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Tini a Tangaroa

Inshore trawl survey off the west coast South Island and in Tasman Bay and Golden Bay, March–April 2025 (KAH2502)

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PLAIN LANGUAGE SUMMARY

This report presents the results from the 17th inshore trawl survey in a time series, which was started in 1992 and covers the west coast of the South Island, from Farewell Spit to the Haast River mouth, and within Tasman Bay and Golden Bay. The survey covers depths from 20 to 400 m (core strata), using RV *Kaharoa,* and is mainly aimed at surveying giant stargazer, red cod, red gurnard, spiny dogfish, tarakihi and snapper, though useful estimates are achieved for other species too, e.g. John dory and rig. Since 2017, two additional strata have been surveyed in 10–20 m in Tasman Bay and Golden Bay to cover the full distribution of snapper in that area.

Data collected include length, weight, and maturity data for selected species, and collection of otoliths of the target species for ageing. The trawl survey provides time series of relative biomass estimates and age, length, and maturity stage information that is used for stock assessments and fisheries management advice for key inshore species.

In 2025, a total of 57 trawls were successfully completed in the core strata and another six were carried out in strata 20 and 21.

Biomass estimates for the target species in the core strata were: giant stargazer, 724 t; John dory, 211 t; red gurnard, 1875 t; red cod, 879 t; snapper, 3557 t; spiny dogfish, 2662 t; and tarakihi, 660 t. The snapper biomass (core strata plus the 10–20 m strata) was the highest ever in the time series at 4453 t.

This was the final survey to be carried out on RV *Kaharoa*, with future surveys to be carried out on its replacement vessel, RV *Kaharoa II.* This voyage also served as an intercalibration between the two vessels, with both fishing side by side to provide continuity in the time series. The intercalibration results are presented in a separate report.

Data for all species that have been caught in the time series are also presented online in the Trawl Survey Information Portal, https://tsip.niwa.co.nz/home.

EXECUTIVE SUMMARY

MacGibbon, D.J.[1]; Ballara, S.L.[1]; Walsh, C.[2]; Buckthought, D.[1]; Bian, R.[1] (2026). Inshore trawl survey off the west coast South Island and in Tasman Bay and Golden Bay, March-April 2025 (KAH2502).

***New Zealand Fisheries Assessment Report 2026/10.* 84 p.**

This report presents the results from the seventeenth inshore trawl survey along the west coast of the South Island, from Farewell Spit to the Haast River mouth, and within Tasman Bay and Golden Bay, at depths from 20 to 400 m, using RV *Kaharoa*. The survey took place from 20 March to 14 April 2025 and used a stratified two-phase design optimised for giant stargazer, red cod, red gurnard, snapper, spiny dogfish, and tarakihi. Snapper was added as a target species to this time series (which started in 1992) in 2017 with the addition of two new strata in depths of 10–20 m: stratum 20 in Tasman Bay; and stratum 21 in Golden Bay. In 2025, a total of 57 phase one stations were successfully completed in the core strata and another six were carried out in strata 20 and 21. There was insufficient time to carry out any phase two stations.

The biomass estimates for the target species in the core strata were: giant stargazer, 724 t; red gurnard, 1875 t; red cod, 878 t; snapper, 3557 t; spiny dogfish, 2662 t; and tarakihi, 660 t. The snapper biomass estimate, including the 10–20 m strata, was 4453 t. Target CVs of 20% were met for red gurnard (13.1%), snapper (12.7%), and tarakihi (12.9%). The target CV of 20% was exceeded for giant stargazer (23.1%), spiny dogfish (34.1%) and the target CV of 25% was exceeded for red cod (31.2%). There was no formal target CV for John dory, but the CV was 20.2%.

The snapper biomass was the highest in the time series, up slightly from the previous high in 2023. The cohort of 1+ snapper from the 2019 survey was the largest ever seen in the time series, and this cohort persisted at age 7+ in 2025 and, along with 6+ snapper, dominated the length and age frequencies. The overall snapper age frequency was broad, with fish ranging in age from 1–48 years, but most fish were 20 or younger. Juvenile snapper were caught mostly in the 10–20 m strata. These strata provide important information on future recruitment and contain a variable proportion of the adult population.

Red gurnard biomass increased from 2023 and was the second highest estimate in the time series behind 2021. Giant stargazer biomass declined from 2023, was the lowest estimate for the time series, and a lack of juvenile recruitment for several surveys has continued. John dory biomass was up slightly from 2023, at a level slightly below the time series mean, and substantially lower than the time series peaks seen in 2015 and 2017. Red cod biomass increased substantially from 2023, which was the time series low, but biomass is still well below the time series mean and the length frequency shows there is still a lack of juvenile fish. Spiny dogfish biomass decreased slightly from 2023, and the three most recent estimates are the three lowest in the time series. Tarakihi biomass increased slightly from the series low in 2023 to the second lowest estimate in the time series in 2025, with few juvenile tarakihi caught.

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1. INTRODUCTION

This report presents results from the seventeenth trawl survey using RV *Kaharoa* at depths of 20–400 m off the west coast of the South Island (WCSI) and in Tasman Bay and Golden Bay (TBGB). Surveys were conducted in 1992, 1994, 1995, 1997, 2000, 2003, and every second year from 2005 to 2025. The 2025 survey was the final survey to be carried out by RV *Kaharoa* which has been replaced by RV *Kaharoa II*. This voyage also served as an intercalibration between the two vessels, with both fishing side by side to provide continuity in the time series. The intercalibration results are presented in a separate report (Devine et al. 2026).

The survey design was optimised to estimate the relative biomass of giant stargazer (*Kathetostoma giganteum*), red cod (*Pseudophycis bachus*), red gurnard (*Chelidonichthys kumu*), snapper (*Chrysophrys auratus*), spiny dogfish (*Squalus acanthias*), and tarakihi (*Nemadactylus macropterus*). Since 2013, John dory (*Zeus faber*) has been included as a 'pseudo' target species. They are not included in the station optimisation process but, at the request of the Inshore Working Group, extra data have been collected including length, weight, sex, gonad development, and, since 2023, otoliths. This was in response to an increasing biomass during the early 2000s and the difficulty experienced by commercial fishers without Annual Catch Entitlement to avoid bycatch of John dory while targeting other species.

The results of earlier surveys in this series were reported by Drummond & Stevenson (1995a, 1995b, 1996), Stevenson (1998, 2002, 2004, 2006, 2007a, 2012), Stevenson & Hanchet (2010), MacGibbon & Stevenson (2013), Stevenson & MacGibbon (2015, 2018), MacGibbon (2019), and MacGibbon et al. (2022, 2024a). The first four surveys in the series were reviewed by Stevenson & Hanchet (2000). Additional analyses were completed to determine the non-target species for which relative abundance trends and size comparison information should be provided in each survey report (Stevenson 2007b).

The survey was expanded in 2017 to include two new strata in 10–20 m in inner Tasman Bay and inner Golden Bay. These strata were added because snapper distribution in this area was found to extend shallower than the core strata (which start at 20 m).

This report details the 2025 *Kaharoa* trawl survey design and methods and provides relative biomass estimates for commercially important species managed under the Quota Management System (QMS). The trawl survey provides time series of relative biomass estimates and age, length, and maturity stage information that is used for stock assessments and fisheries management advice. Results are presented for the whole survey area, and separately for the TBGB strata and the west coast strata. This is because the TBGB region is a nursery ground for a number of species caught on the survey, including snapper (Langley 2020) and tarakihi (Vooren 1975).

Snapper and tarakihi otoliths were aged under this project and results are included in this report. Catch-at-age information, when combined with estimates of selectivity-at-age within an age-structured population model, can be used to estimate the relative year class strengths of cohorts recruited to the exploitable stock. Snapper stocks characteristically show large inter-annual variability in year class strength (Blackwell et al. 1999, 2000, Blackwell & Gilbert 2001, 2002, 2005, 2008, Parker et al. 2015, Parsons et al. 2018), as do tarakihi stocks (Langley & Starr 2012, Fisheries New Zealand 2025). Relative year class strength is an important parameter in snapper and tarakihi population models because it directly influences annual stock productivity or surplus production estimates. Estimates of the strength of pre-recruit year classes from trawl surveys provide valuable information for biomass projections and catch limit reviews, which are important components of stock assessments.

In addition to the target and key species, all species that have ever been caught in the time series (including non-QMS species and invertebrates) are also presented online in the Trawl Survey Information Portal, https://tsip.niwa.co.nz/home .

1.1 Project objectives

Overall objective

1. To determine the relative abundance and distribution of inshore finfish species off the west coast of the South Island, and Tasman Bay and Golden Bay in the 2024/25, 2026/27 and 2028/29 fishing years; focusing on red cod (*Pseudophycis bachus*), red gurnard (*Chelidonichthys kumu*), snapper *Chrysophys auratus*) stargazer (*Kathetostoma giganteum*), tarakihi (*Nemadactylus macropterus*), John dory (*Zeus faber*), spiny dogfish (*Squalus acanthias*), rig (*Mustelus lenticulatus*) and school shark (*Galeorhinus galeus*).

Specific project objectives

1. To determine the relative abundance and distribution of red cod, red gurnard, stargazer, snapper, tarakihi, John Dory and spiny dogfish off the west coast of the South Island from Farewell Spit to the Haast River mouth, and within Tasman Bay and Golden Bay by carrying out trawl surveys in March/April of 2025, 2027, and 2029. The target coefficients of variation (CV) of the biomass estimates for these species are as follows: red cod (20–25%), red gurnard (20%), snapper (20%), giant stargazer (20%), tarakihi (20%), and spiny dogfish (20%).
2. To collect the data and determine the length frequency, length-weight relationship and reproductive condition of red cod, red gurnard, snapper, giant stargazer, tarakihi, John Dory and spiny dogfish.
3. To collect otoliths from red gurnard, John dory, giant stargazer, tarakihi, snapper and red cod.
4. To collect the data to determine the length frequencies of all other Quota Management System (QMS) species.
5. To age snapper and tarakihi otoliths collected during the survey
6. To identify benthic macro-invertebrates collected during the trawl survey.
7. To present biomass trends and size composition information for all species for which the WCSI survey reliably monitors relative abundance trends.
8. Broader outcomes.
9. To carry out trawl inter-calibration between *Kaharoa* and *Kaharoa II* and estimate species-specific catchability ratios from the intercalibration.

The result of specific project objective 9 will be presented in a separate Fisheries Assessment Report (Devine et al. 2026).

From 2025, the WCSI survey also includes strata, starting south of New Plymouth and extending as far as Mana Island, which were formerly part of the previous west coast North Island (WCNI) survey (Jones et al. 2024). This area was referred to as the west coast central area (WCC) and also includes two new strata in the 50–100 m depth and covering the area between strata G10M (off the North Island) and strata 19 in Tasman and Golden Bays. The WCC survey in 2025 was carried out from *Kaharoa II* and will be presented in a separate Fisheries Assessment Report (Underwood et al. 2026).

2. METHODS

2.1 Survey area and design

The 2025 *Kaharoa* survey was a two-phase stratified random trawl survey after Francis (1984). The survey area covered depths of 20–200 m off the west coast of the South Island from Cape Farewell to Karamea; 25–400 m from Karamea to Cape Foulwind; 20–400 m from Cape Foulwind to the Haast River mouth; and 10–70 m within TBGB inside a line drawn between Farewell Spit and Stephens Island (Figure 1). The maximum depth off the west coast north of Karamea was limited to 200 m because of historically low catch rates of all species in the 200–400 m range.

The core survey area of 25 594 km^2, including untrawlable ground, was divided into 16 strata by area and depth (Table 1, Figure 1). The core strata (strata 1–19) were identical to those used in previous surveys in the time series and two strata in the 10–20 m depth range in TBGB (strata 20–21) were the same as those introduced in 2017. The addition of the 10–20 m strata brings the total survey area to 25 976 km^2. Eighty-four percent of the total survey area was trawlable ground. Non-trawlable ground was identified before the voyage from data collected during previous trawl surveys in the area and that ground was excluded from the random station generation.

Phase-one station allocation was optimised using the R (Version 4.5.1, R Core Team 2025) function *allocate* (Francis 2006) to achieve the target CVs. The *allocate* function uses stratum area and catch rate data from previous trawl surveys in the time series to simulate optimal station allocation for a given target CV. Simulations were run for each target species separately. Based on the simulation results, the survey plan was to carry out 57 phase-one stations in the core strata, which would give a CV of 25% for red cod, and 20% for all other target species. For snapper the procedure was the same except that strata 20 and 21 were also included using data since 2017, when these strata were first introduced, which resulted in another six phase-one stations being required, bringing the total of planned phase-one stations to 63.

The survey always begins in TBGB before proceeding to the west coast, and all phase-one stations are completed before phase two begins. Phase-two stations are typically not included for snapper as the Inshore Working Group agreed that by the end of phase one, snapper will be likely to have begun moving out of the survey area. Evidence of this occurred in the 2017 survey, when the length frequency of snapper from phase-two stations in outer Tasman Bay showed a shift to smaller snapper compared with snapper caught during phase one (Stevenson & MacGibbon 2018). However, before the 2023 survey, the Inshore Working Group agreed that, should it be necessary, phase-two stations could be carried out in Tasman Bay or Golden Bay to reduce the CV for snapper before the vessel progressed to the west coast to complete the phase-one stations. This was not required in 2025.

Station positions were randomly generated using Earth Sciences NZ’s custom software ‘RandomStation’ (Doonan & Rasmussen 2017). The stations were required to be a minimum of 5.6 km (3 nautical miles) apart.

2.2 Vessel, gear, and trawling procedure

RV *Kaharoa* is a 28 m stern trawler with a beam of 8.2 m, displacement of 302 t, engine power of 522 kW, and capable of trawling to depths of 500 m. The two-panel trawl net used during the survey was designed and constructed in 1991 specifically for South Island inshore trawl surveys. The net was fitted with a 60 mm knotless codend (inside measurement). Details of the net design were given by Beentjes & Stevenson (2008). Gear specifications were the same as for previous surveys (Drummond & Stevenson 1996).

Procedures followed those recommended by Stevenson & Hanchet (1999). All tows were undertaken in daylight, and four to five tows per day were planned. For each tow, the vessel steamed to the station position and, if necessary, the bottom was checked with the echosounder to determine trawlability. Once the station was considered trawlable, the gear was shot so that the midpoint of the tow would coincide as closely as possible with the generated random position. The direction of the tow was influenced by a combination of factors, including weather conditions, tides, depth contours, and the location of the next tow, but was usually in the direction of the next planned station.

If the station was found to be in an area of foul ground or the depth was out of the stratum range, an area within 5 km of the station was searched for a replacement tow path. If the search was unsuccessful, the station was abandoned and the next alternative station within the stratum was chosen from the random station list. Standard tows were of one hour duration, at a speed over the ground of 3 knots, and the distance covered was measured by GPS. The tow was deemed to have started when the net monitor indicated that the net was on the bottom and was completed when hauling began. A warp length of 200 m was used for all tows less than 70 m depth. At greater depths, the warp to depth ratio decreased linearly to about 2.4:1 at 400 m.

2.3 Water temperature

Water temperature profiles at each station were recorded by a calibrated Seabird Microcat CTD (conductivity, temperature, depth) unit attached just behind the headline of the net, but only data on surface and bottom temperatures are stored in the *trawl* database. Full temperature profiles are stored in the *ctd* database. Surface temperatures were taken at a depth of 5 m below the surface. Bottom temperatures were taken at about 4.5 m above the sea floor because that is the approximate height of the CTD off the bottom (i.e., the approximate headline height of the trawl).

2.4 Catch and biological sampling

The catch from each tow was sorted into species and weighed on electronic motion-compensating Marel scales to the nearest 0.1 kg. Organisms were identified to species where possible. Crustaceans, shellfish, and other invertebrate species not readily identified were placed in sealed plastic bags with a label noting the trip code and station number and frozen for later identification on shore.

Length, to the nearest whole centimetre (cm) below the actual length, and sex (where possible) were recorded for all species managed under the QMS and a selection of non-QMS species, either for the whole catch or a randomly selected subsample of up to 200 fish per tow. For target species, more detailed biological data were collected on a sub-sample of up to 20 fish per tow. This included individual fish weight (grams), length to the nearest millimetre (mm), sex, and gonad stage. Otoliths were also removed for later ageing from red cod, red gurnard, giant stargazer, John dory, snapper, and tarakihi.

Middle depth (MD) maturity stages were used to stage teleost fish species while chondrichthyans were staged using the sharks and skates (SS) staging scale (Appendix 1).

All station and biological data were entered into the Fisheries New Zealand *trawl* database after final error checking had been carried out after the survey.

2.5 Trawl survey data analysis

Biomass estimates, population scaled length frequency distributions, and their associated CVs were estimated by the swept area method of Francis (1981, 1989) using R-SurvCalc, an updated version of the C++ trawl survey analysis program SurvCalc (Francis & Fu 2009) implemented in the R-programming language. Biomass was estimated for the core strata (strata 1–19) and, for snapper, the core plus strata 20 and 21. References to ‘biomass’ are to *relative* abundance estimates unless otherwise stated.

The following assumptions were made for calculating biomass estimates:

1. The area swept during each tow equalled the distance between the doors multiplied by the distance towed.
2. Vulnerability was 1.0. This assumes that all fish in the area swept were caught and there was no escapement.
3. Vertical availability was 1.0. This assumes that all fish in the water column were below the headline height and available to the net.
4. Areal availability was 1.0. This assumes that the fishstock being sampled was entirely within the survey area at the time of the survey.
5. Within the survey area, fish were evenly distributed over both trawlable and non-trawlable ground.

None of these assumptions are likely to be correct but were adopted for all the trawl survey time series of relative biomass (Stevenson & Hanchet 1999). Biomass values are also presented for recruited biomass, adult biomass, and for some species by age cohort. Recruited lengths were determined following past discussions with the commercial fishing industry and reflect the minimum lengths considered desirable for sale to the public; they are often the minimum legal sizes previously set for fishery management (but not all species have minimum legal sizes). Adult biomass was determined using the length at 50% maturity for a given species (L_{50}) where fish greater than or equal to the L_{50} were deemed adult. Age cohorts were determined using length as a proxy for age, using length cohorts discernible from the length frequency. Not all species had obvious modes that could be determined from their length frequency distributions.

Length frequencies were scaled by the percentage of catch sampled, area swept, and stratum area. The geometric mean functional relationship was used to calculate the length-weight coefficients for species where sufficient length-weight data were collected on the 2025 survey. For other species, coefficients were chosen from the *rdb* database based on whether there were coefficients from previous surveys in the time series, or on the best match between the size range of the fish used to calculate the coefficients in *rdb* and the sample size range from this survey (Appendix 2).

Sex ratios were calculated using scaled population numbers and were expressed as the ratio of males to females.

2.6 Ageing methods and analysis

2.6.1 Otolith collection

Up to 20 otolith pairs were collected from snapper and tarakihi for each station where the species were caught in sufficient number. In addition, extra otoliths were selected (from within the randomly selected length frequency sample) to ensure that enough otoliths from large fish were collected.

2.6.2 Snapper age determination

Snapper otoliths were prepared using the break and burn technique (Chugunova 1963) and a standardised procedure for reading otoliths was followed, outlined in the age determination protocol for snapper (Walsh et al. 2014). The forced margin method was implemented to anticipate the otolith margin type (wide, line, narrow) *a priori* based on the month in which the fish was sampled to provide guidance in determining age. The theoretical birthdate for ageing snapper is 1 January following Paul (1976) and, to be consistent with past trawl survey snapper ageing, otoliths were aged as age groups (i.e., 0+, 1+) as of the collection date, March–April 2025.

Otoliths were read using a single reader method that incorporated an audit of the primary otolith reader by a second experienced otolith reader. Both readers read a random subset of otoliths from the full set. Success or failure of the primary reader was determined by how well their initial readings matched the final-agreed ages as derived from a double-reading-conferring process.

2.6.3 Tarakihi age determination

Tarakihi otoliths were prepared and read in accordance with the age determination protocol for tarakihi (Walsh et al. 2016). This included thin-section preparation of the otoliths and application of the forced margin method to anticipate the otolith margin type (wide, line, narrow) *a priori*, based on the month in which the fish were sampled, to provide guidance in determining age. Determining the maximum dorsal-ventral width of the year one zone was used to ensure accurate counts of successive opaque zones. The theoretical "birthday" for tarakihi is 1 May (Walsh et al. 2016).

As for snapper, otoliths were read using a single reader method that incorporated an audit of the primary otolith reader by a second experienced otolith reader.

2.6.4 Catch-at-length and -age analysis

Scaled length frequency distributions were estimated by the area-swept method (Francis 1981, 1989) using an updated version of Earth Sciences NZ's catch-at-length-and-age software, CALA (Francis & Bian 2011). This updated version had been implemented in the R-programming language, instead of the C++ program used previously, and was applied to the age data and catch rates calculated using SurvCalc to produce separate age-length keys for male, female, and all fish (all fish included some unsexed fish). All available otoliths were aged and used to produce the age-length key, but for snapper, only age data and scaled length frequencies for all strata in TBGB were used to estimate catch-at-age in this report.

The age-length key derived from the age data was assumed to be representative of the March–April period. The main assumption of an age-length key is that the sample was taken randomly with respect to age from within each length interval (Southward 1976) and this assumption was met.

2.7 Survey representativeness

Representativeness refers to the survey catchability and whether biomass estimates from a group of species were within an acceptable range (representative) or were considered too high or too low (non-representative). This approach was derived by Francis et al. (2001), who examined data from 17 trawl survey time series, including the west coast South Island inshore trawl survey time series from 1992 to 2000. The method involves ranking species in order of increasing biomass index within each year and then averaging across species to obtain a mean rank for that year.

Different species were selected by Francis et al. (2001) for different time series and were based on groups they believed to be well sampled by the trawl, determined by looking at the frequency of occurrence and discussions with knowledgeable people. The analysis was split into two regions: 1) TBGB; and 2) west coast South Island. The species selection used by Francis et al. (2001) had continued to be used when updating the catchability analyses of this time series but was revised in 2023 (MacGibbon et al. 2024a). Some species, upon review, were deemed to be unlikely to be well sampled by the trawl and were therefore not appropriate to include in the analysis. The 2025 analysis repeated the same approach and species selection used for the 2023 survey (MacGibbon et al. 2024a).

3. RESULTS

3.1 Timetable and personnel

RV *Kaharoa* departed Wellington on 20 March 2025. *Kaharoa* docked in Nelson the next day to take fish bins and ice from Talley's Nelson and to rendezvous with RV *Kaharoa II* for the intercalibration. The trawl survey began on 22 March, in stratum 19 (outer Tasman Bay). *Kaharoa* returned to Talley's Nelson on 25 March to unload fish and take on new ice and fish bins, and completed the remaining stations in TBGB before again unloading fish and taking fresh ice from Talley's Nelson on 28 March. *Kaharoa* proceeded to the west coast strata on 28 March and continued working until returning to Nelson for another fish unload and to undertake engineering requirements on 8 April. The survey resumed on the west coast on 9 April, and the final station was completed on 12 April before returning to Nelson for the final unload on 13 April. *Kaharoa* departed later that afternoon and arrived in Wellington the following day for demobilisation.

3.2 Station and tow data

A total of 57 core phase-one stations were completed (Table 1). Three phase-one stations were carried out in each of stratum 20 and stratum 21 (10–20 m strata). This gave a total of 63 valid phase-one stations for the entire survey (Figure 1). There was insufficient time to carry out any phase two stations.

A summary of gear and tow parameters by stratum depth range are given in Table 2; individual station data are given in Appendix 3. Headline height ranged from 4.1 to 4.9 m and doorspread ranged between 65.4 and 99.2 m (Table 2, Appendix 3). Measurements of headline height and doorspread, together with observations that the doors and other bottom-contacting components of the trawl gear were polishing well (i.e., from contact with the seabed), indicated that the gear was operating correctly. Overall, gear parameters were similar to those of previous years (Drummond & Stevenson 1995a, 1995b, 1996, Stevenson 1998, 2002, 2004, 2006, 2007a, 2012, Stevenson & Hanchet 2010, MacGibbon & Stevenson 2013, Stevenson & MacGibbon 2015, 2018, MacGibbon 2019, MacGibbon et al. 2022, 2024a)., indicating consistency between surveys.

3.3 Catch composition

A total of about 26.1 t of fish and invertebrates were caught from the 63 valid biomass tows, averaging 414.3 kg per tow. Amongst the fish catch, 16 chondrichthyan and 67 teleost species were recorded. Species codes, common names, scientific names, and catch weights of all species caught during the survey are given in Appendix 4. Benthic macro-invertebrate species identified from the catch are given in Appendix 5.

The most abundant species by weight was snapper with 9.2 t caught (35.5% of the total catch) (Appendix 4). The top five species, making up 64% of the total catch weight, were snapper, spiny dogfish, red gurnard, gemfish (*Rexea solandri*), and red cod. The target species — giant stargazer, John dory, red cod, red gurnard, snapper, spiny dogfish, and tarakihi — made up 66% of the total catch. Red gurnard and barracouta occurred in over 70% of the tows.

Of the species caught, a summary of the length frequency and biological samples taken is given in Table 3. Length data were collected from 44 different species, totalling 20 251 fish from 772 samples. More detailed biological examinations were carried out on 20 different species totalling 279 samples of 3325 individual fish. Pairs of otoliths were collected from 237 giant stargazer, 182 John dory, 340 red cod, 636 red gurnard, 568 snapper, and 462 tarakihi.

Thirty-nine species or species groups of benthic macroinvertebrates were identified during the survey or from retained specimens identified later ashore (Appendix 5). The number of invertebrate species does not necessarily reflect biodiversity in the survey area because the gear is not designed to collect benthic macroinvertebrates. In addition, station location strongly influences the incidence of some groups. For example, some bryozoans prefer hard substrate, so if no trawl station fell on such substrate, then this group may not be represented in the catch.

3.4 Target species time series trends

3.4.1 Giant stargazer

Giant stargazer were caught in 41% of stations in 2025, down slightly from 45% of stations in 2023. For stations that caught giant stargazer in 2025, catch rates ranged from 0.2–240 kg per km^2. The highest catch rate came from stratum 13 (200–400 m, Greymouth to Okarito) which also had the highest mean catch rate, followed by strata 12 and 15 (all south of Greymouth, Table 4).

The time series distribution of giant stargazer catch rates are shown in Figure 2a. The overall geographic distribution has changed little over the time series except that no giant stargazer have been caught in Tasman Bay or Golden Bay (strata 17–19) in the last three surveys. Prior to that, low numbers of small fish (mostly under 40 cm) were caught there. Throughout the time series catch rates have been highest in strata south of Greymouth in the 100–200 and 200–400 m strata. While catches were made north of Greymouth, they were at substantially lower rates than in the southern strata.

The length frequency distribution for giant stargazer in 2025 was broad, and most fish were between 30 and 70 cm (Figure 3a). There were more males overall, particularly between 40 and 60 cm, but over 60 cm, most fish were female. The sex ratio (male:female) was 1.4:1 (Figure 3a). This was slightly lower than in 2023 (1.5:1), but slightly higher than in 2021 (1.3:1). Most males under 50 cm were immature or resting and fish larger than this were mostly resting or maturing (Table 5). Just 12 males were in active spawning condition. All females under 60 cm were immature or resting. Above this length, all were resting or maturing, apart from two ripe, one running ripe, and one that was partially spent. Because the survey takes place in autumn and the spawning period of giant stargazer is in winter, a lack of fish in spawning or spent condition was not surprising and the reasonable numbers of maturing fish was to be expected.

For most of the time series, the length frequency distribution has been broad with most fish of both sexes between 20 and 70 cm in length (Figure 3a). Clear cohorts were not usually discernible. The 2025 survey had the lowest numbers of juvenile fish (under 45 cm) in the time series, with the 2021 and 2023 surveys having the second and third lowest numbers, respectively. However, the number of fish under 45 cm has been declining since 2013. This declining trend was visible for both the west coast as well as TBGB but was especially pronounced in the latter—where just 9–46 individual fish were caught per survey between 2013 and 2019, and no stargazer were caught in the last three surveys.

Biomass estimates were consistent for the first four surveys but declined in 2000 and again in 2003 to a low (at that time) of 834 t (Figure 4, Table 6). Biomass steadily increased after that, peaking at 2118 t in 2013 and remained between 1500 and 2000 t until 2021, when it declined to the second lowest estimate in the time series at 915 t in 2023 and further in 2025 to 724 t (CV 23%). The 2025 estimate of was the lowest in the time series (Table 6, Figure 4). Most biomass has come from the west coast South Island region, with little contribution from TBGB (and none on the last three surveys) (Figure 4). In 2025, WCSI strata 12 and 13 accounted for 188 and 115 t respectively, almost 42% of the total biomass (Table 7).

Juvenile biomass increased from 2003 to a high in 2009, which was sustained until 2013 and then declined. The three most recent estimates of juvenile biomass were the three lowest in the time series (Figure 5). Adult biomass was substantially higher than juvenile biomass throughout the time series (Figure 5). Adult biomass increased after 2003 until 2009, after which there was a relatively sustained period; it was during this period that juvenile biomass started to decline. Adult biomass declined after 2019, and 2025 was the lowest estimate in the time series, with three of the five lowest estimates being the last three surveys. The survey series is providing an indication of poor recruitment, followed by a decrease in the adult population at a time lag.

Recruited biomass (> 30 cm) of giant stargazer in 2025 was 720 t (CV 23%), or 99.4% of the total biomass (Table 8). Adult biomass (fish > 45 cm) was 675 t (CV 24%) and accounted for 93.4% of the total biomass (Table 8). As no obvious cohorts could be discerned from the length frequency, no biomass values by cohort were presented for giant stargazer.

3.4.2 John dory

John dory were caught in 49% of stations in 2025, down from 55% of stations in 2023. For stations that caught John dory, catch rates ranged from 1.7–52 kg per km^2, with the highest catch rate coming from stratum one (20–100 m, Cape Farewell to Karamea) (Figure 2b). Mean catch rates by stratum are presented in Table 4 and show that stratum 1 also had the highest mean catch rate in 2025, followed by 18 and 19 (Tasman Bay). The time series distribution of John dory catch rates are shown in Figure 2b. The overall geographic distribution of John dory has been fairly similar throughout the time series, but with some southward progression, most notably from 2000. Catch rates have increased over time, peaking in 2015 and 2017, which also coincided with peak biomass. The highest catch rates have always been in TBGB and the northern strata of the west coast. Catches south of Greymouth were uncommon.

There were no clear modes in the length frequencies in the 1990s, although small but distinct 1+ cohorts could be seen in 1992 and 1994 (Figure 3b). The large increase in biomass in the 2000s coincided with larger and more distinct modes seen in the length frequency distribution, particularly (though not exclusively) 1+ fish, which have been distinct in a number of years since 2000 (e.g., 2000, 2003, 2009, 2015, 2017, and 2021). The 2021 length frequency distribution showed the strongest 1+ mode in the time series from TBGB, at around 24–34 cm. These fish were not obvious as 3+ fish in 2023. This cohort might be the mode of 32–46 cm fish observed in TBGB, but the right-hand shoulder of the 2023 1+ cohort, which was substantial and centred around 28 cm, overlapped the 3+ group. The mode from the west coast, centred around 38 cm, was likely to be the 3+ fish. Throughout the time series, where 1+ cohorts were visible, they were consistently stronger in TBGB (Figure 3b). This was the case again in 2025, although the 1+ cohort was the weakest it has been since 2007. Overall numbers of fish were lower in 2025 despite the small increase in biomass. This was likely to be due to the fish that were present being larger; with west coast fish having a larger mode centred around 40–42 cm in 2025. These were likely to be 3+ fish, which were seen as a reasonable cohort of 1+ fish in 2023, mostly from Tasman Bay and Golden Bay. The male:female sex ratio favoured females slightly at 0.93:1.

Most John dory of both sexes less than 30 cm were immature or resting (Table 5). Most males above 30 cm were ripe or running ripe. For females above 30 cm, the full range of gonad development was seen, but few were immature or resting. 47% were maturing, 18% were ripe or running ripe, and 22% were partially or fully spent.

The John dory biomass estimate of 211 t was a slight increase from 2023 (203 t), substantially lower than the time series highs in 2015 and 2017 but close to the time series mean of 220 t (Table 6, Figure 4). Biomass was low in the 1990s and increased from the 2000s, peaking in 2015. In most years, more biomass was from the west coast, but in 2023 biomass was evenly split between the west coast and TBGB (Figure 4). Overall, biomass has been relatively stable in Tasman and Golden Bay but has decreased in the last two surveys. While TBGB biomass decreased in 2025, the west coast biomass increased slightly for the first time in ten years, which caused total survey biomass to show an overall increase. Despite the TBGB component of the biomass decreasing in 2025, these three strata still contributed just over one third of the total biomass (Table 7).

John dory biomass was comprised mainly of adult fish throughout the time series (Figure 5). Adult biomass declined during the 1990s, increased in the early 2000s to a time series high in 2015, and has declined each year since except for a slight increase to 208 t in 2025. The 2025 estimate was close to the mean adult biomass of 209 t and substantially higher than the biomass during the 1990s. Juvenile biomass has fluctuated and has not always tracked adult abundance indices (Figure 5). The highest juvenile biomass was in 2009, although the associated CV was also high. The juvenile 2025 estimate of 2.7 t was substantially below the time series mean of 10.8 t.

