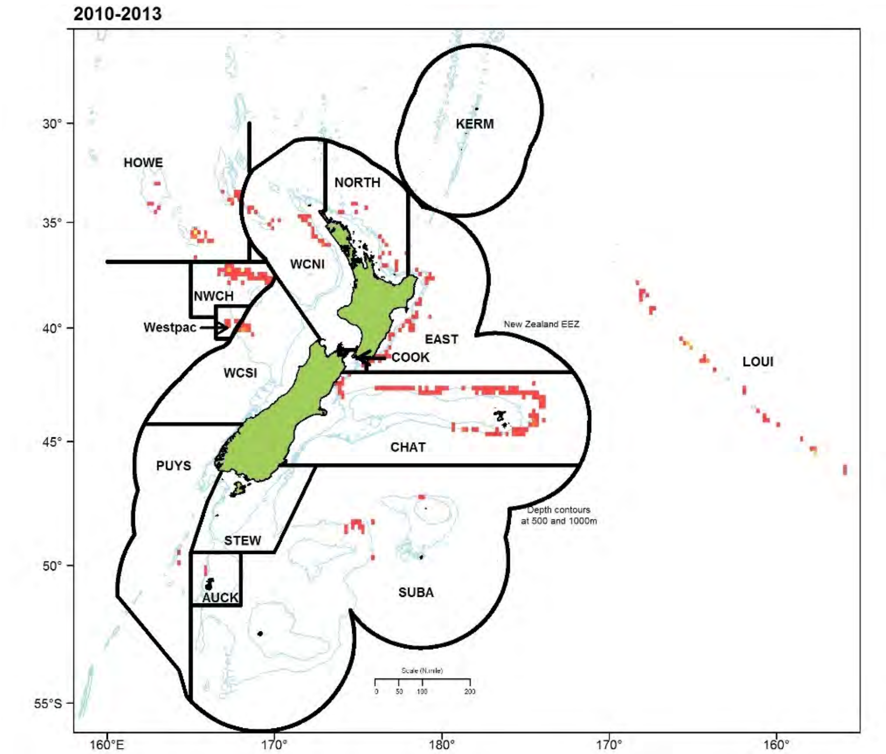
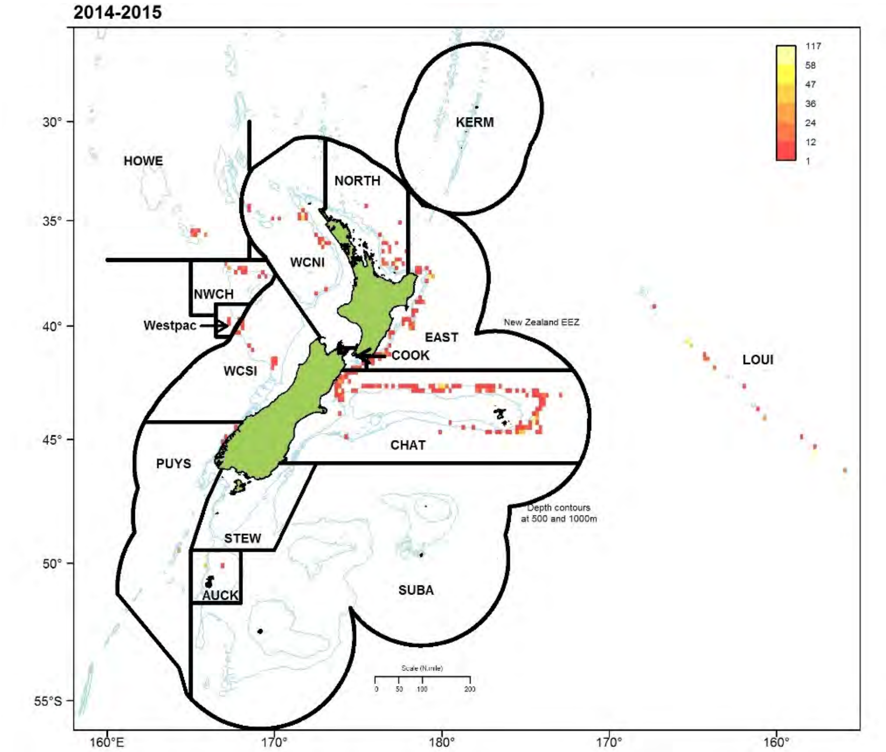




**Figure A2 [Continued]:**



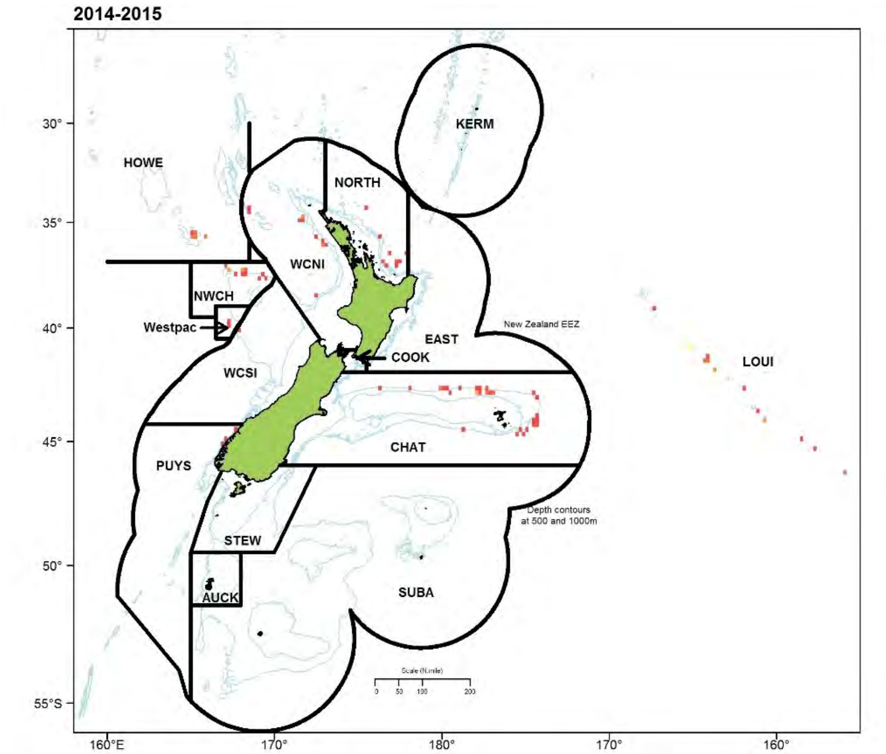




**Figure A2 [Continued]:**

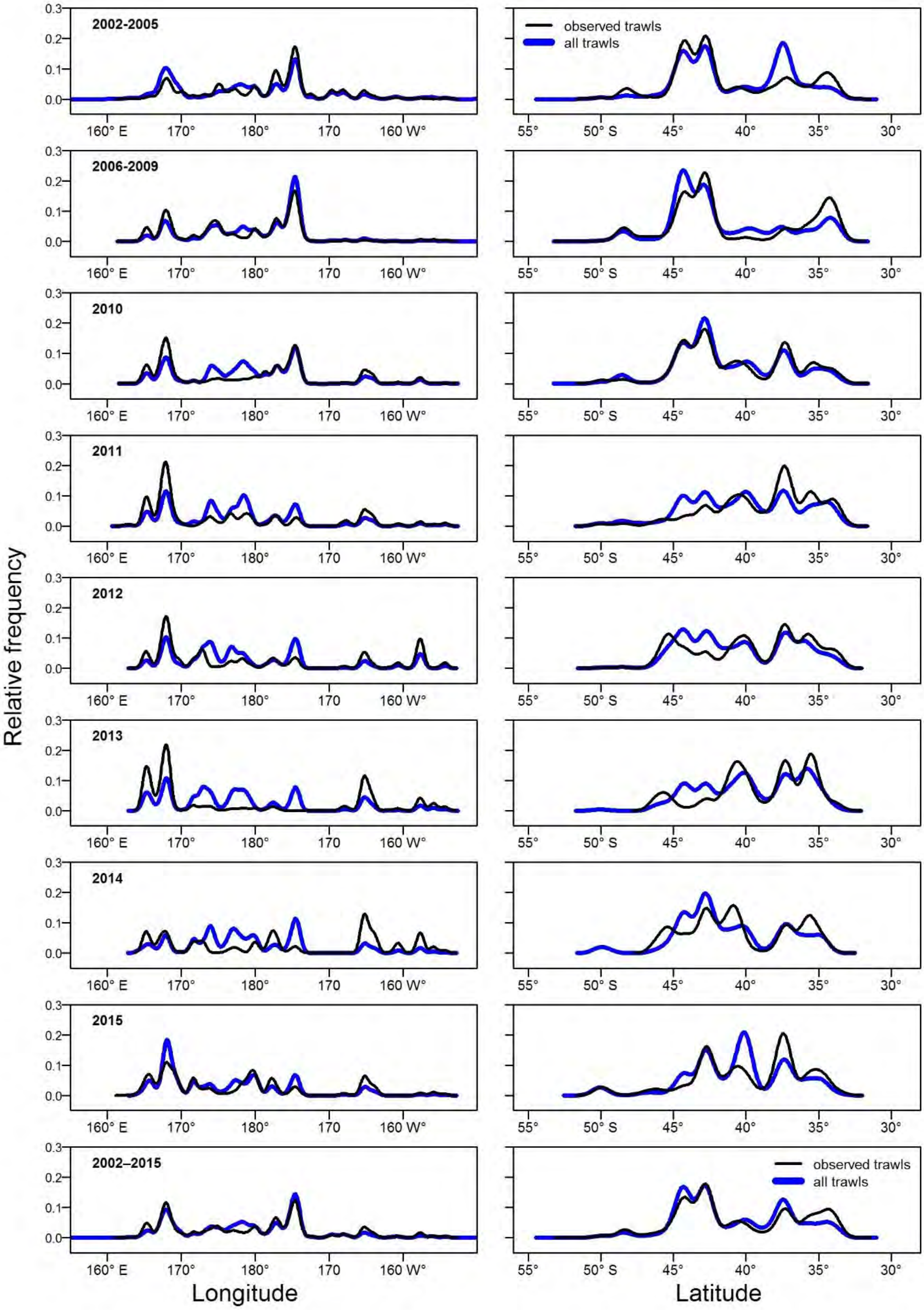



**Figure A3: Comparison of start positions (latitude and longitude) of observed tows with those of all commercial tows in the orange roughy target trawl fishery, by blocks of fishing years to 2009, for individual fishing years 2010–15 and for all years combined, for fishing years 2002–15. The relative frequency was calculated from a density function that used linear approximation to estimate frequencies at a series of equally spaced points.**

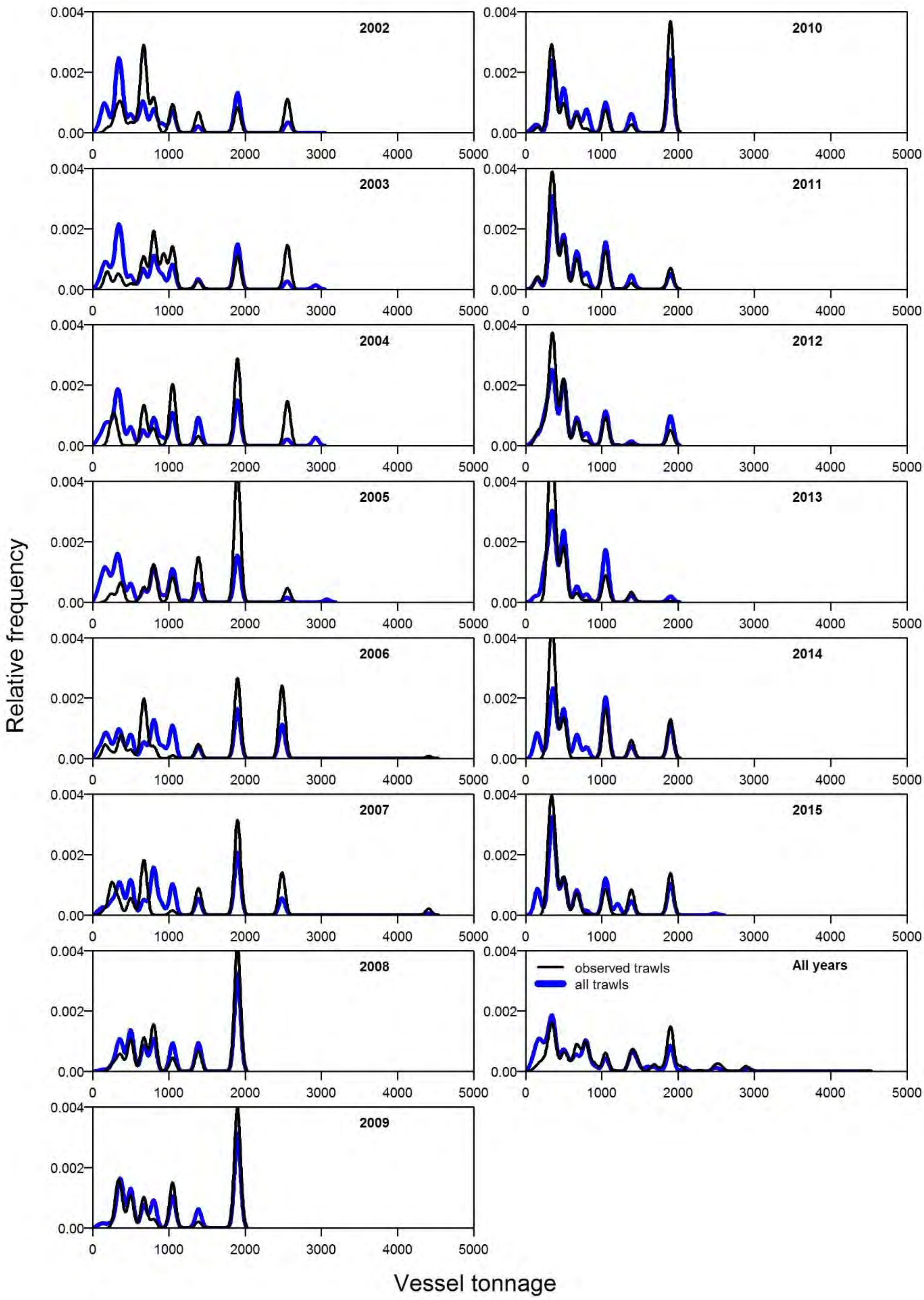



**Figure A4: Comparison of vessel sizes (gross registered tonnage) in observed tows versus all recorded commercial tows in the orange roughy target trawl fishery for fishing years 2002–15 and for all years combined. The relative frequency was calculated from a density function that used linear approximation to estimate frequencies at a series of equally spaced points.**

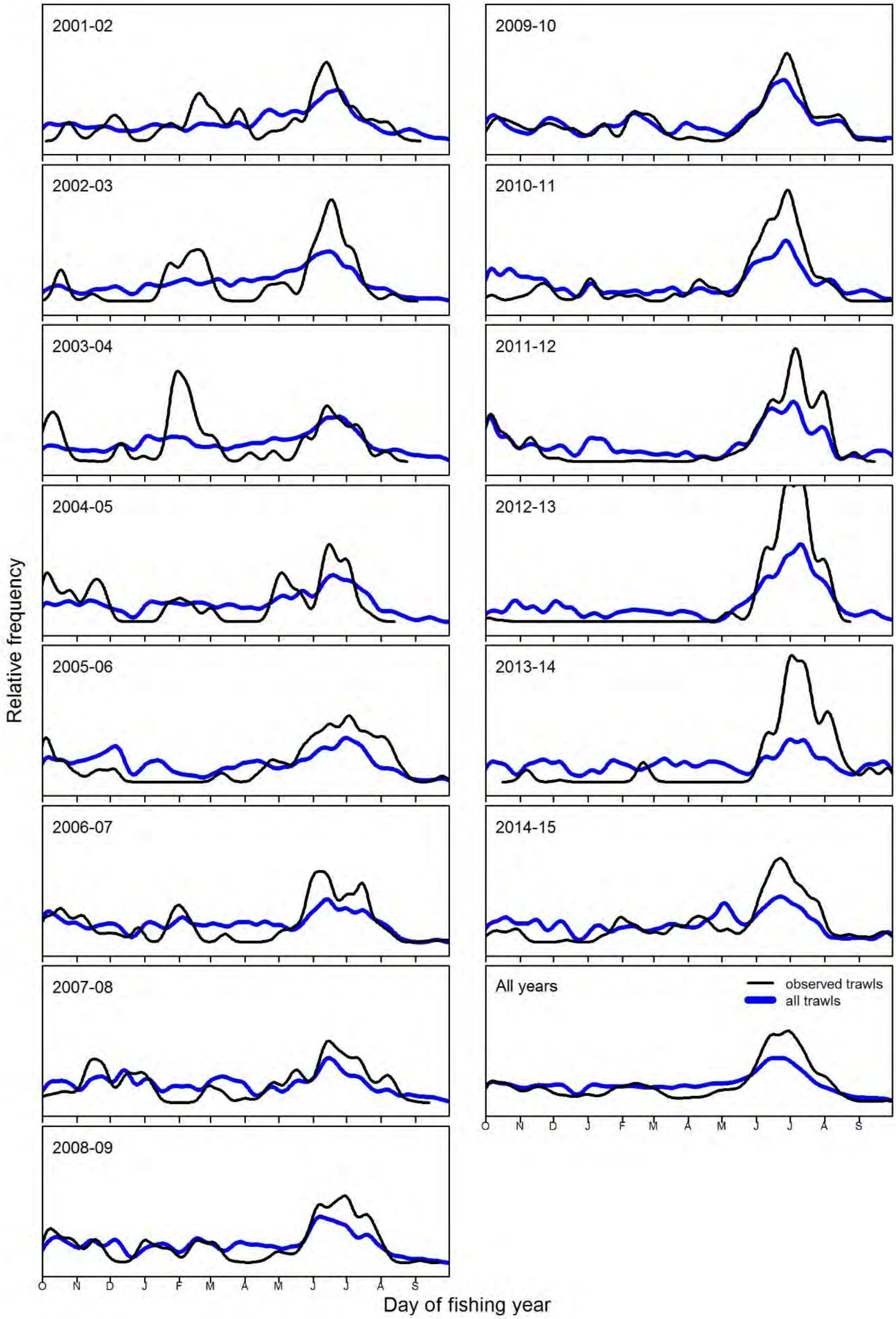



**Figure A5: Comparison of the temporal spread of observed tows with all recorded commercial tows for fishing years 2002–15, and for all years combined for target orange roughy trawls, and for all fishing years combined. The relative frequency of the numbers of tows was calculated from a density function that used linear approximation to estimate frequencies at a series of equally spaced points.**

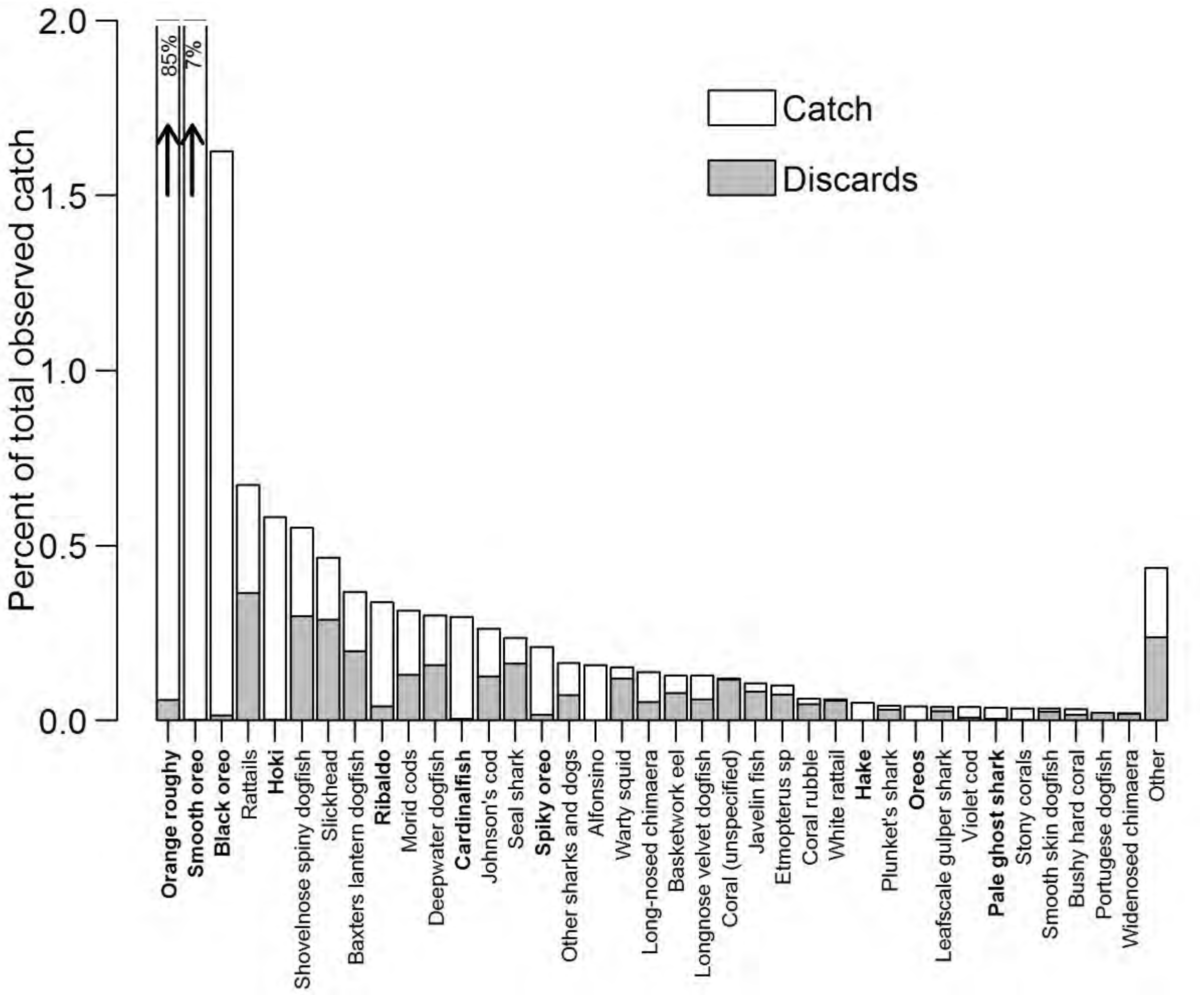



**Figure A6: Percentage of the total catch contributed by the main bycatch species (those representing 0.02% or more of the total catch) in the observed portion of the orange roughy target trawl fishery for fishing years 2002–15, and the percentage discarded. The Other category is the sum of all bycatch species representing less than 0.02% of the total catch. Names in bold are QMS species, names in italics are QMS species that can be legally discarded under Schedule 6 of the Fisheries Act (1996).**

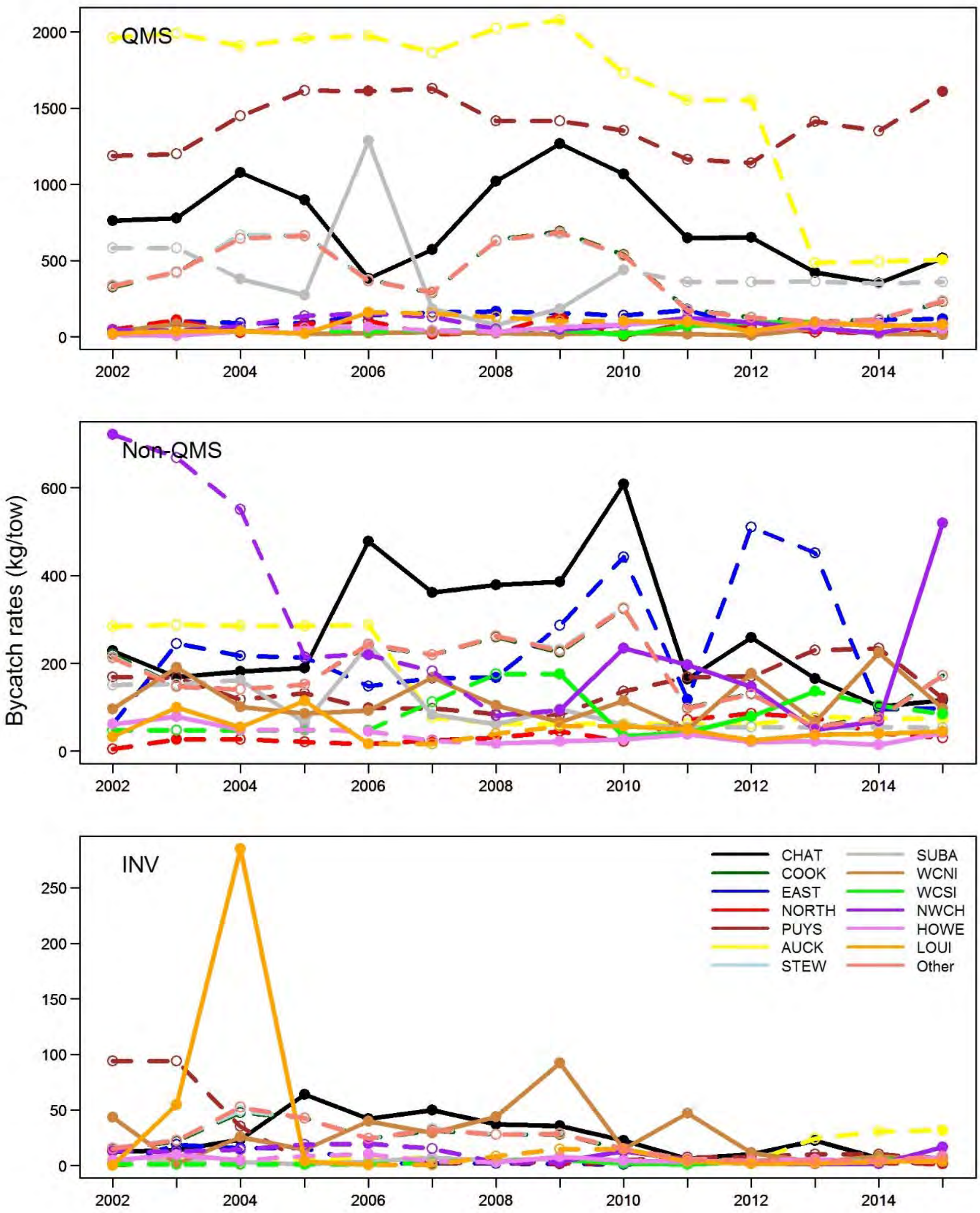



**Figure A7: Annual bycatch rates by species category and areas used for stratification, in the orange roughy target trawl fishery. Bycatch rates are the median of the bootstrap sample of 1000. Filled dots and solid lines indicate periods during which there were sufficient observed trawls (over 25) to calculate an individual bycatch rate for the area, otherwise dots are unfilled and lines are dashed and bycatch rates were calculated using additional records from adjacent years or, if still not sufficient, using records from all areas for individual years (see Table A7) as required to obtain at least 25 records. [Continued on next pages]**

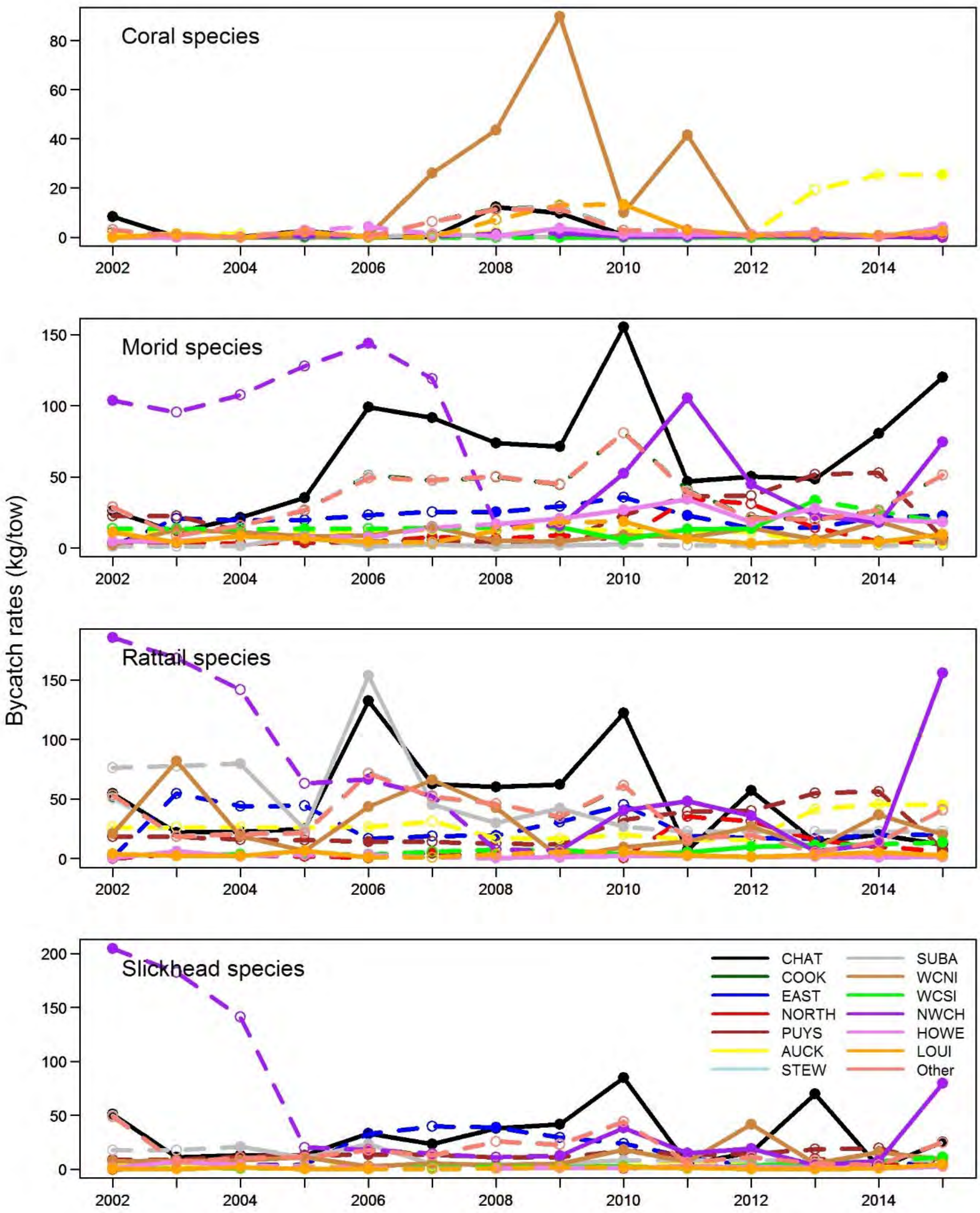



**Figure A7 [Continued]:**

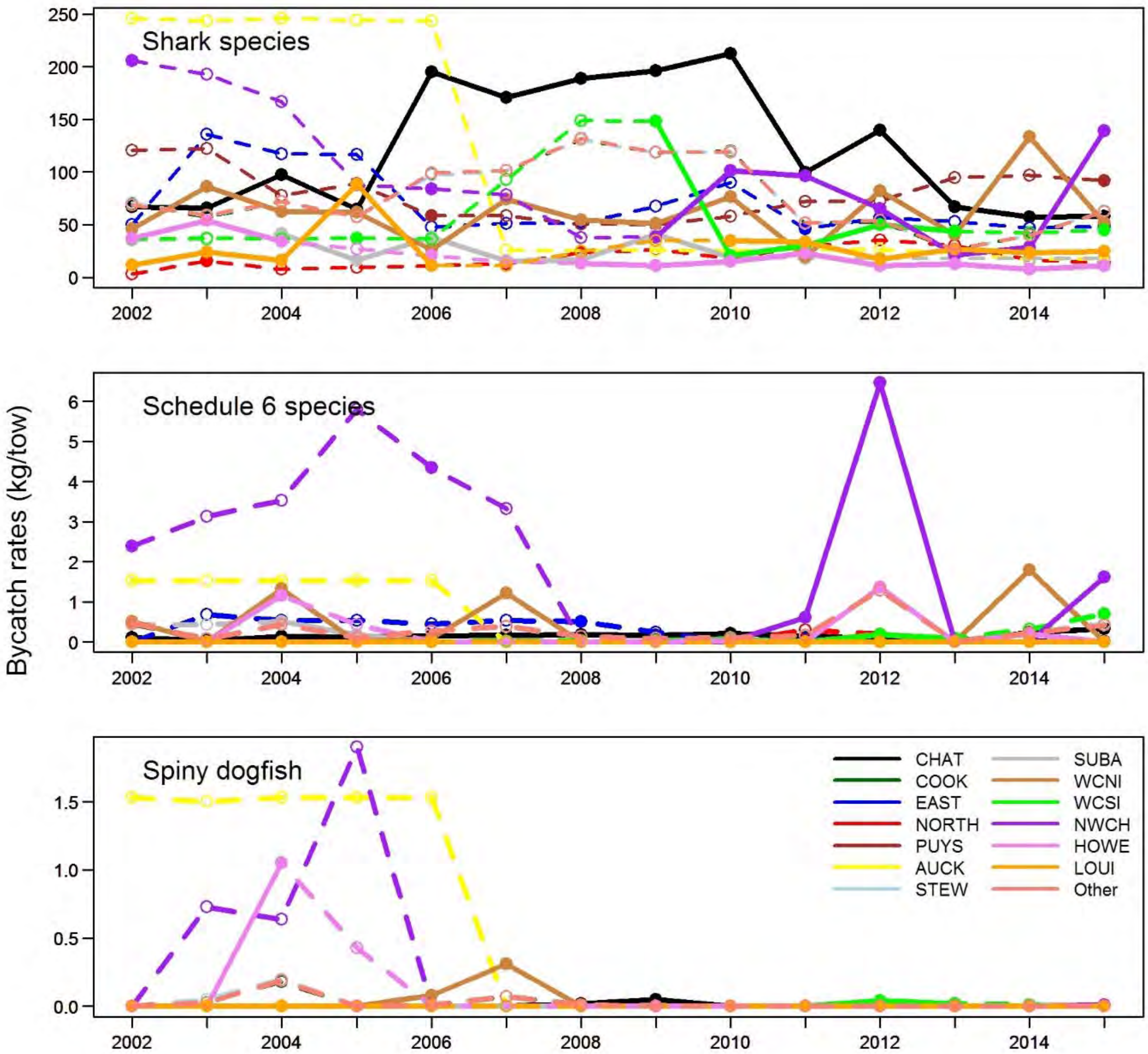



**Figure A7 [Continued]:**

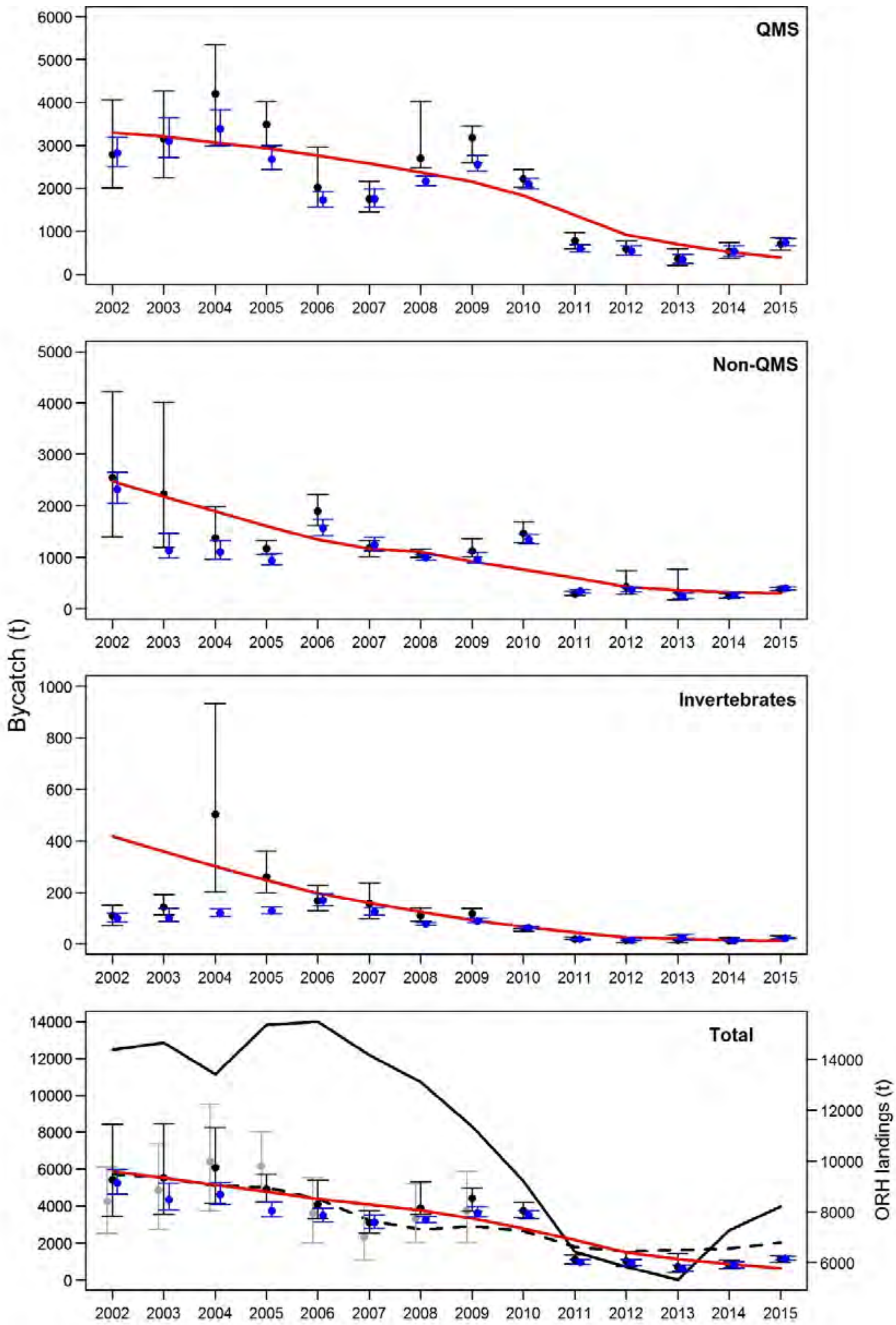



**Figure A8: Annual estimates of bycatch (t) in the orange roughy target trawl fishery, by species category and overall, for 2001–02 to 2014–15: black dots, ratio method; blue dots, statistical model method. Also shown (in grey) are earlier estimates of total bycatch calculated for 2001–02 to 2008–09 (Anderson 2011). 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 orange roughy, and the dashed line shows annual effort (number of tows), scaled to have mean equal to that of total bycatch. [Continued on next pages]**

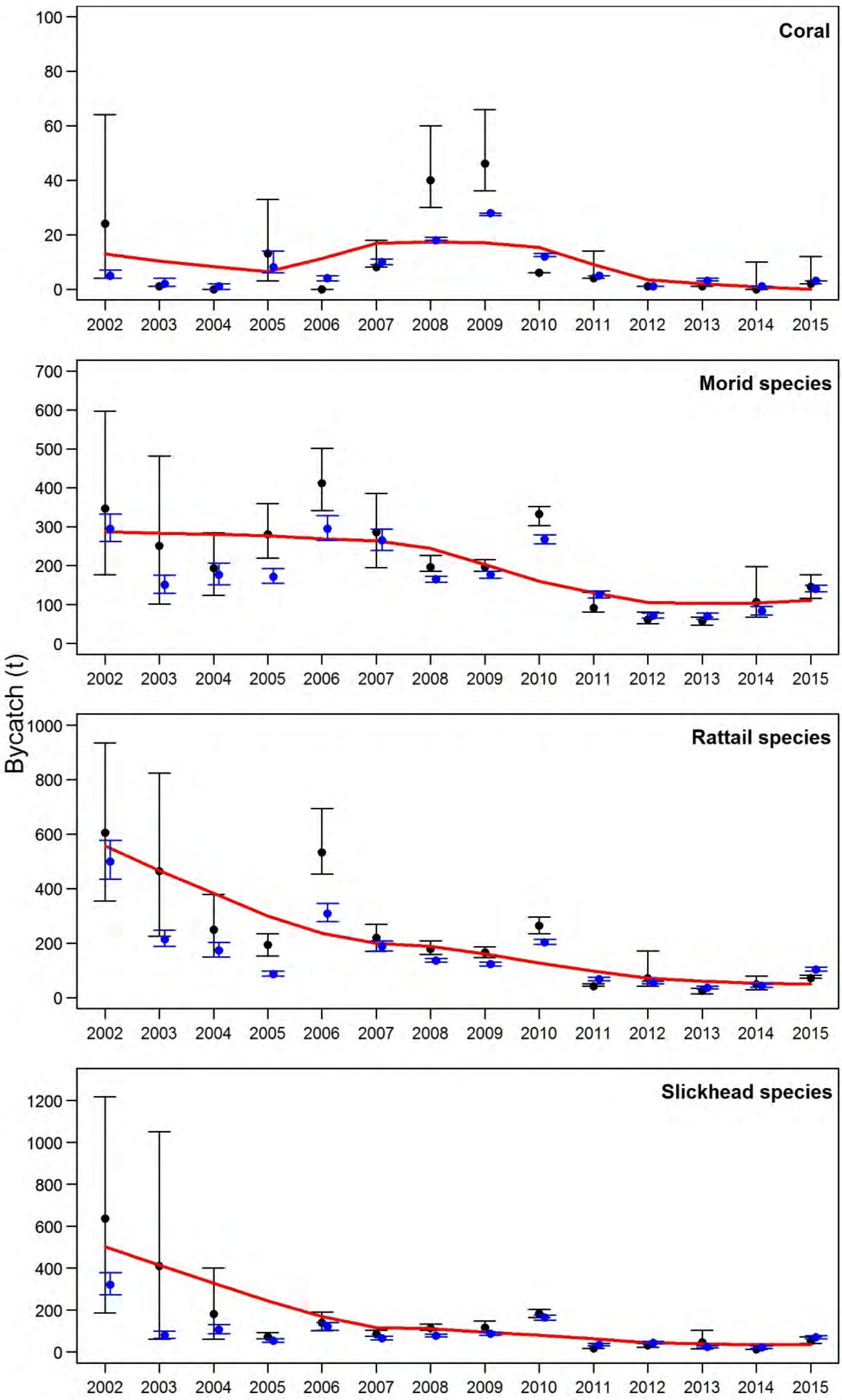



**Figure A8 [Continued]:**

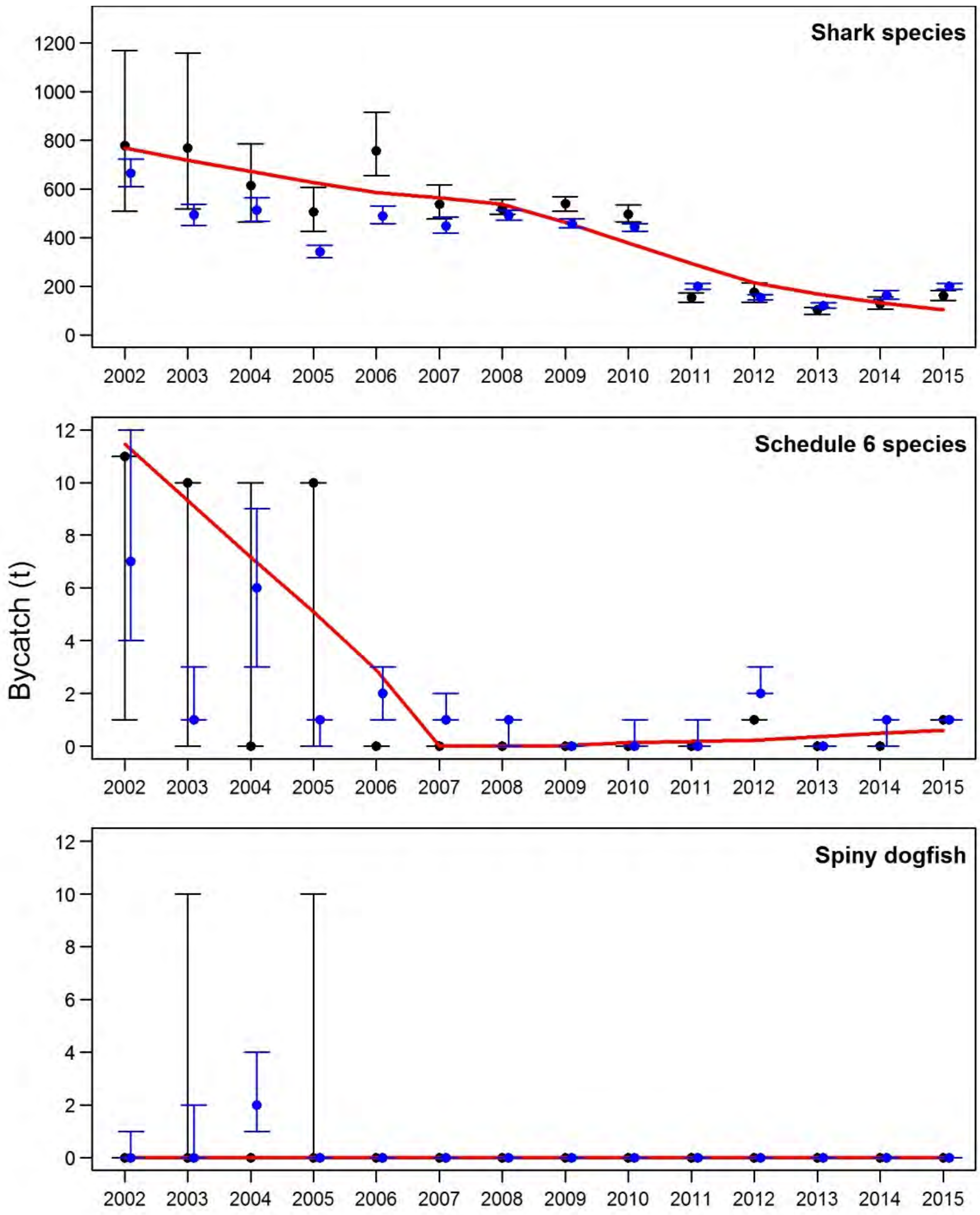
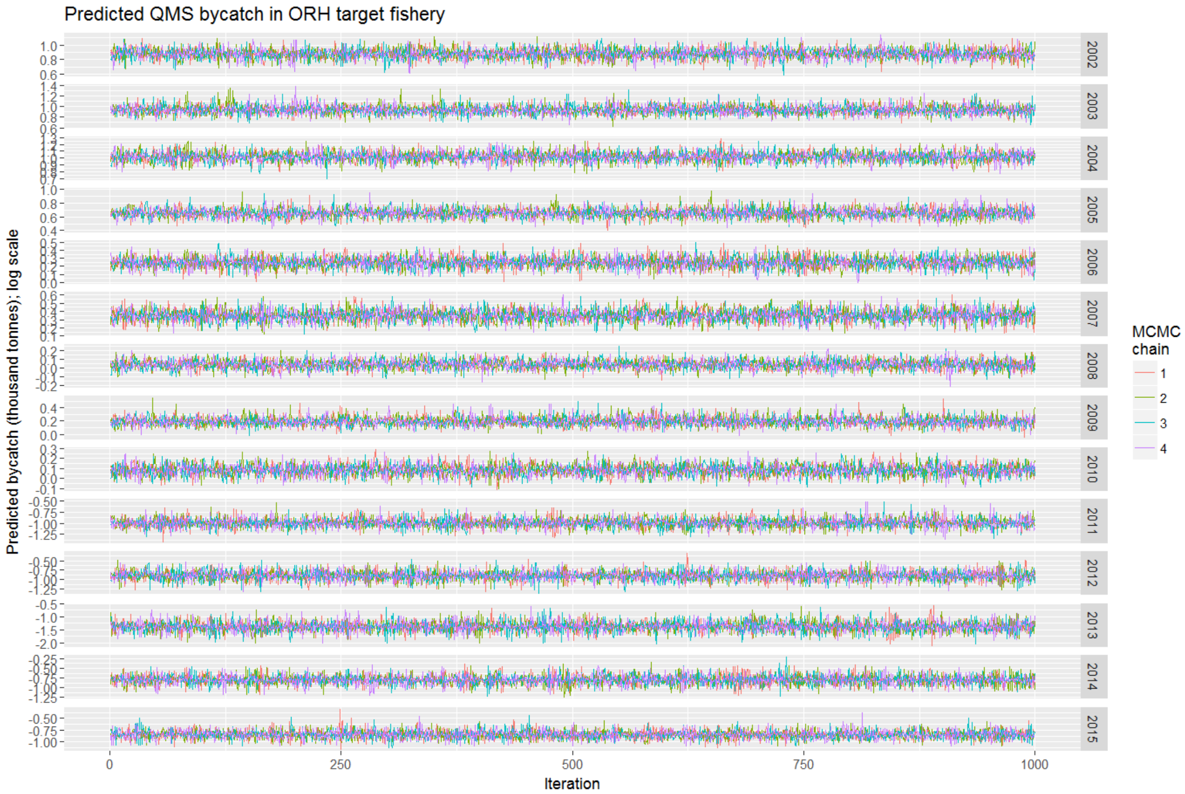



**Figure A8 [Continued]:**



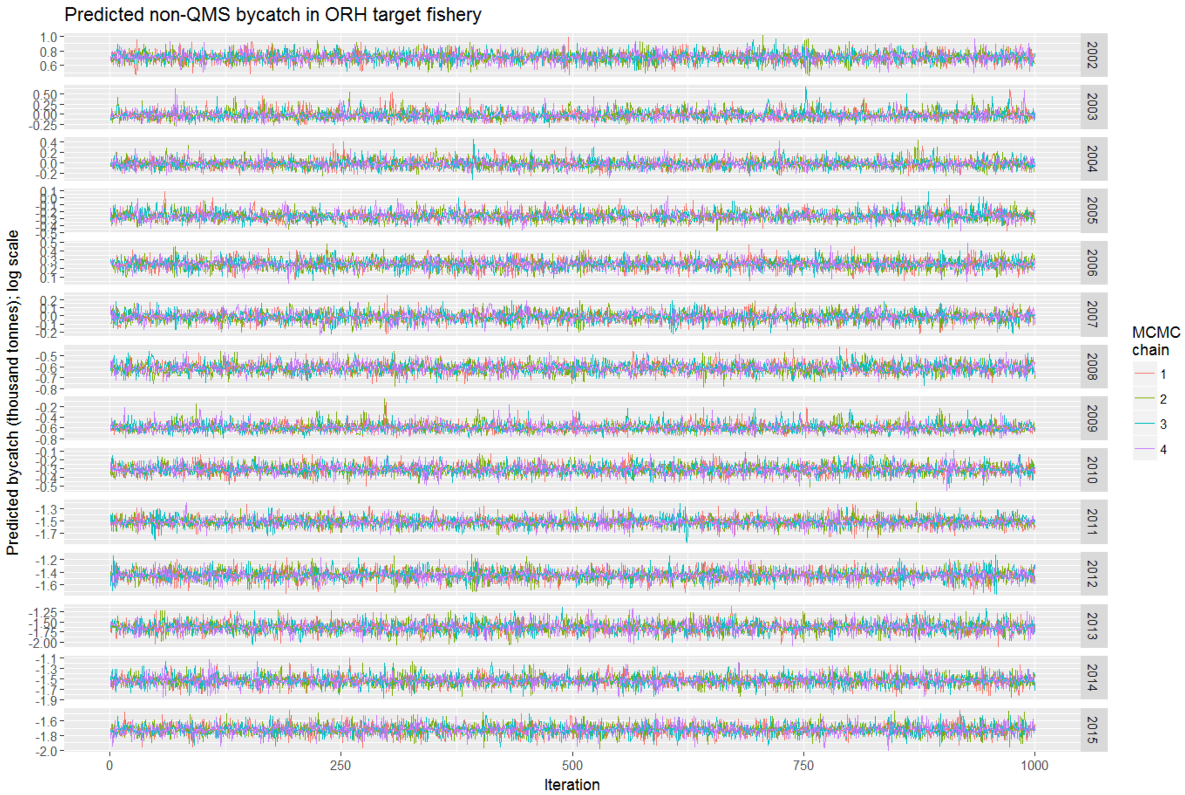




**Figure A9: Convergence diagnostics for estimation of ORH standard region bycatch. MCMC trace plots are shown for the estimated bycatch per year.** **[Continued on next page]**

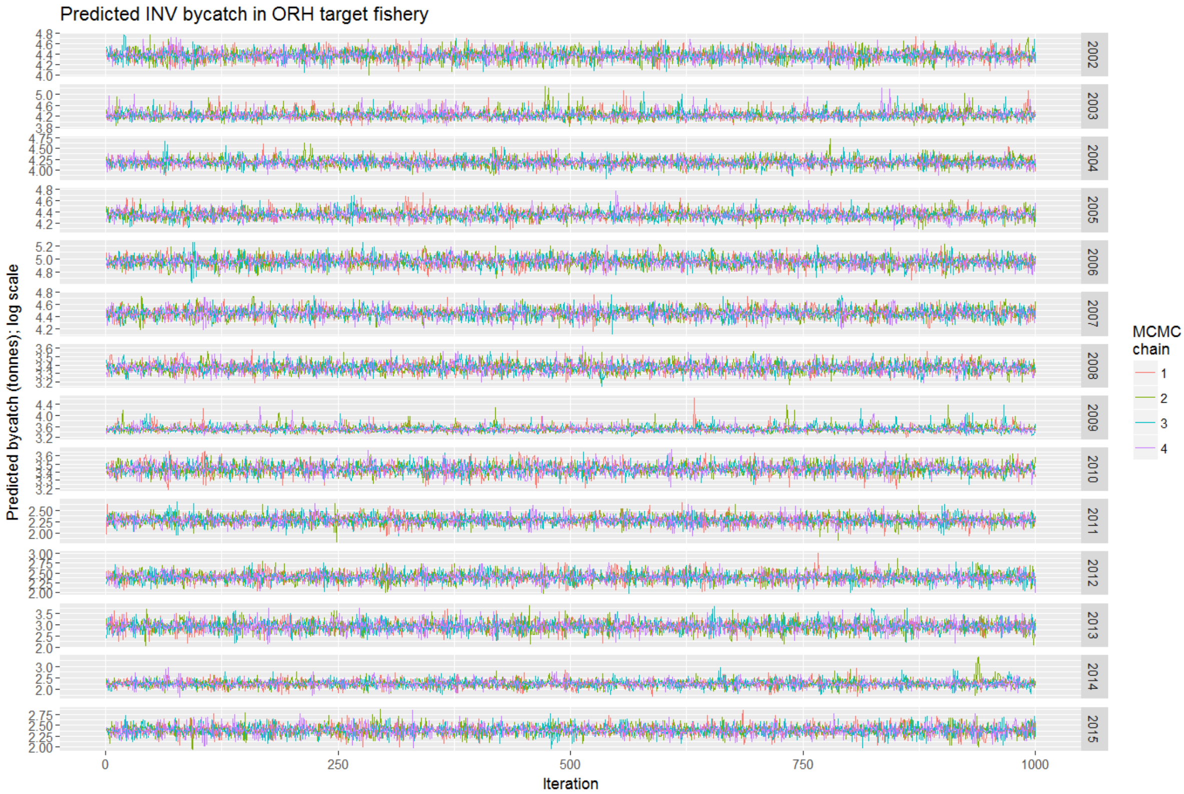



**Figure A9 [Continued]:**

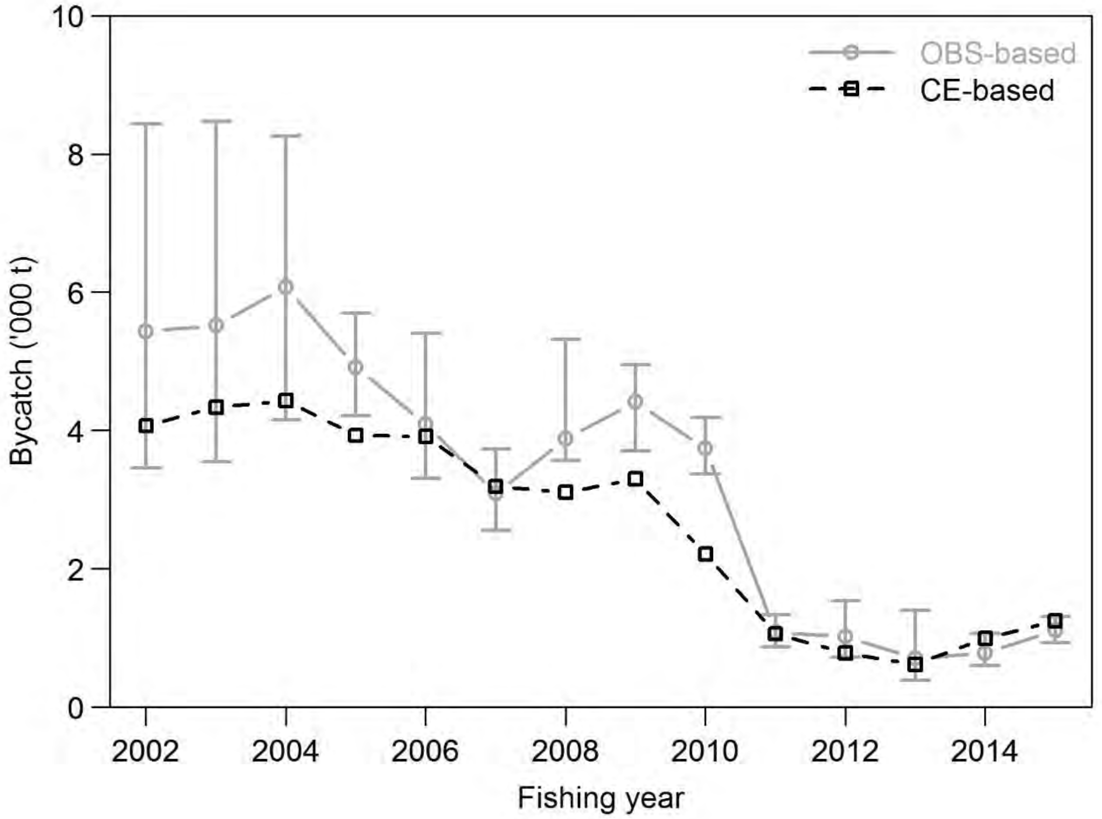



**Figure A10: Total annual bycatch in the orange roughy target trawl fishery from scaled up observer catch rates (ratio method) and commercial catch effort records.**

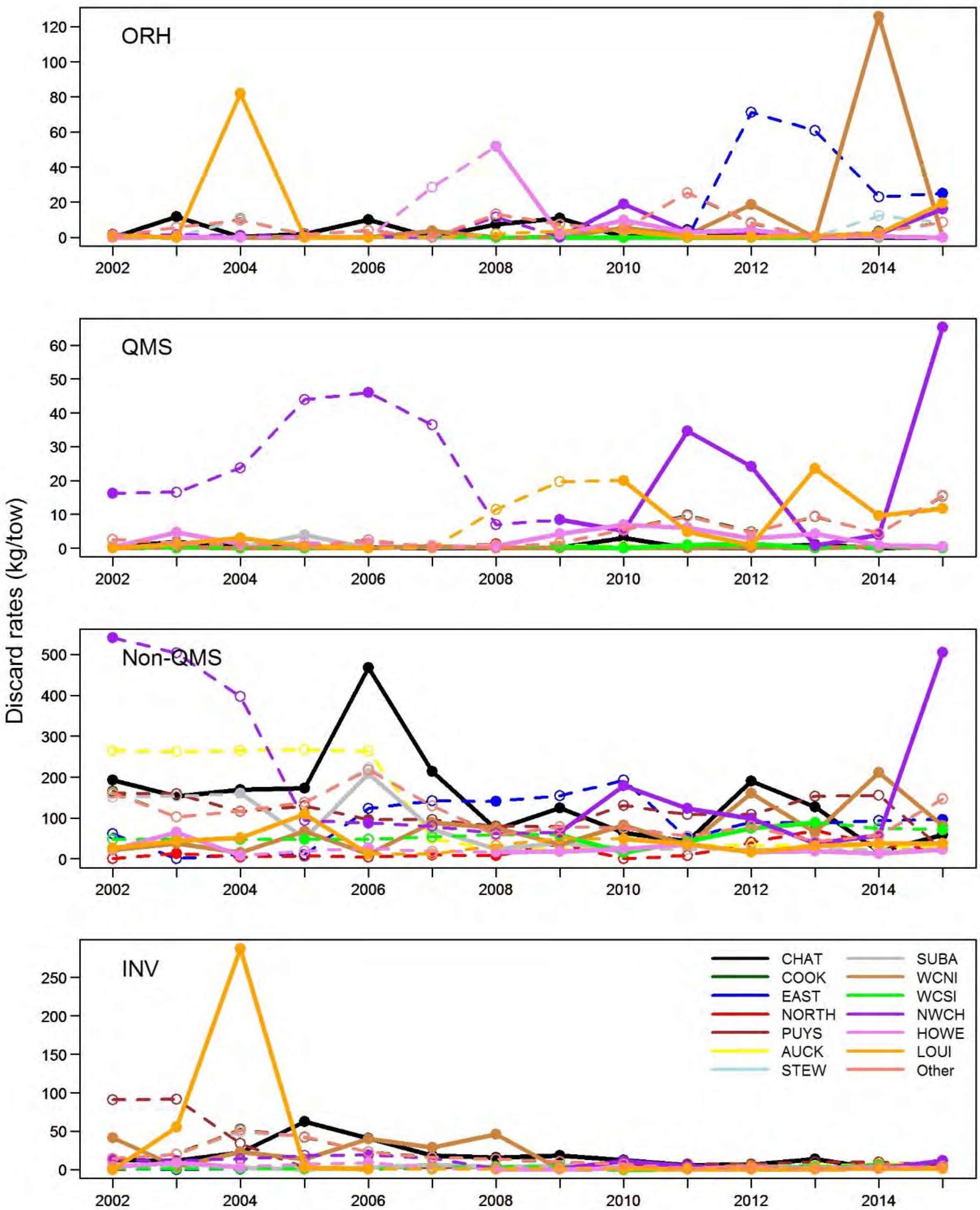



**Figure A11: Annual discard rates by species category and areas used for stratification, in the orange roughy target trawl fishery. Discard rates are the median of the bootstrap sample of 1000. Filled dots and solid lines indicate periods during which there were sufficient observed trawls (over 25) to calculate an individual discard rate for the area, otherwise dots are unfilled and lines are dashed and bycatch rates were calculated using additional from adjacent years or, if still not sufficient, using records from all areas for individual years (see Table A7) as required to obtain at least 25 records.** **[Continued on next pages]**

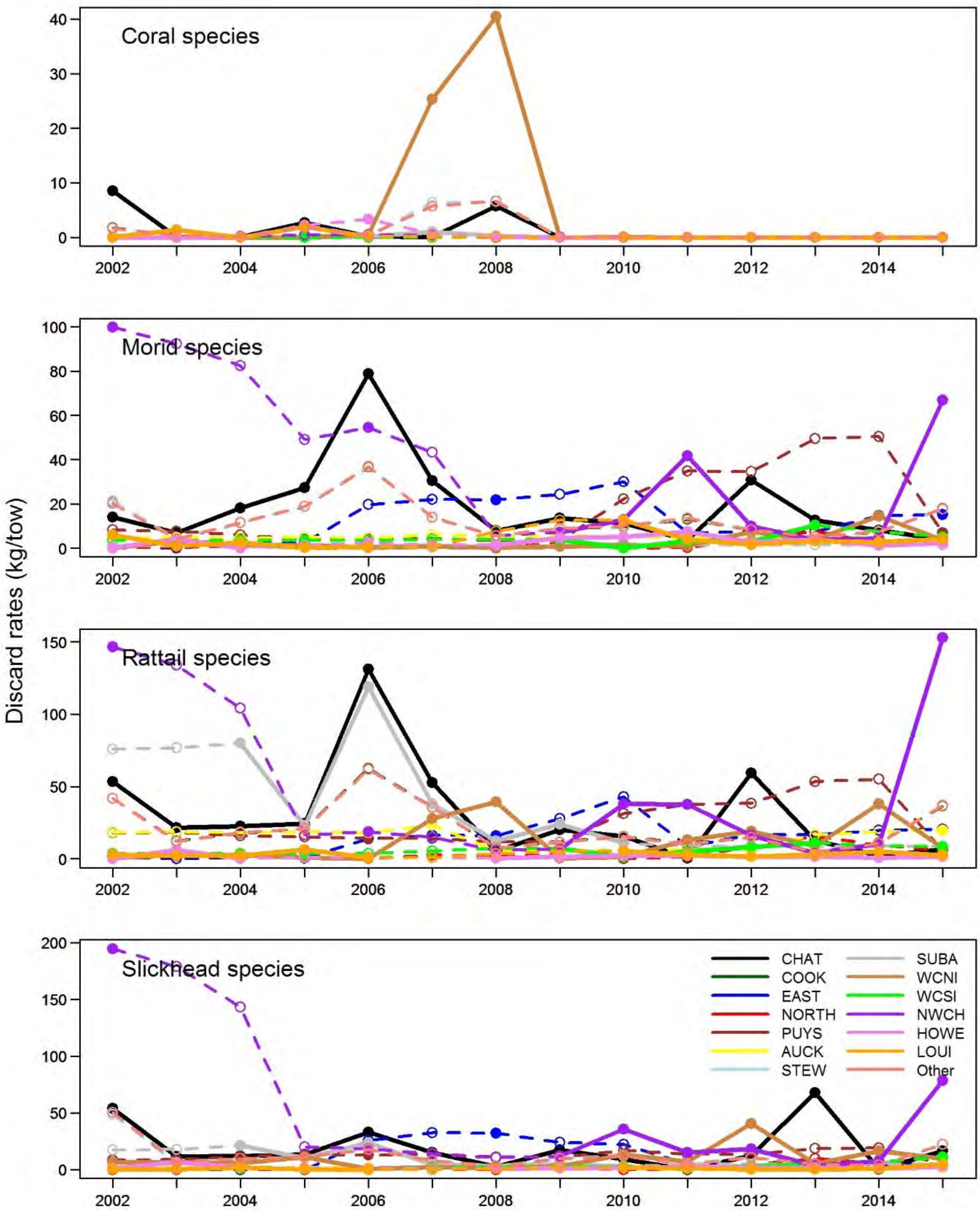



**Figure A11 [Continued]:**

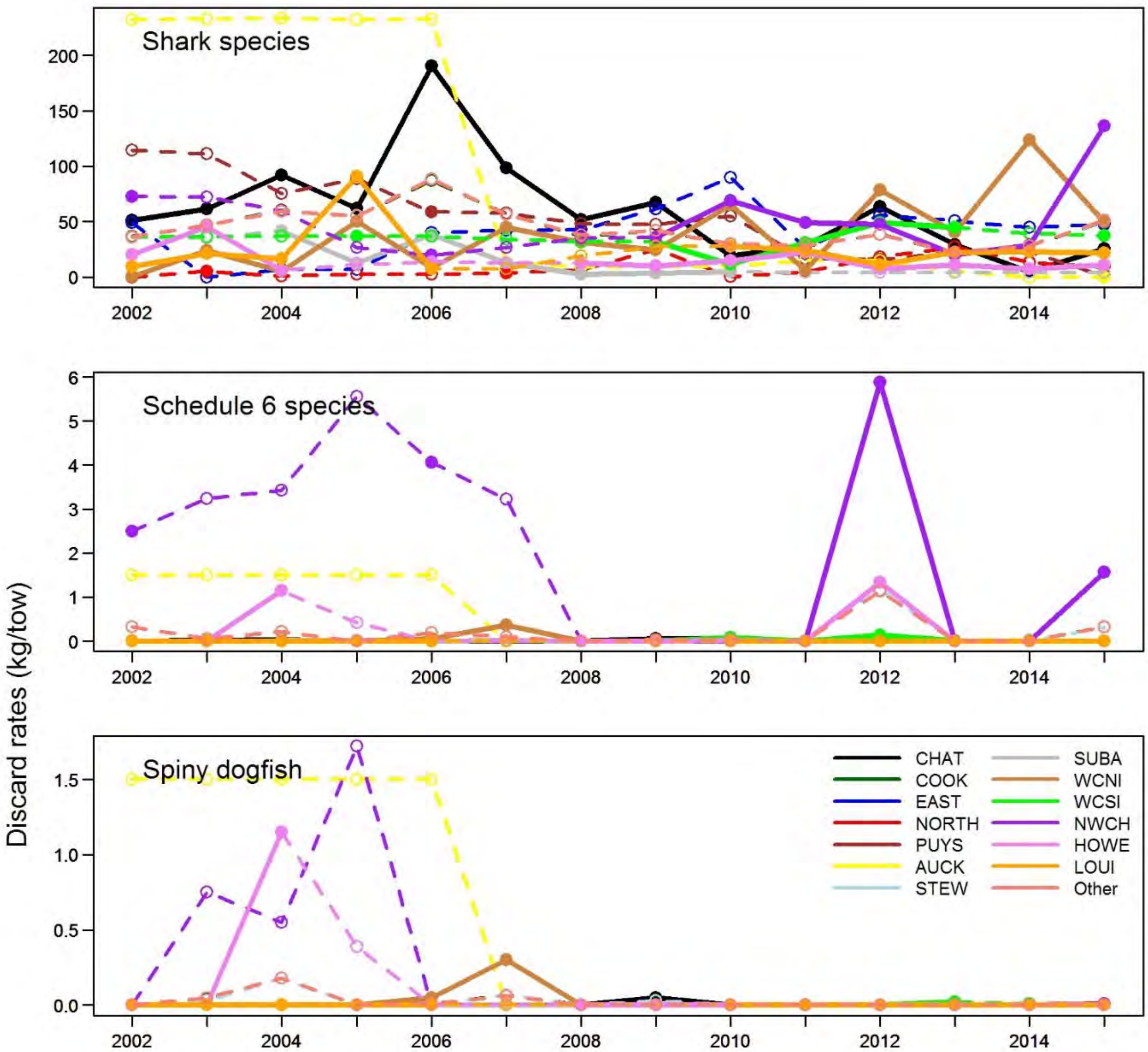



**Figure A11 [Continued]:**

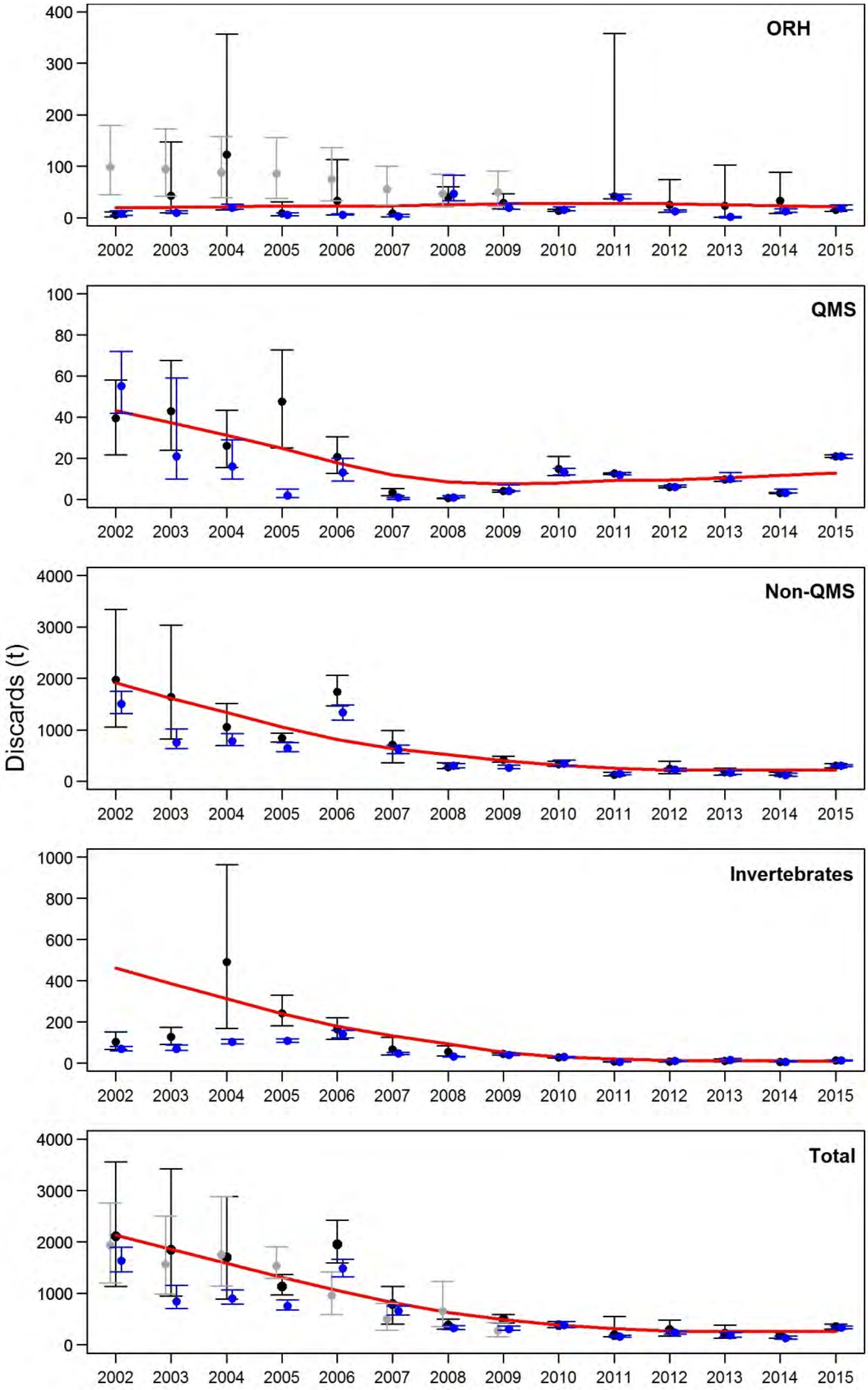



**Figure A12: Annual estimates of discards (t) in the orange roughy target trawl fishery, by species category and overall, for 2001–02 to 2014–15. Also shown (in grey) are earlier estimates of total discards calculated for 2001–02 to 2008–09 (Anderson 2011). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally weighted polynomial regression to annual discards. [Continued on next pages]**

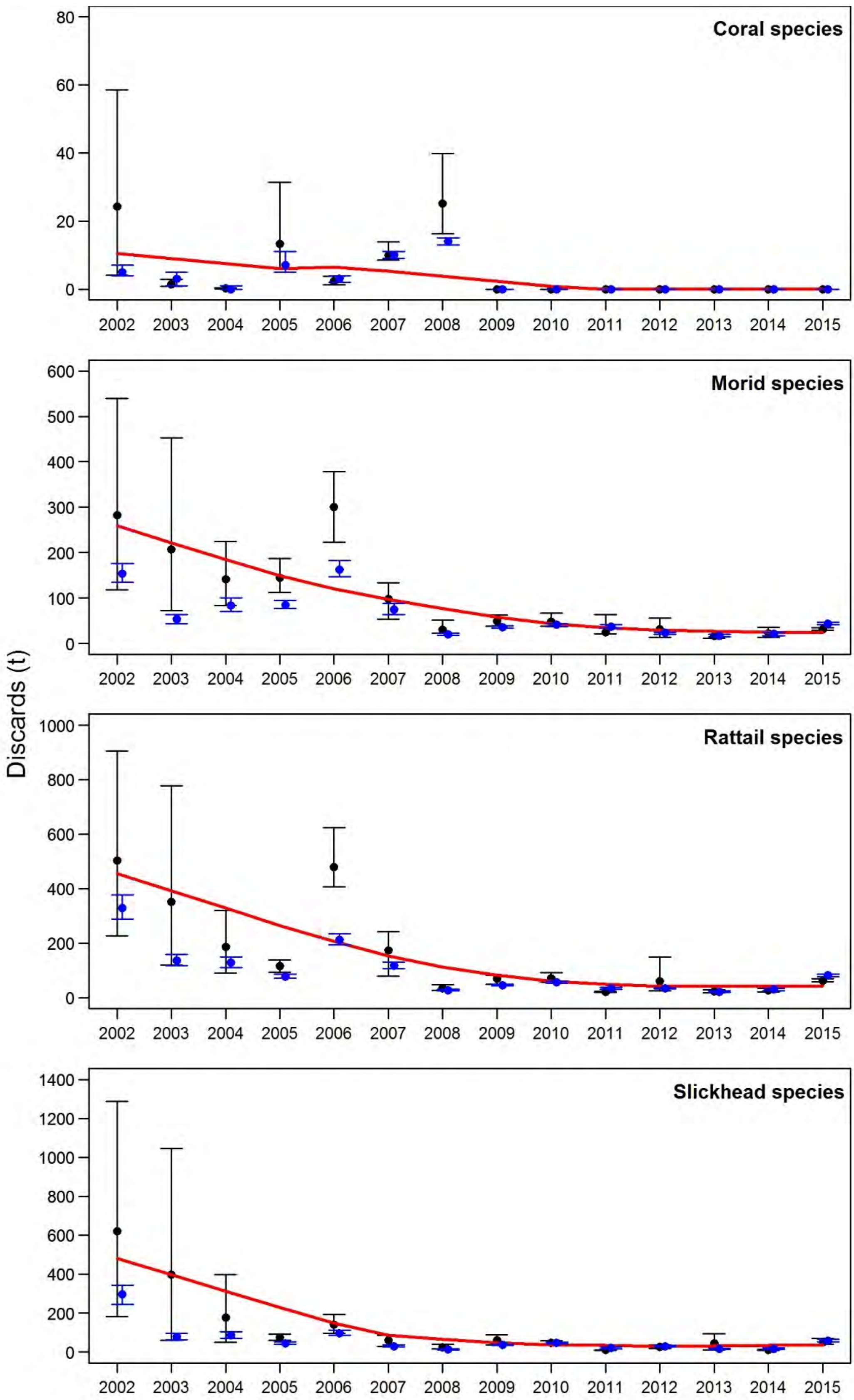



**Figure A12 [Continued]:**

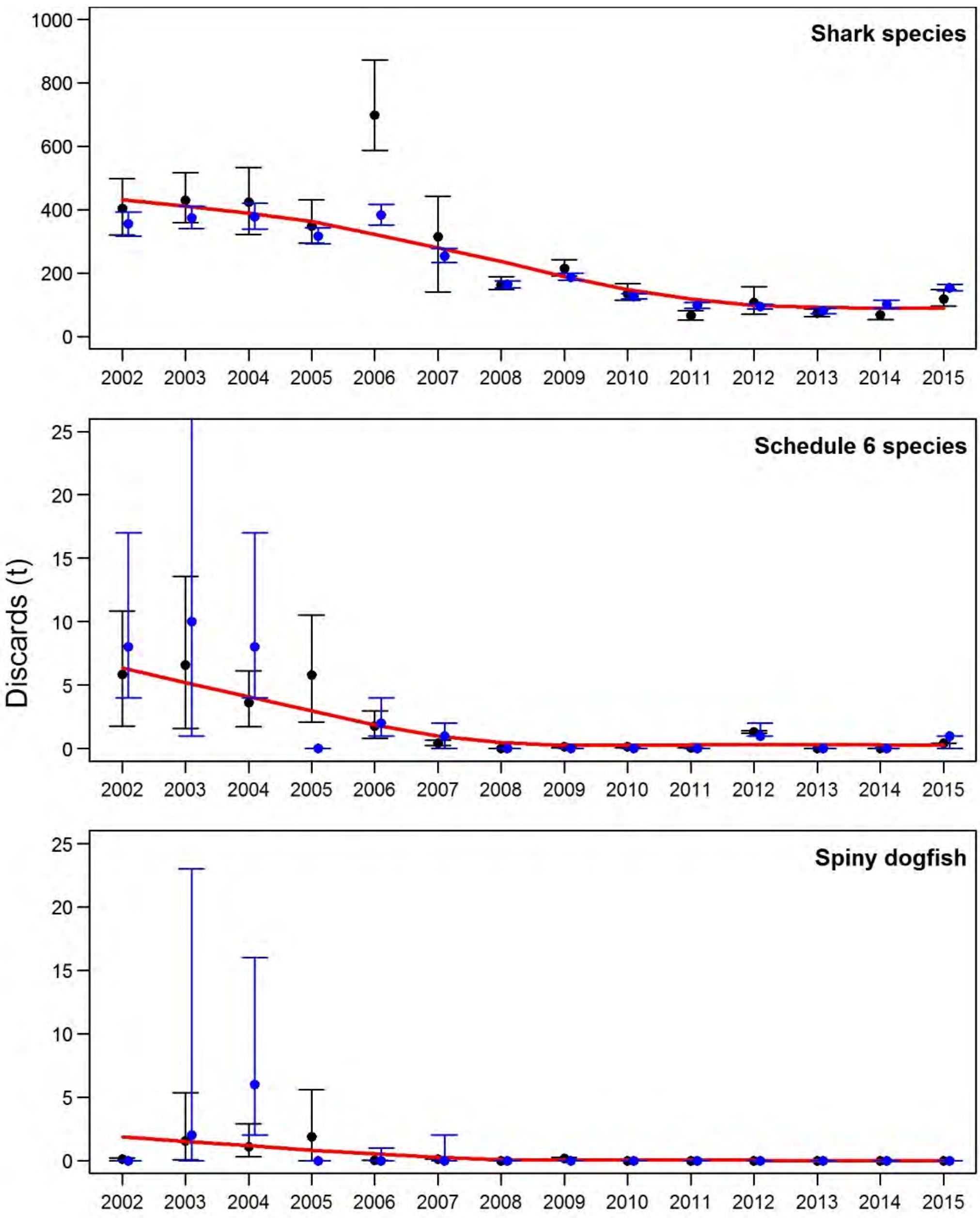
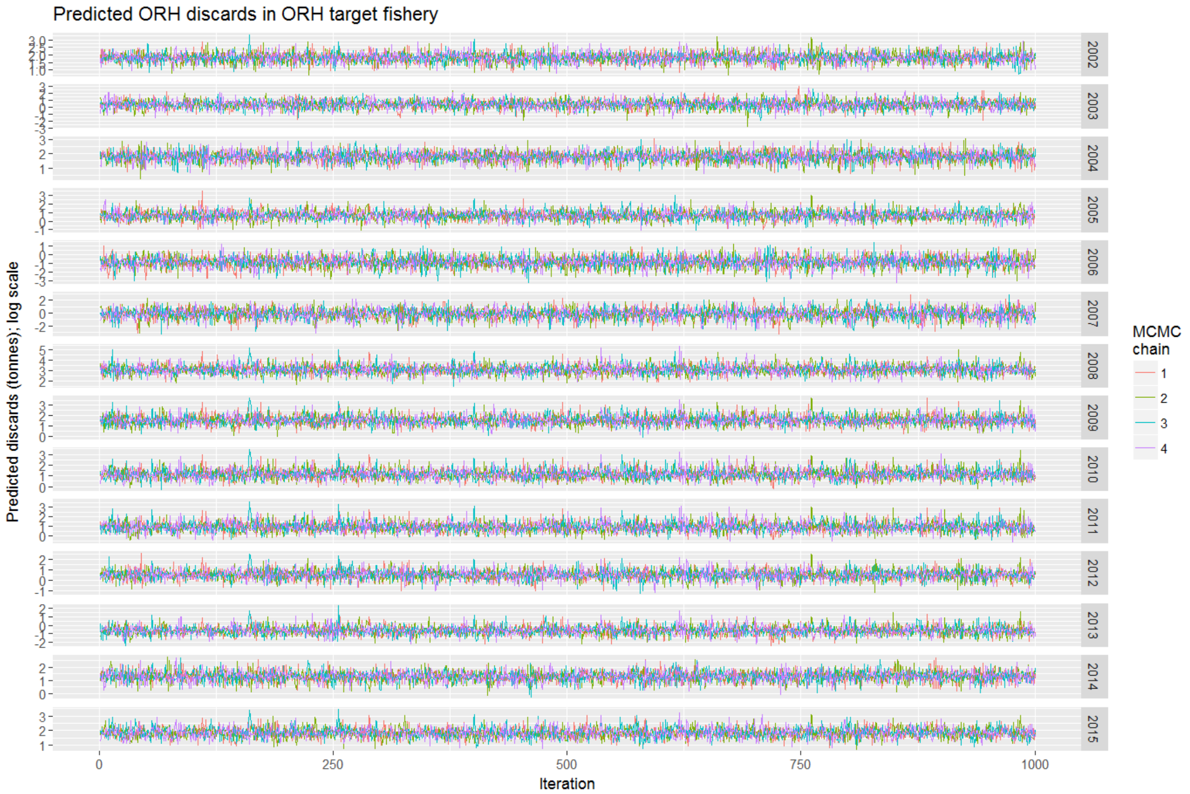



**Figure A12 [Continued]:**



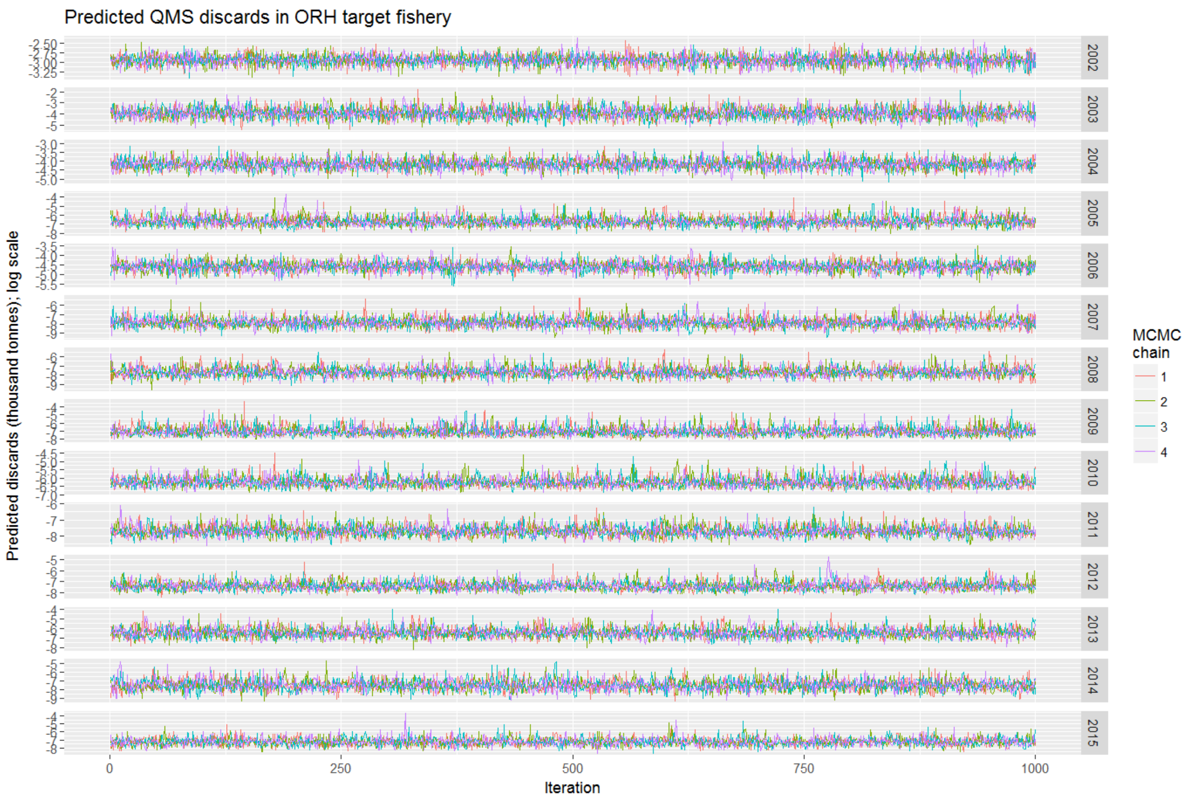
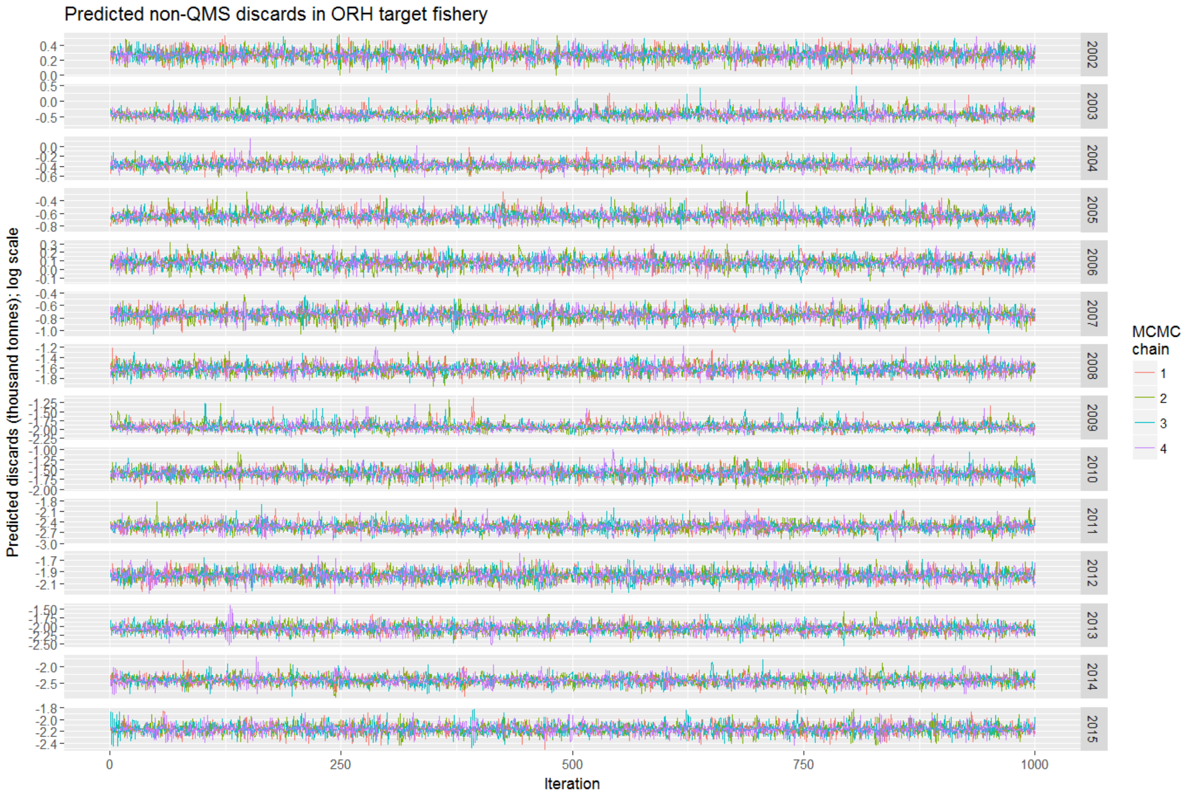




**Figure A13: Convergence diagnostics for estimation of ORH standard region discards. MCMC trace plots are shown for the estimated discards per year. [Continued on next page]**



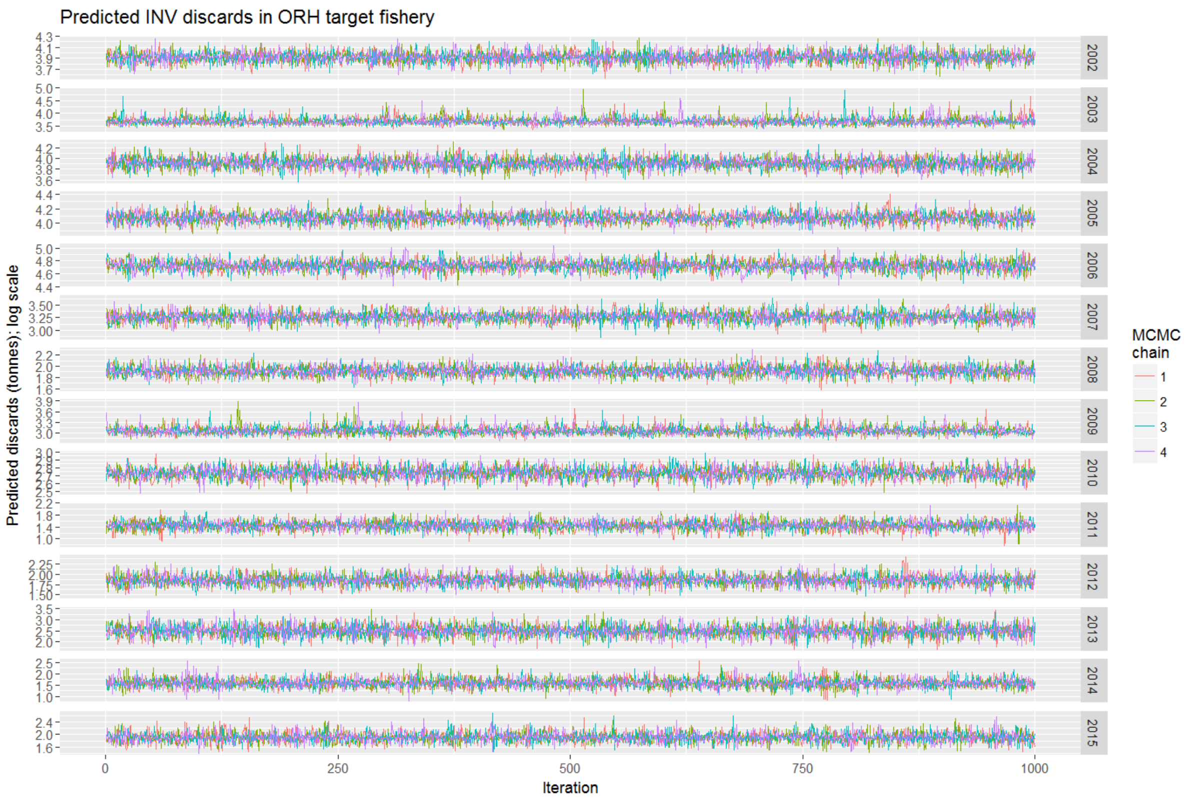




**Figure A13 [Continued]:**

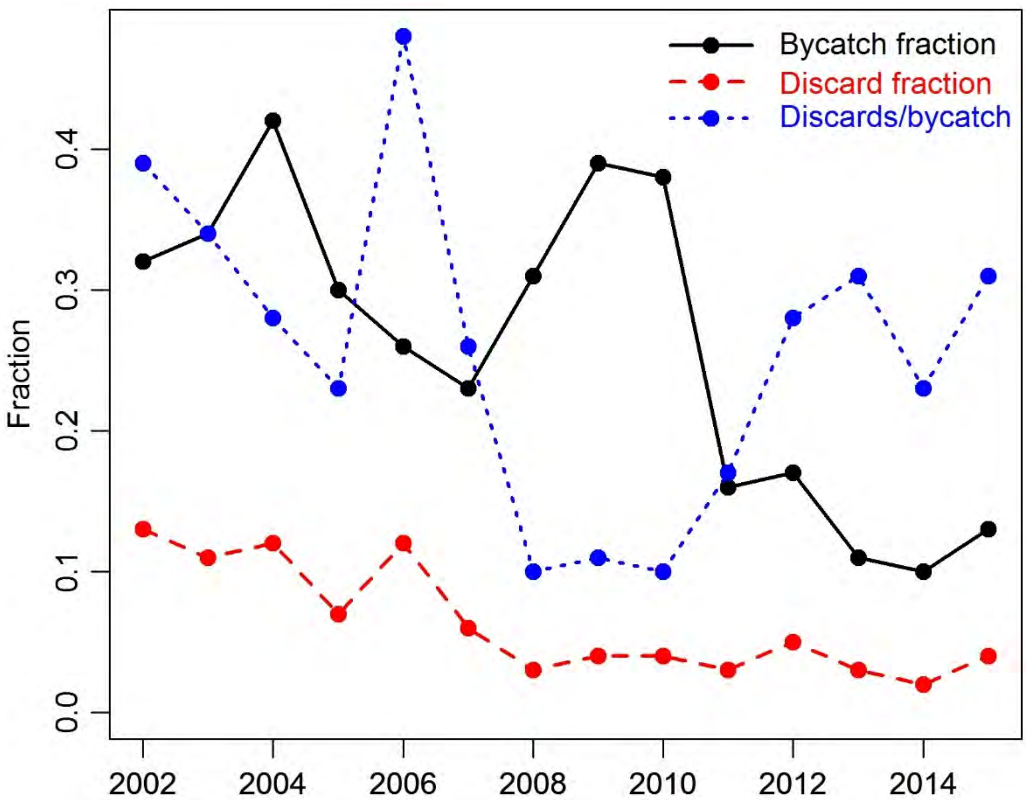



**Figure A14: Bycatch and discard fractions in the target orange roughy fishery. Bycatch fraction, total bycatch divided by total estimated orange roughy catch; Discard fraction, total discards divided by total estimated orange roughy catch; Discards/bycatch, total discards divided by total bycatch.**

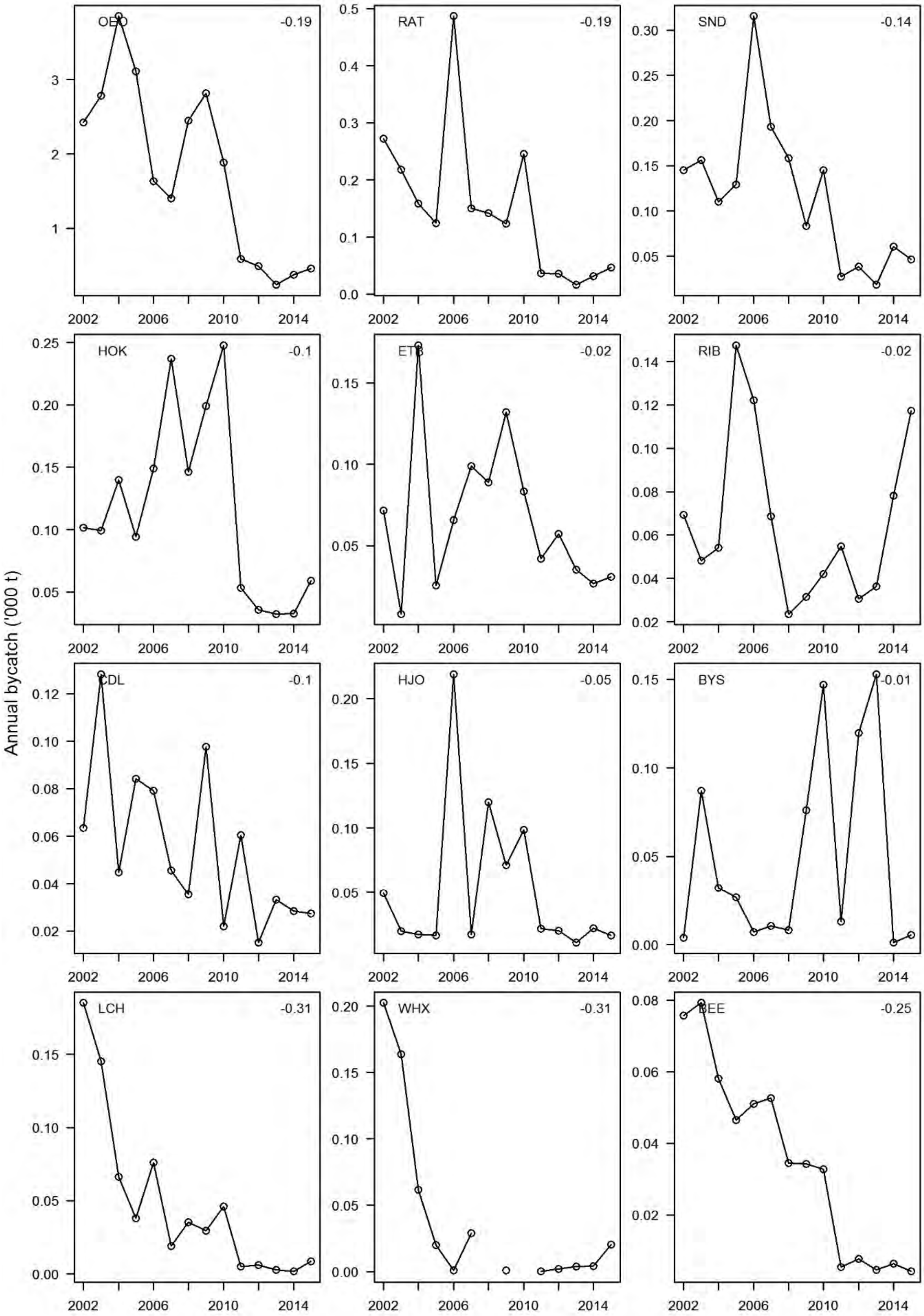



**Figure A15: Annual bycatch estimates in the orange roughy target trawl fishery for a selection of the main bycatch species by catch weight between 2001–02 and 2014–15. See Tables A1 and A2 for species code definitions. The slope of a regression through the data points is shown in the top right. Note: the scale changes on the y-axis between plots; lines are joined only where there are data points for consecutive years.**

## APPENDIX B: SUMMARY DATA TABLES FOR THE OREO FISHERY

**Table B1: Observed FISH catch and discards for target oreo 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 oreo trawl fishery from 1 Oct 2001 to 30 Sep 2015. Records are ordered by decreasing percentage of catch. Codes in bold are QMS species (as of 1 October 2016); codes in italics are Schedule 6 QMA species (can legally be returned to the sea). [Continued on next page]**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| SSO | Smooth oreo | *Pseudocyttus maculatus* | 33 846.3 | 64.01 | 0.07 |
| BOE | Black oreo | *Allocyttus niger* | 16 593.3 | 31.38 | 0.04 |
| ORH | Orange roughy | *Hoplostethus atlanticus* | 1 027.7 | 1.94 | 0.00 |
| ETB | Baxter’s lantern dogfish | *Etmopterus baxteri* | 292.3 | 0.55 | 19.90 |
| RAT | Rattails | Macrouridae | 193.7 | 0.37 | 57.84 |
| **HOK** | Hoki | *Macruronus novaezelandiae* | 189.3 | 0.36 | 0.12 |
| OEO | Oreos | *P. maculatus, A. niger, & N. rhomboidalis* | 123.9 | 0.23 | 0.00 |
| MCA | Ridge-scaled rattail | *Macrourus carinatus* | 98.9 | 0.19 | 1.19 |
| SLK | Slickhead | Alepocephalidae | 74.2 | 0.14 | 54.44 |
| DWD | Deepwater dogfish | - | 56.8 | 0.11 | 53.00 |
| BSH | Seal shark | *Dalatias licha* | 52.9 | 0.10 | 91.28 |
| ETM | Etmopterus sp | *Etmopterus* sp. | 45.4 | 0.09 | 70.68 |
| BEE | Basketwork eel | *Diastobranchus capensis* | 42.1 | 0.08 | 88.22 |
| OSD | Other sharks and dogs | Selachii | 30.8 | 0.06 | 45.28 |
| MOD | Morid cods | Moridae | 23.5 | 0.04 | 45.91 |
| HJO | Johnson's cod | *Halargyreus johnsonii* | 20.7 | 0.04 | 35.02 |
| JAV | Javelin fish | *Lepidorhynchus denticulatus* | 19.0 | 0.04 | 83.34 |
| **GSP** | Pale ghost shark | *Hydrolagus bemisi* | 16.7 | 0.03 | 1.55 |
| SOR | Spiky oreo | *Neocyttus rhomboidalis* | 11.2 | 0.02 | 0.09 |
| SND | Shovelnose dogfish | *Deania calcea* | 9.6 | 0.02 | 31.78 |
| VCO | Violet cod | *Antimora rostrata* | 8.5 | 0.02 | 41.28 |
| SQA | Squalus spp | *Squalus* spp. | 8.3 | 0.02 | 93.82 |
| LCH | Long-nosed chimaera | *Harriotta raleighana* | 7.9 | 0.01 | 71.48 |
| CYP | Longnose velvet dogfish | *Centroscymnus crepidater* | 6.4 | 0.01 | 13.44 |
| **HAK** | Hake | *Merluccius australis* | 5.8 | 0.01 | 0.10 |
| GRC | Grenadier cod | *Tripterophycis gilchristi* | 5.5 | 0.01 | 0.09 |
| SSM | Smallscaled brown slickhead | *Alepocephalus antipodianus* | 5.4 | 0.01 | 42.45 |
| ***SSK*** | Smooth skate | *Dipturus innominatus* | 5.4 | 0.01 | 2.00 |
| ETL | Lucifer dogfish | *Etmopterus lucifer* | 3.7 | 0.01 | 38.83 |
| WOE | Warty oreo | *Allocyttus verrucosus* | 2.5 | <0.01 | 76.28 |
| **CDL** | Cardinalfish | Epigonidae | 2.4 | <0.01 | 1.53 |
| SMC | Small-headed cod | *Lepidion microcephalus* | 2.3 | <0.01 | 16.70 |
| CHI | Chimaera spp. | *Chimaera* spp. | 2.3 | <0.01 | 83.82 |
| CHG | Giant chimaera | *Chimaera lignaria* | 2.1 | <0.01 | 73.99 |
| BSL | Black slickhead | *Xenodermichthys* spp. | 2.0 | <0.01 | 100.00 |
| **RIB** | Ribaldo | *Mora moro* | 1.8 | <0.01 | 0.06 |
| **WWA** | White warehou | *Seriolella caerulea* | 1.7 | <0.01 | 0.00 |
| BBE | Banded bellowsfish | *Centriscops humerosus* | 1.7 | <0.01 | 12.78 |
| CHP | Chimaera, brown | *Chimaera* sp. | 1.6 | <0.01 | 86.93 |
| ***SPD*** | Spiny dogfish | *Squalus acanthias* | 1.6 | <0.01 | 100.00 |
| **LIN** | Ling | *Genypterus blacodes* | 1.6 | <0.01 | 0.00 |
| ROC | Rock cod | *Lotella rhacinus* | 1.3 | <0.01 | 98.15 |
| CSQ | Leafscale gulper shark | *Centrophorus squamosus* | 1.1 | <0.01 | 27.38 |
| PLS | Plunket's shark | *Proscymnodon plunketi* | 1.1 | <0.01 | 17.14 |
| CMU | Abyssal rattail | *Coryphaenoides murrayi* | 1.1 | <0.01 | 100.00 |
| APR | Catshark | *Apristurus* spp. | 1.1 | <0.01 | 38.26 |
| SNR | Rough shovelnose dogfish | *Deania histricosa* | 0.9 | <0.01 | 10.44 |
| HYD | | *Hydrolagus* sp. | 0.8 | <0.01 | 100.00 |
| RAG | Ragfish | *Pseudoicichthys australis* | 0.8 | <0.01 | 77.46 |
| **SBW** | Southern blue whiting | *Micromesistius australis* | 0.8 | <0.01 | 0.00 |

**Table B1 [Continued]:**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| NOR | Tubeshoulder | *Normichthys yahganorum* | 0.7 | <0.01 | 100.00 |
| LEG | Giant lepidion | *Lepidion schmidti & Lepidion inosimae* | 0.6 | <0.01 | 53.55 |
| TOA | Toadfish | *Neophrynichthys* sp. | 0.6 | <0.01 | 94.52 |
| CBI | Two saddle rattail | *Coelorinchus biclinozonalis* | 0.6 | <0.01 | 100.00 |
| **GSH** | Dark ghost shark | *Hydrolagus novaezealandiae* | 0.5 | <0.01 | 12.85 |
| BJA | Black javelinfish | *Mesobius antipodum* | 0.5 | <0.01 | 0.00 |
| EPL | Bigeye cardinalfish | *Epigonus lenimen* | 0.5 | <0.01 | 66.95 |
| PSY | | *Psychrolutes microporos* | 0.5 | <0.01 | 57.42 |
| DWE | Deepwater eel | - | 0.4 | <0.01 | 100.00 |
| SBK | Spineback | *Notacanthus sexspinis* | 0.4 | <0.01 | 65.74 |
| BTH | Bluntnose skates deepsea skates | *Notoraja* spp. | 0.4 | <0.01 | 88.47 |
| RCH | Widenosed chimaera | *Rhinochimaera pacifica* | 0.4 | <0.01 | 93.14 |
| PSK | Longnosed deepsea skate | *Bathyraja shuntovi* | 0.4 | <0.01 | 61.88 |
| WIT | Witch | *Arnoglossus scapha* | 0.4 | <0.01 | 96.59 |
| LAN | Lantern fish | Myctophidae | 0.4 | <0.01 | 91.51 |
| RUD | Rudderfish | *Centrolophus niger* | 0.4 | <0.01 | 100.00 |
| DSK | Deepwater spiny skate (arctic skate) | *Amblyraja hyperborea* | 0.3 | <0.01 | 100.00 |
| SCM | Largespine velvet dogfish | *Centroscymnus macracanthus* | 0.3 | <0.01 | 32.28 |
| EEL | Eels, marine | - | 0.3 | <0.01 | 85.08 |
| CYO | Smooth skin dogfish | *Centroscymnus owstoni* | 0.3 | <0.01 | 51.19 |
| OSK | Skate other | Rajidae | 0.3 | <0.01 | 72.54 |
| SBI | Bigscaled brown slickhead | *Alepocephalus australis* | 0.3 | <0.01 | 53.85 |
| SKA | Skate | Rajidae Arhynchobatidae (Families) | 0.3 | <0.01 | 99.62 |
| CYL | Portuguese dogfish | *Centroscymnus coelolepis* | 0.2 | <0.01 | 45.89 |
| **MOO** | Moonfish | *Lampris guttatus* | 0.2 | <0.01 | 0.00 |
| LPI | Giant lepidion | *Lepidion inosimae* | 0.2 | <0.01 | 78.26 |
| ***RSK*** | Rough skate | *Zearaja nasuta* | 0.2 | <0.01 | 20.74 |
| CON | Conger eel | *Conger* spp. | 0.2 | <0.01 | 89.40 |
| **LDO** | Lookdown dory | *Cyttus traversi* | 0.2 | <0.01 | 0.46 |
| HGB | Giant black ghost shark | *Hydrolagus* sp. d | 0.2 | <0.01 | 70.05 |
| SDE | Seadevil | *Cryptopsaras couesii* | 0.2 | <0.01 | 25.81 |
| ***PTO*** | Patagonian toothfish | *Dissostichus eleginoides* | 0.2 | <0.01 | 0.00 |
| IBR | Cookiecutter shark | *Isistius brasiliensis* | 0.2 | <0.01 | 0.00 |
| LAE | | *Laemonema* spp. | 0.2 | <0.01 | 96.05 |
| TOP | Pale toadfish | *Ambophthalmos angustus* | 0.2 | <0.01 | 93.10 |
| CSH | Catshark | - | 0.2 | <0.01 | 50.63 |
| SHA | Shark | - | 0.2 | <0.01 | 100.00 |
| TUB | | *Tubbia tasmanica* | 0.1 | <0.01 | 100.00 |
| DRE | Regan's lanternfish | *Diaphus regani* | 0.1 | <0.01 | 0.00 |
| SBR | Southern bastard cod | *Pseudophycis barbata* | 0.1 | <0.01 | 100.00 |
| UFISH | Unidentified | - | 0.1 | <0.01 | 36.62 |
| **SPE** | Sea perch | *Helicolenus* spp. | 0.1 | <0.01 | 0.82 |
| SYN | | Synaphobranchidae | 0.1 | <0.01 | 87.50 |
| **BNS** | Bluenose | *Hyperoglyphe antarctica* | 0.1 | <0.01 | 0.00 |
| EPR | Robust cardinalfish | *Epigonus robustus* | 0.1 | <0.01 | 30.17 |
| COD | Cod | - | 0.1 | <0.01 | 72.12 |
| MOR | Moray eel | Muraenidae | 0.1 | <0.01 | 100.00 |
| RHY | Common roughy | *Paratrachichthys trailli* | 0.1 | <0.01 | 100.00 |
| NEX | Snipe eels | Nemichthyidae | 0.1 | <0.01 | 93.10 |
| WHR | Unicorn rattail | *Trachyrincus longirostris* | 0.1 | <0.01 | 6.67 |

**Table B2: Observed INVERTEBRATE bycatch and discards for oreo 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 oreo trawl fishery from 1 Oct 2001 to 30 Sep 2015. 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). [Continued on next page]**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| COU | Coral (unspecified) | Various Orders & Families | 60.3 | 0.11 | 100.00 |
| WSQ | Warty squid | *Onykia* spp. | 32.7 | 0.06 | 87.63 |
| SVA | | *Solenosmilia variabilis* | 24.2 | 0.05 | 0.05 |
| GDU | Bushy hard coral | *Goniocorella dumosa* | 12.1 | 0.02 | 17.60 |
| PAB | Bubblegum coral | *Paragorgia arborea* | 3.4 | 0.01 | 45.53 |
| TAM | Tam O shanter urchin | Echinothurioida | 3.2 | 0.01 | 75.64 |
| MOC | | *Madrepora oculata* | 3.1 | 0.01 | 100.00 |
| CBD | Coral rubble - dead | - | 2.5 | <0.01 | 93.33 |
| HTH | Sea cucumber | *Holothurian unidentified* | 2.2 | <0.01 | 21.56 |
| MIQ | Warty squid | *Onykia ingens* | 1.4 | <0.01 | 80.40 |
| SIA | Stony corals | Scleractinia | 1.0 | <0.01 | 100.00 |
| CHR | Golden coral | *Chrysogorgia* spp. | 0.9 | <0.01 | 74.58 |
| URO | Sea urchin other | - | 0.8 | <0.01 | 88.05 |
| **SQU** | Arrow squid | *Nototodarus sloanii & N. gouldi* | 0.6 | <0.01 | 47.75 |
| ***SCC*** | Sea cucumber | *Stichopus mollis* | 0.5 | <0.01 | 98.63 |
| PSL | | *Paralomis dosleini* | 0.5 | <0.01 | 100.00 |
| ONG | Sponges | Porifera | 0.5 | <0.01 | 76.74 |
| **KIC** [1] | King crab | *Lithodes murrayi, Neolithodes brodiei* | 0.5 | <0.01 | 12.21 |
| NEB | Brodie's king crab | *Neolithodes brodiei* | 0.4 | <0.01 | 13.93 |
| DWO | Deepwater octopus | *Graneledone* spp. | 0.4 | <0.01 | 100.00 |
| SFI | Starfish | Asteroidea & Ophiuroidea | 0.4 | <0.01 | 84.38 |
| GRM | Sea urchin | *Gracilechinus multidentatus* | 0.4 | <0.01 | 84.31 |
| DDI | | *Desmophyllum dianthus* | 0.3 | <0.01 | 3.24 |
| JFI | Jellyfish | - | 0.3 | <0.01 | 32.40 |
| CAY | | *Caryophyllia* spp. | 0.3 | <0.01 | 96.77 |
| OCT | Octopus | *Pinnoctopus cordiformis* | 0.3 | <0.01 | 85.86 |
| ISI | Bamboo corals | Isididae | 0.3 | <0.01 | 71.24 |
| OSP | Pacific oyster spat | *Crassostrea gigas* | 0.3 | <0.01 | 100.00 |
| HYA | Floppy tubular sponge | *Hyalascus* sp. | 0.2 | <0.01 | 0.43 |
| TSQ | | *Todarodes filippovae* | 0.2 | <0.01 | 88.74 |
| OPH | Ophiuroid (brittle star) | - | 0.2 | <0.01 | 92.61 |
| GOC | Gorgonian coral | Gorgonacea | 0.2 | <0.01 | 100.00 |
| LMU | Murray's king crab | *Lithodes murrayi* | 0.2 | <0.01 | 3.10 |
| ACS | Smooth deepsea anemones | Actinostolidae | 0.2 | <0.01 | 27.65 |
| BOO | Bamboo coral | *Keratoisis* spp. | 0.2 | <0.01 | 9.24 |
| CBB | Coral rubble | - | 0.1 | <0.01 | 17.24 |
| PMN | | *Primnoa* spp. | 0.1 | <0.01 | 100.00 |
| ECH | Echinoderms | Echinodermata | 0.1 | <0.01 | 84.73 |
| SOT | | *Solaster torulatus* | 0.1 | <0.01 | 66.72 |
| GSQ | Giant squid | *Architeuthis* spp. | 0.1 | <0.01 | 78.33 |
| PMO | | *Pseudostichopus mollis* | 0.1 | <0.01 | 47.06 |
| CRB | Crab | - | 0.1 | <0.01 | 83.51 |
| VSQ | Violet squid | *Histioteuthis* spp. | 0.1 | <0.01 | 67.05 |
| ECN | Echinoid (sea urchin) | - | 0.1 | <0.01 | 97.70 |
| OPC | | *Ophiocreas* spp. | 0.1 | <0.01 | 100.00 |
| DHO | Sea urchin | *Dermechinus horridus* | 0.1 | <0.01 | 86.70 |
| ERO | Deepwater branching coral | *Enallopsammia rostrata* | 0.1 | <0.01 | 100.00 |
| MRQ | Warty squid | *Onykia robsoni* | 0.1 | <0.01 | 79.01 |
| GLS | Glass sponges | Hexactinellida | 0.1 | <0.01 | 100.00 |
| PAO | | *Pillsburiaster aoteanus* | 0.1 | <0.01 | 84.79 |

**Table B2 [Continued]:**

| Species code | Common name | Scientific name | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|---|---|
| PSQ | Large red scaly squid | *Pholidoteuthis massyae* | 0.1 | <0.01 | 95.83 |
| PRA | Prawn | - | 0.1 | <0.01 | 87.50 |
| HTR | Trojan starfish | *Hippasteria phrygiana* | 0.1 | <0.01 | 73.53 |
| ANT | Anemones | Anthozoa | 0.1 | <0.01 | 48.53 |
| HDR | Hydroid | Hydrozoa | 0.1 | <0.01 | 1.52 |
| SPI | Spider crab | - | 0.1 | <0.01 | 46.88 |
| COR | Hydrocorals | Stylasteridae | 0.1 | <0.01 | 87.03 |
| CPA | Pentagon star | *Ceramaster patagonicus* | 0.1 | <0.01 | 78.57 |
| CLL | Precious coral | *Corallium* spp. | 0.1 | <0.01 | 100.00 |
| HMT | Deepsea anemone | Hormathiidae | 0.1 | <0.01 | 51.53 |
| FMA | | *Fusitriton magellanicus* | 0.1 | <0.01 | 71.71 |
| LPT | Spiny lace coral | *Lepidotheca* spp. | 0.1 | <0.01 | 100.00 |
| PSI | Geometric star | *Psilaster acuminatus* | <1 | <0.01 | 53.06 |
| COB | Black coral | Antipatharia | <1 | <0.01 | 22.77 |
| RSQ | | *Ommastrephes bartrami* | <1 | <0.01 | 86.84 |
| OPI | Umbrella octopus | *Opisthoteuthis* spp. | <1 | <0.01 | 78.95 |
| BNO | | *Benthoctopus* spp. | <1 | <0.01 | 75.00 |
| ZOR | Rat-tail star | *Zoroaster* spp. | <1 | <0.01 | 96.88 |
| BTD | | *Benthodytes* sp. | <1 | <0.01 | 6.25 |
| ASR | Asteroid (starfish) | - | <1 | <0.01 | 100.00 |
| OCP | Octopod | - | <1 | <0.01 | 86.67 |
| PED | Scarlet prawn | *Aristaeopsis edwardsiana* | <1 | <0.01 | 86.21 |
| LLT | Long-spined king crab | *Lithodes* cf. *longispinus* | <1 | <0.01 | 57.14 |
| GOR | | *Gorgonocephalus* spp. | <1 | <0.01 | 82.14 |
| AWA | | *Astrothorax waitei* | <1 | <0.01 | 36.90 |
| PSE | Sea urchin | *Pseudechinus* spp. | <1 | <0.01 | 96.15 |
| CJA | Sun star | *Crossaster multispinus* | <1 | <0.01 | 69.23 |
| ODT | Pentagonal tooth-star | *Odontaster* spp. | <1 | <0.01 | 92.00 |
| PTA | Deepwater prawn | *Pasiphaea* aff. *tarda* | <1 | <0.01 | 63.64 |
| EPZ | | *Epizoanthus spp.* | <1 | <0.01 | 18.26 |
| NAT | Natant decapod | - | <1 | <0.01 | 71.43 |
| DSO | Demosponges | Demospongiae | <1 | <0.01 | 100.00 |
| DMG | | *Dipsacaster magnificus* | <1 | <0.01 | 39.41 |
| KSP | Kina spat | *Evechinus chloroticus* | <1 | <0.01 | 100.00 |
| BES | | *Benthopecten* spp. | <1 | <0.01 | 73.68 |
| ACN | Bushy bamboo coral | *Acanella* spp. | <1 | <0.01 | 100.00 |
| ACA | Subantarctic ruby prawn | *Acanthephyra* spp. | <1 | <0.01 | 27.78 |
| GAS | Gastropods | Gastropoda | <1 | <0.01 | 100.00 |
| BTE | | *Benthoctopus tegginmathae* | <1 | <0.01 | 100.00 |
| THO | Bottlebrush coral | *Thouarella* spp. | <1 | <0.01 | 100.00 |
| PKN | Abyssal star | *Plutonaster knoxi* | <1 | <0.01 | 83.33 |
| CRN | Sea lily, stalked crinoid | - | <1 | <0.01 | 16.39 |
| PBA | | *Pasiphaea barnardi* | <1 | <0.01 | 91.67 |
| MSL | Starfish | *Mediaster sladeni* | <1 | <0.01 | 91.67 |
| SDM | Pagurid | *Sympagurus dimorphus* | <1 | <0.01 | 81.82 |
| ERR | Red coral | *Errina* spp. | <1 | <0.01 | 45.45 |
| CRU | Crustacea | - | <1 | <0.01 | 18.18 |
| CAL | Giant purple pedinid | *Caenopedina porphyrogigas* | <1 | <0.01 | 100.00 |
| PHB | Grey fibrous massive sponge | *Phorbas* spp. | <1 | <0.01 | 100.00 |
| LHO | Omega prawn | *Lipkius holthuisi* | <1 | <0.01 | 90.00 |

**Table B3: Observed bycatch by species group for oreo target trawls. Estimated catch (t), percentage of total catch, and overall percentage discarded from observer records for the oreo trawl fishery from 1 Oct 2001 to 30 Sep 2015.**

| Group | Observed catch (t) | % of catch | % discarded |
|---|---|---|---|
| **Fish** | | | |
| Oreo (target) | 50 577 | 95.37 | 0.06 |
| Fish (other) | 1 238 | 2.33 | 0.47 |
| Sharks & dogfish | 521 | 0.98 | 40.12 |
| Rattails | 314 | 0.59 | 41.68 |
| Slickhead species | 82 | 0.15 | 55.74 |
| Morid species | 65 | 0.12 | 37.08 |
| Eels | 44 | 0.08 | 88.88 |
| Chimaeras | 25 | 0.05 | 26.70 |
| Rays & Skates | 7 | 0.01 | 22.28 |
| **Invertebrates** | | | |
| Cnidaria | 64 | 0.12 | 99.10 |
| Coral species | 46 | 0.09 | 20.64 |
| Squid | 35 | 0.07 | 86.53 |
| Echinoderms | 9 | 0.02 | 65.66 |
| Crustacea | 2 | <0.01 | 48.06 |
| Sponges | 1 | <0.01 | 59.43 |
| Octopuses | 1 | <0.01 | 97.99 |
| Other molluscs | 0 | <0.01 | 95.72 |