Recruited biomass (> 25 cm) of John dory in 2025 was 210 t (CV 20%) or 99.8% of the total biomass (Table 8). Adult biomass (males > 27 cm and females > 30 cm) was 208 t (CV 20%) and accounted for 98.7% of the total biomass (Table 8). A cohort of 1+ John dory accounted for 6.3 t (CV 27.1%) of the biomass or 3.0% (Table 9).

3.4.3 Red cod

Red cod were caught in 48% of stations in 2025, up from 33% of stations in 2023. For stations that caught red cod in 2025, catch rates ranged from 0.2–804 kg per km^2 with the highest catch rate coming from stratum 11 (25–100 m, Greymouth to Okarito). Mean catch rates by stratum are presented in Table 4 and show that stratum 11 also had the highest mean catch rate, followed by stratum 5 (25–100 m, Karamea to Cape Foulwind), and stratum 14 (25–100 m, Okarito to Haast). The time series distribution of red cod is shown in Figure 2c. Catch rates have been declining over the last few surveys, and the distribution appears to be more concentrated in the southern strata in recent years, especially when compared to surveys from 1992 to 2007.

In several years, 0+, 1+, and occasionally 2+ fish have been discernible in the length frequency distribution (Figure 3c). Strong cohorts of 1+ fish (approximately 24–35 cm) were apparent in all surveys from 2005 to 2013 but since then, have either not been seen or, when visible, such as in 2015 and 2017, were substantially weaker than those seen from 2005 to 2013. In comparison to the west coast, the length frequency distribution was indiscernible in TBGB with the last substantial cohort visible in 2009. Numbers of red cod increased in 2025 compared with 2023 but were still substantially lower than those seen earlier in the time series. In 2025, a weak 0+ cohort can be seen from about 15–20 cm, and the rest of the distribution was broad, with more fish over 40 cm compared with 2023. The distribution was similar between males and females with a sex ratio that slightly favoured males at 1.03:1. Across the size range, almost all fish of both sexes were resting or immature (Table 5). Because red cod spawn from late winter to spring (Fisheries New Zealand 2021) and there were few large fish, the lack of red cod with maturing, ripe, or spent gonads was not surprising.

Total biomass estimates were relatively high and stable for the first four surveys, varying from 2546 t to 3370 t (Table 6, Figure 4). There was a sharp decline in 2000 to 414 t, but biomass gradually increased to pre-decline levels by 2009. Since 2009, biomass has declined, and the 2019 and 2021 estimates were the third and fourth lowest, respectively, while the 2023 estimate of just 69 t was the lowest in the time series (albeit with a high CV of 69%). The 2025 estimate of 879 t was a substantial increase and had a more precise CV of 31% but was still the fifth lowest estimate in the time series.

Throughout the time series, most of the red cod biomass has come from the west coast (Figure 4). While estimates from TBGB have always been substantially lower than the west coast, estimates have been particularly low since 2011, ranging between 0.3 t (2023) and 64.8 t (2011), compared with the TBGB time series mean of 177 t. The estimate of 0.5 t in 2025 for Golden Bay & Tasman Bay was estimated from one individual fish caught in stratum 18 (Tasman Bay) (Table 7). In 2025, just three strata (5, 11, and 14) accounted for 93% of the total biomass (Table 7).

Numbers of small red cod have been low on this survey for some time now, which is concerning considering the dependence on recruitment for successful red cod fisheries (Beentjes 2000). Biomass has declined since 2009 and four of the five lowest estimates in the time series occurred in the four recent surveys.

Juvenile (< 30 cm) biomass has consistently been greater than adult biomass throughout the time series (Figure 5). Both increased in 2025 from 2023, which was the time series low for both indices, although the respective CVs were high. The biomass of adult red cod declined to 6 t or 9% of the total biomass in 2023 but this has increased to 23% in 2025 (Table 8). This was higher than that observed in 2021 (16%); but less than in 2019 (36%). Recruited biomass (> 40 cm) of red cod in 2025 was 503 t (CV 37%) or 99.8% of the total biomass (Table 8). A cohort of 0+ red cod (< 24 cm) accounted for 7.6 t (CV 37.8%) or 0.9% of the total biomass (Table 9).

3.4.4 Red gurnard

Red gurnard were caught at 71% of all stations and in 100% of stations less than 100 m in 2025 (Figure 2d). For stations that caught red gurnard, the catch rates ranged from 0.8–668 kg per km^2 with the highest catch rate coming from stratum five (25–100 m, Karamea to Cape Foulwind). The highest mean catch rate by stratum also came from stratum 5, followed by stratum 11 (25–100 m, Greymouth to Okarito) and stratum 19 (20–70 m, outer Tasman Bay), but several strata had catch rates that exceeded 100 kg per km^2 including all strata in TBGB (Table 4). As usual, catches were significantly lower in the 100–200 m strata, and no red gurnard were caught in the 200–400 m strata. The time series distribution of red gurnard is shown in Figure 2d. The geographic distribution of red gurnard has been relatively consistent throughout the time series with the highest catches in TBGB, and in the strata shallower than 100 m on the west coast. The catch rates however have been increasing substantially, particularly since 2015, coinciding with a large and stable increase in biomass for the last ten years.

Throughout the time series, larger numbers of smaller fish have been caught in TBGB compared with the west coast (Figure 3d). Conversely, the west coast had larger numbers of larger fish than TBGB. However, in 2023, larger numbers of smaller fish were seen off the west coast than in TBGB, including a strong cohort of 1+ fish about 13–18 cm. Although 1+ cohorts have been visible in a number of surveys (e.g., 2009, 2013, 2015, and 2021), the 1+ cohort in 2023 was the strongest in the time series. These fish, now 3+, were not distinct in the length frequency distribution in 2025 but were likely to be part of a large mode from about 20–45 cm that probably contained multiple year classes. The 1+ cohort was distinct but small in 2025 and again was mainly from the west coast rather than TBGB. The number of males increased in 2025 compared with 2023, but the number of females decreased, despite the overall increase in biomass. The male:female ratio in 2025 was noticeably in favour of males at 1.4:1. This was a dramatic change compared with 2023, where the ratio was 0.6:1.

Below 30 cm, most red gurnard of both sexes were immature or resting (Table 5). Above 30 cm, a full range of development was seen except that there were no immature fish (of either sex) or partially spent males. Red gurnard have a long spawning period and ripe individuals can be found in the Hauraki Gulf throughout the year (Fisheries New Zealand 2021), which is consistent with finding fish of all developmental stages on this survey.

Red gurnard biomass estimates were consistent from 1992 to 2000 but had declined by the 2003 survey to the time series low of 270 t (Table 6, Figure 4). Biomass increased from 2003 and since 2015, has been at record highs with 2021 being the highest estimate in the time series (2022 t). The 2023 estimate dropped by 26% but was still well above the time series mean (1004 t), before increasing again in 2025 to 1875 t, the second highest estimate in the time series. A large proportion of the biomass has always occurred in the TBGB region, but markedly more has been from the west coast South Island in most years since 2011 (Figure 4). The biomass of both regions increased in 2025. While red gurnard were caught across all strata less than 100 m, two strata contributed markedly more to the total biomass: stratum 19 (outer Tasman Bay) with 456 t or 24% of the total biomass and stratum 5 (Karamea to Cape Foulwind) with 574 t or 31% of the total biomass (Table 7).

Throughout the time series, adult (over 30 cm) biomass has been greater than juvenile biomass, although juvenile biomass was often substantial (Figure 5). Juvenile biomass has increased over the last three surveys and the 2025 estimate was the second highest in the time series, behind 2019. Adult biomass increased in 2025 from 2023 to the fourth highest estimate in the time series. As seen with total biomass, juveniles and adults both show a relatively high and stable biomass since 2015.

Adult biomass in 2025 was 1326 t (CV 12%) or 70.7% of the total (Table 8). Recruited length was the same as the L_{50} for red gurnard, hence the recruited biomass and CV were identical (Table 8). A 1+ cohort of red gurnard accounted for 1.2 t (CV 77.4%) or 0.1% of the total biomass (Table 9).

3.4.5 Snapper

Snapper were caught in 65% of stations across the survey ground in 2025, and 100% of stations in TBGB. For stations that caught snapper in 2025, catch rates ranged from 3.5–4162 kg per km^2, with the highest catch rate coming from stratum 21 (10–20 m, inner Golden Bay, the highest catch rate in the time series). Mean catch rates by stratum are shown in Table 4. Stratum 21 also had the highest mean catch rate at 3713 kg per km^2, followed by stratum 17 (20–33 m, Golden Bay), and stratum 20 (10–20 m, inner Tasman Bay). Mean catch rates for strata in TBGB ranged from 684–3713 kg per km^2, with much lower catches on the west coast, particularly in the southern strata.

The geographic distribution of snapper catch rates is shown in Figure 2f. Catch rates were low prior to 2009 and most stations, even those in TBGB, did not contain snapper. Catch rates and the distribution of snapper catches increased from 2009, most notably in Golden Bay at first but expanding with time over the TBGB strata and then extending to the west coast from 2013. The addition of the 10–20 m strata in inner Tasman Bay and inner Golden Bay in 2017 saw a further increase in catch rates (and logically, geographic range). This has been sustained with the continued expansion of the range and catch rates of snapper down the west coast, with catches south of Greymouth every year since 2019.

Prior to 2009, so few snapper were caught that the length frequency was sparse and uninformative (Figure 3e). Large numbers of 1+ snapper (around 14–19 cm) were caught on the 2009 survey (Figure 3e) (Stevenson & Hanchet 2010). This indicated a strong 2007 year-class of fish, which was dominant in the length frequency distribution from 2013 until about 2019 (MacGibbon 2019). Also visible were fish from the 2011 and 2013 year-classes, which were also relatively strong (Parker et al. 2015, Parsons et al. 2018) and could be tracked through subsequent surveys. These strong year classes and the apparent increasing abundance of snapper in the TBGB region were the impetus for expanding the trawl survey area to include two new strata in 10–20 m, one in each of TB and GB, beginning with the 2017 survey (Stevenson & MacGibbon 2018).

The length frequency distribution in 2025 showed small but distinct cohorts of 1+ and 2+ fish of around 13–19 and 20–25 cm in length (Figure 3e). These fish were almost entirely found in the 10–-20 m strata. The rest of the distribution was broad and contained multiple year classes. The length frequency distribution was noticeably narrower on the west coast compared with TBGB, with fish ranging in length from about 35–55 cm compared to about 10–70 cm. The sex ratio was even, with a male:female ratio of 1.03:1 (Figure 3e).

Gonad stage development at given length intervals are shown in Table 5. Fish of both sexes under 30 cm were all immature or resting. Above this length, most fish of both sexes were resting. A reasonable number of males were still maturing or ripe, one male was running ripe, and one was fully spent. Four females over 30 cm were maturing, one was ripe, and one was fully spent. The small number of snapper in spawning condition is not surprising given that snapper spawn in spring/summer and the survey takes place in autumn.

Time series biomass estimates of snapper are shown in Figure 4 and in Table 6. The 2025 estimate of 4453 t (CV 14%) for the expanded survey that includes the 10–20 m strata was slightly higher than that in 2023 and was the highest in the time series. Ninety percent of the biomass came from the five strata in TBGB (Table 7). Although stratum 19 had the lowest mean catch rate of these strata, it contributed substantially more biomass (42% of total from TBGB) because it has the greatest area of these strata. While the highest catch rates were in the 10–20 m strata (20 and 21), these strata are small and contributed less biomass. Biomass decreased slightly on the west coast in 2025 compared with 2023, but the increase in TBGB meant that the overall biomass increased slightly.

This expansion of the survey area is now in its fifth year with the 2023 and 2025 estimates of snapper for the expanded survey being almost three times the estimate from 2021 (the previous highest biomass) (Table 6, Figure 4). The core biomass of snapper was very low throughout the time series until a slight increase in 2013, which was the impetus for the expansion of the survey into 10–20 m. From 2013, there was a step increase in the biomass in the core area, followed by a massive increase in 2023, mainly from the core TBGB strata. Biomass has increased every year in the core plus 10–20 m strata, especially in 2023.

Throughout the time series, juvenile fish have comprised only a small minority of the total biomass (Figure 5). The introduction of the 10–20 m strata in 2017 indicated that while these strata were important for juvenile snapper, most of the total biomass was adult fish (Table 8). Adult biomass decreased slightly in the core strata in 2025 compared with 2023, whereas for the core + 10–20 m strata biomass increased slightly in 2025. For the core strata, juvenile biomass increased in 2025 (no juveniles were caught in the core strata in 2023). For the core + 10–20 m strata, juvenile biomass decreased slightly in 2025.

The recruited/adult biomass (> 25 cm) of snapper in 2025 accounted for 4438 t (CV 13%) or 99.8% of the total biomass (all strata, includes 10–20 m) (Table 8). The 1+ and 2+ cohorts accounted for 4.2 t (CV 32%) and 20.9 t (CV 31.5%) of the total biomass, respectively, or <0.1% and 0.5%, respectively (Table 9).

3.4.6 Spiny dogfish

Spiny dogfish were caught throughout the survey area and were present in 67% of stations. For stations that caught spiny dogfish, catch rates ranged from 2.4–793 kg per km^2 with the highest catch rate in stratum 6 (100–200 m, Karamea to Cape Foulwind). Mean catch rates by stratum are given in Table 4. Stratum 6 also had the highest mean catch rate, followed closely by stratum 14 (25–100 m, Okarito to Haast) and stratum 7 (25–100 m, Cape Foulwind to Greymouth). All strata caught spiny dogfish except for stratum 9. The geographic distribution of spiny dogfish catch rates is shown in Figure 2e. Spiny dogfish distribution has been relatively consistent over the time series, being widespread across the entire survey area in all depths but catch rates were typically higher south of Cape Foulwind compared with north of Cape Foulwind and within TBGB. Catch rates also appear to have declined overall since about 2017 in TBGB.

The length frequency has shown a fairly broad distribution for spiny dogfish from the west coast over time, usually between about 30 cm and 80 cm (Figure 3f). The length frequency distribution for TBGB has been narrower in comparison with the west coast, mainly from about 50–70 cm, and comprised mostly males. This was true of the 2025 survey except that TBGB has a slightly narrower length distribution (55–70 cm) (Figure 3f). From about 2013, both the left- and right-hand tails of the west coast distribution have been truncated, especially the right-hand tail in 2023 and 2025. This was not so apparent in the TBGB distribution.

In 2025, there were more males between about 50 and 70 cm than females, but more females over 70 cm. More spiny dogfish were caught off the west coast and of those caught in TBGB, almost all were male. Almost all spiny dogfish less than 50 cm were immature (Table 5). Nearly all males larger than 50 cm were mature, while all but one female between 51 and 60 cm were immature or maturing. All stages were observed in females above 60 cm and half over 70 cm had pups. There were substantially more males than females with a sex ratio of 2:1 (Figure 3f). In TBGB, the ratio was even higher at more than 32:1, more than double the male:female ratio seen in 2023.

Biomass fluctuated between 3919 and 10 270 t from 1992 to 2011 (Table 6, Figure 4). Biomass in 2013 was the highest in the series, but this was influenced by a single large catch, reflected in the large CV. Biomass has generally declined since then to the lowest estimate of the series in 2021 at 2226 t. While there was a slight increase in 2023 to 3043 t, biomass decreased slightly in 2025 to 2662 t. This was the second lowest estimate in the series and the three most recent surveys were the three lowest in the time series. The decrease in biomass was from both areas, i.e., both TBGB and the west coast (Figure 4). This decline in abundance was also present in other surveys, including the more offshore west coast South Island trawl survey (Devine et al. 2025) and the winter inshore east coast South Island survey (MacGibbon et al. 2024b). In 2025, almost all of the biomass from the TBGB area came from stratum 19 (outer Tasman Bay), but all core strata across the survey ground contributed to varying extents, except stratum 9 (200–400 m, Cape Foulwind to Greymouth) (Table 7).

In most years, adult fish have made up most of the biomass, with exceptions in 2019 and 2023 (Figure 5). The juvenile contribution to biomass was still a significant proportion, especially when compared with most other species monitored by the survey. Biomass of both juveniles and adults showed an overall declining pattern since 2013. Juvenile biomass decreased in 2025 and was the second lowest estimate in the time series. The biomass of adults also showed a slight decrease in 2025 but most of the reduction in total biomass was from juveniles.

The 2025 biomass estimate for adult (> 58 cm for males, > 72 cm for females) spiny dogfish was 1646 t (CV 40%) or 61.8% (Table 8). As no obvious cohorts could be discerned from the length frequency distributions, no biomass values by cohort were not presented for spiny dogfish.

3.4.7 Tarakihi

Tarakihi were caught throughout the survey area in all strata and were present in 62% of stations in 2025. For stations that caught tarakihi, catch rates ranged from 0.5–188 kg per km^2, with the highest catch rate coming from stratum 13 (200–400 m, Greymouth to Okarito). Mean catch rates by stratum are given in Table 4. Stratum 13 also had the highest mean catch rate, followed by stratum 12 (100–200 m, Greymouth to Okarito), and stratum 15 (100–200 m, Okarito to Haast).

The geographic distribution of tarakihi catch rates for the time series is shown in Figure 2g. The location of tarakihi catches has been much the same throughout the time series but in recent years, catch rates have declined, particularly in TBGB, with none caught there in 2023. The highest catch rates have always in the southern area of the west coast, particularly around strata 12, 13, 15, and 16. In 2025, catch rates were, as usual, the highest in the south of the survey area. Notably, tarakihi were caught in TBGB after being completely absent in 2023. The maximum catch rate observed in 2025 was the second lowest observed in the time series, after 2023.

Most years had 1+, 2+, and occasionally 3+ cohorts visible in the length frequency distribution, mostly in the TBGB region but also off the west coast to a lesser extent (Figure 3g). However, these modes were increasingly weakening for the last four surveys, particularly from TBGB which is an important area for juveniles. In 2025, the very low numbers of fish caught in TBGB meant that the distribution was not visible. From the west coast, a weak mode of 1+ fish can be seen at 10–15 cm, and a small but distinct cohort of 2+ fish around 16–20 cm. While this 2+ cohort was not strong in comparison to some that have been seen from TBGB in the past, for the west coast, this was one of the strongest 2+ cohorts.

Below 30 cm, fish of both sexes were either immature or resting (Table 5). Above this, the full range of development was seen in males. For females over 30 cm, most fish were resting or maturing, and a small number were ripe or running ripe. More males than females were in active spawning condition. Tarakihi are known to spawn in summer and autumn, and the west coast South Island near Jackson Bay is a known spawning ground (Fisheries New Zealand 2021). There were substantially fewer males with a male:female sex ratio of 0.6:1, a slight increase in males from 2023, when the ratio was 0.4:1 (Figure 3g).

Biomass gradually declined from 1992 until 2003, increased sharply in 2005 and 2017, then decreased to a nadir in 2023 before increasing slightly in 2025 to the second lowest estimate in the series (Table 6, Figure 4). Throughout the time series, most of the biomass has been from the west coast region, with little from TBGB, where the fish were mainly juveniles (Figure 4). The years with lower biomass from TBGB coincided with years in which the length frequency distribution lacked fish under 31 cm (Figure 3g). In 2023, no biomass came from TBGB, but in 2025, some tarakihi were caught here, albeit just 32 fish (Figure 3g, Table 7). In 2025, tarakihi biomass was highly variable across strata, but more than half (53%) came from just two strata (12 and 13, Greymouth to Okarito 100–200 and 200–400 m)(Table 7).

Most of the biomass throughout the time series has comprised adult fish (Figure 5). Juvenile and adult indices did not track each other in most years but both saw an increase in 2025. For juveniles, the three lowest estimates were from the three most recent surveys, while for adults, of the three lowest estimates in the series, two were the most recent surveys. The adult biomass in 2025 was 625 t (CV 13%) or 94.7% of the total biomass (Table 8). Recruited biomass was 635 t (CV 13%) or 96.2% of the total. The 1+ and 2+ cohorts accounted for 1.8 t (CV 37.7%) and 16.6 t (CV 29.8%), respectively, or 0.3% and 2.5% of the total biomass, respectively.

3.5 Trends in other species

All information on non-target species is available in the Trawl Survey Information Portal online, at https://tsip.niwa.co.nz/home.

3.6 Snapper catch-at-length and -age

The scaled population numbers-at-age are presented in Figure 6 from 2019 (the first year that otoliths were aged from this survey series). The age frequency distributions were similar between males and females in all years. There was a broad range of ages from 1 to 51 years, but most fish were under 20 years of age. The overall mean weighted CV for 2025 for all fish was 25% and ranged from 25–35% since 2019. Cohorts could be tracked through the age frequency. The 2025 age frequency was dominated by 6- and 7-year-old fish (more than 40% of fish by number). This year class could be tracked from 0+ and 1+ fish in 2019, 2- and 3-year-olds in 2021, and to 4- and 5-year-olds in 2023. Although present, 0+ fish were not strong in the 2019 age frequency, but we would not expect to readily catch fish of this size with a 60 mm codend. Their presence in low numbers and their persistence in the catch since then suggests that they were a particularly strong year class. No 0+ fish have been seen since 2019 but 1+ fish have been seen every year.

The presence of 4+ fish in 2021 and the corresponding 6+ and 8+ fish in 2023 and 2025, respectively, meant that these fish would have been 2+ in 2019, but they were absent from the 2019 age frequency. There were also a higher number of snapper aged 8–20 in 2023 than would be expected based on the numbers of fish aged 6–18 in 2021. This suggests that there could be some variability in the catchability of snapper in the survey, but overall, the survey tracks age classes of snapper well.

3.7 Tarakihi catch-at-length and -age

The scaled population numbers-at-age are presented in Figure 7. This is the first time tarakihi otoliths have been aged as part of the survey project. The age frequency in 2025 was fairly similar between males and females although there are more older females than males. The overall mean weight CV for all fish (which includes some unsexed fish) was 31%. Two-year-olds were the strongest age class with almost 25% by number; this fits with the relatively small yet distinct mode in the length frequency plot of fish from about 15–20 cm (see Figure 3g). A number of other stronger year classes from the 2025 age distribution can be seen in the time series length frequency distribution plot as well: 7- and 8-year-olds can be seen as small but distinct 1+ mode and 2+ modes in 2019 (around 9–15 and 16–21 cm resepectively); 10-year-olds can be seen as a strong 2+ mode in 2017 (around 17–23 cm, not visible as 1+ because there was no survey in 2016); and 11-year-olds can be seen as a very strong and distinct mode of 1+ fish in 2015 (around 9–15 cm). This demonstrates that year classes can be tracked through time.

3.8 Survey representativeness

For the analysis of target species only, catchability fluctuated somewhat but no surveys were deemed to have either high or low catchability; all points were within the 95% confidence intervals (Figure 8). For the analysis of target plus well estimated species, the overall pattern was very similar to the target species-only analysis but fluctuated slightly more (Figure 8). The 2003 survey was just below the lower 95% confidence interval which may indicate that this survey had low catchability. All other surveys in the time series can be considered representative.

4. SUMMARY

The 2025 survey successfully extended the March–April RV *Kaharoa* bottom trawl survey time series for the inshore west coast South Island and TBGB to 17 surveys. The results show that the survey continues to monitor the target species as well as adults and/or pre-recruits and juveniles of several other species.

The biomass estimate for snapper in the expanded survey (including the 10–20 m strata) was the highest in the time series, similar to that in 2023, and represented a nearly three-fold increase from the 2021 survey. The very strong 1+ cohort of snapper from 2019 was still present as 7+ fish in 2025 and the strong 2+ cohort from 2021 persisted as 6+ fish. These two year-classes dominated the catch. There were also distinct but not particularly strong cohorts of 1+ and 2+ snapper in 2025. A high proportion of the juvenile biomass continues to be found in the 10–20 m strata, although, even in these shallow strata, most of the total biomass is adult fish. Biomass of snapper off the west coast decreased slightly compared with 2023 but is still substantially above the time series mean.

Red gurnard biomass increased from 2023 and was the second highest estimate in the time series, close to the time series high from 2021. Biomass has been high and stable for the last ten years compared with the period before this. The increase came from both the TBGB area and the west coast. The 2023 length frequency showed the strongest 1+ cohort of red gurnard in the time series, and the increase in adult biomass was to be expected as these fish are now 3+. The 1+ cohort in 2025 was weak.

Giant stargazer biomass was down slightly from 2023 and was the lowest estimate in the time series. The lack of juvenile recruitment to sustain adult biomass has continued and, for the last three surveys, no giant stargazer have been caught in TBGB.

John dory biomass was up slightly from the previous survey and just slightly below the time series mean. Biomass decreased from TBGB but increased on the west coast. While substantially lower than the time series high in 2015, John dory biomass has been relatively stable for the last three surveys. There was a small but relatively distinct cohort of 1+ fish in the length frequency distribution.

Red cod biomass was up substantially from the time series low in 2023 and was similar to the 2021 estimate. Although the length frequency showed much higher numbers of 0+ fish relative to 2023, numbers were still very low.

Spiny dogfish biomass decreased slightly from the 2023 estimate and was the second lowest in the time series. The last three surveys are the three lowest in the time series. Similar decreasing trends were seen in the more offshore west coast South Island *Tangaroa* surveys (Devine et al. 2025) and the inshore east coast South Island trawl surveys (MacGibbon et al. 2024b). The size range of spiny dogfish also seems to have truncated over recent years.

Tarakihi biomass increased from the time series low in 2023 but is nonetheless the second lowest estimate in the time series. Small but distinct cohorts of 1+ and 2+ fish could be seen in the length frequency, with 2+ fish also being the most dominant age class in the age frequency. The age frequency also indicated that strong year classes observed in the length frequencies from previous surveys could be tracked through time. A few tarakihi were caught in TBGB, after being completely absent in 2023.

All species that have ever been caught in the time series (including non-QMS species and invertebrates) are also presented online in the Trawl Survey Information Portal, https://tsip.niwa.co.nz/home.

5. FULFILMENT OF BROADER OUTCOMES

Acoustic and oceanographic data

Approximately 5.3 GB of acoustic data were continuously collected by *Kaharoa* on the Simrad ES60 echosounder during the survey. The quality of these data was generally high given the favourable weather conditions during most of the survey. These data are archived in the Fisheries New Zealand *acoustic* database

To correct for the speed of sound through water at differing temperatures and salinities and to provide profiles of temperature and salinity throughout the survey area, data on salinity, temperature, and depth using a net mounted CTD were collected. These data are stored in the Fisheries New Zealand *CTD* database.

Building capacity and capability in the research sector

A variety of projects were supported by the survey:

- Collection of tissue samples from 25 John dory and 14 kingfish for Victoria University of Wellington PhD projects.
- Prey species thought to be important for Māui dolphins collected from 30 different stations.
- Stomachs removed from 10 skipjack and 15 albacore tuna caught by trolling after trawling operations had finished for the day. Analysis of stomach contents will improve the knowledge of the micronekton community in the diet of tuna on the west coast of the South Island and their role in the ecosystem.
- Collection of otoliths from rare species for the continued construction of the otolith identification atlas for educational and research purposes.

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This was the final trawl survey to be carried out by RV *Kaharoa,* which has now been superseded by RV *Kaharoa II*. Special thanks to all the past crew of *Kaharoa* and the scientific staff that contributed to a time series of seventeen surveys over 33 years of the west coast South Island and TBGB.

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8. TABLES

Table 1: Stratum depth ranges, area, non-trawlable area, number of successful phase one and phase two biomass stations and station density.

Stratum	Depth (m)	Area (km^2)	Non-trawlable area (km^2)	No. of phase 1 stations	No. of phase 2 stations	Station density (km^2 per station)
1	20–100	1 343	102	3	–	448
2	100–200	4 302	300	5	–	860
5	25–100	1 224	0	3	–	408
6	100–200	3 233	238	3	–	1 078
7	25–100	927	0	3	–	309
8	100–200	2 354	214	4	–	589
9	200–400	1 877	1 456	3	–	626
11	25–100	1 438	63	5	–	288
12	100–200	2 054	501	5	–	411
13	200–400	1 101	466	3	–	367
14	25–100	851	36	3	–	284
15	100–200	881	373	3	–	294
16	200–400	319	35	3	–	106
17	20–33	307	27	3	–	102
18	20–42	947	30	3	–	316
19	20–70	2 436	193	5	–	487
20	10–20	217	0	3	–	72
21	10–20	165	0	3	–	55
Total (core, 1–19)	20–400	25 594	4 034	57	–	449
Total (core + 10–20 m)	10–400	25 976	4 034	63	0	412

Table 2: Gear parameters for valid biomass stations by stratum depth range for the entire survey area, Tasman Bay and Golden Bay, and the west coast (n, number of stations; s.d., standard deviation).

		n	Mean	s.d.	Range
All stations		63			
	Headline height (m)		4.4	0.15	4.1–4.9
	Doorspread (m)		80.8	8.61	65.4–99.2
	Distance (n. miles)		2.9	0.35	1.6–3.1
	Warp:depth ratio		4.3	2.74	2.4–13.3
Tasman Bay/Golden Bay					
10–70 m		17			
	Headline height (m)		4.3	0.11	4.2–4.6
	Doorspread (m)		71.4	2.62	65.4–74.9
	Distance (n. miles)		2.7	0.56	1.6–3.1
	Warp:depth ratio		7.4	3.35	3.3–13.3
10–20 m		6			
	Headline height (m)		4.3	0.09	4.2–4.4
	Doorspread (m)		68.9	2.28	65.4–71.5
	Distance (n. miles)		2.3	0.61	1.6–3.1
	Warp:depth ratio		11.5	0.98	10.5–13.3
20–70 m		11			
	Headline height (m)		4.3	0.12	4.2–4.6
	Doorspread (m)		72.7	1.70	69–74.9
	Distance (n. miles)		2.9	0.43	1.6–3.1
	Warp:depth ratio		5.2	1.38	3.3–8
West coast					
20–400 m		46			
	Headline height (m)		4.4	0.16	4.1–4.9
	Doorspread (m)		84.3	7.33	70.5–99.2
	Distance (n. miles)		2.9	0.19	2–3.1
	Warp:depth ratio		3.2	1.23	2.4–7.7
20–100 m		17			
	Headline height (m)		4.5	0.15	4.4–4.9
	Doorspread (m)		76.4	3.74	70.5–83
	Distance (n. miles)		3.0	0.06	2.9–3.1
	Warp:depth ratio		4.1	1.66	2.8–7.7
100–200 m		20			
	Headline height (m)		4.3	0.12	4.1–4.5
	Doorspread (m)		87.1	3.41	79.3–92.4
	Distance (n. miles)		2.9	0.27	2–3.1
	Warp:depth ratio		2.7	0.05	2.6–2.8
200–400 m		9			
	Headline height (m)		4.3	0.08	4.2–4.4
	Doorspread (m)		92.8	3.55	88.2–99.2
	Distance (n. miles)		3.0	0.03	2.9–3
	Warp:depth ratio		2.5	0.07	2.4–2.6

Table 3: Number of biological and length frequency records for all teleost and chondrichthyan species. No. of samples refers to the number of stations on which fish were sampled. Measurement methods; 1, fork length; 2, total length; 5, pelvic length; G, chimaera length. †, Biological data includes length and weight and usually one or more of the following: gonad/maturity stage, otoliths. Species codes are given in Appendix 4.

		Length frequency data		Biological data (†)		
Species code	Measurement method	No. of samples	No. of fish	No. of samples	No. of fish	No. of otolith pairs
ATT	1	17	289	–	–	–
BAR	1	49	655	–	–	–
BCO	2	7	24	–	–	–
BRC	2	1	1	1	1	–
BRI	2	2	3	–	–	–
BRZ	2	1	1	1	1	–
BWH	2	1	1	1	1	–
ELE	1	7	33	–	–	–
EMA	1	4	4	–	–	–
ESO	2	8	159	–	–	–
FRO	1	16	220	–	–	–
GIZ	2	26	297	26	239	237
GSH	G	24	413	–	–	–
GUR	1	45	3 869	45	650	636
HAK	2	7	71	–	–	–
HBA	2	12	876	1	3	–
HOK	2	11	432	–	–	–
HPC	2	16	185	–	–	–
JDO	2	31	182	31	182	182
JGU	1	3	54	1	38	–
JMD	1	24	436	–	–	–
JMN	1	33	1 282	–	–	–
KIN	1	3	4	1	1	–
LEA	2	9	347	–	–	–
LIN	2	15	112	–	–	–
LSO	2	30	372	–	–	–
MDO	2	1	1	1	1	–
NMP	1	39	977	39	473	462
NSD	2	21	181	9	106	–
RCO	2	30	1 382	30	348	340
RSK	5	16	54	1	1	–
RSO	1	29	847	5	84	–
SCH	2	36	217	1	8	–
SFL	2	15	366	–	–	–
SNA	1	41	3 178	41	580	568
SPD	2	42	1 836	41	600	–
SPO	2	40	460	–	–	–
SSH	2	3	8	2	7	–

Table 3: continued.

Species code	Measurement method	Length frequency data No. of samples	No. of fish	Biological data (†) No. of samples	No. of fish	No. of otolith pairs
SSK	5	13	35	1	1	–
SWA	1	9	61	–	–	–
TRE	1	15	67	–	–	–
TUR	2	2	4	–	–	–
WAR	1	14	228	–	–	–
YBF	2	4	27	–	–	–
SSK	5	13	35	1	1	–

Table 4: Mean catch rates (kg km^{-2}) by stratum for the 20 most abundant QMS species in order of catch abundance. Species codes are given in Appendix 4; bolded codes indicate the seven target species.

	Species code									
Stratum	**SNA**	**SPD**	**GUR**	RSO	**RCO**	BAR	**GIZ**	SPO	**NMP**	GSH
1	67.1	38.2	6.3	10.1	0.9	27.2	–	16.2	42.7	11.6
2	14.9	6.1	–	12.4	–	78.3	12.9	2.7	12.4	14.1
5	95.8	170.1	469.2	–	162.4	7.3	–	41.5	2.3	–
6	9.0	273.0	8.8	89.6	1.5	137.4	–	11.8	3.2	92.1
7	62.9	239.1	165.2	–	11.0	41.5	4.6	6.7	1.1	40.0
8	8.8	26.8	4.5	25.7	0.1	82.1	70.8	7.7	26.0	30.2
9	–	–	–	80.0	–	–	23.9	–	11.5	–
11	30.7	221.3	254.9	3.0	348.3	55.9	11.1	33.7	6.4	–
12	4.3	53.8	2.5	59.9	16.2	34.7	91.5	5.4	109.2	29.1
13	–	1.9	–	18.3	1.2	21.7	104.3	3.3	116.0	17.7
14	17.4	259.7	107.3	50.8	140.2	61.7	50.8	51.2	22.1	–
15	–	222.2	15.0	7.7	0.9	17.2	87.5	4.6	60.1	3.6
16	–	12.7	–	494.3	24.5	–	41.7	1.5	39.2	71.4
17	2 534.2	37.1	102.2	–	–	10.0	–	103.4	1.0	–
18	702.5	5.1	144.0	–	0.5	23.8	–	122.6	0.4	–
19	684.2	140.1	187.1	–	–	120.4	–	16.8	2.3	–
20	1 303.3	–	–	–	–	–	–	–	–	–
21	3 713.4	–	–	–	–	–	–	–	–	–

	Species code									
Stratum	SCH	JMN	JMD	SQU	LIN	**JDO**	SSK	HOK	FRO	WAR
1	57.2	21.2	1.8	16.6	0.1	30.0	10.6	–	4.4	–
2	10.8	–	0.7	12.7	–	3.9	–	–	0.8	–
5	52.9	50.8	0.2	0.8	–	11.7	–	–	1.9	74.2
6	35.3	–	68.1	23.6	–	15.4	8.7	–	0.1	3.8
7	10.5	–	0.8	9.7	1.1	16.3	26.4	–	–	0.1
8	4.8	1.1	59.7	20.2	–	1.3	–	–	–	–
9	–	–	–	19.5	1.8	–	5.3	–	–	–
11	22.9	10.6	0.5	0.2	2.7	–	0.2	1.7	1.3	1.9
12	4.3	2.0	25.8	8.7	5.4	–	7.3	23.4	36.5	1.3
13	17.5	–	2.0	19.4	–	–	–	1.0	2.0	–
14	32.8	15.2	1.8	9.0	8.4	–	15.9	57.4	11.2	11.0
15	3.1	–	2.7	9.2	0.6	–	0.0	0.0	8.9	7.1
16	–	–	–	17.2	116.3	–	31.7	3.7	4.0	–
17	–	51.5	–	0.1	–	15.5	–	–	–	–
18	0.2	37.7	–	–	–	16.2	–	–	–	–
19	21.2	2.6	1.4	1.2	–	21.1	6.0	–	–	–
20	–	–	–	–	–	–	–	–	–	–
21	–	–	–	–	–	–	–	–	–	–

Table 5: Number of individuals at each reproductive stage for each of the seven target species sampled (small fish of undetermined sex were not included). –; no data. Stages are given in Appendix 1.

	Male gonad stages							Female gonad stages							
Length (cm)	1	2	3	4	5	6	7	1	2	3	4	5	6	7	Total
Giant stargazer															
11–20	–	–	–	–	–	–	–	4	–	–	–	–	–	–	4
21–30	2	1	–	–	–	–	–	6	1	–	–	–	–	–	10
31–40	6	4	1	–	–	–	–	–	4	–	–	–	–	–	15
41–50	1	31	15	4	–	–	–	6	7	–	–	–	–	–	64
51–60	–	30	19	6	–	–	–	–	10	7	1	1	–	–	74
61–70	–	6	–	2	–	–	–	–	7	45	1	–	1	–	62
> 70	–	–	–	–	–	–	–	–	–	4	–	–	–	–	4
Total	9	72	35	12	0	0	0	16	29	56	2	1	1	0	233
John dory															
< 20	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1
21–30	1	9	–	2	–	–	–	5	7	–	–	–	–	–	24
31–40	1	7	4	20	–	–	–	1	11	11	–	1	2	–	58
41–50	–	3	5	18	3	–	–	–	–	30	7	8	13	3	90
> 50	–	–	–	1	–	–	–	–	–	2	–	1	1	1	6
Total	2	19	9	41	3	0	0	7	18	43	7	10	16	4	179
Red cod															
< 20	14	–	–	–	–	–	–	22	–	–	–	–	–	–	36
21–30	38	12	–	7	–	–	–	30	–	–	2	–	–	–	89
31–40	9	37	–	–	–	–	–	42	18	–	–	–	–	–	106
41–50	–	13	–	4	–	1	–	1	33	–	–	–	–	2	54
51–60	–	1	1	1	–	1	–	–	37	3	1	–	–	5	50
> 60	–	–	–	–	–	–	–	–	3	1	–	–	–	–	4
Total	61	63	1	12	0	2	0	95	91	4	3	0	0	7	339
Red gurnard															
< 21	1	3	–	–	–	–	–	3	–	–	–	–	–	–	7
21–30	2	85	6	27	7	–	2	41	39	19	1	–	1	3	233
31–40	–	56	13	44	27	–	1	–	68	72	12	6	27	16	342
> 40	–	2	2	2	–	–	–	–	13	22	5	1	12	5	64
Total	3	146	21	73	34	0	3	44	120	113	18	7	40	24	646
Snapper															
< 21	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1
21–30	3	6	–	–	–	–	–	6	2	–	–	–	–	–	17
31–40	–	86	1	4	–	–	1	2	104	1	–	–	–	–	199
41–50	–	93	8	4	1	–	–	–	124	2	–	–	–	–	232
51–60	–	23	17	5	–	–	–	–	32	–	1	–	–	–	78
61–70	–	4	7	2	–	–	–	–	7	–	–	–	–	1	21
> 70	–	–	1	1	–	–	–	–	1	1	–	–	–	–	4
Total	4	212	34	16	1	0	1	8	270	4	1	0	0	1	552

Table 5: Continued.

Length (cm)	Male gonad stages							Female gonad stages							Total
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
Tarakihi															
< 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
11–20	62	–	–	–	–	–	–	42	–	–	–	–	–	–	104
21–30	12	3	–	–	–	–	–	18	1	–	–	–	–	–	34
31–40	1	19	7	55	4	–	1	5	38	79	8	1	–	–	218
> 40	–	–	2	16	1	1	1	–	2	80	4	1	–	–	108
Total	75	22	9	71	5	1	2	65	41	159	12	2	0	0	464
Spiny dogfish															
< 31	–	–	–					1	–	–	–	–			1
31–40	3	–	–					7	–	–	–	–			10
41–50	27	–	1					25	1	–	–	–			54
51–60	12	26	114					35	28	1	–	–			216
61–70	9	26	168					5	8	6	8	5			235
71–80	–	1	2					1	4	8	5	18			39
> 80	–	–	–					–	1	1	–	6			8
Total	51	53	285					74	42	16	13	29			563

Table 6: Relative biomass estimates (t) and CVs for the core strata series for QMS species. Species codes are given in Appendix 4. Snapper biomass estimations do not include phase-two stations (except for stations 18 and 19 on KAH2302).

Species	KAH9204		KAH9404		KAH9504		KAH9701		KAH0004		KAH0304		KAH0503		KAH0704		KAH0904	
code	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV
BAR	2 420	15	5 228	16	4 474	13	2 993	19	1 787	11	4 485	19.7	2 763	13	2 582	14	3 512	17
ELE	21	42	167	33	84	35	94	33	42	63	48	34.1	59	33	28	53	185	83
ESO	68	33	68	16	38	31	45	29	16	32	21	56.5	27	45	39	71	75	32
FRO	24	33	27	23	89	31	259	32	316	16	494	21.7	423	45	529	39	835	35
GIZ	1 450	14	1 358	17	1 556	16	1 450	15	1 023	12	834	14.9	1 458	19	1 630	13	1 952	19
GSH	380	17	722	14	767	24	1 591	21	2 259	8.8	544	15.1	832	22	2 215	21	900	17
GUR	564	16	551	14	577	19	470	13	625	14	270	20.2	442	17	553	17	651	18
HAK	390	25	99	31	5 197	27	1 019	46	15	36	55	47.1	1 673	30	359	35	212	56
HOK	404	16	826	49	3 611	21	1 100	25	103	50	233	22	701	55	772	52	1 302	46
JDO	101	29	73	27	27	36	17	31	141	16	288	19	222	14	174	26	269	23
JMD	90	24	97	26	106	20	162	19	168	33	87	21.1	118	22	62	23	79	23
JMN	258	57	68	23	57	29	363	27	194	46	126	48.7	98	21	214	62	399	24
LEA	185	30	230	23	153	34	231	34	236	50	254	17.8	139	20	252	40	323	27
LIN	280	19	261	20	373	16	151	30	95	46	150	32.6	274	37	180	27	291	37
LSO	86	19	77	25	124	21	68	21	59	19	2	43.6	21	42	119	46	62	16
NMP	1 351	13	1 403	13	1 417	10	1 087	12	964	19	912	20.1	2 050	12	1 189	21	1 088	22
NSD	130	19	159	21	89	28	164	46	256	18	111	27	180	22	134	29	189	28
RCO	2 690	13	3 370	18	3 077	15	2 546	23	414	26	906	24.3	2 610	18	1 638	19	2 782	25
RSK	171	25	198	22	250	22	185	31	186	23	43	34.3	58	30	256	23	114	22
RSO	130	19	68	29	21	55	704	83	120	30	137	22.7	474	49	101	19	143	29
SCH	975	21	1 176	40	1 201	35	1 432	25	896	13	655	18.3	774	14	816	20	1 085	16
SFL	98	30	203	23	132	28	106	28	62	22	10	33.2	62	25	67	47	170	32
SNA	71	32	15	56	22	47	115	48	21	59	10	93.4	10	70	56	70	81	58
SPD	3 856	15	7 093	7.1	8 370	10	5 275	13	4 777	13	4 446	14.6	6 175	12	6 291	14	10 270	19
SPE	233	21	425	18	667	23	338	14	302	22	76	25.3	150	20	163	19	336	20
SPO	286	14	378	10	487	10	308	18	333	18	144	21.5	153	19	383	33	274	26
SQU	2 765	18	1 195	9.2	3 467	14	966	13	523	11	2 255	11.7	889	9.3	1 228	9	402	16
SSK	330	18	336	18	315	20	302	26	140	29	91	78.8	80	30	55	44	67	61
SWA	267	37	64	35	39	19	204	20	99	34	69	27.1	72	28	165	20	80	24
WAR	123	40	80	22	113	29	842	31	272	37	191	66.1	116	40	286	50	175	27

Table 6: continued.

Species	KAH1104		KAH1304		KAH1503		KAH1703		KAH1902		KAH2101		KAH2302		KAH2502	
code	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV
BAR	4 958	21	3 423	16	2 662	21	4 153	30	2 568	15	1 423	25	227	15	1 621	24
ELE	169	53	110	26	72	45	92	65	61	48	170	77	25	41	183	55
ESO	26	42	25	26	92	40	119	20	36	28	52	32	6	43	45	53
FRO	251	29	424	24	341	34	518	23	520	22	338	43	95	32	110	35
GIZ	1 620	16	2 118	9	1 984	11	1 674	14	2 081	18	985	27	915	15	724	23
GSH	2 348	23	981	23	1 211	55	772	37	518	27	258	29	393	17	587	37
GUR	837	21	754	12	1 776	16	1 708	12	1 642	16	2 022	18	1 498	15	1 874	13
HAK	44	36	36	41	81	37	217	61	111	33	179	63	<1	100	11	78
HOK	1 527	61	1 545	43	2 129	36	539	62	1064	41	157	83	<1	54	103	59
JDO	327	18	231	21	487	16	431	12	274	31	227	16	203	17	211	20
JMD	217	37	106	43	43	40	58	23	174	31	80	25	85	44	430	61
JMN	95	39	56	35	399	38	156	19	438	19	309	24	172	30	183	29
LEA	111	20	231	19	239	30	170	15	333	44	386	46	127	27	66	31
LIN	234	43	405	44	472	53	150	18	316	26	166	45	70	33	64	42
LSO	62	16	43	37	90	22	85	16	47	11	47	18	30	18	74	21
NMP	1 331	15	1 272	22	1 060	17	1 857	18	1 094	19	969	25	493	17	660	13
NSD	368	29	211	26	259	22	180	25	177	47	396	17	337	19	321	20
RCO	2 055	28	1 247	38	989	45	1 247	21	666	23	768	26	69	71	879	31
RSK	261	21	243	24	150	20	270	21	132	26	123	26	87	24	128	43
RSO	101	34	113	28	186	17	545	28	559	22	433	26	759	26	922	32
SCH	1 099	14	912	12	788	17	933	15	720	20	708	18	354	23	467	30
SFL	71	23	48	52	84	33	112	21	26	24	33	39	4	44	35	47
SNA (core strata)	66	31	277	56	837	32	674	20	972	14	883	20	3 633	21	3 557	16
SNA (+ 10-20 m)							791	17	1316	12	1 566	13	4 404	18	4453	14
SPD	6 154	14	15 086	57	7 613	21	3 255	22	4 031	22	2 226	14	3 043	27	2 662	34
SPE	548	39	161	20	191	21	153	31	133	28	2	100	47	44	71	25
SPO	264	20	278	20	622	27	506	33	467	14	272	14	270	14	446	24
SQU	153	14	308	14	419	21	280	16	572	29	263	29	92	20	311	27
SSK	180	34	188	29	342	25	62	37	204	28	123	39	35	57	130	35
SWA	69	32	68	28	109	32	86	22	17	54	5	54	28	32	4	33
WAR	263	27	248	22	222	36	646	51	312	45	229	30	273	72	124	74

Table 7: Estimated biomass (t) and CV (%) by stratum for the 20 most abundant commercially important species in order of catch abundance. Species codes are given in Appendix 4. Stratum depth ranges are given in Table 1. + indicates less than or equal to 0.5 t. Strata 20 and 21 are only applicable to snapper.

	Species code									
Stratum	SNA	SPD	GUR	RSO	RCO	BAR	GIZ	SPO	NMP	GSH
1	90	51	8	14	1	37	0	22	57	16
	(40)	(44)	(55)	(64)	(100)	(55)	(0)	(89)	(84)	(71)
2	64	26	0	53	0	337	56	11	53	61
	(61)	(63)	(0)	(57)	(0)	(38)	(62)	(62)	(55)	(74)
5	117	208	574	0	199	9	0	51	3	0
	(29)	(28)	(27)	(0)	(85)	(56)	(0)	(12)	(76)	(0)
6	29	883	28	290	5	444	0	38	10	298
	(63)	(95)	(43)	(92)	(100)	(71)	(0)	(100)	(62)	(67)
7	58	222	153	0	10	38	4	6	1	37
	(49)	(45)	(78)	(0)	(99)	(99)	(97)	(65)	(78)	(76)
8	21	63	11	60	+	193	167	18	61	71
	(78)	(78)	(62)	(59)	(100)	(12)	(65)	(100)	(18)	(78)
9	0	0	0	150	0	0	45	0	22	0
	(0)	(0)	(0)	(49)	(0)	(0)	(28)	(0)	(100)	(0)
11	44	318	367	4	501	80	16	48	9	0
	(34)	(39)	(29)	(100)	(40)	(48)	(100)	(25)	(100)	(0)
12	9	111	5	123	33	71	188	11	224	60
	(81)	(48)	(56)	(38)	(39)	(26)	(45)	(75)	(14)	(45)
13	0	2	0	20	1	24	115	4	128	19
	(0)	(100)	(0)	(38)	(91)	(87)	(66)	(100)	(32)	(62)
14	15	221	91	43	119	53	43	44	19	0
	(59)	(74)	(52)	(100)	(59)	(61)	(73)	(47)	(100)	(0)
15	0	196	13	7	1	15	77	4	53	3
	(0)	(88)	(85)	(62)	(19)	(33)	(26)	(100)	(27)	(51)
16	0	4	0	158	8	0	13	+	12	23
	(0)	(85)	(0)	(49)	(44)	(0)	(58)	(100)	(98)	(41)
17	778	11	31	0	0	3	0	32	+	0
	(24)	(97)	(27)	(0)	(0)	(52)	(0)	(25)	(57)	(0)
18	665	5	136	0	+	23	0	116	+	0
	(27)	(54)	(7)	(0)	(100)	(62)	(0)	(75)	(52)	(0)
19	1667	341	456	0	0	293	0	41	6	0
	(29)	(48)	(19)	(0)	(0)	(58)	(0)	(55)	(72)	(0)
20	283	–	–	–	–	–	–	–	–	–
	(36)	–	–	–	–	–	–	–	–	–
21	613	–	–	–	–	–	–	–	–	–
	(6)	–	–	–	–	–	–	–	–	–

Table 7: continued.

Species code

Stratum	SCH	JMN	JMD	SQU	LIN	JDO	SSK	HOK	FRO	WAR
1	77	28	2	22	+	40	14	0	6	0
	(67)	(95)	(0)	(41)	(100)	(40)	(91)	(0)	(93)	(0)
2	47	0	3	54	0	17	0	0	4	0
	(34)	(0)	(86)	(42)	(0)	(45)	(0)	(0)	(100)	(0)
5	65	62	+	1	0	14	0	0	2	91
	(63)	(59)	(100)	(61)	(0)	(67)	(0)	(0)	(94)	(100)
6	114	0	220	76	0	50	28	0	+	12
	(100)	(0)	(100)	(99)	(0)	(64)	(90)	(0)	(100)	(100)
7	10	0	1	9	1	15	25	0	0	+
	(60)	(0)	(100)	(83)	(100)	(50)	(100)	(0)	(0)	(100)
8	11	3	141	47	0	3	0	2	0	0
	(100)	(100)	(100)	(43)	(0)	(59)	(0)	(100)	(0)	(0)
9	0	0	0	37	3	0	10	0	0	0
	(0)	(0)	(0)	(39)	(100)	(0)	(100)	(0)	(0)	(0)
11	33	15	1	+	4	0	+	2	2	3
	(53)	(56)	(56)	(100)	(72)	(0)	(100)	(100)	(100)	(97)
12	9	4	53	18	11	0	15	48	75	3
	(57)	(61)	(79)	(45)	(28)	(0)	(91)	(76)	(48)	(100)
13	19	0	2	21	0	0	0	1	2	0
	(52)	(0)	(100)	(2)	(0)	(0)	(0)	(80)	(100)	(0)
14	28	13	2	8	7	0	14	49	10	9
	(68)	(81)	(24)	(91)	(100)	(0)	(100)	(100)	(100)	(50)
15	3	0	2	8	1	0	0	0	8	6
	(58)	(0)	(44)	(36)	(100)	(0)	(0)	(0)	(32)	(56)
16	0	0	0	5	37	0	10	1	1	0
	(0)	(0)	(0)	(28)	(69)	(0)	(66)	(57)	(100)	(0)
17	0	16	0	+	0	5	0	0	0	0
	(0)	(56)	(0)	(100)	(0)	(16)	(0)	(0)	(0)	(0)
18	+	36	0	0	0	15	0	0	0	0
	(100)	(66)	(0)	(0)	(0)	(17)	(0)	(0)	(0)	(0)
19	52	6	3	3	0	51	15	0	0	0
	(62)	(49)	(91)	(66)	(0)	(36)	(100)	(0)	(0)	(0)

Table 8: Estimates of recruited biomass (fish length ≥ recruited length) of target and secondary species and adult biomass of target species (fish length ≥ 50% maturity length, L_{50}) for the 2025 survey.

Species	Recruited length (cm)	Recruited fish		L_{50} (cm)	Adult fish	
		Biomass	CV (%)		Biomass	CV (%)
Giant stargazer	30	720	23	45	675	24
John dory	25	210	20	27 (male) 30 (female)	208	20
Red cod	40	503	37	30	200	39
Red gurnard	30	1 326	12	30	1 326	12
Snapper (all strata)	25	4 438	13	25	4 438	13
Spiny dogfish	–	–	–	58 (male) 72 (female)	1 646	40
Tarakihi	25	635	13	31	625	13

Table 9: Biomass estimates (t) by year class, where discrete estimated year classes were determined from modes in the length frequency distributions.

Species	Year class	Length range (cm)	Biomass (t)	CV (%)
John dory	1+	23–31	6.3	27.1
Red cod	0+	< 24	7.6	37.8
Red gurnard	1+	14–17	1.2	77.4
Snapper	1+	13–20	4.2	32.0
	2+	21–29	20.9	31.5
Tarakihi	1+	11–15	1.8	37.7
	2+	16–21	16.6	29.8

9. FIGURES

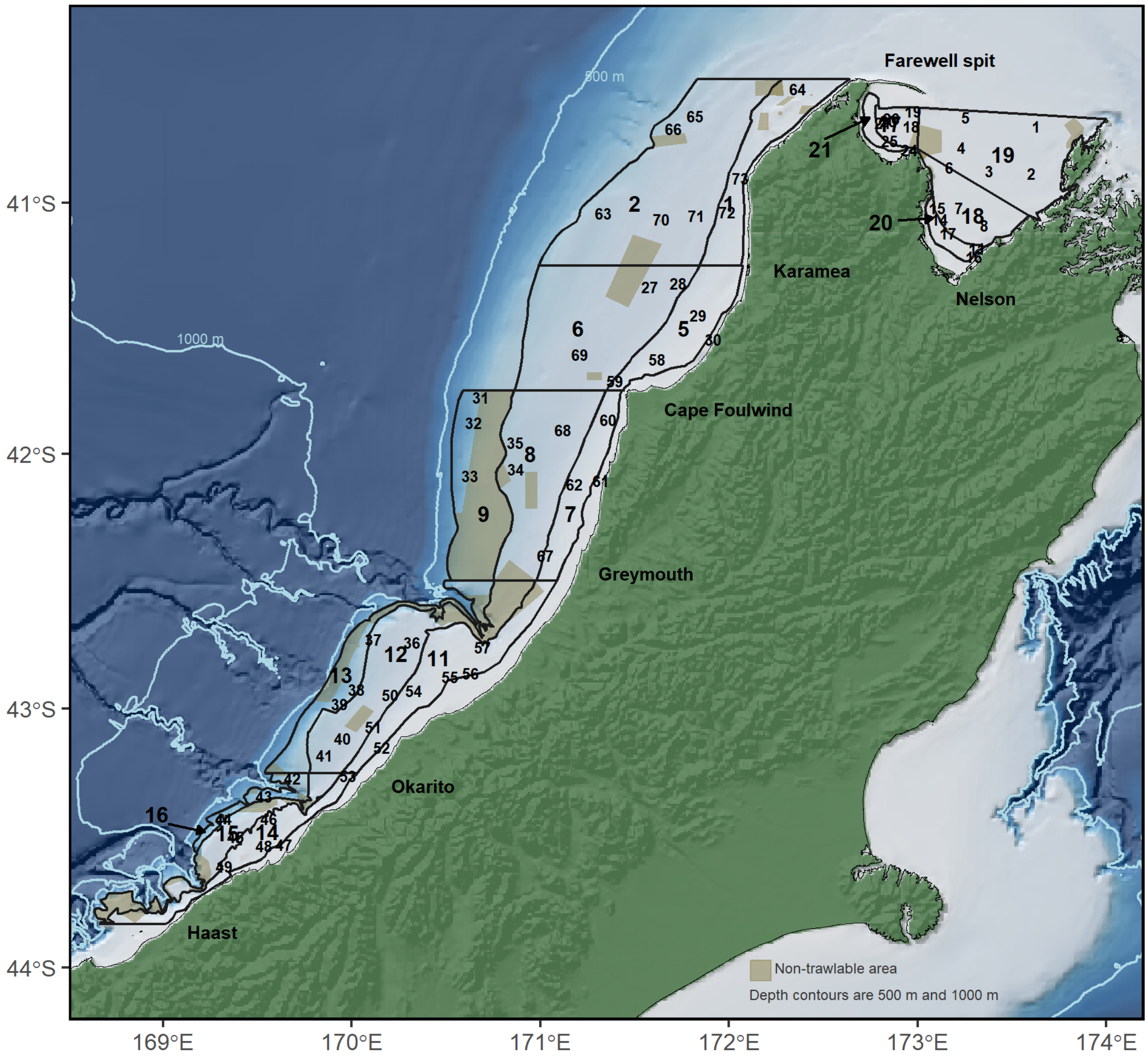


Figure 1: Survey area showing stratum boundaries and numbers (larger numbers) for the 2025 west coast South Island inshore trawl survey, with mid points of valid station positions (smaller numbers) and foul ground (grey shaded regions).

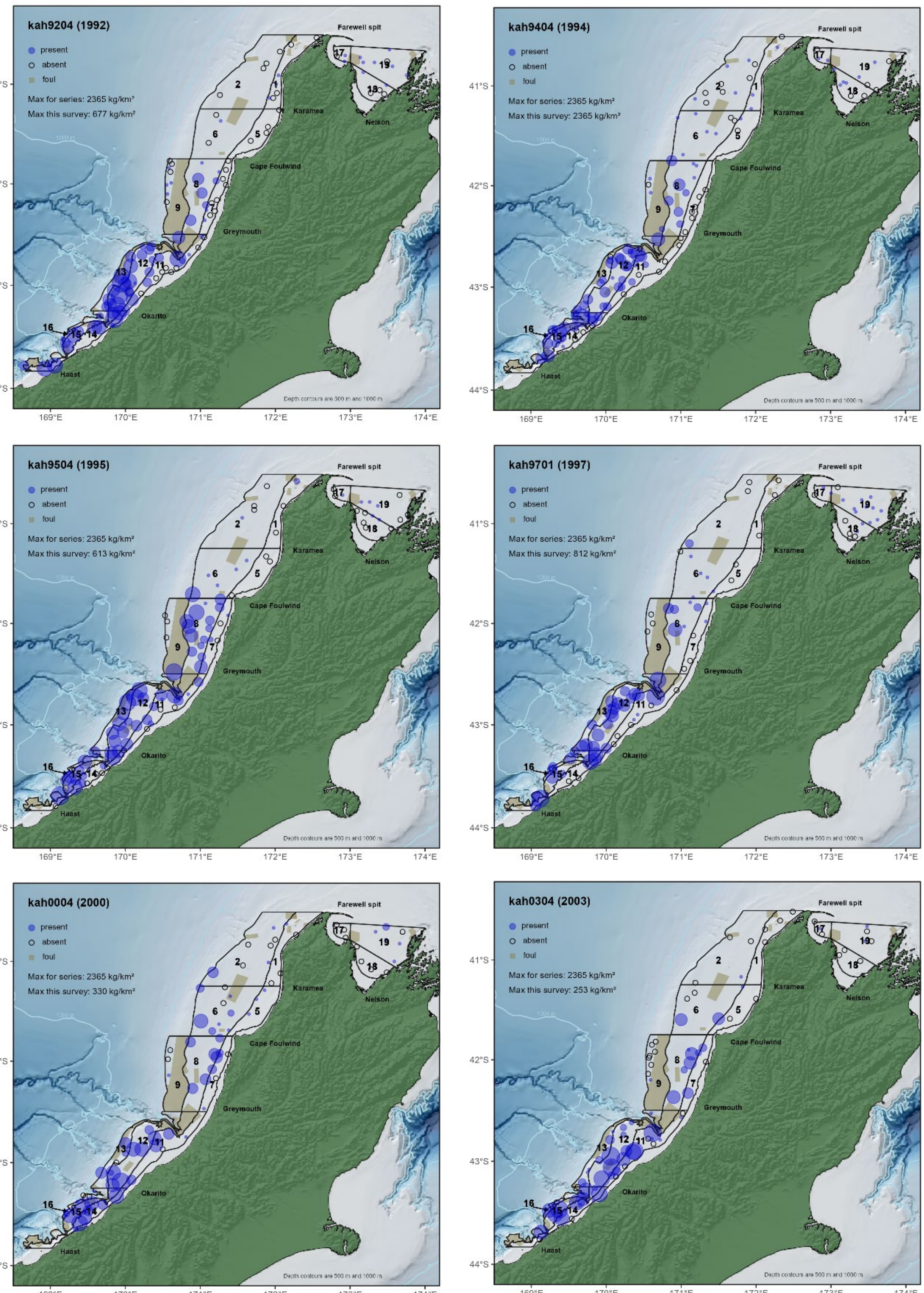


Figure 2: (a) Catch rates (kg km^{-2}) and distribution of giant stargazer.

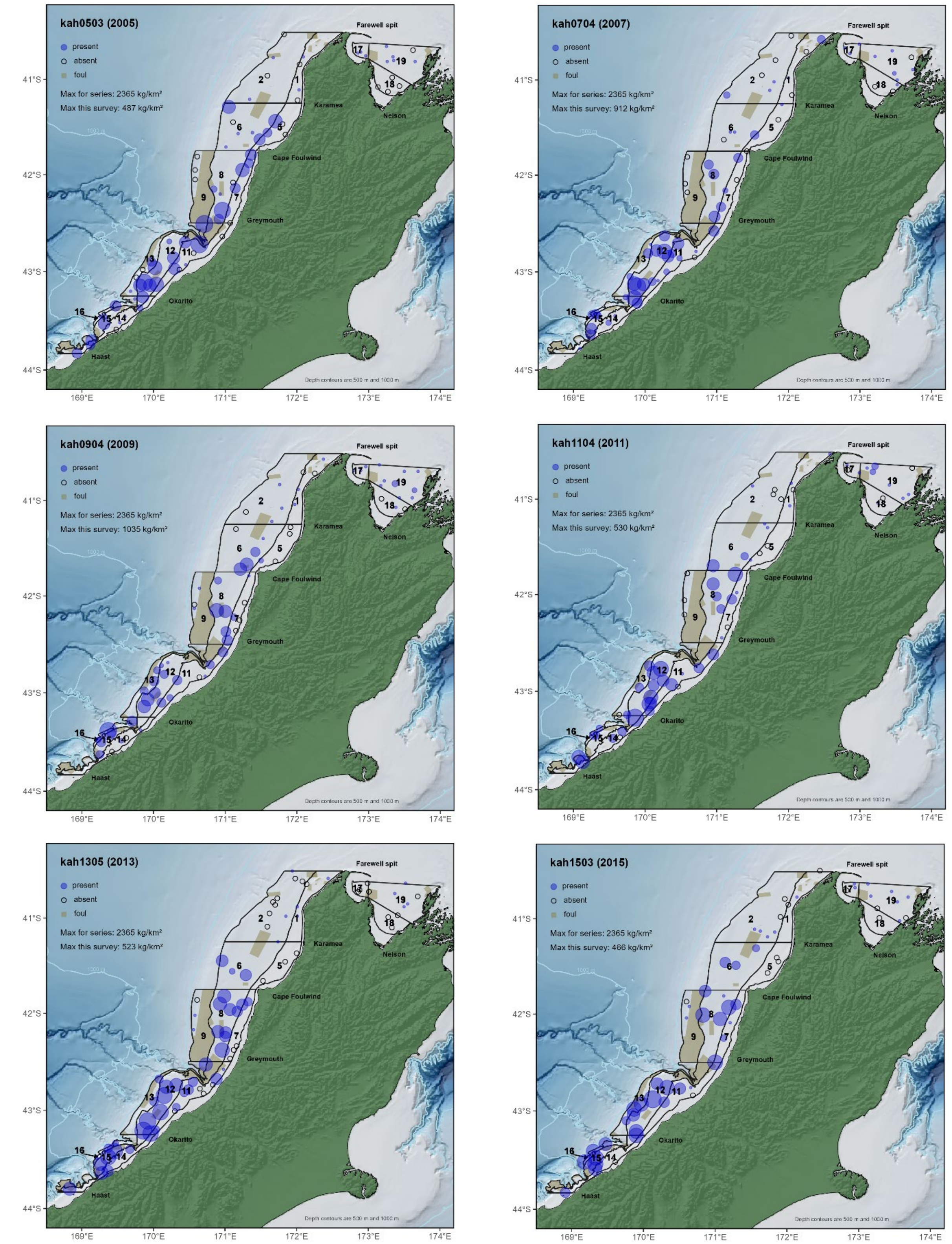


Figure 2: (a, continued) Catch rates (kg km^{-2}) and distribution of giant stargazer.