**Table B4: Number of observed trawls targeting oreo by area (see Figure 1 for area boundaries) and fishing year.**

| Fishing year | CHAT | COOK | EAST | NORTH | PUYS | AUCK | STEW | SUBA |
|---|---|---|---|---|---|---|---|---|
| 2002 | 124 | - | 1 | - | 115 | 6 | 171 | 84 |
| 2003 | 81 | - | - | - | 75 | 16 | 28 | 87 |
| 2004 | 94 | - | - | - | 27 | 14 | 72 | 149 |
| 2005 | 148 | - | 1 | - | 5 | 7 | 53 | 218 |
| 2006 | 164 | - | 1 | - | - | - | 6 | 161 |
| 2007 | 160 | - | - | - | 17 | - | 120 | 714 |
| 2008 | 195 | - | - | - | 51 | 12 | 54 | 664 |
| 2009 | 335 | - | - | - | 12 | 6 | 70 | 424 |
| 2010 | 286 | - | 1 | - | 71 | 19 | 44 | 506 |
| 2011 | 211 | - | - | - | 11 | 3 | 23 | 337 |
| 2012 | 189 | - | - | - | 33 | 7 | 22 | 166 |
| 2013 | 56 | - | - | - | 64 | - | 21 | - |
| 2014 | 176 | - | - | - | 8 | 2 | 9 | - |
| 2015 | 163 | - | - | - | 4 | - | 44 | - |

| Fishing year | WCNI | WCSI | NWCH | HOWE | KERM | LOUI | SPRFMO other | Total |
|---|---|---|---|---|---|---|---|---|
| 2002 | - | - | 1 | - | - | - | - | 502 |
| 2003 | - | - | - | - | - | - | - | 287 |
| 2004 | 15 | - | - | - | - | - | - | 371 |
| 2005 | - | - | - | - | - | - | - | 432 |
| 2006 | - | - | - | - | - | 6 | - | 338 |
| 2007 | - | - | - | - | - | - | - | 1 011 |
| 2008 | - | - | - | - | - | - | - | 976 |
| 2009 | - | - | - | 1 | - | - | - | 848 |
| 2010 | - | - | 1 | - | - | - | - | 928 |
| 2011 | - | - | - | - | - | 4 | - | 589 |
| 2012 | - | - | - | - | - | - | - | 417 |
| 2013 | - | - | - | - | - | - | - | 141 |
| 2014 | - | - | - | - | - | - | - | 195 |
| 2015 | - | - | - | - | - | - | - | 211 |

**Table B5: Summary of effort and estimated catch in the target trawl fishery for oreo species, for observed tows and overall, by fishing year. Trips include those with any recorded targeting of oreo species.**

| Fishing year | Number of trawls | | Number of vessels | | Number of trips | | Oreo target catch (t) | | Percentage observed (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Observed | All | Observed | All | Observed | All | Observed | All | Catch | Trawls |
| 2002 | 502 | 2 976 | 11 | 18 | 14 | 134 | 2 625 | 14 487 | 18.1 | 16.9 |
| 2003 | 287 | 2 832 | 7 | 18 | 8 | 136 | 2 227 | 12 845 | 17.3 | 10.1 |
| 2004 | 371 | 2 565 | 7 | 18 | 14 | 131 | 1 884 | 12 054 | 15.6 | 14.5 |
| 2005 | 432 | 2 687 | 8 | 25 | 13 | 135 | 2 845 | 13 311 | 21.4 | 16.1 |
| 2006 | 338 | 2 311 | 11 | 18 | 14 | 117 | 3 675 | 12 838 | 28.6 | 14.6 |
| 2007 | 1 011 | 2 293 | 7 | 16 | 14 | 97 | 6 420 | 13 001 | 49.4 | 44.1 |
| 2008 | 976 | 2 499 | 4 | 11 | 14 | 77 | 6 234 | 13 026 | 47.9 | 39.1 |
| 2009 | 848 | 2 167 | 6 | 10 | 13 | 72 | 5 665 | 12 576 | 45.0 | 39.1 |
| 2010 | 928 | 2 542 | 6 | 12 | 12 | 61 | 5 857 | 14 733 | 39.8 | 36.5 |
| 2011 | 589 | 1 903 | 4 | 10 | 6 | 56 | 4 881 | 12 634 | 38.6 | 31.0 |
| 2012 | 417 | 1 659 | 4 | 8 | 6 | 46 | 3 349 | 11 666 | 28.7 | 25.1 |
| 2013 | 141 | 1 278 | 4 | 8 | 5 | 43 | 1 240 | 9 827 | 12.6 | 11.0 |
| 2014 | 195 | 1 259 | 3 | 8 | 4 | 37 | 2 091 | 9 415 | 22.2 | 15.5 |
| 2015 | 211 | 1 259 | 2 | 6 | 3 | 33 | 1 584 | 9 905 | 16.0 | 16.8 |
| All years | 7 246 | 30 230 | 22 | 43 | 132 | 1 160 | 50 577 | 172 318 | 29.4 | 24.0 |

**Table B6: Summary statistics for the oreo target trawl fisheries, by area, including observer coverage and aspects of data quality for fishing years 2002–15 (e.g., number of tows with positional data).**

| 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 |
|---|---|---|---|---|---|
| SUBA | 65.7 | 11 172 | 31.3 | 100.0 | 1.0 |
| CHAT | 42.7 | 11 121 | 21.3 | 99.9 | 4.9 |
| STEW | 64.5 | 3 009 | 24.5 | 99.9 | 0.9 |
| PUYS | 65.7 | 2 480 | 19.8 | 100.0 | 0.0 |
| SPRFMO other | 26.0 | 1 566 | 0.0 | 100.0 | 0.8 |
| AUCK | 65.7 | 315 | 29.2 | 100.0 | 0.0 |
| EAST | 38.0 | 274 | 1.5 | 100.0 | 22.3 |
| LOUI | 65.7 | 184 | 5.4 | 21.7 | 23.9 |
| COOK | 41.7 | 64 | 0.0 | 100.0 | 26.6 |
| WCNI | 43.7 | 23 | 65.2 | 100.0 | 0.0 |
| NORTH | 43.7 | 15 | 0.0 | 100.0 | 13.3 |
| NWCH | 41.7 | 5 | 40.0 | 100.0 | 40.0 |
| WCSI | 26.0 | 2 | 0.0 | 100.0 | 0.0 |
| HOWE | - | - | - | - | - |
| KERM | - | - | - | - | - |

**Table B7: Number of years of observer data required to provide more than 25 records for bycatch and discard rate calculations for the target oreo fishery. * = fewer than 25 records for the entire period combined, annual rates calculated using data from all areas.**

| Fishing year | CHAT | COOK | EAST | LOUI | PUYS | AUCK | STEW | SUBA | Other |
|---|---|---|---|---|---|---|---|---|---|
| 2002 | 1 | * | * | * | 1 | 3 | 1 | 1 | * |
| 2003 | 1 | * | * | * | 1 | 3 | 1 | 1 | * |
| 2004 | 1 | * | * | * | 1 | 3 | 1 | 1 | * |
| 2005 | 1 | * | * | * | 3 | 5 | 1 | 1 | * |
| 2006 | 1 | * | * | * | 5 | 5 | 3 | 1 | * |
| 2007 | 1 | * | * | * | 3 | 7 | 1 | 1 | * |
| 2008 | 1 | * | * | * | 1 | 5 | 1 | 1 | * |
| 2009 | 1 | * | * | * | 3 | 3 | 1 | 1 | * |
| 2010 | 1 | * | * | * | 1 | 3 | 1 | 1 | * |
| 2011 | 1 | * | * | * | 3 | 3 | 3 | 1 | * |
| 2012 | 1 | * | * | * | 1 | 5 | 3 | 1 | * |
| 2013 | 1 | * | * | * | 1 | 6 | 3 | 3 | * |
| 2014 | 1 | * | * | * | 3 | 6 | 3 | 4 | * |
| 2015 | 1 | * | * | * | 3 | 6 | 2 | 5 | * |

**Table B8: Estimates of annual species bycatch (t) in the oreo target trawl fishery, by standard area, based on the RATIO model. 0.0 is less than 0.1; 95% confidence intervals in parentheses. [Continued on next pages]**

**(a) QMS**

| | Ratio model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | LOUI | | PUYS | |
| 2002 | 66.9 | (12.6–175.3) | 3.8 | (2.1–6.0) | 9.7 | (5.4–15.7) | 0.0 | (0.0–0.0) | 58.0 | (9.4–149.8) |
| 2003 | 43.1 | (5.8–112.5) | 3.3 | (1.4–6.1) | 26.7 | (11.0–51.4) | 0.0 | (0.0–0.0) | 72.4 | (29.2–140.4) |
| 2004 | 246.3 | (38.2–541.3) | 0.9 | (0.3–1.9) | 6.9 | (2.0–13.7) | 4.0 | (1.1–8.3) | 22.5 | (6.0–51.5) |
| 2005 | 349.1 | (209.2–577.5) | 1.0 | (0.1–2.1) | 6.8 | (0.8–15.3) | 28.0 | (3.5–60.8) | 18.5 | (4.4–40.8) |
| 2006 | 95.0 | (27.7–213.6) | 1.9 | (0.9–3.5) | 3.9 | (1.6–7.4) | 0.0 | (0.0–0.0) | 5.8 | (1.8–11.8) |
| 2007 | 446.0 | (118.9–1 037.1) | 0.4 | (0.1–1.1) | 0.8 | (0.1–2.4) | 5.3 | (0.8–13.8) | 0.9 | (0.4–1.6) |
| 2008 | 78.8 | (38.1–135.9) | 0.0 | (0.0–0.1) | 0.1 | (0.1–0.2) | 0.0 | (0.0–0.0) | 7.0 | (1.1–16.3) |
| 2009 | 198.6 | (95.3–319.4) | 0.4 | (0.0–0.7) | 0.6 | (0.1–1.1) | 0.0 | (0.0–0.0) | 1.0 | (0.3–2.2) |
| 2010 | 399.9 | (228.5–709.5) | 0.0 | (0.0–0.0) | 0.4 | (0.1–0.9) | 0.0 | (0.0–0.0) | 0.4 | (0.1–0.8) |
| 2011 | 26.7 | (9.4–49.5) | 0.0 | (0.0–0.0) | 0.6 | (0.1–2.0) | 0.1 | (0.0–0.4) | 2.5 | (0.9–4.8) |
| 2012 | 154.1 | (64.4–314.8) | 0.0 | (0.0–0.0) | 0.2 | (0.1–0.3) | 0.0 | (0.0–0.0) | 1.4 | (0.4–2.7) |
| 2013 | 64.1 | (16.5–149.6) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 100 | (0.9–24.9) |
| 2014 | 18.5 | (12.0–28.8) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.4) | 0.0 | (0.0–0.0) | 65.4 | (4.6–168.3) |
| 2015 | 140.7 | (53.5–308.8) | 0.0 | (0.0–0.0) | 0.1 | (0.1–0.3) | 0.0 | (0.0–0.0) | 3.0 | (0.3–8.2) |

**(a) QMS, *continued.***

| | Ratio model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | Other | |
| 2002 | 9.9 | (3.8–18.9) | 71.2 | (44.7–104.1) | 10.2 | (2.1–23.0) | 35.4 | (20.2–58.3) |
| 2003 | 15.5 | (5.9–29.1) | 21.6 | (0.9–61.3) | 486.9 | (87.2–1 096.8) | 99.8 | (43.8–189.9) |
| 2004 | 6.6 | (2.3–12.3) | 6.0 | (4.8–6.8) | 6.4 | (1.4–18.5) | 51.3 | (12.1–97.6) |
| 2005 | 0.2 | (0.1–0.5) | 24.3 | (4.4–51.5) | 14.7 | (3.3–30.5) | 62.6 | (7.8–137.3) |
| 2006 | 2.1 | (0.2–6.4) | 17.7 | (6.5–44.1) | 146.6 | (37.6–363.1) | 59.5 | (26.1–112.4) |
| 2007 | 2.5 | (0.8–5.2) | 1.6 | (1.2–2.1) | 6.8 | (4.0–10.7) | 19.7 | (3.7–55.8) |
| 2008 | 12.1 | (3.3–25.7) | 0.9 | (0.6–1.4) | 5.2 | (3.3–7.9) | 0.0 | (0.0–0.1) |
| 2009 | 16.8 | (4.0–35.4) | 3.5 | (0.6–7.3) | 6.9 | (5.3–8.9) | 0.2 | (0.0–0.4) |
| 2010 | 11.0 | (1.2–31.6) | 0.9 | (0.6–1.3) | 45.3 | (13.8–88.4) | 0.2 | (0.1–0.5) |
| 2011 | 39.4 | (8.1–101.0) | 5.2 | (1.7–10.8) | 6.8 | (5.0–8.9) | 0.1 | (0.0–0.4) |
| 2012 | 7.2 | (1.6–18.1) | 29.8 | (13.3–51.4) | 4.7 | (2.7–8.4) | 0.0 | (0.0–0.0) |
| 2013 | 0.0 | (0.0–0.0) | 50.8 | (26.6–82.1) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.0) |
| 2014 | 51.9 | (11.7–126.6) | 20.6 | (10.7–34.5) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2015 | 12.3 | (2.8–29.4) | 0.3 | (0.1–0.5) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |

**Table B8 [Continued]:**

**(b) NON-QMS**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 83.4 (42.7–119.5) | 4.7 (3.3–6.5) | 12.2 (8.4–16.5) | 0.0 (0.0–0.0) | 14.6 (12.0–18.0) |
| 2003 | 63.4 (46.5–91.2) | 1.8 (1.4–2.2) | 14.4 (11.1–18.2) | 0.0 (0.0–0.0) | 49.1 (31.4–81.1) |
| 2004 | 97.9 (57.0–143.3) | 0.5 (0.3–0.9) | 4.0 (2.2–6.1) | 2.3 (1.3–3.6) | 20.7 (15.8–26.8) |
| 2005 | 81.6 (62.5–117.2) | 0.5 (0.2–0.7) | 3.3 (1.7–5.2) | 13.4 (7.0–21.3) | 19.6 (15.2–24.7) |
| 2006 | 104.7 (71.9–155.9) | 1.9 (1.4–2.6) | 3.8 (2.8–5.3) | 0.0 (0.0–0.0) | 9.7 (4.4–14.3) |
| 2007 | 65.8 (41.6–99.0) | 0.3 (0.3–0.4) | 0.7 (0.6–0.8) | 4.2 (3.7–4.8) | 2.1 (1.2–3.7) |
| 2008 | 116.1 (91.6–148.1) | 0.1 (0.1–0.2) | 0.4 (0.4–0.4) | 0.0 (0.0–0.0) | 15.5 (5.1–35.5) |
| 2009 | 105.1 (84.4–128.0) | 0.4 (0.2–0.4) | 0.5 (0.4–0.6) | 0.0 (0.0–0.0) | 2.3 (1.6–3.4) |
| 2010 | 155.2 (117.2–197.8) | 0.0 (0.0–0.0) | 0.3 (0.2–0.5) | 0.0 (0.0–0.0) | 0.6 (0.5–0.9) |
| 2011 | 103.2 (81.3–127.8) | 0.0 (0.0–0.0) | 0.5 (0.4–0.7) | 0.1 (0.1–0.1) | 3.4 (2.8–4.2) |
| 2012 | 151.8 (117.7–205.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 1.8 (1.2–2.5) |
| 2013 | 186.3 (137.8–251.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.0 (0.7–1.4) |
| 2014 | 116.0 (97.3–146.0) | 0.0 (0.0–0.0) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) | 8.4 (6.1–10.9) |
| 2015 | 188.2 (135.0–256.3) | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) | 0.0 (0.0–0.0) | 0.4 (0.3–0.5) |

**(b) NON-QMS, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 3.4 (2.1–5.0) | 170.6 (106.6–256.9) | 51.3 (17.6–102.0) | 44.7 (32.1–59.1) |
| 2003 | 5.2 (3.3–8.1) | 136.1 (37.9–323.8) | 102.7 (75.3–159.7) | 52.6 (40.1–66.0) |
| 2004 | 2.8 (1.8–4.0) | 26.4 (17.9–38.1) | 60.3 (38.7–75.9) | 29.3 (17.4–45.8) |
| 2005 | 0.1 (0.1–0.2) | 22.6 (16.3–30.3) | 76.9 (41.4–157.6) | 30.4 (15.5–48.1) |
| 2006 | 0.4 (0.3–0.6) | 41.4 (34.2–49.6) | 148.3 (83.7–217.7) | 61.5 (45.9–83.3) |
| 2007 | 0.3 (0.2–0.4) | 6.3 (5.3–7.5) | 45.8 (41.2–50.5) | 16.1 (14.3–18.0) |
| 2008 | 0.8 (0.6–1.0) | 7.8 (5.2–11.1) | 63.4 (56.4–71.1) | 0.1 (0.1–0.2) |
| 2009 | 1.1 (0.8–1.4) | 11.1 (7.1–18.2) | 83.5 (75.9–90.8) | 0.2 (0.1–0.2) |
| 2010 | 0.3 (0.2–0.4) | 25.5 (5.5–61.5) | 91.3 (83.7–100.0) | 0.2 (0.1–0.2) |
| 2011 | 0.9 (0.7–1.3) | 17.9 (5.3–41.7) | 45.4 (39.1–52.0) | 0.1 (0.1–0.1) |
| 2012 | 0.2 (0.2–0.3) | 11.5 (7.3–18.8) | 30.1 (25.5–36.1) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 12.9 (8.7–18.9) | 0.2 (0.2–0.3) | 0.0 (0.0–0.0) |
| 2014 | 1.4 (1.0–1.9) | 9.9 (7.0–13.6) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) |
| 2015 | 0.3 (0.2–0.4) | 0.4 (0.2–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(c) INV**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 2.7 (1.1–4.5) | 1.5 (0.5–3.4) | 3.8 (1.3–8.8) | 0.0 (0.0–0.0) | 51.7 (12.7–133.7) |
| 2003 | 4.8 (2.4–8.1) | 1.1 (0.2–3.6) | 9.2 (1.9–28.6) | 0.0 (0.0–0.0) | 130.1 (21.5–423.5) |
| 2004 | 3.8 (1.6–7.0) | 0.0 (0.0–0.1) | 0.2 (0.1–0.7) | 0.2 (0.1–0.4) | 1.5 (0.8–2.3) |
| 2005 | 10.7 (3.4–26.2) | 0.0 (0.0–0.1) | 0.4 (0.2–0.7) | 1.4 (0.7–2.7) | 1.2 (0.7–1.9) |
| 2006 | 3.4 (2.3–4.6) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 10.6 (0.8–36.1) |
| 2007 | 3.6 (1.8–5.9) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.4 (0.3–0.7) | 3.8 (0.7–9.3) |
| 2008 | 4.1 (2.7–6.7) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 41.2 (7.0–109.9) |
| 2009 | 8.2 (5.4–11.9) | 0.1 (0.0–0.2) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 1.9 (0.4–4.6) |
| 2010 | 4.9 (3.5–6.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.3) |
| 2011 | 4.0 (2.8–5.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.8 (0.2–1.6) |
| 2012 | 10.2 (6.6–15.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2013 | 9.5 (5.9–14.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) |
| 2014 | 6.9 (5.1–8.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.1 (0.7–1.7) |
| 2015 | 10.6 (7.5–14.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |

**Table B8 [Continued]:**

**(c) INV, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | SQUAK | STEW | SUBA | Other |
| 2002 | 1.6 (0.7–2.7) | 6.6 (5.3–8.1) | 1.3 (0.0–3.9) | 13.5 (4.5–34.3) |
| 2003 | 2.3 (1.0–4.1) | 0.8 (0.1–2.5) | 6.2 (2.9–10.8) | 32.1 (6.3–105.0) |
| 2004 | 0.8 (0.2–1.6) | 1.1 (0.5–1.6) | 2.1 (0.4–3.2) | 1.9 (0.8–5.8) |
| 2005 | 0.0 (0.0–0.1) | 1.1 (0.7–1.6) | 9.2 (4.0–17.4) | 3.4 (1.7–6.2) |
| 2006 | 0.1 (0.0–0.3) | 3.1 (2.1–4.6) | 5.9 (2.7–10.1) | 2.1 (1.6–2.9) |
| 2007 | 0.1 (0.0–0.2) | 0.5 (0.4–0.8) | 4.1 (2.4–7.3) | 1.6 (1.0–2.6) |
| 2008 | 0.3 (0.0–0.8) | 0.6 (0.3–1.1) | 16.3 (7.0–34.2) | 0.0 (0.0–0.1) |
| 2009 | 0.4 (0.1–1.1) | 0.5 (0.3–0.8) | 35.1 (5.5–121.7) | 0.0 (0.0–0.1) |
| 2010 | 0.0 (0.0–0.1) | 0.5 (0.3–0.7) | 8.1 (5.8–11.8) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.1–0.2) | 0.3 (0.2–0.5) | 2.1 (1.5–2.8) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.4 (0.3–0.6) | 2.2 (1.7–2.7) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.7 (0.5–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.2 (0.1–0.3) | 0.4 (0.3–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(d) Coral species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 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) |
| 2003 | 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) |
| 2004 | 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) |
| 2005 | 1.5 (0.0–4.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.1 (0.0–0.4) | 0.0 (0.0–0.0) |
| 2006 | 0.3 (0.0–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 10.3 (0.0–35.5) |
| 2007 | 0.5 (0.0–1.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 3.7 (0.7–9.4) |
| 2008 | 1.0 (0.0–3.8) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 40.9 (6.8–106.6) |
| 2009 | 0.1 (0.0–0.3) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 1.9 (0.4–4.7) |
| 2010 | 0.7 (0.3–1.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) |
| 2011 | 0.4 (0.0–0.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.7 (0.2–1.5) |
| 2012 | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2014 | 0.4 (0.0–1.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.6 (0.2–1.2) |
| 2015 | 0.8 (0.2–1.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(d) Coral species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | SQUAK | STEW | SUBA | Other |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.3 (0.0–0.8) | 0.3 (0.0–1.0) |
| 2006 | 0.0 (0.0–0.2) | 0.4 (0.0–1.6) | 1.5 (0.1–4.8) | 0.4 (0.1–0.8) |
| 2007 | 0.0 (0.0–0.1) | 0.1 (0.0–0.3) | 0.5 (0.2–0.9) | 0.4 (0.1–1.2) |
| 2008 | 0.2 (0.0–0.7) | 0.1 (0.0–0.2) | 9.3 (0.6–26.3) | 0.0 (0.0–0.0) |
| 2009 | 0.3 (0.0–0.9) | 0.0 (0.0–0.0) | 30.5 (0.7–117.0) | 0.0 (0.0–0.1) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 2.8 (0.9–6.4) | 0.0 (0.0–0.0) |
| 2011 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.3 (0.1–0.7) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.2–0.8) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 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 B8 [Continued]:

### (e) Morid species

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 2.4 (1.1–3.7) | 0.1 (0.0–0.1) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.3 (0.1–0.4) |
| 2003 | 3.5 (1.3–6.7) | 0.0 (0.0–0.1) | 0.3 (0.1–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.2) |
| 2004 | 4.5 (1.7–9.1) | 0.0 (0.0–0.1) | 0.2 (0.1–0.4) | 0.1 (0.0–0.2) | 0.4 (0.1–0.9) |
| 2005 | 3.9 (2.7–5.8) | 0.0 (0.0–0.1) | 0.3 (0.1–0.6) | 1.1 (0.5–2.2) | 0.3 (0.1–0.8) |
| 2006 | 8.5 (4.6–15.4) | 0.1 (0.0–0.2) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.2 (0.0–0.4) |
| 2007 | 8.2 (4.0–15.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2008 | 15.3 (10.7–21.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 12.5 (8.1–18.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2010 | 10.7 (7.2–16.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 13.7 (10.3–17.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) |
| 2012 | 22.6 (16.5–29.8) | 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 | 33.2 (21.5–47.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 20.9 (14.3–27.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) |
| 2015 | 28.4 (20.7–38.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

### (e) Morid species, *continued.*

| | Ratio model | | | |
|---|---|---|---|---|
| | SQUAK | STEW | SUBA | Other |
| 2002 | 0.1 (0.0–0.4) | 1.4 (0.9–2.0) | 0.0 (0.0–0.1) | 0.6 (0.3–0.9) |
| 2003 | 0.1 (0.0–0.6) | 1.3 (0.0–4.2) | 0.8 (0.1–2.0) | 1.1 (0.4–2.1) |
| 2004 | 0.1 (0.0–0.3) | 1.1 (0.4–2.1) | 2.7 (0.0–8.0) | 1.7 (0.6–3.0) |
| 2005 | 0.0 (0.0–0.0) | 0.6 (0.4–1.0) | 12.6 (5.7–23.1) | 2.5 (1.1–5.3) |
| 2006 | 0.0 (0.0–0.2) | 0.9 (0.6–1.2) | 1.1 (0.3–2.4) | 3.0 (1.7–5.5) |
| 2007 | 0.0 (0.0–0.1) | 0.1 (0.1–0.2) | 1.1 (0.5–2.1) | 0.7 (0.2–1.4) |
| 2008 | 0.1 (0.0–0.1) | 0.2 (0.1–0.4) | 0.9 (0.6–1.2) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.1–0.2) | 0.2 (0.1–0.3) | 1.6 (1.2–2.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 3.5 (2.2–6.0) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.1) | 0.1 (0.0–0.1) | 0.9 (0.6–1.1) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) | 0.4 (0.2–0.5) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.2 (0.1–0.3) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

### (f) Rattail species

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 17.1 (8.2–24.9) | 1.1 (0.7–1.7) | 2.8 (1.8–4.3) | 0.0 (0.0–0.0) | 2.9 (2.0–4.0) |
| 2003 | 19.5 (14.7–28.2) | 0.5 (0.4–0.7) | 4.1 (3.0–5.8) | 0.0 (0.0–0.0) | 4.0 (0.1–10.7) |
| 2004 | 15.2 (7.3–27.0) | 0.2 (0.0–0.3) | 1.1 (0.4–1.9) | 0.6 (0.2–1.1) | 5.6 (3.9–7.6) |
| 2005 | 8.1 (3.6–15.3) | 0.1 (0.0–0.3) | 0.9 (0.3–2.1) | 3.7 (1.2–9.0) | 5.4 (3.9–7.1) |
| 2006 | 27.4 (17.5–40.7) | 0.8 (0.6–1.2) | 1.6 (1.1–2.3) | 0.0 (0.0–0.0) | 1.7 (0.2–3.6) |
| 2007 | 7.6 (4.3–11.4) | 0.2 (0.1–0.2) | 0.3 (0.2–0.4) | 1.9 (1.4–2.4) | 0.3 (0.2–0.4) |
| 2008 | 28.7 (17.9–43.3) | 0.1 (0.0–0.1) | 0.2 (0.1–0.2) | 0.0 (0.0–0.0) | 0.6 (0.3–1.1) |
| 2009 | 19.0 (13.6–25.2) | 0.1 (0.1–0.1) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.5 (0.2–0.9) |
| 2010 | 14.9 (10.3–20.6) | 0.0 (0.0–0.0) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) | 0.2 (0.1–0.4) |
| 2011 | 24.3 (17.6–34.9) | 0.0 (0.0–0.0) | 0.2 (0.2–0.2) | 0.0 (0.0–0.0) | 1.0 (0.5–1.8) |
| 2012 | 15.7 (12.1–19.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.1–1.0) |
| 2013 | 39.1 (23.6–57.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) |
| 2014 | 15.0 (10.2–20.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.1 (0.6–1.8) |
| 2015 | 27.5 (19.6–37.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |

**Table B8 [Continued]:**

**(f) Rattail species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 1.8 (0.9–3.1) | 31.2 (24.5–40.5) | 35.5 (3.2–88.5) | 10.2 (7.0–15.7) |
| 2003 | 2.8 (1.5–4.9) | 26.2 (5.4–67.2) | 45.4 (29.8–70.9) | 14.8 (9.8–21.4) |
| 2004 | 1.7 (1.0–2.7) | 6.9 (2.5–13.2) | 29.1 (2.6–42.5) | 8.2 (3.1–13.9) |
| 2005 | 0.1 (0.0–0.1) | 6.1 (4.1–8.4) | 38.2 (7.6–107.8) | 8.6 (2.6–21.0) |
| 2006 | 0.2 (0.1–0.4) | 13.9 (10.7–16.9) | 96.9 (41.2–166.6) | 25.6 (17.2–36.2) |
| 2007 | 0.1 (0.1–0.2) | 2.2 (1.7–2.7) | 27.1 (23.7–30.8) | 7.3 (5.2–9.1) |
| 2008 | 0.3 (0.2–0.4) | 1.8 (0.9–3.1) | 32.7 (27.7–38.4) | 0.1 (0.0–0.1) |
| 2009 | 0.4 (0.3–0.6) | 2.1 (1.6–2.7) | 37.7 (32.6–43.5) | 0.0 (0.0–0.0) |
| 2010 | 0.1 (0.1–0.1) | 1.1 (0.8–1.5) | 38.7 (34.3–43.5) | 0.0 (0.0–0.0) |
| 2011 | 0.3 (0.2–0.5) | 1.2 (0.9–1.6) | 26.1 (21.5–31.1) | 0.0 (0.0–0.0) |
| 2012 | 0.1 (0.0–0.1) | 2.6 (2.0–3.4) | 14.5 (11.3–18.4) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 2.6 (2.0–3.3) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) |
| 2014 | 0.5 (0.3–0.7) | 2.1 (1.5–2.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.1 (0.1–0.2) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(g) Slickhead species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 1.8 (0.4–4.3) | 0.2 (0.1–0.3) | 0.5 (0.3–0.7) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) |
| 2003 | 1.6 (0.4–4.0) | 0.1 (0.0–0.1) | 0.6 (0.3–1.1) | 0.0 (0.0–0.0) | 0.8 (0.0–3.0) |
| 2004 | 6.5 (2.1–11.9) | 0.0 (0.0–0.1) | 0.3 (0.2–0.7) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2005 | 1.4 (0.8–2.3) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.6 (0.2–1.0) | 0.0 (0.0–0.1) |
| 2006 | 5.8 (2.8–10.2) | 0.1 (0.0–0.1) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.2 (0.1–0.4) |
| 2007 | 2.7 (1.2–4.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.2–0.4) | 0.1 (0.0–0.1) |
| 2008 | 8.4 (5.4–11.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.3 (0.0–0.6) |
| 2009 | 16.4 (9.3–26.0) | 0.0 (0.0–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) |
| 2010 | 14.8 (4.8–36.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2011 | 6.1 (4.2–8.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.3) |
| 2012 | 12.4 (9.0–16.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2013 | 10.6 (6.6–16.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2014 | 19.6 (7.2–36.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.2 (0.1–0.4) |
| 2015 | 26.1 (12.1–50.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(g) Slickhead species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.2 (0.0–0.7) | 8.7 (6.0–12.0) | 0.0 (0.0–0.0) | 1.7 (1.2–2.5) |
| 2003 | 0.4 (0.0–1.1) | 7.1 (0.0–17.2) | 6.7 (3.2–12.2) | 2.2 (1.0–3.9) |
| 2004 | 0.2 (0.0–0.5) | 5.0 (2.2–7.5) | 5.2 (3.5–7.2) | 2.5 (1.2–5.6) |
| 2005 | 0.0 (0.0–0.0) | 1.5 (1.0–2.3) | 4.4 (1.9–9.6) | 1.3 (0.5–2.4) |
| 2006 | 0.0 (0.0–0.0) | 3.2 (1.5–4.7) | 3.9 (2.2–5.7) | 2.6 (1.5–4.3) |
| 2007 | 0.0 (0.0–0.0) | 0.6 (0.4–0.8) | 2.5 (1.8–3.6) | 1.0 (0.6–1.4) |
| 2008 | 0.0 (0.0–0.1) | 2.0 (1.1–3.3) | 4.6 (3.5–6.0) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.1) | 1.6 (1.1–2.4) | 3.0 (2.4–3.6) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 2.9 (1.3–5.3) | 5.8 (4.9–6.8) | 0.0 (0.0–0.0) |
| 2011 | 0.0 (0.0–0.1) | 2.5 (1.2–4.3) | 2.5 (1.8–3.3) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 3.9 (1.0–12.3) | 1.9 (1.3–2.6) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 5.0 (1.5–9.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.1 (0.0–0.2) | 3.4 (1.8–5.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

## Table B8 [Continued]:

**(h) Shark species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 23.0 (11.7–39.7) | 2.8 (1.7–4.3) | 7.0 (4.3–10.8) | 0.0 (0.0–0.0) | 10.7 (8.3–13.8) |
| 2003 | 22.7 (13.7–33.8) | 0.4 (0.3–0.6) | 3.5 (2.2–5.4) | 0.0 (0.0–0.0) | 10.3 (0.9–25.4) |
| 2004 | 45.4 (18.6–94.2) | 0.2 (0.1–0.4) | 1.7 (0.9–2.9) | 1.0 (0.5–1.7) | 10.6 (8.4–13.4) |
| 2005 | 20.0 (14.7–30.1) | 0.1 (0.1–0.2) | 0.9 (0.6–1.3) | 3.6 (2.4–5.2) | 10.3 (8.1–12.7) |
| 2006 | 33.6 (14.3–84.9) | 0.5 (0.3–1.1) | 1.0 (0.5–2.0) | 0.0 (0.0–0.0) | 6.7 (3.2–11.5) |
| 2007 | 37.1 (13.6–70.3) | 0.1 (0.1–0.2) | 0.2 (0.2–0.3) | 1.4 (1.0–2.0) | 1.7 (0.9–3.2) |
| 2008 | 55.0 (42.3–72.7) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 14.3 (4.2–33.5) |
| 2009 | 50.3 (37.6–67.1) | 0.2 (0.1–0.2) | 0.2 (0.2–0.3) | 0.0 (0.0–0.0) | 1.6 (1.0–2.5) |
| 2010 | 108.8 (82.6–144.9) | 0.0 (0.0–0.0) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.4 (0.3–0.5) |
| 2011 | 49.1 (38.1–63.0) | 0.0 (0.0–0.0) | 0.2 (0.2–0.3) | 0.0 (0.0–0.1) | 2.0 (1.6–2.5) |
| 2012 | 89.2 (59.2–138.3) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 1.1 (0.6–1.7) |
| 2013 | 94.5 (67.9–126.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.8 (0.6–1.2) |
| 2014 | 50.6 (41.2–65.3) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 6.6 (4.5–9.3) |
| 2015 | 95.6 (64.3–138.3) | 0.0 (0.0–0.0) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) | 0.3 (0.2–0.4) |

**(h) Shark species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | SQUAK | STEW | SUBA | Other |
| 2002 | 0.7 (0.5–1.1) | 122.1 (63.8–205.7) | 12.1 (8.7–17.6) | 25.9 (15.0–40.8) |
| 2003 | 1.1 (0.7–1.6) | 13.3 (4.4–25.3) | 24.9 (14.0–41.3) | 12.7 (8.7–18.7) |
| 2004 | 0.5 (0.3–0.7) | 11.9 (6.3–19.8) | 18.3 (13.5–25.1) | 12.4 (7.0–23.2) |
| 2005 | 0.0 (0.0–0.0) | 10.5 (6.5–16.0) | 17.1 (12.1–22.7) | 8.1 (5.5–11.9) |
| 2006 | 0.1 (0.1–0.2) | 18.6 (14.2–25.6) | 27.4 (6.8–51.5) | 15.8 (8.4–32.9) |
| 2007 | 0.1 (0.1–0.1) | 2.9 (2.2–3.6) | 10.7 (9.5–12.2) | 5.5 (3.9–7.8) |
| 2008 | 0.3 (0.2–0.5) | 1.3 (0.6–2.4) | 17.8 (15.8–19.8) | 0.0 (0.0–0.0) |
| 2009 | 0.5 (0.3–0.7) | 6.9 (3.0–14.6) | 34.4 (30.8–38.7) | 0.1 (0.1–0.1) |
| 2010 | 0.1 (0.1–0.2) | 21.6 (1.9–59.0) | 38.4 (34.2–42.8) | 0.1 (0.0–0.2) |
| 2011 | 0.4 (0.3–0.6) | 14.2 (2.0–37.4) | 13.9 (11.4–16.6) | 0.0 (0.0–0.1) |
| 2012 | 0.1 (0.1–0.1) | 4.3 (2.6–6.8) | 11.5 (9.4–14.1) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 4.9 (2.9–8.2) | 0.1 (0.1–0.1) | 0.0 (0.0–0.0) |
| 2014 | 0.6 (0.4–0.9) | 3.8 (2.3–5.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.1 (0.1–0.2) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(i) Schedule 6 species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 0.1 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 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) |
| 2006 | 0.2 (0.0–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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 (0.0–0.0) |
| 2008 | 4.6 (0.0–18.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.2) | 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 | 1.6 (0.0–6.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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) |
| 2012 | 16.7 (0.0–51.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 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 | 0.1 (0.0–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**Table B8 [Continued]:**

**(i) Schedule 6 species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.1 (0.0–0.4) | 0.2 (0.0–0.9) | 0.0 (0.0–0.1) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 1.6 (0.0–4.3) | 0.2 (0.0–0.5) |
| 2004 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.2) | 0.0 (0.0–0.1) |
| 2005 | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.3) | 0.0 (0.0–0.1) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) |
| 2007 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2011 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(j) Spiny dogfish**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 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) |
| 2003 | 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) |
| 2004 | 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) |
| 2005 | 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) |
| 2006 | 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) |
| 2007 | 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 | 4.6 (0.0–18.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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 (0.0–0.0) |
| 2010 | 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) |
| 2011 | 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) |
| 2012 | 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) |
| 2013 | 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 | 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 | 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) |

**(j) Spiny dogfish, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 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 | 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 B8 [Continued]:**

**(k) Total**

| | Ratio model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | LOUI | | PUYS | |
| 2002 | 152.9 | (56.3–299.4) | 9.9 | (5.9–15.9) | 25.6 | (15.1–41.0) | 0.0 | (0.0–0.0) | 124.3 | (34.1–301.5) |
| 2003 | 111.4 | (54.6–211.8) | 6.2 | (3.0–11.9) | 50.3 | (24.0–98.2) | 0.0 | (0.0–0.0) | 251.6 | (82.1–645.0) |
| 2004 | 348.0 | (96.8–691.6) | 1.4 | (0.6–2.8) | 11.1 | (4.3–20.6) | 6.4 | (2.5–12.4) | 44.7 | (22.7–80.5) |
| 2005 | 441.4 | (275.1–720.9) | 1.5 | (0.4–3.0) | 10.4 | (2.7–21.1) | 42.8 | (11.1–84.8) | 39.3 | (20.3–67.5) |
| 2006 | 203.1 | (101.9–374.1) | 3.8 | (2.3–6.2) | 7.9 | (4.4–12.8) | 0.0 | (0.0–0.0) | 26.1 | (7.0–62.3) |
| 2007 | 515.3 | (162.3–1 142.1) | 0.8 | (0.4–1.5) | 1.6 | (0.8–3.2) | 9.9 | (4.8–19.3) | 6.8 | (2.3–14.6) |
| 2008 | 198.9 | (132.3–290.7) | 0.2 | (0.2–0.3) | 0.6 | (0.5–0.8) | 0.0 | (0.0–0.0) | 63.7 | (13.2–161.7) |
| 2009 | 311.8 | (185.2–459.3) | 0.8 | (0.3–1.3) | 1.2 | (0.4–1.9) | 0.0 | (0.0–0.0) | 5.2 | (2.3–10.2) |
| 2010 | 560.0 | (349.1–914.1) | 0.0 | (0.0–0.0) | 0.8 | (0.3–1.4) | 0.0 | (0.0–0.0) | 1.1 | (0.6–2.1) |
| 2011 | 133.9 | (93.6–182.8) | 0.0 | (0.0–0.0) | 1.1 | (0.5–2.8) | 0.2 | (0.1–0.6) | 6.7 | (3.9–10.7) |
| 2012 | 316.0 | (188.7–535.1) | 0.0 | (0.0–0.0) | 0.3 | (0.2–0.4) | 0.0 | (0.0–0.0) | 3.2 | (1.6–5.3) |
| 2013 | 259.8 | (160.2–415.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 11.1 | (1.7–26.4) |
| 2014 | 141.4 | (114.5–183.3) | 0.0 | (0.0–0.0) | 0.4 | (0.3–0.8) | 0.0 | (0.0–0.0) | 74.9 | (11.4–180.9) |
| 2015 | 339.5 | (195.9–579.5) | 0.0 | (0.0–0.0) | 0.3 | (0.2–0.5) | 0.0 | (0.0–0.0) | 3.4 | (0.6–8.8) |

**(j) Total, *continued.***

| | Ratio model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | Other | |
| 2002 | 14.9 | (6.5–26.6) | 248.5 | (156.5–369.1) | 62.8 | (19.8–128.9) | 93.6 | (56.9–151.7) |
| 2003 | 23.0 | (10.1–41.2) | 158.5 | (38.8–387.6) | 595.8 | (165.4–1 267.2) | 184.5 | (90.2–360.9) |
| 2004 | 10.3 | (4.3–17.9) | 33.5 | (23.3–46.5) | 68.7 | (40.5–97.6) | 82.5 | (30.3–149.2) |
| 2005 | 0.4 | (0.2–0.7) | 48.0 | (21.4–83.4) | 100.7 | (48.7–205.5) | 96.5 | (25.0–191.6) |
| 2006 | 2.6 | (0.5–7.3) | 62.3 | (42.7–98.3) | 300.8 | (124.0–590.9) | 123.1 | (73.6–198.6) |
| 2007 | 2.9 | (1.0–5.7) | 8.5 | (6.9–10.4) | 56.7 | (47.5–68.4) | 37.4 | (18.9–76.4) |
| 2008 | 13.1 | (3.9–27.5) | 9.4 | (6.1–13.6) | 84.9 | (66.7–113.2) | 0.2 | (0.2–0.3) |
| 2009 | 18.3 | (4.8–37.9) | 15.1 | (8.0–26.3) | 125.6 | (86.7–221.5) | 0.4 | (0.1–0.6) |
| 2010 | 11.3 | (1.4–32.1) | 27.0 | (6.4–63.5) | 144.7 | (103.3–200.2) | 0.4 | (0.2–0.7) |
| 2011 | 40.5 | (8.9–102.5) | 23.4 | (7.2–53.0) | 54.2 | (45.6–63.8) | 0.2 | (0.1–0.5) |
| 2012 | 7.4 | (1.8–18.4) | 41.7 | (20.9–70.8) | 37.1 | (29.9–47.3) | 0.0 | (0.0–0.0) |
| 2013 | 0.0 | (0.0–0.0) | 64.4 | (35.7–101.9) | 0.3 | (0.2–0.4) | 0.0 | (0.0–0.0) |
| 2014 | 53.5 | (12.8–128.8) | 30.9 | (18.1–48.6) | 0.1 | (0.1–0.1) | 0.0 | (0.0–0.0) |
| 2015 | 12.7 | (3.0–29.9) | 0.6 | (0.3–1.1) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |

**Table B9: Estimates of annual species categories bycatch in the oreo target trawl fishery rounded to the nearest 1 t, by standard area, based on the STATISTICAL model; 95% confidence intervals in parentheses. – is N/A; 95% confidence intervals in parentheses. [Continued on next pages]**

**(a) QMS**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 52 | (38–75) | 12 | (2–73) | – | – | 0 | (0–0) | 39 | (34–48) |
| 2003 | 59 | (42–90) | – | – | – | – | – | – | 69 | (46–108) |
| 2004 | 209 | (154–298) | – | – | – | – | – | – | 36 | (17–78) |
| 2005 | 374 | (285–505) | 2 | (0–18) | – | – | – | – | 14 | (2–97) |
| 2006 | 114 | (93–145) | 2 | (0–10) | 0 | (0–0) | – | – | – | – |
| 2007 | 312 | (256–396) | – | – | – | – | – | – | 4 | (2–10) |
| 2008 | 112 | (85–148) | – | – | – | – | – | – | 14 | (6–36) |
| 2009 | 246 | (231–264) | – | – | – | – | – | – | 1 | (0–3) |
| 2010 | 521 | (445–621) | 0 | (0–1) | – | – | 0 | (0–0) | 4 | (3–4) |
| 2011 | 33 | (24–48) | – | – | 0 | (0–0) | – | – | 5 | (2–12) |
| 2012 | 142 | (109–189) | – | – | – | – | – | – | 4 | (3–7) |
| 2013 | 48 | (27–84) | – | – | – | – | – | – | 32 | (31–33) |
| 2014 | 46 | (33–65) | – | – | – | – | – | – | 9 | (2–31) |
| 2015 | 132 | (95–189) | – | – | – | – | – | – | 1 | (0–2) |

**(a) QMS, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 4 | (2–15) | 114 | (85–156) | 17 | (9–35) | – | – |
| 2003 | 31 | (14–77) | 34 | (10–125) | 230 | (144–405) | – | – |
| 2004 | 8 | (5–16) | 8 | (4–18) | 12 | (7–21) | 22 | (17–34) |
| 2005 | 0 | (0–0) | 27 | (17–49) | 23 | (15–35) | – | – |
| 2006 | – | – | 29 | (9–98) | 95 | (72–132) | – | – |
| 2007 | – | – | 10 | (9–12) | 17 | (15–18) | – | – |
| 2008 | 15 | (13–22) | 3 | (2–6) | 13 | (11–14) | – | – |
| 2009 | 2 | (1–6) | 5 | (4–7) | 17 | (14–21) | – | – |
| 2010 | 17 | (16–18) | 3 | (2–5) | 50 | (45–56) | – | – |
| 2011 | 61 | (54–91) | 2 | (1–9) | 20 | (16–26) | – | – |
| 2012 | 15 | (13–20) | 24 | (14–46) | 11 | (8–15) | – | – |
| 2013 | – | – | 69 | (35–159) | – | – | – | – |
| 2014 | 3 | (1–14) | 19 | (12–42) | – | – | – | – |
| 2015 | – | – | 6 | (6–6) | – | – | – | – |

**(b) NON-QMS**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 130 | (105–160) | 21 | (5–99) | – | – | 0 | (0–0) | 27 | (22–32) |
| 2003 | 79 | (63–100) | – | – | – | – | – | – | 53 | (42–69) |
| 2004 | 122 | (97–156) | – | – | – | – | – | – | 34 | (22–54) |
| 2005 | 106 | (90–126) | 2 | (1–11) | – | – | – | – | 30 | (11–79) |
| 2006 | 155 | (135–180) | 1 | (0–5) | 0 | (0–0) | – | – | – | – |
| 2007 | 84 | (71–100) | – | – | – | – | – | – | 8 | (6–13) |
| 2008 | 170 | (148–199) | – | – | – | – | – | – | 9 | (6–13) |
| 2009 | 203 | (188–219) | – | – | – | – | – | – | 4 | (3–7) |
| 2010 | 221 | (198–247) | 0 | (0–0) | – | – | 1 | (1–1) | 7 | (7–7) |
| 2011 | 166 | (141–196) | – | – | 0 | (0–0) | – | – | 6 | (3–11) |
| 2012 | 211 | (180–248) | – | – | – | – | – | – | 5 | (4–6) |
| 2013 | 278 | (204–381) | – | – | – | – | – | – | 4 | (4–4) |
| 2014 | 192 | (163–229) | – | – | – | – | – | – | 17 | (8–37) |
| 2015 | 187 | (154–229) | – | – | – | – | – | – | 2 | (1–4) |

**Table B9 [Continued]:**

**(b) NON-QMS, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 4 | (2–11) | 179 | (157–206) | 63 | (48–83) | – | – |
| 2003 | 12 | (7–21) | 94 | (61–148) | 101 | (77–133) | – | – |
| 2004 | 4 | (2–8) | 20 | (17–25) | 81 | (67–99) | 1 | (0–1) |
| 2005 | 1 | (1–1) | 39 | (29–53) | 79 | (70–91) | – | – |
| 2006 | – | – | 68 | (28–169) | 122 | (105–144) | – | – |
| 2007 | – | – | 35 | (33–38) | 115 | (111–120) | – | – |
| 2008 | 1 | (1–2) | 15 | (12–18) | 144 | (138–152) | – | – |
| 2009 | 2 | (1–6) | 22 | (19–26) | 154 | (141–169) | – | – |
| 2010 | 1 | (1–1) | 34 | (31–37) | 180 | (165–196) | – | – |
| 2011 | 3 | (1–9) | 8 | (5–15) | 81 | (74–89) | – | – |
| 2012 | 1 | (1–2) | 11 | (7–17) | 50 | (43–58) | – | – |
| 2013 | – | – | 24 | (16–37) | – | – | – | – |
| 2014 | 4 | (1–15) | 14 | (7–30) | – | – | – | – |
| 2015 | – | – | 8 | (8–8) | – | – | – | – |

**(c) INV**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 4 | (3–6) | 1 | (0–5) | – | – | 0 | (0–0) | 36 | (32–43) |
| 2003 | 6 | (4–9) | – | – | – | – | – | – | 49 | (42–60) |
| 2004 | 5 | (3–7) | – | – | – | – | – | – | 2 | (1–4) |
| 2005 | 8 | (7–10) | 0 | (0–2) | – | – | – | – | 2 | (0–9) |
| 2006 | 6 | (5–7) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 5 | (4–6) | – | – | – | – | – | – | 3 | (3–3) |
| 2008 | 6 | (5–7) | – | – | – | – | – | – | 13 | (10–17) |
| 2009 | 12 | (11–13) | – | – | – | – | – | – | 0 | (0–1) |
| 2010 | 7 | (6–9) | 0 | (0–0) | – | – | 0 | (0–0) | 1 | (1–1) |
| 2011 | 7 | (6–10) | – | – | 1 | (1–1) | – | – | 2 | (1–3) |
| 2012 | 13 | (10–16) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 12 | (8–20) | – | – | – | – | – | – | 0 | (0–1) |
| 2014 | 11 | (9–14) | – | – | – | – | – | – | 2 | (1–6) |
| 2015 | 16 | (12–22) | – | – | – | – | – | – | 0 | (0–0) |

**(c) INV, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 2 | (1–5) | 12 | (10–16) | 2 | (1–4) | – | – |
| 2003 | 3 | (2–6) | 1 | (0–5) | 7 | (4–11) | – | – |
| 2004 | 1 | (0–1) | 2 | (1–3) | 3 | (2–5) | 1 | (1–1) |
| 2005 | 0 | (0–0) | 2 | (1–3) | 7 | (6–9) | – | – |
| 2006 | – | – | 4 | (1–11) | 8 | (6–10) | – | – |
| 2007 | – | – | 3 | (3–4) | 9 | (9–10) | – | – |
| 2008 | 1 | (0–1) | 1 | (1–1) | 25 | (24–26) | – | – |
| 2009 | 0 | (0–1) | 1 | (1–1) | 26 | (25–27) | – | – |
| 2010 | 0 | (0–0) | 1 | (1–1) | 13 | (12–14) | – | – |
| 2011 | 0 | (0–1) | 0 | (0–0) | 3 | (3–4) | – | – |
| 2012 | 0 | (0–0) | 0 | (0–1) | 4 | (3–5) | – | – |
| 2013 | – | – | 2 | (1–2) | – | – | – | – |
| 2014 | 0 | (0–1) | 1 | (0–2) | – | – | – | – |
| 2015 | – | – | 0 | (0–0) | – | – | – | – |

**Table B9 [Continued]:**

**(d) Coral species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–2) |
| 2003 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–3) |
| 2004 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–2) |
| 2005 | 1 | (0–2) | 0 | (0–1) | – | – | – | – | 2 | (1–8) |
| 2006 | 1 | (1–2) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 1 | (1–2) | – | – | – | – | – | – | 3 | (2–3) |
| 2008 | 2 | (1–3) | – | – | – | – | – | – | 15 | (11–23) |
| 2009 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–1) |
| 2010 | 1 | (1–2) | 0 | (0–0) | – | – | 0 | (0–0) | 1 | (1–1) |
| 2011 | 1 | (0–1) | – | – | 1 | (1–1) | – | – | 1 | (1–2) |
| 2012 | 1 | (0–2) | – | – | – | – | – | – | 0 | (0–1) |
| 2013 | 1 | (0–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 1 | (0–4) | – | – | – | – | – | – | 3 | (1–9) |
| 2015 | 2 | (1–6) | – | – | – | – | – | – | 0 | (0–1) |

**(d) Coral species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2003 | 0 | (0–0) | 0 | (0–0) | 0 | (0–1) | – | – |
| 2004 | 0 | (0–0) | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 0 | (0–0) | 1 | (0–3) | – | – |
| 2006 | – | – | 0 | (0–1) | 3 | (2–6) | – | – |
| 2007 | – | – | 0 | (0–0) | 2 | (1–3) | – | – |
| 2008 | 1 | (0–1) | 0 | (0–0) | 14 | (13–15) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 17 | (17–18) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 3 | (3–4) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 1 | (1–1) | – | – |
| 2012 | 0 | (0–0) | 0 | (0–0) | 1 | (0–1) | – | – |
| 2013 | – | – | 0 | (0–0) | – | – | – | – |
| 2014 | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | – | – | 0 | (0–0) | – | – | – | – |

**(e) Morid species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 5 | (4–7) | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2003 | 3 | (2–5) | – | – | – | – | – | – | 0 | (0–0) |
| 2004 | 8 | (6–10) | – | – | – | – | – | – | 0 | (0–1) |
| 2005 | 14 | (11–17) | 0 | (0–1) | – | – | – | – | 1 | (0–1) |
| 2006 | 10 | (9–11) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 11 | (9–12) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 15 | (13–16) | – | – | – | – | – | – | 0 | (0–1) |
| 2009 | 18 | (17–19) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 18 | (16–20) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 17 | (15–19) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 21 | (18–24) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 24 | (19–32) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 29 | (25–35) | – | – | – | – | – | – | 1 | (1–1) |
| 2015 | 26 | (21–33) | – | – | – | – | – | – | 0 | (0–0) |

**Table B9 [Continued]:**

**(e) Morid species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 0 | (0–0) | 1 | (1–2) | 1 | (0–1) | – | – |
| 2003 | 0 | (0–0) | 1 | (0–1) | 1 | (0–1) | – | – |
| 2004 | 0 | (0–1) | 1 | (1–1) | 2 | (1–2) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 1 | (1–1) | 5 | (5–6) | – | – |
| 2006 | – | – | 1 | (1–1) | 2 | (1–2) | – | – |
| 2007 | – | – | 1 | (0–1) | 2 | (2–3) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | 2 | (2–2) | – | – |
| 2009 | 0 | (0–0) | 1 | (0–1) | 3 | (2–3) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 4 | (4–4) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 2 | (1–2) | – | – |
| 2012 | 0 | (0–0) | 0 | (0–1) | 1 | (1–1) | – | – |
| 2013 | – | – | 1 | (0–1) | – | – | – | – |
| 2014 | 0 | (0–0) | 0 | (0–1) | – | – | – | – |
| 2015 | – | – | 0 | (0–0) | – | – | – | – |

**(f) Rattail species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **EAST** | | **LOUI** | | **NWCH** | | **PUYS** | |
| 2002 | 33 | (28–39) | 1 | (0–4) | – | – | 0 | (0–0) | 7 | (6–8) |
| 2003 | 21 | (17–25) | – | – | – | – | – | – | 7 | (6–10) |
| 2004 | 14 | (12–16) | – | – | – | – | – | – | 3 | (3–4) |
| 2005 | 12 | (11–13) | 0 | (0–0) | – | – | – | – | 1 | (1–2) |
| 2006 | 30 | (26–34) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 24 | (21–28) | – | – | – | – | – | – | 1 | (1–1) |
| 2008 | 34 | (31–38) | – | – | – | – | – | – | 5 | (4–7) |
| 2009 | 33 | (31–35) | – | – | – | – | – | – | 1 | (1–1) |
| 2010 | 29 | (26–33) | 0 | (0–0) | – | – | 0 | (0–0) | 2 | (2–2) |
| 2011 | 36 | (32–41) | – | – | 0 | (0–0) | – | – | 1 | (1–1) |
| 2012 | 28 | (24–33) | – | – | – | – | – | – | 1 | (1–1) |
| 2013 | 34 | (26–45) | – | – | – | – | – | – | 1 | (0–1) |
| 2014 | 28 | (23–34) | – | – | – | – | – | – | 3 | (2–3) |
| 2015 | 39 | (31–49) | – | – | – | – | – | – | 0 | (0–0) |

**(f) Rattail species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 3 | (2–4) | 45 | (39–52) | 51 | (44–60) | – | – |
| 2003 | 5 | (4–7) | 32 | (25–41) | 66 | (53–83) | – | – |
| 2004 | 1 | (1–2) | 9 | (8–10) | 31 | (27–37) | 0 | (0–0) |
| 2005 | 1 | (1–1) | 5 | (4–5) | 26 | (24–29) | – | – |
| 2006 | – | – | 12 | (10–15) | 73 | (64–84) | – | – |
| 2007 | – | – | 9 | (9–10) | 69 | (66–73) | – | – |
| 2008 | 1 | (1–2) | 5 | (5–6) | 74 | (71–78) | – | – |
| 2009 | 2 | (1–2) | 6 | (5–6) | 68 | (62–74) | – | – |
| 2010 | 1 | (0–1) | 3 | (3–3) | 68 | (63–74) | – | – |
| 2011 | 1 | (1–2) | 3 | (3–4) | 50 | (46–56) | – | – |
| 2012 | 0 | (0–0) | 4 | (3–5) | 24 | (21–27) | – | – |
| 2013 | – | – | 4 | (3–5) | – | – | – | – |
| 2014 | 1 | (1–1) | 2 | (2–2) | – | – | – | – |
| 2015 | – | – | 2 | (2–2) | – | – | – | – |

**Table B9 [Continued]:**

**(g) Slickhead species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 3 | (2–4) | 1 | (1–4) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2003 | 3 | (2–5) | – | – | – | – | – | – | 1 | (1–1) |
| 2004 | 5 | (4–7) | – | – | – | – | – | – | 1 | (0–1) |
| 2005 | 4 | (3–5) | 0 | (0–2) | – | – | – | – | 0 | (0–1) |
| 2006 | 7 | (6–8) | 0 | (0–2) | 0 | (0–0) | – | – | – | – |
| 2007 | 5 | (4–6) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 9 | (8–11) | – | – | – | – | – | – | 1 | (1–1) |
| 2009 | 18 | (18–19) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 16 | (15–18) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 8 | (7–10) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 15 | (12–18) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 15 | (10–20) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 19 | (15–23) | – | – | – | – | – | – | 1 | (1–1) |
| 2015 | 23 | (18–29) | – | – | – | – | – | – | 0 | (0–0) |

**(g) Slickhead species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 0 | (0–0) | 9 | (8–11) | 2 | (1–2) | – | – |
| 2003 | 0 | (0–1) | 12 | (8–19) | 5 | (3–7) | – | – |
| 2004 | 0 | (0–0) | 6 | (5–8) | 5 | (4–6) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 3 | (2–3) | 4 | (3–5) | – | – |
| 2006 | – | – | 5 | (4–6) | 6 | (5–7) | – | – |
| 2007 | – | – | 3 | (3–3) | 6 | (5–6) | – | – |
| 2008 | 0 | (0–0) | 3 | (2–3) | 7 | (6–7) | – | – |
| 2009 | 0 | (0–0) | 3 | (3–3) | 6 | (6–7) | – | – |
| 2010 | 0 | (0–0) | 4 | (4–5) | 11 | (10–12) | – | – |
| 2011 | 0 | (0–0) | 1 | (1–2) | 4 | (4–5) | – | – |
| 2012 | 0 | (0–0) | 4 | (3–5) | 4 | (3–5) | – | – |
| 2013 | – | – | 4 | (3–5) | – | – | – | – |
| 2014 | 0 | (0–0) | 2 | (2–3) | – | – | – | – |
| 2015 | – | – | 3 | (3–3) | – | – | – | – |

**(h) Shark species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 62 | (54–72) | 1 | (0–5) | – | – | 0 | (0–0) | 19 | (16–21) |
| 2003 | 26 | (21–32) | – | – | – | – | – | – | 14 | (11–18) |
| 2004 | 45 | (39–52) | – | – | – | – | – | – | 12 | (10–15) |
| 2005 | 36 | (32–42) | 0 | (0–1) | – | – | – | – | 8 | (7–10) |
| 2006 | 39 | (35–44) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 54 | (49–60) | – | – | – | – | – | – | 3 | (3–3) |
| 2008 | 77 | (70–84) | – | – | – | – | – | – | 17 | (14–20) |
| 2009 | 97 | (92–102) | – | – | – | – | – | – | 3 | (3–4) |
| 2010 | 135 | (126–145) | 0 | (0–0) | – | – | 0 | (0–0) | 4 | (4–4) |
| 2011 | 67 | (60–75) | – | – | 0 | (0–0) | – | – | 2 | (2–3) |
| 2012 | 105 | (94–118) | – | – | – | – | – | – | 3 | (3–3) |
| 2013 | 98 | (77–126) | – | – | – | – | – | – | 3 | (3–4) |
| 2014 | 82 | (69–99) | – | – | – | – | – | – | 9 | (7–11) |
| 2015 | 109 | (88–133) | – | – | – | – | – | – | 1 | (0–1) |

## Table B9 [Continued]:

**(h) Shark species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 2 | (1–2) | 75 | (70–82) | 23 | (20–27) | – | – |
| 2003 | 1 | (1–2) | 25 | (19–32) | 19 | (15–24) | – | – |
| 2004 | 1 | (1–1) | 17 | (15–19) | 25 | (22–29) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 10 | (9–12) | 21 | (19–25) | – | – |
| 2006 | – | – | 10 | (8–13) | 23 | (19–27) | – | – |
| 2007 | – | – | 16 | (15–16) | 29 | (28–31) | – | – |
| 2008 | 1 | (1–1) | 6 | (5–7) | 41 | (39–43) | – | – |
| 2009 | 1 | (1–2) | 14 | (13–15) | 59 | (55–64) | – | – |
| 2010 | 1 | (1–1) | 26 | (25–26) | 67 | (63–72) | – | – |
| 2011 | 1 | (0–1) | 4 | (3–4) | 22 | (20–24) | – | – |
| 2012 | 0 | (0–1) | 8 | (7–9) | 20 | (18–22) | – | – |
| 2013 | – | – | 7 | (6–9) | – | – | – | – |
| 2014 | 1 | (1–1) | 4 | (3–5) | – | – | – | – |
| 2015 | – | – | 3 | (3–3) | – | – | – | – |

**(i) Schedule 6 species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **EAST** | | **LOUI** | | **NWCH** | | **PUYS** | |
| 2002 | 0 | (0–1) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2004 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2005 | 0 | (0–1) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 2 | (2–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2009 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 1 | (1–1) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 5 | (4–9) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 0 | (0–3) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2015 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |