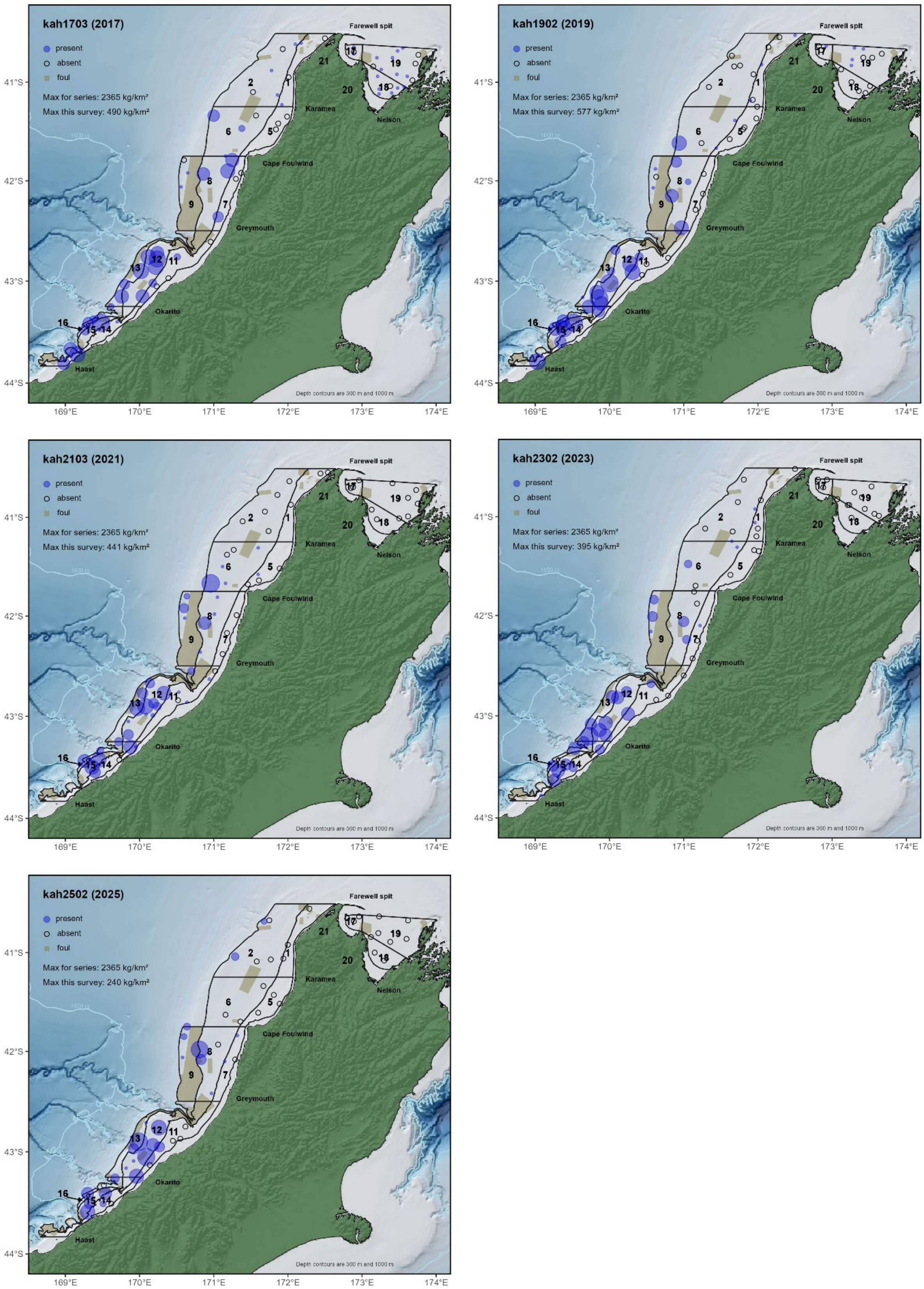


Figure 2: (a, continued) Catch rates (kg km^{-2}) and distribution of giant stargazer.

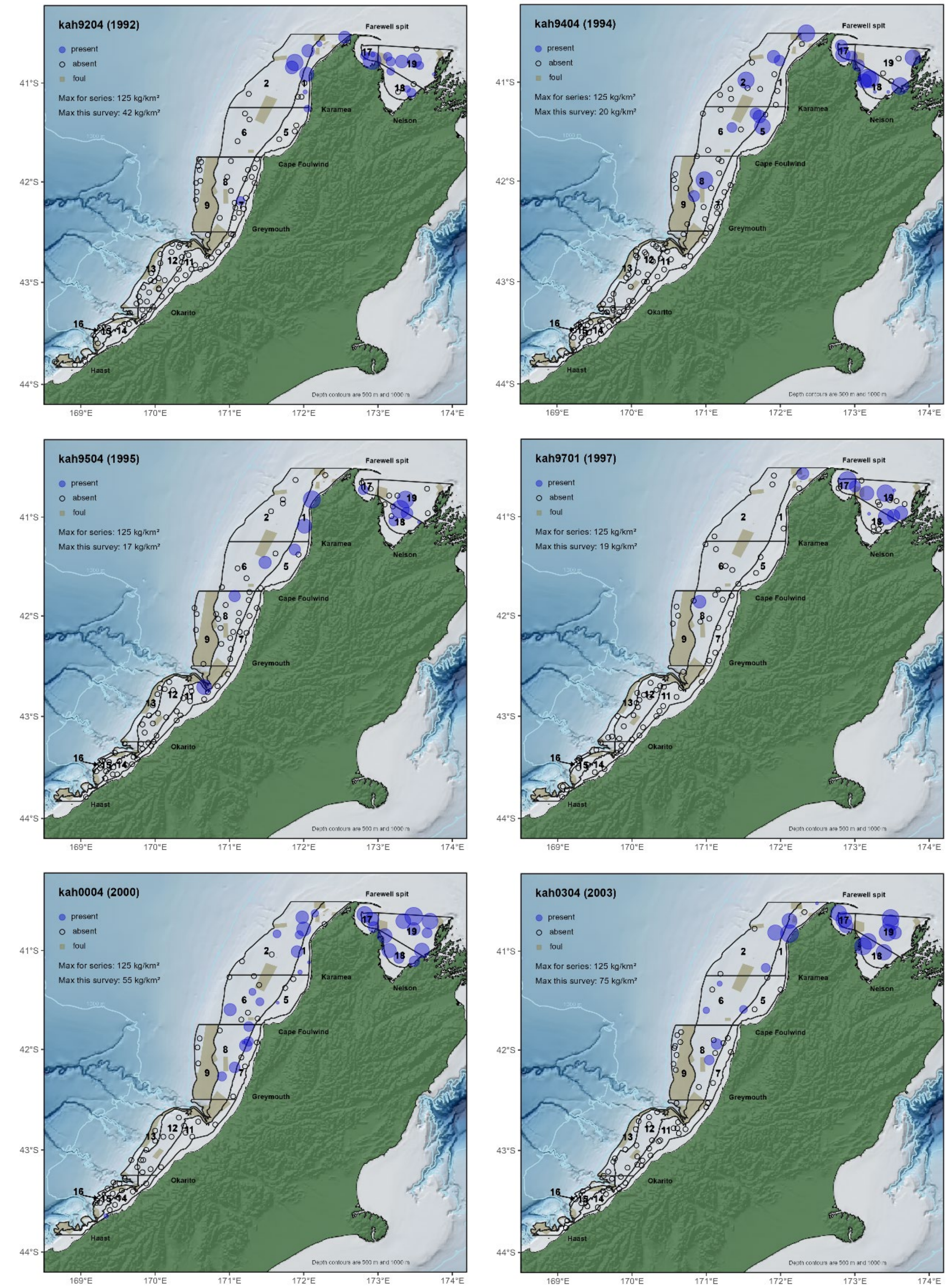


Figure 2: (b) Catch rates (kg km^{-2}) and distribution of John dory.

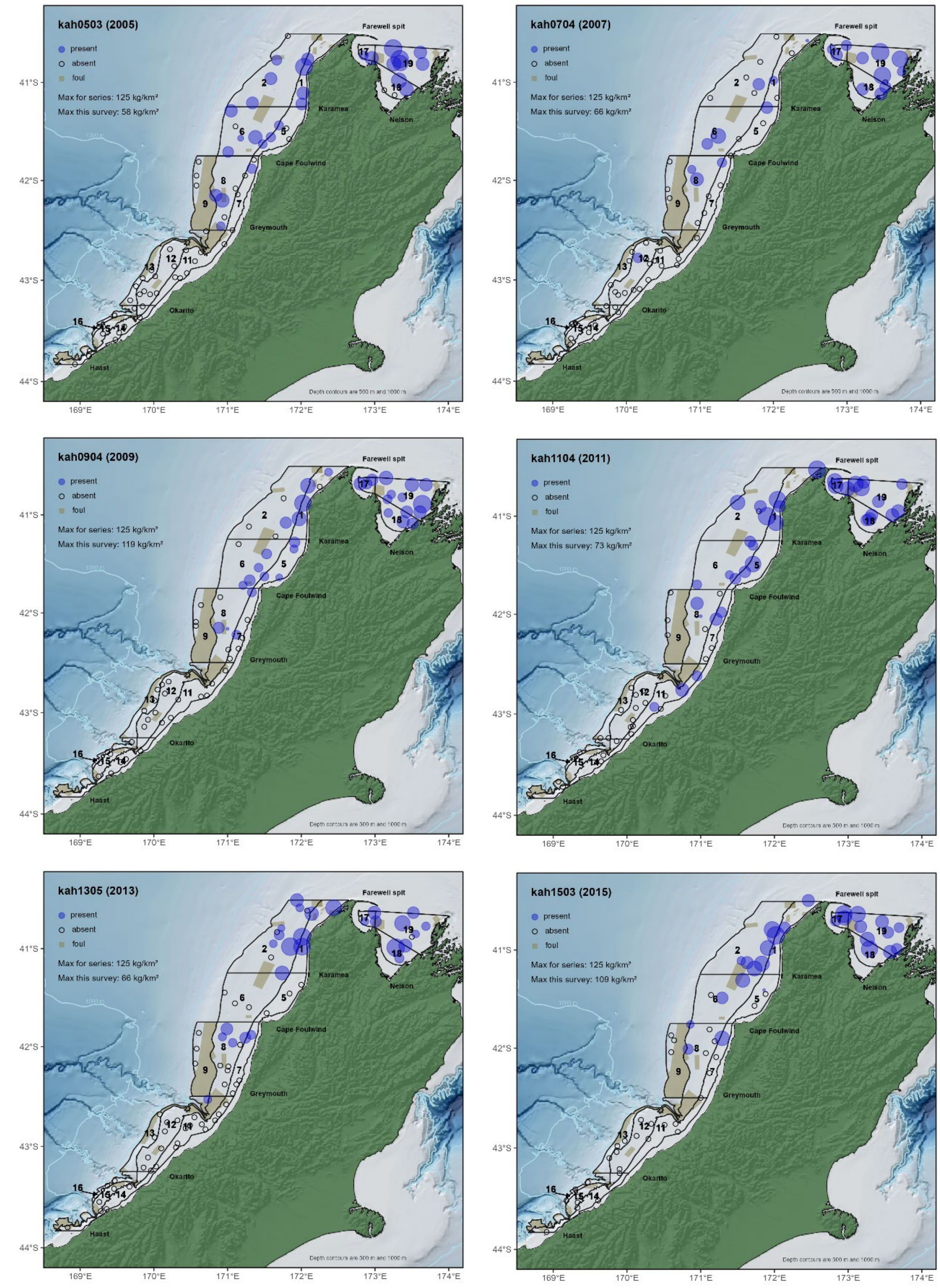


Figure 2: (b, continued) Catch rates (kg km^{-2}) and distribution of John dory.

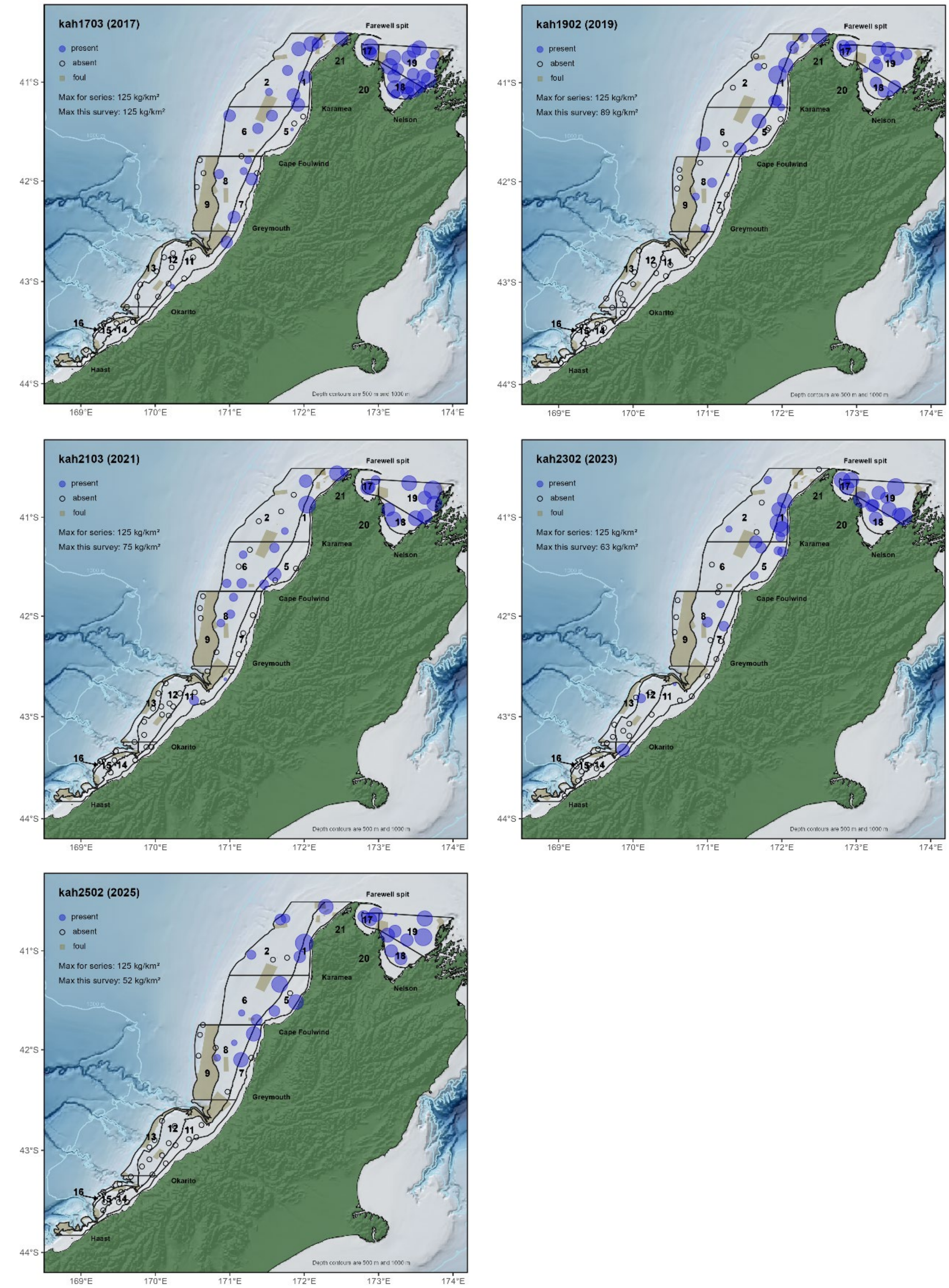


Figure 2: (b, continued) Catch rates (kg km^{-2}) and distribution of John dory.

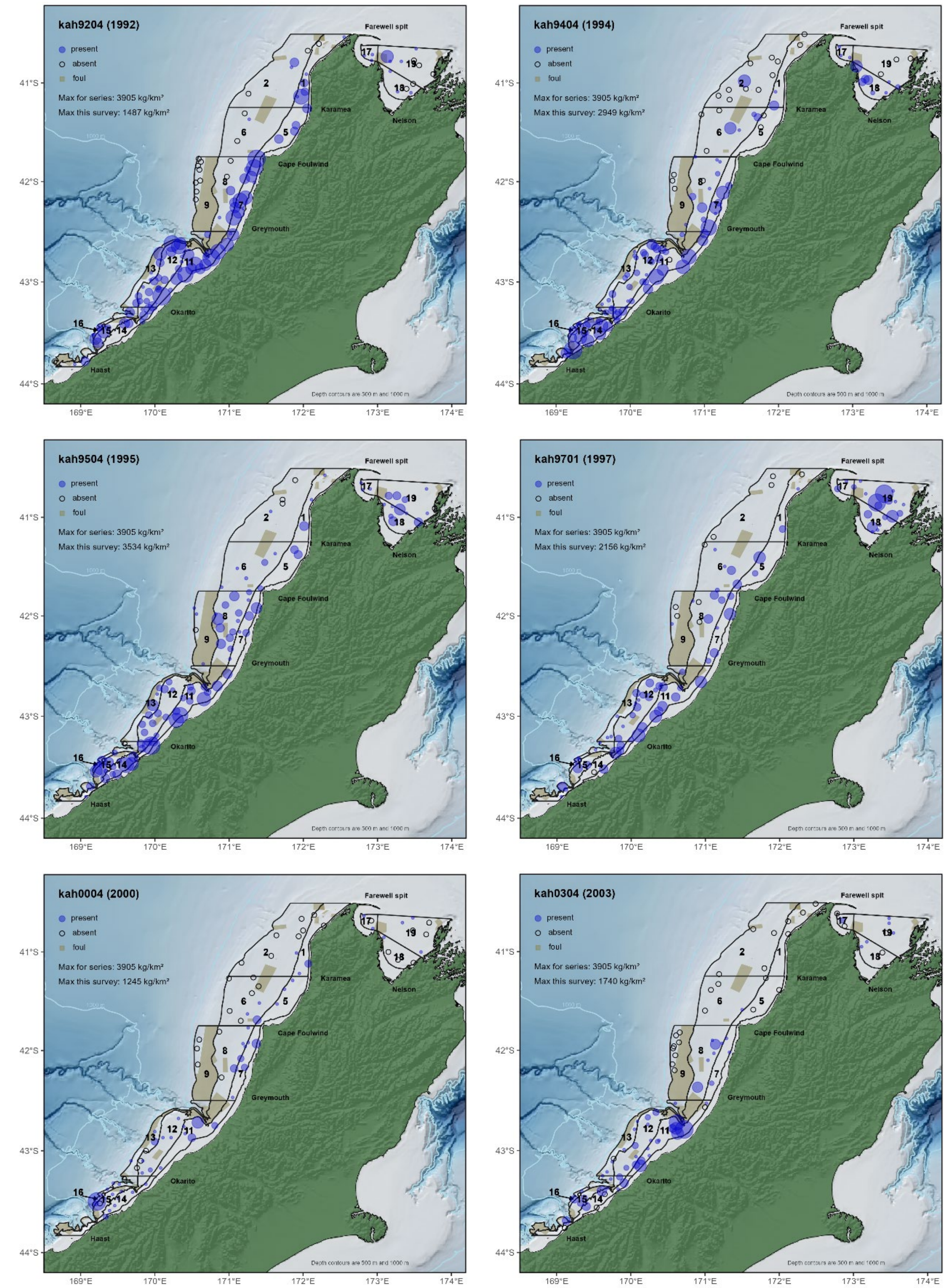


Figure 2: (c) Catch rates (kg km^{-2}) and distribution of red cod. NB: stations in TBGB appear to have had no catch. In each stratum there was one station that did catch red cod but all were <0.5 kg and so appear as zero catches.

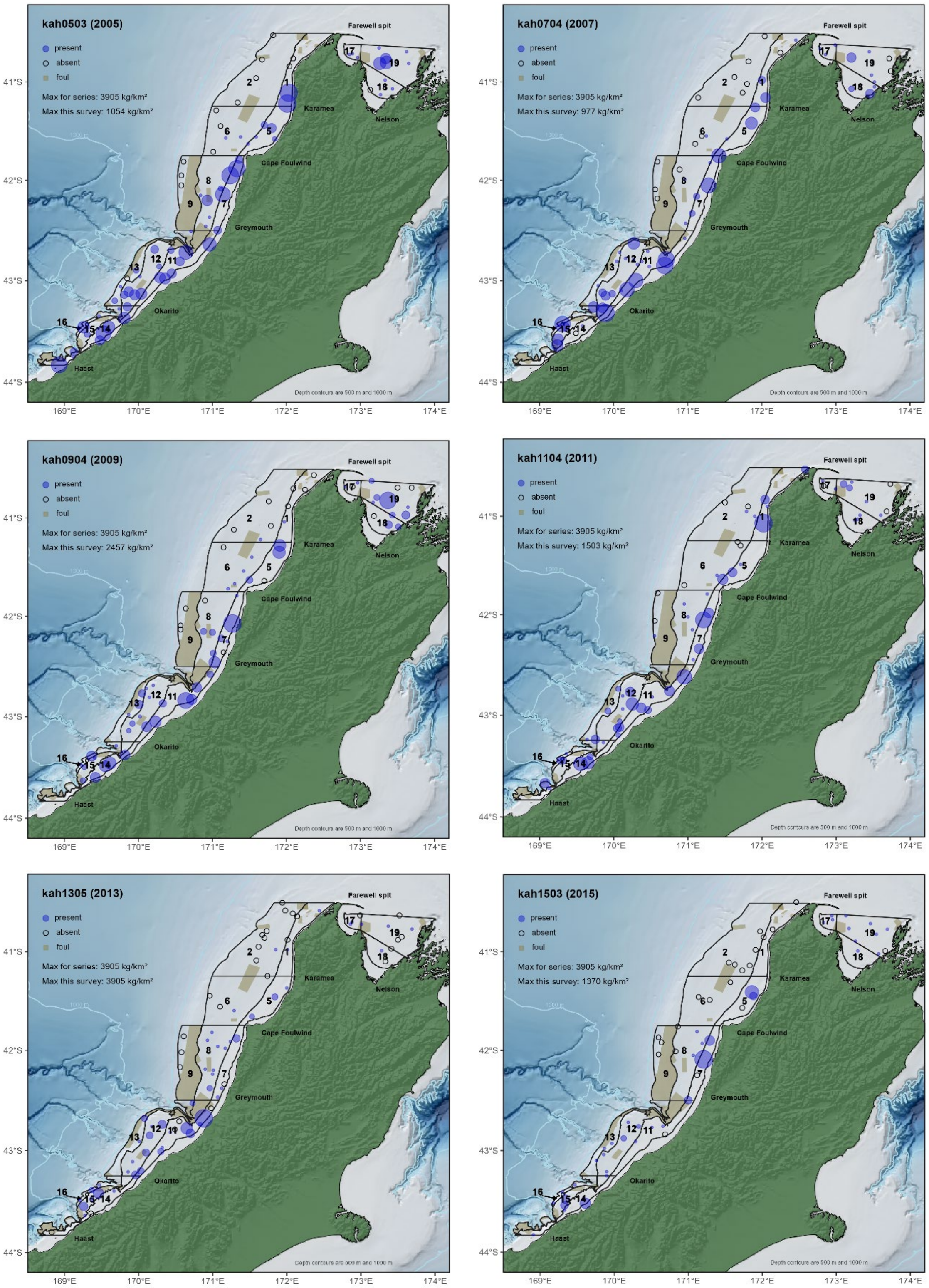


Figure 2: (c, continued) Catch rates (kg km^{-2}) and distribution of red cod. NB: stations in TBGB appear to have had no catch. In each stratum there was one station that did catch red cod but all were <0.5 kg and so appear as zero catches.

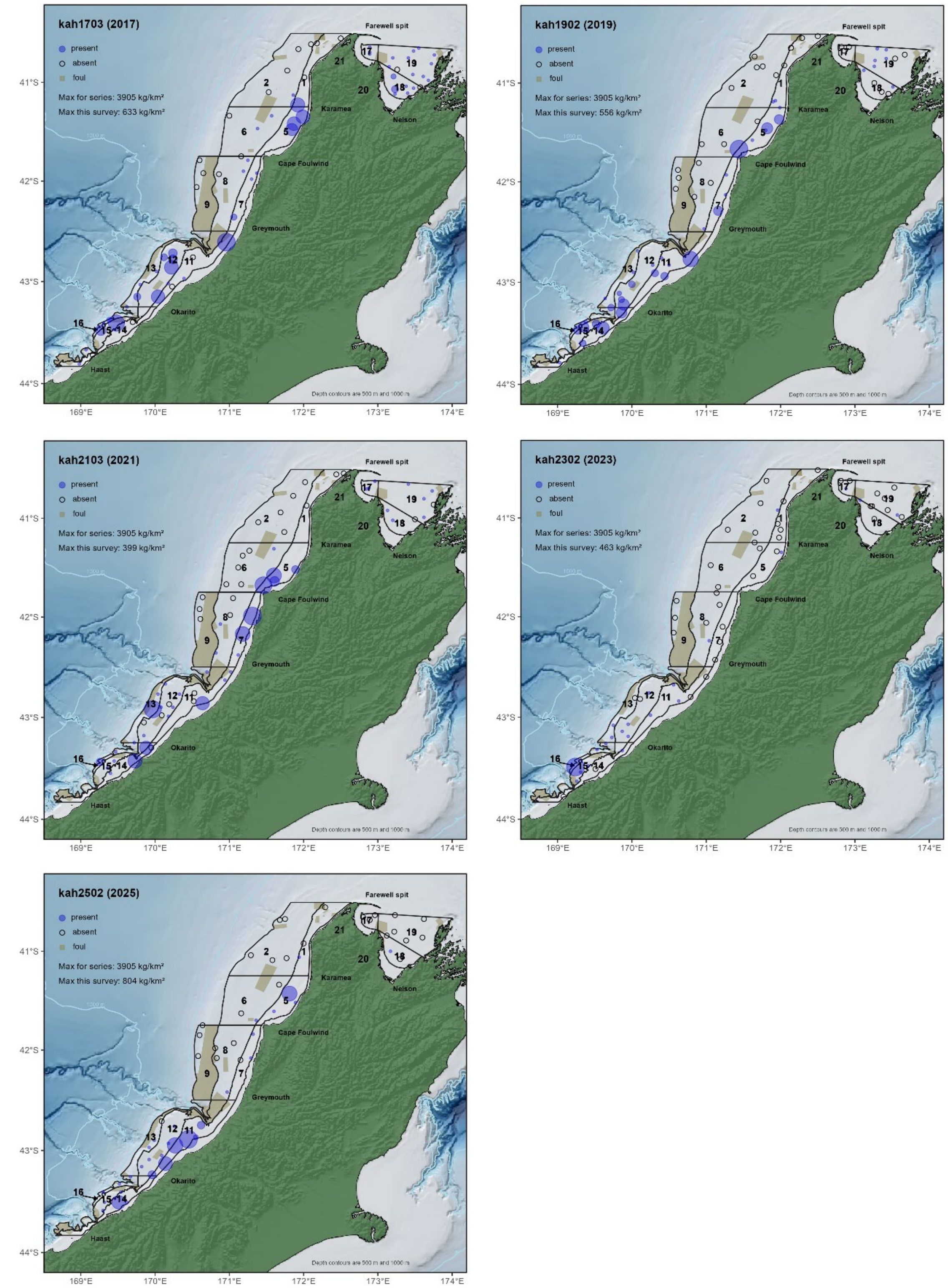


Figure 2: (c, continued) Catch rates (kg km^{-2}) and distribution of red cod. NB: stations in TBGB appear to have had no catch. In each stratum there was one station that did catch red cod but all were <0.5 kg and so appear as zero catches.

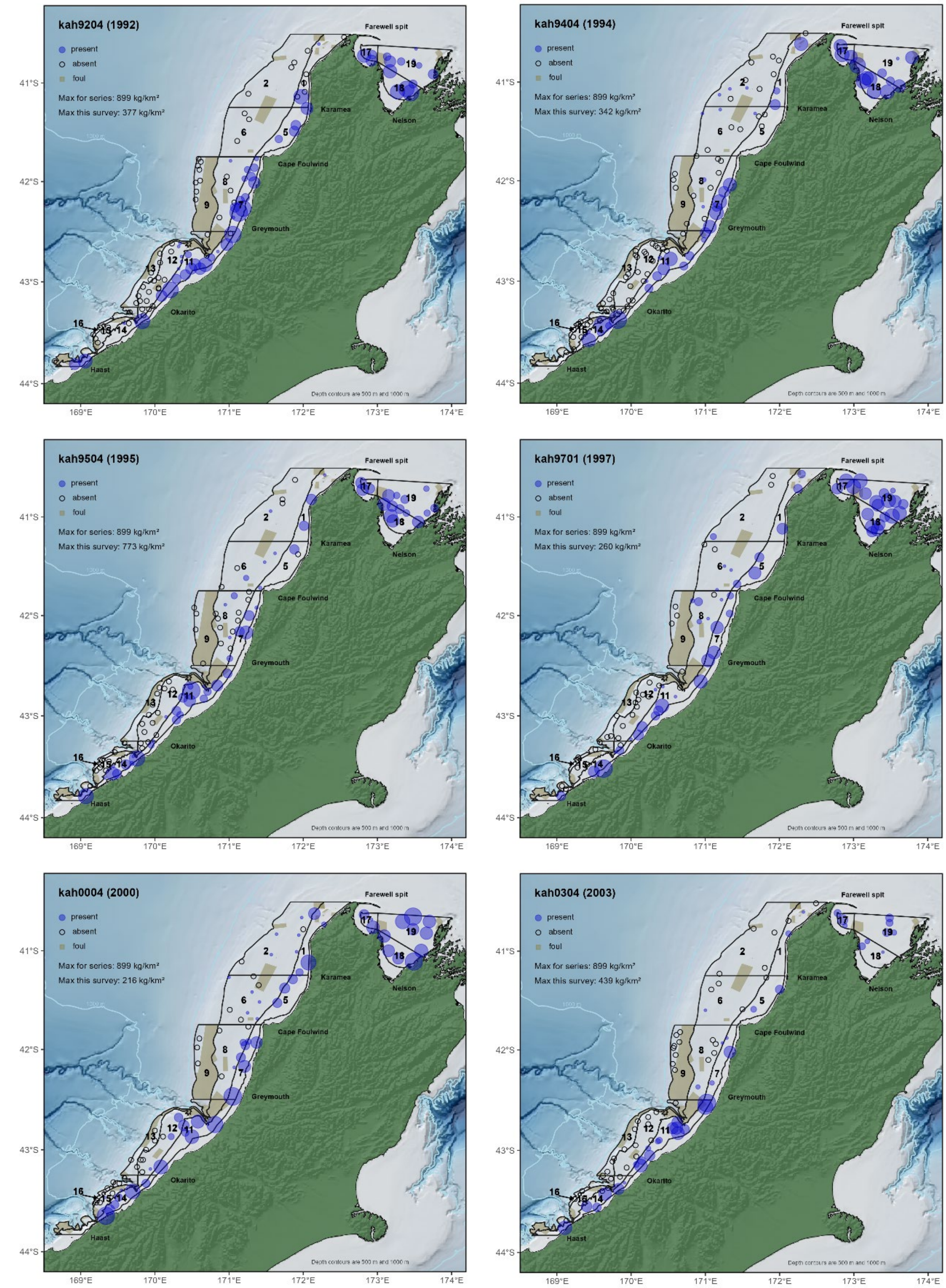


Figure 2: (d) Catch rates (kg km^{-2}) and distribution of red gurnard.

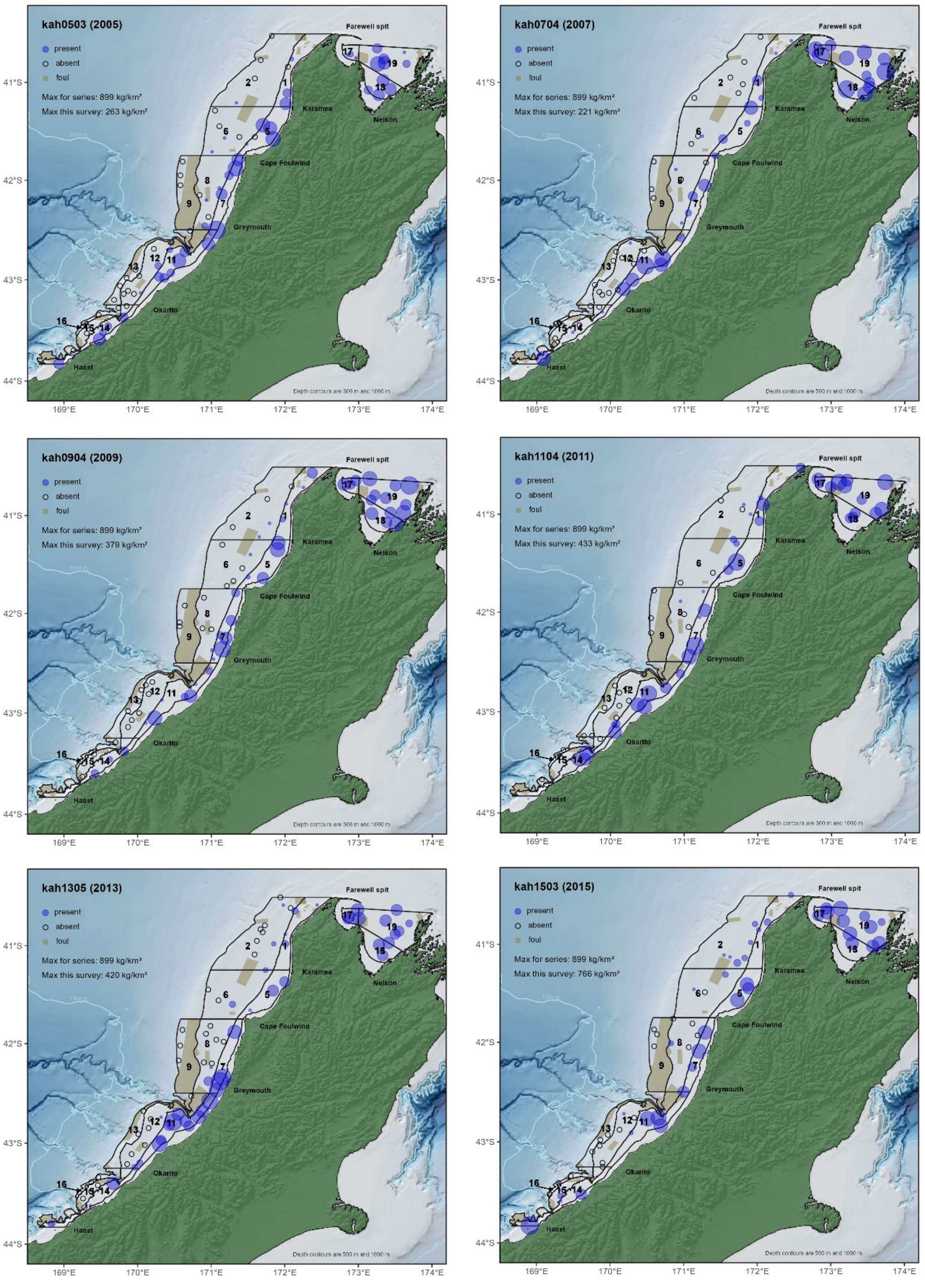


Figure 2: (d, continued) Catch rates (kg km^{-2}) and distribution of red gurnard.

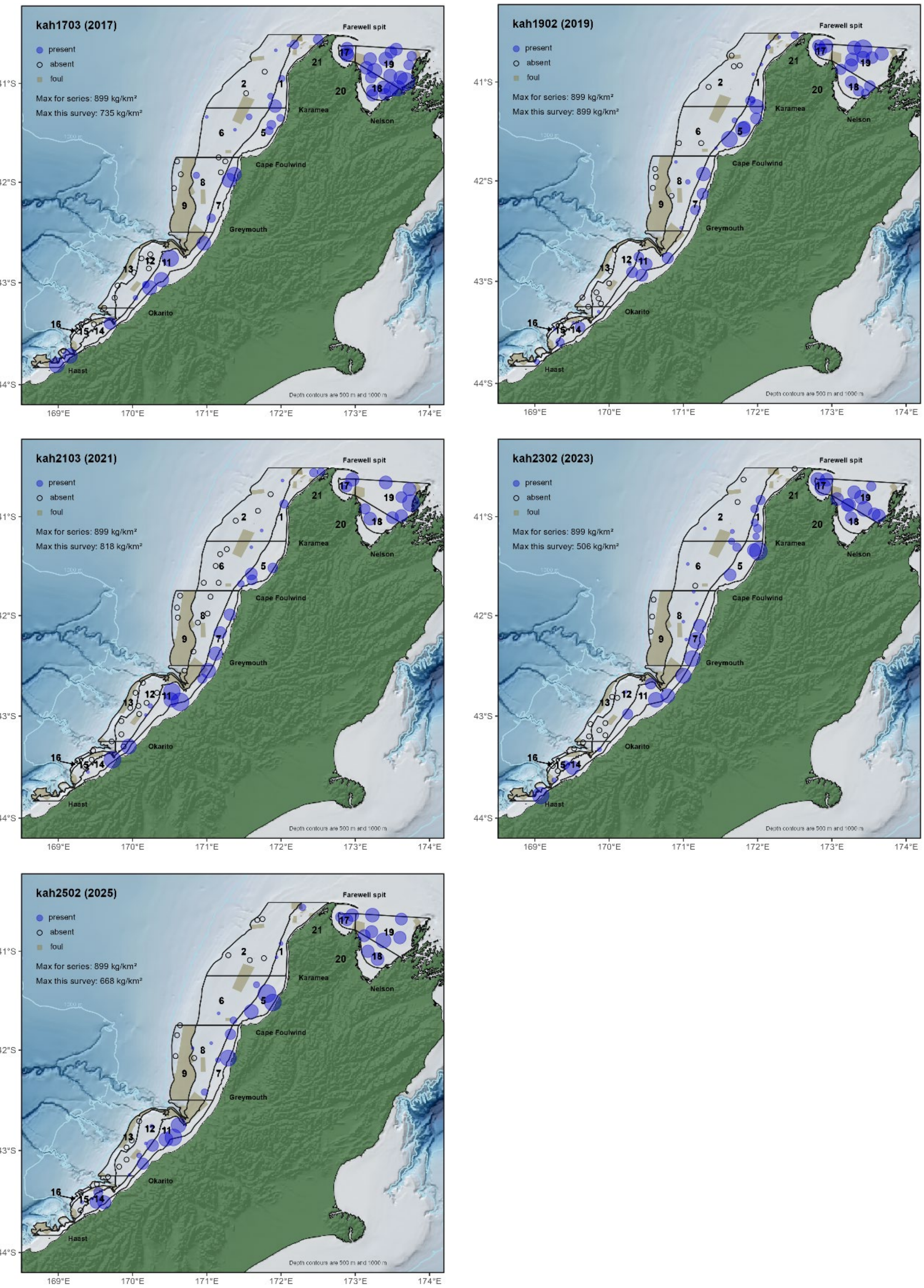


Figure 2: (d, continued) Catch rates (kg km^{-2}) and distribution of red gurnard.

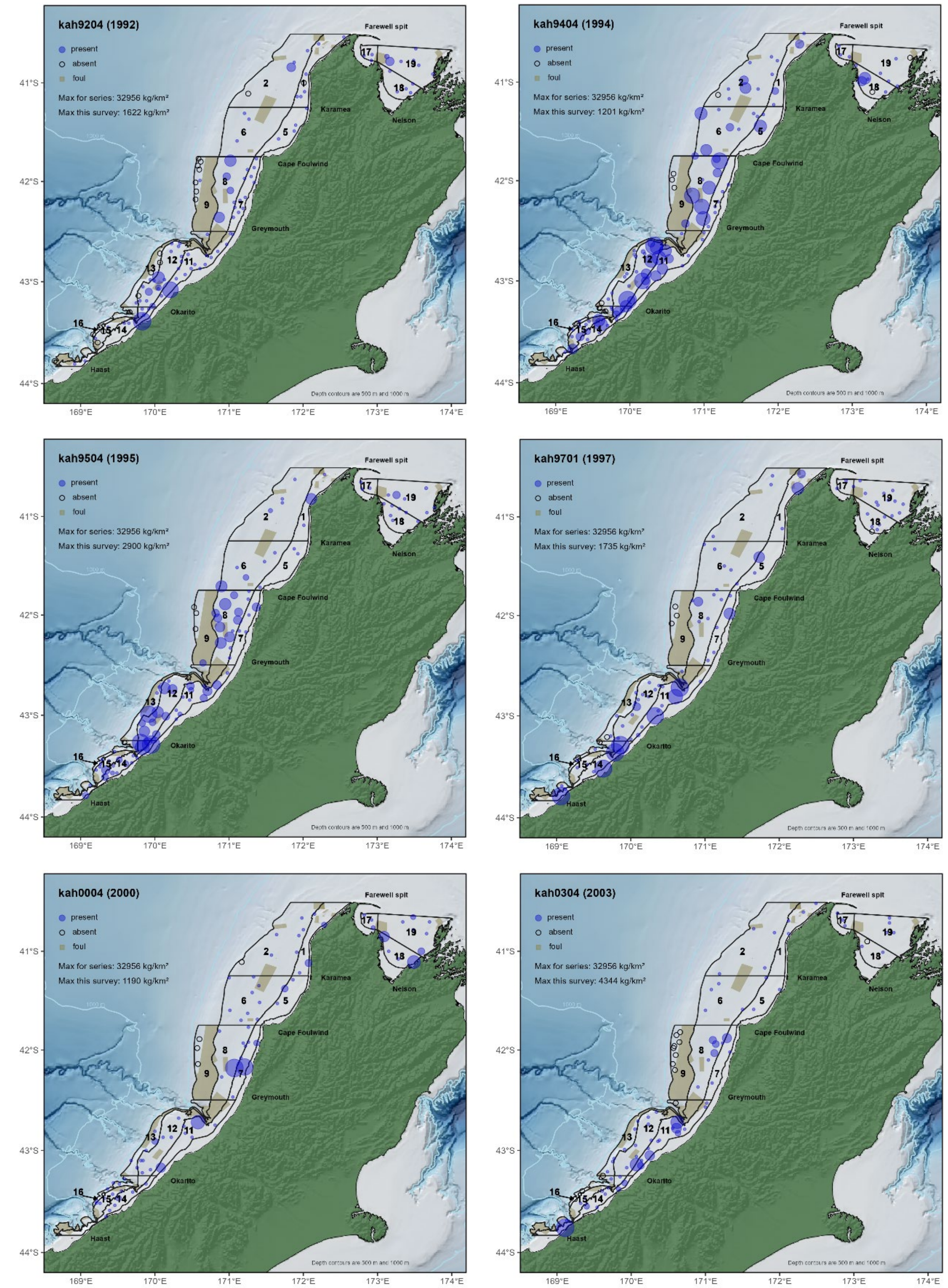


Figure 2: (e) Catch rates (kg km^{-2}) and distribution of spiny dogfish.

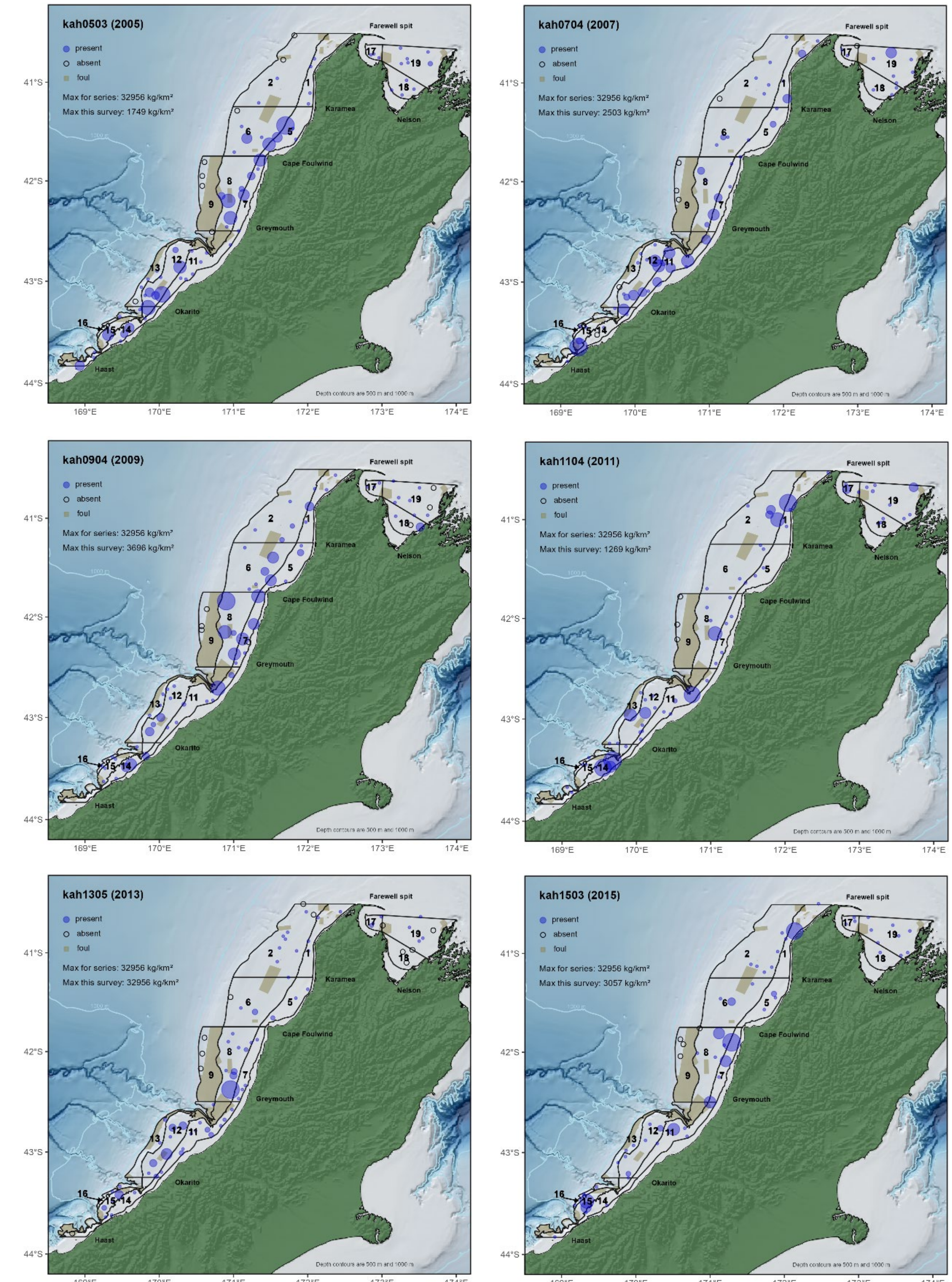


Figure 2: (e, continued) Catch rates (kg km^{-2}) and distribution of spiny dogfish.

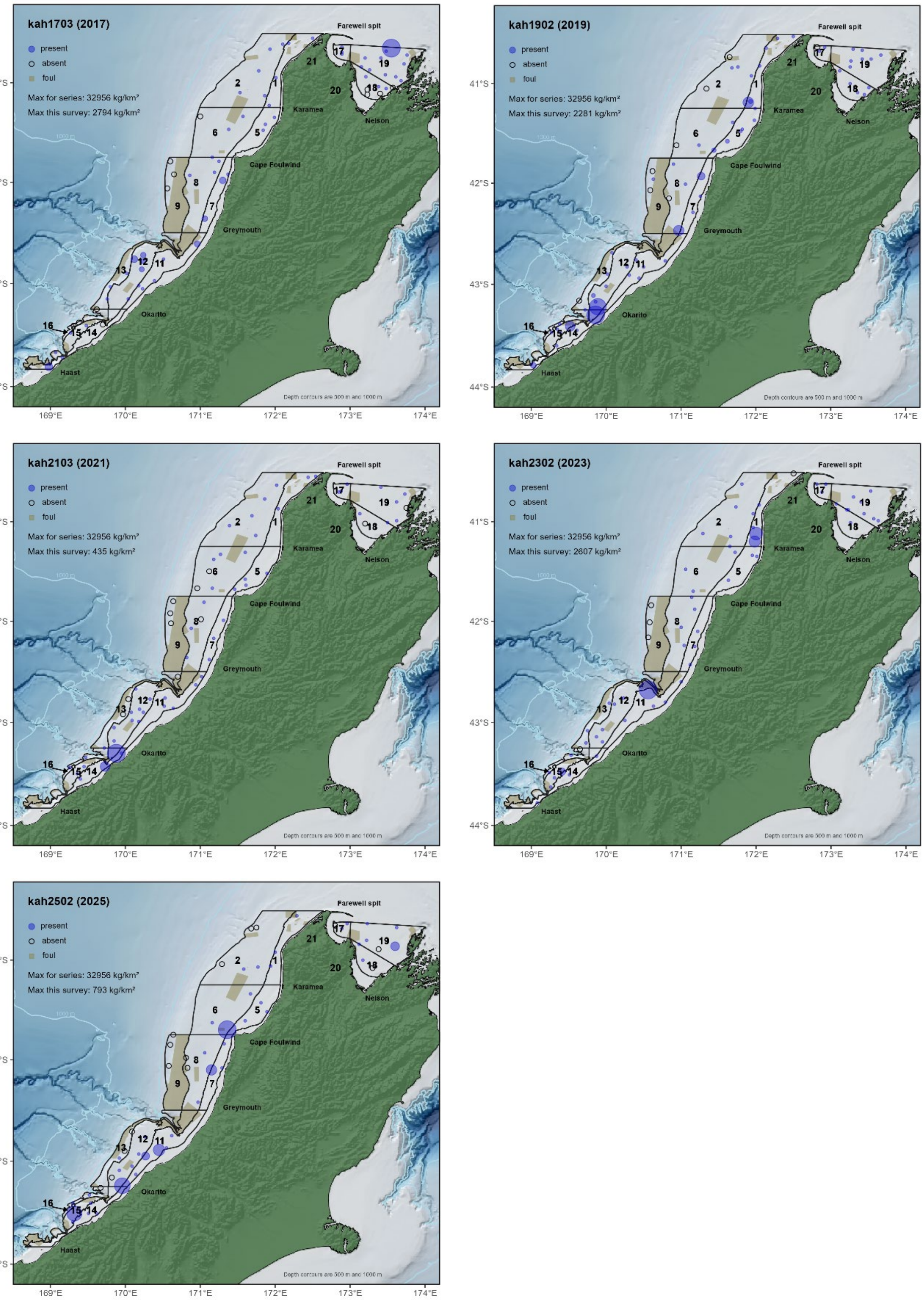


Figure 2: (e, continued) Catch rates (kg km^{-2}) and distribution of spiny dogfish.

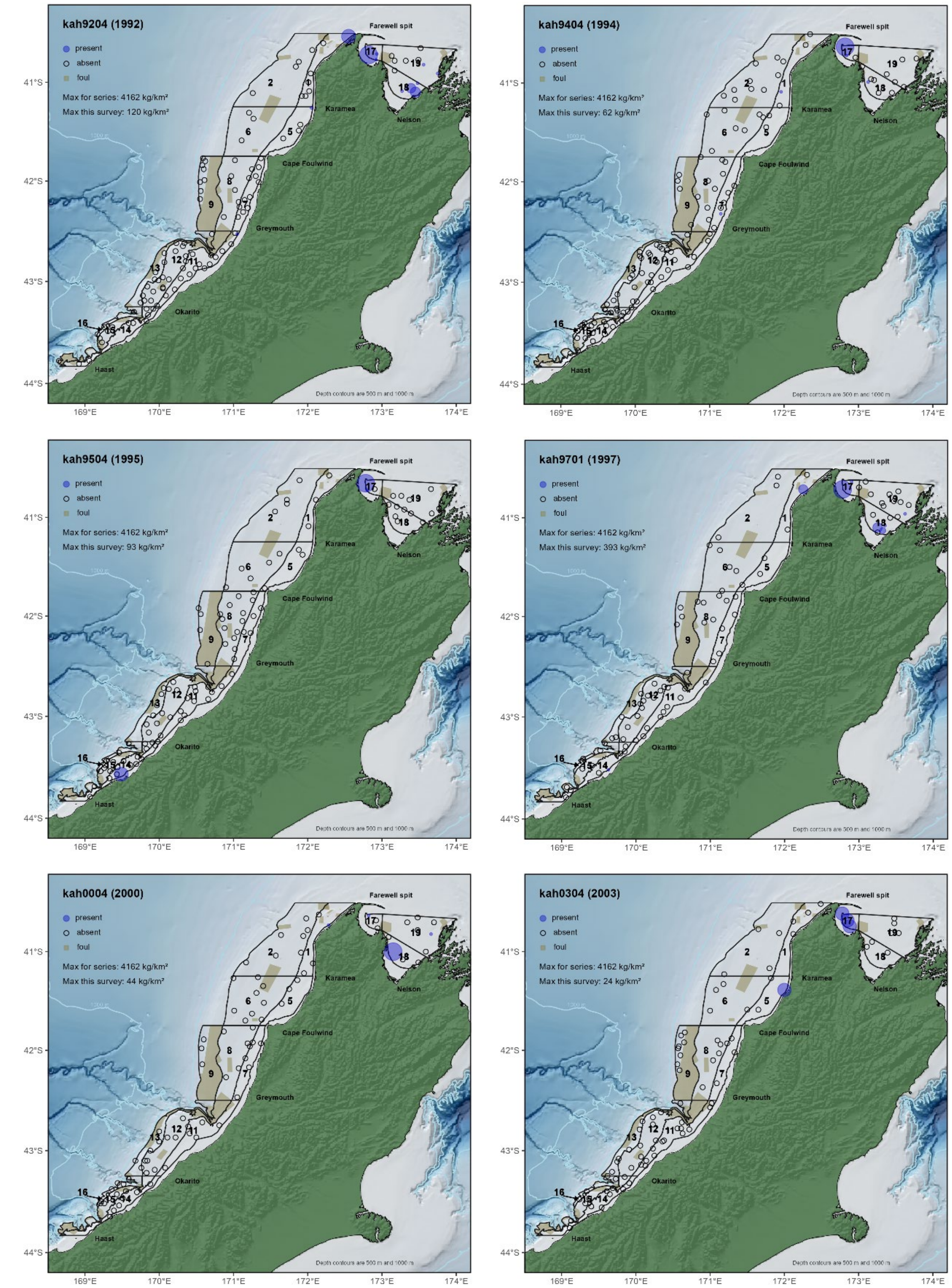


Figure 2: (f) Catch rates (kg km^{-2}) and distribution of snapper.

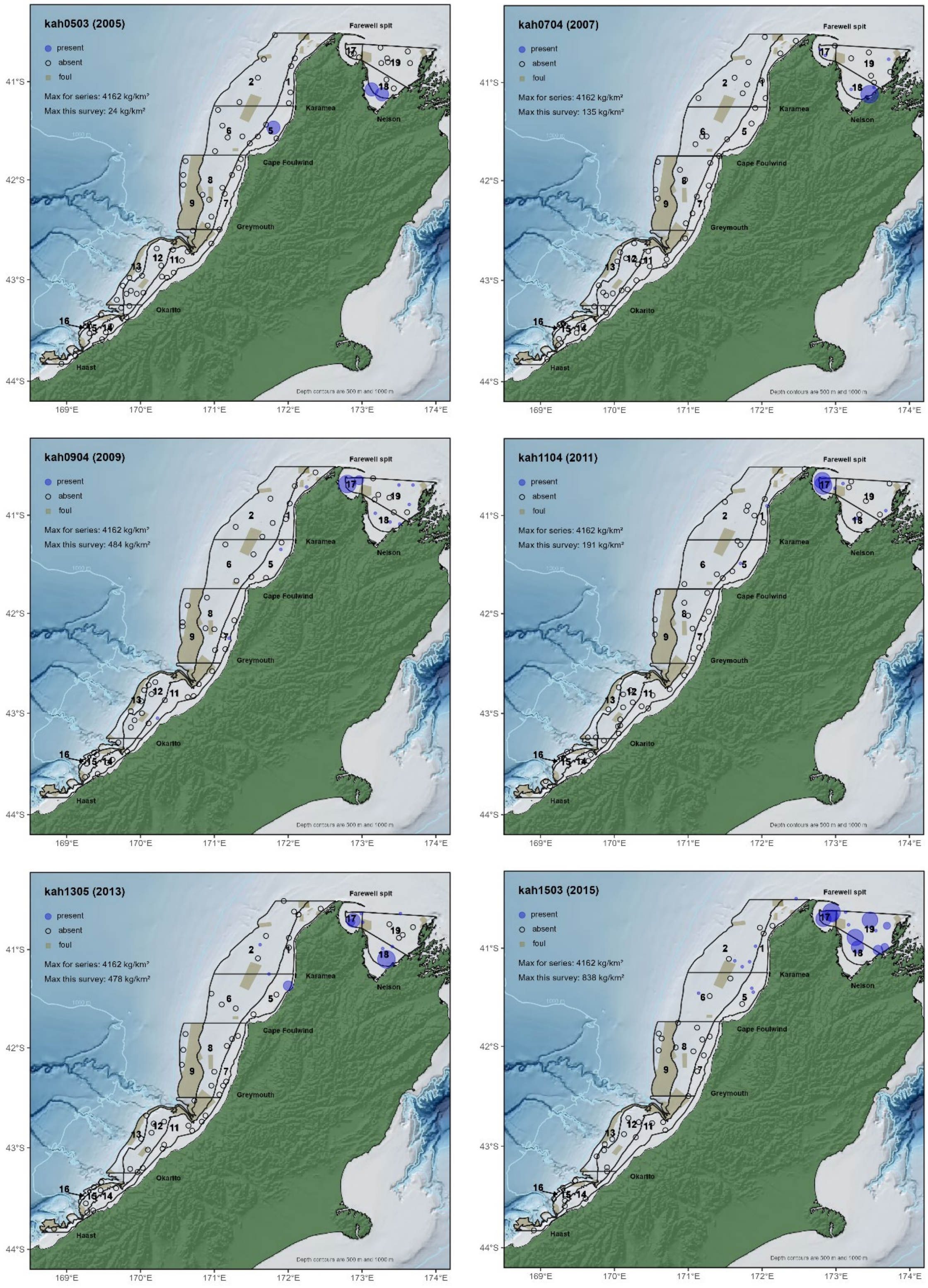


Figure 2: (f, continued) Catch rates (kg km^{-2}) and distribution of snapper.

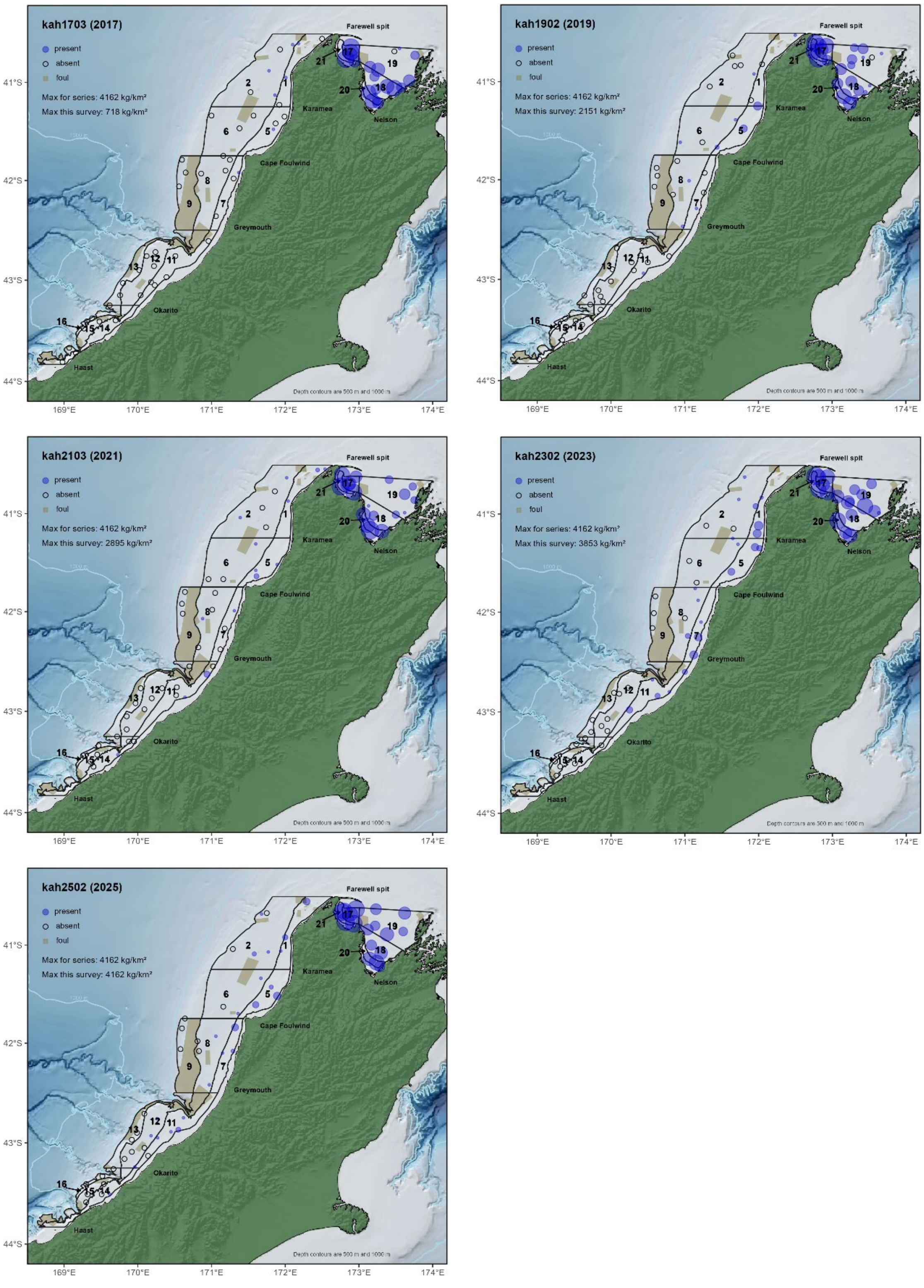


Figure 2: (f, continued) Catch rates (kg km^{-2}) and distribution of snapper.

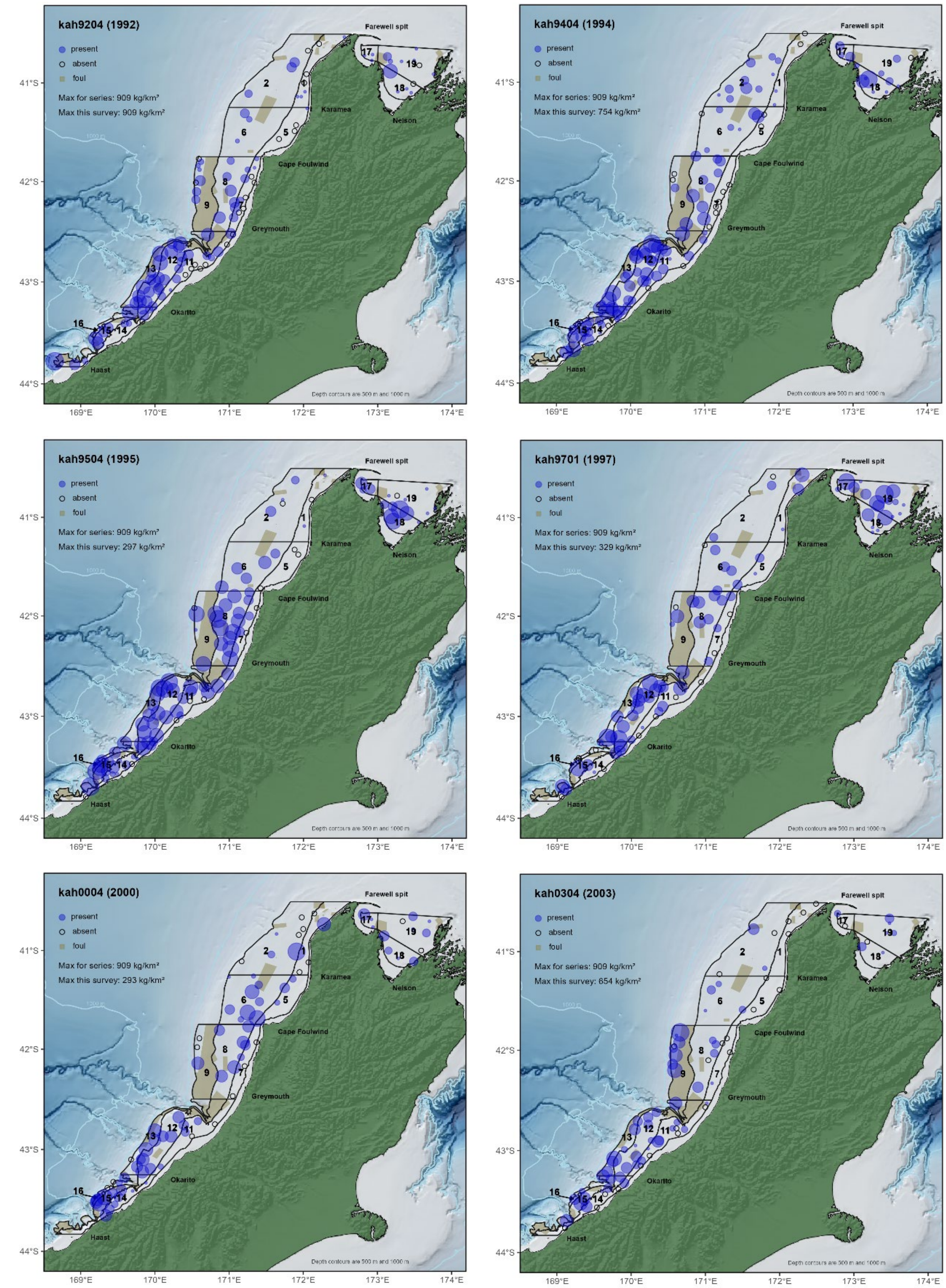


Figure 2: (g) Catch rates (kg km^{-2}) and distribution of tarakihi.