**(i) Schedule 6 species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2003 | 0 | (0–0) | 1 | (0–2) | 0 | (0–1) | – | – |
| 2004 | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | – | – | 0 | (0–1) | 0 | (0–0) | – | – |
| 2007 | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | 0 | (0–1) | 0 | (0–1) | – | – |
| 2013 | – | – | 0 | (0–0) | – | – | – | – |
| 2014 | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | – | – | 0 | (0–0) | – | – | – | – |

**Table B9 [Continued]:**

**(j) Spiny dogfish**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **EAST** | | **LOUI** | | **NWCH** | | **PUYS** | |
| 2002 | 0 | (0–1) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2004 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2005 | 0 | (0–1) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 2 | (2–4) | – | – | – | – | – | – | 0 | (0–2) |
| 2009 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–1) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 0 | (0–3) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 0 | (0–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2015 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |

**(j) Spiny dogfish, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2003 | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | – | – |
| 2004 | 0 | (0–0) | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2006 | – | – | 0 | (0–1) | 0 | (0–1) | – | – |
| 2007 | – | – | 0 | (0–0) | 0 | (0–0) | – | – |
| 2008 | 0 | (0–0) | 0 | (0–1) | 0 | (0–1) | – | – |
| 2009 | 0 | (0–0) | 0 | (0–0) | 0 | (0–1) | – | – |
| 2010 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – |
| 2013 | – | – | 0 | (0–0) | – | – | – | – |
| 2014 | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2015 | – | – | 0 | (0–0) | – | – | – | – |

**Table B10: Estimates of total annual bycatch rounded to the nearest t in the oreo target trawl fishery, by species category and fishing year, based on the RATIO model; 95% confidence intervals in parentheses.**

| Fishing year | QMS | | non-QMS | | Invertebrate | | Total bycatch | |
|---|---|---|---|---|---|---|---|---|
| 2002 | 335 | (245–475) | 475 | (375–575) | 106 | (66–196) | 916 | (686–1 246) |
| 2003 | 866 | (456–1 516) | 475 | (365–665) | 234 | (104–524) | 1 575 | (925–2 705) |
| 2004 | 421 | (211–721) | 281 | (241–341) | 13 | (13–23) | 715 | (465–1 085) |
| 2005 | 626 | (456–856) | 303 | (253–383) | 36 | (26–56) | 965 | (735–1 295) |
| 2006 | 423 | (263–663) | 442 | (362–542) | 33 | (13–53) | 898 | (638–1 258) |
| 2007 | 643 | (303–1 243) | 251 | (231–281) | 22 | (22–32) | 916 | (556–1 556) |
| 2008 | 158 | (108–218) | 330 | (300–370) | 91 | (51–171) | 579 | (459–759) |
| 2009 | 415 | (305–535) | 350 | (330–380) | 76 | (36–156) | 841 | (671–1 071) |
| 2010 | 700 | (520–1 010) | 425 | (385–485) | 19 | (19–29) | 1 144 | (924–1 524) |
| 2011 | 147 | (107–217) | 234 | (204–274) | 14 | (14–14) | 395 | (325–505) |
| 2012 | 264 | (174–424) | 257 | (217–307) | 14 | (14–24) | 535 | (405–755) |
| 2013 | 177 | (117–257) | 217 | (167–287) | 11 | (11–11) | 405 | (295–555) |
| 2014 | 173 | (83–303) | 167 | (147–197) | 12 | (12–12) | 352 | (242–512) |
| 2015 | 189 | (99–359) | 228 | (178–298) | 12 | (12–12) | 429 | (289–669) |

| Fishing year | Coral species | | Morid species | | Rattail species | | Slickhead species | |
|---|---|---|---|---|---|---|---|---|
| 2002 | 0 | (0–0) | 11 | (1–11) | 119 | (79–179) | 13 | (13–23) |
| 2003 | 0 | (0–0) | 11 | (1–11) | 133 | (103–183) | 22 | (12–32) |
| 2004 | 0 | (0–0) | 12 | (12–22) | 81 | (51–101) | 24 | (14–34) |
| 2005 | 0 | (0–10) | 24 | (14–34) | 88 | (58–158) | 12 | (12–12) |
| 2006 | 10 | (0–40) | 14 | (14–24) | 200 | (140–270) | 23 | (13–23) |
| 2007 | 13 | (3–13) | 15 | (15–25) | 100 | (90–100) | 17 | (17–17) |
| 2008 | 70 | (30–140) | 26 | (16–26) | 114 | (104–134) | 30 | (20–30) |
| 2009 | 46 | (16–136) | 22 | (22–32) | 99 | (89–109) | 38 | (28–48) |
| 2010 | 3 | (3–13) | 17 | (17–27) | 92 | (82–92) | 34 | (24–64) |
| 2011 | 2 | (2–2) | 15 | (15–25) | 75 | (65–95) | 14 | (14–14) |
| 2012 | 0 | (0–0) | 26 | (26–36) | 42 | (42–52) | 25 | (15–35) |
| 2013 | 0 | (0–0) | 32 | (22–52) | 43 | (33–63) | 22 | (12–22) |
| 2014 | 0 | (0–0) | 25 | (15–35) | 24 | (14–24) | 25 | (15–45) |
| 2015 | 0 | (0–0) | 35 | (25–45) | 36 | (26–46) | 37 | (17–57) |

| Fishing year | Shark species | | Schedule 6 species | | Spiny dogfish | |
|---|---|---|---|---|---|---|
| 2002 | 258 | (188–338) | 5 | (5–5) | 5 | (5–5) |
| 2003 | 101 | (81–131) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 118 | (88–168) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 84 | (74–94) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 130 | (100–180) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 98 | (78–128) | 0 | (0–0) | 0 | (0–0) |
| 2008 | 135 | (115–165) | 2 | (2–22) | 2 | (2–22) |
| 2009 | 163 | (153–183) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 267 | (227–317) | 1 | (1–11) | 0 | (0–0) |
| 2011 | 106 | (86–136) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 141 | (111–191) | 24 | (4–54) | 0 | (0–0) |
| 2013 | 109 | (79–139) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 72 | (62–92) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 118 | (78–158) | 0 | (0–0) | 0 | (0–0) |

**Table B11: Estimates of total annual bycatch in the oreo trawl fishery rounded to the nearest t, by species category and fishing year, based on the STATISTICAL model; 95% confidence intervals in parentheses.**

| Fishing year | QMS | non-QMS | Invertebrate | Total bycatch |
|---|---|---|---|---|
| 2002 | 247 (203–322) | 428 (383–514) | 58 (52–67) | 733 (638–903) |
| 2003 | 439 (325–641) | 342 (293–406) | 68 (59–80) | 849 (677–1 127) |
| 2004 | 299 (237–394) | 265 (230–305) | 13 (11–17) | 577 (478–716) |
| 2005 | 450 (350–605) | 261 (229–316) | 20 (17–28) | 731 (596–949) |
| 2006 | 246 (198–327) | 349 (297–454) | 18 (14–25) | 613 (509–806) |
| 2007 | 343 (288–427) | 243 (228–261) | 20 (19–22) | 606 (535–710) |
| 2008 | 160 (130–202) | 339 (315–369) | 45 (42–50) | 544 (487–621) |
| 2009 | 272 (255–292) | 386 (365–409) | 39 (38–41) | 697 (658–742) |
| 2010 | 594 (519–695) | 443 (415–475) | 23 (21–25) | 1 060 (955–1 195) |
| 2011 | 124 (108–158) | 266 (239–299) | 14 (12–16) | 404 (359–473) |
| 2012 | 198 (161–249) | 277 (246–316) | 17 (15–21) | 492 (422–586) |
| 2013 | 152 (108–245) | 307 (232–411) | 15 (10–22) | 474 (350–678) |
| 2014 | 81 (60–117) | 231 (196–276) | 15 (12–19) | 327 (268–412) |
| 2015 | 139 (102–196) | 197 (164–238) | 16 (12–22) | 352 (278–456) |

| Fishing year | Coral species | Morid species | Rattail species | Slickhead species |
|---|---|---|---|---|
| 2002 | 0 (0–3) | 8 (6–10) | 140 (122–161) | 16 (13–21) |
| 2003 | 0 (0–4) | 5 (3–7) | 131 (106–163) | 22 (15–32) |
| 2004 | 0 (0–3) | 11 (9–15) | 59 (51–68) | 17 (14–21) |
| 2005 | 4 (1–13) | 21 (18–25) | 45 (41–50) | 11 (9–14) |
| 2006 | 4 (2–8) | 12 (11–14) | 115 (102–132) | 18 (15–22) |
| 2007 | 6 (5–8) | 14 (12–15) | 104 (98–110) | 14 (13–15) |
| 2008 | 32 (27–40) | 17 (16–19) | 121 (113–130) | 20 (18–22) |
| 2009 | 18 (17–19) | 22 (20–23) | 109 (101–118) | 28 (26–30) |
| 2010 | 6 (5–7) | 23 (21–25) | 104 (96–112) | 32 (29–35) |
| 2011 | 4 (3–5) | 19 (16–22) | 92 (83–103) | 15 (12–17) |
| 2012 | 2 (1–4) | 23 (20–26) | 57 (50–66) | 23 (19–27) |
| 2013 | 1 (0–2) | 25 (19–33) | 39 (30–51) | 19 (14–25) |
| 2014 | 4 (2–13) | 31 (26–37) | 33 (27–41) | 22 (18–27) |
| 2015 | 2 (1–7) | 26 (21–33) | 41 (33–51) | 25 (21–32) |

| Fishing year | Shark species | Schedule 6 species | Spiny dogfish |
|---|---|---|---|
| 2002 | 183 (166–203) | 1 (0–2) | 0 (0–3) |
| 2003 | 86 (70–106) | 1 (0–4) | 0 (0–3) |
| 2004 | 101 (88–115) | 1 (0–2) | 0 (0–2) |
| 2005 | 77 (67–88) | 0 (0–1) | 0 (0–2) |
| 2006 | 72 (63–83) | 1 (0–2) | 0 (0–2) |
| 2007 | 102 (95–109) | 0 (0–0) | 0 (0–1) |
| 2008 | 141 (131–152) | 2 (2–3) | 2 (2–7) |
| 2009 | 174 (165–185) | 0 (0–0) | 0 (0–2) |
| 2010 | 232 (220–247) | 1 (1–2) | 0 (0–1) |
| 2011 | 96 (87–106) | 0 (0–1) | 0 (0–1) |
| 2012 | 136 (122–152) | 5 (4–11) | 0 (0–1) |
| 2013 | 109 (86–138) | 0 (0–3) | 0 (0–3) |
| 2014 | 96 (80–114) | 0 (0–1) | 0 (0–3) |
| 2015 | 112 (92–137) | 0 (0–1) | 0 (0–1) |

**Table B12: Summary of results of linear regression analyses for trends in annual bycatch, by species category. 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 | -0.055 | 0.128 |
| **NON-QMS** | **-0.061** | **0.009** |
| **INV** | **-0.044** | **0.022** |
| **Total** | **-0.085** | **0.001** |
| **Morid species** | **0.070** | **<0.000** |
| **Rattail species** | **-0.178** | **<0.000** |
| Shark species | -0.013 | 0.582 |
| Slickhead species | 0.025 | 0.410 |

**Table B13: Total annual bycatch estimates for the oreo trawl fishery, based on catch effort records, compared with the ratio method observer-based estimates. Estimates are derived by summing the difference between the recorded total catch and oreo 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 | 601 | 65.6 |
| 2003 | 486 | 30.9 |
| 2004 | 431 | 60.3 |
| 2005 | 892 | 92.4 |
| 2006 | 601 | 66.9 |
| 2007 | 774 | 84.5 |
| 2008 | 322 | 55.6 |
| 2009 | 501 | 59.6 |
| 2010 | 1 132 | 98.9 |
| 2011 | 205 | 51.9 |
| 2012 | 492 | 92.0 |
| 2013 | 345 | 85.2 |
| 2014 | 223 | 63.4 |
| 2015 | 388 | 90.4 |
| All years | 7 393 | 69.3 |

**Table B14: Estimates of annual discards in the oreo target trawl fishery rounded to the nearest 0.1 t, by species category and standard area, based on the RATIO model.**

**(a) OEO**

| | | | | | Ratio model |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.2 (0.0–0.7) | 0.0 (0.0–0.2) | 0.4 (0.0–1.2) | 0.0 (0.0–0.0) | 3.7 (0.4–12.3) |
| 2004 | 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 (0.0–0.0) |
| 2005 | 4.0 (0.0–11.6) | 0.1 (0.0–0.4) | 0.8 (0.0–2.6) | 2.9 (0.0–10.4) | 0.0 (0.0–0.0) |
| 2006 | 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) |
| 2007 | 0.0 (0.0–0.0) | 0.1 (0.0–0.4) | 0.2 (0.0–0.7) | 1.4 (0.0–4.6) | 0.0 (0.0–0.0) |
| 2008 | 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) |
| 2009 | 0.0 (0.0–47.5) | 0.0 (0.0–0.1) | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 1.1 (0.0–3.5) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.6 (0.0–1.7) |
| 2011 | 12.7 (0.0–38.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 1.9 (0.0–5.6) |
| 2012 | 15.9 (0.0–61.8) | 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 | 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 | 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 | 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 B14 [Continued]:**

**(a) OEO, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 1.5 (0.0–4.0) | 1.5 (0.0–6.2) | 0.4 (0.0–0.9) |
| 2003 | 0.0 (0.0–0.0) | 9.4 (0.0–34.0) | 0.0 (0.0–0.1) | 1.4 (0.1–4.5) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 0.0 (0.0–0.0) | 0.4 (0.1–0.8) | 42.9 (0.0–161.6) | 6.8 (0.0–22.9) |
| 2006 | 0.0 (0.0–0.0) | 0.2 (0.0–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 24.6 (1.0–72.0) | 5.2 (0.0–18.2) |
| 2008 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 4.5 (0.0–11.3) | 0.0 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 7.2 (0.4–20.1) | 0.0 (0.0–0.1) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 7.2 (0.0–25.1) | 0.0 (0.0–0.0) |
| 2011 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.6) | 0.0 (0.0–0.0) |
| 2013 | 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 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(b) QMS**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 1.1 (0.0–2.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.2 (0.0–0.6) |
| 2003 | 0.1 (0.0–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 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 (0.0–0.1) |
| 2005 | 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 (0.0–0.1) |
| 2006 | 0.2 (0.0–0.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 0.0 (0.0–0.2) | 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 | 4.5 (0.0–18.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.9) | 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 | 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) |
| 2011 | 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) |
| 2012 | 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) |
| 2013 | 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 | 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 | 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) |

**(b) QMS, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.4) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2004 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.2) | 0.0 (0.0–0.1) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.2 (0.0–0.6) | 0.0 (0.0–0.1) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) | 0.1 (0.0–0.2) |
| 2007 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2011 | 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 | 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 | 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 | 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 | 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 B14 [Continued]:**

**(c) NON-QMS**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 44.4 (31.7–67.8) | 3.6 (2.7–4.8) | 9.2 (6.9–12.5) | 0.0 (0.0–0.0) | 13.8 (11.5–16.5) |
| 2003 | 62.5 (44.9–90.4) | 1.6 (1.2–2.0) | 13.2 (9.9–16.9) | 0.0 (0.0–0.0) | 41.4 (22.0–73.6) |
| 2004 | 96.2 (56.3–142.6) | 0.5 (0.2–0.8) | 3.6 (1.8–5.9) | 2.2 (1.0–3.5) | 14.7 (9.2–21.5) |
| 2005 | 80.6 (61.7–115.9) | 0.4 (0.1–0.6) | 2.4 (1.0–4.0) | 9.9 (4.0–16.4) | 14.7 (10.0–20.2) |
| 2006 | 89.5 (67.7–114.5) | 1.6 (1.2–2.1) | 3.2 (2.3–4.3) | 0.0 (0.0–0.0) | 8.2 (2.7–12.5) |
| 2007 | 43.0 (24.9–66.3) | 0.2 (0.1–0.3) | 0.4 (0.2–0.6) | 2.4 (1.5–3.6) | 1.8 (0.9–3.3) |
| 2008 | 22.3 (15.4–30.4) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 11.4 (1.2–31.8) |
| 2009 | 23.1 (4.7–40.3) | 0.1 (0.1–0.2) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.7 (0.3–1.5) |
| 2010 | 24.6 (11.5–40.2) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) |
| 2011 | 9.2 (6.8–12.8) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.0) | 0.6 (0.4–0.8) |
| 2012 | 35.9 (23.6–49.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.3 (0.2–0.7) |
| 2013 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) |
| 2014 | 26.5 (0.0–61.7) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 1.0 (0.7–1.4) |
| 2015 | 5.9 (4.1–8.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |

**(c) NON-QMS, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 3.2 (1.9–4.9) | 138.0 (90.5–197.1) | 35.3 (16.8–74.2) | 33.8 (25.2–44.9) |
| 2003 | 5.0 (3.0–7.4) | 130.5 (34.0–337.5) | 86.0 (60.5–130.9) | 47.6 (36.2–60.9) |
| 2004 | 2.6 (1.7–3.8) | 23.1 (15.1–35.2) | 56.0 (21.8–76.3) | 27.7 (14.5–45.4) |
| 2005 | 0.1 (0.1–0.1) | 21.6 (15.9–28.1) | 29.2 (23.0–37.1) | 22.3 (9.1–36.4) |
| 2006 | 0.4 (0.2–0.6) | 34.0 (27.0–41.7) | 115.6 (52.1–211.9) | 51.3 (38.9–66.8) |
| 2007 | 0.2 (0.2–0.3) | 4.8 (3.9–5.9) | 22.2 (19.9–24.9) | 9.3 (5.8–14.0) |
| 2008 | 0.4 (0.2–0.6) | 4.0 (2.5–5.9) | 21.3 (17.7–25.0) | 0.0 (0.0–0.0) |
| 2009 | 0.6 (0.3–0.9) | 2.0 (1.5–2.9) | 21.6 (19.6–23.7) | 0.0 (0.0–0.1) |
| 2010 | 0.1 (0.1–0.2) | 3.6 (1.9–6.3) | 24.4 (21.9–27.4) | 0.0 (0.0–0.0) |
| 2011 | 0.3 (0.2–0.5) | 3.2 (1.9–5.0) | 11.0 (8.5–14.0) | 0.0 (0.0–0.0) |
| 2012 | 0.1 (0.0–0.1) | 4.0 (2.7–6.2) | 6.9 (5.5–8.7) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 5.0 (3.5–7.6) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) |
| 2014 | 0.5 (0.3–0.7) | 5.2 (3.6–6.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.1 (0.1–0.2) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(d) INV**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 2.7 (1.0–4.3) | 1.4 (0.5–3.5) | 3.7 (1.2–8.6) | 0.0 (0.0–0.0) | 51.1 (13.1–128.1) |
| 2003 | 4.7 (2.5–8.3) | 1.1 (0.2–3.6) | 9.0 (1.7–29.2) | 0.0 (0.0–0.0) | 127.4 (20.6–431.3) |
| 2004 | 3.1 (0.9–6.6) | 0.0 (0.0–0.1) | 0.2 (0.1–0.7) | 0.1 (0.0–0.4) | 0.5 (0.2–1.1) |
| 2005 | 10.4 (3.1–27.0) | 0.0 (0.0–0.1) | 0.3 (0.1–0.7) | 1.3 (0.5–2.6) | 0.5 (0.2–0.8) |
| 2006 | 3.0 (2.1–4.2) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 2.6 (0.1–10.1) |
| 2007 | 2.5 (0.9–4.7) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.4 (0.2–0.6) | 1.0 (0.1–2.8) |
| 2008 | 1.4 (0.3–3.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2009 | 3.1 (1.9–4.9) | 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 | 2.8 (1.8–4.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 2.7 (1.8–3.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2012 | 8.8 (5.4–13.8) | 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 | 8.7 (5.0–12.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2014 | 3.8 (0.4–8.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.5 (0.3–0.7) |
| 2015 | 1.4 (0.7–2.2) | 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 B14 [Continued]:**

**(d) INV, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 1.4 (0.5–2.4) | 6.5 (5.2–7.9) | 0.7 (0.0–1.6) | 13.4 (4.4–36.4) |
| 2003 | 2.1 (0.8–3.9) | 0.8 (0.0–2.5) | 4.7 (1.7–8.8) | 31.1 (6.0–104.1) |
| 2004 | 0.7 (0.2–1.5) | 1.1 (0.5–1.7) | 1.9 (0.4–3.1) | 1.5 (0.6–5.7) |
| 2005 | 0.0 (0.0–0.0) | 1.0 (0.6–1.4) | 6.2 (2.4–12.6) | 3.0 (1.2–6.1) |
| 2006 | 0.0 (0.0–0.0) | 2.5 (1.6–3.7) | 5.2 (2.4–9.5) | 1.9 (1.3–2.6) |
| 2007 | 0.0 (0.0–0.0) | 0.4 (0.3–0.6) | 4.0 (2.2–7.2) | 1.5 (0.9–2.5) |
| 2008 | 0.1 (0.0–0.2) | 0.6 (0.3–1.1) | 6.7 (5.1–8.6) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.2) | 0.2 (0.1–0.2) | 3.9 (3.3–4.7) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.1) | 0.4 (0.2–0.6) | 3.9 (3.5–4.5) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.2) | 0.3 (0.2–0.4) | 1.4 (1.0–2.0) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.4 (0.2–0.6) | 1.7 (1.3–2.1) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.6 (0.4–0.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.1 (0.0–0.3) | 0.4 (0.3–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(e) Coral species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 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) |
| 2003 | 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) |
| 2004 | 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) |
| 2005 | 1.4 (0.0–4.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.1 (0.0–0.4) | 0.0 (0.0–0.0) |
| 2006 | 0.2 (0.0–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 2.6 (0.0–10.0) |
| 2007 | 0.4 (0.0–1.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.9 (0.0–2.7) |
| 2008 | 0.9 (0.0–2.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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) |
| 2010 | 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) |
| 2011 | 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) |
| 2012 | 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) |
| 2013 | 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 | 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 | 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) |

**(e) Coral species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.7) | 0.3 (0.0–1.0) |
| 2006 | 0.0 (0.0–0.0) | 0.4 (0.0–1.2) | 1.4 (0.0–4.3) | 0.3 (0.0–0.7) |
| 2007 | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.5 (0.2–0.9) | 0.4 (0.1–1.2) |
| 2008 | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.4 (0.0–1.2) | 0.0 (0.0–0.0) |
| 2009 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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 | 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 | 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 | 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 | 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 B14 [Continued]:**

**(f) Morid species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 2.4 (1.1–3.7) | 0.0 (0.0–0.1) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.3 (0.1–0.4) |
| 2003 | 3.4 (1.2–6.1) | 0.0 (0.0–0.1) | 0.3 (0.1–0.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.2) |
| 2004 | 4.4 (1.6–8.4) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.1) | 0.4 (0.1–0.9) |
| 2005 | 3.7 (2.5–5.7) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.4 (0.1–0.7) | 0.3 (0.1–0.7) |
| 2006 | 7.8 (3.9–14.8) | 0.1 (0.0–0.2) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) | 0.1 (0.0–0.4) |
| 2007 | 6.1 (2.6–13.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.0) |
| 2008 | 3.5 (1.5–6.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 2.3 (0.6–3.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2010 | 2.6 (0.9–7.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 1.4 (0.2–3.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2012 | 4.6 (1.9–10.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2013 | 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 | 11.0 (0.0–26.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) |
| 2015 | 0.9 (0.4–1.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(f) Morid species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.1 (0.0–0.1) | 0.8 (0.4–1.1) | 0.0 (0.0–0.1) | 0.4 (0.2–0.8) |
| 2003 | 0.1 (0.0–0.2) | 0.1 (0.0–0.2) | 0.4 (0.1–0.8) | 1.0 (0.3–1.9) |
| 2004 | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) | 0.1 (0.0–0.3) | 0.7 (0.3–1.4) |
| 2005 | 0.0 (0.0–0.0) | 0.5 (0.3–0.9) | 0.4 (0.2–1.0) | 0.8 (0.2–1.6) |
| 2006 | 0.0 (0.0–0.0) | 0.5 (0.3–0.8) | 1.0 (0.2–2.2) | 2.7 (1.5–5.2) |
| 2007 | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 1.1 (0.4–2.0) | 0.5 (0.2–1.2) |
| 2008 | 0.1 (0.0–0.1) | 0.1 (0.0–0.1) | 0.6 (0.4–0.9) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.1–0.2) | 0.1 (0.0–0.2) | 0.9 (0.8–1.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 1.1 (0.9–1.3) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.1) | 0.0 (0.0–0.1) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.2 (0.1–0.2) | 0.3 (0.2–0.4) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.1 (0.1–0.2) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(g) Rattail species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 16.9 (7.8–25.4) | 1.0 (0.7–1.5) | 2.6 (1.9–3.8) | 0.0 (0.0–0.0) | 2.8 (1.9–4.0) |
| 2003 | 19.4 (14.3–29.2) | 0.5 (0.3–0.7) | 3.9 (2.8–5.6) | 0.0 (0.0–0.0) | 3.9 (0.1–9.9) |
| 2004 | 15.1 (7.2–28.1) | 0.2 (0.0–0.3) | 1.1 (0.4–1.9) | 0.6 (0.2–1.1) | 3.4 (2.0–5.0) |
| 2005 | 8.2 (3.8–14.3) | 0.1 (0.0–0.1) | 0.4 (0.1–0.8) | 1.8 (0.3–3.2) | 3.6 (2.2–5.2) |
| 2006 | 23.0 (14.5–35.9) | 0.6 (0.4–1.0) | 1.2 (0.8–2.1) | 0.0 (0.0–0.0) | 1.3 (0.1–3.0) |
| 2007 | 5.7 (2.5–9.4) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) | 0.8 (0.4–1.3) | 0.2 (0.2–0.3) |
| 2008 | 3.2 (1.6–5.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.4 (0.1–0.9) |
| 2009 | 6.3 (1.6–9.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2010 | 4.3 (2.5–7.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 1.1 (0.5–1.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) |
| 2012 | 2.0 (0.7–3.9) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2013 | 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 | 5.2 (0.0–13.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.4) |
| 2015 | 2.7 (1.9–3.7) | 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 B14 [Continued]:

**(g) Rattail species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 1.8 (0.9–3.2) | 31.0 (24.2–39.9) | 26.7 (2.9–69.4) | 9.6 (6.8–13.8) |
| 2003 | 2.7 (1.4–4.8) | 25.7 (5.2–80.1) | 40.6 (24.8–64.4) | 14.2 (9.5–20.7) |
| 2004 | 1.6 (1.0–2.6) | 6.9 (2.6–13.0) | 29.4 (2.7–43.7) | 8.2 (2.8–15.0) |
| 2005 | 0.1 (0.0–0.1) | 6.2 (4.3–8.4) | 5.8 (1.6–12.7) | 4.0 (0.6–7.3) |
| 2006 | 0.2 (0.1–0.4) | 9.9 (4.3–12.4) | 69.6 (9.0–159.4) | 19.7 (4.1–31.8) |
| 2007 | 0.1 (0.1–0.2) | 1.4 (1.1–1.6) | 9.4 (8.0–11.2) | 2.9 (1.4–5.1) |
| 2008 | 0.1 (0.0–0.2) | 1.1 (0.6–1.8) | 6.0 (4.8–7.6) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.2) | 0.3 (0.2–0.4) | 7.7 (6.6–9.0) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.6 (0.3–0.9) | 11.5 (9.6–13.7) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.2) | 0.5 (0.3–0.7) | 3.7 (2.3–5.6) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 1.6 (1.0–2.2) | 1.7 (1.3–2.2) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 1.8 (1.2–2.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.1 (0.0–0.2) | 1.9 (1.3–2.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(h) Slickhead species**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **COOK** | **EAST** | **LOUI** | **PUYS** |
| 2002 | 1.8 (0.4–4.1) | 0.2 (0.1–0.3) | 0.5 (0.3–0.7) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) |
| 2003 | 1.6 (0.4–3.8) | 0.1 (0.0–0.1) | 0.6 (0.2–1.0) | 0.0 (0.0–0.0) | 0.9 (0.0–3.2) |
| 2004 | 6.2 (1.8–11.7) | 0.0 (0.0–0.1) | 0.3 (0.1–0.7) | 0.2 (0.1–0.4) | 0.0 (0.0–0.0) |
| 2005 | 1.4 (0.8–2.3) | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.4 (0.2–0.7) | 0.0 (0.0–0.1) |
| 2006 | 4.8 (2.2–9.1) | 0.1 (0.0–0.1) | 0.2 (0.1–0.2) | 0.0 (0.0–0.0) | 0.2 (0.0–0.4) |
| 2007 | 1.6 (0.6–3.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.3) | 0.1 (0.0–0.1) |
| 2008 | 2.0 (0.4–4.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.5) |
| 2009 | 0.9 (0.2–3.8) | 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 | 1.7 (0.8–3.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 0.4 (0.1–0.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2012 | 2.5 (1.0–4.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.1) |
| 2013 | 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 (0.0–0.1) |
| 2014 | 3.8 (0.0–10.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.1–0.4) |
| 2015 | 0.8 (0.3–1.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(h) Slickhead species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **Other** |
| 2002 | 0.2 (0.0–0.7) | 8.7 (6.2–11.9) | 0.0 (0.0–0.0) | 1.7 (1.1–2.5) |
| 2003 | 0.4 (0.0–1.1) | 7.2 (0.0–18.0) | 5.0 (1.7–10.6) | 2.0 (0.9–3.6) |
| 2004 | 0.2 (0.0–0.5) | 4.9 (2.3–7.5) | 4.9 (2.2–6.9) | 2.4 (1.1–5.5) |
| 2005 | 0.0 (0.0–0.0) | 1.5 (0.9–2.3) | 2.5 (1.4–4.3) | 0.9 (0.4–1.6) |
| 2006 | 0.0 (0.0–0.0) | 3.0 (1.3–4.9) | 4.0 (2.3–5.8) | 2.3 (1.4–4.0) |
| 2007 | 0.0 (0.0–0.0) | 0.6 (0.4–0.8) | 2.4 (1.8–3.6) | 0.9 (0.5–1.3) |
| 2008 | 0.0 (0.0–0.1) | 1.8 (0.9–3.0) | 4.0 (3.0–5.4) | 0.0 (0.0–0.0) |
| 2009 | 0.1 (0.0–0.1) | 1.2 (0.7–2.0) | 2.9 (2.4–3.5) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 2.6 (1.1–5.0) | 5.2 (4.3–6.2) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.1) | 2.2 (1.1–3.9) | 1.8 (1.2–2.4) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 1.8 (0.7–3.6) | 1.9 (1.2–2.6) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 2.3 (1.0–4.7) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.1 (0.0–0.2) | 2.2 (1.3–3.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.1 (0.1–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

## Table B14 [Continued]:

### (i) Shark species

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 21.3 (10.8–36.0) | 2.2 (1.4–3.3) | 5.6 (3.5–8.5) | 0.0 (0.0–0.0) | 9.9 (8.1–12.1) |
| 2003 | 21.3 (12.7–32.9) | 0.4 (0.2–0.5) | 3.0 (1.9–4.5) | 0.0 (0.0–0.0) | 5.0 (1.0–13.2) |
| 2004 | 45.3 (18.8–90.1) | 0.2 (0.1–0.4) | 1.5 (0.8–3.0) | 0.9 (0.5–1.7) | 7.6 (4.7–10.8) |
| 2005 | 20.4 (14.7–31.3) | 0.1 (0.1–0.2) | 0.9 (0.6–1.2) | 3.5 (2.4–5.1) | 7.9 (5.3–11.0) |
| 2006 | 26.3 (13.5–40.2) | 0.4 (0.2–0.6) | 0.8 (0.5–1.2) | 0.0 (0.0–0.0) | 5.7 (1.9–100) |
| 2007 | 22.6 (8.7–43.4) | 0.1 (0.0–0.1) | 0.1 (0.1–0.2) | 0.9 (0.4–1.6) | 1.4 (0.6–2.9) |
| 2008 | 12.4 (9.3–17.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 11.0 (1.2–30.9) |
| 2009 | 11.4 (1.7–29.2) | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.5 (0.1–1.2) |
| 2010 | 15.4 (5.2–26.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) |
| 2011 | 5.7 (4.3–7.3) | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.2 (0.1–0.4) |
| 2012 | 17.3 (10.2–27.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.2 (0.0–0.4) |
| 2013 | 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 | 1.6 (0.0–4.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) |
| 2015 | 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) |

### (i) Shark species, *continued.*

| | Ratio model | | | |
|---|---|---|---|---|
| | SQUAK | STEW | SUBA | Other |
| 2002 | 0.7 (0.5–1.0) | 92.7 (51.0–148.8) | 8.4 (1.8–16.7) | 20.5 (12.7–29.6) |
| 2003 | 1.1 (0.7–1.6) | 6.8 (1.7–13.9) | 25.3 (13.9–40.6) | 10.7 (6.9–15.8) |
| 2004 | 0.5 (0.3–0.7) | 9.8 (4.7–17.7) | 17.6 (12.3–25.1) | 11.5 (5.6–23.5) |
| 2005 | 0.0 (0.0–0.0) | 10.7 (6.3–15.9) | 15.9 (11.1–21.7) | 8.0 (5.5–11.8) |
| 2006 | 0.1 (0.1–0.2) | 16.2 (11.1–23.4) | 27.3 (7.2–49.8) | 13.4 (7.9–19.3) |
| 2007 | 0.1 (0.0–0.1) | 2.3 (1.7–3.0) | 5.2 (4.5–6.0) | 3.4 (1.4–6.2) |
| 2008 | 0.2 (0.0–0.3) | 0.5 (0.2–0.8) | 1.0 (0.6–1.5) | 0.0 (0.0–0.0) |
| 2009 | 0.2 (0.1–0.5) | 0.3 (0.2–0.5) | 3.5 (2.6–4.5) | 0.0 (0.0–0.0) |
| 2010 | 0.0 (0.0–0.0) | 0.2 (0.0–0.6) | 1.0 (0.7–1.3) | 0.0 (0.0–0.0) |
| 2011 | 0.1 (0.0–0.1) | 0.2 (0.1–0.4) | 4.0 (2.4–5.8) | 0.0 (0.0–0.0) |
| 2012 | 0.0 (0.0–0.0) | 0.3 (0.2–0.5) | 1.3 (0.5–2.4) | 0.0 (0.0–0.0) |
| 2013 | 0.0 (0.0–0.0) | 0.5 (0.3–0.6) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 0.1 (0.0–0.1) | 0.3 (0.1–0.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

### (j) Schedule 6 species

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 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) |
| 2004 | 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) |
| 2005 | 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) |
| 2006 | 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) |
| 2007 | 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 | 4.5 (0.0–18.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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 (0.0–0.0) |
| 2010 | 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) |
| 2011 | 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) |
| 2012 | 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) |
| 2013 | 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 | 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 | 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 B14 [Continued]:**

**(j) Schedule 6 species, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | SQUAK | STEW | SUBA | Other |
| 2002 | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0.0 (0.0–0.9) | 0.0 (0.0–0.1) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.6 (0.0–2.0) | 0.1 (0.0–0.2) |
| 2004 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0.0 (0.0–0.2) | 0.0 (0.0–0.1) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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 | 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 | 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 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**(k) Spiny dogfish**

| | Ratio model | | | | |
|---|---|---|---|---|---|
| | CHAT | COOK | EAST | LOUI | PUYS |
| 2002 | 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) |
| 2003 | 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) |
| 2004 | 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) |
| 2005 | 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) |
| 2006 | 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) |
| 2007 | 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 | 4.5 (0.0–18.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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 (0.0–0.0) |
| 2010 | 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) |
| 2011 | 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) |
| 2012 | 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) |
| 2013 | 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 | 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 | 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) |

**(k) Spiny dogfish, *continued.***

| | Ratio model | | | |
|---|---|---|---|---|
| | SQUAK | STEW | SUBA | Other |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2005 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2009 | 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 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 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 | 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 | 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 | 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 | 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 B14 [Continued]:**

**(l) Total**

| | Ratio model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | COOK | | EAST | | LOUI | | PUYS | |
| 2002 | 48.1 | (32.7–74.3) | 5.1 | (3.2–8.4) | 13.1 | (8.2–21.4) | 0.0 | (0.0–0.0) | 65.1 | (24.6–145.1) |
| 2003 | 67.6 | (47.4–99.9) | 2.7 | (1.4–5.7) | 22.6 | (11.6–47.4) | 0.0 | (0.0–0.0) | 172.5 | (43.0–517.2) |
| 2004 | 99.3 | (57.2–149.3) | 0.5 | (0.2–0.9) | 3.8 | (1.9–6.6) | 2.3 | (1.1–3.9) | 15.3 | (9.4–22.6) |
| 2005 | 95.1 | (64.8–154.6) | 0.5 | (0.2–1.0) | 3.5 | (1.1–7.3) | 14.1 | (4.5–29.4) | 15.2 | (10.2–21.1) |
| 2006 | 92.7 | (69.7–119.5) | 1.7 | (1.2–2.2) | 3.4 | (2.3–4.5) | 0.0 | (0.0–0.0) | 10.8 | (2.8–22.6) |
| 2007 | 45.5 | (25.9–71.3) | 0.3 | (0.1–0.7) | 0.6 | (0.3–1.4) | 4.2 | (1.7–8.9) | 2.7 | (1.0–6.0) |
| 2008 | 28.2 | (15.7–51.9) | 0.1 | (0.0–0.1) | 0.2 | (0.1–0.3) | 0.0 | (0.0–0.0) | 11.4 | (1.2–31.9) |
| 2009 | 26.4 | (6.5–93.6) | 0.1 | (0.1–0.3) | 0.2 | (0.1–0.5) | 0.0 | (0.0–0.0) | 1.9 | (0.3–5.0) |
| 2010 | 27.4 | (13.3–44.6) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) | 0.7 | (0.1–1.9) |
| 2011 | 24.6 | (8.6–54.8) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.1) | 2.6 | (0.5–6.5) |
| 2012 | 60.6 | (29.0–125.5) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.0) | 0.4 | (0.2–0.8) |
| 2013 | 8.7 | (5.0–12.7) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.2 | (0.1–0.3) |
| 2014 | 30.3 | (0.4–70.0) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) | 1.5 | (1.1–2.1) |
| 2015 | 7.3 | (4.8–10.5) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.1) |

**(k) Total, *continued.***

| | Ratio model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | Other | |
| 2002 | 4.5 | (2.4–7.4) | 146.1 | (95.6–209.0) | 37.5 | (16.8–82.0) | 47.8 | (29.6–82.7) |
| 2003 | 7.1 | (3.8–11.4) | 140.7 | (34.0–374.0) | 90.8 | (62.2–139.8) | 80.0 | (42.3–169.6) |
| 2004 | 3.3 | (1.8–5.3) | 24.2 | (15.6–37.0) | 58.0 | (22.2–79.6) | 29.2 | (15.1–51.1) |
| 2005 | 0.1 | (0.1–0.2) | 22.9 | (16.6–30.3) | 78.5 | (25.4–211.9) | 32.1 | (10.2–65.6) |
| 2006 | 0.4 | (0.2–0.6) | 36.6 | (28.6–46.1) | 120.9 | (54.5–221.7) | 53.4 | (40.2–69.6) |
| 2007 | 0.2 | (0.2–0.3) | 5.2 | (4.1–6.5) | 50.8 | (23.1–104.0) | 16.0 | (6.7–34.6) |
| 2008 | 0.5 | (0.3–0.8) | 4.6 | (2.7–6.9) | 32.5 | (22.8–45.0) | 0.1 | (0.0–0.1) |
| 2009 | 0.7 | (0.3–1.1) | 2.2 | (1.6–3.1) | 32.8 | (23.2–48.6) | 0.1 | (0.0–0.2) |
| 2010 | 0.2 | (0.1–0.2) | 4.0 | (2.1–6.9) | 35.5 | (25.4–57.0) | 0.0 | (0.0–0.1) |
| 2011 | 0.4 | (0.2–0.6) | 3.5 | (2.0–5.4) | 12.5 | (9.5–16.0) | 0.0 | (0.0–0.1) |
| 2012 | 0.1 | (0.1–0.1) | 4.4 | (2.9–6.8) | 8.8 | (6.8–11.4) | 0.0 | (0.0–0.0) |
| 2013 | 0.0 | (0.0–0.0) | 5.5 | (3.9–8.3) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.0) |
| 2014 | 0.6 | (0.4–0.9) | 5.5 | (3.9–7.2) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2015 | 0.2 | (0.1–0.2) | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |

**Table B15: Estimates of annual discards in the oreo target trawl fishery rounded to the nearest 1 t, by species category and standard area, based on the STATISTICAL model. - is N/A. [Continued on next pages]**

**(a) OEO**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 0 | (0–1) | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–2) |
| 2003 | 0 | (0–1) | – | – | – | – | – | – | 2 | (1–4) |
| 2004 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–1) |
| 2005 | 2 | (1–2) | 0 | (0–1) | – | – | – | – | 1 | (0–3) |
| 2006 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 1 | (0–3) | – | – | – | – | – | – | 2 | (0–10) |
| 2009 | 11 | (11–11) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 1 | (0–5) | 0 | (0–0) | – | – | 0 | (0–0) | 5 | (5–5) |
| 2011 | 5 | (4–9) | – | – | 0 | (0–0) | – | – | 0 | (0–2) |
| 2012 | 5 | (4–7) | – | – | – | – | – | – | 0 | (0–1) |
| 2013 | 0 | (0–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 0 | (0–2) | – | – | – | – | – | – | 0 | (0–2) |
| 2015 | 0 | (0–2) | – | – | – | – | – | – | 0 | (0–0) |

**Table B15 [Continued]:**

**(a) OEO, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 0 | (0–0) | 1 | (1–1) | 1 | (1–4) | – | – |
| 2003 | 0 | (0–0) | 1 | (1–2) | 2 | (1–7) | – | – |
| 2004 | 0 | (0–0) | - | - | 0 | (0–2) | 0 | (0–0) |
| 2005 | 0 | (0–0) | - | - | 16 | (15–19) | – | – |
| 2006 | – | – | - | - | 0 | (0–0) | – | – |
| 2007 | – | – | - | - | 38 | (37–39) | – | – |
| 2008 | 0 | (0–0) | - | (0.0–1) | 9 | (7–16) | – | – |
| 2009 | 0 | (0–0) | - | - | 5 | (4–6) | – | – |
| 2010 | 0 | (0–0) | - | - | 12 | (7–36) | – | – |
| 2011 | 0 | (0–0) | - | (0.0–1) | 4 | (1–17) | – | – |
| 2012 | 0 | (0–0) | - | (0.0–1) | 2 | (1–9) | – | – |
| 2013 | – | – | - | - | – | – | – | – |
| 2014 | 0 | (0–0) | - | - | – | – | – | – |
| 2015 | – | – | - | - | – | – | – | – |

**(b) QMS**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **EAST** | | **LOUI** | | **NWCH** | | **PUYS** | |
| 2002 | 1 | (0–3) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–1) |
| 2003 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2004 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2005 | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 2 | (2–4) | – | – | – | – | – | – | 0 | (0–0) |
| 2009 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2015 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |

**(b) QMS, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2003 | 0 | (0–0) | - | (0.0–1) | 0 | (0–1) | – | – |
| 2004 | 0 | (0–0) | - | - | 0 | (0–1) | 0 | (0–0) |
| 2005 | 0 | (0–0) | - | - | 0 | (0–1) | – | – |
| 2006 | – | – | - | - | 0 | (0–1) | – | – |
| 2007 | – | – | - | - | 0 | (0–0) | – | – |
| 2008 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2013 | – | – | - | - | – | – | – | – |
| 2014 | 0 | (0–0) | - | - | – | – | – | – |
| 2015 | – | – | - | - | – | – | – | – |

**Table B15 [Continued]:**

**(c) NON-QMS**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 64 | (50–84) | 10 | (2–48) | – | – | 0 | (0–0) | 19 | (15–23) |
| 2003 | 26 | (19–39) | – | – | – | – | – | – | 32 | (24–44) |
| 2004 | 103 | (78–138) | – | – | – | – | – | – | 2 | (0–17) |
| 2005 | 74 | (58–96) | 1 | (0–6) | – | – | – | – | 18 | (6–52) |
| 2006 | 103 | (85–126) | 1 | (0–5) | 0 | (0–0) | – | – | – | – |
| 2007 | 40 | (32–51) | – | – | – | – | – | – | 7 | (5–11) |
| 2008 | 39 | (28–55) | – | – | – | – | – | – | 11 | (5–24) |
| 2009 | 52 | (45–60) | – | – | – | – | – | – | 0 | (0–1) |
| 2010 | 36 | (30–46) | 0 | (0–0) | – | – | 1 | (1–1) | 1 | (1–1) |
| 2011 | 18 | (11–31) | – | – | 0 | (0–0) | – | – | 0 | (0–1) |
| 2012 | 31 | (25–40) | – | – | – | – | – | – | 1 | (1–1) |
| 2013 | 8 | (2–37) | – | – | – | – | – | – | 1 | (0–1) |
| 2014 | 53 | (41–71) | – | – | – | – | – | – | 3 | (1–6) |
| 2015 | 11 | (7–20) | – | – | – | – | – | – | 0 | (0–0) |

**(c) NON-QMS, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 3 | (2–8) | 93 | (75–116) | 33 | (22–49) | – | – |
| 2003 | 3 | (1–8) | 60 | (37–98) | 29 | (20–45) | – | – |
| 2004 | 0 | (0–2) | 16 | (8–40) | 53 | (41–70) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 18 | (12–29) | 11 | (8–15) | – | – |
| 2006 | – | – | 44 | (16–120) | 87 | (73–105) | – | – |
| 2007 | – | – | 14 | (13–15) | 49 | (47–52) | – | – |
| 2008 | 1 | (0–2) | 4 | (3–5) | 41 | (39–43) | – | – |
| 2009 | 1 | (1–3) | 4 | (3–4) | 31 | (28–35) | – | – |
| 2010 | 1 | (0–1) | 6 | (5–8) | 40 | (37–45) | – | – |
| 2011 | 0 | (0–2) | 2 | (1–4) | 17 | (15–19) | – | – |
| 2012 | 0 | (0–0) | 5 | (3–8) | 10 | (9–11) | – | – |
| 2013 | – | – | 11 | (7–18) | – | – | – | – |
| 2014 | 1 | (0–5) | 5 | (3–10) | – | – | – | – |
| 2015 | – | – | 5 | (5–5) | – | – | – | – |

**(d) INV**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 4 | (3–5) | 0 | (0–2) | – | – | 0 | (0–0) | 34 | (31–39) |
| 2003 | 4 | (3–6) | – | – | – | – | – | – | 49 | (42–60) |
| 2004 | 3 | (2–5) | – | – | – | – | – | – | 1 | (0–3) |
| 2005 | 7 | (6–9) | 0 | (0–1) | – | – | – | – | 1 | (0–3) |
| 2006 | 4 | (3–5) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 3 | (2–4) | – | – | – | – | – | – | 3 | (3–3) |
| 2008 | 1 | (1–2) | – | – | – | – | – | – | 0 | (0–1) |
| 2009 | 5 | (5–6) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 4 | (3–5) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 4 | (3–6) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 10 | (8–12) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 10 | (7–15) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 5 | (4–7) | – | – | – | – | – | – | 1 | (0–1) |
| 2015 | 2 | (1–3) | – | – | – | – | – | – | 0 | (0–0) |

**Table B15 [Continued]:**

**(d) INV, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 2 | (1–4) | 11 | (9–14) | 1 | (1–3) | – | – |
| 2003 | 3 | (2–5) | 1 | (0.0–4) | 4 | (2–7) | – | – |
| 2004 | 0 | (0–0) | 1 | (1–2) | 3 | (2–4) | 1 | (1–1) |
| 2005 | 0 | (0–0) | 1 | (1–2) | 5 | (4–6) | – | – |
| 2006 | – | – | 3 | (1–7) | 6 | (5–7) | – | – |
| 2007 | – | – | 2 | (2–2) | 9 | (8–9) | – | – |
| 2008 | 0 | (0–0) | 1 | (1–1) | 13 | (12–14) | – | – |
| 2009 | 0 | (0–0) | - | (0.0–1) | 7 | (6–7) | – | – |
| 2010 | 0 | (0–0) | 1 | (1–1) | 8 | (7–8) | – | – |
| 2011 | 0 | (0–0) | - | - | 2 | (2–3) | – | – |
| 2012 | 0 | (0–0) | - | (0.0–1) | 3 | (2–3) | – | – |
| 2013 | – | – | 1 | (1–2) | – | – | – | – |
| 2014 | 0 | (0–0) | - | (0.0–1) | – | – | – | – |
| 2015 | – | – | - | - | – | – | – | – |

**(e) Coral species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2004 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–1) |
| 2005 | 1 | (0–2) | 0 | (0–0) | – | – | – | – | 1 | (0–7) |
| 2006 | 1 | (0–1) | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 1 | (0–2) | – | – | – | – | – | – | 2 | (2–3) |
| 2008 | 1 | (0–3) | – | – | – | – | – | – | 1 | (0–12) |
| 2009 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2015 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |

**(e) Coral species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2003 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2004 | 0 | (0–0) | - | - | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0 | (0–0) | - | (0.0–1) | 1 | (0–2) | – | – |
| 2006 | – | – | - | (0.0–1) | 1 | (1–2) | – | – |
| 2007 | – | – | - | - | 1 | (1–2) | – | – |
| 2008 | 0 | (0–0) | - | - | 1 | (1–2) | – | – |
| 2009 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2013 | – | – | - | - | – | – | – | – |
| 2014 | 0 | (0–0) | - | - | – | – | – | – |
| 2015 | – | – | - | - | – | – | – | – |

**Table B15 [Continued]:**

**(f) Morid species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 2 | (2–3) | 0 | (0–2) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2003 | 1 | (1–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2004 | 2 | (1–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2005 | 3 | (3–4) | 0 | (0–1) | – | – | – | – | 0 | (0–0) |
| 2006 | 7 | (7–8) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 5 | (5–6) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 4 | (4–5) | – | – | – | – | – | – | 0 | (0–1) |
| 2009 | 5 | (4–5) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 6 | (5–7) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 2 | (2–3) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 5 | (4–6) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 5 | (3–8) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 14 | (11–18) | – | – | – | – | – | – | 1 | (0–1) |
| 2015 | 3 | (2–4) | – | – | – | – | – | – | 0 | (0–0) |

**(f) Morid species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 0 | (0–0) | 1 | (1–1) | 0 | (0–0) | – | – |
| 2003 | 0 | (0–0) | - | (0.0–1) | 0 | (0–1) | – | – |
| 2004 | 0 | (0–0) | - | - | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0 | (0–0) | - | - | 1 | (1–1) | – | – |
| 2006 | – | – | 1 | (0.0–1) | 2 | (1–2) | – | – |
| 2007 | – | – | - | - | 2 | (2–2) | – | – |
| 2008 | 0 | (0–0) | - | - | 1 | (1–1) | – | – |
| 2009 | 0 | (0–0) | - | - | 1 | (1–2) | – | – |
| 2010 | 0 | (0–0) | - | - | 2 | (2–2) | – | – |
| 2011 | 0 | (0–0) | - | - | 0 | (0–1) | – | – |
| 2012 | 0 | (0–0) | - | - | 0 | (0–1) | – | – |
| 2013 | – | – | - | - | – | – | – | – |
| 2014 | 0 | (0–0) | - | - | – | – | – | – |
| 2015 | – | – | - | - | – | – | – | – |

**(g) Rattail species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 31 | (26–37) | 1 | (0–5) | – | – | 0 | (0–0) | 7 | (5–8) |
| 2003 | 17 | (14–22) | – | – | – | – | – | – | 7 | (6–10) |
| 2004 | 15 | (12–18) | – | – | – | – | – | – | 3 | (3–4) |
| 2005 | 7 | (6–8) | 0 | (0–0) | – | – | – | – | 1 | (1–1) |
| 2006 | 25 | (22–29) | 0 | (0–1) | 0 | (0–0) | – | – | – | – |
| 2007 | 13 | (11–15) | – | – | – | – | – | – | 1 | (1–1) |
| 2008 | 5 | (4–6) | – | – | – | – | – | – | 1 | (1–1) |
| 2009 | 10 | (10–11) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 8 | (7–9) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 2 | (2–3) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 4 | (3–5) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 7 | (4–13) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 9 | (7–12) | – | – | – | – | – | – | 1 | (1–1) |
| 2015 | 11 | (8–17) | – | – | – | – | – | – | 0 | (0–0) |

**Table B15 [Continued]:**

**(g) Rattail species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 2 | (2–3) | 44 | (38–50) | 30 | (25–35) | – | – |
| 2003 | 4 | (3–6) | 34 | (27–44) | 40 | (33–50) | – | – |
| 2004 | 1 | (1–2) | 10 | (9–12) | 23 | (20–27) | 0 | (0–0) |
| 2005 | 1 | (1–1) | 4 | (4–5) | 9 | (8–11) | – | – |
| 2006 | – | – | 11 | (9–13) | 40 | (36–45) | – | – |
| 2007 | – | – | 6 | (6–6) | 24 | (23–25) | – | – |
| 2008 | 0 | (0–0) | 2 | (2–2) | 13 | (12–14) | – | – |
| 2009 | 0 | (0–1) | 2 | (1–2) | 14 | (13–15) | – | – |
| 2010 | 0 | (0–0) | 1 | (1–1) | 17 | (16–19) | – | – |
| 2011 | 0 | (0–0) | 1 | (0.0–1) | 5 | (5–6) | – | – |
| 2012 | 0 | (0–0) | 1 | (1–1) | 3 | (3–4) | – | – |
| 2013 | – | – | 2 | (2–3) | – | – | – | – |
| 2014 | 0 | (0–0) | 1 | (1–1) | – | – | – | – |
| 2015 | – | – | 2 | (2–2) | – | – | – | – |

**(h) Slickhead species**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **CHAT** | | **EAST** | | **LOUI** | | **NWCH** | | **PUYS** | |
| 2002 | 2 | (1–2) | 1 | (1–5) | – | – | 0 | (0–0) | 0 | (0–1) |
| 2003 | 1 | (1–2) | – | – | – | – | – | – | 1 | (1–1) |
| 2004 | 3 | (2–3) | – | – | – | – | – | – | 1 | (0–1) |
| 2005 | 1 | (1–2) | 0 | (0–2) | – | – | – | – | 0 | (0–1) |
| 2006 | 5 | (4–5) | 0 | (0–2) | 0 | (0–0) | – | – | – | – |
| 2007 | 2 | (2–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 3 | (2–3) | – | – | – | – | – | – | 1 | (0–1) |
| 2009 | 2 | (2–2) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 4 | (3–4) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 1 | (1–2) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 3 | (2–4) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 3 | (1–5) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 6 | (4–8) | – | – | – | – | – | – | 1 | (0–1) |
| 2015 | 4 | (2–6) | – | – | – | – | – | – | 0 | (0–0) |

**(h) Slickhead species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **SQUAK** | | **STEW** | | **SUBA** | | **WCNI** | |
| 2002 | 0 | (0–0) | 10 | (8–13) | 2 | (2–3) | – | – |
| 2003 | 1 | (0–1) | 12 | (8–18) | 5 | (3–7) | – | – |
| 2004 | 0 | (0–0) | 6 | (5–8) | 5 | (4–6) | 0 | (0–0) |
| 2005 | 0 | (0–0) | 3 | (2–3) | 4 | (3–4) | – | – |
| 2006 | – | – | 6 | (5–7) | 8 | (6–9) | – | – |
| 2007 | – | – | 2 | (2–3) | 6 | (6–6) | – | – |
| 2008 | 0 | (0–0) | 3 | (3–3) | 8 | (8–9) | – | – |
| 2009 | 0 | (0–0) | 2 | (2–2) | 5 | (4–5) | – | – |
| 2010 | 0 | (0–0) | 4 | (4–4) | 9 | (8–10) | – | – |
| 2011 | 0 | (0–0) | 1 | (1–1) | 3 | (2–3) | – | – |
| 2012 | 0 | (0–0) | 3 | (2–3) | 3 | (2–3) | – | – |
| 2013 | – | – | 2 | (1–3) | – | – | – | – |
| 2014 | 0 | (0–0) | 2 | (1–2) | – | – | – | – |
| 2015 | – | – | 2 | (2–2) | – | – | – | – |

**Table B15 [Continued]:**

**(i) Shark species**

| | Statistical model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **EAST** | **LOUI** | **NWCH** | **PUYS** |
| 2002 | 75 (62–91) | 2 (0–10) | – – | 0 (0–0) | 21 (18–26) |
| 2003 | 29 (23–38) | – – | – – | – – | 16 (11–22) |
| 2004 | 61 (51–73) | – – | – – | – – | 17 (13–22) |
| 2005 | 56 (46–68) | 1 (0–3) | – – | – – | 14 (10–18) |
| 2006 | 46 (38–55) | 0 (0–2) | 0 (0–0) | – – | – – |
| 2007 | 50 (43–58) | – – | – – | – – | 3 (2–3) |
| 2008 | 13 (11–15) | – – | – – | – – | 4 (4–5) |
| 2009 | 20 (18–21) | – – | – – | – – | 0 (0–0) |
| 2010 | 15 (13–17) | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) |
| 2011 | 18 (13–25) | – – | 0 (0–0) | – – | 1 (0–1) |
| 2012 | 19 (14–25) | – – | – – | – – | 1 (0–1) |
| 2013 | 4 (2–9) | – – | – – | – – | 0 (0–0) |
| 2014 | 5 (3–8) | – – | – – | – – | 1 (0–1) |
| 2015 | 2 (1–6) | – – | – – | – – | 0 (0–0) |

**(i) Shark species, *continued.***

| | Statistical model | | | |
|---|---|---|---|---|
| | **SQUAK** | **STEW** | **SUBA** | **WCNI** |
| 2002 | 3 (2–4) | 73 (65–82) | 15 (12–17) | – – |
| 2003 | 3 (2–4) | 30 (22–41) | 13 (10–17) | – – |
| 2004 | 2 (1–3) | 22 (18–26) | 19 (16–22) | 0 (0–0) |
| 2005 | 0 (0–0) | 14 (12–17) | 19 (16–22) | – – |
| 2006 | – – | 15 (11–19) | 19 (16–22) | – – |
| 2007 | – – | 10 (10–11) | 15 (14–16) | – – |
| 2008 | 0 (0–0) | 1 (1–2) | 3 (2–3) | – – |
| 2009 | 0 (0–1) | 1 (1–2) | 5 (4–5) | – – |
| 2010 | 0 (0–0) | 1 (1–1) | 3 (2–3) | – – |
| 2011 | 0 (0–0) | 1 (1–2) | 5 (4–6) | – – |
| 2012 | 0 (0–0) | 2 (1–3) | 2 (2–2) | – – |
| 2013 | – – | - (0.0–1) | – – | – – |
| 2014 | 0 (0–0) | - (0.0–1) | – – | – – |
| 2015 | – – | - - | – – | – – |

**(j) Schedule 6 species**

| | Statistical model | | | | |
|---|---|---|---|---|---|
| | **CHAT** | **EAST** | **LOUI** | **NWCH** | **PUYS** |
| 2002 | 1 (0–7) | 0 (0–1) | – – | 0 (0–0) | 0 (0–1) |
| 2003 | 0 (0–4) | – – | – – | – – | 0 (0–2) |
| 2004 | 0 (0–3) | – – | – – | – – | 0 (0–1) |
| 2005 | 0 (0–1) | 0 (0–0) | – – | – – | 0 (0–0) |
| 2006 | 0 (0–1) | 0 (0–0) | 0 (0–0) | – – | – – |
| 2007 | 0 (0–1) | – – | – – | – – | 0 (0–0) |
| 2008 | 2 (2–4) | – – | – – | – – | 0 (0–1) |
| 2009 | 0 (0–0) | – – | – – | – – | 0 (0–0) |
| 2010 | 0 (0–1) | 0 (0–0) | – – | 0 (0–0) | 0 (0–0) |
| 2011 | 0 (0–0) | – – | 0 (0–0) | – – | 0 (0–0) |
| 2012 | 0 (0–0) | – – | – – | – – | 0 (0–0) |
| 2013 | 0 (0–0) | – – | – – | – – | 0 (0–0) |
| 2014 | 0 (0–0) | – – | – – | – – | 0 (0–0) |
| 2015 | 0 (0–0) | – – | – – | – – | 0 (0–0) |

**Table B15 [Continued]:**

**(j) Schedule 6 species, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 0 | (0–0) | 6 | (5–14) | 0 | (0–3) | – | – |
| 2003 | 0 | (0–1) | 1 | (0.0–15) | 0 | (0–5) | – | – |
| 2004 | 0 | (0–0) | - | (0.0–3) | 0 | (0–2) | 0 | (0–0) |
| 2005 | 0 | (0–0) | - | (0.0–1) | 0 | (0–1) | – | – |
| 2006 | – | – | - | (0.0–2) | 0 | (0–1) | – | – |
| 2007 | – | – | - | - | 0 | (0–0) | – | – |
| 2008 | 0 | (0–0) | - | (0.0–1) | 0 | (0–1) | – | – |
| 2009 | 0 | (0–0) | - | - | 0 | (0–1) | – | – |
| 2010 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2013 | – | – | - | - | – | – | – | – |
| 2014 | 0 | (0–0) | - | - | – | – | – | – |
| 2015 | – | – | - | - | – | – | – | – |

**(k) Spiny dogfish**

| | Statistical model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CHAT | | EAST | | LOUI | | NWCH | | PUYS | |
| 2002 | 0 | (0–4) | 0 | (0–1) | – | – | 0 | (0–0) | 0 | (0–2) |
| 2003 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2004 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2005 | 0 | (0–0) | 0 | (0–0) | – | – | – | – | 0 | (0–0) |
| 2006 | 0 | (0–0) | 0 | (0–0) | 0 | (0–0) | – | – | – | – |
| 2007 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2008 | 2 | (2–2) | – | – | – | – | – | – | 0 | (0–1) |
| 2009 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2010 | 0 | (0–0) | 0 | (0–0) | – | – | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0 | (0–0) | – | – | 0 | (0–0) | – | – | 0 | (0–0) |
| 2012 | 0 | (0–0) | – | – | – | – | – | – | 0 | (0–0) |
| 2013 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2014 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |
| 2015 | 0 | (0–1) | – | – | – | – | – | – | 0 | (0–0) |

**(k) Spiny dogfish, *continued.***

| | Statistical model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SQUAK | | STEW | | SUBA | | WCNI | |
| 2002 | 0 | (0–0) | 5 | (5–11) | 0 | (0–0) | – | – |
| 2003 | 0 | (0–0) | - | (0.0–1) | 0 | (0–0) | – | – |
| 2004 | 0 | (0–0) | - | - | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2006 | – | – | - | - | 0 | (0–0) | – | – |
| 2007 | – | – | - | - | 0 | (0–0) | – | – |
| 2008 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2009 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2010 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2011 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2012 | 0 | (0–0) | - | - | 0 | (0–0) | – | – |
| 2013 | – | – | - | - | – | – | – | – |
| 2014 | 0 | (0–0) | - | - | – | – | – | – |
| 2015 | – | – | - | - | – | – | – | – |

**Table B16: Estimates of total annual discards (rounded to the nearest 0.1 t) in the oreo target trawl fishery based on observed discard rates and using on the RATIO model, by species category and fishing year; 95% confidence intervals in parentheses.**

| Fishing year | OEO | | QMS | | non-QMS | | Invertebrate | | Total discards | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 4.5 | (1.5–9.8) | 1.9 | (0.6–3.0) | 351.4 | (292.9–423.0) | 106.9 | (64.2–194.8) | 464.8 | (359.3–630.7) |
| 2003 | 15.8 | (4.3–43.4) | 0.2 | (0.0–0.6) | 431.6 | (322.1–645.6) | 222.2 | (96.8–542.7) | 669.7 | (423.1–1 232.2) |
| 2004 | 0.0 | (0.0–0.1) | 0.2 | (0.1–0.4) | 266.7 | (212.4–323.6) | 12.5 | (9.2–17.7) | 279.4 | (221.7–341.8) |
| 2005 | 73.3 | (19.3–188.3) | 0.4 | (0.2–0.9) | 220.4 | (191.6–256.8) | 28.7 | (18.9–45.6) | 322.7 | (229.9–491.5) |
| 2006 | 0.2 | (0.0–0.6) | 0.5 | (0.2–1.1) | 366.4 | (289.5–465.3) | 17.7 | (12.7–26.2) | 384.8 | (302.4–493.2) |
| 2007 | 66.1 | (40.5–126.8) | 0.1 | (0.0–0.3) | 149.6 | (130.5–173.5) | 20.6 | (17.4–25.0) | 236.4 | (188.4–325.6) |
| 2008 | 10.5 | (5.9–17.3) | 6.1 | (1.5–19.7) | 99.5 | (85.3–123.0) | 18.5 | (16.4–21.5) | 134.6 | (109.1–181.5) |
| 2009 | 31.8 | (16.6–70.4) | 0.4 | (0.2–1.1) | 84.7 | (66.4–101.8) | 12.5 | (11.0–14.4) | 129.5 | (94.3–187.8) |
| 2010 | 18.2 | (9.9–35.5) | 0.0 | (0.0–0.1) | 83.9 | (70.4–100.4) | 11.4 | (10.3–13.1) | 113.4 | (90.5–149.0) |
| 2011 | 18.8 | (4.2–46.0) | 0.0 | (0.0–0.0) | 35.3 | (31.3–40.0) | 6.5 | (5.5–7.7) | 60.6 | (41.0–93.7) |
| 2012 | 20.2 | (4.1–66.2) | 0.0 | (0.0–0.0) | 61.7 | (49.2–75.8) | 14.0 | (10.6–19.2) | 95.9 | (63.9–161.2) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 6.8 | (5.4–9.5) | 10.2 | (6.5–14.2) | 16.9 | (11.8–23.6) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 39.7 | (12.2–75.0) | 5.8 | (2.3–10.3) | 45.6 | (14.6–85.4) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 12.4 | (10.5–14.7) | 1.9 | (1.2–2.7) | 14.3 | (11.7–17.4) |

| Fishing year | Coral species | | Morid species | | Rattail species | | Slickhead species | | Shark species | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 0.0 | (0.0–0.0) | 5.0 | (3.7–6.5) | 110.8 | (81.4–155.1) | 16.9 | (13.6–20.9) | 199.4 | (155.9–258.6) |
| 2003 | 0.0 | (0.0–0.0) | 6.2 | (3.9–9.2) | 123.2 | (90.5–181.8) | 20.2 | (11.2–32.3) | 83.6 | (65.7–107.4) |
| 2004 | 0.0 | (0.0–0.0) | 7.0 | (4.2–11.1) | 78.9 | (53.8–99.1) | 23.2 | (17.2–30.4) | 112.8 | (83.7–163.1) |
| 2005 | 2.7 | (0.8–6.5) | 7.6 | (6.0–9.7) | 37.2 | (29.1–47.6) | 8.5 | (6.9–10.7) | 81.7 | (70.5–94.1) |
| 2006 | 4.8 | (1.1–13.5) | 16.4 | (11.5–23.6) | 150.0 | (81.8–241.9) | 17.7 | (13.7–23.2) | 107.0 | (81.3–135.0) |
| 2007 | 5.6 | (4.0–7.9) | 11.8 | (8.1–18.9) | 41.6 | (37.5–46.2) | 12.3 | (10.7–14.4) | 60.9 | (46.3–82.1) |
| 2008 | 2.3 | (1.2–4.5) | 6.2 | (4.3–9.0) | 21.1 | (18.8–24.3) | 15.6 | (13.2–18.3) | 33.0 | (22.2–54.2) |
| 2009 | 0.0 | (0.0–0.0) | 6.1 | (4.4–7.0) | 24.7 | (19.9–28.3) | 9.1 | (7.9–11.9) | 30.6 | (21.0–48.9) |
| 2010 | 0.0 | (0.0–0.0) | 6.1 | (4.4–10.8) | 25.9 | (23.2–29.2) | 16.2 | (13.9–18.8) | 25.4 | (15.3–36.0) |
| 2011 | 0.0 | (0.0–0.0) | 2.6 | (1.5–4.7) | 8.4 | (7.0–10.5) | 6.1 | (4.7–7.9) | 14.7 | (12.6–16.9) |
| 2012 | 0.0 | (0.0–0.0) | 6.6 | (3.9–12.2) | 7.0 | (5.4–9.0) | 8.7 | (6.5–11.8) | 24.6 | (17.5–35.4) |
| 2013 | 0.0 | (0.0–0.0) | 0.3 | (0.2–0.4) | 2.8 | (2.2–3.5) | 2.8 | (1.5–5.2) | 0.6 | (0.4–0.8) |
| 2014 | 0.0 | (0.0–0.0) | 14.0 | (2.9–29.6) | 8.7 | (3.2–16.8) | 7.7 | (3.3–14.0) | 2.5 | (0.7–5.0) |
| 2015 | 0.0 | (0.0–0.0) | 1.3 | (0.7–2.0) | 4.9 | (4.0–5.8) | 3.5 | (3.0–4.3) | 0.2 | (0.2–0.2) |

| Fishing year | Schedule 6 species | | Spiny dogfish | |
|---|---|---|---|---|
| 2002 | 5.0 | (4.7–6.2) | 4.5 | (4.5–6.9) |
| 2003 | 0.8 | (0.1–2.3) | 0.0 | (0.0–0.0) |
| 2004 | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.0) |
| 2005 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2006 | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.0) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2008 | 6.0 | (1.5–19.6) | 6.0 | (1.5–19.7) |
| 2009 | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) |

**Table B17: Estimates of total annual discards (rounded to the nearest 1 t) in the oreo target trawl fishery based on observed discard rates and using the STATISTICAL model, by species categories and fishing year; 95% confidence intervals in parentheses.**

| Fishing year | OEO | QMS | non-QMS | Invertebrate | Total discards |
|---|---|---|---|---|---|
| 2002 | 3 (2–7) | 1 (1–3) | 226 (195–273) | 53 (48–59) | 280 (244–335) |
| 2003 | 6 (3–12) | 1 (0–2) | 154 (124–196) | 62 (54–73) | 217 (178–271) |
| 2004 | 0 (0–2) | 0 (0–1) | 180 (147–226) | 10 (9–13) | 190 (156–240) |
| 2005 | 20 (17–24) | 0 (0–1) | 125 (100–164) | 15 (13–18) | 140 (113–183) |
| 2006 | 0 (0–1) | 0 (0–1) | 239 (196–316) | 13 (10–17) | 252 (206–334) |
| 2007 | 38 (38–39) | 0 (0–1) | 111 (101–123) | 16 (15–17) | 127 (116–141) |
| 2008 | 11 (7–27) | 2 (2–4) | 96 (82–116) | 16 (15–17) | 114 (99–137) |
| 2009 | 16 (15–18) | 0 (0–1) | 89 (81–98) | 13 (12–14) | 102 (93–113) |
| 2010 | 19 (12–46) | 0 (0–0) | 86 (77–96) | 13 (12–14) | 99 (89–110) |
| 2011 | 9 (5–27) | 0 (0–1) | 38 (31–51) | 7 (6–9) | 45 (37–61) |
| 2012 | 7 (5–17) | 0 (0–1) | 47 (40–57) | 13 (11–16) | 60 (51–74) |
| 2013 | 0 (0–3) | 0 (0–1) | 20 (11–50) | 12 (8–17) | 32 (19–68) |
| 2014 | 0 (0–4) | 0 (0–1) | 64 (50–82) | 6 (5–8) | 70 (55–91) |
| 2015 | 0 (0–2) | 0 (0–1) | 17 (12–26) | 2 (1–3) | 19 (13–30) |

| Fishing year | Coral species | Morid species | Rattail species | Slickhead species |
|---|---|---|---|---|
| 2002 | 0 (0–0) | 4 (3–6) | 115 (100–132) | 16 (13–20) |
| 2003 | 0 (0–0) | 3 (2–4) | 104 (85–128) | 19 (13–29) |
| 2004 | 0 (0–1) | 2 (2–3) | 53 (46–62) | 15 (12–18) |
| 2005 | 2 (1–10) | 5 (4–6) | 22 (19–25) | 8 (7–11) |
| 2006 | 2 (1–5) | 10 (9–11) | 76 (68–87) | 19 (15–23) |
| 2007 | 5 (4–7) | 8 (7–9) | 44 (41–47) | 10 (10–11) |
| 2008 | 4 (2–16) | 7 (6–8) | 21 (20–23) | 15 (14–17) |
| 2009 | 0 (0–0) | 7 (6–7) | 26 (24–29) | 9 (9–10) |
| 2010 | 0 (0–0) | 8 (7–9) | 27 (24–30) | 17 (15–18) |
| 2011 | 0 (0–0) | 3 (2–3) | 8 (7–10) | 5 (4–6) |
| 2012 | 0 (0–0) | 6 (5–7) | 8 (7–10) | 9 (7–11) |
| 2013 | 0 (0–0) | 5 (3–8) | 10 (6–16) | 5 (3–8) |
| 2014 | 0 (0–0) | 15 (12–19) | 11 (8–15) | 8 (6–11) |
| 2015 | 0 (0–0) | 3 (2–4) | 13 (9–19) | 6 (5–8) |

| Fishing year | Shark species | Schedule 6 species | Spiny dogfish |
|---|---|---|---|
| 2002 | 189 (165–218) | 7 (5–24) | 6 (5–16) |
| 2003 | 91 (71–119) | 2 (0–24) | 0 (0–1) |
| 2004 | 120 (103–142) | 1 (0–9) | 0 (0–1) |
| 2005 | 104 (88–124) | 0 (0–2) | 0 (0–1) |
| 2006 | 80 (67–97) | 0 (0–4) | 0 (0–0) |
| 2007 | 77 (69–87) | 0 (0–1) | 0 (0–0) |
| 2008 | 21 (19–25) | 2 (2–7) | 2 (2–3) |
| 2009 | 27 (25–29) | 0 (0–1) | 0 (0–0) |
| 2010 | 19 (17–22) | 0 (0–1) | 0 (0–0) |
| 2011 | 25 (19–33) | 0 (0–0) | 0 (0–0) |
| 2012 | 23 (18–30) | 0 (0–0) | 0 (0–1) |
| 2013 | 5 (2–10) | 0 (0–0) | 0 (0–1) |
| 2014 | 6 (4–9) | 0 (0–0) | 0 (0–1) |
| 2015 | 2 (1–6) | 0 (0–0) | 0 (0–1) |

**Table B18: Summary of results of linear regression analyses for trends in annual discards, by species category. 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 | -0.055 | 0.128 |
| **NON-QMS** | **-0.061** | **0.009** |
| **INV** | **-0.044** | **0.022** |
| **Total** | **-0.085** | **0.001** |
| **Morid species** | **0.070** | **<0.000** |
| **Rattail species** | **-0.178** | **<0.000** |
| Shark species | -0.013 | 0.582 |
| Slickhead species | 0.025 | 0.410 |

**Table B19: Estimated annual oreo catch (t), total bycatch (t), and total discards (t) in the target oreo target trawl fishery; discard fraction (kg of total discards per kg of oreo caught); and discards as a fraction of bycatch.**

| Fishing year | OEO estimated catch | Total bycatch | Total discards | Bycatch fraction | Discard fraction | Discards / bycatch |
|---|---|---|---|---|---|---|
| 2002 | 14 487 | 916 | 465 | 0.06 | 0.03 | 0.51 |
| 2003 | 12 845 | 1 575 | 670 | 0.12 | 0.05 | 0.43 |
| 2004 | 12 054 | 715 | 279 | 0.06 | 0.02 | 0.39 |
| 2005 | 13 311 | 965 | 323 | 0.07 | 0.02 | 0.33 |
| 2006 | 12 838 | 898 | 385 | 0.07 | 0.03 | 0.43 |
| 2007 | 13 001 | 916 | 236 | 0.07 | 0.02 | 0.26 |
| 2008 | 13 026 | 579 | 135 | 0.04 | 0.01 | 0.23 |
| 2009 | 12 576 | 841 | 129 | 0.07 | 0.01 | 0.15 |
| 2010 | 14 733 | 1 144 | 113 | 0.08 | 0.01 | 0.10 |
| 2011 | 12 634 | 395 | 61 | 0.03 | <0.01 | 0.15 |
| 2012 | 11 666 | 535 | 96 | 0.05 | 0.01 | 0.18 |
| 2013 | 9 827 | 405 | 17 | 0.04 | <0.01 | 0.04 |
| 2014 | 9 415 | 352 | 46 | 0.04 | <0.01 | 0.13 |
| 2015 | 9 905 | 429 | 14 | 0.04 | <0.01 | 0.03 |

**Table B20: Oreo target trawl fishery. Total annual bycatch estimates (t) (with estimated 95% CIs in parenthesis) for individual species (based on the top 10 QMS, top 35 non-QMS, and top 14 INV species observed, with at least 1 t of bycatch in at least one year). 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). 0.0 is less than 0.1; - is N/A. Note, bycatch trends in some cases may be due to inconsistent use of the code over time, e.g., the reducing use of generic codes such as DWD (deepwater dogfish) and increasing use of specific codes (e.g., ETB, Baxter's dogfish); the more likely cases are noted in the table.**

| Fishing year | Species ORH | | (see note) ETB | | HOK | | RAT | | (see note) DWD | | (see note) COU | | (see note) MCA | | SLK | | (see note) BSH | | (see note) ETM | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 165.0 | (100.2–275.2) | 24.5 | (13.5–41.5) | 143.7 | (86.1–262.8) | 116.1 | (75.8–167.5) | 21.6 | (12.5–34.4) | 94.6 | (49.8–169.6) | - | - | 14.5 | (11.6–17.9) | 140.8 | (95.3–200.1) | 47.1 | (12.4–82.8) |
| 2003 | 839.2 | (432.6–1 490.5) | 0.3 | (0.1–0.6) | 16.9 | (10.3–35.2) | 107.4 | (88.2–135.6) | 27.4 | (14.4–43.1) | 210.9 | (88.8–537.6) | - | - | 22.1 | (13.5–34.0) | 63.5 | (47.2–84.2) | 191.7 | (80.0–412.5) |
| 2004 | 396.8 | (186.1–675.4) | 58.4 | (36.7–109.5) | 22.9 | (10.5–41.4) | 79.2 | (59.8–99.0) | 4.5 | (1.4–9.6) | 3.5 | (2.4–5.0) | - | - | 24.0 | (18.0–30.9) | 45.5 | (29.5–64.2) | 0.2 | (0.1–0.4) |
| 2005 | 590.6 | (425.0–818.9) | 20.1 | (14.0–28.0) | 17.1 | (12.1–25.6) | 79.0 | (45.8–153.1) | 36.4 | (28.8–47.6) | 19.7 | (9.8–34.9) | - | - | 11.5 | (8.5–16.7) | 4.6 | (1.9–8.6) | 65.2 | (47.5–97.2) |
| 2006 | 298.4 | (159.7–529.8) | 54.8 | (30.4–83.9) | 101.8 | (46.5–216.3) | 153.9 | (86.1–255.6) | 55.7 | (34.2–106.5) | 1.2 | (0.3–3.2) | 37.1 | (6.7–91.6) | 18.9 | (14.9–24.3) | 5.9 | (4.0–11.8) | 18.8 | (8.4–32.3) |
| 2007 | 541.3 | (238.6–1 120.4) | 60.1 | (45.1–79.4) | 64.9 | (32.9–312.7) | 46.8 | (42.5–51.2) | 15.1 | (13.3–17.4) | 1.4 | (1.1–2.2) | 48.1 | (42.6–52.8) | 13.0 | (11.2–15.2) | 11.9 | (3.4–41.1) | 3.4 | (3.0–4.0) |
| 2008 | 126.4 | (88.4–183.6) | 80.9 | (71.2–94.4) | 15.9 | (8.0–28.6) | 62.7 | (52.0–77.9) | 22.5 | (13.6–35.9) | - | - | 51.0 | (46.8–55.8) | 19.2 | (16.3–22.5) | 9.0 | (2.5–17.6) | 10.0 | (8.6–11.7) |
| 2009 | 391.7 | (293.9–520.3) | 139.0 | (125.2–156.5) | 13.8 | (11.2–18.1) | 50.7 | (45.3–57.3) | 17.6 | (14.6–22.2) | - | - | 40.2 | (35.0–45.8) | 39.2 | (32.2–49.0) | 2.5 | (1.3–4.9) | - | - |
| 2010 | 600.7 | (438.2–914.8) | 220.8 | (181.0–272.2) | 92.8 | (70.7–124.3) | 36.8 | (32.4–41.6) | 14.6 | (10.6–19.4) | - | - | 36.9 | (32.9–41.4) | 36.0 | (25.3–57.8) | 2.6 | (1.0–5.7) | - | - |
| 2011 | 122.5 | (88.6–180.5) | 78.9 | (59.6–109.9) | 17.4 | (11.4–26.4) | 52.0 | (44.6–63.0) | 10.3 | (6.6–15.2) | - | - | 22.6 | (19.8–26.4) | 13.0 | (10.9–15.7) | 0.1 | (0.0–0.2) | - | - |
| 2012 | 166.6 | (87.2–330.8) | 102.7 | (72.9–151.2) | 73.3 | (51.3–100.7) | 31.7 | (27.8–36.1) | 10.8 | (5.6–18.0) | - | - | 9.3 | (7.0–13.1) | 17.6 | (14.2–21.8) | 13.6 | (9.5–18.9) | - | - |
| 2013 | 59.0 | (42.3–82.7) | 103.0 | (74.9–135.0) | 100.1 | (56.8–175.8) | 43.6 | (27.2–63.9) | - | - | - | - | 0.3 | (0.2–0.6) | 13.1 | (9.1–18.8) | 1.3 | (1.1–1.7) | - | - |
| 2014 | 131.3 | (46.6–275.9) | 45.2 | (20.5–73.3) | 37.8 | (27.0–51.8) | 19.6 | (14.5–26.8) | 1.8 | (0.0–4.7) | - | - | 1.3 | (0.9–1.9) | 25.7 | (13.2–43.2) | 1.5 | (0.5–2.9) | - | - |
| 2015 | 108.5 | (65.4–170.0) | 77.0 | (56.9–102.2) | 72.9 | (24.1–168.3) | 31.3 | (23.7–41.9) | - | - | - | - | 1.1 | (1.1–1.2) | 18.4 | (6.1–42.4) | 0.1 | (0.0–0.1) | - | - |
| slope | -0.12 | | 0.20 | | 0.03 | | **-0.12** | | **-0.33** | | **-0.58** | | 0.21 | | 0.01 | | **-0.41** | | **-0.56** | |

| Fishing year | Species BEE | | WSQ | | (see note) OSD | | MOD | | JAV | | HJO | | SVA | | GSP | | SSI | | HAK | | GDU | | SND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 6.8 | (5.6–8.2) | 11.8 | (10.2–13.7) | 57.1 | (35.5–83.4) | 3.2 | (2.6–4.1) | 5.0 | (3.9–6.5) | 0.0 | (0.0–0.2) | - | - | 15.7 | (12.5–21.0) | - | - | 5.1 | (4.1–6.2) | - | - | 4.4 | (2.9–6.7) |
| 2003 | 22.1 | (15.9–29.5) | 5.4 | (3.2–8.9) | 7.9 | (5.6–10.5) | 5.9 | (3.6–9.1) | 4.1 | (1.2–7.9) | 0.4 | (0.2–1.0) | - | - | 5.1 | (3.5–7.3) | - | - | 1.2 | (0.5–2.2) | - | - | 0.2 | (0.0–0.4) |
| 2004 | 29.3 | (11.3–65.5) | 8.0 | (5.5–11.2) | 6.2 | (1.8–13.3) | 5.8 | (3.2–10.1) | 1.5 | (0.8–2.6) | 0.7 | (0.1–2.6) | - | - | 2.1 | (1.1–3.6) | - | - | 6.3 | (4.5–8.5) | - | - | 0.8 | (0.2–1.9) |
| 2005 | 11.1 | (8.8–14.5) | 7.7 | (5.7–11.6) | 17.0 | (13.0–23.0) | 7.2 | (5.7–9.3) | 3.6 | (3.4–4.4) | 0.2 | (0.1–0.3) | - | - | 3.5 | (2.2–5.7) | - | - | 1.0 | (0.5–1.6) | - | - | 1.1 | (0.6–1.8) |
| 2006 | 12.4 | (8.8–17.9) | 8.5 | (7.1–10.1) | 0.1 | (0.0–0.5) | 6.2 | (4.5–8.3) | 3.1 | (1.5–5.3) | 7.5 | (4.1–14.6) | 5.8 | (0.0–20.2) | 7.0 | (5.3–9.0) | - | - | 2.8 | (1.9–4.1) | 5.3 | (0.1–17.1) | 0.7 | (0.2–1.4) |
| 2007 | 18.6 | (14.8–22.9) | 8.8 | (7.6–10.5) | 1.6 | (1.3–2.5) | 10.1 | (4.7–17.4) | 2.1 | (1.6–3.1) | 2.2 | (1.3–3.7) | 2.1 | (0.4–5.2) | 5.6 | (4.1–11.3) | - | - | 2.0 | (1.6–2.6) | 4.2 | (2.5–7.1) | 1.4 | (0.5–2.8) |
| 2008 | 17.2 | (15.5–19.3) | 12.1 | (11.1–13.3) | 2.0 | (1.5–3.1) | 10.9 | (6.5–16.7) | 3.7 | (3.1–4.5) | 6.6 | (4.6–9.0) | 37.5 | (14.1–85.1) | 2.8 | (2.2–3.7) | - | - | 0.5 | (0.3–0.8) | 22.0 | (8.7–46.4) | 0.4 | (0.1–0.8) |
| 2009 | 12.3 | (11.3–13.2) | 11.6 | (10.3–13.8) | 0.4 | (0.1–0.8) | 11.3 | (7.9–15.9) | 7.9 | (6.6–9.4) | 2.3 | (1.3–4.0) | 45.6 | (15.8–105.3) | 4.1 | (3.3–5.0) | - | - | 0.6 | (0.4–0.9) | 0.6 | (0.2–1.5) | 2.1 | (1.3–3.2) |
| 2010 | 9.6 | (8.6–10.9) | 10.1 | (9.0–11.5) | 17.6 | (12.7–23.2) | 7.1 | (5.3–9.2) | 13.3 | (11.1–15.9) | 5.9 | (3.9–9.0) | 1.1 | (1.0–1.3) | 2.8 | (2.3–3.4) | - | - | 0.8 | (0.3–1.5) | 2.7 | (1.2–5.5) | 5.2 | (2.6–10.0) |
| 2011 | 6.8 | (5.8–7.9) | 4.3 | (3.5–5.3) | 14.7 | (11.5–18.7) | 3.7 | (2.3–6.2) | 4.8 | (3.7–6.2) | 15.6 | (12.7–18.7) | 0.2 | (0.0–0.7) | 3.0 | (2.2–4.1) | - | - | 0.2 | (0.1–0.3) | 2.3 | (2.1–2.8) | 0.3 | (0.1–0.6) |
| 2012 | 13.2 | (9.9–17.5) | 10.8 | (8.7–12.8) | 2.5 | (1.1–4.3) | 10.9 | (7.4–16.0) | 0.9 | (0.6–1.3) | 15.5 | (10.9–20.8) | - | - | 3.1 | (2.4–4.0) | - | - | 0.3 | (0.1–0.5) | 0.1 | (0.0–0.3) | 3.6 | (2.3–5.3) |
| 2013 | 10.5 | (7.2–14.3) | 9.3 | (6.1–13.3) | 0.2 | (0.1–0.4) | 4.5 | (1.3–9.4) | 0.7 | (0.4–1.0) | - | - | - | - | 9.7 | (2.4–29.9) | - | - | 0.1 | (0.0–0.2) | - | - | - | - |
| 2014 | 6.5 | (5.0–8.4) | 6.4 | (5.1–7.7) | 17.8 | (3.6–38.8) | 11.2 | (2.0–22.5) | 0.7 | (0.3–1.7) | 12.1 | (2.2–26.4) | - | - | 1.7 | (0.6–3.4) | - | - | 0.5 | (0.1–1.5) | 0.0 | (0.0–0.1) | 1.7 | (0.2–4.4) |
| 2015 | 6.9 | (4.5–10.0) | 10.9 | (8.1–14.7) | 0.1 | (0.0–0.1) | 0.4 | (0.1–1.0) | 0.7 | (0.3–1.3) | 28.5 | (20.1–39.0) | - | - | 4.8 | (2.4–8.1) | - | - | 0.3 | (0.1–0.5) | - | - | 26.4 | (9.8–65.4) |
| slope | -0.06 | | 0 | | -0.19 | | -0.05 | | -0.12 | | 0.28 | | -0.04 | | -0.04 | | 0.00 | | **-0.24** | | -0.02 | | 0.08 | |

## Table B20 [Continued]:

| Fishing year | Species LCH | | VCO | | SQA | | ETP | | CYP | | GSH | | SSK | | GRC | | (see note) SSM | | CSQ | | SPD | | ETL | | PAB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 4.0 | (3.3–4.7) | 0.0 | (0.0–0.1) | - | - | - | - | - | - | 0.5 | (0.1–1.1) | 0.2 | (0.0–0.9) | 0.0 | (0.0–0.3) | - | - | - | - | 5.0 | (5.0–7.8) | 0.1 | (0.0–0.1) | - | - |
| 2003 | 1.4 | (0.5–2.9) | - | - | - | - | - | - | - | - | 0.3 | (0.1–0.6) | 0.7 | (0.0–2.2) | 1.9 | (0.1–5.1) | - | - | - | - | - | - | 10.0 | (3.4–24.6) | - | - |
| 2004 | 2.6 | (1.1–4.5) | 0.1 | (0.0–0.2) | - | - | - | - | - | - | 0.1 | (0.0–0.5) | 0.3 | (0.1–0.7) | 5.7 | (2.1–13.0) | - | - | - | - | - | - | 0.7 | (0.2–1.9) | - | - |
| 2005 | 2.1 | (1.2–3.1) | 0.0 | (0.0–0.1) | 4.9 | (3.0–7.4) | - | - | 0.4 | (0.1–0.7) | 0.4 | (0.1–0.9) | 0.1 | (0.0–0.4) | 17.0 | (10.1–27.1) | - | - | - | - | - | - | 0.1 | (0.0–0.2) | 1.9 | (0.1–5.7) |
| 2006 | 4.4 | (3.4–5.8) | 1.4 | (0.4–2.6) | 38.9 | (23.6–58.7) | - | - | 0.5 | (0.2–1.0) | 0.5 | (0.0–1.6) | 0.2 | (0.1–0.3) | 0.0 | (0.0–0.2) | - | - | 0.5 | (0.1–1.4) | - | - | - | - | 1.9 | (0.4–5.0) |
| 2007 | 1.9 | (1.6–2.3) | 0.1 | (0.1–0.1) | - | - | - | - | 2.6 | (1.7–4.0) | - | - | - | - | 0.0 | (0.0–0.1) | - | - | 0.3 | (0.0–0.7) | - | - | - | - | 1.9 | (1.3–3.1) |
| 2008 | 2.6 | (2.0–3.6) | 4.2 | (2.7–6.6) | - | - | - | - | 3.9 | (2.0–6.7) | 0.1 | (0.0–0.2) | 0.1 | (0.0–0.1) | 0.2 | (0.1–0.3) | - | - | - | - | 6.6 | (2.0–20.3) | 2.5 | (1.1–5.3) | 0.3 | (0.1–0.7) |
| 2009 | 2.4 | (2.0–3.1) | 11.1 | (8.7–14.3) | 0.1 | (0.0–0.1) | - | - | 1.9 | (1.5–2.3) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.1) | - | - | - | - | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.1) | 3.8 | (2.5–6.1) | 2.0 | (1.2–4.0) |
| 2010 | 2.6 | (2.2–3.3) | 3.6 | (1.5–8.4) | - | - | - | - | 2.3 | (1.7–3.0) | 0.0 | (0.0–0.1) | 2.7 | (1.0–7.6) | 3.1 | (1.8–5.6) | - | - | 0.3 | (0.1–0.7) | - | - | - | - | 0.9 | (0.3–1.9) |
| 2011 | 0.4 | (0.2–0.7) | 0.2 | (0.0–0.4) | - | - | - | - | 0.5 | (0.2–0.8) | 0.0 | (0.0–0.1) | - | - | - | - | - | - | 0.2 | (0.0–0.4) | - | - | - | - | 0.3 | (0.0–0.9) |
| 2012 | 1.0 | (0.6–1.5) | 0.4 | (0.3–0.6) | - | - | - | - | 1.0 | (0.4–1.9) | 0.0 | (0.0–0.1) | 20.7 | (4.0–55.3) | - | - | 2.8 | (0.4–10.9) | 0.2 | (0.0–0.4) | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.2) | 0.2 | (0.0–0.5) |
| 2013 | 0.5 | (0.3–0.8) | 0.2 | (0.1–0.3) | - | - | - | - | 4.0 | (0.6–10.7) | 0.2 | (0.0–0.6) | - | - | - | - | 3.5 | (1.0–8.3) | 0.2 | (0.0–0.5) | 0.0 | (0.0–0.1) | - | - | 0.0 | (0.0–0.1) |
| 2014 | 1.8 | (0.3–3.9) | 0.2 | (0.1–0.3) | - | - | - | - | 1.9 | (0.6–3.5) | - | - | 0.1 | (0.0–0.4) | 0.0 | (0.0–0.1) | 2.7 | (1.0–4.8) | 0.7 | (0.2–1.5) | - | - | - | - | - | - |
| 2015 | 3.3 | (1.8–5.6) | - | - | - | - | - | - | 5.4 | (3.8–7.5) | 0.1 | (0.0–0.4) | 0.1 | (0.0–0.3) | - | - | 14.1 | (10.0–19.8) | - | - | - | - | - | - | 0.7 | (0.2–1.6) |
| slope | -0.07 | | 0.06 | | -0.12 | | 0.00 | | **0.27** | | -0.10 | | 0.01 | | -0.21 | | **0.34** | | 0.06 | | -0.12 | | -0.15 | | 0.00 | |

| Fishing year | Species TAM | | CHI | | MOC | | SCC | | URO | | RIB | | CDL | | LIN | | PLS | | SMC | | CBD | | MIQ | | CHG | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | - | - | 0.8 | (0.1–2.3) | - | - | - | - | 0.6 | (0.4–1.0) | 0.8 | (0.5–1.3) | - | - | 1.0 | (0.5–2.3) | - | - | 1.9 | (0.1–3.5) | - | - | - | - | 0.5 | (0.3–0.7) |
| 2003 | - | - | 0.0 | (0.0–0.1) | - | - | - | - | 2.3 | (1.2–3.8) | 0.0 | (0.0–0.1) | - | - | - | - | - | - | - | - | - | - | - | - | 0.0 | (0.0–0.1) |
| 2004 | - | - | 0.2 | (0.0–0.8) | - | - | - | - | 0.3 | (0.2–0.5) | 0.2 | (0.0–0.5) | 0.2 | (0.0–0.6) | 0.1 | (0.0–0.3) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.1) | - | - | - | - | 0.4 | (0.2–0.8) |
| 2005 | 0.0 | (0.0–0.1) | 0.8 | (0.4–1.6) | - | - | - | - | 0.1 | (0.0–0.1) | 0.5 | (0.2–0.9) | 10.2 | (2.1–28.8) | 0.1 | (0.0–0.2) | 0.3 | (0.0–0.7) | - | - | - | - | - | - | 0.6 | (0.3–0.9) |
| 2006 | 0.6 | (0.4–0.9) | 1.1 | (0.6–1.8) | - | - | - | - | 0.1 | (0.0–0.1) | 0.3 | (0.2–0.4) | 0.3 | (0.0–0.7) | 0.1 | (0.0–0.3) | 0.1 | (0.0–0.2) | - | - | - | - | - | - | 0.1 | (0.0–0.3) |
| 2007 | 1.5 | (1.4–1.6) | 1.6 | (1.4–1.8) | - | - | - | - | - | - | 0.2 | (0.1–0.3) | 0.1 | (0.0–0.4) | 2.9 | (1.0–11.7) | 0.0 | (0.0–0.1) | - | - | 3.7 | (2.1–6.9) | - | - | 0.1 | (0.1–0.3) |
| 2008 | 1.6 | (1.3–2.3) | 0.1 | (0.1–0.3) | 5.3 | (3.0–10.0) | - | - | - | - | 0.1 | (0.0–0.2) | - | - | 0.0 | (0.0–0.1) | 0.3 | (0.0–0.9) | - | - | 0.1 | (0.0–0.4) | 0.7 | (0.2–1.2) | 0.1 | (0.0–0.3) |
| 2009 | 2.0 | (1.5–2.7) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.1) | - | - | - | - | 0.5 | (0.3–0.8) | - | - | 0.2 | (0.1–0.3) | 0.1 | (0.0–0.5) | - | - | - | - | 0.7 | (0.3–1.1) | 0.5 | (0.3–0.9) |
| 2010 | 2.1 | (1.4–3.6) | 0.1 | (0.1–0.2) | 0.1 | (0.0–0.2) | - | - | - | - | 0.6 | (0.3–0.9) | 0.1 | (0.0–0.3) | 0.2 | (0.1–0.3) | 0.4 | (0.0–1.4) | 0.0 | (0.0–0.1) | - | - | 0.5 | (0.4–0.7) | 2.0 | (1.8–2.3) |
| 2011 | 0.5 | (0.2–1.1) | 0.5 | (0.2–0.9) | - | - | - | - | 0.2 | (0.0–0.4) | 0.3 | (0.1–0.5) | - | - | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.1) | - | - | 0.1 | (0.0–0.3) | 2.1 | (1.5–2.9) | 0.1 | (0.0–0.1) |
| 2012 | 0.2 | (0.1–0.3) | 0.1 | (0.0–0.2) | - | - | 2.0 | (0.0–6.1) | 0.4 | (0.0–1.3) | 0.1 | (0.0–0.2) | - | - | 0.1 | (0.0–0.3) | 0.2 | (0.0–0.5) | 0.8 | (0.4–1.3) | - | - | - | - | 0.5 | (0.1–1.1) |
| 2013 | 1.0 | (0.3–2.0) | - | - | - | - | - | - | - | - | - | - | - | - | 0.2 | (0.0–0.4) | 0.1 | (0.0–0.3) | 27.1 | (17.0–39.4) | - | - | - | - | 0.9 | (0.3–1.6) |
| 2014 | 0.2 | (0.0–0.4) | 1.9 | (0.1–5.2) | - | - | - | - | - | - | 0.1 | (0.0–0.4) | 0.1 | (0.0–0.6) | 0.1 | (0.0–0.1) | 0.0 | (0.0–0.1) | 0.1 | (0.0–0.2) | - | - | - | - | 1.0 | (0.4–2.1) |
| 2015 | 0.4 | (0.2–0.6) | 0.1 | (0.0–0.3) | - | - | - | - | - | - | 0.7 | (0.0–2.8) | - | - | 0.0 | (0.0–0.1) | 3.6 | (1.4–7.1) | 2.0 | (1.0–3.3) | - | - | - | - | 0.7 | (0.3–1.4) |
| slope | 0.11 | | -0.06 | | -0.01 | | 0.05 | | -0.12 | | -0.03 | | -0.10 | | -0.06 | | 0.10 | | 0.14 | | -0.02 | | 0.04 | | 0.10 | |

## Table B20 [Continued]:

| Fishing year | SFI | HTH | BSL | PSE | CHP | WWA | BBE | ROC | SKA | APR | CMU | TOA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Species | | | | | | | | | | | |
| 2002 | 0.1 (0.0–0.2) | - - | 1.2 (0.0–3.8) | - - | - - | 0.2 (0.1–0.5) | - - | - - | 1.1 (0.4–1.9) | - - | - - | 0.3 (0.2–0.5) |
| 2003 | 0.5 (0.1–1.8) | 0.5 (0.2–0.8) | - - | - - | - - | 0.2 (0.0–0.6) | - - | - - | 0.2 (0.0–0.8) | - - | - - | 0.1 (0.0–0.2) |
| 2004 | 0.1 (0.0–0.1) | - - | 0.2 (0.0–1.2) | - - | 0.8 (0.3–1.4) | 0.2 (0.0–0.5) | - - | - - | 0.1 (0.0–0.5) | - - | - - | 0.2 (0.1–0.4) |
| 2005 | 0.1 (0.0–0.1) | - - | - - | - - | 0.4 (0.2–0.8) | 0.0 (0.0–0.1) | - - | - - | - - | 0.2 (0.1–0.3) | 6.0 (2.4–11.6) | 0.1 (0.1–0.2) |
| 2006 | 0.2 (0.1–0.4) | 0.1 (0.1–0.2) | 0.1 (0.0–0.2) | - - | 0.9 (0.4–1.7) | 0.0 (0.0–0.1) | - - | 0.5 (0.1–1.2) | - - | 0.5 (0.1–1.4) | 0.0 (0.0–0.1) | 0.3 (0.2–0.4) |
| 2007 | 0.0 (0.0–0.1) | 0.1 (0.0–0.4) | 0.0 (0.0–0.1) | 0.1 (0.0–0.3) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) | - - | 1.9 (1.3–2.9) | - - | 0.1 (0.1–0.3) | - - | 0.2 (0.0–0.8) |
| 2008 | - - | 0.1 (0.0–0.1) | 0.5 (0.3–0.9) | - - | 0.2 (0.1–0.4) | - - | 0.1 (0.0–0.4) | - - | - - | 0.2 (0.1–0.5) | - - | 0.1 (0.0–0.2) |
| 2009 | 0.1 (0.0–0.1) | 4.0 (2.6–6.0) | 0.1 (0.0–0.1) | - - | 1.9 (1.6–2.2) | 0.0 (0.0–0.1) | 0.1 (0.0–0.2) | - - | - - | 0.1 (0.0–0.2) | - - | 0.1 (0.0–0.2) |
| 2010 | - - | 0.2 (0.2–0.3) | 0.5 (0.3–0.7) | - - | 0.5 (0.2–0.9) | 0.0 (0.0–0.1) | - - | - - | - - | 0.5 (0.2–1.2) | - - | 0.1 (0.0–0.1) |
| 2011 | 0.0 (0.0–0.1) | 0.2 (0.1–0.3) | 1.2 (0.1–3.4) | - - | 0.2 (0.1–0.3) | 1.5 (1.0–2.5) | 7.2 (2.0–16.1) | - - | - - | 0.0 (0.0–0.1) | - - | - - |
| 2012 | 0.1 (0.0–0.1) | 0.1 (0.0–0.2) | 2.4 (1.4–4.7) | - - | 0.2 (0.0–0.3) | 0.0 (0.0–0.1) | - - | - - | - - | 0.4 (0.1–0.8) | - - | 0.1 (0.0–0.1) |
| 2013 | - - | 0.2 (0.1–0.3) | 1.2 (0.1–3.3) | - - | 0.0 (0.0–0.1) | - - | - - | - - | - - | - - | - - | 0.0 (0.0–0.1) |
| 2014 | 0.3 (0.0–0.7) | 0.1 (0.0–0.4) | - - | - - | 0.1 (0.0–0.1) | - - | - - | - - | - - | - - | - - | 0.1 (0.0–0.2) |
| 2015 | 0.0 (0.0–0.1) | 0.0 (0.0–0.1) | 0.2 (0.0–0.6) | - - | 0.2 (0.0–0.5) | 0.0 (0.0–0.1) | - - | - - | - - | 1.3 (0.2–3.1) | - - | 0.0 (0.0–0.1) |
| slope | -0.02 | 0 | 0.07 | 0.00 | -0.03 | -0.02 | 0.05 | -0.04 | -0.08 | 0.08 | -0.06 | -0.06 |

## APPENDIX B [Continued]: OREO FIGURES

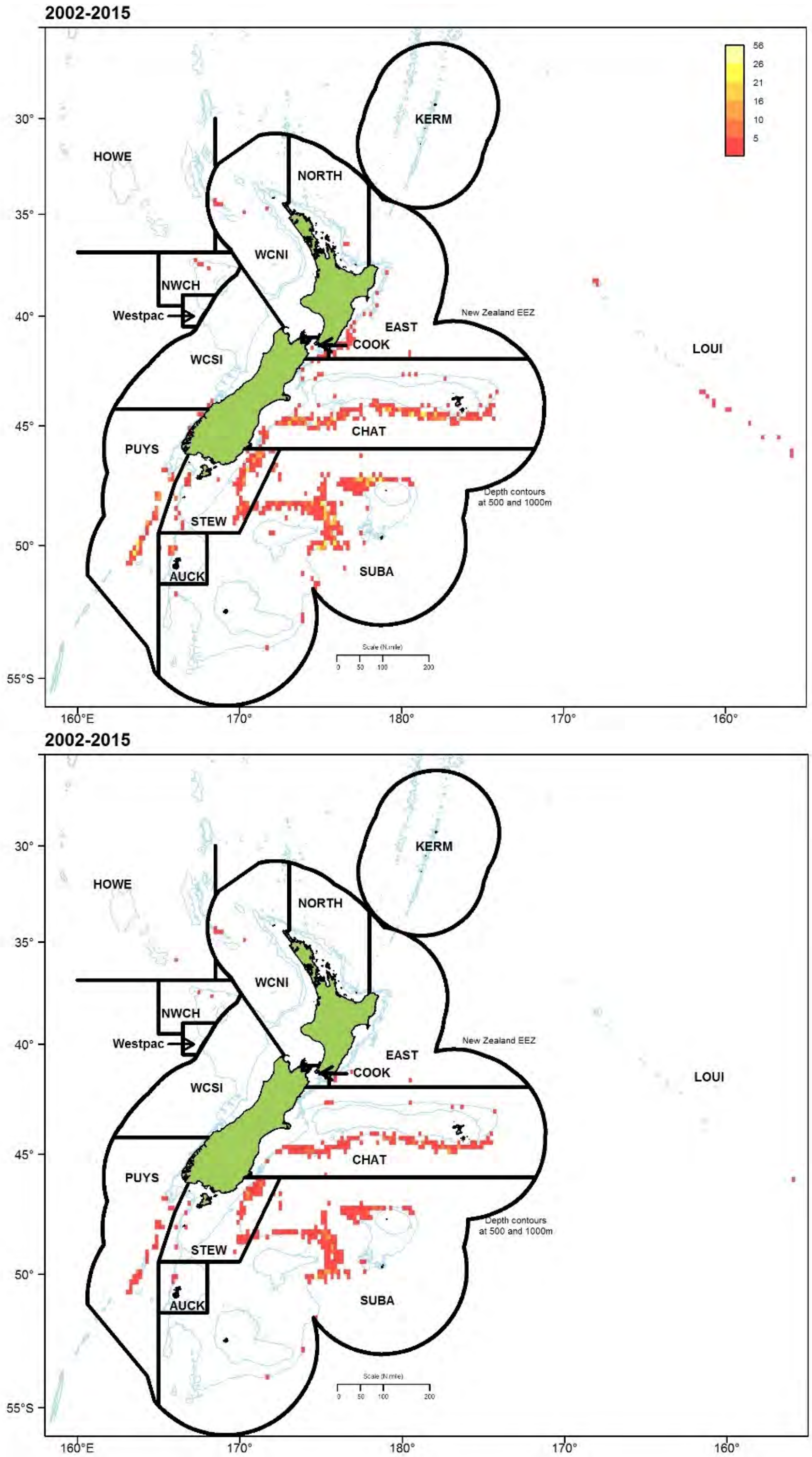
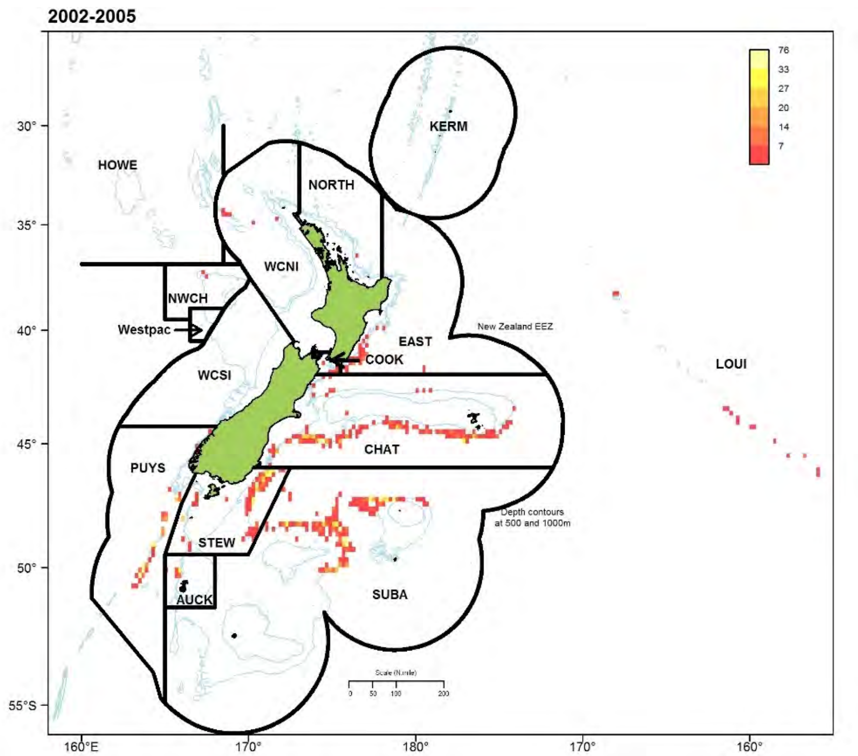



**Figure B1: Density plots showing the distribution of all commercial tows with recorded position data targeting oreo (top) and all tows recorded by observers on vessels targeting oreo (bottom), for fishing years 2002–15. The legend indicates the average number of tows per year in each 0.1˚ cell; solid lines mark the boundary of the EEZ and areas used in the analyses; dashed lines indicates the approximate 1000 m isobaths.**



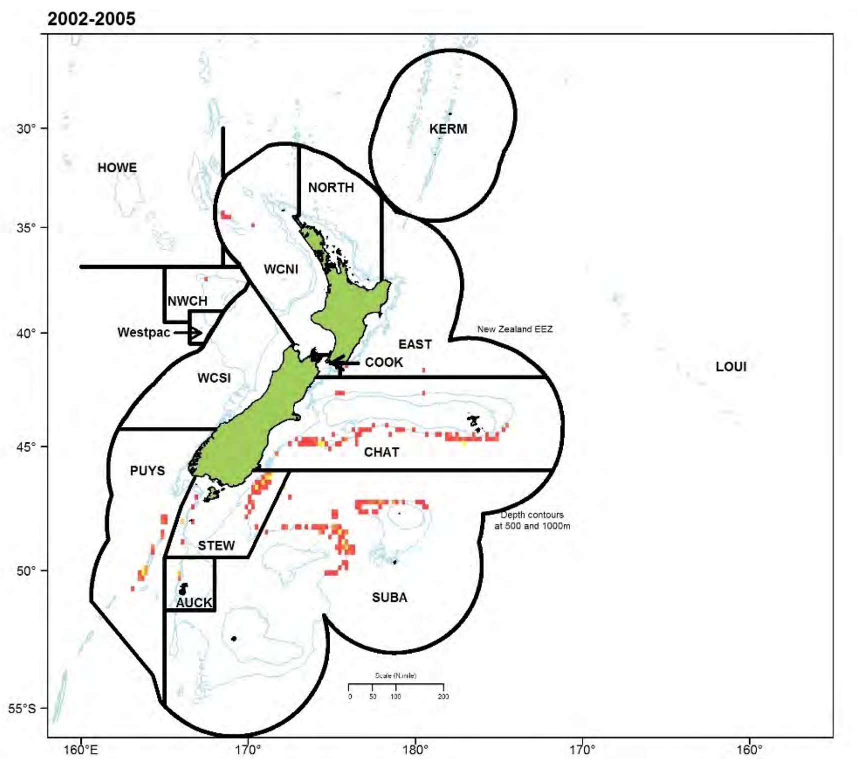
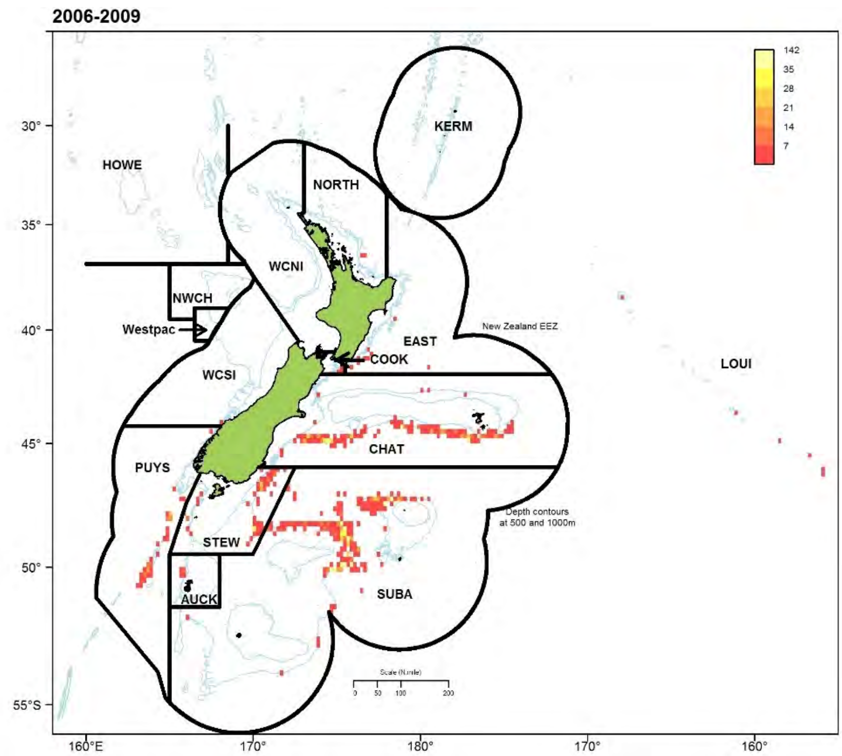




**Figure B2: Density plots showing the distribution of all commercial tows with recorded position data targeting oreo (top) and all tows recorded by observers on vessels targeting oreo (bottom), in blocks of years. The legend indicates the average number of tows per year in each 0.1° cell. See Figure 2 caption for more details. [Continued on next pages]**



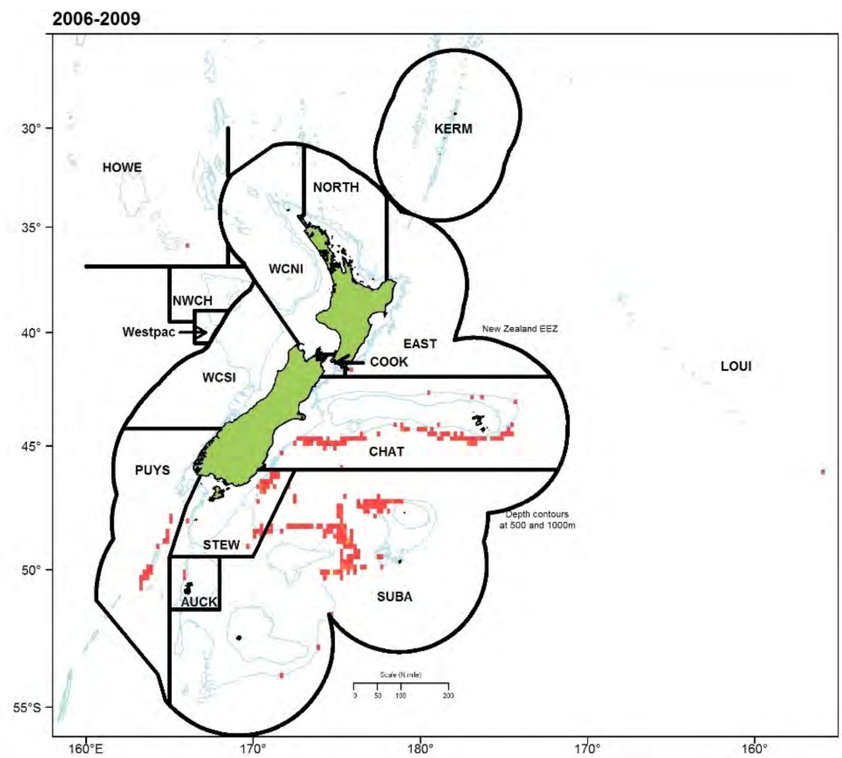
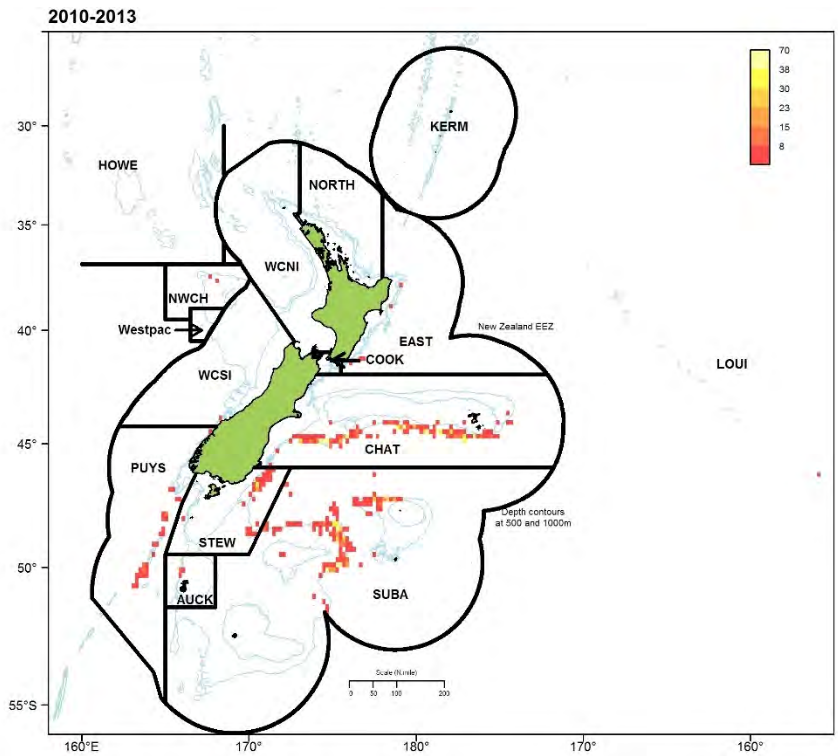




**Figure B2 [Continued]:**



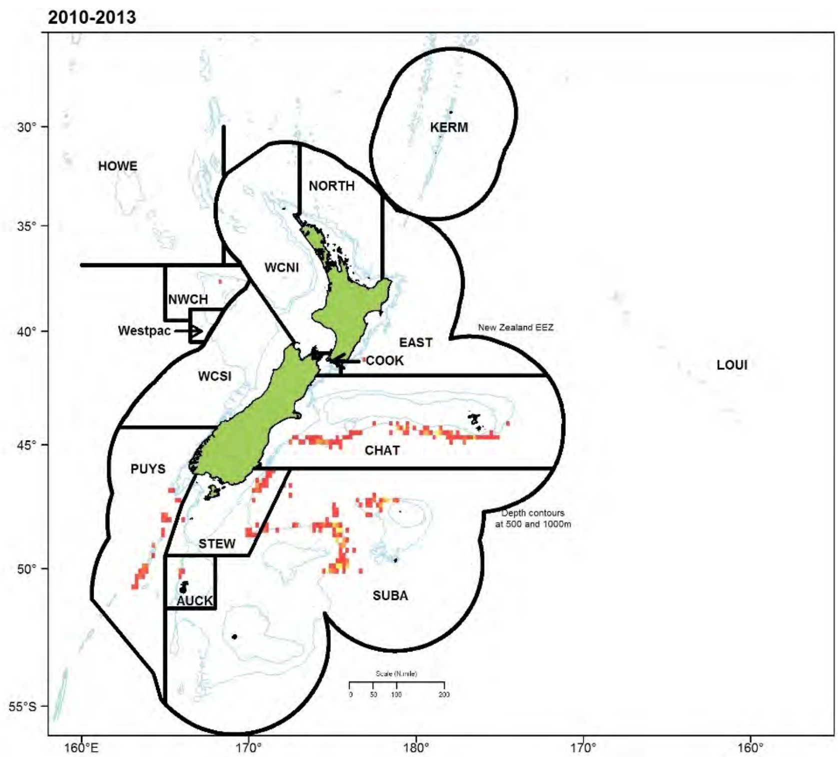
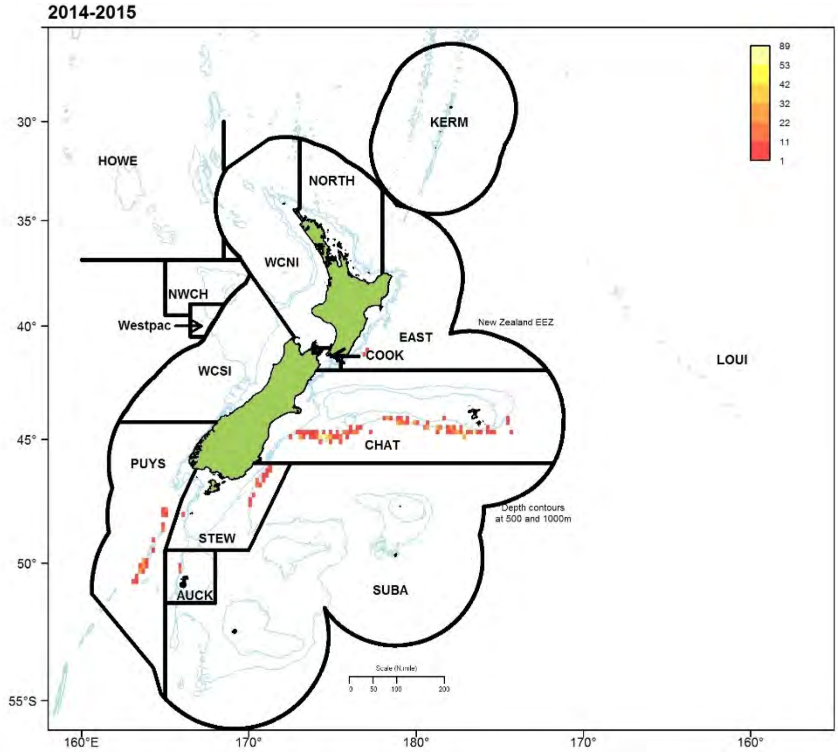