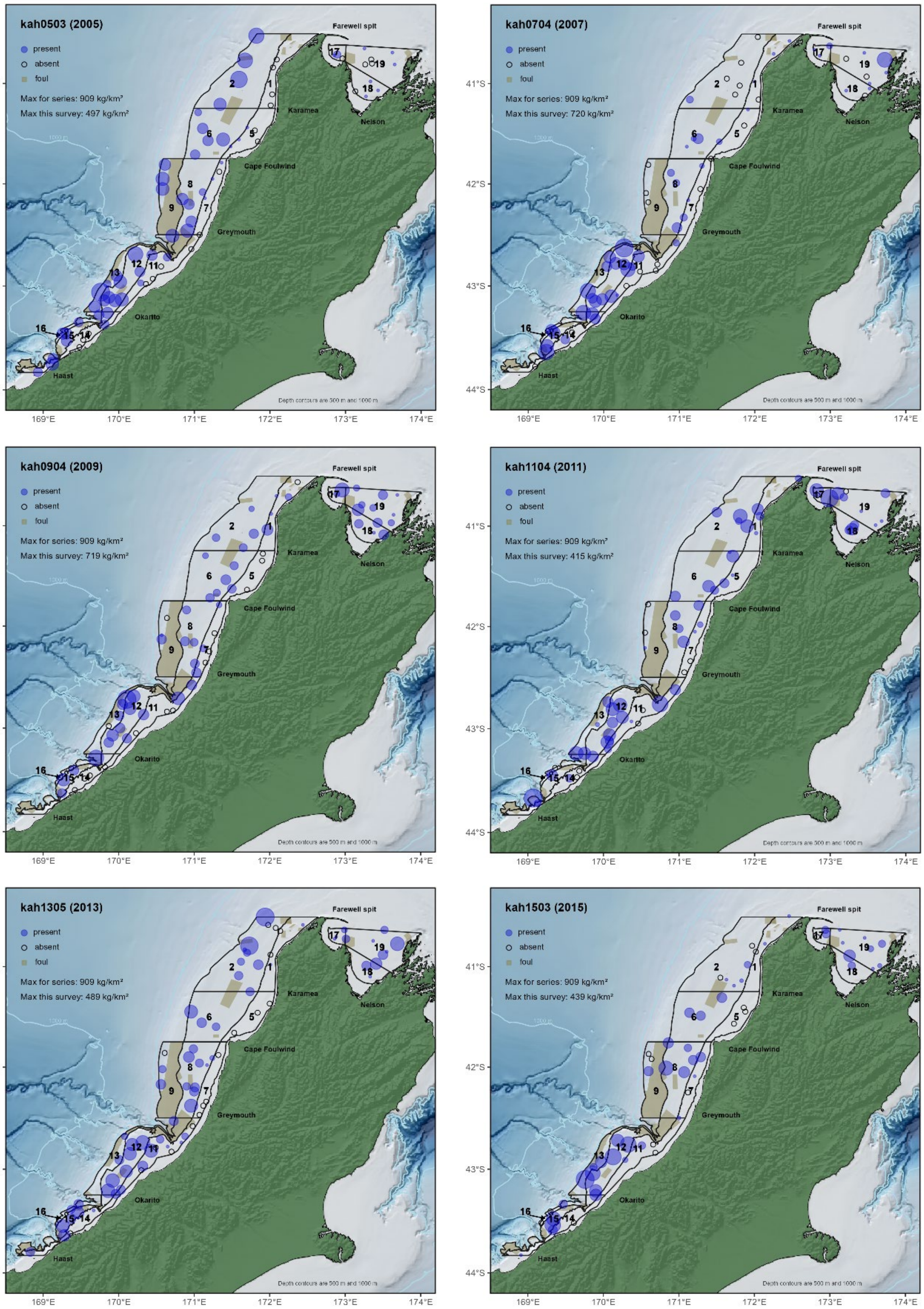


Figure 2: (g, continued) Catch rates (kg km^{-2}) and distribution of tarakihi.

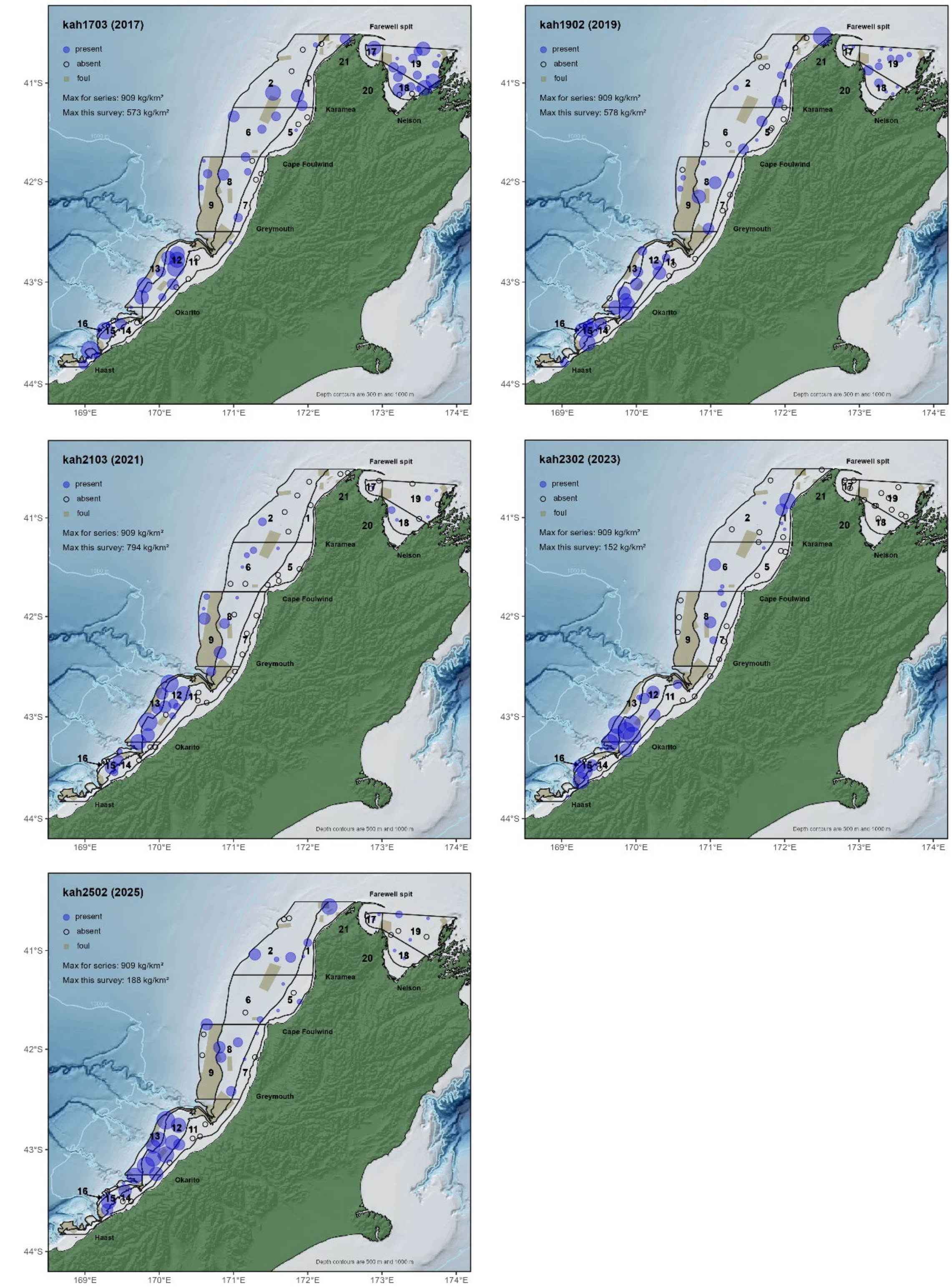


Figure 2: (g, continued) Catch rates (kg km^{-2}) and distribution of tarakihi.

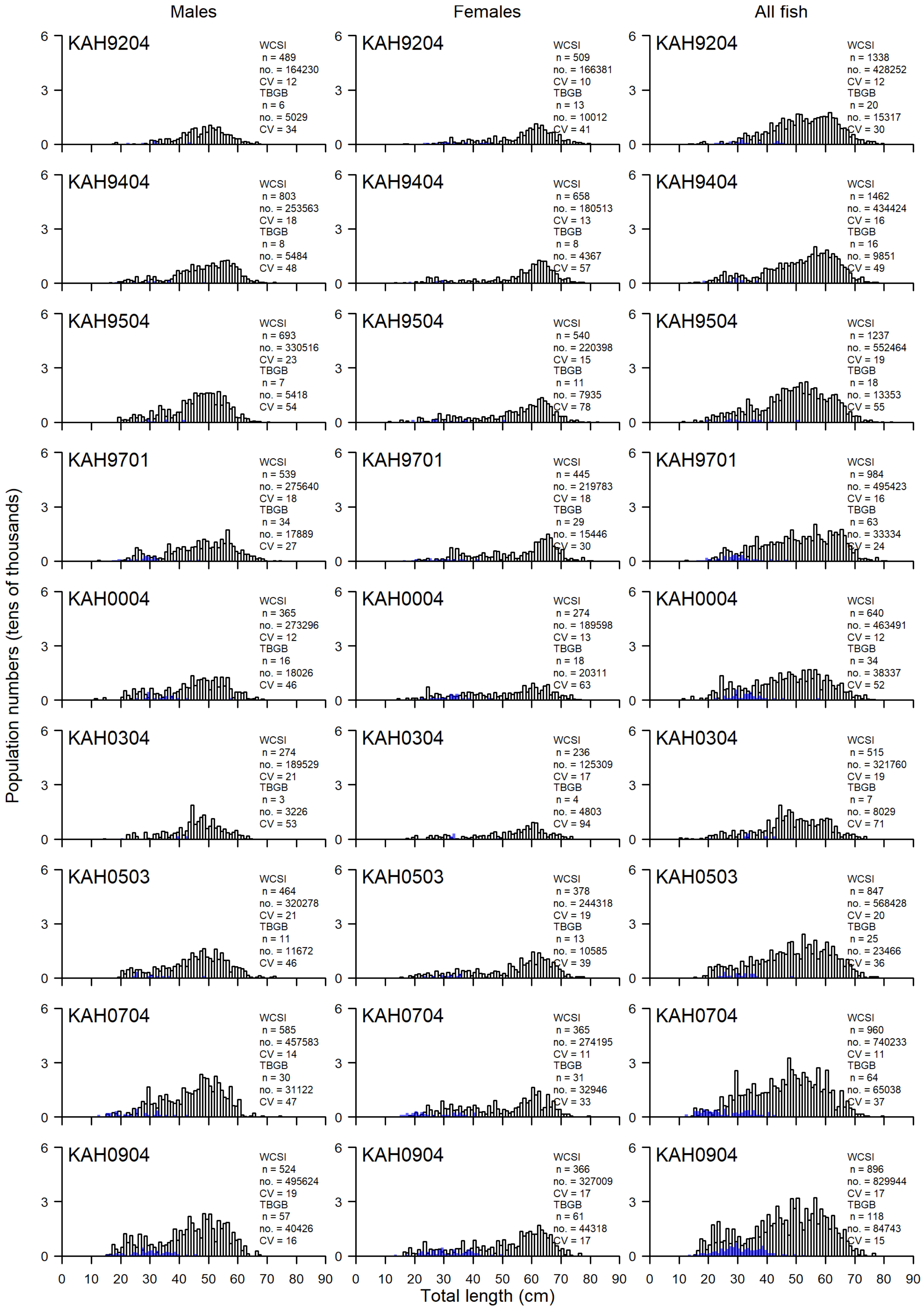


Figure 3: (a) Time series scaled population length frequencies with Tasman Bay and Golden Bay (TBGB) and west coast South Island (WCSI) for giant stargazer. n = number of fish measured, no. = scaled population number, CV = coefficient of variation. 'All fish' includes any unsexed fish. Blue bars indicate TBGB and black bars indicate west coast South Island. (Continued on next page)

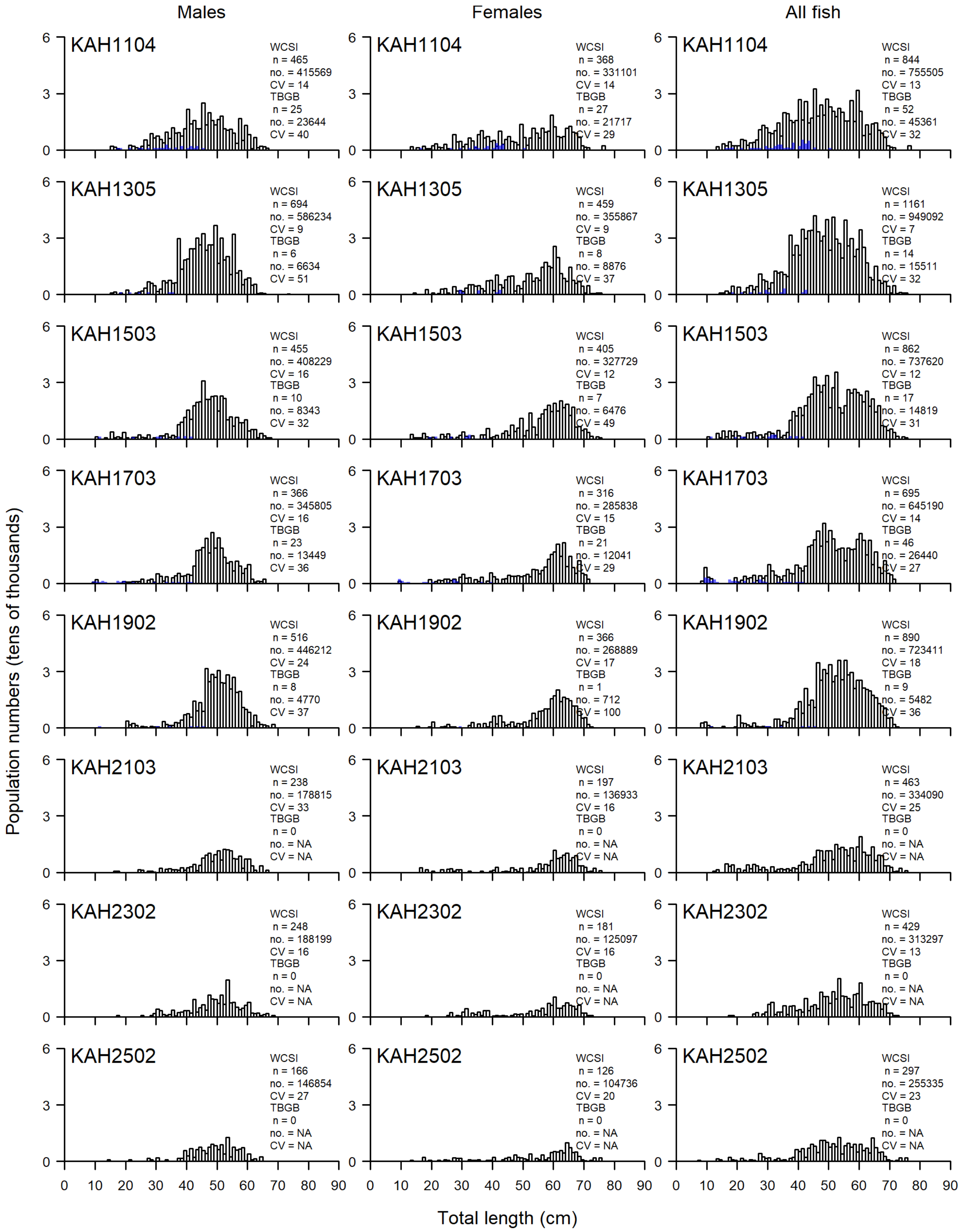


Figure 3: (a) Giant stargazer continued.

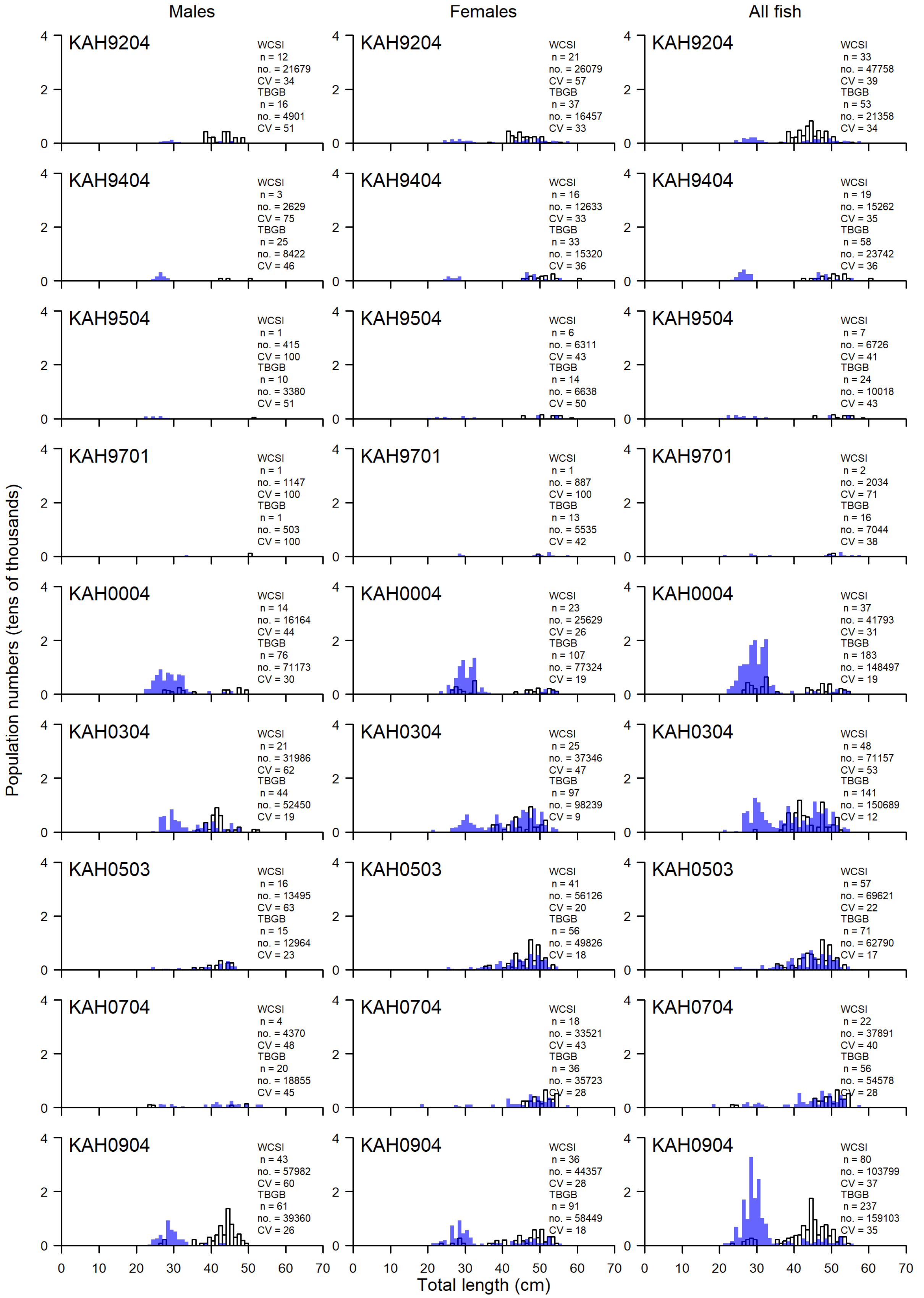


Figure 3: (b) John dory. See (a) for plot description.

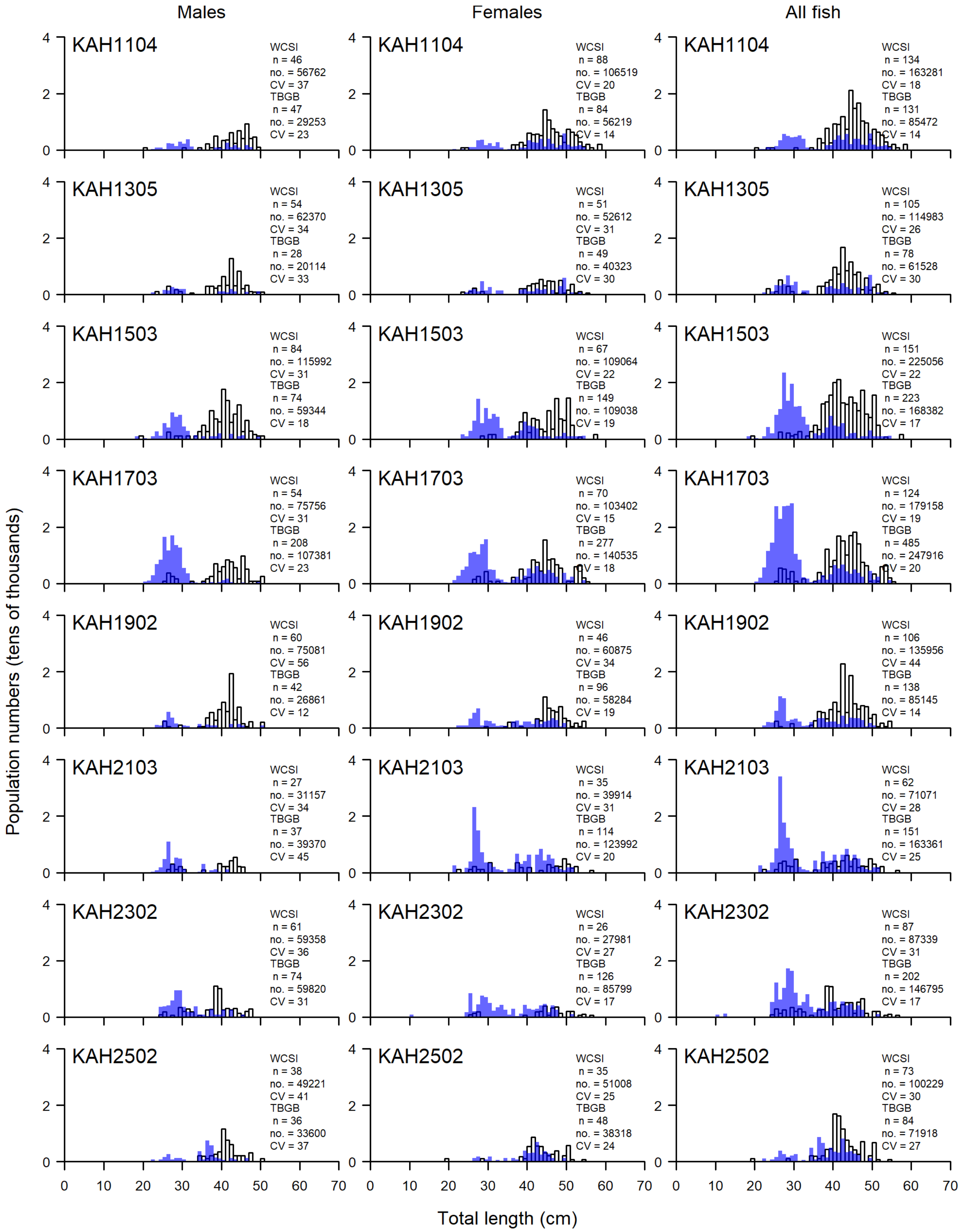


Figure 3: (b) John dory continued.

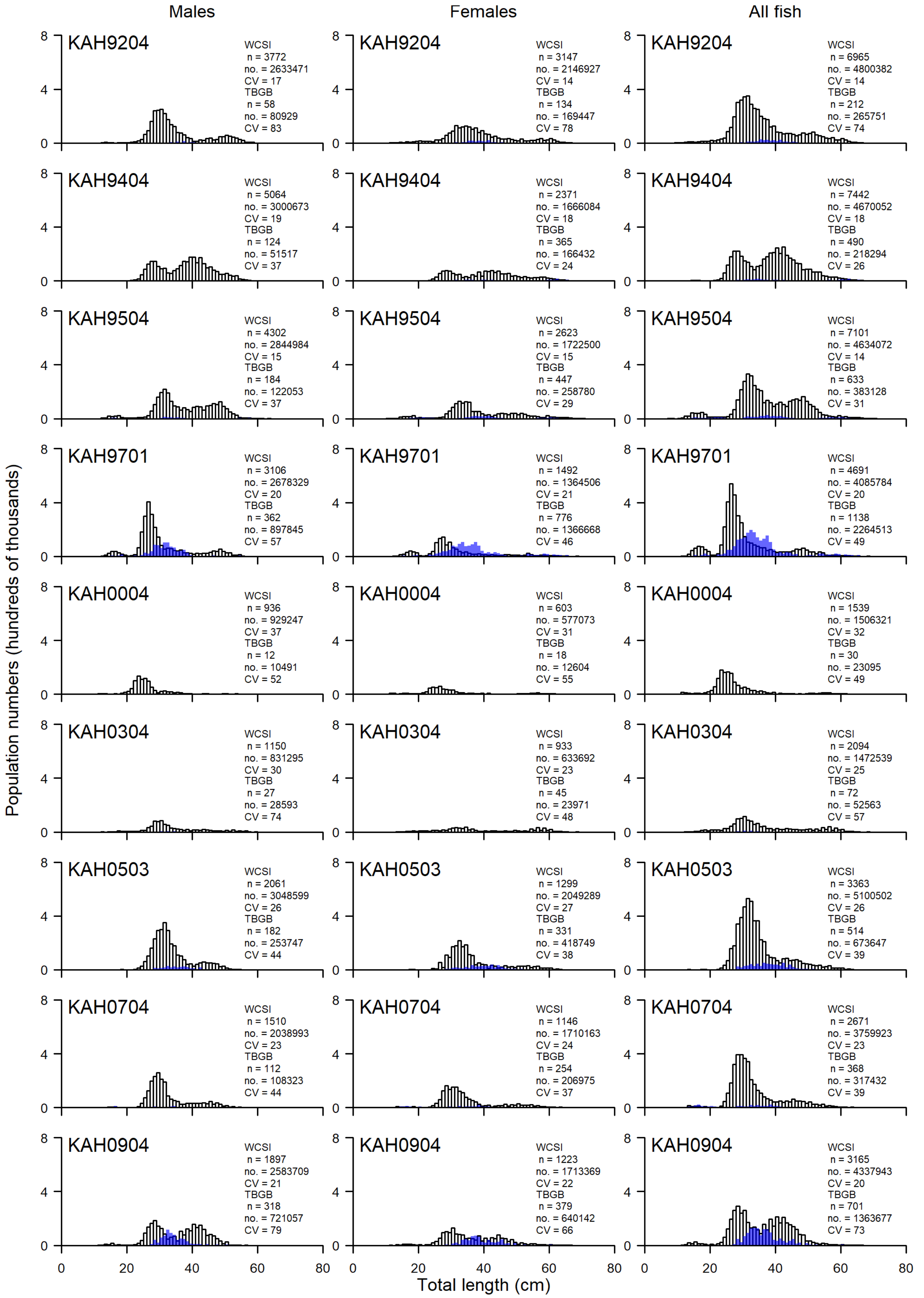


Figure 3: (c) Red cod. See (a) for plot description.

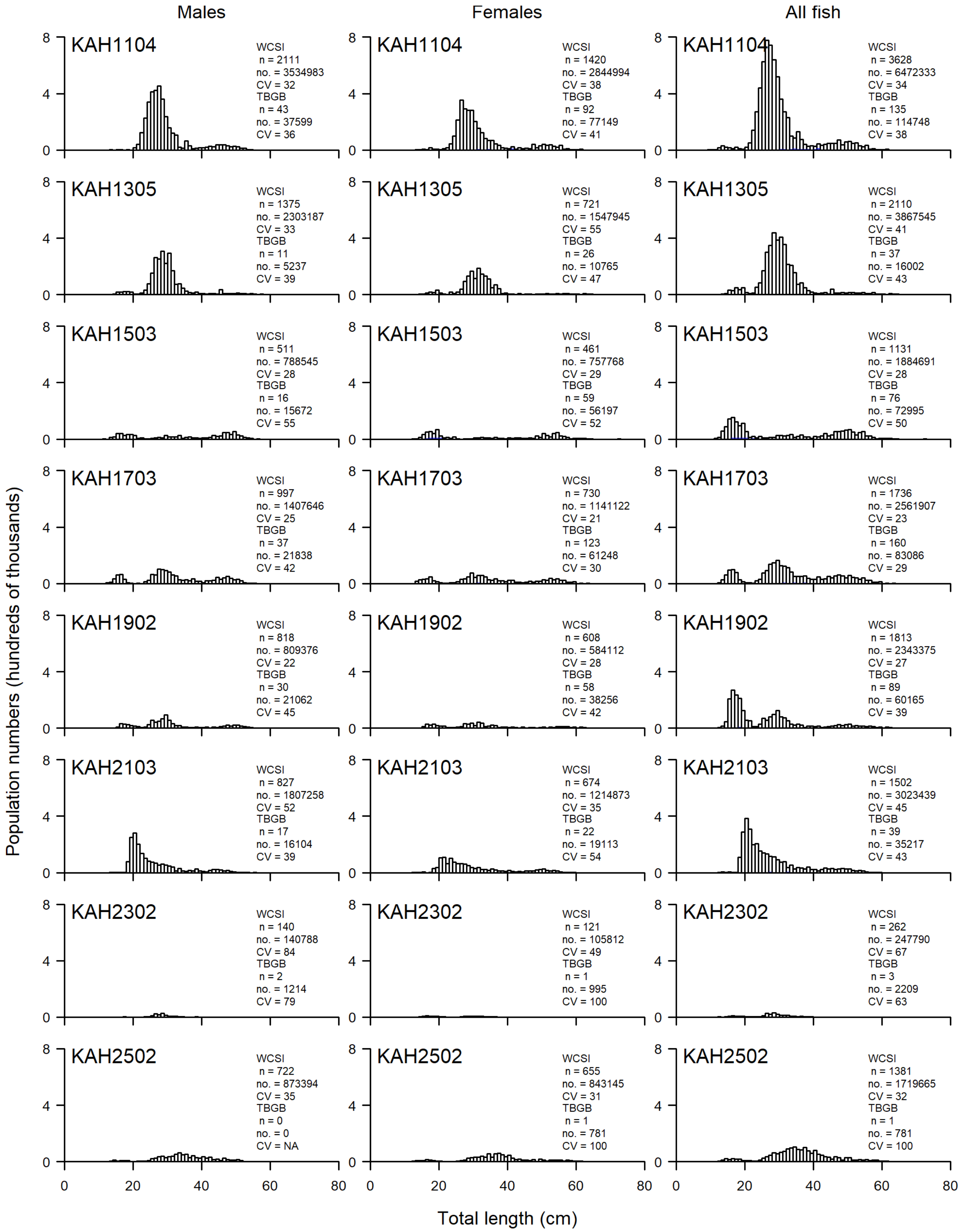


Figure 3: (c) Red cod continued.

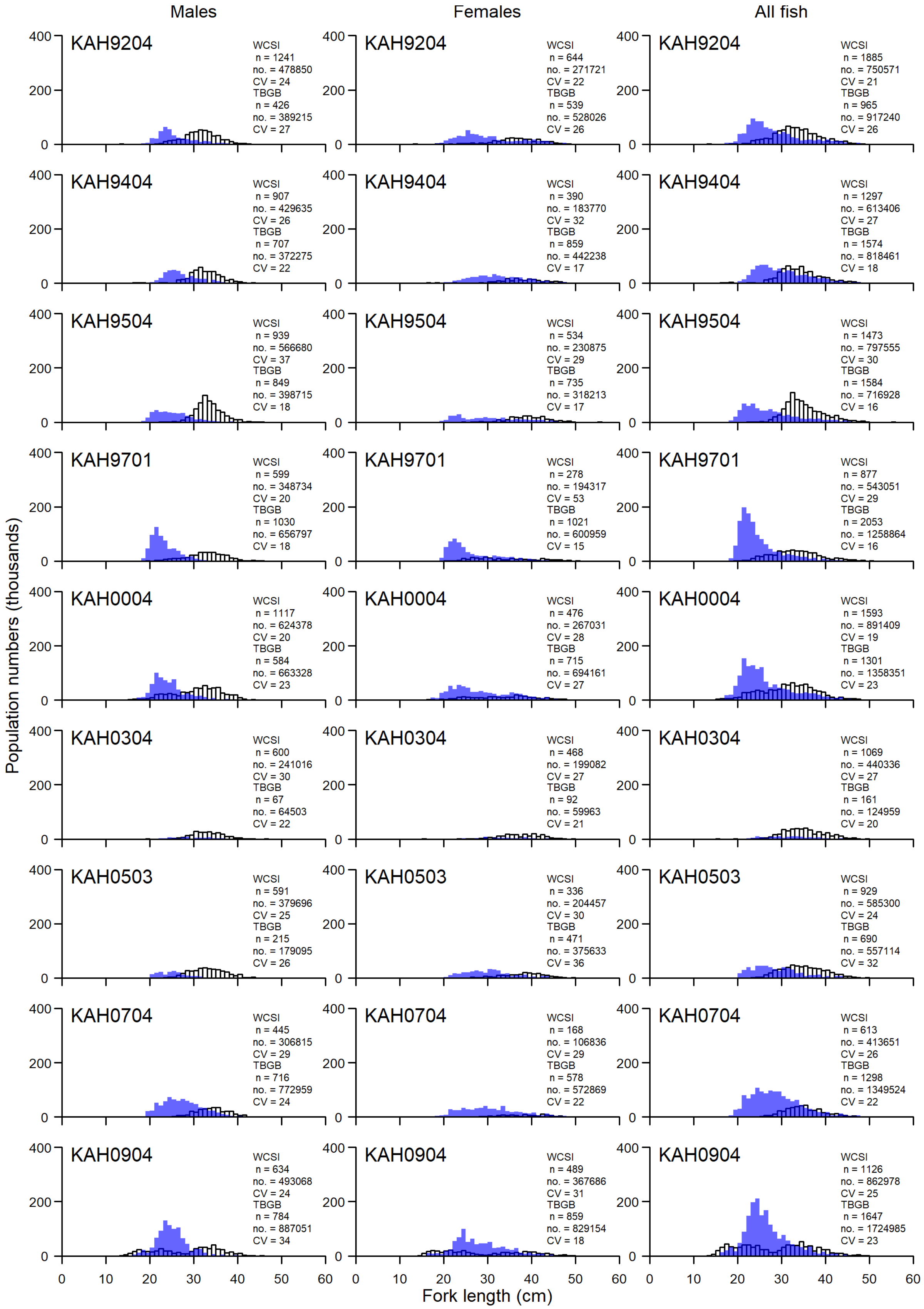


Figure 3: (d) Red gurnard. See (a) for plot description.