**Figure B2 [Continued]:**



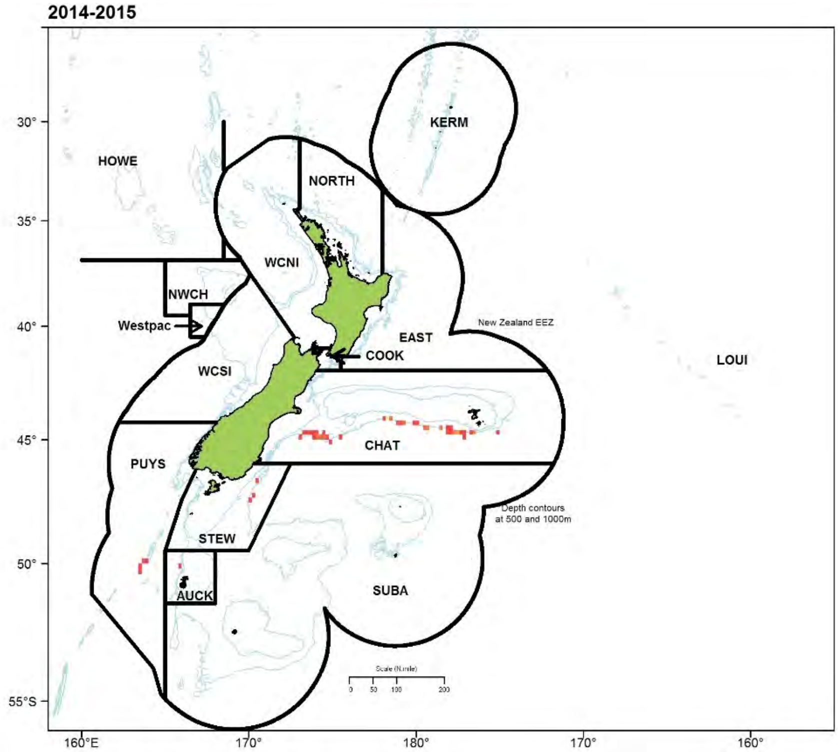




**Figure B2 [Continued]:**

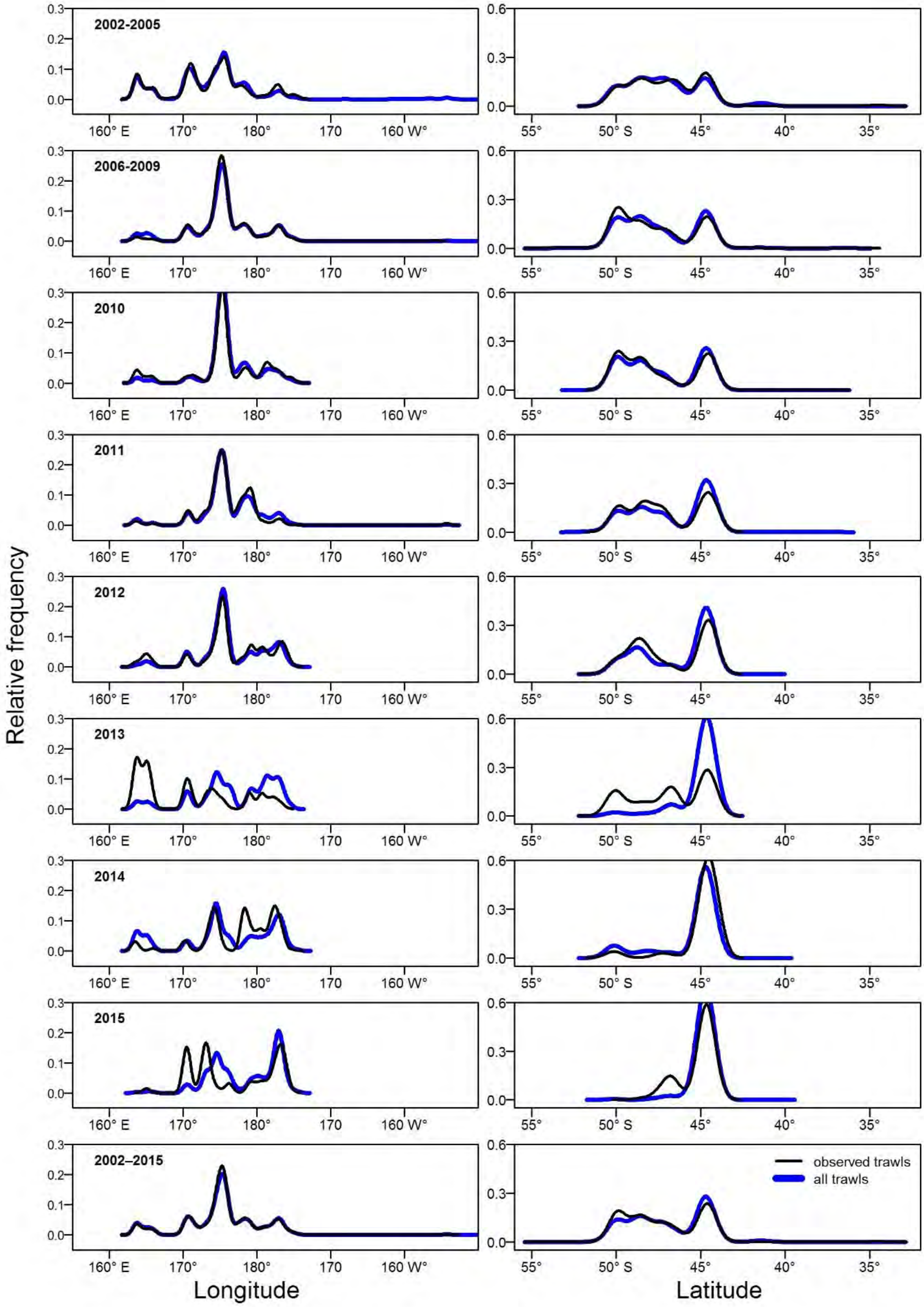



**Figure B3: Comparison of start positions (latitude and longitude) of observed tows with those of all commercial tows in the oreo target trawl fishery, by blocks of fishing years to 2009, for individual fishing years 2010–15 and for all years combined, for fishing years 2002–15. The relative frequency was calculated from a density function that used linear approximation to estimate frequencies at a series of equally spaced points.**

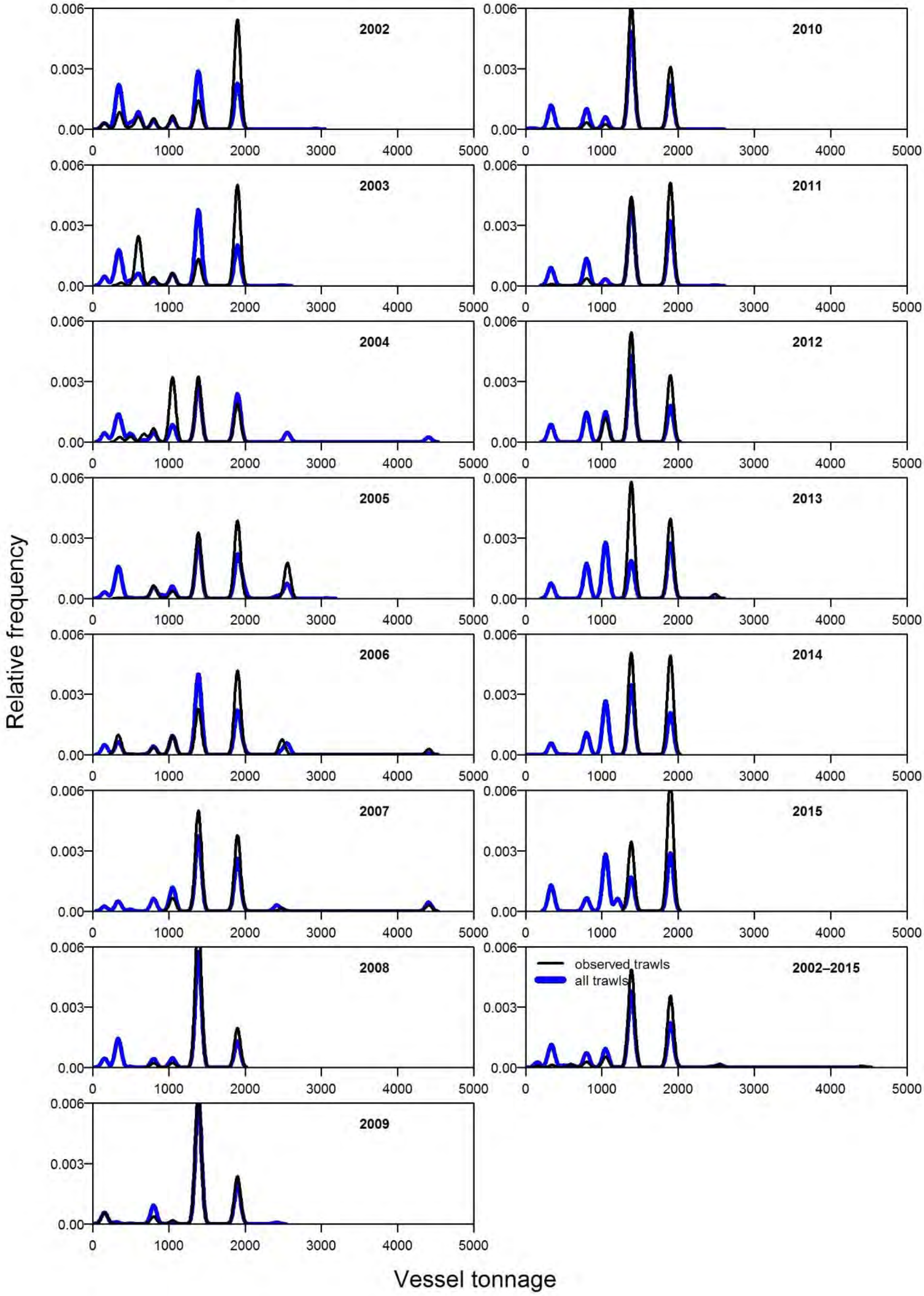



**Figure B4: Comparison of vessel sizes (gross registered tonnage) in observed tows versus all recorded commercial tows in the oreo target trawl fishery for individual fishing years and for all years combined, for the fishing years 2002–15. The relative frequency was calculated from a density function that used linear approximation to estimate frequencies at a series of equally spaced points.**

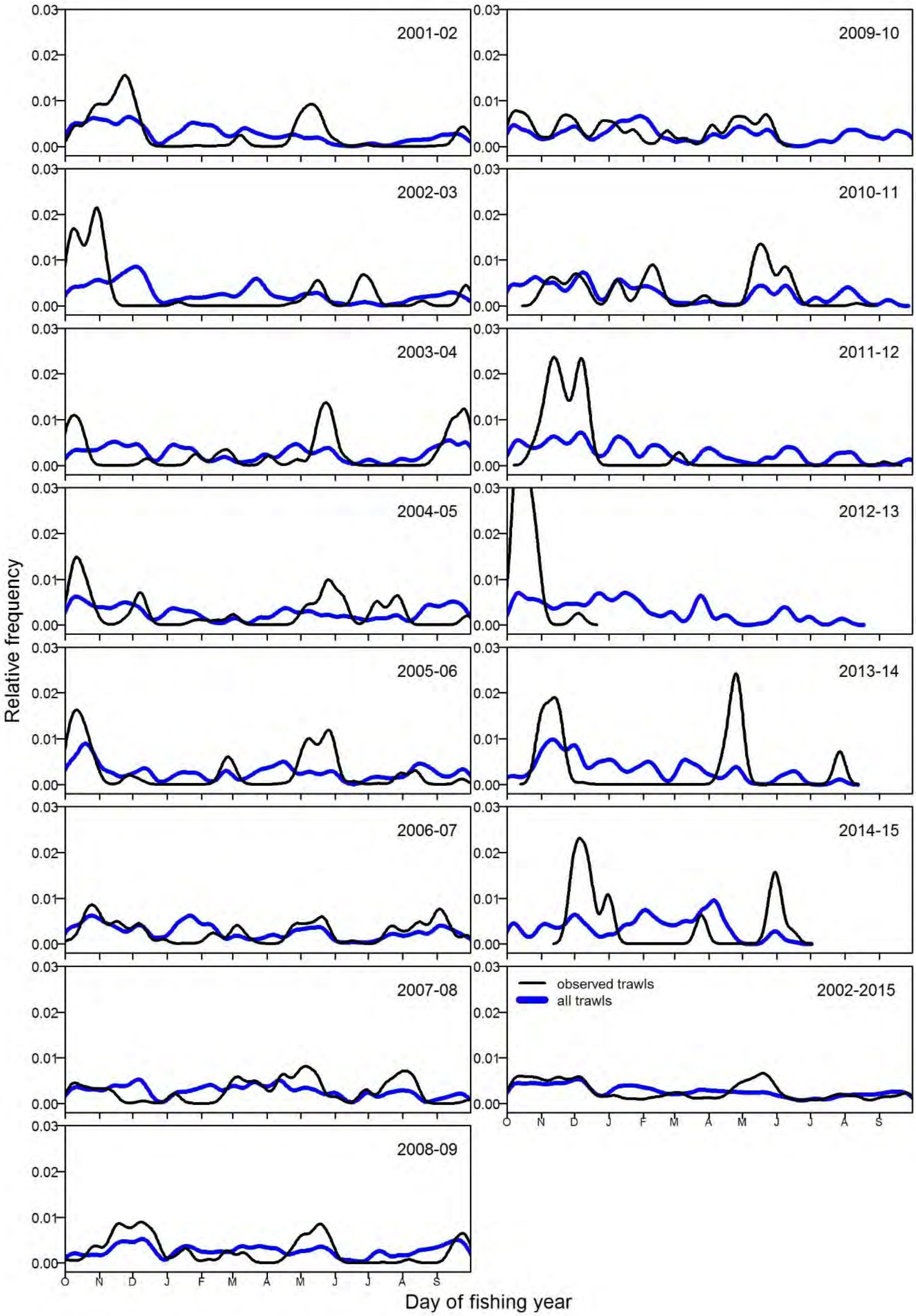



**Figure B5: Comparison of the temporal spread of observed tows with all recorded commercial tows for fishing years 2002–15, and for all years combined for target oreo trawls. The relative frequency of the numbers of tows was calculated from a density function that used linear approximation to estimate frequencies at a series of equally spaced points.**

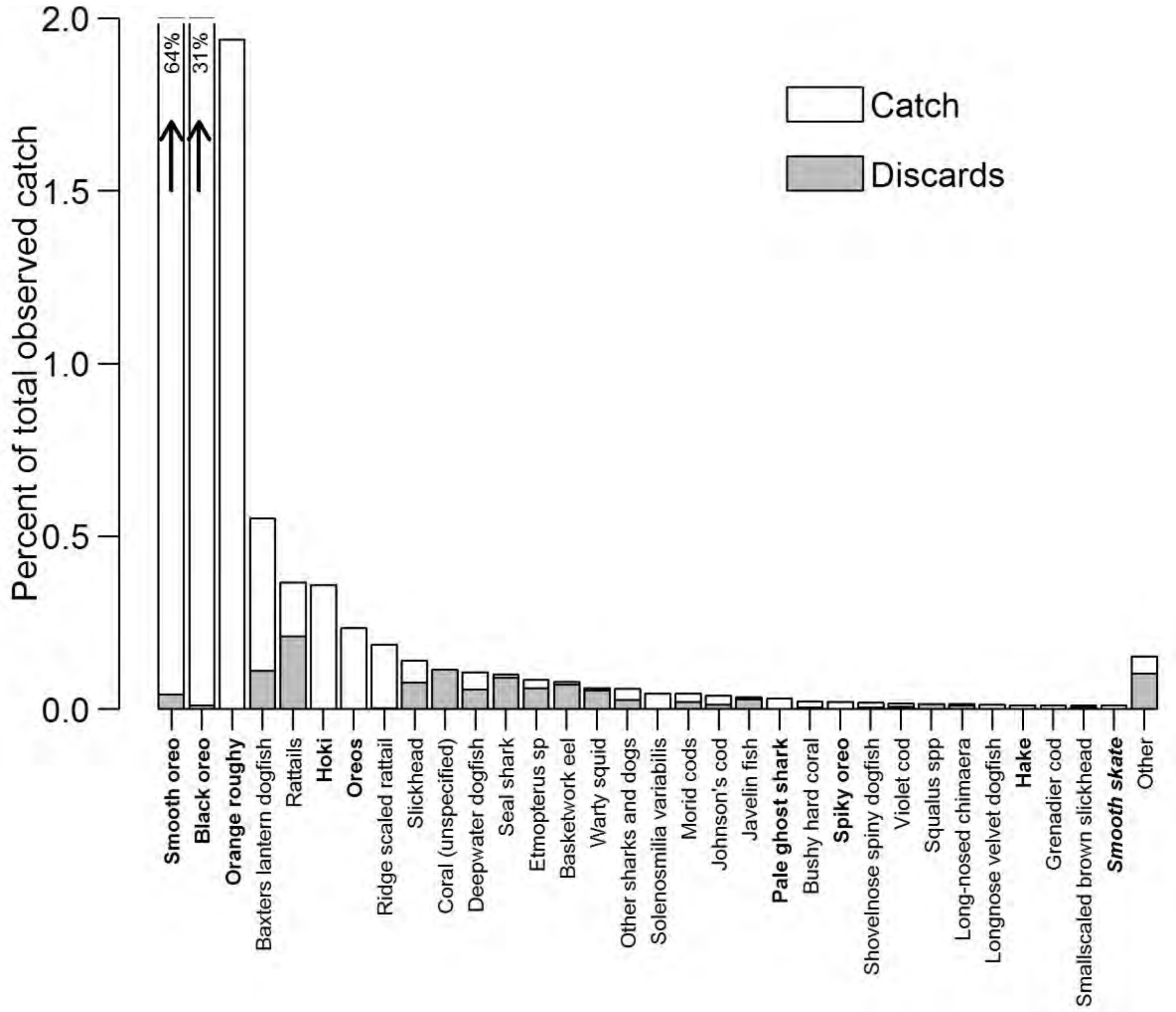



**Figure B6: Percentage of the total catch contributed by the main bycatch species (those representing 0.01% or more of the total catch) in the observed portion of the oreo trawl fishery between 2001–02 and 2014–15, and the percentage discarded. The Other category is the sum of all bycatch species representing less than 0.01% of the total catch. Names in bold are QMS species, names in italics are QMS species that can be legally discarded under Schedule 6 of the Fisheries Act (1996).**

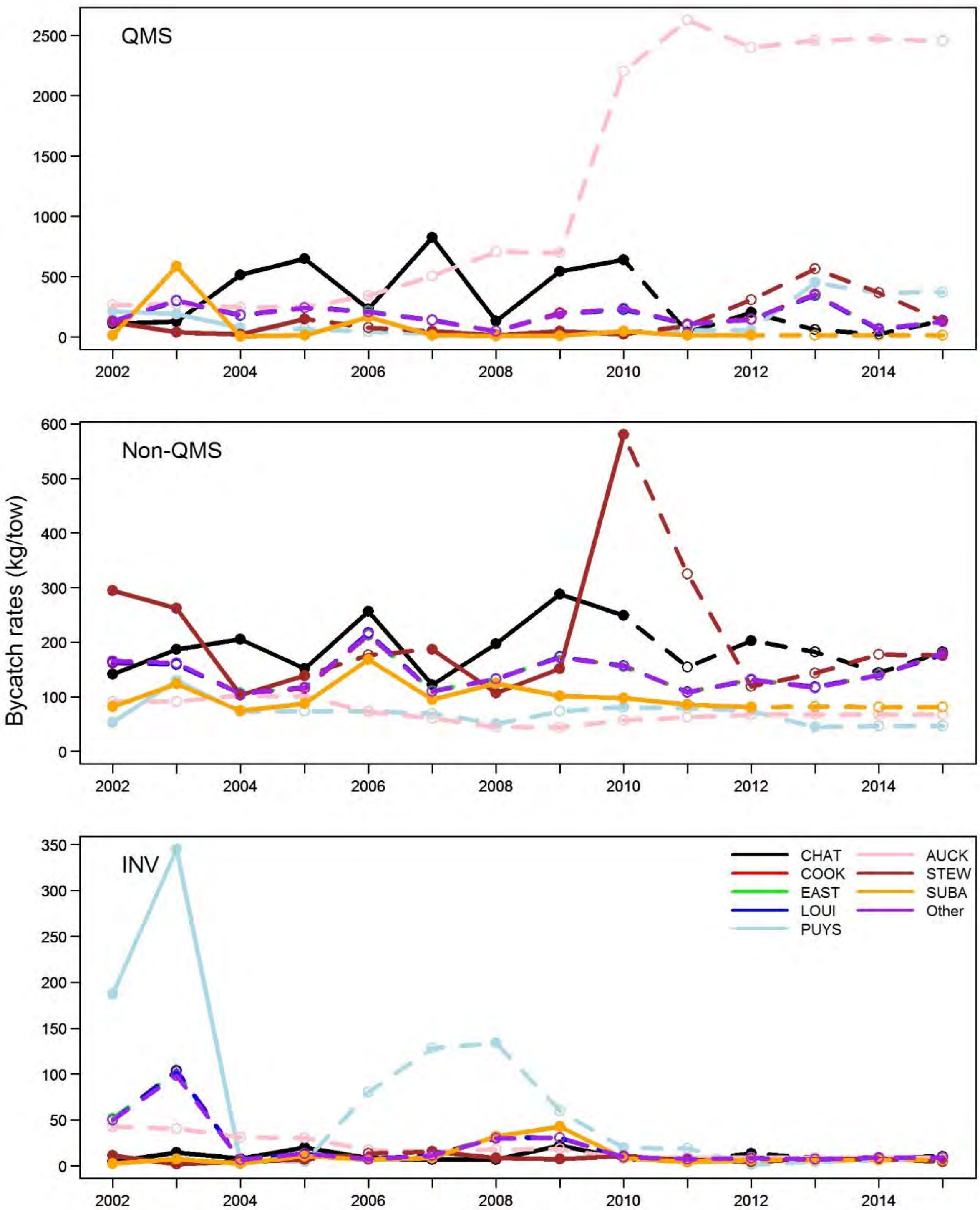



**Figure B7: Annual bycatch rates by species category and areas used for stratification, in the oreo target trawl fishery. Bycatch rates are the median of the bootstrap sample of 1000. Filled dots and solid lines indicate periods during which there were sufficient observed trawls (over 25) to calculate an individual bycatch rate for the area, otherwise dots are unfilled and lines are dashed and bycatch rates were calculated using additional records from adjacent years or, if still not sufficient, using records from all areas for individual years (see Table B7) as required to obtain at least 25 records. [Continued on next pages]**

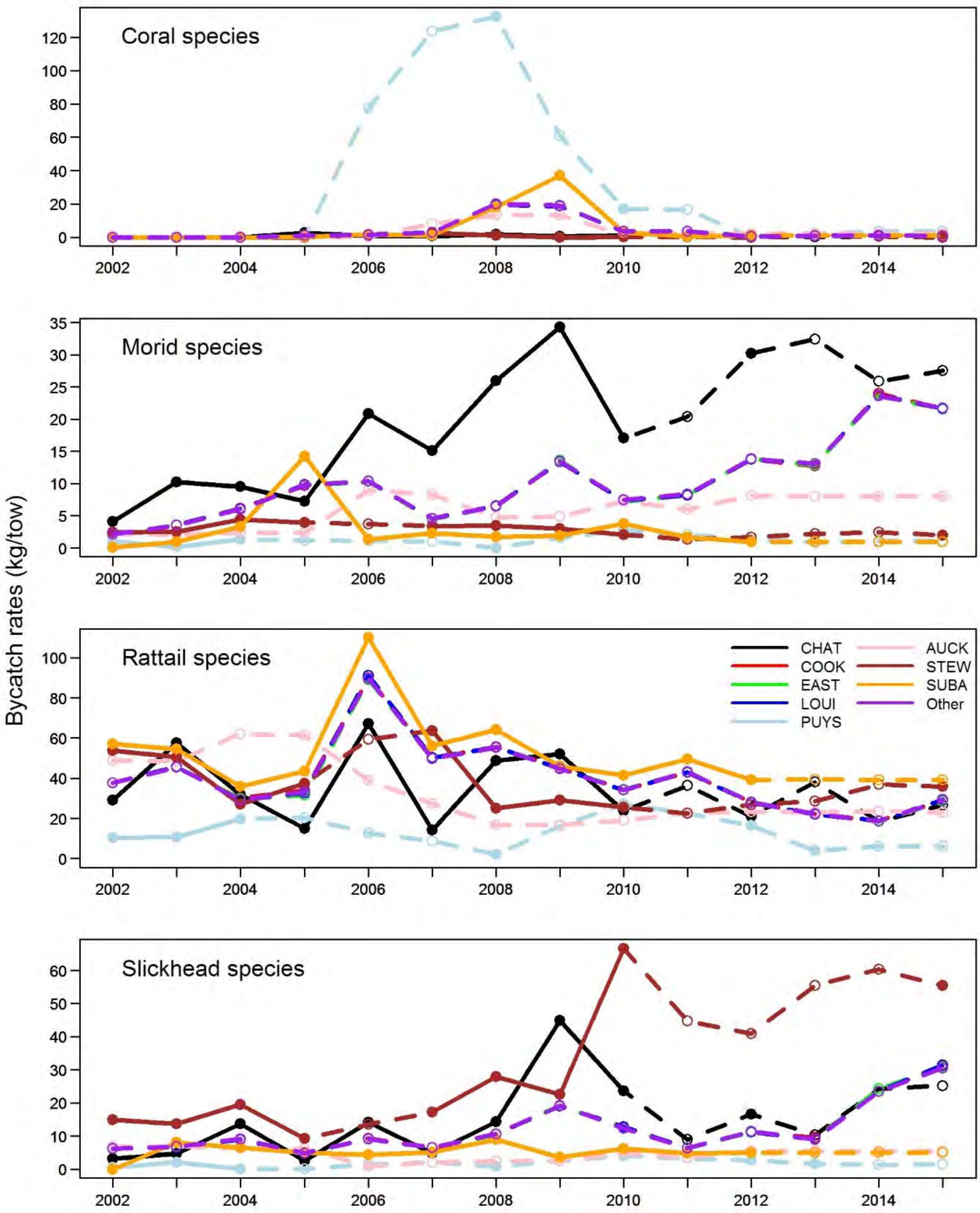



**Figure B7 [Continued]:**

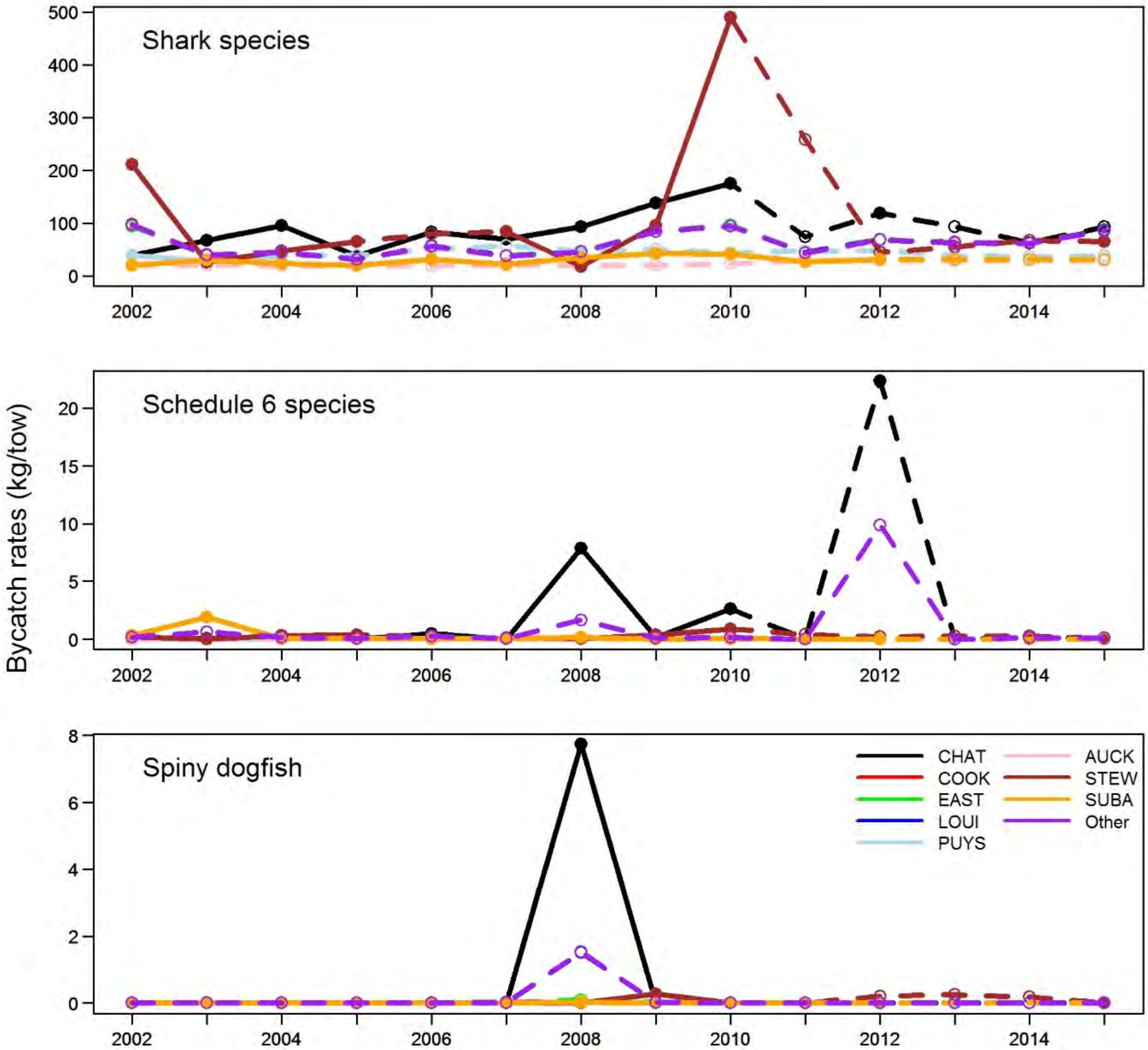



**Figure B7 [Continued]:**

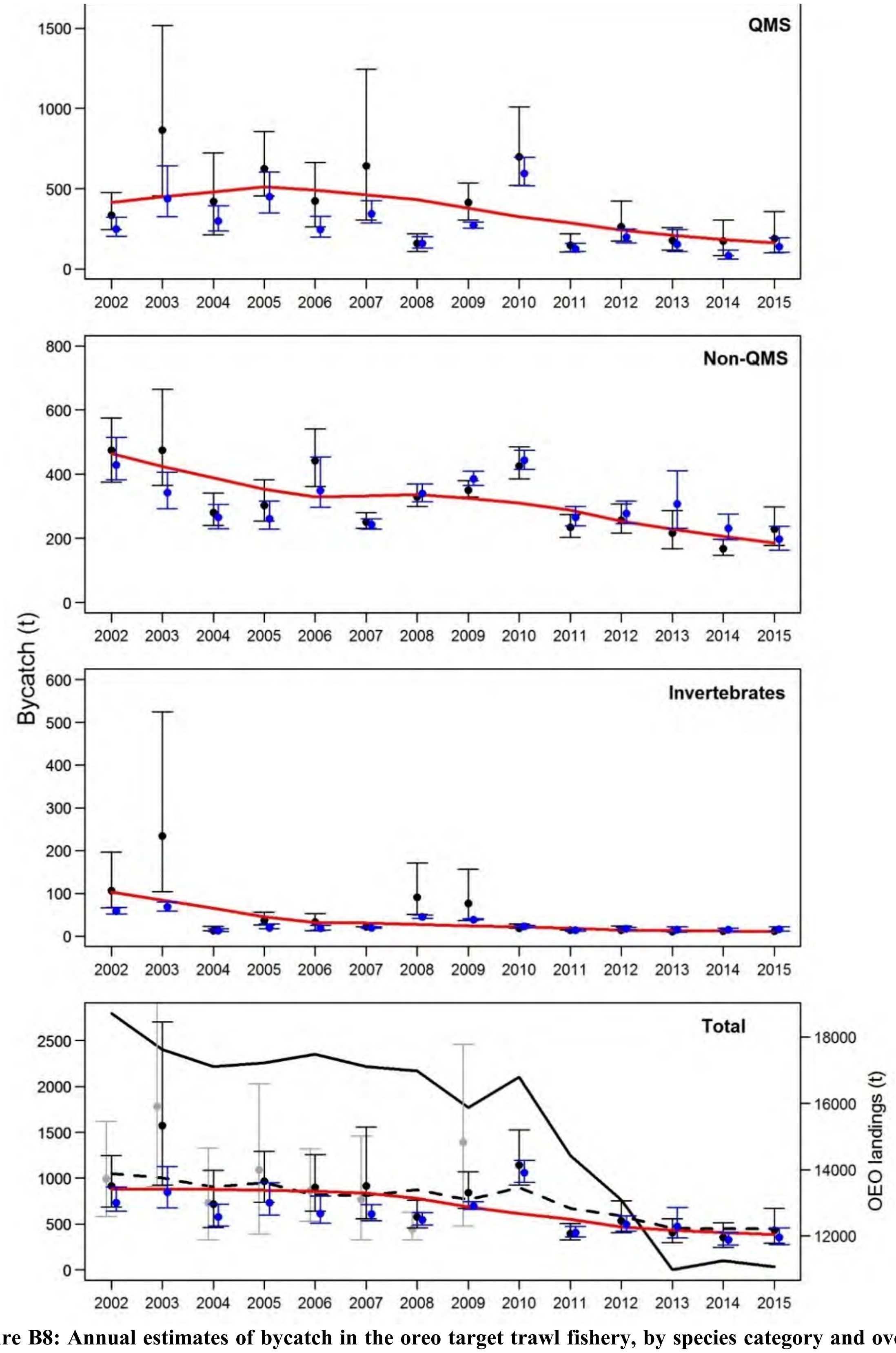



**Figure B8: Annual estimates of bycatch in the oreo target trawl fishery, by species category and overall, for 2001–02 to 2014–15: black dots, ratio method; blue dots, statistical model method. Also shown (in grey) are earlier estimates of total bycatch calculated for 2001–02 to 2008–09 (Anderson 2011). 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 oreos, and the dashed line shows annual effort (number of tows), scaled to have mean equal to that of total bycatch. [Continued on next pages]**

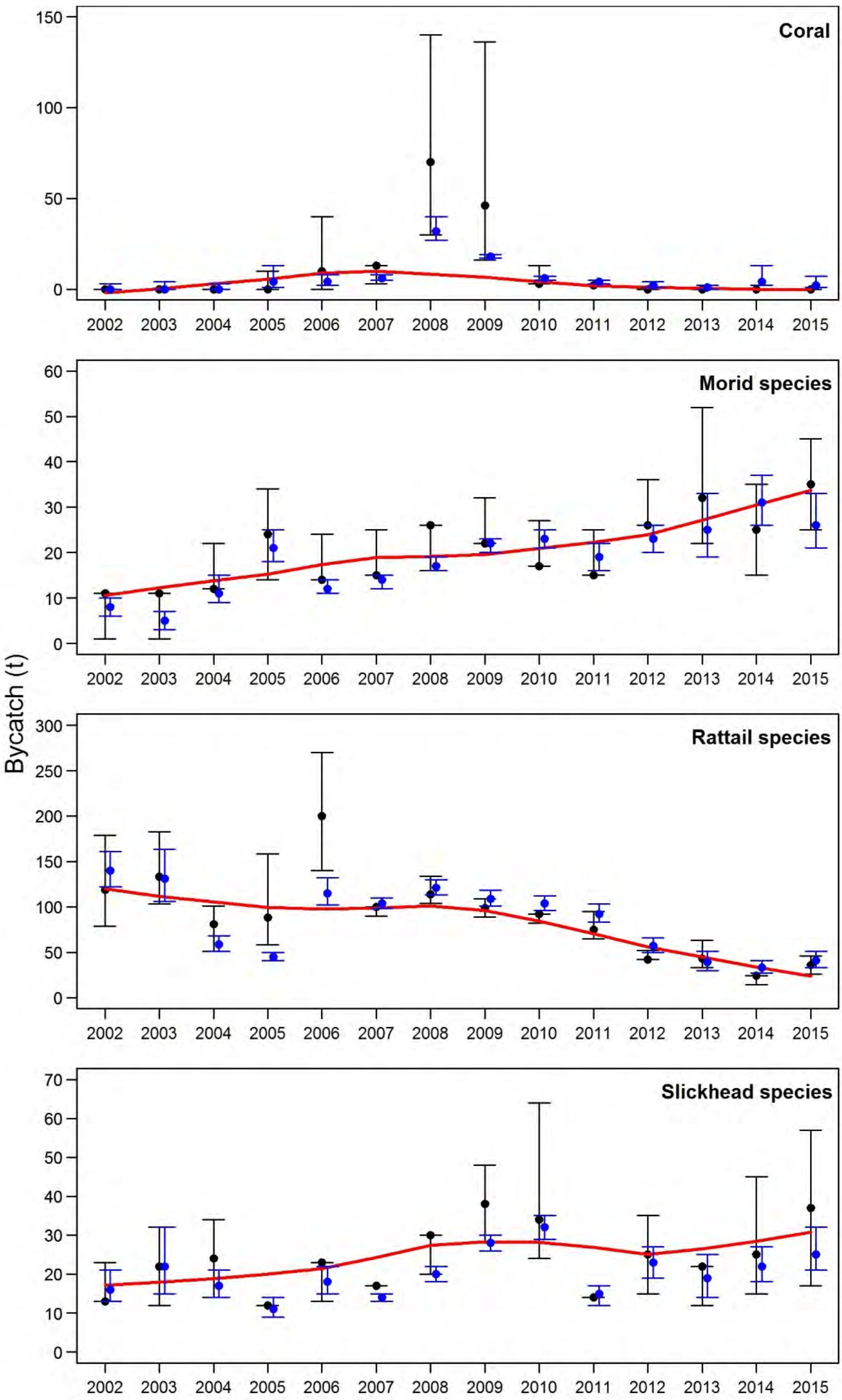



**Figure B8 [Continued]:**

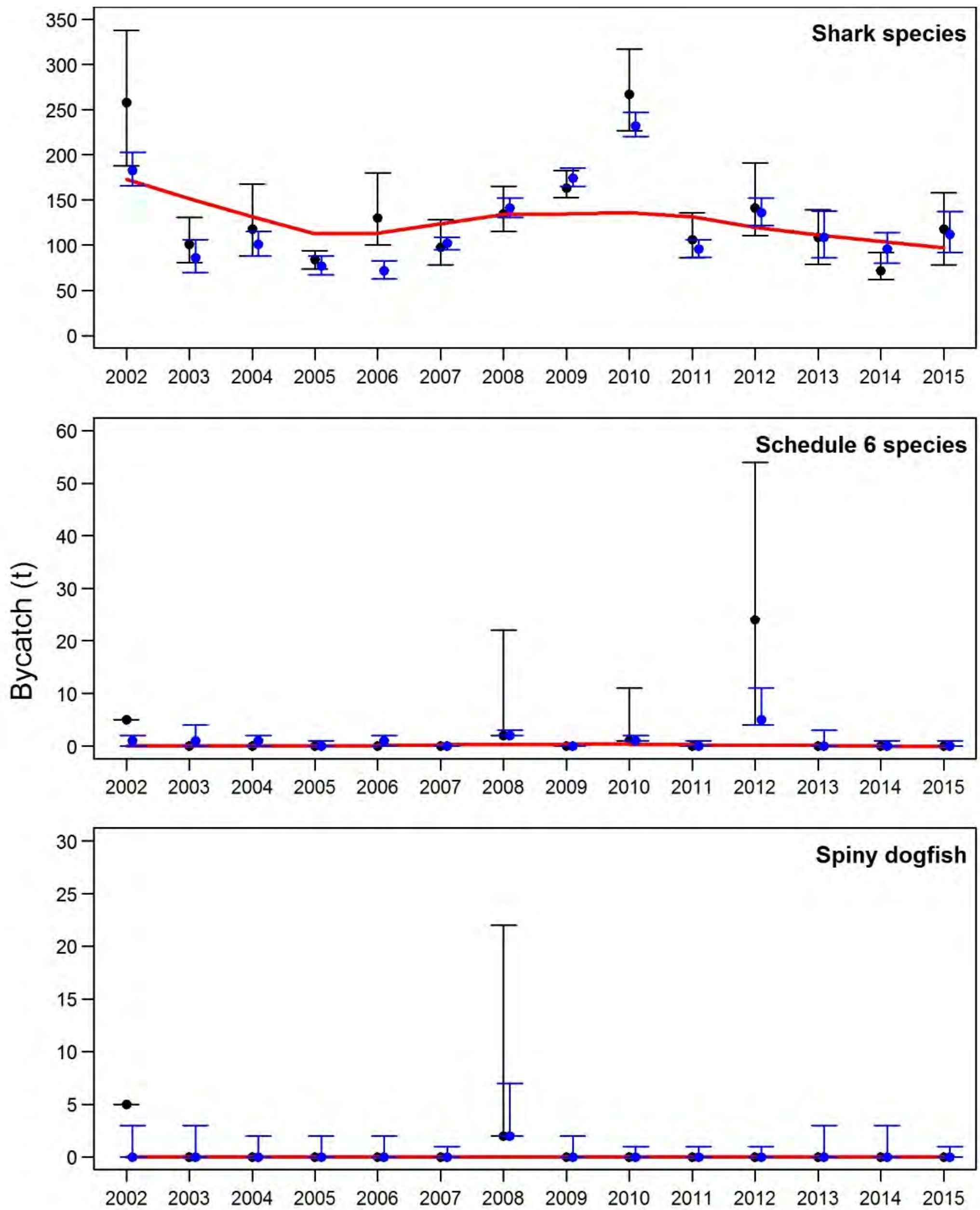



**Figure B8 [Continued]:**

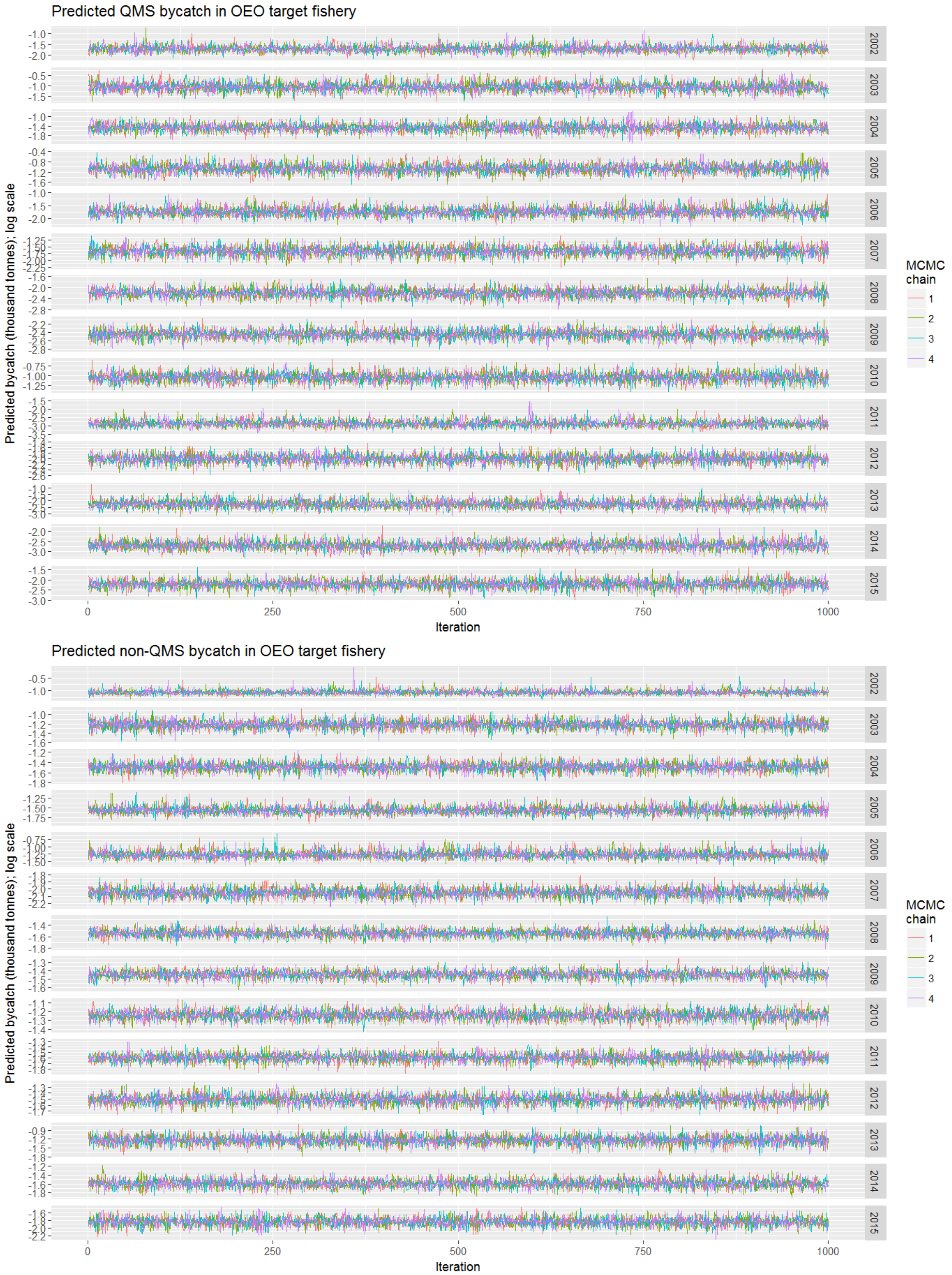



**Figure B9: Convergence diagnostics for estimation of OEO standard region bycatch. MCMC trace plots are shown for the estimated bycatch per year. [Continued on next page]**

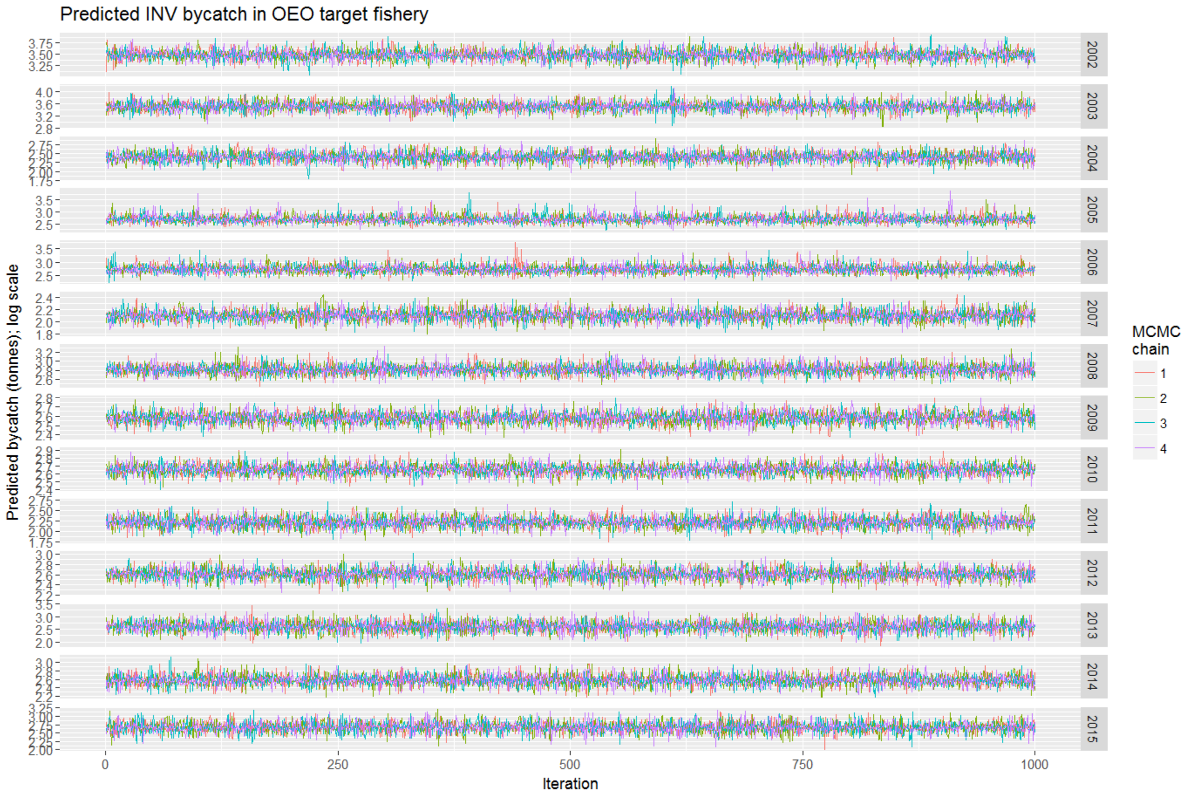



**Figure B9 [Continued]:**

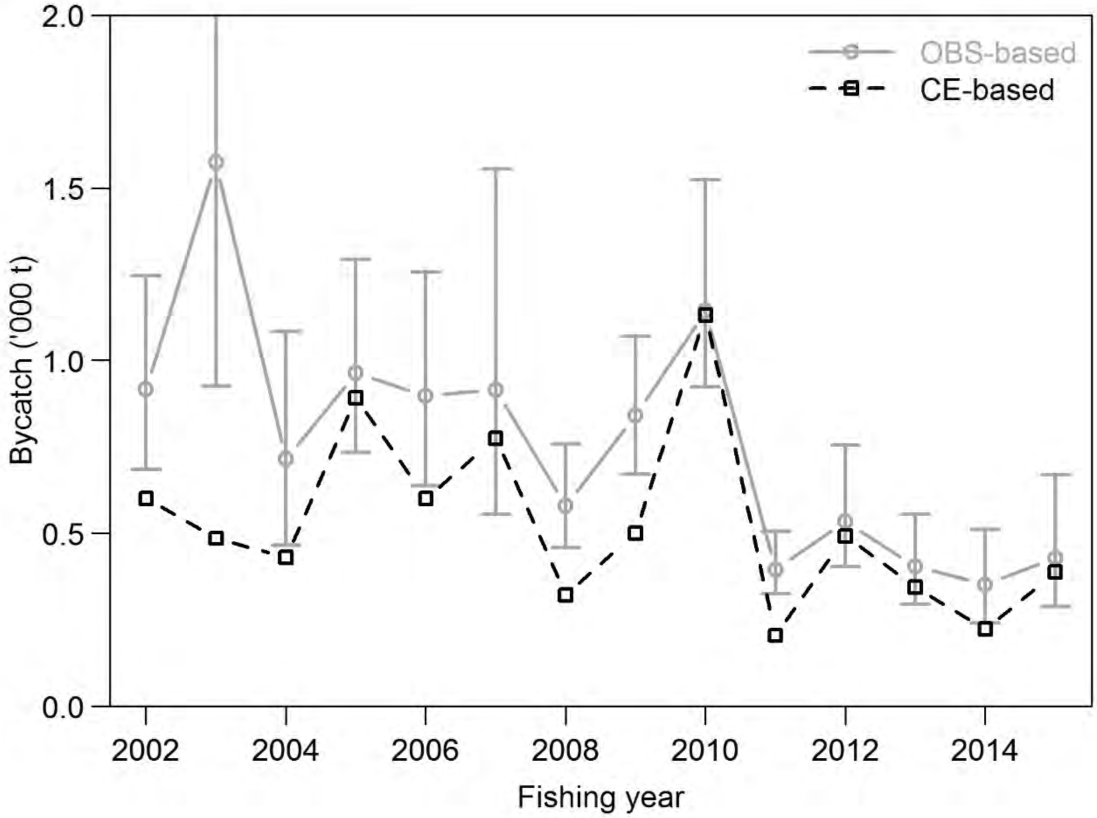



**Figure B10: Total annual bycatch in the oreo target trawl fishery from scaled up observer catch rates (ratio method) and commercial catch effort records.**

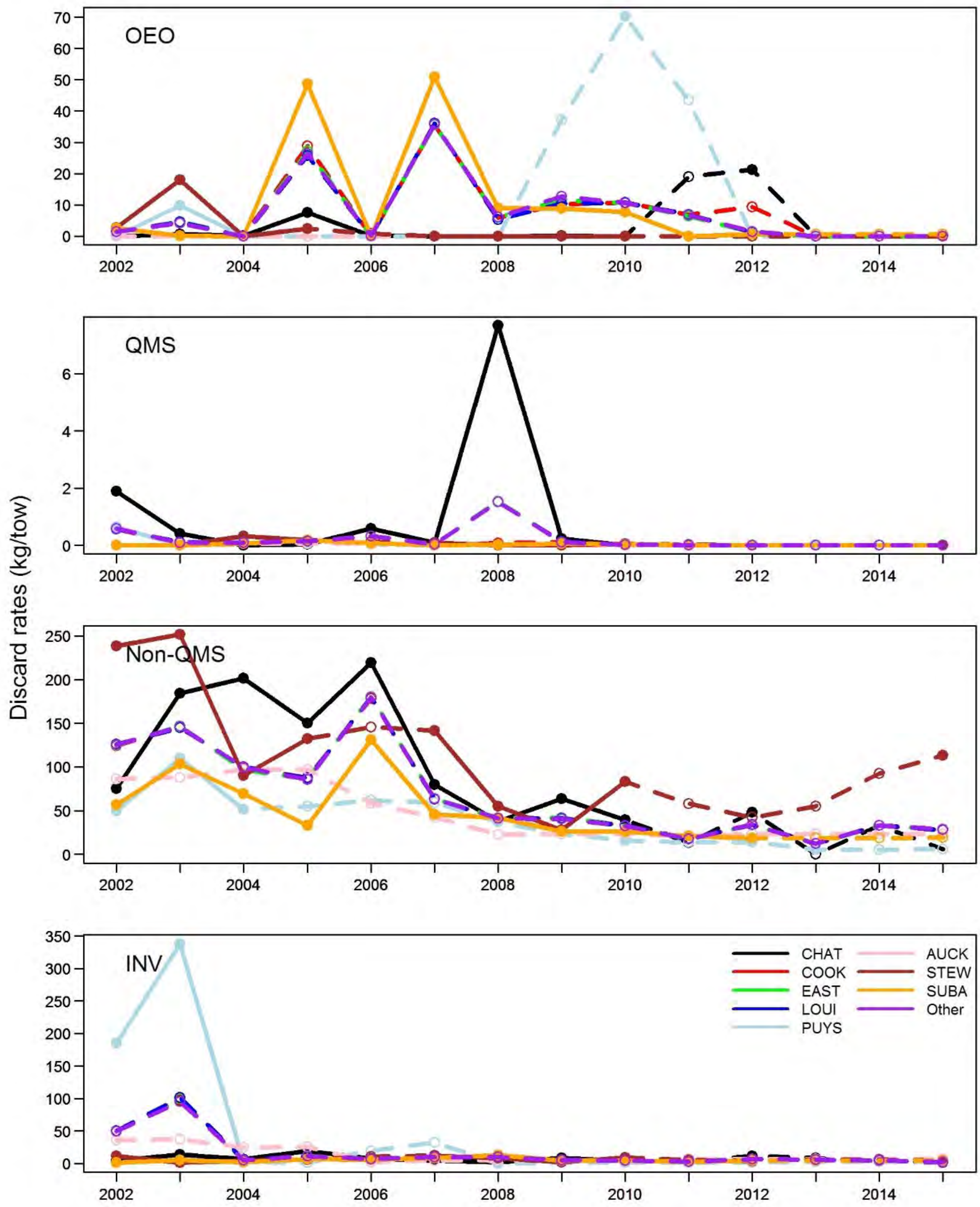



**Figure B11: Annual discard rates by species category and areas used for stratification, in the oreo target trawl fishery. Discard rates are the median of the bootstrap sample of 1000. Filled dots and solid lines indicate periods during which there were sufficient observed trawls (over 25) to calculate an individual discard rate for the area, otherwise dots are unfilled and lines are dashed and bycatch rates were calculated using additional records from adjacent years or, if still not sufficient, using records from all areas for individual years (Table B7) as required to obtain at least 25 records. [Continued on next pages]**

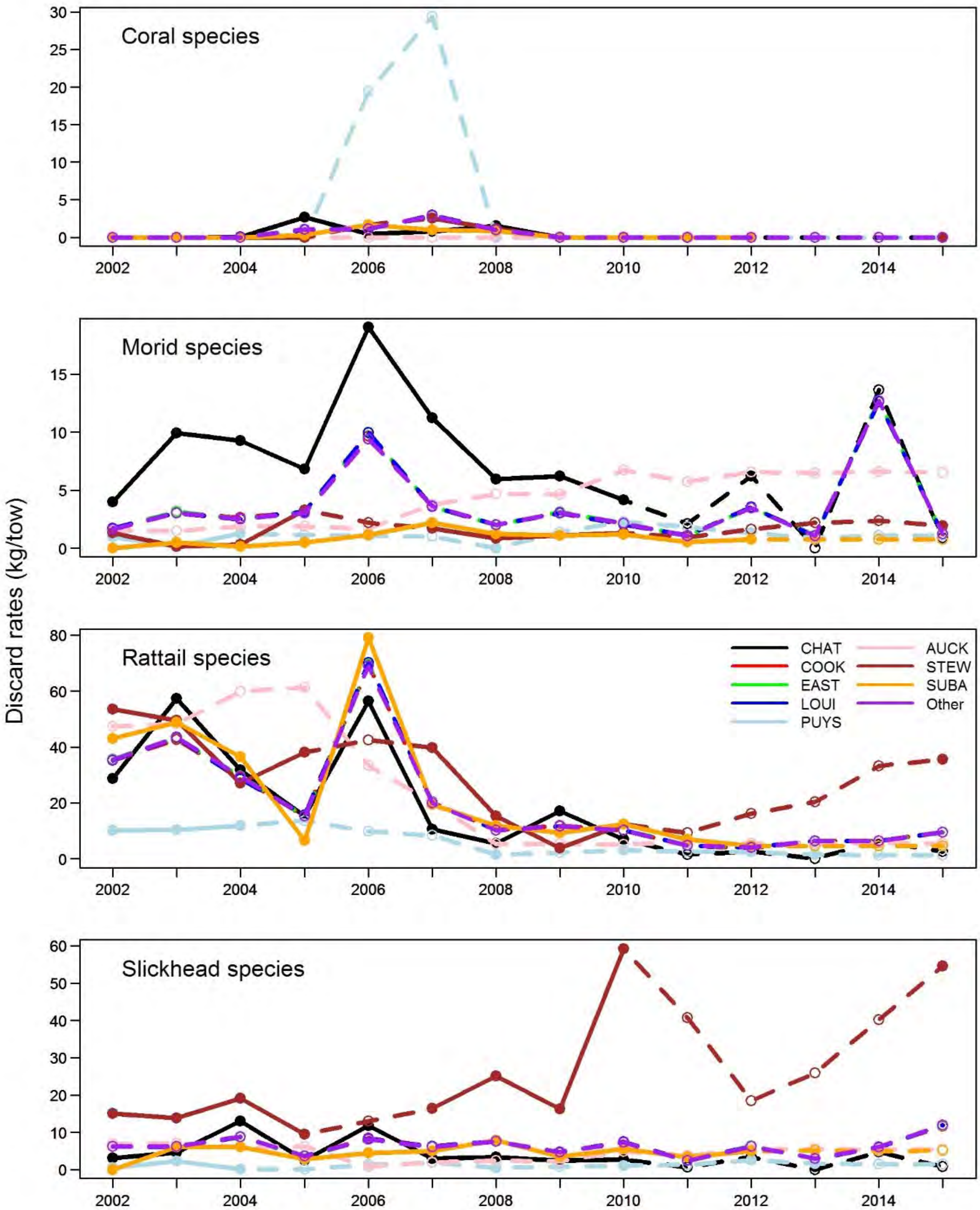



**Figure B11 [Continued]:**

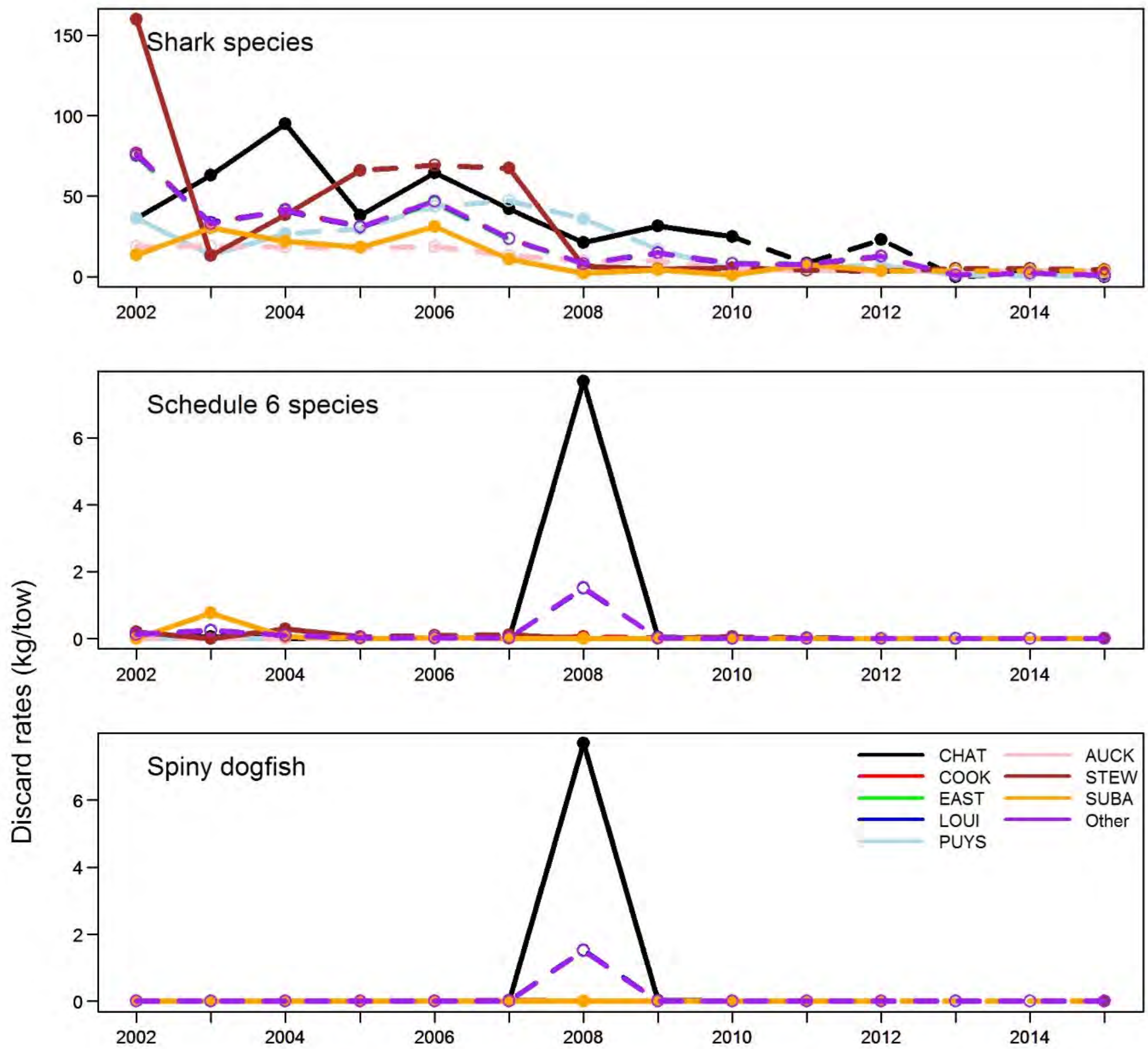



**Figure B11 [Continued]:**

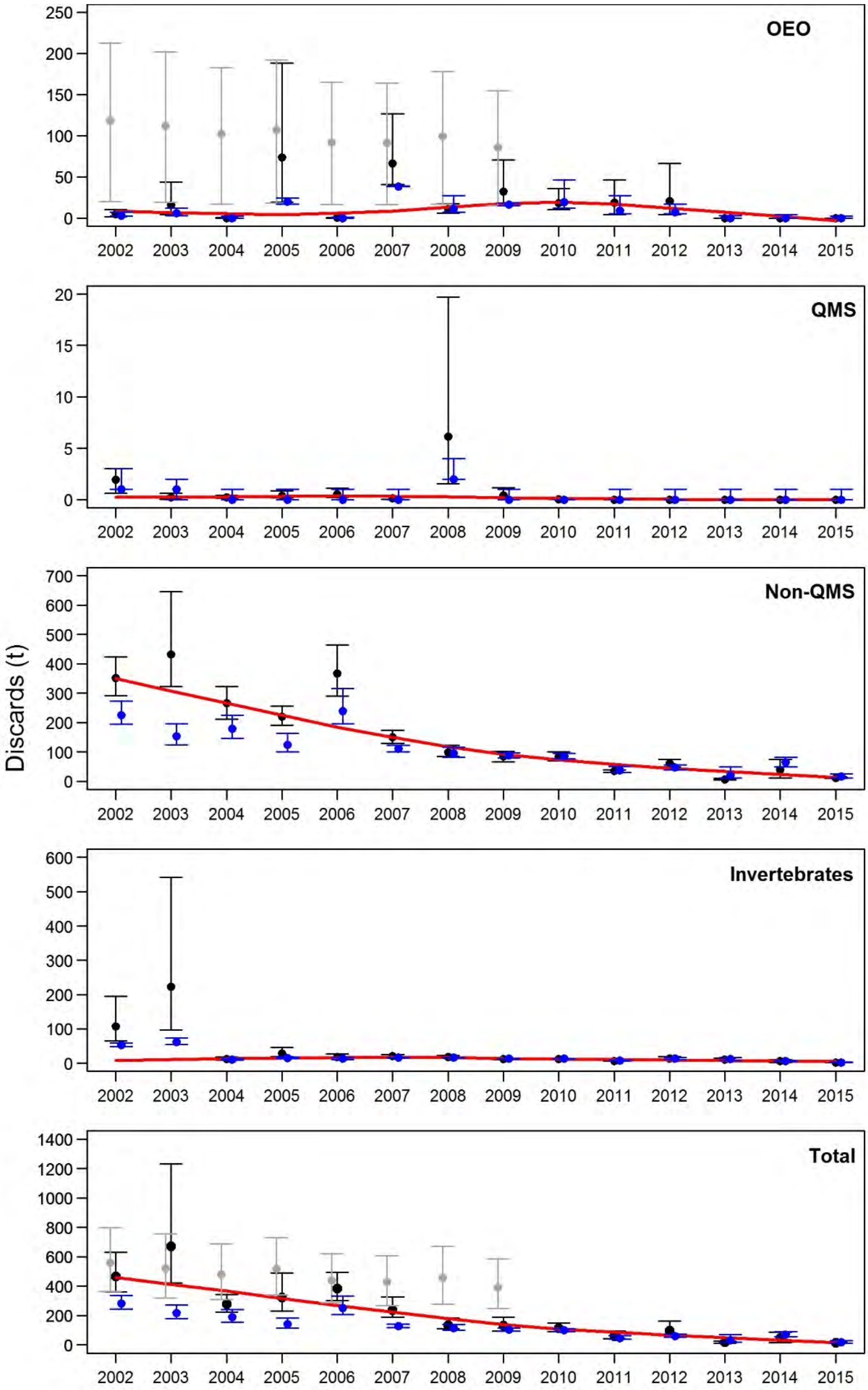



**Figure B12: Annual estimates of discards in the oreo fishery, by species category and overall, for 2001–02 to 2014–15. Also shown (in grey) are earlier estimates of total discards calculated for 2001–02 to 2008–09 (Anderson 2011). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally weighted polynomial regression to annual discards.** **[Continued on next pages]**

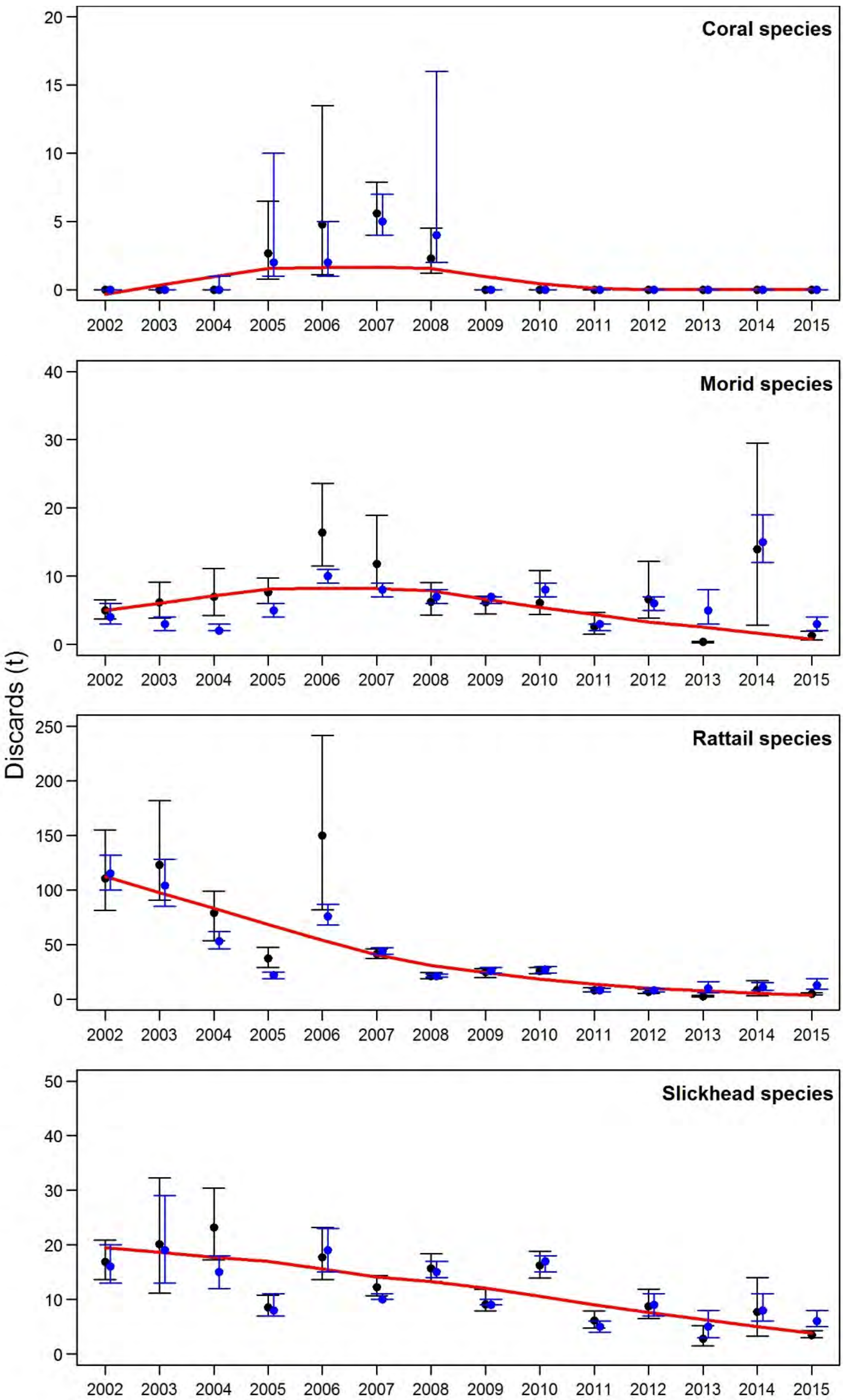



**Figure B12 [Continued]:**

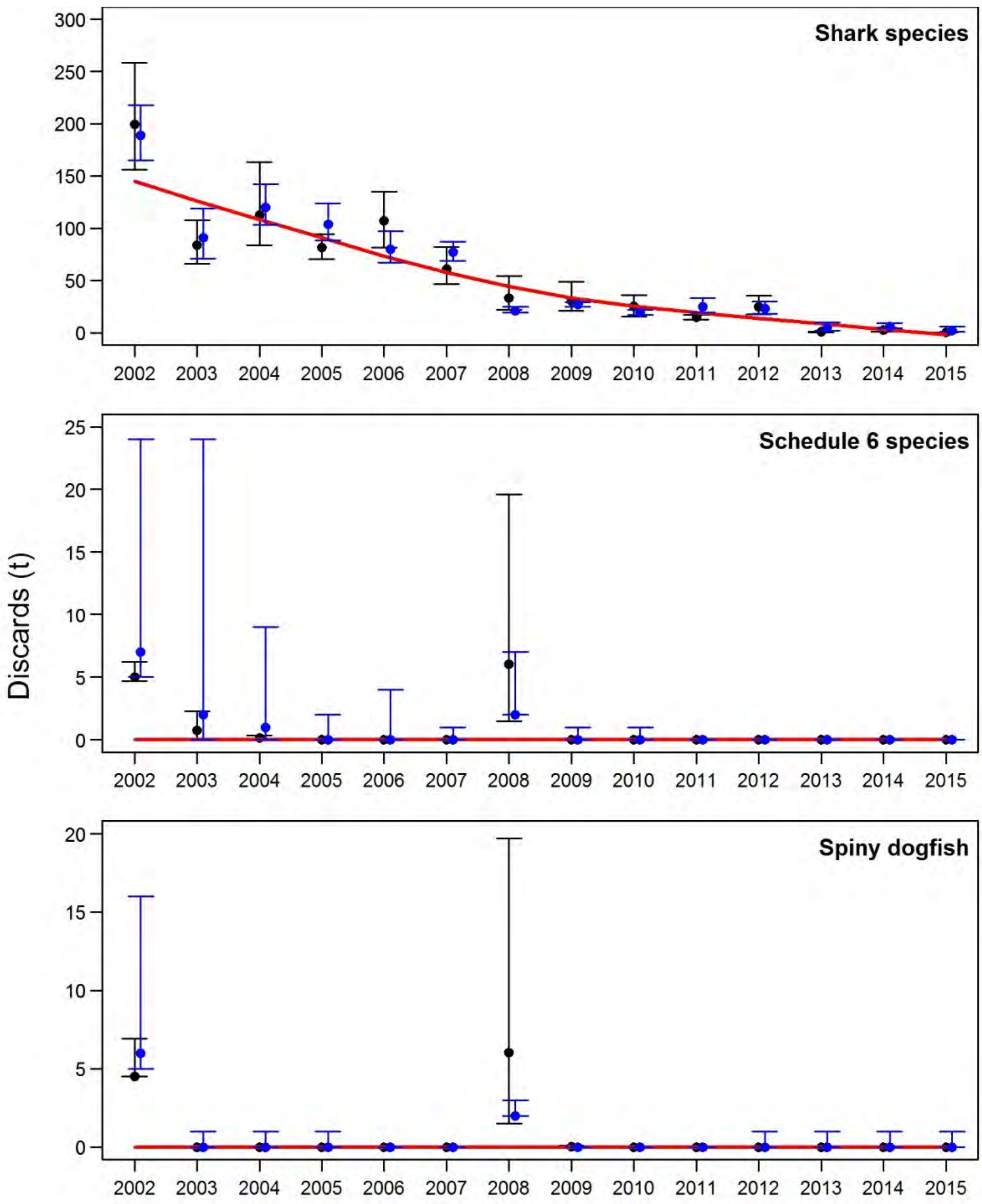
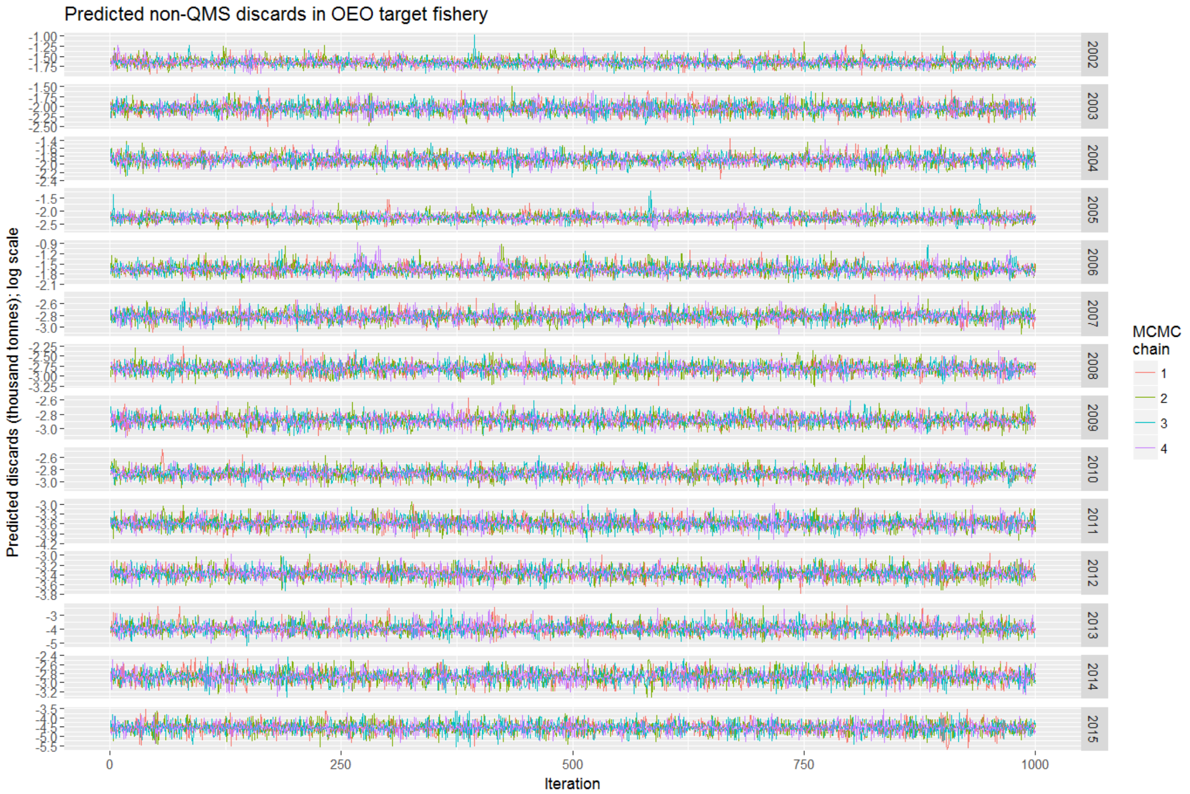



**Figure B12 [Continued]:**


**Figure B13: Convergence diagnostics for estimation of OEO standard region discards. MCMC trace plots are shown for the estimated discards per year. [Continued on next page]**



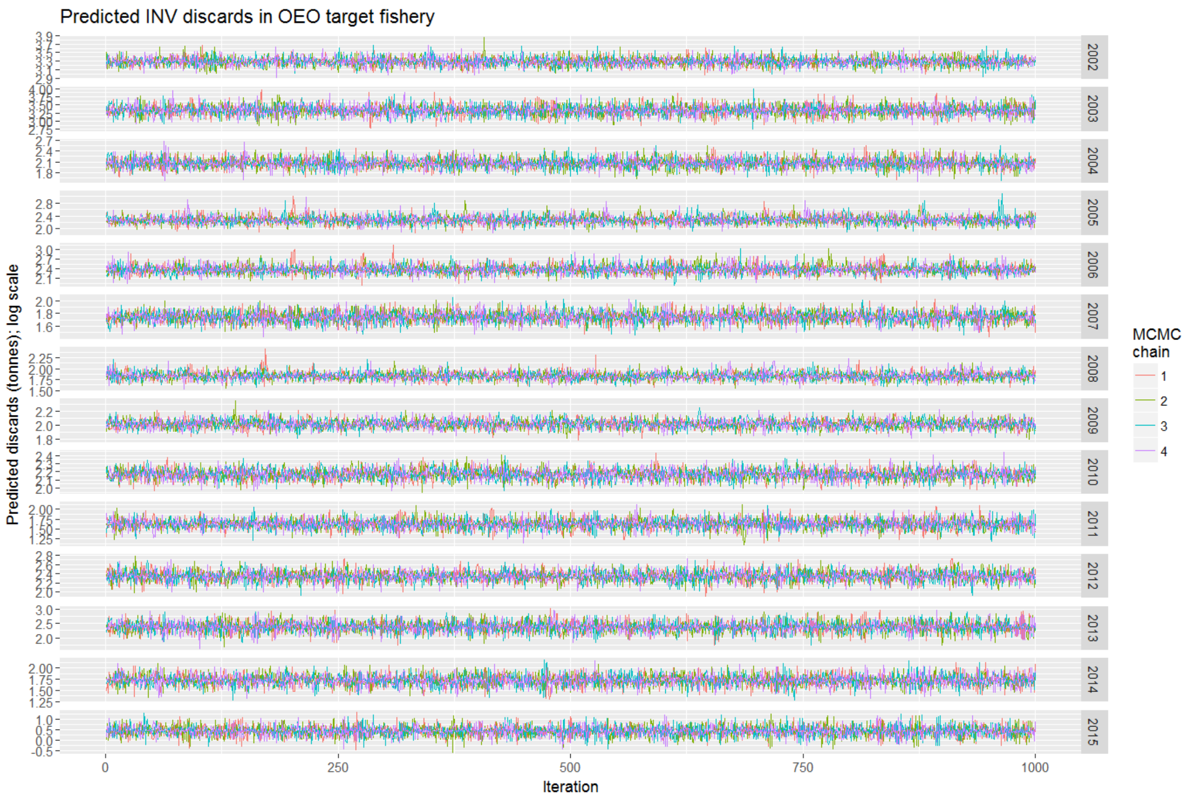




**Figure B13 [Continued]:**

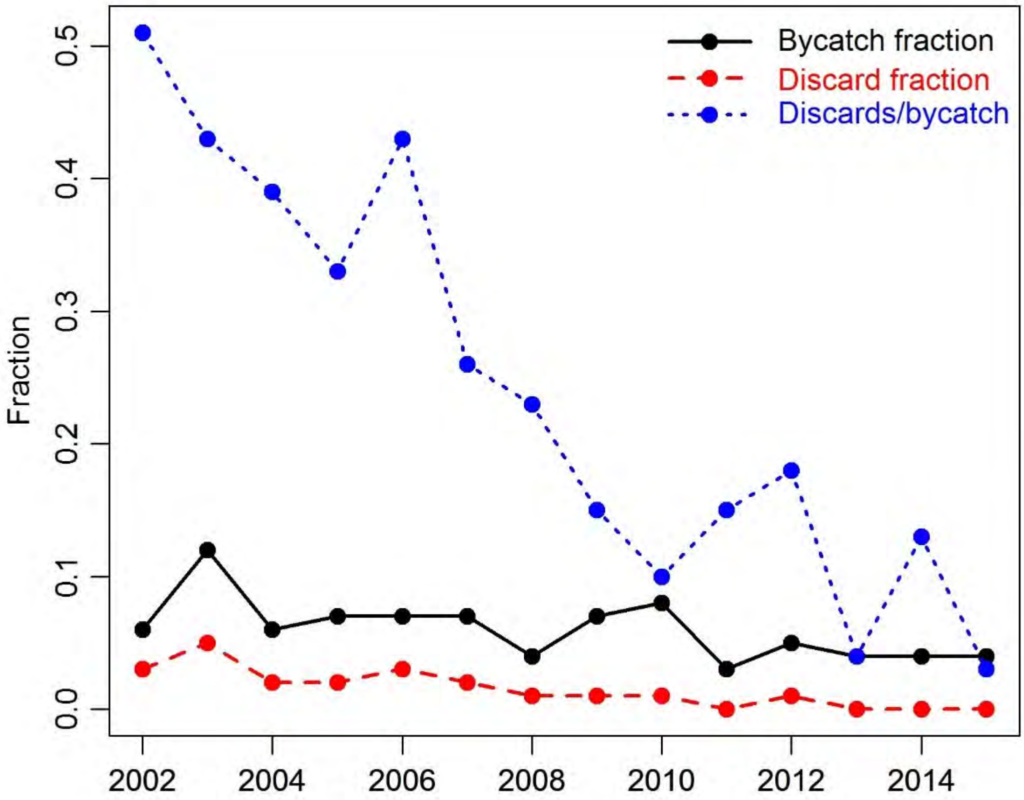



**Figure B14: Bycatch and discard fractions in the target oreo fishery. Bycatch fraction, total bycatch divided by total estimated oreo catch; Discard fraction, total discards divided by total estimated oreo catch; Discards/bycatch, total discards divided by total bycatch.**

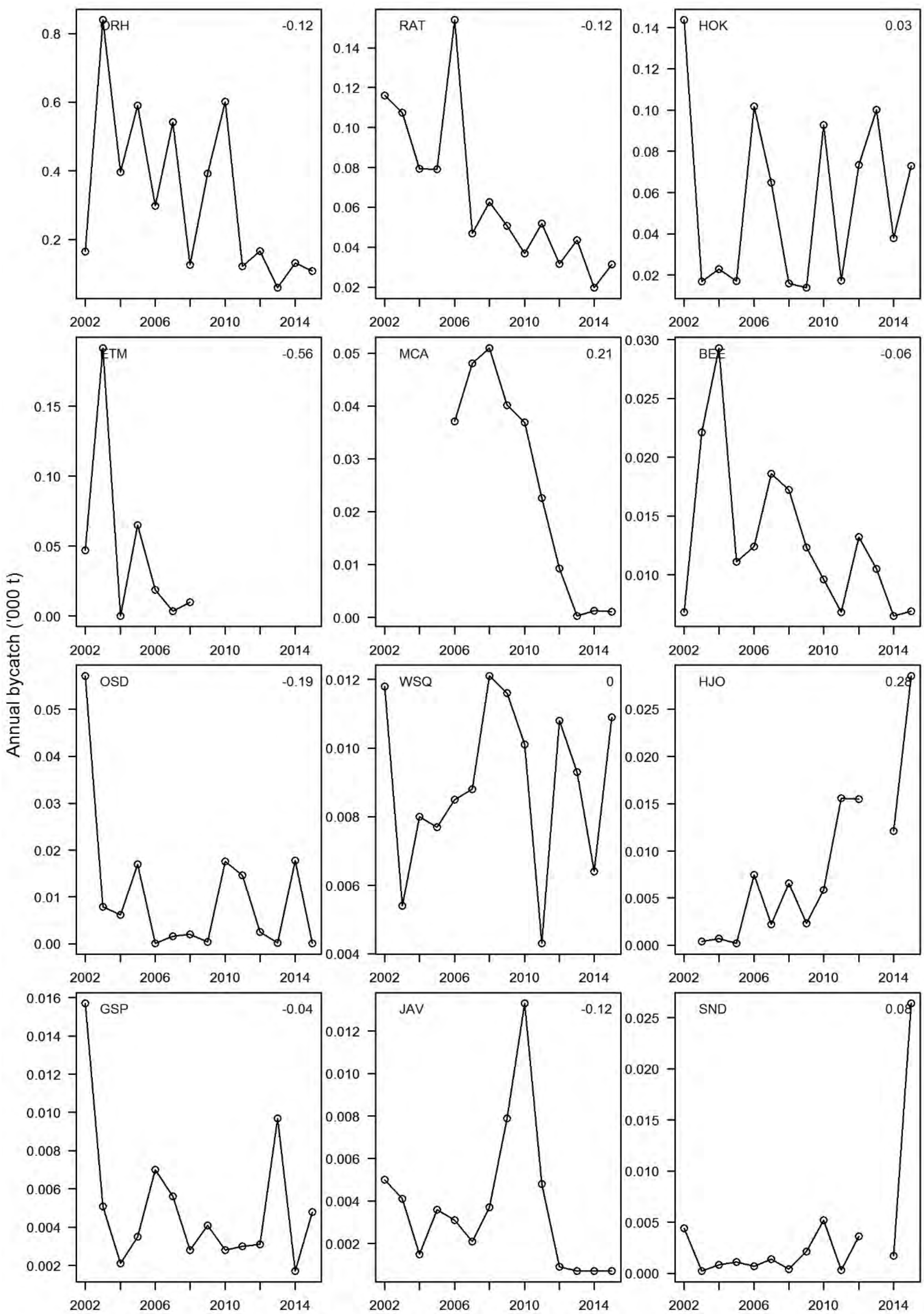



**Figure B15: Annual bycatch estimates in the target oreo trawl fishery for a selection of the main bycatch species by catch weight between 2001–02 and 2014–15. See Tables B1 and B2 for species code definitions. The slope of a regression through the data points is shown in the top right. Note: the scale changes on the y-axis between plots; lines are joined only where there are data points for consecutive years.**

## APPENDIX C: ORANGE ROUGHY BYCATCH AND DISCARDS ON THE CHATHAM RISE (NWCR and ESCR)

**Table C1: Estimates of annual species BYCATCH (t) in the ORANGE ROUGHY target trawl fishery, by current management areas for the Chatham Rise only, based on the RATIO and STATISTICAL models; 95% confidence intervals in parentheses. – is N/A. [Continued on next pages]**

**(a) QMS**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 165.4 | (99.7–282.2) | 1 104.1 | (558.5–1 873.8) | 367.0 | (218.0–625.0) | 1 779 | (1 530–2 082) |
| 2003 | 188.8 | (116.4–283.7) | 1 847.5 | (1 241.8–2 810.3) | 310.0 | (239.0–406.0) | 2 593 | (2 221–3 008) |
| 2004 | 310.4 | (175.4–551.1) | 2 354.3 | (1 305.9–3 623.9) | 723.0 | (436.0–1 214.0) | 2 701 | (2 364–3 134) |
| 2005 | 120.8 | (65.4–197.9) | 1 548.8 | (1 187.6–1 943.0) | 148.0 | (106.0–209.0) | 2 218 | (1 998–2 469) |
| 2006 | 124.9 | (45.9–254.9) | 848.6 | (422.4–1 638.9) | 121.0 | (90.0–170.0) | 1 392 | (1 179–1 653) |
| 2007 | 4.9 | (1.4–11.6) | 1 140.3 | (782.4–1 525.6) | 17.0 | (9.0–31.0) | 1 868 | (1 610–2 171) |
| 2008 | 15.7 | (11.3–21.4) | 1 330.4 | (1 123.8–2 131.5) | 42.0 | (38.0–47.0) | 2 207 | (2 070–2 369) |
| 2009 | 75.2 | (49.0–115.4) | 1 328.0 | (781.3–1 579.5) | 167.0 | (115.0–252.0) | 2 215 | (2 098–2 355) |
| 2010 | 120.0 | (35.2–320.9) | 658.2 | (554.9–780.3) | 123.0 | (99.0–163.0) | 1 529 | (1 434–1 638) |
| 2011 | 5.5 | (1.6–13.4) | 227.4 | (125.7–368.8) | 2.0 | (1.0–6.0) | 245 | (196–314) |
| 2012 | 9.4 | (3.5–21.3) | 229.3 | (147.9–334.1) | – | – | 323 | (256–416) |
| 2013 | 1.4 | (0.9–2.4) | 195.7 | (124.6–276.1) | 6.0 | (3.0–12.0) | 201 | (101–417) |
| 2014 | 26.4 | (13.6–50.9) | 189.2 | (103.2–357.1) | 60.0 | (36.0–103.0) | 343 | (253–472) |
| 2015 | 21.9 | (11.4–37.3) | 202.1 | (131.0–292.8) | 50.0 | (38.0–67.0) | 447 | (371–549) |

**(b) NON-QMS**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 607.0 | (181.4–1 349.4) | 254.4 | (160.7–406.1) | 395.0 | (263.0–605.0) | 448 | (392–514) |
| 2003 | 146.0 | (62.4–235.8) | 308.4 | (218.2–430.6) | 217.0 | (177.0–269.0) | 520 | (458–594) |
| 2004 | 307.4 | (225.8–416.4) | 322.4 | (221.8–461.1) | 576.0 | (383.0–869.0) | 538 | (464–621) |
| 2005 | 58.2 | (44.4–74.2) | 312.3 | (275.8–373.9) | 114.0 | (86.0–153.0) | 577 | (527–635) |
| 2006 | 72.0 | (40.5–107.3) | 1 213.0 | (923.6–1 527.5) | 120.0 | (92.0–159.0) | 1 647 | (1 444–1 895) |
| 2007 | 8.5 | (5.1–13.0) | 717.2 | (538.4–835.6) | 24.0 | (16.0–37.0) | 1 218 | (1 077–1 379) |
| 2008 | 23.8 | (19.1–29.1) | 448.5 | (394.7–502.9) | 69.0 | (63.0–77.0) | 762 | (722–807) |
| 2009 | 141.5 | (98.6–213.8) | 350.1 | (313.4–390.3) | 157.0 | (121.0–213.0) | 670 | (636–711) |
| 2010 | 154.3 | (102.1–218.8) | 339.5 | (304.4–372.0) | 213.0 | (174.0–267.0) | 749 | (711–793) |
| 2011 | 7.2 | (4.8–10.6) | 66.0 | (46.4–95.3) | 6.0 | (3.0–15.0) | 100 | (82–125) |
| 2012 | 12.4 | (7.9–17.9) | 90.7 | (33.6–186.7) | – | – | 127 | (104–156) |
| 2013 | 1.9 | (1.2–3.2) | 56.0 | (28.6–106.0) | 7.0 | (4.0–12.0) | 34 | (19–63) |
| 2014 | 34.3 | (14.6–67.5) | 37.9 | (28.0–51.1) | 51.0 | (33.0–82.0) | 78 | (60–103) |
| 2015 | 22.0 | (15.3–29.9) | 29.3 | (18.7–40.1) | 41.0 | (34.0–51.0) | 52 | (44–64) |

**(c) INV**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 15.5 | (5.8–25.1) | 17.0 | (3.2–45.9) | 22.0 | (11.0–45.0) | 16 | (13–20) |
| 2003 | 17.6 | (6.3–31.4) | 18.2 | (6.5–30.6) | 26.0 | (19.0–37.0) | 34 | (28–42) |
| 2004 | 10.7 | (7.8–13.7) | 49.9 | (19.5–96.0) | 33.0 | (18.0–58.0) | 41 | (34–50) |
| 2005 | 6.8 | (2.8–12.3) | 108.2 | (66.1–175.9) | 8.0 | (5.0–11.0) | 109 | (100–121) |
| 2006 | 8.7 | (3.2–15.8) | 101.5 | (55.2–167.6) | 14.0 | (9.0–23.0) | 177 | (146–216) |
| 2007 | 0.2 | (0.0–0.4) | 101.8 | (54.3–171.8) | 1.0 | (0.0–2.0) | 125 | (108–148) |
| 2008 | 3.1 | (1.9–4.6) | 42.3 | (24.2–74.2) | 8.0 | (8.0–10.0) | 57 | (54–61) |
| 2009 | 4.2 | (2.9–5.7) | 37.2 | (26.6–55.1) | 7.0 | (5.0–11.0) | 59 | (55–63) |
| 2010 | 4.9 | (2.4–7.8) | 12.6 | (11.0–14.6) | 10.0 | (7.0–14.0) | 35 | (32–39) |
| 2011 | 0.2 | (0.1–0.3) | 2.4 | (1.5–3.7) | 0.0 | (0.0–0.0) | 5 | (4–7) |
| 2012 | 0.4 | (0.2–0.7) | 3.2 | (0.1–7.8) | – | – | 5 | (4–8) |
| 2013 | 0.1 | (0.1–0.2) | 2.3 | (0.9–4.7) | 1.0 | (0.0–2.0) | 2 | (0–6) |
| 2014 | 2.0 | (0.4–4.7) | 2.5 | (1.0–4.8) | 2.0 | (1.0–5.0) | 4 | (3–6) |
| 2015 | 1.1 | (0.6–1.6) | 1.1 | (0.6–1.7) | 3.0 | (2.0–5.0) | 2 | (2–3) |

**Table C1 [Continued]:**

**(d) Coral species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 0.0 | (0.0–0.0) | 7.6 | (0.0–45.2) | 1.0 | (0.0–4.0) | 6 | (4–15) |
| 2003 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.0) | 0 | (0–1) |
| 2004 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.0 | (0.0–1.0) | 0 | (0–2) |
| 2005 | 0.0 | (0.0–0.0) | 4.5 | (0.0–18.5) | 1.0 | (0.0–2.0) | 6 | (4–14) |
| 2006 | 0.2 | (0.0–0.6) | 0.1 | (0.0–0.3) | 0.0 | (0.0–1.0) | 2 | (0–5) |
| 2007 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) | 1 | (0–2) |
| 2008 | 0.3 | (0.0–1.0) | 16.2 | (5.6–30.6) | 1.0 | (1.0–1.0) | 13 | (12–15) |
| 2009 | 0.0 | (0.0–0.0) | 10.2 | (1.5–25.7) | 0.0 | (0.0–0.0) | 12 | (11–12) |
| 2010 | 0.0 | (0.0–0.0) | 0.7 | (0.3–1.2) | 0.0 | (0.0–0.0) | 3 | (3–4) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.0) | 0 | (0–1) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | – | – | 0 | (0–1) |
| 2013 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) | 0 | (0–3) |
| 2014 | 0.0 | (0.0–0.0) | 0.2 | (0.0–0.6) | 0.0 | (0.0–0.0) | 0 | (0–1) |
| 2015 | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |

**(e) Morid species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 93.6 | (3.3–228.9) | 29.0 | (7.1–51.7) | 24.0 | (19.0–31.0) | 76 | (60–97) |
| 2003 | 7.5 | (1.6–16.2) | 21.2 | (3.1–48.1) | 10.0 | (8.0–12.0) | 49 | (39–62) |
| 2004 | 29.7 | (16.7–44.7) | 39.8 | (16.9–75.7) | 17.0 | (13.0–23.0) | 97 | (74–126) |
| 2005 | 4.2 | (2.6–6.1) | 61.6 | (40.0–84.1) | 14.0 | (12.0–18.0) | 129 | (113–148) |
| 2006 | 6.3 | (2.3–11.1) | 264.6 | (167.8–339.3) | 44.0 | (35.0–55.0) | 434 | (366–515) |
| 2007 | 1.4 | (0.6–2.6) | 183.5 | (102.2–308.0) | 10.0 | (8.0–13.0) | 380 | (322–453) |
| 2008 | 3.5 | (2.7–4.4) | 89.6 | (75.6–104.6) | 10.0 | (9.0–11.0) | 159 | (147–172) |
| 2009 | 14.6 | (9.2–22.6) | 70.5 | (60.3–81.7) | 11.0 | (10.0–13.0) | 157 | (143–173) |
| 2010 | 24.0 | (12.1–42.5) | 91.6 | (79.1–104.3) | 28.0 | (25.0–32.0) | 213 | (198–231) |
| 2011 | 1.1 | (0.5–2.0) | 20.8 | (11.0–48.6) | 0.0 | (0.0–1.0) | 36 | (27–48) |
| 2012 | 1.8 | (0.7–3.2) | 17.7 | (8.7–32.0) | – | – | 29 | (22–40) |
| 2013 | 0.2 | (0.1–0.2) | 26.6 | (14.6–39.5) | 1.0 | (1.0–1.0) | 41 | (22–75) |
| 2014 | 3.0 | (1.8–4.3) | 49.7 | (23.1–89.0) | 16.0 | (11.0–21.0) | 80 | (61–106) |
| 2015 | 2.5 | (1.6–3.7) | 56.1 | (39.4–88.4) | 16.0 | (12.0–21.0) | 78 | (67–92) |

**(f) Rattail species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 81.5 | (12.2–184.2) | 78.1 | (17.9–142.1) | 102.0 | (78.0–136.0) | 157 | (127–197) |
| 2003 | 20.9 | (9.9–30.9) | 35.0 | (4.5–94.8) | 31.0 | (25.0–38.0) | 66 | (54–80) |
| 2004 | 103.4 | (67.2–159.0) | 21.2 | (12.6–32.3) | 40.0 | (32.0–52.0) | 80 | (62–103) |
| 2005 | 4.1 | (2.0–6.8) | 41.9 | (27.4–59.4) | 16.0 | (13.0–20.0) | 65 | (57–74) |
| 2006 | 25.9 | (9.6–47.3) | 325.6 | (259.8–457.2) | 74.0 | (60.0–93.0) | 325 | (275–387) |
| 2007 | 0.3 | (0.2–0.5) | 123.9 | (64.4–172.4) | 13.0 | (10.0–18.0) | 224 | (187–274) |
| 2008 | 4.0 | (2.3–6.0) | 71.5 | (50.9–101.0) | 10.0 | (10.0–11.0) | 97 | (92–102) |
| 2009 | 39.2 | (22.2–58.9) | 47.8 | (38.8–56.5) | 17.0 | (15.0–19.0) | 96 | (88–107) |
| 2010 | 68.1 | (36.3–113.9) | 55.6 | (47.7–64.4) | 57.0 | (51.0–63.0) | 138 | (127–151) |
| 2011 | 3.1 | (1.6–5.2) | 2.4 | (1.5–3.5) | 0.0 | (0.0–0.0) | 7 | (5–9) |
| 2012 | 5.2 | (2.3–8.6) | 21.0 | (1.7–80.3) | – | – | 19 | (16–24) |
| 2013 | 0.5 | (0.1–1.5) | 11.0 | (1.8–39.4) | 0.0 | (0.0–1.0) | 6 | (3–13) |
| 2014 | 13.1 | (0.8–37.2) | 2.8 | (2.0–3.8) | 7.0 | (5.0–9.0) | 11 | (8–15) |
| 2015 | 3.4 | (1.9–5.3) | 1.1 | (0.7–1.6) | 6.0 | (5.0–8.0) | 6 | (4–8) |

**Table C1 [Continued]:**

**(g) Slickhead species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 297.9 | (88.4–714.0) | 28.2 | (1.2–84.2) | 116.0 | (79.0–179.0) | 104 | (71–156) |
| 2003 | 22.5 | (3.1–61.1) | 5.1 | (1.4–13.3) | 19.0 | (15.0–26.0) | 21 | (14–30) |
| 2004 | 55.4 | (19.9–119.5) | 13.7 | (6.8–25.8) | 26.0 | (19.0–38.0) | 40 | (28–56) |
| 2005 | 3.7 | (1.0–7.8) | 21.6 | (14.5–33.9) | 10.0 | (8.0–14.0) | 30 | (25–36) |
| 2006 | 8.6 | (2.8–33.9) | 79.6 | (36.7–148.2) | 43.0 | (31.0–59.0) | 126 | (101–160) |
| 2007 | 1.2 | (0.1–3.6) | 45.1 | (31.6–56.9) | 10.0 | (7.0–14.0) | 110 | (86–140) |
| 2008 | 1.9 | (1.0–3.2) | 45.0 | (34.6–57.1) | 7.0 | (6.0–9.0) | 63 | (58–69) |
| 2009 | 36.3 | (13.8–82.2) | 26.8 | (21.8–32.3) | 21.0 | (18.0–25.0) | 73 | (63–86) |
| 2010 | 25.3 | (15.0–37.8) | 45.5 | (38.2–52.9) | 51.0 | (41.0–65.0) | 124 | (111–142) |
| 2011 | 1.2 | (0.7–1.9) | 0.6 | (0.2–1.2) | 0.0 | (0.0–0.0) | 2 | (1–3) |
| 2012 | 1.9 | (1.0–3.0) | 5.4 | (1.6–10.4) | – | – | 12 | (7–22) |
| 2013 | 0.2 | (0.1–0.2) | 2.7 | (0.7–5.9) | 1.0 | (1.0–2.0) | 6 | (2–22) |
| 2014 | 0.7 | (0.1–1.9) | 0.6 | (0.2–1.1) | 1.0 | (1.0–3.0) | 2 | (1–4) |
| 2015 | 7.1 | (3.2–12.4) | 1.6 | (0.4–3.1) | 8.0 | (7.0–11.0) | 4 | (3–6) |

**(h) Shark species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 50.9 | (27.4–86.8) | 97.9 | (58.5–164.3) | 80.0 | (66.0–97.0) | 172 | (150–199) |
| 2003 | 51.4 | (28.2–81.4) | 122.2 | (96.7–152.2) | 69.0 | (61.0–78.0) | 199 | (177–224) |
| 2004 | 95.1 | (77.4–114.5) | 197.3 | (128.9–309.9) | 85.0 | (72.0–99.0) | 290 | (257–329) |
| 2005 | 18.4 | (12.6–26.9) | 108.5 | (89.2–130.6) | 36.0 | (32.0–42.0) | 181 | (166–198) |
| 2006 | 22.5 | (14.6–31.9) | 508.6 | (406.6–655.7) | 89.0 | (77.0–103.0) | 513 | (460–574) |
| 2007 | 4.4 | (2.6–6.9) | 342.6 | (281.9–407.0) | 21.0 | (18.0–24.0) | 453 | (407–505) |
| 2008 | 10.9 | (8.3–14.5) | 227.0 | (201.2–256.9) | 34.0 | (32.0–37.0) | 380 | (364–399) |
| 2009 | 46.0 | (34.0–59.5) | 191.9 | (168.7–229.5) | 32.0 | (30.0–35.0) | 353 | (336–372) |
| 2010 | 30.2 | (24.3–37.0) | 126.2 | (111.6–140.7) | 54.0 | (48.0–60.0) | 287 | (274–303) |
| 2011 | 1.5 | (1.2–1.8) | 40.6 | (28.0–55.0) | 2.0 | (2.0–2.0) | 58 | (47–71) |
| 2012 | 3.0 | (2.4–3.6) | 49.1 | (26.2–76.5) | – | – | 63 | (52–77) |
| 2013 | 1.0 | (0.6–1.4) | 31.3 | (19.5–48.0) | 2.0 | (2.0–3.0) | 33 | (21–52) |
| 2014 | 15.6 | (8.8–27.1) | 24.3 | (18.6–32.0) | 19.0 | (15.0–24.0) | 48 | (39–60) |
| 2015 | 7.3 | (5.5–9.6) | 20.2 | (10.0–29.7) | 17.0 | (15.0–20.0) | 32 | (28–37) |

**(i) Schedule 6 species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 1.0 | (0.0–4.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–1.0) | 0 | (0–1) |
| 2003 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2004 | 0.5 | (0.0–1.1) | 0.1 | (0.0–0.3) | 0.0 | (0.0–1.0) | 0 | (0–1) |
| 2005 | 0.1 | (0.0–0.3) | 0.1 | (0.0–0.4) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2006 | 0.0 | (0.0–0.0) | 0.4 | (0.1–1.0) | 0.0 | (0.0–0.0) | 0 | (0–1) |
| 2007 | 0.0 | (0.0–0.0) | 0.4 | (0.0–1.1) | 0.0 | (0.0–0.0) | 0 | (0–1) |
| 2008 | 0.0 | (0.0–0.0) | 0.2 | (0.1–0.4) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2009 | 0.1 | (0.0–0.3) | 0.1 | (0.1–0.3) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.2) | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | – | – | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) |
| 2014 | 0.2 | (0.0–0.6) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) |
| 2015 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0.0 | (0.0–0.0) | 0 | (0–0) |

**Table C1 [Continued]:**

**(j) Spiny dogfish**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | | NWCR | | ESCR | | NWCR | | ESCR |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2003 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2004 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2005 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2006 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2008 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2009 | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | - | – | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) |

**Table C2: Estimates of annual species DISCARDS (t) in the ORANGE ROUGHY target trawl fishery, by current management areas for the Chatham Rise only, based on the RATIO and STATISTICAL models; 95% confidence intervals in parentheses. – is N/A. [Continued on next pages]**

**(a) ORH**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | | NWCR | | ESCR | | NWCR | | ESCR |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 2 | (0–53) | 1 | (0–12) |
| 2003 | 0.0 | (0.0–0.0) | 29.7 | (0.0–139.0) | 15 | (1–182) | 17 | (9–71) |
| 2004 | 0.0 | (0.0–0.0) | 0.1 | (0.0–68.2) | 1 | (0–7) | 4 | (3–5) |
| 2005 | 2.6 | (0.0–8.0) | 2.4 | (0.0–22.9) | 2 | (1–8) | 3 | (2–5) |
| 2006 | 16.5 | (0.0–56.3) | 0.0 | (0.0–0.0) | 8 | (5–41) | 3 | (0–29) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–6) | 1 | (0–17) |
| 2008 | 0.0 | (0.0–0.0) | 9.7 | (0.0–27.9) | 1 | (0–7) | 11 | (9–16) |
| 2009 | 0.0 | (0.0–0.0) | 11.6 | (1.3–27.4) | 5 | (1–40) | 21 | (14–42) |
| 2010 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.4) | 1 | (0–7) | 1 | (0–3) |
| 2011 | 0.0 | (0.0–0.0) | 63.4 | (0.0–258.9) | 1 | (0–7) | 25 | (21–50) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | – | – | 0 | (0–5) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–7) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 1 | (0–20) | 0 | (0–7) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 1 | (0–14) | 0 | (0–3) |

**(b) QMS**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | | NWCR | | ESCR | | NWCR | | ESCR |
| 2002 | 3.3 | (0.0–9.8) | 0.2 | (0.0–0.6) | 3 | (1–15) | 1 | (0–2) |
| 2003 | 0.2 | (0.0–0.8) | 4.8 | (0.0–18.1) | 0 | (0–2) | 6 | (3–18) |
| 2004 | 0.0 | (0.0–0.0) | 0.6 | (0.1–1.7) | 0 | (0–2) | 1 | (1–3) |
| 2005 | 0.0 | (0.0–0.0) | 0.4 | (0.0–1.1) | 0 | (0–0) | 0 | (0–1) |
| 2006 | 0.0 | (0.0–0.0) | 0.4 | (0.1–1.3) | 0 | (0–1) | 1 | (0–2) |
| 2007 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.3) | 0 | (0–0) | 0 | (0–1) |
| 2008 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0.0 | (0.0–0.0) | 0.2 | (0.0–0.4) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 2.0 | (0.0–5.9) | 0 | (0–0) | 3 | (2–4) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | – | – | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.3) | 0 | (0–0) | 0 | (0–3) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2015 | 0.0 | (0.0–0.0) | 0.2 | (0.0–0.5) | 0 | (0–0) | 0 | (0–1) |

**Table C2 [Continued]:**

**(c) NON-QMS**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 576.1 | (127.8–1 259.3) | 215.8 | (132.0–339.2) | 294 | (190–463) | 269 | (229–318) |
| 2003 | 144.0 | (58.0–233.8) | 266.3 | (159.4–387.8) | 180 | (138–237) | 379 | (333–435) |
| 2004 | 306.6 | (228.2–417.1) | 290.2 | (193.6–418.2) | 496 | (333–737) | 409 | (354–475) |
| 2005 | 52.9 | (40.0–68.9) | 284.1 | (248.7–341.0) | 88 | (62–126) | 403 | (363–446) |
| 2006 | 67.9 | (27.3–108.1) | 1 186.0 | (895.1–1 516.9) | 85 | (64–114) | 1 416 | (1 235–1 630) |
| 2007 | 8.4 | (5.1–13.0) | 421.1 | (59.9–675.8) | 20 | (13–31) | 550 | (469–653) |
| 2008 | 12.6 | (9.6–16.8) | 70.6 | (56.1–89.0) | 38 | (34–43) | 133 | (120–147) |
| 2009 | 97.2 | (57.0–157.9) | 87.1 | (71.9–106.2) | 50 | (34–82) | 163 | (149–180) |
| 2010 | 45.6 | (0.5–124.7) | 24.0 | (14.6–33.6) | 75 | (52–116) | 50 | (45–56) |
| 2011 | 2.2 | (0.2–3.8) | 17.3 | (8.5–41.4) | 4 | (2–11) | 22 | (15–34) |
| 2012 | 3.7 | (0.2–6.9) | 64.5 | (2.3–144.1) | – | – | 63 | (51–79) |
| 2013 | 0.4 | (0.3–0.4) | 31.2 | (9.8–75.2) | 3 | (2–4) | 13 | (7–25) |
| 2014 | 0.0 | (0.0–0.0) | 11.7 | (2.3–24.9) | 4 | (0–37) | 19 | (13–28) |
| 2015 | 8.2 | (3.9–13.4) | 15.5 | (1.0–25.8) | 10 | (8–15) | 24 | (18–34) |

**(d) INV**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 14.4 | (5.5–24.5) | 16.4 | (3.0–43.2) | 27 | (12–58) | 13 | (11–16) |
| 2003 | 13.5 | (5.3–26.4) | 15.2 | (2.6–30.0) | 19 | (14–27) | 25 | (20–31) |
| 2004 | 10.7 | (7.7–13.7) | 49.1 | (19.2–91.8) | 27 | (16–45) | 34 | (28–41) |
| 2005 | 6.5 | (2.5–12.5) | 108.0 | (62.7–180.7) | 7 | (5–10) | 97 | (89–106) |
| 2006 | 8.5 | (3.4–15.2) | 97.6 | (52.1–161.1) | 12 | (8–18) | 150 | (124–182) |
| 2007 | 0.1 | (0.0–0.2) | 37.4 | (10.5–88.6) | 1 | (0–1) | 39 | (33–47) |
| 2008 | 1.0 | (0.7–1.3) | 18.5 | (2.3–47.5) | 3 | (3–4) | 19 | (18–19) |
| 2009 | 3.1 | (2.0–4.3) | 18.7 | (14.8–23.1) | 6 | (4–8) | 34 | (31–38) |
| 2010 | 4.1 | (1.9–6.6) | 6.6 | (5.5–7.9) | 7 | (5–11) | 17 | (16–20) |
| 2011 | 0.2 | (0.1–0.3) | 2.5 | (1.5–3.9) | 0 | (0–0) | 4 | (3–6) |
| 2012 | 0.3 | (0.1–0.5) | 2.3 | (0.1–6.9) | – | – | 3 | (2–5) |
| 2013 | 0.1 | (0.0–0.1) | 1.3 | (0.2–3.1) | 0 | (0–1) | 1 | (0–5) |
| 2014 | 0.0 | (0.0–0.0) | 1.0 | (0.0–2.7) | 0 | (0–2) | 2 | (1–3) |
| 2015 | 0.4 | (0.2–0.7) | 0.4 | (0.1–0.8) | 1 | (1–2) | 1 | (1–2) |

**(e) Coral species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 0.0 | (0.0–0.0) | 12.9 | (0.0–40.7) | 1 | (0–27) | 7 | (4–44) |
| 2003 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0 | (0–3) | 1 | (0–11) |
| 2004 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0 | (0–7) | 1 | (0–17) |
| 2005 | 0.0 | (0.0–0.0) | 4.4 | (0.0–18.1) | 2 | (0–27) | 14 | (5–75) |
| 2006 | 0.2 | (0.0–0.6) | 0.1 | (0.0–0.3) | 0 | (0–6) | 4 | (1–35) |
| 2007 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0 | (0–1) | 1 | (0–12) |
| 2008 | 0.0 | (0.0–0.0) | 7.4 | (0.3–19.9) | 0 | (0–2) | 9 | (7–22) |
| 2009 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | – | – | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |

**Table C2 [Continued]:**

**(f) Morid species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 88.8 | (2.9–230.4) | 6.9 | (2.1–16.6) | 16 | (13–21) | 17 | (13–22) |
| 2003 | 6.5 | (0.9–14.9) | 11.4 | (2.4–25.0) | 10 | (8–13) | 19 | (15–25) |
| 2004 | 28.9 | (17.4–43.2) | 32.5 | (15.4–62.9) | 26 | (19–36) | 57 | (44–75) |
| 2005 | 3.1 | (1.6–4.9) | 47.9 | (31.9–65.2) | 19 | (15–24) | 77 | (68–89) |
| 2006 | 5.7 | (2.0–10.7) | 213.4 | (133.3–290.4) | 48 | (37–61) | 226 | (192–266) |
| 2007 | 1.4 | (0.7–2.6) | 59.1 | (15.9–92.0) | 7 | (5–9) | 100 | (81–125) |
| 2008 | 1.3 | (0.8–1.9) | 7.7 | (3.2–15.9) | 3 | (3–3) | 13 | (12–15) |
| 2009 | 5.9 | (2.2–13.0) | 11.6 | (6.7–17.6) | 5 | (4–6) | 22 | (19–25) |
| 2010 | 10.8 | (0.0–31.5) | 3.3 | (1.5–5.8) | 8 | (7–10) | 10 | (8–13) |
| 2011 | 0.5 | (0.0–1.0) | 8.4 | (0.5–32.1) | 0 | (0–0) | 5 | (4–9) |
| 2012 | 0.8 | (0.0–2.0) | 10.9 | (0.0–25.3) | – | – | 13 | (10–19) |
| 2013 | 0.1 | (0.0–0.1) | 6.4 | (2.2–13.7) | 0 | (0–1) | 4 | (2–8) |
| 2014 | 0.0 | (0.0–0.0) | 5.4 | (0.6–12.2) | 4 | (2–8) | 7 | (4–13) |
| 2015 | 0.8 | (0.3–1.5) | 1.1 | (0.2–2.0) | 2 | (2–3) | 2 | (2–3) |

**(g) Rattail species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 79.3 | (11.0–182.4) | 76.2 | (17.5–140.3) | 104 | (79–138) | 132 | (109–165) |
| 2003 | 20.8 | (10.5–31.8) | 34.6 | (4.1–93.0) | 29 | (24–37) | 52 | (43–63) |
| 2004 | 103.1 | (68.4–157.2) | 21.0 | (12.2–32.2) | 40 | (32–52) | 65 | (51–82) |
| 2005 | 4.0 | (2.0–6.8) | 41.4 | (25.9–57.8) | 15 | (12–19) | 55 | (49–62) |
| 2006 | 26.0 | (9.8–47.5) | 324.5 | (258.5–469.0) | 71 | (57–89) | 270 | (231–319) |
| 2007 | 0.3 | (0.2–0.5) | 104.2 | (10.8–172.1) | 11 | (8–14) | 143 | (118–175) |
| 2008 | 0.6 | (0.2–1.1) | 5.7 | (3.1–11.4) | 2 | (2–2) | 9 | (8–11) |
| 2009 | 25.1 | (11.8–41.8) | 8.4 | (3.9–12.2) | 15 | (14–15) | 18 | (16–22) |
| 2010 | 15.4 | (0.0–30.8) | 4.7 | (1.9–8.5) | 11 | (10–14) | 12 | (10–16) |
| 2011 | 0.7 | (0.0–1.3) | 0.2 | (0.1–0.3) | 0 | (0–0) | 1 | (0–2) |
| 2012 | 1.1 | (0.0–2.6) | 21.2 | (0.0–79.9) | – | – | 15 | (12–20) |
| 2013 | 0.0 | (0.0–0.1) | 9.6 | (0.6–39.5) | 0 | (0–1) | 4 | (2–8) |
| 2014 | 0.0 | (0.0–0.0) | 1.4 | (0.0–3.3) | 3 | (1–5) | 4 | (2–6) |
| 2015 | 1.4 | (0.4–3.2) | 0.5 | (0.1–1.1) | 3 | (2–4) | 2 | (1–3) |

**(h) Slickhead species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 313.2 | (83.5–743.9) | 29.7 | (1.2–92.4) | 179 | (119–276) | 75 | (52–110) |
| 2003 | 23.0 | (2.3–66.0) | 5.5 | (1.4–13.8) | 24 | (18–33) | 13 | (9–18) |
| 2004 | 55.3 | (19.9–122.5) | 12.7 | (6.3–24.2) | 38 | (27–57) | 27 | (20–38) |
| 2005 | 3.6 | (0.9–7.9) | 21.7 | (15.0–32.8) | 17 | (12–23) | 24 | (21–29) |
| 2006 | 8.4 | (2.8–28.1) | 77.0 | (36.8–139.4) | 67 | (49–94) | 95 | (77–119) |
| 2007 | 1.2 | (0.0–3.4) | 28.1 | (0.8–50.1) | 10 | (7–15) | 47 | (36–63) |
| 2008 | 0.6 | (0.1–1.9) | 1.8 | (0.8–3.4) | 2 | (2–2) | 3 | (2–3) |
| 2009 | 30.7 | (9.8–74.7) | 3.1 | (0.7–5.0) | 19 | (18–21) | 9 | (7–12) |
| 2010 | 11.5 | (0.0–18.0) | 1.7 | (0.8–2.8) | 11 | (9–15) | 6 | (5–9) |
| 2011 | 0.5 | (0.0–0.9) | 0.0 | (0.0–0.1) | 0 | (0–0) | 0 | (0–1) |
| 2012 | 0.9 | (0.0–1.6) | 4.6 | (0.5–10.4) | – | – | 8 | (5–15) |
| 2013 | 0.1 | (0.1–0.2) | 2.1 | (0.2–5.1) | 1 | (1–1) | 2 | (0–8) |
| 2014 | 0.0 | (0.0–0.0) | 0.2 | (0.0–0.8) | 1 | (0–3) | 1 | (0–2) |
| 2015 | 4.7 | (0.9–9.5) | 0.2 | (0.0–0.5) | 5 | (4–6) | 1 | (1–1) |

**Table C2 [Continued]:**

**(i) Shark species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 34.0 | (15.8–56.6) | 77.2 | (55.9–101.5) | 73 | (59–89) | 128 | (111–148) |
| 2003 | 51.5 | (27.2–82.8) | 111.7 | (88.3–142.5) | 68 | (60–78) | 169 | (151–190) |
| 2004 | 96.4 | (77.6–115.6) | 186.9 | (113.6–285.4) | 84 | (72–99) | 248 | (220–280) |
| 2005 | 16.3 | (11.0–23.9) | 104.5 | (85.1–126.7) | 36 | (32–42) | 163 | (150–177) |
| 2006 | 20.2 | (12.0–30.3) | 499.4 | (400.9–636.0) | 87 | (74–102) | 446 | (399–501) |
| 2007 | 4.3 | (2.5–6.7) | 189.3 | (26.4–314.6) | 13 | (11–15) | 210 | (186–241) |
| 2008 | 7.8 | (5.6–11.2) | 53.5 | (42.5–66.6) | 19 | (18–21) | 99 | (92–108) |
| 2009 | 31.5 | (21.9–45.0) | 57.9 | (46.1–82.3) | 24 | (23–26) | 107 | (99–116) |
| 2010 | 5.1 | (0.5–10.6) | 10.2 | (5.4–13.6) | 10 | (7–12) | 27 | (23–32) |
| 2011 | 0.4 | (0.1–0.7) | 10.5 | (5.5–14.5) | 2 | (1–2) | 20 | (13–31) |
| 2012 | 0.6 | (0.2–1.1) | 22.4 | (0.0–52.4) | – | – | 25 | (19–34) |
| 2013 | 0.1 | (0.1–0.2) | 11.6 | (2.7–27.7) | 1 | (1–1) | 12 | (7–21) |
| 2014 | 0.0 | (0.0–0.0) | 3.0 | (0.7–6.0) | 2 | (1–4) | 4 | (2–7) |
| 2015 | 0.8 | (0.5–1.2) | 12.0 | (0.5–21.2) | 8 | (5–12) | 16 | (13–20) |

**(j) Schedule 6 species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–0) |
| 2003 | 0.0 | (0.0–0.0) | 0.1 | (0.0–0.2) | 0 | (0–1) | 0 | (0–0) |
| 2004 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–0) |
| 2005 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–0) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2008 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | – | – | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |

**(k) Spiny dogfish**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | NWCR | | ESCR | | NWCR | | ESCR | |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2008 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2009 | 0.1 | (0.0–0.3) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | – | – | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |

## APPENDIX D: OREO BYCATCH AND DISCARDS ON THE CHATHAM RISE (OEO 3A and OEO 4)

**Table D1: Estimates of annual species BYCATCH (t) in the OREO target trawl fishery, for QMAs OEO 3A and OEO 4 only, based on the RATIO or STATISTICAL models; 95% confidence intervals in parentheses. [Continued on next pages]**

**(a) QMS**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 38.1 (4.0–111.6) | 81.5 (26.3–155.6) | 37 (26–56) | 67 (22–214) |
| 2003 | 5.5 (3.2–8.7) | 65.9 (11.4–151.2) | 34 (22–60) | 46 (23–118) |
| 2004 | 22.3 (8.8–43.8) | 150.2 (12.4–333.6) | 39 (16–98) | 171 (122–257) |
| 2005 | 43.0 (4.2–140.0) | 184.1 (77.6–315.4) | 14 (3–66) | 293 (226–402) |
| 2006 | 45.5 (20.1–158.1) | 53.1 (17.8–134.8) | 51 (37–75) | 87 (61–130) |
| 2007 | 34.1 (10.2–102.6) | 283.6 (80.6–672.6) | 9 (1–53) | 286 (232–367) |
| 2008 | 8.4 (3.5–15.7) | 47.7 (21.9–86.7) | 29 (13–66) | 90 (68–124) |
| 2009 | 17.0 (2.4–59.4) | 145.8 (72.4–246.1) | 27 (23–35) | 247 (223–281) |
| 2010 | 16.1 (4.8–31.4) | 262.6 (138.9–448.0) | 34 (15–84) | 454 (389–554) |
| 2011 | 2.1 (1.0–3.7) | 22.6 (7.8–43.5) | 10 (5–22) | 32 (20–54) |
| 2012 | 43.1 (2.5–123.8) | 93.0 (35.9–188.9) | 31 (15–69) | 124 (91–176) |
| 2013 | 19.6 (3.6–50.5) | 37.6 (9.7–77.3) | 18 (9–42) | 57 (24–137) |
| 2014 | 4.9 (2.4–8.7) | 12.3 (8.4–17.6) | 18 (8–37) | 39 (26–61) |
| 2015 | 16.2 (4.9–33.5) | 121.6 (37.9–269.7) | 29 (15–62) | 141 (92–227) |