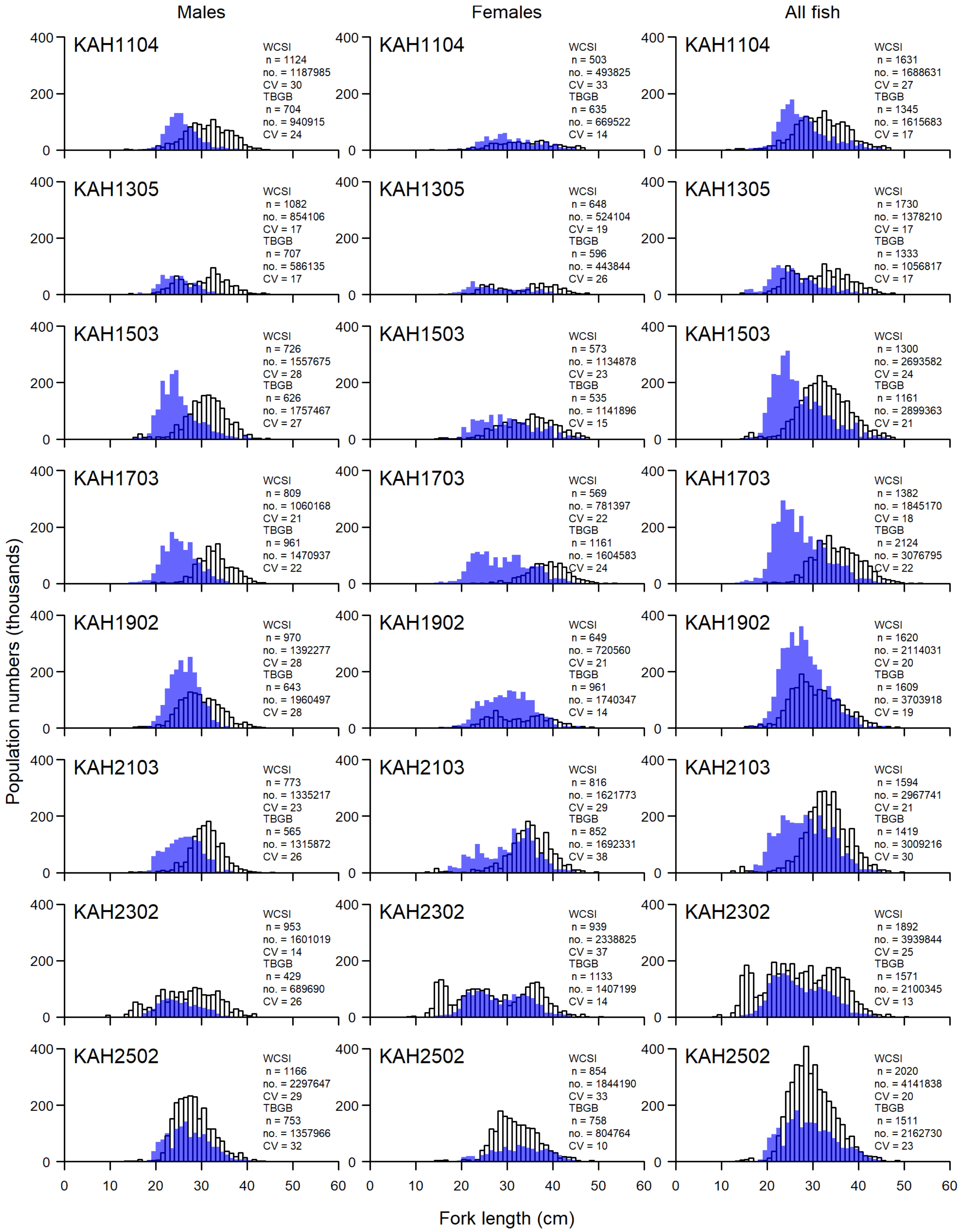


Figure 3: (d) Red gurnard continued.

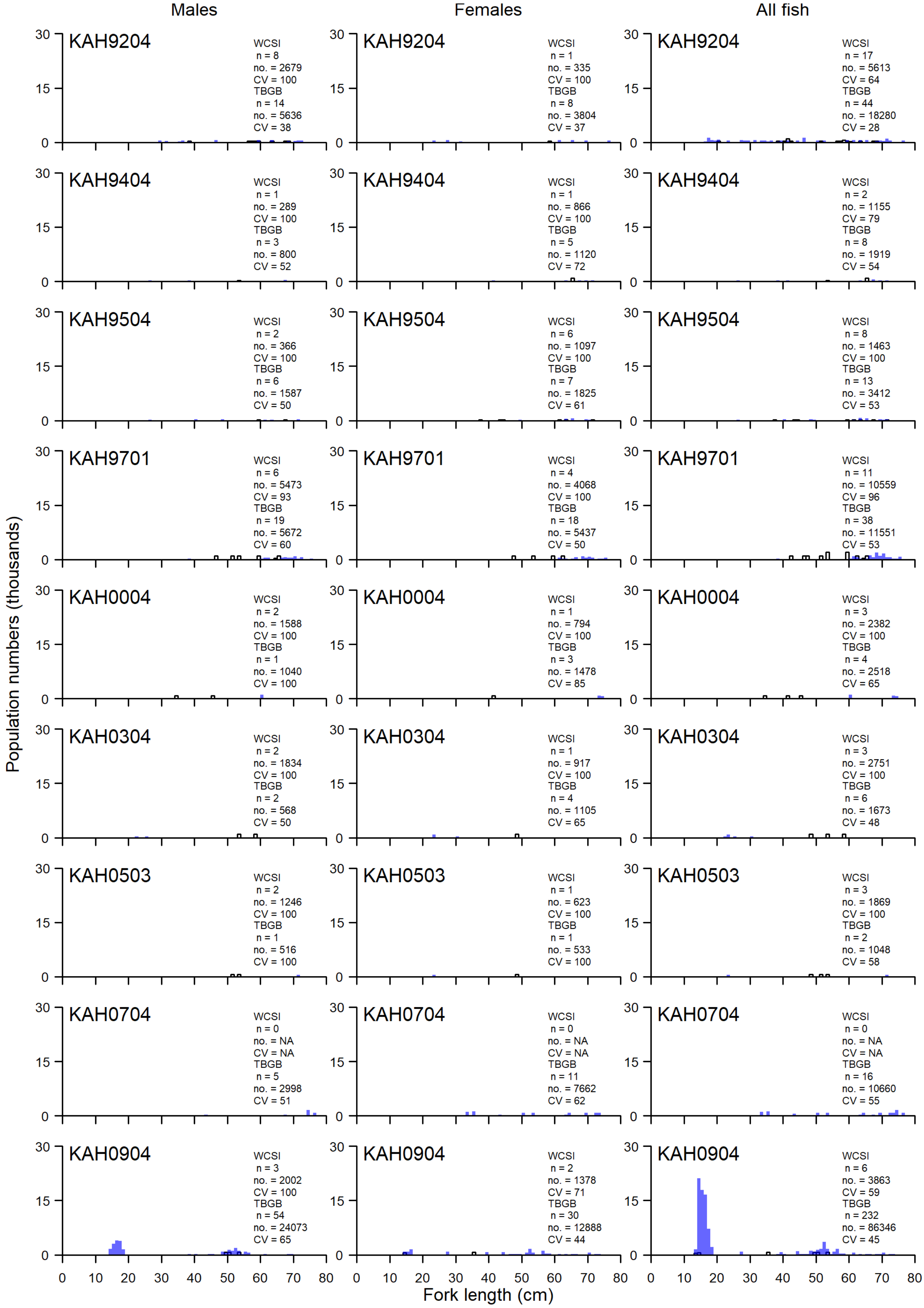
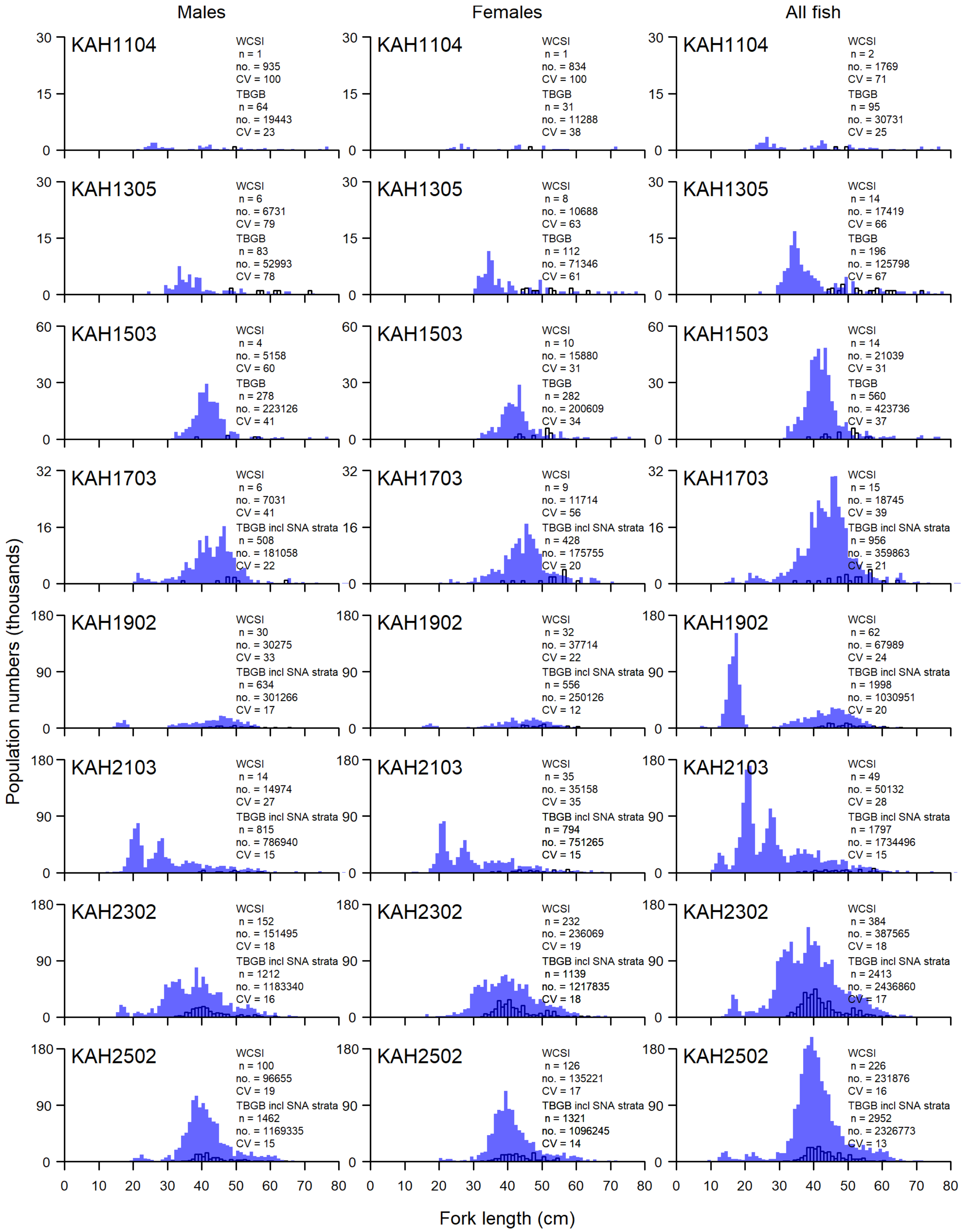


Figure 3: (e) Snapper. See (a) for plot description.


Males
Females
All fish
Population numbers (thousands)
Fork length (cm)
KAH1104
WCSI n = 1 no. = 935 CV = 100 TBGB n = 64 no. = 19443 CV = 23
KAH1104
WCSI n = 1 no. = 834 CV = 100 TBGB n = 31 no. = 11288 CV = 38
KAH1104
WCSI n = 2 no. = 1769 CV = 71 TBGB n = 95 no. = 30731 CV = 25
KAH1305
WCSI n = 6 no. = 6731 CV = 79 TBGB n = 83 no. = 52993 CV = 78
KAH1305
WCSI n = 8 no. = 10688 CV = 63 TBGB n = 112 no. = 71346 CV = 61
KAH1305
WCSI n = 14 no. = 17419 CV = 66 TBGB n = 196 no. = 125798 CV = 67
KAH1503
WCSI n = 4 no. = 5158 CV = 60 TBGB n = 278 no. = 223126 CV = 41
KAH1503
WCSI n = 10 no. = 15880 CV = 31 TBGB n = 282 no. = 200609 CV = 34
KAH1503
WCSI n = 14 no. = 21039 CV = 31 TBGB n = 560 no. = 423736 CV = 37
KAH1703
WCSI n = 6 no. = 7031 CV = 41 TBGB incl SNA strata n = 508 no. = 181058 CV = 22
KAH1703
WCSI n = 9 no. = 11714 CV = 56 TBGB incl SNA strata n = 428 no. = 175755 CV = 20
KAH1703
WCSI n = 15 no. = 18745 CV = 39 TBGB incl SNA strata n = 956 no. = 359863 CV = 21
KAH1902
WCSI n = 30 no. = 30275 CV = 33 TBGB incl SNA strata n = 634 no. = 301266 CV = 17
KAH1902
WCSI n = 32 no. = 37714 CV = 22 TBGB incl SNA strata n = 556 no. = 250126 CV = 12
KAH1902
WCSI n = 62 no. = 67989 CV = 24 TBGB incl SNA strata n = 1998 no. = 1030951 CV = 20
KAH2103
WCSI n = 14 no. = 14974 CV = 27 TBGB incl SNA strata n = 815 no. = 786940 CV = 15
KAH2103
WCSI n = 35 no. = 35158 CV = 35 TBGB incl SNA strata n = 794 no. = 751265 CV = 15
KAH2103
WCSI n = 49 no. = 50132 CV = 28 TBGB incl SNA strata n = 1797 no. = 1734496 CV = 15
KAH2302
WCSI n = 152 no. = 151495 CV = 18 TBGB incl SNA strata n = 1212 no. = 1183340 CV = 16
KAH2302
WCSI n = 232 no. = 236069 CV = 19 TBGB incl SNA strata n = 1139 no. = 1217835 CV = 18
KAH2302
WCSI n = 384 no. = 387565 CV = 18 TBGB incl SNA strata n = 2413 no. = 2436860 CV = 17
KAH2502
WCSI n = 100 no. = 96655 CV = 19 TBGB incl SNA strata n = 1462 no. = 1169335 CV = 15
KAH2502
WCSI n = 126 no. = 135221 CV = 17 TBGB incl SNA strata n = 1321 no. = 1096245 CV = 14
KAH2502
WCSI n = 226 no. = 231876 CV = 16 TBGB incl SNA strata n = 2952 no. = 2326773 CV = 13
0 10 20 30 40 50 60 70 80

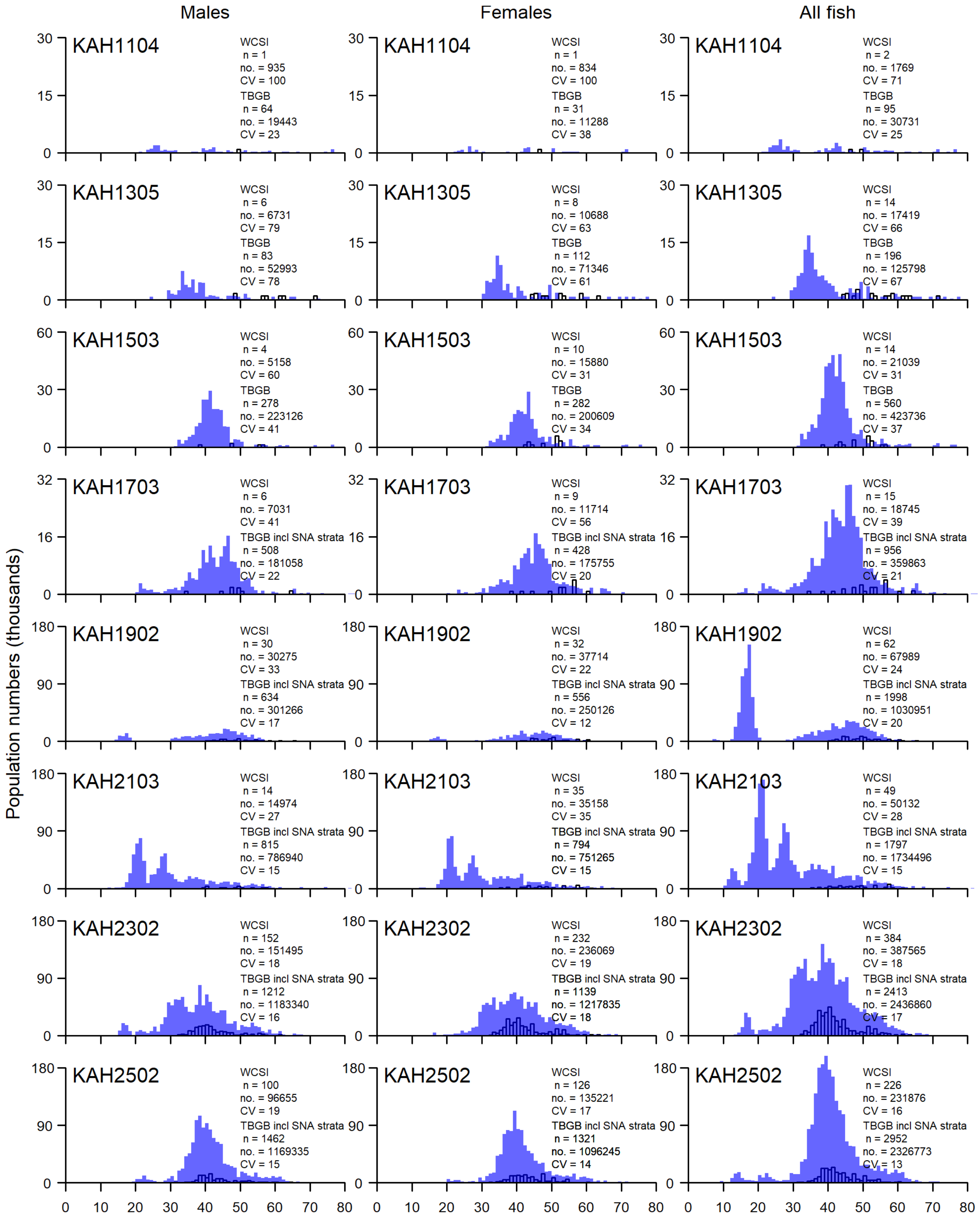


Figure 3: (e) Snapper continued.

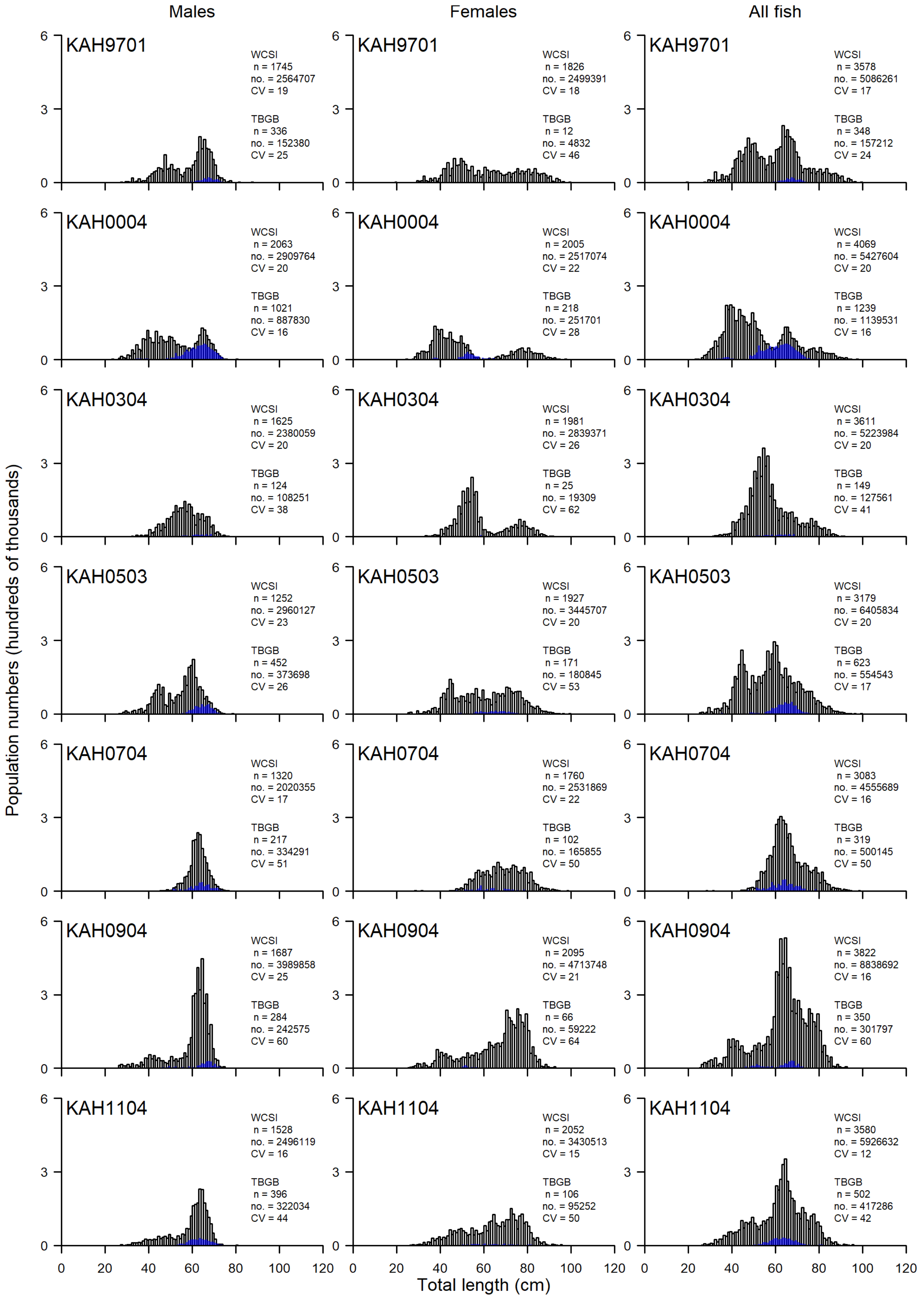


Figure 3: (f) Spiny dogfish. NB: spiny dogfish were not measured before 1997. See (a) for plot description.

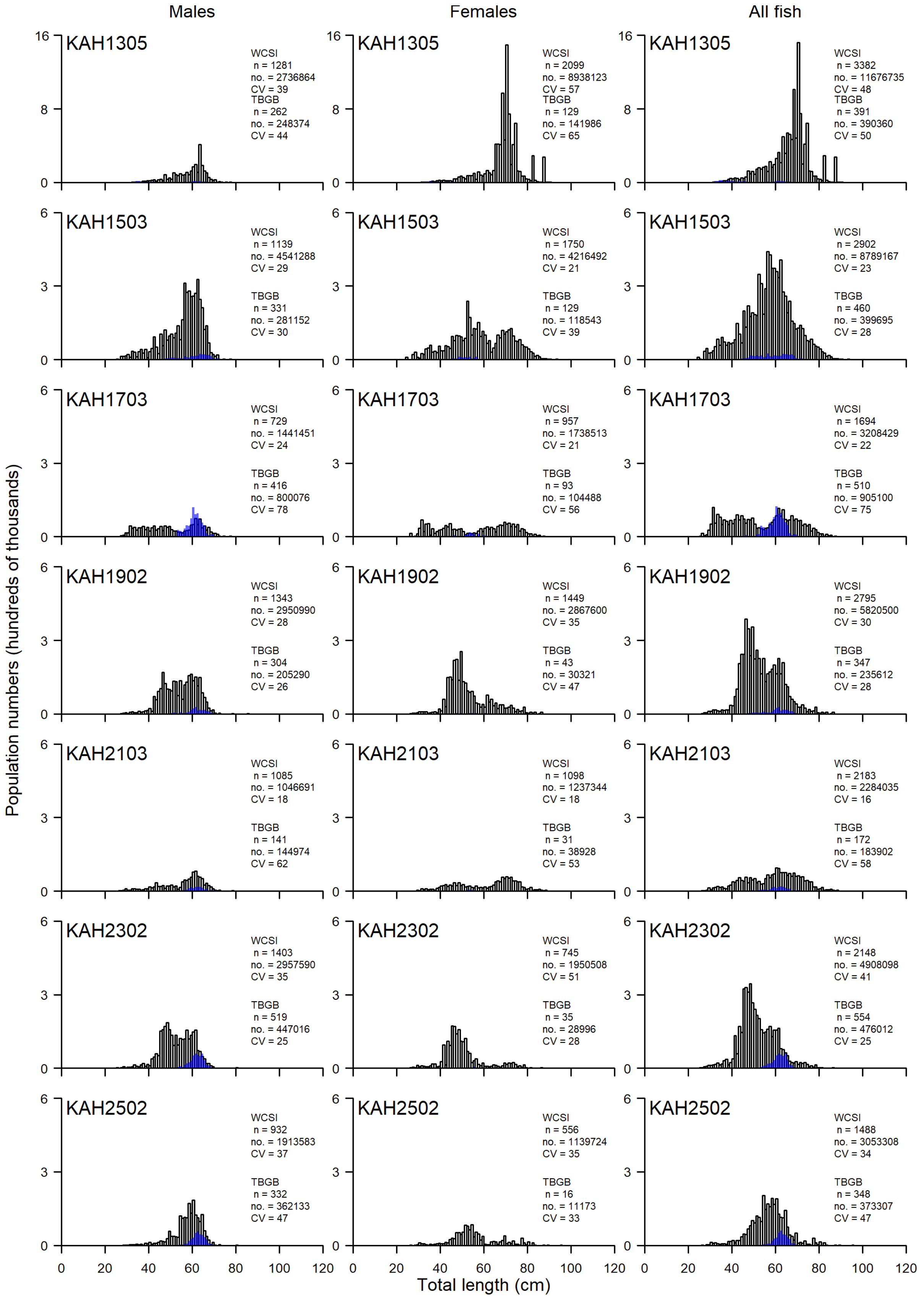


Figure 3: (f) Spiny dogfish continued.

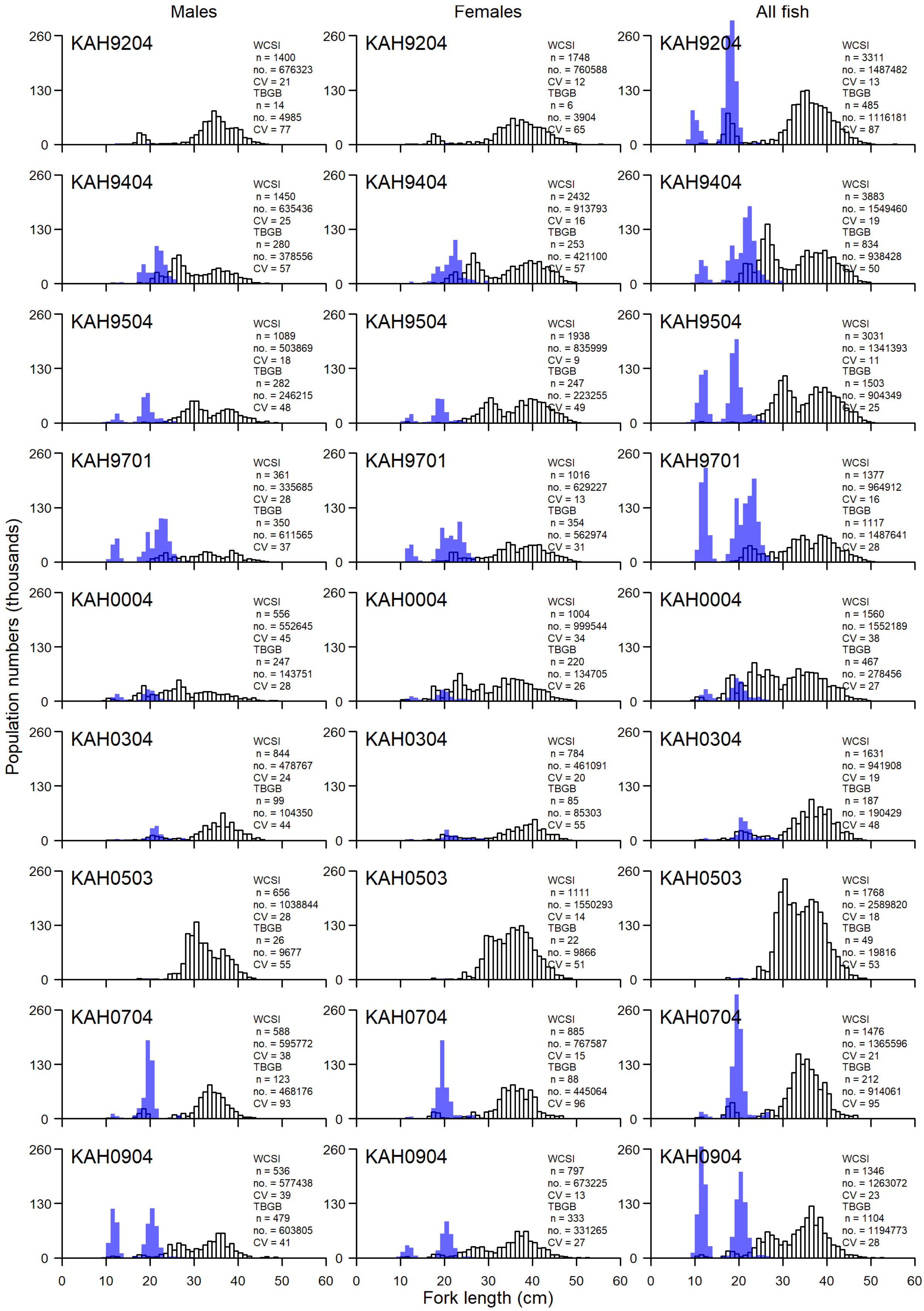


Figure 3: (g) Tarakihi. See (a) for plot description.

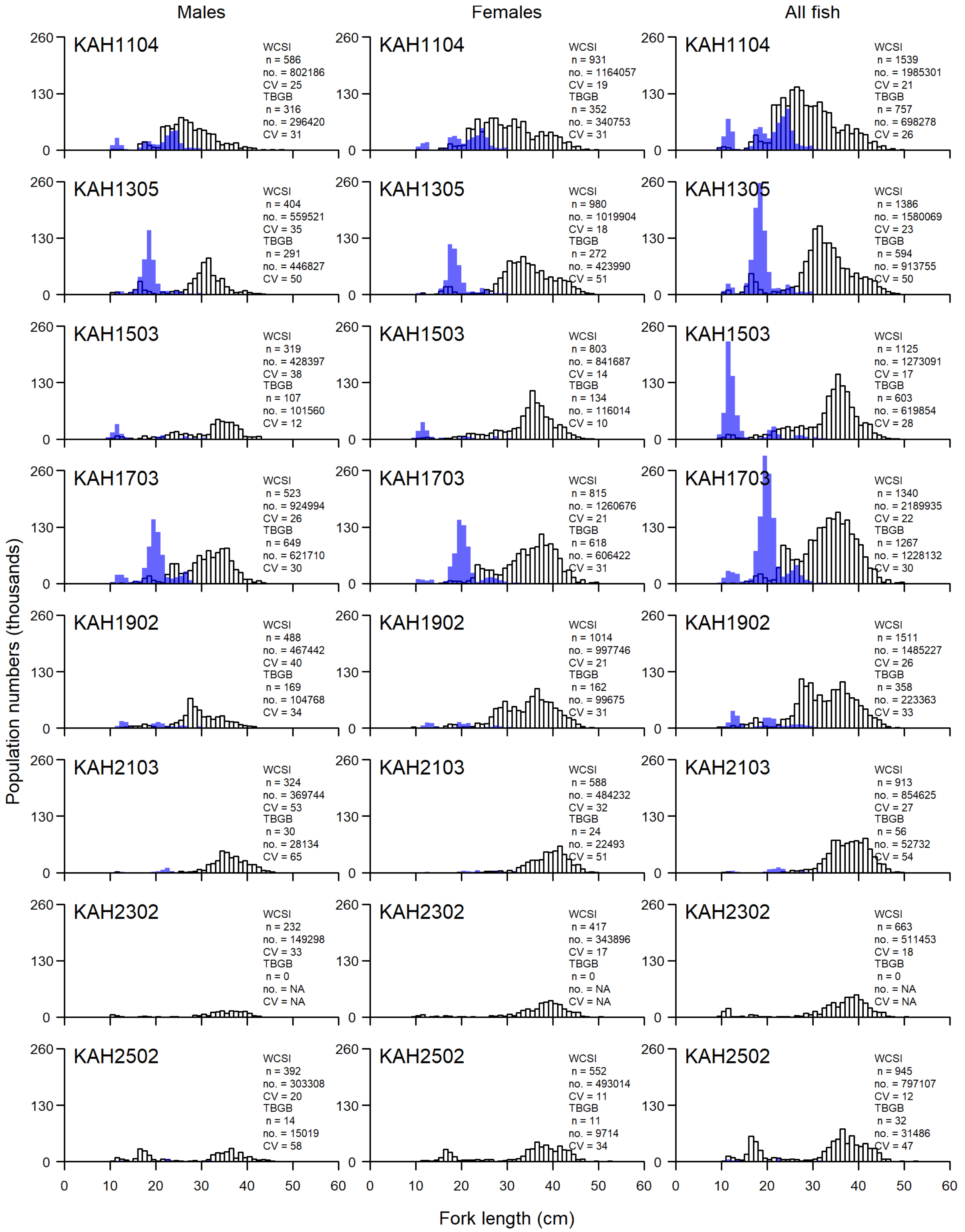


Figure 3: (g) Tarakihi continued.