**(b) NON-QMS**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 59.1 (40.2–83.8) | 21.2 (10.7–40.7) | 89 (73–110) | 38 (20–72) |
| 2003 | 48.5 (36.2–62.1) | 20.0 (10.5–31.3) | 73 (56–96) | 9 (6–15) |
| 2004 | 73.0 (27.8–157.2) | 37.8 (19.7–55.8) | 56 (37–83) | 59 (46–78) |
| 2005 | 77.2 (32.7–122.8) | 39.0 (27.1–52.0) | 36 (24–56) | 58 (50–68) |
| 2006 | 49.5 (18.4–86.4) | 56.7 (31.5–107.2) | 77 (63–96) | 74 (62–89) |
| 2007 | 55.7 (42.5–75.0) | 39.5 (23.5–62.0) | 32 (17–62) | 54 (46–64) |
| 2008 | 56.1 (36.3–86.1) | 57.2 (42.3–74.8) | 75 (55–104) | 90 (78–105) |
| 2009 | 36.2 (25.8–50.0) | 63.3 (49.3–77.9) | 75 (66–88) | 122 (114–133) |
| 2010 | 58.7 (45.6–72.7) | 84.8 (61.6–114.4) | 87 (65–116) | 130 (119–144) |
| 2011 | 73.6 (53.7–98.8) | 32.3 (26.1–39.8) | 112 (89–142) | 60 (48–75) |
| 2012 | 84.5 (60.1–122.2) | 79.4 (58.4–114.6) | 125 (86–184) | 111 (95–131) |
| 2013 | 67.4 (53.2–82.9) | 109.8 (73.5–155.7) | 102 (67–158) | 158 (105–246) |
| 2014 | 48.8 (35.5–64.6) | 67.9 (55.7–82.7) | 61 (46–83) | 118 (99–143) |
| 2015 | 74.3 (44.9–113.1) | 112.3 (70.0–171.8) | 79 (57–110) | 106 (85–134) |

**(c) INV**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 1.8 (0.8–3.1) | 1.6 (0.4–4.4) | 3 (2–4) | 3 (1–8) |
| 2003 | 3.5 (2.0–5.3) | 1.1 (0.4–2.1) | 5 (3–7) | 1 (0–5) |
| 2004 | 1.7 (0.2–4.0) | 1.8 (0.7–3.4) | 1 (1–3) | 3 (2–5) |
| 2005 | 2.8 (1.1–4.3) | 5.3 (1.3–12.5) | 3 (1–7) | 5 (4–6) |
| 2006 | 2.1 (0.8–3.8) | 1.2 (0.6–2.0) | 3 (3–5) | 2 (1–3) |
| 2007 | 2.1 (1.6–2.9) | 2.2 (0.9–3.9) | 1 (1–3) | 3 (2–4) |
| 2008 | 1.5 (0.8–2.6) | 2.2 (1.3–4.0) | 2 (1–4) | 3 (3–4) |
| 2009 | 1.9 (0.6–4.7) | 5.5 (3.7–7.8) | 3 (3–4) | 9 (8–10) |
| 2010 | 2.0 (1.2–3.0) | 2.6 (1.7–4.0) | 3 (2–5) | 4 (4–5) |
| 2011 | 2.1 (1.3–3.1) | 2.0 (1.2–3.0) | 4 (3–6) | 3 (2–5) |
| 2012 | 2.9 (1.8–4.3) | 6.2 (3.9–10.0) | 4 (3–7) | 8 (6–10) |
| 2013 | 3.3 (2.5–4.3) | 6.3 (3.7–9.7) | 3 (1–5) | 11 (6–20) |
| 2014 | 3.5 (2.1–5.0) | 3.6 (2.8–4.5) | 4 (3–6) | 6 (5–8) |
| 2015 | 6.0 (3.3–9.4) | 4.6 (3.1–6.3) | 9 (6–13) | 7 (5–11) |

**Table D1 [Continued]:**

**(d) Coral species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–1) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–0) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–1) |
| 2005 | 0.3 (0.0–0.6) | 0.8 (0.0–2.4) | 0 (0–2) | 1 (0–2) |
| 2006 | 0.2 (0.0–0.6) | 0.0 (0.0–0.0) | 0 (0–1) | 1 (0–3) |
| 2007 | 0.2 (0.0–0.4) | 0.2 (0.0–1.2) | 0 (0–1) | 1 (0–2) |
| 2008 | 0.0 (0.0–0.0) | 0.7 (0.0–2.0) | 0 (0–1) | 1 (0–2) |
| 2009 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0 (0–0) | 0 (0–1) |
| 2010 | 0.0 (0.0–0.1) | 0.4 (0.2–0.8) | 0 (0–1) | 1 (1–2) |
| 2011 | 0.0 (0.0–0.1) | 0.3 (0.0–1.0) | 0 (0–1) | 0 (0–2) |
| 2012 | 0.2 (0.0–0.7) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–1) |
| 2013 | 0.4 (0.0–0.8) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–3) |
| 2014 | 0.6 (0.0–1.6) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–2) |
| 2015 | 0.0 (0.0–0.1) | 0.8 (0.2–1.7) | 1 (0–3) | 1 (0–5) |

**(e) Morid species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 1.7 (1.1–2.6) | 0.6 (0.1–1.4) | 3 (2–4) | 1 (1–2) |
| 2003 | 2.8 (1.0–5.3) | 0.9 (0.2–2.0) | 3 (2–4) | 1 (1–2) |
| 2004 | 3.6 (1.4–6.5) | 1.6 (0.3–3.9) | 3 (2–5) | 3 (2–4) |
| 2005 | 4.0 (0.8–6.9) | 1.6 (1.0–2.3) | 3 (2–4) | 3 (2–4) |
| 2006 | 2.6 (0.3–5.5) | 6.1 (3.3–13.6) | 4 (3–5) | 7 (6–8) |
| 2007 | 3.0 (2.2–5.0) | 5.4 (2.8–9.7) | 3 (2–4) | 7 (6–9) |
| 2008 | 4.0 (2.9–5.4) | 8.9 (5.9–12.4) | 9 (7–11) | 13 (11–16) |
| 2009 | 2.8 (1.8–3.7) | 8.5 (5.4–12.6) | 6 (5–7) | 14 (13–15) |
| 2010 | 4.5 (2.5–7.0) | 5.7 (3.4–9.1) | 6 (5–8) | 10 (9–11) |
| 2011 | 7.5 (4.9–10.7) | 6.2 (4.1–8.8) | 10 (8–13) | 12 (9–15) |
| 2012 | 8.7 (5.3–13.2) | 13.3 (9.1–18.3) | 11 (8–14) | 19 (16–23) |
| 2013 | 8.0 (5.8–10.7) | 26.6 (15.2–39.6) | 11 (7–16) | 24 (16–35) |
| 2014 | 6.7 (4.3–9.9) | 12.9 (10.4–16.5) | 12 (10–16) | 21 (17–26) |
| 2015 | 9.6 (6.1–14.3) | 18.6 (11.5–27.6) | 12 (9–15) | 21 (16–28) |

**(f) Rattail species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 13.4 (9.3–19.0) | 1.5 (0.6–2.8) | 21 (16–27) | 4 (3–5) |
| 2003 | 16.4 (11.7–20.8) | 3.0 (0.9–6.5) | 23 (18–31) | 4 (3–7) |
| 2004 | 11.1 (6.5–16.0) | 6.2 (1.6–12.5) | 19 (14–27) | 8 (6–11) |
| 2005 | 27.8 (3.6–61.2) | 3.1 (0.9–5.7) | 10 (8–12) | 4 (3–4) |
| 2006 | 18.8 (2.0–39.4) | 7.5 (4.4–11.9) | 19 (16–22) | 10 (9–12) |
| 2007 | 18.3 (12.1–27.1) | 4.5 (2.3–7.1) | 9 (6–12) | 7 (5–9) |
| 2008 | 11.9 (7.1–19.6) | 15.6 (7.7–25.7) | 21 (16–26) | 16 (14–19) |
| 2009 | 7.9 (5.9–9.9) | 10.9 (7.2–16.4) | 17 (15–20) | 18 (17–19) |
| 2010 | 8.8 (6.1–12.4) | 7.1 (4.6–10.8) | 15 (12–19) | 11 (10–12) |
| 2011 | 19.7 (12.6–30.9) | 6.0 (4.3–7.7) | 28 (23–35) | 12 (10–16) |
| 2012 | 15.6 (11.2–20.8) | 6.2 (4.4–8.1) | 19 (15–25) | 12 (10–15) |
| 2013 | 12.2 (9.5–15.2) | 20.9 (6.9–42.2) | 19 (14–28) | 19 (13–28) |
| 2014 | 7.3 (5.3–9.7) | 8.1 (5.4–11.7) | 14 (12–18) | 12 (10–14) |
| 2015 | 13.5 (8.4–19.8) | 13.8 (7.8–22.1) | 20 (16–26) | 15 (11–19) |

**Table D1 [Continued]:**

**(g) Slickhead species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | OEO3A | OEO4 | OEO3A | OEO4 |
| 2002 | 1.4 (0.4–3.3) | 0.2 (0.0–0.4) | 2 (2–3) | 2 (1–4) |
| 2003 | 1.5 (0.4–3.3) | 1.0 (0.1–2.5) | 1 (1–2) | 1 (1–3) |
| 2004 | 6.0 (0.9–14.0) | 2.2 (0.4–5.1) | 3 (2–4) | 5 (3–8) |
| 2005 | 2.7 (0.4–5.8) | 0.5 (0.2–0.8) | 1 (0–1) | 1 (1–2) |
| 2006 | 1.2 (0.1–2.7) | 5.0 (2.3–8.8) | 2 (2–3) | 7 (6–9) |
| 2007 | 1.3 (0.9–2.1) | 1.6 (0.7–2.9) | 1 (0–1) | 3 (2–4) |
| 2008 | 1.3 (0.6–2.1) | 5.1 (3.2–7.3) | 3 (2–4) | 8 (6–11) |
| 2009 | 0.4 (0.2–0.7) | 13.1 (7.6–19.3) | 2 (1–2) | 18 (17–20) |
| 2010 | 1.5 (0.8–2.4) | 9.1 (2.6–21.6) | 3 (2–4) | 12 (10–14) |
| 2011 | 3.0 (1.7–4.7) | 3.0 (1.6–5.0) | 3 (2–4) | 7 (5–10) |
| 2012 | 1.9 (0.8–3.6) | 8.0 (5.9–10.5) | 5 (3–6) | 15 (12–20) |
| 2013 | 2.1 (1.3–3.1) | 7.0 (4.4–10.2) | 4 (2–6) | 15 (9–23) |
| 2014 | 1.4 (0.8–2.0) | 15.2 (8.9–23.3) | 4 (3–5) | 15 (12–18) |
| 2015 | 7.1 (3.4–12.0) | 17.9 (6.2–44.3) | 6 (4–8) | 20 (14–28) |

**(h) Shark species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | OEO3A | OEO4 | OEO3A | OEO4 |
| 2002 | 12.6 (5.8–23.1) | 12.4 (6.1–20.6) | 24 (18–31) | 10 (7–14) |
| 2003 | 16.5 (10.6–23.1) | 7.5 (3.3–13.4) | 22 (16–30) | 9 (7–14) |
| 2004 | 48.6 (13.1–128.1) | 14.4 (6.1–27.8) | 30 (23–39) | 23 (18–29) |
| 2005 | 17.4 (5.1–45.1) | 9.0 (3.5–16.6) | 15 (12–20) | 15 (12–18) |
| 2006 | 6.5 (1.8–16.3) | 30.0 (14.8–78.8) | 14 (11–17) | 25 (22–29) |
| 2007 | 17.1 (10.2–26.1) | 21.6 (9.3–42.1) | 15 (12–19) | 27 (24–32) |
| 2008 | 33.1 (18.2–55.7) | 25.3 (18.6–33.5) | 39 (33–48) | 43 (37–49) |
| 2009 | 21.7 (12.9–35.0) | 28.4 (21.4–37.5) | 43 (39–48) | 59 (55–64) |
| 2010 | 42.3 (32.4–53.2) | 58.9 (41.6–80.8) | 60 (51–72) | 90 (83–99) |
| 2011 | 35.6 (24.8–49.2) | 15.0 (10.6–21.3) | 39 (33–47) | 33 (27–41) |
| 2012 | 54.7 (35.4–84.8) | 45.5 (26.4–75.6) | 46 (38–57) | 64 (55–76) |
| 2013 | 42.2 (32.9–54.0) | 47.1 (28.9–71.0) | 43 (31–59) | 72 (51–102) |
| 2014 | 30.2 (19.1–44.2) | 24.8 (20.6–29.3) | 36 (30–44) | 45 (38–54) |
| 2015 | 40.2 (22.0–67.5) | 55.4 (31.5–91.0) | 45 (36–58) | 65 (51–84) |

**(i) Schedule 6 species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | OEO3A | OEO4 | OEO3A | OEO4 |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.2) | 0 (0–2) | 0 (0–0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–2) | 0 (0–1) |
| 2004 | 0.3 (0.0–0.9) | 0.0 (0.0–0.0) | 0 (0–3) | 0 (0–1) |
| 2005 | 0.3 (0.1–0.7) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–1) |
| 2006 | 0.2 (0.0–0.6) | 0.0 (0.0–0.0) | 0 (0–2) | 0 (0–2) |
| 2007 | 0.2 (0.0–0.4) | 0.0 (0.0–0.1) | 0 (0–1) | 0 (0–1) |
| 2008 | 0.0 (0.0–0.0) | 0.2 (0.0–12.1) | 1 (0–4) | 2 (2–3) |
| 2009 | 0.0 (0.0–0.2) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–0) |
| 2010 | 0.0 (0.0–0.0) | 0.1 (0.0–4.2) | 0 (0–3) | 1 (1–2) |
| 2011 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–1) | 0 (0–1) |
| 2012 | 39.8 (0.0–119.4) | 0.0 (0.0–0.0) | 5 (4–12) | 0 (0–5) |
| 2013 | 13.2 (0.0–39.6) | 0.0 (0.0–0.0) | 0 (0–3) | 0 (0–2) |
| 2014 | 0.0 (0.0–0.0) | 0.1 (0.0–0.2) | 0 (0–1) | 0 (0–1) |
| 2015 | 0.0 (0.0–0.0) | 0.1 (0.0–0.3) | 0 (0–2) | 0 (0–2) |

**Table D1 [Continued]:**

**(k) Spiny dogfish**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | OEO3A | | OEO4 | | OEO3A | | OEO4 | |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2003 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2008 | 0.0 | (0.0–0.0) | 0.3 | (0.0–12.0) | 0 | (0–0) | 2 | (2–2) |
| 2009 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |

**Table D2: Estimates of annual species DISCARDS (t) in the OREO target trawl fishery, for QMAs OEO 3A and OEO 4 only, based on the RATIO or STATISTICAL models; 95% confidence intervals in parentheses. [Continued on next pages]**

**(a) OEO**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | OEO3A | | OEO4 | | OEO3A | | OEO4 | |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2003 | 0.2 | (0.0–0.6) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2004 | 0.0 | (0.0–0.2) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2005 | 0.3 | (0.0–0.9) | 2.0 | (0.0–7.8) | 1 | (0–1) | 2 | (1–4) |
| 2006 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–2) |
| 2008 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2009 | 13.8 | (0.0–58.5) | 0.0 | (0.0–0.0) | 11 | (11–12) | 0 | (0–2) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2011 | 0.0 | (0.0–0.0) | 11.8 | (0.0–47.3) | 0 | (0–3) | 4 | (4–8) |
| 2012 | 37.3 | (0.0–112.0) | 0.2 | (0.0–0.7) | 5 | (4–10) | 1 | (0–9) |
| 2013 | 12.4 | (0.0–37.2) | 0.0 | (0.0–0.0) | 0 | (0–2) | 0 | (0–4) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–2) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–2) | 0 | (0–3) |

**(b) QMS**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | OEO3A | | OEO4 | | OEO3A | | OEO4 | |
| 2002 | 0.9 | (0.5–1.6) | 0.2 | (0.0–0.4) | 1 | (0–3) | 0 | (0–1) |
| 2003 | 0.0 | (0.0–0.1) | 0.0 | (0.0–0.2) | 0 | (0–1) | 0 | (0–1) |
| 2004 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2005 | 0.2 | (0.0–0.6) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–0) |
| 2006 | 0.2 | (0.0–0.6) | 0.1 | (0.0–0.4) | 0 | (0–1) | 0 | (0–1) |
| 2007 | 0.1 | (0.0–0.4) | 0.0 | (0.0–0.2) | 0 | (0–1) | 0 | (0–1) |
| 2008 | 0.0 | (0.0–0.0) | 3.0 | (0.0–11.9) | 0 | (0–1) | 2 | (2–4) |
| 2009 | 0.2 | (0.0–1.1) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–2) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–1) | 0 | (0–1) |

**Table D2 [Continued]:**

**(c) NON-QMS**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 29.8 (18.8–47.0) | 20.3 (9.6–40.6) | 38 (30–50) | 25 (13–50) |
| 2003 | 46.5 (36.0–59.4) | 20.3 (10.6–31.3) | 23 (15–38) | 6 (4–10) |
| 2004 | 72.2 (28.4–157.7) | 38.0 (19.9–58.2) | 44 (30–67) | 47 (34–67) |
| 2005 | 67.0 (29.9–101.9) | 38.4 (25.8–53.3) | 22 (10–45) | 39 (32–49) |
| 2006 | 47.5 (17.5–83.7) | 43.2 (26.3–65.3) | 62 (50–78) | 32 (24–44) |
| 2007 | 38.3 (28.4–52.3) | 24.8 (14.2–39.8) | 23 (12–43) | 22 (18–28) |
| 2008 | 6.4 (1.9–12.7) | 12.4 (8.2–17.6) | 10 (4–23) | 22 (17–31) |
| 2009 | 13.8 (2.8–24.9) | 11.8 (7.0–18.1) | 27 (22–33) | 23 (20–28) |
| 2010 | 6.9 (1.8–13.8) | 13.9 (5.4–23.6) | 11 (5–28) | 22 (18–27) |
| 2011 | 0.1 (0.0–0.2) | 8.5 (6.2–11.8) | 1 (0–5) | 16 (10–25) |
| 2012 | 1.6 (0.4–3.2) | 24.6 (16.4–34.4) | 2 (1–3) | 24 (20–31) |
| 2013 | 0.5 (0.1–1.1) | 0.0 (0.0–0.0) | 3 (0–28) | 8 (2–35) |
| 2014 | 0.0 (0.0–0.0) | 21.5 (18.8–25.0) | 2 (0–19) | 40 (32–51) |
| 2015 | 0.6 (0.0–1.5) | 5.3 (3.7–7.4) | 2 (1–9) | 9 (5–16) |

**(d) INV**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 1.7 (0.7–3.0) | 1.6 (0.4–4.4) | 2 (2–3) | 2 (1–7) |
| 2003 | 3.4 (1.9–5.2) | 1.1 (0.3–2.1) | 3 (2–5) | 1 (0–4) |
| 2004 | 1.0 (0.1–2.4) | 1.8 (0.6–3.3) | 1 (0–2) | 2 (2–4) |
| 2005 | 2.4 (0.7–3.8) | 5.2 (1.5–12.5) | 2 (1–5) | 5 (4–6) |
| 2006 | 1.8 (0.6–3.5) | 1.0 (0.5–1.8) | 3 (2–4) | 1 (1–2) |
| 2007 | 1.6 (1.1–2.2) | 1.6 (0.6–3.3) | 1 (0–2) | 2 (2–3) |
| 2008 | 0.5 (0.1–0.9) | 0.8 (0.1–2.1) | 1 (0–3) | 1 (1–1) |
| 2009 | 1.1 (0.4–1.6) | 1.9 (0.9–3.3) | 2 (2–3) | 3 (3–4) |
| 2010 | 1.0 (0.6–1.7) | 1.6 (0.9–2.5) | 2 (1–3) | 2 (2–3) |
| 2011 | 1.2 (0.6–2.0) | 1.5 (0.9–2.3) | 2 (1–4) | 2 (2–3) |
| 2012 | 1.9 (1.1–2.9) | 5.3 (3.3–9.0) | 3 (2–6) | 6 (5–8) |
| 2013 | 1.4 (0.8–2.2) | 6.2 (3.8–9.4) | 2 (1–4) | 9 (5–16) |
| 2014 | 0.4 (0.2–0.9) | 2.8 (2.3–3.4) | 1 (0–1) | 4 (3–6) |
| 2015 | 0.3 (0.1–0.5) | 1.1 (0.4–1.9) | 1 (0–1) | 1 (1–2) |

**(e) Coral species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2003 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2004 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–7) | 0 (0–4) |
| 2005 | 0.2 (0.0–0.5) | 0.8 (0.0–2.4) | 0 (0–12) | 1 (0–8) |
| 2006 | 0.2 (0.0–0.6) | 0.0 (0.0–0.0) | 0 (0–12) | 1 (0–17) |
| 2007 | 0.1 (0.0–0.3) | 0.2 (0.0–1.1) | 0 (0–27) | 1 (0–25) |
| 2008 | 0.0 (0.0–0.0) | 0.6 (0.0–1.8) | 0 (0–7) | 0 (0–6) |
| 2009 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2010 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2011 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–2) | 0 (0–2) |
| 2012 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2013 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2014 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2015 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |

**Table D2 [Continued]:**

**(f) Morid species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 1.6 (1.1–2.5) | 0.5 (0.2–1.0) | 3 (2–4) | 1 (1–2) |
| 2003 | 2.8 (0.9–5.4) | 0.9 (0.2–2.0) | 2 (1–3) | 1 (0–2) |
| 2004 | 3.4 (1.1–6.5) | 1.6 (0.3–3.8) | 3 (2–5) | 3 (2–4) |
| 2005 | 3.9 (0.7–7.1) | 1.4 (0.8–2.2) | 2 (2–3) | 2 (2–3) |
| 2006 | 2.5 (0.2–5.6) | 5.6 (2.9–12.5) | 4 (3–5) | 6 (5–7) |
| 2007 | 2.1 (1.2–3.5) | 4.0 (1.7–7.9) | 2 (1–4) | 5 (4–7) |
| 2008 | 0.6 (0.1–1.4) | 2.1 (0.8–3.8) | 2 (1–3) | 3 (2–4) |
| 2009 | 2.2 (0.8–3.4) | 0.5 (0.3–1.2) | 3 (3–4) | 2 (2–3) |
| 2010 | 0.0 (0.0–0.2) | 1.7 (0.7–4.4) | 1 (1–2) | 3 (2–4) |
| 2011 | 0.0 (0.0–0.0) | 1.3 (0.2–3.2) | 0 (0–1) | 1 (1–2) |
| 2012 | 0.0 (0.0–0.0) | 3.3 (1.3–6.7) | 2 (1–3) | 4 (3–5) |
| 2013 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2014 | 0.0 (0.0–0.0) | 8.9 (7.0–10.8) | 7 (4–11) | 12 (9–16) |
| 2015 | 0.0 (0.0–0.1) | 0.9 (0.3–1.7) | 0 (0–1) | 1 (0–2) |

**(g) Rattail species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 13.2 (9.2–18.3) | 1.5 (0.6–2.8) | 20 (16–26) | 4 (3–6) |
| 2003 | 15.9 (11.9–20.2) | 3.0 (0.9–6.4) | 19 (14–25) | 4 (3–7) |
| 2004 | 11.0 (6.7–16.4) | 6.2 (1.9–13.1) | 17 (11–24) | 8 (6–11) |
| 2005 | 21.2 (3.0–38.0) | 3.1 (1.2–5.9) | 5 (4–7) | 3 (3–4) |
| 2006 | 16.6 (1.0–36.9) | 5.4 (2.7–8.9) | 16 (14–19) | 8 (7–10) |
| 2007 | 13.5 (8.0–21.5) | 3.2 (1.4–6.0) | 5 (4–8) | 5 (4–6) |
| 2008 | 1.4 (0.4–3.1) | 1.6 (0.7–3.1) | 4 (2–6) | 2 (2–3) |
| 2009 | 5.3 (1.9–8.4) | 2.0 (1.0–4.9) | 8 (7–9) | 4 (4–5) |
| 2010 | 1.1 (0.1–2.8) | 2.4 (1.0–4.0) | 6 (3–9) | 4 (3–5) |
| 2011 | 0.0 (0.0–0.0) | 1.0 (0.4–1.8) | 1 (1–3) | 1 (1–2) |
| 2012 | 0.1 (0.0–0.3) | 1.3 (0.5–2.6) | 2 (1–5) | 2 (1–3) |
| 2013 | 0.0 (0.0–0.1) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2014 | 0.0 (0.0–0.0) | 4.2 (3.1–5.8) | 7 (4–11) | 5 (4–7) |
| 2015 | 0.1 (0.0–0.2) | 2.6 (1.7–3.5) | 4 (2–8) | 3 (2–6) |

**(h) Slickhead species**

| | Ratio model | | Statistical model | |
|---|---|---|---|---|
| | **OEO3A** | **OEO4** | **OEO3A** | **OEO4** |
| 2002 | 1.4 (0.4–3.3) | 0.2 (0.0–0.4) | 2 (1–3) | 2 (1–3) |
| 2003 | 1.4 (0.3–3.3) | 1.0 (0.2–2.5) | 1 (1–2) | 1 (0–2) |
| 2004 | 5.8 (0.9–13.8) | 2.1 (0.4–5.1) | 2 (2–4) | 4 (2–6) |
| 2005 | 2.4 (0.3–5.5) | 0.5 (0.2–0.8) | 1 (0–1) | 1 (1–2) |
| 2006 | 1.1 (0.1–2.3) | 4.5 (1.7–8.1) | 2 (1–3) | 5 (4–7) |
| 2007 | 0.9 (0.6–1.4) | 0.9 (0.3–2.2) | 0 (0–1) | 2 (1–2) |
| 2008 | 0.2 (0.0–0.4) | 1.3 (0.2–2.7) | 1 (0–1) | 2 (1–2) |
| 2009 | 0.3 (0.0–0.7) | 0.9 (0.2–3.2) | 1 (0–1) | 1 (1–2) |
| 2010 | 0.1 (0.0–0.2) | 1.1 (0.4–1.9) | 1 (0–1) | 2 (2–3) |
| 2011 | 0.1 (0.0–0.2) | 0.4 (0.1–0.7) | 0 (0–0) | 0 (0–1) |
| 2012 | 0.0 (0.0–0.0) | 1.8 (0.8–3.1) | 1 (0–1) | 2 (1–4) |
| 2013 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 0 (0–0) | 0 (0–0) |
| 2014 | 0.0 (0.0–0.0) | 3.1 (2.1–4.3) | 1 (1–2) | 4 (3–5) |
| 2015 | 0.1 (0.0–0.4) | 0.6 (0.2–1.3) | 0 (0–1) | 1 (0–2) |

**Table D2 [Continued]:**

**(i) Shark species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | OEO3A | | OEO4 | | OEO3A | | OEO4 | |
| 2002 | 12.6 | (4.7–23.4) | 12.2 | (5.8–21.2) | 21 | (16–29) | 19 | (13–28) |
| 2003 | 15.4 | (9.7–22.2) | 7.5 | (3.4–13.5) | 20 | (15–28) | 18 | (11–28) |
| 2004 | 48.4 | (14.0–137.8) | 14.4 | (6.1–28.0) | 22 | (17–30) | 31 | (23–42) |
| 2005 | 17.2 | (4.8–45.5) | 9.1 | (3.6–16.5) | 10 | (7–14) | 19 | (15–24) |
| 2006 | 6.1 | (1.5–15.7) | 21.5 | (13.2–31.1) | 9 | (8–12) | 25 | (21–31) |
| 2007 | 7.5 | (4.0–14.2) | 12.1 | (5.3–24.7) | 6 | (5–9) | 21 | (17–26) |
| 2008 | 3.9 | (1.2–8.2) | 6.8 | (5.0–9.7) | 7 | (4–11) | 15 | (11–22) |
| 2009 | 5.1 | (0.1–11.5) | 7.1 | (3.9–13.8) | 7 | (6–9) | 17 | (14–20) |
| 2010 | 5.7 | (1.5–10.9) | 7.9 | (1.3–14.9) | 6 | (4–9) | 17 | (13–21) |
| 2011 | 0.0 | (0.0–0.0) | 5.3 | (4.0–6.8) | 3 | (1–5) | 8 | (5–13) |
| 2012 | 0.4 | (0.0–1.3) | 11.8 | (6.9–18.7) | 6 | (3–11) | 19 | (13–30) |
| 2013 | 0.2 | (0.0–0.4) | 0.0 | (0.0–0.0) | 1 | (0–5) | 3 | (0–17) |
| 2014 | 0.0 | (0.0–0.0) | 1.3 | (0.8–1.8) | 1 | (0–1) | 3 | (2–4) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |

**(j) Schedule 6 species**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | OEO3A | | OEO4 | | OEO3A | | OEO4 | |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.2) | 0 | (0–7) | 0 | (0–7) |
| 2003 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–18) | 0 | (0–22) |
| 2004 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–2) | 0 | (0–5) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2008 | 0.0 | (0.0–0.0) | 3.0 | (0.0–11.9) | 0 | (0–13) | 2 | (2–18) |
| 2009 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–2) | 0 | (0–4) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |

**(j) Spiny dogfish**

| | Ratio model | | | | Statistical model | | | |
|---|---|---|---|---|---|---|---|---|
| | OEO3A | | OEO4 | | OEO3A | | OEO4 | |
| 2002 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–1) |
| 2003 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2004 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2008 | 0.0 | (0.0–0.0) | 3.0 | (0.0–11.9) | 0 | (0–0) | 2 | (2–3) |
| 2009 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.1) | 0 | (0–0) | 0 | (0–0) |
| 2010 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–0) |
| 2011 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–1) |
| 2012 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–1) |
| 2013 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–1) |
| 2014 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–1) |
| 2015 | 0.0 | (0.0–0.0) | 0.0 | (0.0–0.0) | 0 | (0–0) | 0 | (0–1) |

## APPENDIX E: COMBINED ORANGE ROUGHY AND OREO FISHERY BYCATCH AND DISCARDS IN THE CHATHAM RISE MARINE STEWARDSHIP COUNCIL (MSC) UNIT OF CERTIFICATION (UoC) AREA.

**Table E1: Estimates of annual species BYCATCH (t) in the combined orange roughy and oreo target trawl fishery, by the Marine Stewardship Council Unit of Certification (UoC) area for orange roughy (see Figure 1), based on the RATIO and STATISTICAL models; 95% confidence intervals in parentheses. [Continued on next page]**

**(a) Ratio model**

| Fishing year | QMS | non-QMS | Invertebrate | Coral species | Morid |
|---|---|---|---|---|---|
| 2002 | 94.7 (20.9–250.4) | 265.4 (141.8–747.0) | 19.3 (4.4–16.8) | 14.1 (0.0–0.0) | 28.9 (3.1–114.4) |
| 2003 | 107.6 (26.0–184.7) | 315.6 (122.3–332.1) | 20.3 (10.4–36.8) | 0.0 (0.0–0.4) | 22.1 (3.9–21.3) |
| 2004 | 84.5 (64.2–156.5) | 366.5 (183.7–389.2) | 49.3 (6.0–16.8) | 0.1 (0.0–0.0) | 41.8 (13.6–34.6) |
| 2005 | 81.2 (11.4–23.7) | 330.7 (99.7–167.8) | 111.5 (6.6–28.6) | 4.2 (0.0–9.4) | 58.7 (5.8–13.7) |
| 2006 | 184.9 (9.7–176.6) | 1 234.9 (101.5–167.5) | 100.7 (5.4–16.7) | 0.1 (0.1–1.0) | 266.5 (6.3–14.8) |
| 2007 | 267.0 (1.3–5.2) | 722.3 (30.3–55.2) | 96.5 (1.0–3.6) | 0.1 (0.0–2.0) | 176.9 (2.7–9.6) |
| 2008 | 90.8 (14.3–62.9) | 510.1 (72.5–205.1) | 47.2 (6.9–21.3) | 17.9 (0.0–4.1) | 99.3 (7.2–37.6) |
| 2009 | 86.4 (13.6–148.1) | 401.3 (107.5–406.6) | 41.5 (4.5–10.7) | 9.9 (0.0–0.1) | 76.7 (10.5–36.7) |
| 2010 | 84.7 (56.3–476.0) | 411.6 (219.9–498.4) | 14.8 (6.7–18.3) | 1.0 (0.0–0.2) | 101.5 (20.2–91.0) |
| 2011 | 36.5 (1.4–4.8) | 100.7 (73.9–118.2) | 3.6 (2.7–5.2) | 0.1 (0.0–0.9) | 30.3 (8.6–14.8) |
| 2012 | 41.8 (3.8–123.2) | 164.8 (93.9–153.6) | 6.9 (7.8–15.2) | 0.0 (0.0–0.6) | 28.5 (15.6–25.1) |
| 2013 | 78.8 (7.9–80.0) | 94.1 (115.5–241.8) | 2.9 (6.4–41.2) | 0.0 (0.0–0.4) | 46.9 (12.3–29.8) |
| 2014 | 63.3 (11.8–23.1) | 96.1 (99.2–164.5) | 5.1 (6.2–12.0) | 0.2 (0.0–1.6) | 57.9 (17.4–26.6) |
| 2015 | 156.3 (16.9–60.7) | 102.7 (91.6–167.4) | 3.4 (6.2–11.3) | 0.0 (0.2–1.2) | 108.7 (10.8–20.3) |

| Fishing year | Rattail | Slickhead | Shark | Schedule 6 species | Spiny dogfish |
|---|---|---|---|---|---|
| 2002 | 78.2 (24.1–108.6) | 27.4 (4.4–366.9) | 104.9 (21.6–83.0) | 0.0 (0.0–1.4) | 0.0 (0.0–0.0) |
| 2003 | 35.8 (30.2–65.6) | 5.7 (4.6–62.4) | 126.5 (45.0–110.2) | 0.1 (0.0–0.4) | 0.0 (0.0–0.0) |
| 2004 | 29.0 (51.5–116.5) | 15.9 (15.0–83.0) | 210.8 (64.8–184.9) | 0.1 (0.1–1.4) | 0.0 (0.0–0.0) |
| 2005 | 43.1 (6.1–17.1) | 21.1 (2.6–13.6) | 107.4 (34.1–70.2) | 0.1 (0.0–0.5) | 0.0 (0.0–0.0) |
| 2006 | 323.7 (28.5–67.0) | 83.3 (2.9–27.3) | 517.1 (20.5–49.4) | 0.4 (0.0–0.7) | 0.0 (0.0–0.0) |
| 2007 | 122.3 (1.7–4.3) | 43.6 (0.7–9.1) | 348.4 (16.2–33.8) | 0.4 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 88.3 (2.9–47.4) | 50.6 (2.4–23.9) | 254.7 (44.0–81.0) | 0.2 (0.0–13.8) | 0.0 (0.0–15.3) |
| 2009 | 56.8 (20.8–111.8) | 39.8 (3.8–124.9) | 213.1 (49.9–148.7) | 0.1 (0.0–0.5) | 0.0 (0.0–0.4) |
| 2010 | 64.0 (62.6–208.0) | 54.0 (27.8–74.8) | 169.9 (87.8–129.0) | 0.4 (0.0–0.4) | 0.0 (0.0–0.0) |
| 2011 | 3.7 (17.1–35.7) | 3.1 (3.4–8.6) | 61.5 (32.5–58.0) | 0.1 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 29.0 (13.6–23.5) | 11.4 (5.7–13.1) | 90.3 (43.5–90.1) | 0.0 (0.0–101.0) | 0.0 (0.0–0.0) |
| 2013 | 19.4 (14.7–30.8) | 4.2 (7.1–102.0) | 48.1 (46.1–89.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 11.0 (10.3–49.1) | 13.9 (4.9–17.5) | 46.1 (46.1–76.5) | 0.1 (0.0–0.6) | 0.0 (0.0–0.0) |
| 2015 | 8.1 (14.7–25.6) | 10.6 (17.3–59.6) | 61.8 (35.5–63.8) | 0.2 (0.0–0.4) | 0.0 (0.0–0.0) |

**Table E1 [Continued]:**

**(b) Statistical model**

| Fishing year | QMS | non-QMS | Invertebrate | Coral species | Morid |
|---|---|---|---|---|---|
| 2002 | 2 036 (1 750–2 396) | 484 (423–552) | 18 (15–23) | 5 (4–13) | 66 (52–85) |
| 2003 | 2 819 (2 447–3 266) | 518 (458–588) | 36 (29–45) | 0 (0–1) | 39 (30–50) |
| 2004 | 3 073 (2 663–3 556) | 621 (546–709) | 46 (38–56) | 1 (0–2) | 74 (58–97) |
| 2005 | 2 530 (2 280–2 809) | 614 (566–670) | 112 (102–123) | 7 (4–15) | 128 (112–147) |
| 2006 | 1 497 (1 277–1 775) | 1 684 (1 483–1 913) | 170 (141–208) | 0 (0–3) | 492 (418–588) |
| 2007 | 2 216 (1 937–2 531) | 1 163 (1 040–1 299) | 119 (103–139) | 1 (0–2) | 349 (298–409) |
| 2008 | 2 345 (2 188–2 523) | 851 (806–902) | 61 (58–65) | 14 (12–17) | 168 (155–183) |
| 2009 | 2 442 (2 316–2 585) | 798 (758–842) | 70 (66–75) | 12 (11–13) | 159 (147–174) |
| 2010 | 1 980 (1 856–2 127) | 874 (830–920) | 40 (37–44) | 4 (3–5) | 214 (200–231) |
| 2011 | 355 (281–459) | 160 (131–197) | 7 (5–10) | 0 (0–1) | 47 (35–64) |
| 2012 | 466 (383–574) | 239 (204–281) | 11 (8–14) | 0 (0–1) | 49 (39–63) |
| 2013 | 329 (180–610) | 135 (87–215) | 8 (4–19) | 0 (0–0) | 85 (49–148) |
| 2014 | 343 (264–453) | 188 (153–231) | 9 (6–12) | 0 (0–2) | 116 (89–152) |
| 2015 | 733 (598–906) | 140 (119–166) | 7 (5–10) | 0 (0–1) | 156 (126–198) |

| Fishing year | Rattail | Slickhead | Shark | Schedule 6 species | Spiny dogfish |
|---|---|---|---|---|---|
| 2002 | 152 (122–193) | 70 (45–98) | 190 (164–221) | 0 (0–0) | 0 (0–0) |
| 2003 | 54 (45–67) | 11 (8–18) | 192 (168–219) | 0 (0–0) | 0 (0–0) |
| 2004 | 63 (50–80) | 29 (22–40) | 290 (257–329) | 0 (0–1) | 0 (0–0) |
| 2005 | 67 (59–76) | 28 (24–34) | 191 (175–208) | 0 (0–0) | 0 (0–0) |
| 2006 | 379 (320–450) | 146 (122–183) | 627 (560–705) | 1 (0–2) | 0 (0–0) |
| 2007 | 220 (184–262) | 97 (80–122) | 461 (419–510) | 1 (0–1) | 0 (0–0) |
| 2008 | 118 (111–126) | 73 (68–81) | 429 (407–452) | 0 (0–1) | 0 (0–0) |
| 2009 | 110 (102–120) | 91 (82–103) | 401 (383–420) | 0 (0–1) | 0 (0–0) |
| 2010 | 140 (129–152) | 124 (112–136) | 365 (348–384) | 1 (1–2) | 0 (0–0) |
| 2011 | 10 (7–14) | 6 (3–10) | 82 (68–100) | 0 (0–1) | 0 (0–0) |
| 2012 | 31 (25–39) | 29 (20–38) | 119 (103–139) | 0 (0–0) | 0 (0–0) |
| 2013 | 23 (12–42) | 10 (4–20) | 62 (41–94) | 0 (0–0) | 0 (0–0) |
| 2014 | 27 (20–36) | 21 (13–31) | 88 (73–108) | 0 (0–1) | 0 (0–0) |
| 2015 | 18 (14–24) | 12 (10–19) | 85 (72–103) | 0 (0–1) | 0 (0–0) |

**Table E2: Estimates of annual species DISCARDS (t) in the combined orange roughy and oreo target trawl fishery, by the Marine Stewardship Council Unit of Certification (UoC) areas for orange roughy (see Figure 1), based on the RATIO and STATISTICAL models; 95% confidence intervals in parentheses. [Continued on next page]**

**(a) Ratio model**

| Fishing year | ORH & OEO | QMS | non-QMS | Invertebrate | Coral |
|---|---|---|---|---|---|
| 2002 | 0.0 (0.0–0.0) | 0.2 (0.0–7.4) | 233.4 (89.5–721.6) | 18.6 (4.2–16.0) | 14.0 (0.0–0.0) |
| 2003 | 33.5 (0.0–1.1) | 0.2 (0.0–0.5) | 275.9 (113.2–331.7) | 17.5 (8.2–33.0) | 0.0 (0.0–0.4) |
| 2004 | 1.1 (0.0–0.2) | 0.1 (0.0–0.6) | 331.1 (182.7–384.3) | 48.2 (5.7–16.3) | 0.1 (0.0–0.0) |
| 2005 | 5.3 (0.0–12.9) | 0.4 (0.0–0.1) | 306.5 (94.7–160.0) | 109.6 (6.2–27.2) | 4.2 (0.0–9.2) |
| 2006 | 0.4 (0.0–42.5) | 0.2 (0.0–0.7) | 1 214.3 (92.9–158.1) | 94.7 (4.8–16.0) | 0.1 (0.1–0.8) |
| 2007 | 0.1 (0.0–0.0) | 0.1 (0.0–0.0) | 429.3 (27.2–50.7) | 36.0 (0.6–3.0) | 0.1 (0.0–1.9) |
| 2008 | 10.4 (0.0–0.0) | 0.0 (0.0–13.8) | 79.7 (23.9–98.5) | 19.7 (0.8–6.6) | 8.2 (0.0–0.0) |
| 2009 | 11.4 (0.0–83.6) | 0.2 (0.0–1.6) | 97.6 (18.2–330.6) | 19.8 (3.3–6.7) | 0.0 (0.0–0.0) |
| 2010 | 2.2 (0.0–0.0) | 0.1 (0.0–0.0) | 34.0 (33.9–182.9) | 7.7 (5.3–15.6) | 0.0 (0.0–0.0) |
| 2011 | 80.7 (0.0–38.2) | 0.0 (0.0–0.0) | 28.3 (0.1–20.8) | 3.5 (1.4–3.8) | 0.0 (0.0–0.0) |
| 2012 | 0.2 (0.0–94.8) | 0.0 (0.0–0.0) | 92.6 (3.4–8.2) | 5.6 (5.5–12.2) | 0.0 (0.0–0.0) |
| 2013 | 1.0 (0.0–0.0) | 0.0 (0.0–0.0) | 9.7 (2.2–140.1) | 2.9 (5.6–19.4) | 0.0 (0.0–0.0) |
| 2014 | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) | 26.4 (15.0–22.5) | 2.6 (2.6–4.3) | 0.0 (0.0–0.0) |
| 2015 | 0.4 (0.0–0.0) | 0.0 (0.0–0.0) | 33.8 (16.5–79.9) | 1.3 (1.5–4.1) | 0.0 (0.0–0.0) |

| Fishing year | Morid | Rattail | Slickhead | Shark | Schedule 6 | Spiny dogfish |
|---|---|---|---|---|---|---|
| 2002 | 7.4 (3.2–107.5) | 80.3 (24.7–109.2) | 30.8 (4.5–370.2) | 86.4 (16.7–70.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2003 | 11.9 (2.9–19.3) | 34.6 (26.6–52.4) | 5.8 (5.0–61.2) | 114.9 (43.4–107.4) | 0.1 (0.0–0.4) | 0.0 (0.0–0.0) |
| 2004 | 35.4 (12.8–32.2) | 27.8 (51.3–119.2) | 15.3 (15.6–88.0) | 199.1 (63.1–176.2) | 0.0 (0.0–0.7) | 0.0 (0.0–0.0) |
| 2005 | 46.1 (4.5–12.0) | 42.9 (6.2–16.6) | 21.2 (2.6–13.3) | 103.3 (31.1–65.0) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2006 | 212.8 (5.9–13.1) | 321.3 (27.0–61.7) | 81.2 (2.6–26.1) | 507.4 (18.2–43.5) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2007 | 60.6 (2.4–8.0) | 102.9 (1.4–3.8) | 28.0 (0.7–8.8) | 197.2 (14.9–34.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2008 | 8.6 (4.1–13.7) | 7.2 (2.1–7.9) | 2.3 (1.5–13.0) | 58.8 (13.3–57.3) | 0.0 (0.0–13.8) | 0.0 (0.0–13.8) |
| 2009 | 11.4 (3.0–24.7) | 100 (5.8–91.4) | 3.8 (0.3–125.1) | 64.3 (5.8–100.8) | 0.0 (0.0–0.4) | 0.0 (0.0–0.4) |
| 2010 | 4.6 (2.1–47.8) | 6.5 (3.5–67.2) | 2.6 (7.3–38.7) | 15.2 (12.4–29.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2011 | 11.3 (0.0–1.9) | 0.3 (0.0–3.0) | 0.3 (0.0–0.6) | 15.8 (0.0–14.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2012 | 15.1 (0.0–0.0) | 24.2 (0.0–0.2) | 7.0 (0.0–0.0) | 36.7 (0.0–1.1) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2013 | 1.6 (0.1–16.1) | 1.0 (0.1–13.4) | 0.0 (0.0–96.1) | 6.0 (1.6–19.8) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2014 | 10.2 (7.0–12.4) | 5.3 (1.9–2.8) | 2.5 (1.6–3.3) | 4.0 (0.4–1.4) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |
| 2015 | 2.5 (1.1–6.9) | 2.2 (3.7–10.4) | 0.8 (5.4–54.3) | 23.6 (1.2–8.2) | 0.0 (0.0–0.0) | 0.0 (0.0–0.0) |

**Table E2 [Continued]:**

**(b) Statistical model**

| Fishing year | ORH & OEO | | QMS | | non-QMS | | Invertebrate | | Coral | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 1 | (0–13) | 1 | (0–2) | 287 | (246–336) | 15 | (12–18) | 8 | (4–63) |
| 2003 | 17 | (9–77) | 7 | (3–18) | 374 | (330–426) | 26 | (21–33) | 1 | (0–14) |
| 2004 | 4 | (3–5) | 1 | (1–3) | 463 | (405–529) | 38 | (32–45) | 2 | (0–26) |
| 2005 | 4 | (4–6) | 0 | (0–1) | 427 | (388–471) | 99 | (92–109) | 16 | (6–92) |
| 2006 | 1 | (0–18) | 1 | (0–3) | 1 403 | (1 223–1 620) | 143 | (119–173) | 2 | (0–26) |
| 2007 | 1 | (0–14) | 0 | (0–1) | 512 | (442–593) | 39 | (33–47) | 2 | (0–18) |
| 2008 | 11 | (10–17) | 0 | (0–0) | 146 | (132–163) | 19 | (19–20) | 12 | (8–37) |
| 2009 | 21 | (14–41) | 0 | (0–1) | 185 | (170–202) | 38 | (35–42) | 0 | (0–0) |
| 2010 | 1 | (0–2) | 3 | (2–4) | 67 | (61–75) | 20 | (18–22) | 0 | (0–0) |
| 2011 | 27 | (21–59) | 0 | (0–0) | 34 | (24–51) | 6 | (4–8) | 0 | (0–0) |
| 2012 | 1 | (0–4) | 0 | (0–1) | 96 | (80–116) | 7 | (6–10) | 0 | (0–0) |
| 2013 | 1 | (0–14) | 0 | (0–5) | 18 | (9–34) | 7 | (3–15) | 0 | (0–0) |
| 2014 | 1 | (0–9) | 0 | (0–1) | 49 | (37–66) | 5 | (3–8) | 0 | (0–0) |
| 2015 | 0 | (0–7) | 1 | (0–2) | 40 | (30–55) | 3 | (2–4) | 0 | (0–0) |

| Fishing year | Morid | | Rattail | | Slickhead | | Shark | | Schedule 6 | | Spiny dogfish | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | 13 | (10–17) | 129 | (105–161) | 52 | (36–76) | 147 | (126–170) | 0 | (0–3 224) | 0 | (0–0) |
| 2003 | 17 | (14–24) | 45 | (37–54) | 9 | (7–13) | 165 | (146–188) | 0 | (0–3 831) | 0 | (0–0) |
| 2004 | 47 | (37–61) | 52 | (42–65) | 22 | (16–31) | 249 | (220–283) | 0 | (0–0) | 0 | (0–0) |
| 2005 | 79 | (70–90) | 57 | (51–64) | 24 | (21–28) | 173 | (160–188) | 0 | (0–0) | 0 | (0–0) |
| 2006 | 274 | (235–323) | 323 | (275–382) | 115 | (96–139) | 553 | (494–620) | 0 | (0–0) | 0 | (0–0) |
| 2007 | 95 | (79–116) | 138 | (116–168) | 42 | (33–54) | 215 | (191–243) | 0 | (0–0) | 0 | (0–0) |
| 2008 | 12 | (11–14) | 11 | (10–13) | 3 | (3–4) | 102 | (93–112) | 0 | (0–0) | 0 | (0–0) |
| 2009 | 20 | (18–22) | 19 | (17–22) | 8 | (7–10) | 115 | (107–124) | 0 | (0–1 569) | 0 | (0–0) |
| 2010 | 10 | (8–12) | 13 | (11–15) | 6 | (5–8) | 36 | (32–42) | 0 | (0–792) | 0 | (0–0) |
| 2011 | 6 | (4–10) | 1 | (0–2) | 1 | (0–2) | 26 | (17–39) | 0 | (0–0) | 0 | (0–0) |
| 2012 | 18 | (14–25) | 18 | (15–23) | 11 | (7–16) | 47 | (37–60) | 0 | (0–0) | 0 | (0–0) |
| 2013 | 2 | (1–7) | 3 | (1–8) | 0 | (0–3) | 13 | (6–28) | 0 | (0–0) | 0 | (0–0) |
| 2014 | 21 | (14–31) | 13 | (9–19) | 5 | (3–8) | 8 | (5–12) | 0 | (0–0) | 0 | (0–0) |
| 2015 | 6 | (4–9) | 5 | (4–8) | 2 | (1–3) | 34 | (24–50) | 0 | (0–0) | 0 | (0–0) |

## APPENDIX F: COMPLETE LIST OF QMS SPECIES CODES

**Table F1: 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 orange roughy and oreo fisheries between 2001–02 and 2015–16. * listed under Schedule 6 of the Fisheries Act 1996 (stocks that may be returned to the sea or other waters). [Continued on next page]**

| Species code | QMS year of entry | Group | Common name | Scientific name | ORH fishery (kg) | OEO fishery (kg) |
|---|---|---|---|---|---|---|
| KBB* | 2010 | Algae | Bladder kelp | *Macrocystis pyrifera* | | |
| PTO* | 2010 | Fish | Patagonian toothfish | *Dissostichus eleginoides* | | 186 |
| RBT | 2009 | Fish | Redbait | *Emmelichthys nitidus* | 9 | |
| PRK* | 2007 | Inv. | Prawn killer | *Ibacus alticrenatus* | 4 | |
| KWH* | 2006 | Inv. | Knobbed whelk | *Austrofucus glans* | 2 | |
| PZL | 2006 | Inv. | King clam | *Panopea zelandica* | | |
| OYS* | 2005 | Inv. | Oysters dredge | *Ostrea chilensis* | | |
| PPI* | 2005 | Inv. | Pipi | *Paphies australis* | 0 | |
| TUA | 2005 | Inv. | Tuatua | *Paphies subtriangulata* | | |
| BIG | 2004 | Fish | Bigeye tuna | *Thunnus obesus* | | |
| BWS* | 2004 | Fish | Blue shark | *Prionace glauca* | 23 | |
| BYA* | 2004 | Inv. | Frilled venus shell | *Bassina yatei* | | |
| CHC* | 2004 | Inv. | Red crab | *Chaceon bicolor* | 240 | |
| DAN* | 2004 | Inv. | Ringed dosinia | *Dosinia anus* | | |
| DSU* | 2004 | Inv. | Silky dosinia | *Dosinia subrosea* | | |
| GLM* | 2004 | Inv. | Green-lipped mussel | *Perna canaliculus* | | |
| GSC* | 2004 | Inv. | Giant spider crab | *Jacquinotia edwardsii* | 26 | 4 |
| HOR | 2004 | Inv. | Horse mussel | *Atrina zelandica* | | |
| KAH | 2004 | Fish. | Kahawai | *Arripis trutta, A. xylabion* | | |
| ATT | 2004 | Fish | Kahawai | *Arripis trutta* | | |
| KIC* | 2004 | Inv. | King crab | *Lithodes murrayi, Neolithodes brodiei* | 2 219 | 475 |
| LDO | 2004 | Fish | Lookdown dory | *Cyttus traversi* | 143 | 216 |
| LFE* | 2004 | Fish | Long-finned eel | *Anguilla dieffenbachii* | | |
| MAK* | 2004 | Fish | Mako shark | *Isurus oxyrinchus* | 15 | |
| MDI* | 2004 | Inv. | Trough shell | *Mactra discors* | | |
| MMI* | 2004 | Inv. | Large trough shell | *Mactra murchisoni* | | |
| MOO | 2004 | Fish | Moonfish | *Lampris guttatus* | 29 | 230 |
| PAR | 2004 | Fish | Parore | *Girella tricuspidata* | 4 | |
| PDO* | 2004 | Inv. | Southern tuatua | *Paphies donacina* | | |
| POR | 2004 | Fish | Porae | *Nemadactylus douglasii* | | |
| POS* | 2004 | Fish | Porbeagle shark | *Lamna nasus* | 79 | |
| RBM | 2004 | Fish | Ray's bream | *Brama brama* | 251 | 61 |
| RSN | 2004 | Fish | Red snapper | *Centroberyx affinis* | | |
| SAE* | 2004 | Inv. | Triangle shell | *Spisula aequilatera* | | |
| SCC* | 2004 | Inv. | Sea cucumber | *Stichopus mollis* | 105 | 511 |
| SCI | 2004 | Inv. | Scampi | *Metanephrops challengeri* | 4 | |
| SPD* | 2004 | Fish | Spiny dogfish | *Squalus acanthias* | 336 | 1 586 |
| STN* | 2004 | Fish | Southern bluefin tuna | *Thunnus maccoyii* | | |
| SWO* | 2004 | Fish | Broadbill swordfish | *Xiphias gladius* | 15 | |
| TOR | 2004 | Fish | Pacific bluefin tuna | *Thunnus orientalis* | | |
| YFN | 2004 | Fish | Yellowfin tuna | *Thunnus albacares* | | |
| KIN* | 2003 | Fish | Kingfish | *Seriola lalandi* | 1 | 1 |
| LEA | 2003 | Fish | Leatherjacket | *Meuschenia scaber* | | |
| RSK* | 2003 | Fish | Rough skate | *Zearaja nasuta* | 443 | 217 |
| SFE* | 2003 | Fish | Short-finned eel | *Anguilla australis, Anguilla reinhardtii* | | |
| SSK* | 2003 | Fish | Smooth skate | *Dipturus innominatus* | 2 782 | 5 394 |
| ANC | 2002 | Fish | Anchovy | *Engraulis australis* | 32 | |
| BUT | 2002 | Fish | Butterfish | *Odax pullus* | 5 | |
| COC* | 2002 | Inv. | Cockle | *Austrovenus stutchburyi* | | |
| EMA | 2002 | Fish | Blue mackerel | *Scomber australasicus* | | |
| GAR | 2002 | Fish | Garfish | *Hyporhamphus ihi* | | |
| PAD* | 2002 | Inv. | Paddle crab | *Ovalipes catharus* | | |
| PIL | 2002 | Fish | Pilchard | *Sardinops sagax* | | |
| QSC* | 2002 | Inv. | Queen scallop | *Zygochlamys delicatula* | | |
| SPR | 2002 | Fish | Sprats | *Sprattus antipodum, S. muelleri* | 2 | |
| SUR* | 2002 | Inv. | Kina | *Evechinus chloroticus* | 55 | 2 |
| ANG | 2000 | Fish | Anguillidae | Anguillidae | | |
| GSP | 1999 | Fish | Pale ghost shark | *Hydrolagus bemisi* | 27 371 | 16 739 |
| SBW | 1999 | Fish | Southern blue whiting | *Micromesistius australis* | 262 | 774 |

**Table F1 [Continued]:**

| Species code | QMS year of entry | Group | Common name | Scientific name | ORH fishery (kg) | OEO fishery (kg) |
|---|---|---|---|---|---|---|
| CDL | 1998 | Fish | Cardinalfish | Epigonidae | 214 388 | 2 418 |
| EPT | 1998 | Fish | Deepsea cardinalfish | *Epigonus telescopus* | 1 166 | |
| FRO | 1998 | Fish | Frostfish | *Lepidopus caudatus* | 33 | 5 |
| GSH | 1998 | Fish | Ghost shark | *Hydrolagus novaezealandiae* | 3 437 | 529 |
| OYU | 1998 | Inv | | | | |
| RBY | 1998 | Fish | Rubyfish | *Plagiogeneion rubiginosum* | 61 | |
| RIB | 1998 | Fish | Ribaldo | *Mora moro* | 244 649 | 1 817 |
| SPE | 1998 | Fish | Sea perch | *Helicolenus* spp. | 4 218 | 122 |
| TRU | 1998 | Fish | Trumpeter | *Latris lineata* | | |
| WWA | 1998 | Fish | White warehou | *Seriolella caerulea* | 349 | 1 680 |
| YEM | 1998 | Fish | Yellow-eyed mullet | *Aldrichetta forsteri* | | |
| SCA | 1992 | Inv | Scallop | *Pecten novaezelandiae* | | |
| CRA | 1990 | Inv | Rock lobster | *Jasus edwardsii* | 3 | |
| PHC | 1990 | Inv | Packhorse rock lobster | *Jasus verreauxi* | | |
| JMA | 1987 | Fish | Jack mackerel | *Trachurus declivis, T. murphyi, T. novaezelandiae* | 351 | |
| 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* | 5 407 | 645 |
| NOS | 1987 | Inv | NZ southern arrow squid | *Nototodarus sloanii* | | |
| NOG | 1987 | Inv | NZ northern arrow squid | *Nototodarus gouldi* | | |
| ASQ | 1987 | Inv | NA | | | |
| BAR | 1986 | Fish | Barracouta | *Thyrsites atun* | 33 | |
| BCO | 1986 | Fish | Blue cod | *Parapercis colias* | 10 | 6 |
| BNS | 1986 | Fish | Bluenose | *Hyperoglyphe antarctica* | 4 831 | 120 |
| BYX | 1986 | Fish | Alfonsino & long-finned beryx | *Beryx splendens & B. decadactylus* | 6 044 | 19 |
| ELE | 1986 | Fish | Elephant fish | *Callorhinchus milii* | 112 | |
| FLA | 1986 | Fish | Flats | | 21 | |
| ESO | 1986 | Fish | N.Z. sole | *Peltorhamphus novaezeelandiae* | 5 | |
| LSO | 1986 | Fish | Lemon sole | *Pelotretis flavilatus* | 1 | |
| SFL | 1986 | Fish | Sand flounder | *Rhombosolea plebeia* | | |
| TUR | 1986 | Fish | Turbot | *Colistium nudipinnis* | | |
| GMU | 1986 | Fish | Grey mullet | *Mugil cephalus* | | |
| GUR | 1986 | Fish | Gurnard | *Chelidonichthys kumu* | 5 | |
| HAK | 1986 | Fish | Hake | *Merluccius australis* | 36 891 | 5 817 |
| HOK | 1986 | Fish | Hoki | *Macruronus novaezelandiae* | 421 190 | 189 284 |
| HPB | 1986 | Fish | Hapuku & bass | *Polyprion oxygeneios & P americanus* | 14 | |
| BAS | 1986 | Fish | Bass groper | *Polyprion americanus* | 5 | |
| HAP | 1986 | Fish | Hapuku | *Polyprion oxygeneios* | 268 | |
| JDO | 1986 | Fish | John dory | *Zeus faber* | 10 | |
| LIN | 1986 | Fish | Ling | *Genypterus blacodes* | 2 572 | 1 557 |
| MOK | 1986 | Fish | Moki | *Latridopsis ciliaris* | 30 | |
| OEO | 1986 | Fish | Oreos | *P. maculatus, A. niger, & N. rhomboidalis* | 29 576 | 123 936 |
| BOE | 1986 | Fish | Black oreo | *Allocyttus niger* | 1 178 459 | 16 593 335 |
| SSO | 1986 | Fish | Smooth oreo | *Pseudocyttus maculatus* | 5 091 993 | 33 846 254 |
| SOR | 1986 | Fish | Spiky oreo | *Neocyttus rhomboidalis* | 151 907 | 11 221 |
| WOE | 1986 | Fish | Warty oreo | *Allocyttus verrucosus* | 9 259 | 2 546 |
| ORH | 1986 | Fish | Orange roughy | *Hoplostethus atlanticus* | 61 286 328 | 1 027 660 |
| RCO | 1986 | Fish | Red cod | *Pseudophycis bachus* | 8 | 8 |
| SCH | 1986 | Fish | School shark | *Galeorhinus galeus* | 1 207 | |
| SKI | 1986 | Fish | Gemfish | *Rexea* spp. | | |
| RSO | 1986 | Fish | Gemfish | *Rexea solandri* | 91 | 19 |
| SNA | 1986 | Fish | Snapper | *Pagrus auratus* | 26 | |
| SPO | 1986 | Fish | Rig | *Mustelus lenticulatus* | 2 | |
| STA | 1986 | Fish | Giant stargazer | *Kathetostoma* spp. | | |
| GIZ | 1986 | Fish | Giant stargazer | *Kathetostoma giganteum* | 333 | 27 |
| SWA | 1986 | Fish | Silver warehou | *Seriolella punctata* | 117 | |
| TAR | 1986 | Fish | Tarakihi | *Nemadactylus macropterus & N.* sp. | | |
| NMP | 1986 | Fish | Tarakihi | *Nemadactylus macropterus* | 6 | |
| TRE | 1986 | Fish | Trevally | *Pseudocaranx georgianus* | | |
| WAR | 1986 | Fish | Common warehou | *Seriolella brama* | 2 | |