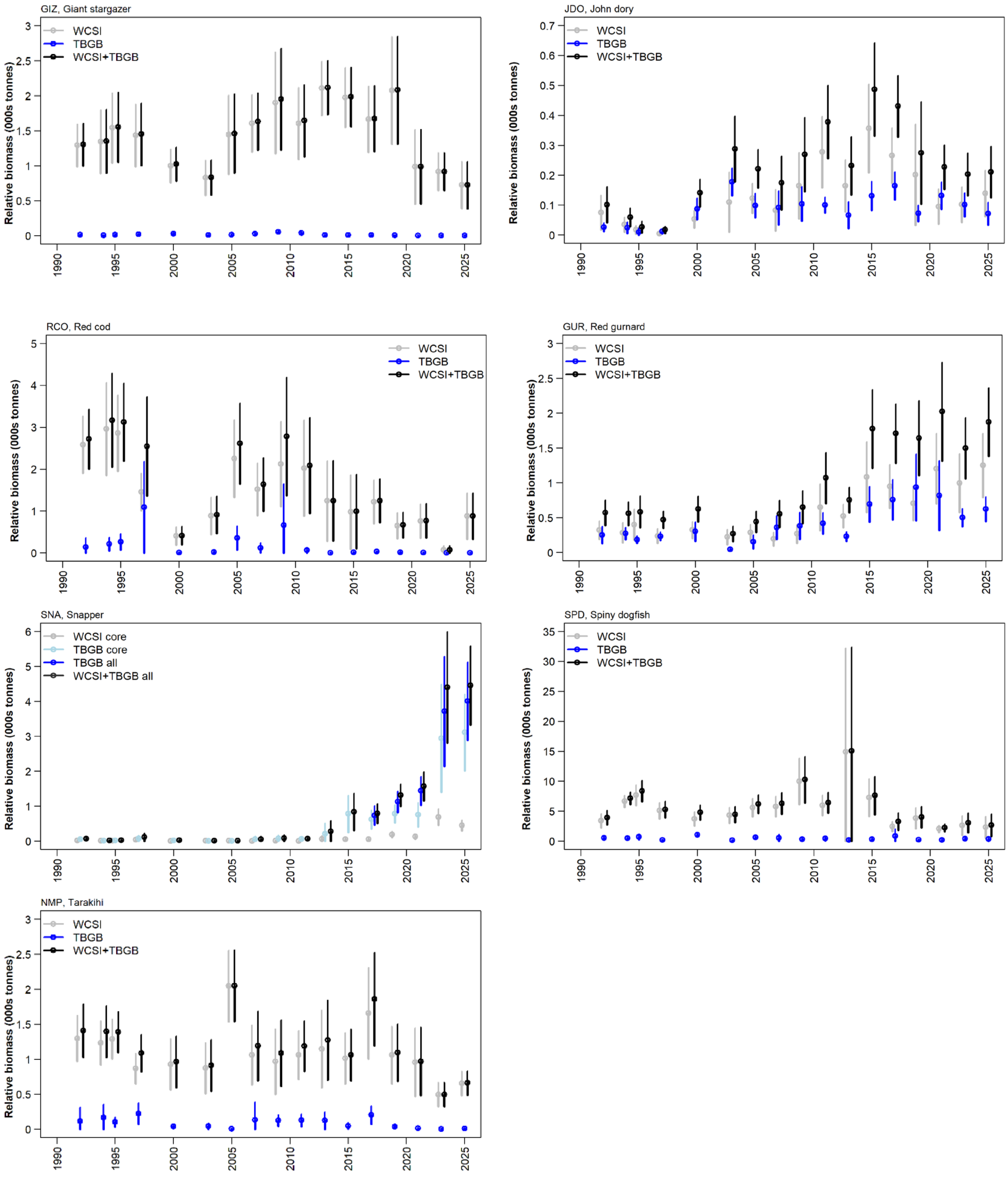


Figure 4: Trends in total biomass in the core strata of the target species for the west coast South Island time series. Error bars are ± two standard deviations. WCSI: core strata 1–16, TBGB: core strata 17–19, WCSI+TBGB: core strata 1–19. Snapper only: TBGB all (strata 17–21), WCSI+TBGB all (strata 1–21).

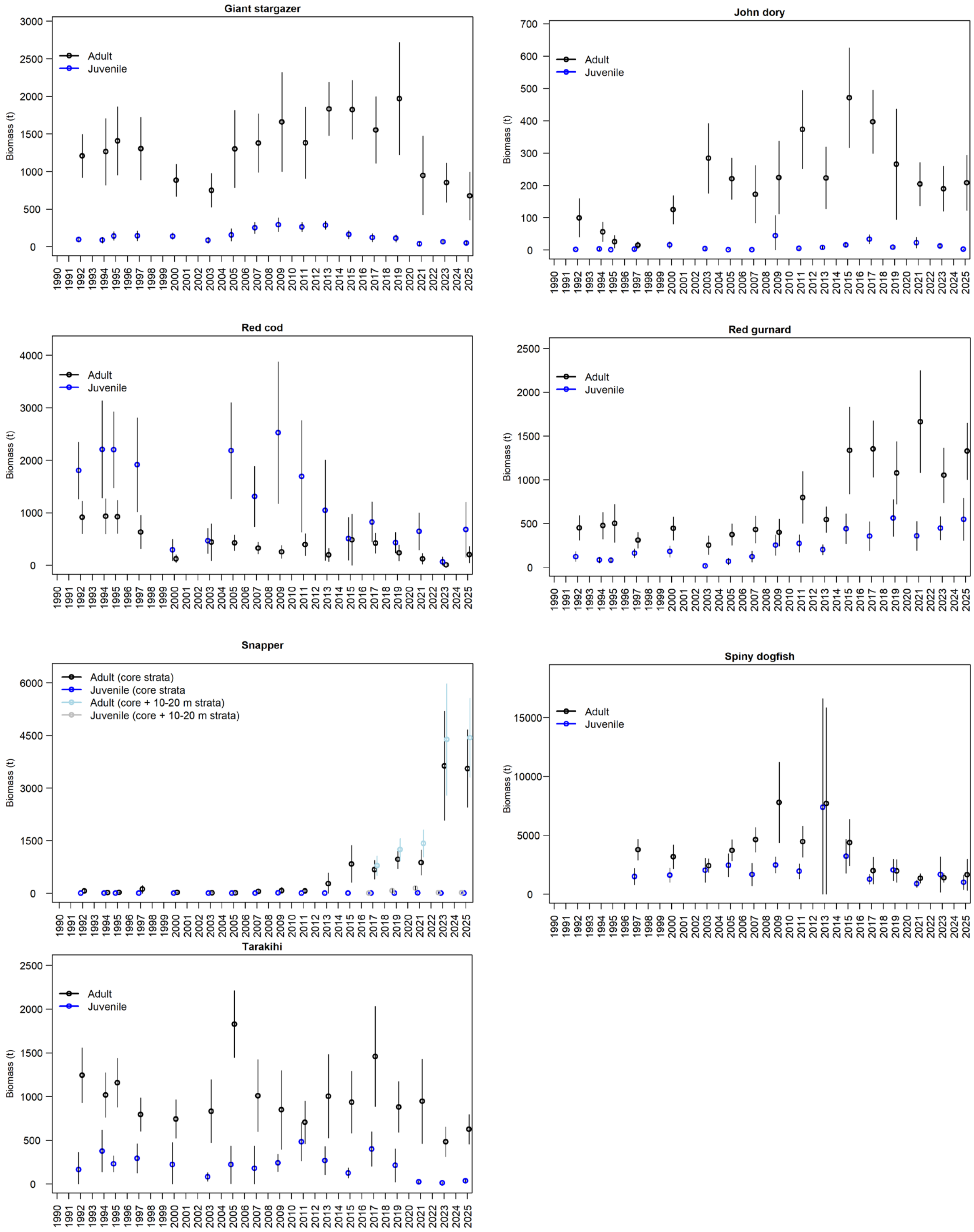


Figure 5: Biomass trends of juveniles and adults with 95% confidence intervals for the target species for both sexes combined for all WCSI surveys. For 50% maturity lengths, see Table 8.

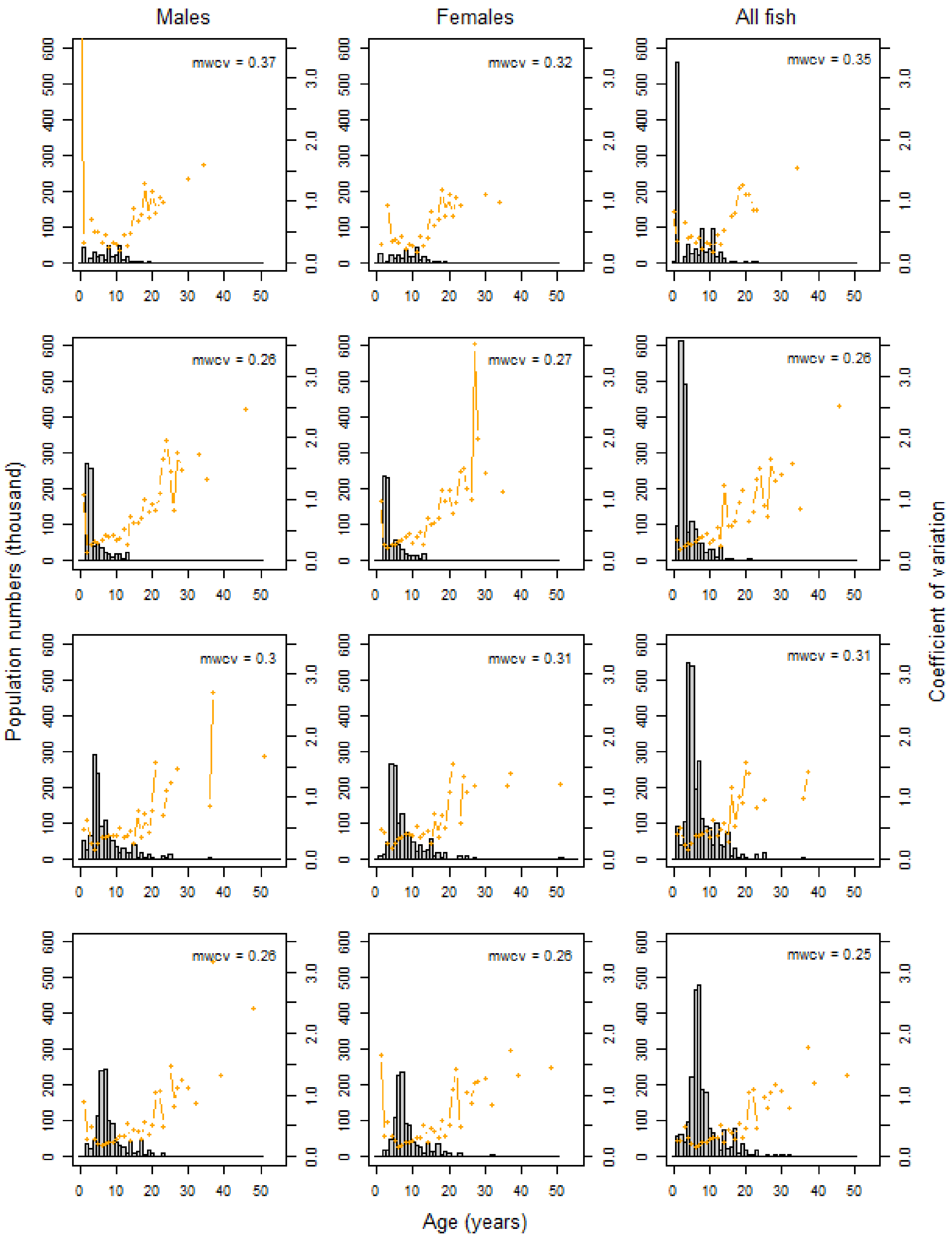


Figure 6: Scaled population numbers at age (histograms) and CV (yellow lines) for snapper from TBGB for the 2019, 2021, 2023 and 2025 surveys. NB: 'All fish' includes unsexed fish.

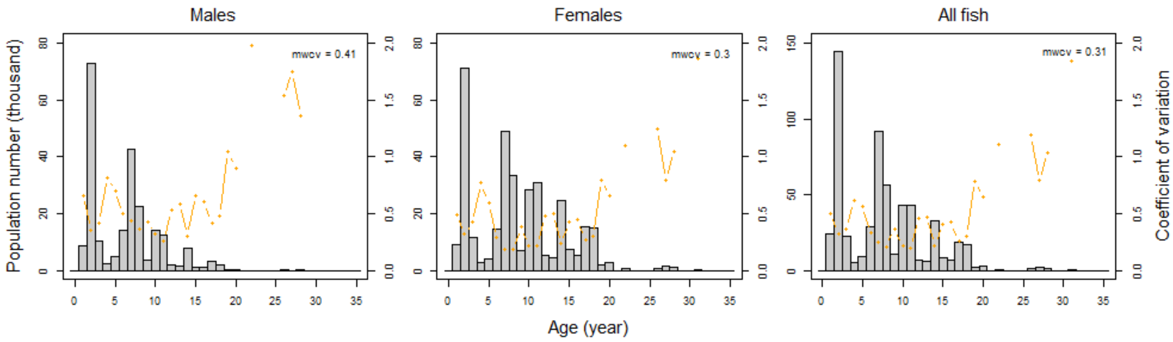


Figure 7: Scaled population numbers at age (histograms) and CV (yellow lines) for tarakihi from the 2025 survey. NB: 'All fish' includes unsexed fish.

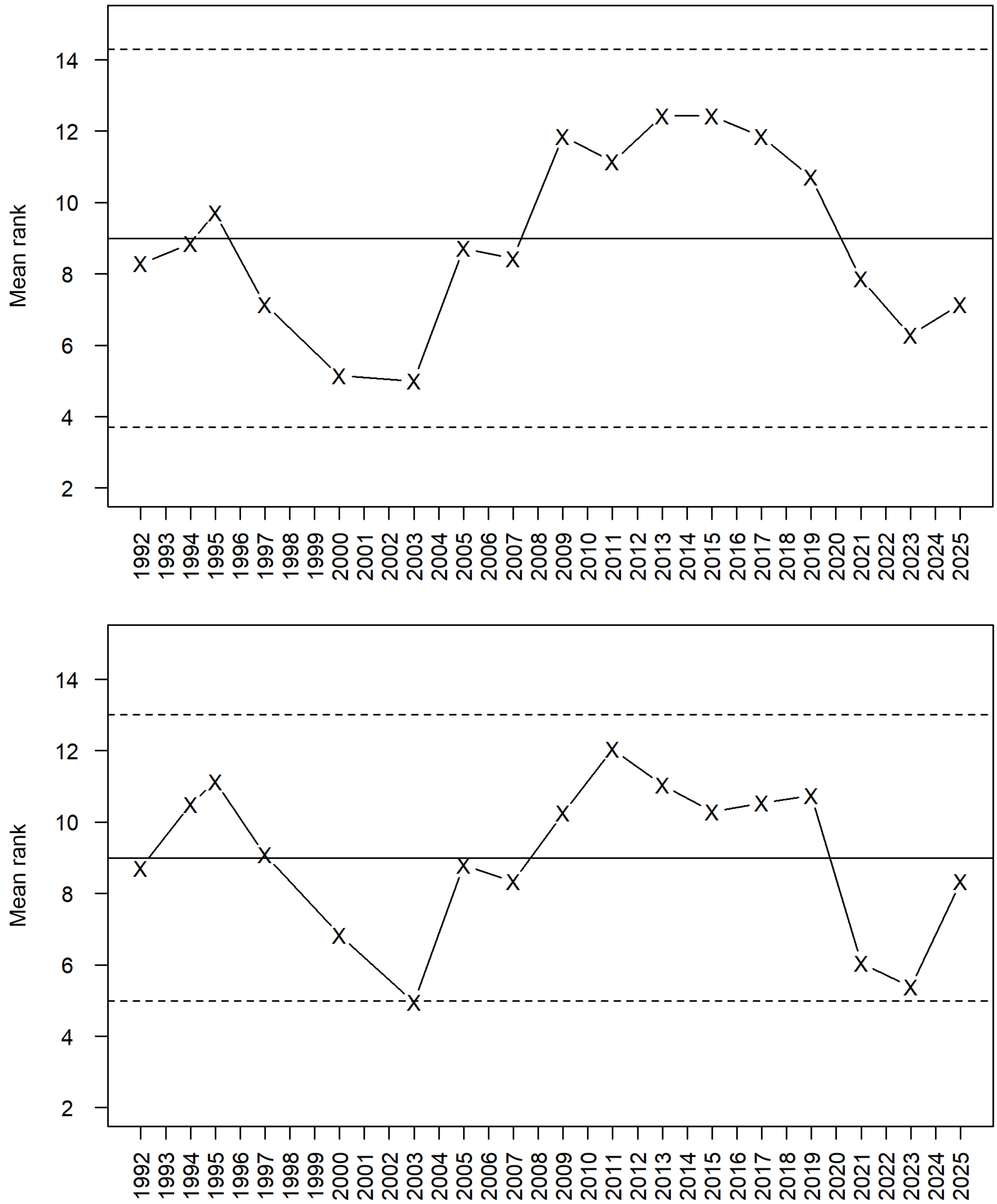


Figure 8: Mean ranks for the WCSI inshore trawl surveys. Upper plot: target species only: GIZ, JDO, RCO, GUR, SNA, SPD, NMP. Lower plot: target species plus BAR, JMD, LEA, SCH, SPO. The solid line indicates the overall mean rank. Mean ranks outside the dashed lines (95% confidence intervals) indicate extreme catchability. See Appendix 4 for definition of species codes.

APPENDIX 1: Maturity stages for teleosts and chondrichthyans

Teleost middle depths stage scale

Gonad stage		Males	Females
1	Immature	Testes small and translucent; threadlike or narrow membranes.	Ovaries small and translucent. No developing oocytes.
2	Resting	Testes thin and flabby; white or transparent.	Ovaries developed, but no developing eggs visible.
3	Ripening	Testes firm and well developed, but milt is present.	Ovaries contain visible developing eggs, but no hyaline eggs present.
4	Ripe	Testes large, well developed; milt is present and flows when testis is cut, but not when body is squeezed.	Some or all eggs hyaline, but eggs not extruded when body is squeezed.
5	Running ripe	Testis is large, well formed; milt flows easily under pressure on the body.	Eggs flow freely from the ovary when cut or the body is pressed.
6	Partially spent	Testis somewhat flabby and may be slightly bloodshot, but milt still flows freely under pressure on the body.	Ovary partially deflated, often bloodshot. Some hyaline and ovulated eggs present and flowing from a cut ovary or when the body is squeezed.
7	Spent	Testis is flabby and bloodshot. No milt in most of testes, but there may be some remaining near the lumen. Milt not easily expressed, even when present.	Ovary bloodshot; ovary wall may appear thick and white. Some residual ovulated eggs may be present but will not flow when body is squeezed.

Shark and skate stage scale

Males

1. Immature (claspers shorter than the pelvic fins)
2. Maturing (claspers at least as long as the pelvic fins but soft)
3. Mature (claspers longer than the pelvic fins and hard and firm)

Females

1. Immature (no eggs visible in the ovary larger than about 2 mm in diameter)
2. Maturing (ovary contains eggs greater than 2 mm in diameter but no yolk apparent)
3. Mature (yolked eggs in the ovary, uterus small and firm)
4. Ripe (‘candle’ of eggs in the uterus, no embryos visible)
5. Running Ripe (embryos visible in the uterus)
6. Spent (no embryos in the ovary, ovary flabby and may be bloodshot. Yolked eggs may be present in the ovary)

APPENDIX 2: Length-weight relationship parameters

From the Fisheries New Zealand *rdb* database; n, sample size.

Species	α	β	r^2	*n*	Length range	Data source
Barracouta	0.005891	2.963647	99.63	406	13.2–91.4	*All surveys in this time series*
Blue warehou	0.015818	3.073884	99.26	1 517	9.0–69.6	*All surveys in this time series*
Gemfish	0.005008	3.067846	99.27	3 180	21.7–106.7	*All surveys in database*
Giant stargazer	0.014780	3.046398	98.68	239	14.2–76.2	KAH2502
Jack mackerel (*Trachurus declivis*)	0.010238	3.051162	99.32	6 217	4.9–56.5	*All surveys in database*
John dory	0.015465	3.024256	95.77	178	23.3–55.4	KAH2502
Ling	0.001699	3.233871	99.18	600	27.0–136.0	*All surveys in this time series*
Red cod	0.007793	3.035364	99.45	343	13.8–65.4	KAH2502
Red gurnard	0.008836	3.034194	98.56	648	14.3–50.4	KAH2502
Rig	0.004036	3.007750	99.29	1 960	32.2–147.0	*All surveys in this time series*
School shark	0.003225	3.086982	99.16	4 218	29.7–157.0	*All surveys in this time series*
Snapper	0.033805	2.882685	99.32	580	8.1–78.5	KAH2502
Spiny dogfish	0.002426	3.107112	95.53	555	29.8–96.9	KAH2502
Tarakihi	0.012642	3.107359	99.59	470	11.1–53.7	KAH2502

APPENDIX 3: Station details. Note: Stations with gear performance of 3 were not suitable for biomass estimation.

Station	Stratum	Gear performance	Date	Start of tow Time	Start of tow ° ' S	Start of tow ° ' E	End of tow ° ' S	End of tow ° ' E	Gear depth (m) Min.	Gear depth (m) Max.	Distance trawled (n. miles)	Headline height (m)	Doorspread (m)	Surface temp ° C	Bottom temp ° C	Warp length (m)
1	0019	1	22-Mar-25	626	40 40.10	173 37.12	40 42.88	173 35.63	55	60	3	4.2	69	18.2	15.5	200
2	0019	1	22-Mar-25	939	40 51.53	173 36.06	40 53.89	173 33.62	52	56	2.99	4.6	72.6	18.3	15.5	200
3	0019	1	22-Mar-25	1154	40 53.59	173 22.52	40 51.25	173 20.05	45	46	2.99	4.3	74.9	19.1	17.6	200
4	0019	1	22-Mar-25	1416	40 47.91	173 13.41	40 45.10	173 11.94	45	45	3.02	4.5	73.3	19	16.9	200
5	0019	1	23-Mar-25	616	40 37.99	173 13.51	40 41.08	173 13.96	48	50	3.1	4.3	72.2	18.5	15.4	200
6	0018	1	23-Mar-25	856	40 50.42	173 07.04	40 51.91	173 10.47	36	38	2.99	4.4	73.3	-	-	200
7	0018	1	23-Mar-25	1127	41 00.25	173 10.33	41 02.30	173 13.08	30	33	2.91	4.4	73.5	19.5	17.6	200
8	0018	1	23-Mar-25	1353	41 04.76	173 17.80	41 06.14	173 21.38	32	34	3.03	4.3	72.9	19.3	17.7	200
9	0020	3	24-Mar-25	618	41 05.66	173 04.38	-	-	-	-	-	-	-	19.8	19.5	200
10	0020	3	24-Mar-25	720	41 10.14	173 08.70	-	-	-	-	-	-	-	-	-	200
11	0020	1	24-Mar-25	821	41 10.68	173 14.17	41 10.89	173 18.24	16	18	3.07	4.3	71.5	20.2	19.5	200
12	0020	3	24-Mar-25	1141	41 08.87	173 09.49	-	-	-	-	-	-	-	-	-	-
13	0020	3	24-Mar-25	-	-	-	-	-	-	-	-	-	-	-	-	-
14	0020	3	24-Mar-25	1350	41 03.98	173 04.01	41 03.65	173 03.95	-	-	-	-	-	-	-	-
15	0020	3	24-Mar-25	1502	41 01.05	173 03.47	41 01.49	173 03.57	-	-	-	-	-	-	-	-
16	0020	1	25-Mar-25	626	41 13.02	173 16.70	41 12.49	173 14.02	14	15	2.08	4.4	71	20.3	19.7	200
17	0020	1	25-Mar-25	805	41 08.15	173 08.27	41 06.07	173 05.41	16	17	2.99	4.4	69.8	19.8	19.4	200
18	0017	1	26-Mar-25	621	40 40.81	172 53.43	40 41.93	172 57.08	30	33	2.98	4.3	74.5	18.9	17.5	200
19	0017	1	26-Mar-25	842	40 37.94	172 57.71	40 37.88	172 53.85	30	34	2.93	4.3	73.1	-	-	200
20	0017	3	26-Mar-25	1201	40 40.29	172 47.89	40 40.40	172 48.07	-	-	-	-	-	-	-	-
21	0021	2	26-Mar-25	1245	40 39.44	172 46.16	40 41.38	172 46.18	17	18	1.94	4.2	65.4	19.1	18.5	200
22	0021	3	26-Mar-25	-	40 43.59	172 45.43	-	-	-	-	-	-	-	-	-	-
23	0017	3	26-Mar-25	1547	40 43.42	172 52.34	-	-	-	-	-	-	-	-	-	-
24	0021	1	27-Mar-25	626	40 46.69	172 55.78	40 47.15	172 53.11	16	18	2.07	4.3	68.1	19	19.1	200
25	0021	2	27-Mar-25	909	40 45.32	172 49.02	40 44.43	172 47.30	18	19	1.57	4.2	67.8	18.9	18.7	200
26	0017	2	27-Mar-25	1148	40 39.03	172 47.92	40 40.04	172 49.55	23	25	1.59	4.2	70.4	19.1	17.8	200
27	0006	3	29-Mar-25	627	41 21.39	171 31.22	41 18.70	171 33.14	132	133	3.05	4.3	86.5	-	-	360
28	0006	1	29-Mar-25	857	41 20.58	171 40.13	41 17.97	171 42.10	121	122	3	4.2	84.9	17.7	13.4	340
29	0005	1	29-Mar-25	1117	41 25.66	171 48.66	41 28.08	171 46.32	51	51	2.98	4.5	76.1	17.5	14.5	200
30	0005	1	29-Mar-25	1332	41 31.41	171 53.19	41 34.01	171 51.08	29	30	3.04	4.6	74.9	17.5	16.1	200
31	0009	1	30-Mar-25	617	41 44.91	170 38.21	41 47.93	170 38.21	336	340	3.01	4.3	93.3	19.2	11.6	840
32	0009	1	30-Mar-25	824	41 51.22	170 35.83	41 54.22	170 35.83	392	396	3	4.4	92.2	19.1	10.8	940
33	0009	1	30-Mar-25	1105	42 03.49	170 34.93	42 06.47	170 34.97	338	349	2.98	4.4	94.2	18.9	12.1	840
34	0008	1	30-Mar-25	1403	42 05.02	170 50.04	42 02.12	170 49.10	192	194	2.98	4.2	88.2	17.9	13.2	520
35	0008	1	30-Mar-25	1548	41 59.02	170 48.86	41 56.04	170 49.59	194	195	3.02	4.2	88	19	13.2	520
36	0012	1	31-Mar-25	624	42 45.75	170 15.40	42 43.12	170 17.34	131	134	2.99	4.4	86.8	17.1	13.4	370
37	0013	1	31-Mar-25	858	42 42.60	170 05.29	42 45.17	170 03.14	214	242	3.01	4.3	88.7	18.7	12.7	620
38	0013	1	31-Mar-25	1127	42 53.95	169 59.68	42 56.73	169 58.38	254	262	2.93	4.4	89.7	17.2	12.6	660
39	0013	1	31-Mar-25	1326	42 58.15	169 55.24	42 59.68	169 51.66	271	279	3.03	4.3	95.6	17	12.3	720

APPENDIX 3: CONTINUED.

		Gear		Start of tow			End of tow		Gear depth (m)		Distance trawled	Headline	Doorspread	Surface temp	Bottom temp	Warp length
Station	Stratum	performance	Date	Time	° ' S	° ' E	° ' S	° ' E	Min.	Max.	(n. miles)	height (m)	(m)	° C	° C	(m)
40	0012	1	31-Mar-25	1541	43 05.50	169 55.07	43 08.25	169 53.65	170	172	2.93	4.5	91.6	17	13.3	470
41	0012	1	1-Apr-25	620	43 09.61	169 49.31	43 12.27	169 47.86	184	189	2.86	4.3	88.1	17.5	13.2	500
42	0016	1	1-Apr-25	826	43 15.51	169 40.25	43 16.53	169 36.43	236	278	2.96	4.3	88.2	17.1	12.8	710
43	0016	1	1-Apr-25	1042	43 19.64	169 31.16	43 20.94	169 27.43	281	316	3	4.2	94.2	16.4	12.7	800
44	0016	1	1-Apr-25	1318	43 24.61	169 18.27	43 26.66	169 15.21	330	340	3.02	4.2	99.2	16.8	11.5	840
45	0015	1	1-Apr-25	1542	43 30.83	169 19.01	43 28.51	169 21.54	125	129	2.95	4.2	87	17.5	13.5	350
46	0015	1	2-Apr-25	621	43 24.34	169 32.43	43 26.10	169 29.23	91	94	2.91	4.4	81.2	16.4	14	260
47	0014	1	2-Apr-25	851	43 30.53	169 37.29	43 32.20	169 34.04	26	26	2.88	4.5	73	16.6	16	200
48	0014	1	2-Apr-25	1052	43 30.43	169 30.47	43 32.89	169 27.97	55	56	3.05	4.4	73.8	16.3	14.9	200
49	0015	1	2-Apr-25	1311	43 35.34	169 17.71	43 37.90	169 15.47	112	117	3.03	4.5	85.3	17.2	13.5	320
50	0012	1	4-Apr-25	624	42 55.54	170 11.07	42 57.89	170 08.60	131	132	2.96	4.5	90.7	17.6	13.7	360
51	0012	1	4-Apr-25	819	43 02.99	170 05.39	43 05.46	170 03.13	124	125	2.97	4.5	89.2	17.8	14	350
52	0011	1	4-Apr-25	1029	43 07.86	170 08.28	43 10.29	170 05.56	40	44	3.13	4.9	74.5	17.1	17.1	200
53	0014	1	4-Apr-25	1230	43 14.34	169 57.44	43 16.64	169 54.84	95	95	2.97	4.5	83	17.7	15.1	270
54	0011	1	5-Apr-25	624	42 57.16	170 16.11	42 54.65	170 18.23	88	92	2.95	4.8	82.2	17.2	14.1	265
55	0011	1	5-Apr-25	918	42 53.13	170 26.76	42 51.46	170 30.15	34	43	2.99	4.7	72.1	17.2	16.7	200
56	0011	1	5-Apr-25	1200	42 52.04	170 33.29	42 51.24	170 37.30	26	28	3.04	4.7	70.5	-	-	200
57	0011	1	5-Apr-25	1446	42 44.89	170 36.97	42 46.03	170 40.70	47	53	2.96	4.5	73.2	17.3	16.1	200
58	0005	1	6-Apr-25	627	41 36.44	171 35.79	41 38.36	171 32.71	62	63	2.99	4.4	75.7	17.5	15.7	200
59	0006	1	6-Apr-25	845	41 41.70	171 21.69	41 43.45	171 20.47	119	122	1.97	4.3	79.3	17.6	13.8	340
60	0007	1	6-Apr-25	1041	41 50.53	171 19.50	41 53.39	171 18.41	71	75	2.97	4.5	74.8	17.3	15.7	220
61	0007	1	6-Apr-25	1313	42 05.02	171 17.22	42 07.71	171 15.37	32	36	3.02	4.5	75	-	-	200
62	0007	1	6-Apr-25	1512	42 05.90	171 09.02	42 08.66	171 07.45	95	97	2.99	4.4	79.7	17.5	14.2	270
63	0002	1	7-Apr-25	648	41 02.52	171 17.39	41 02.52	171 17.39	181	183	2.98	4.3	85.1	19.1	13.8	490
64	0001	1	10-Apr-25	625	40 32.94	172 17.65	40 31.60	172 21.16	88	91	2.98	4.4	81	16.1	14.1	255
65	0002	1	10-Apr-25	1146	40 39.95	171 45.22	40 37.77	171 47.90	166	171	2.98	4.3	92	-	-	460
66	0002	1	10-Apr-25	1403	40 41.05	171 40.77	40 43.29	171 38.24	199	200	2.94	4.4	92.4	18.9	13.9	530
67	0008	1	11-Apr-25	633	42 25.01	170 58.23	42 22.90	170 59.28	116	120	2.24	4.3	84.3	16.9	13.3	330
68	0008	1	11-Apr-25	1103	41 55.74	171 03.67	41 53.02	171 05.17	160	161	2.94	4.1	89.3	17.5	13.3	440
69	0006	1	11-Apr-25	1408	41 37.55	171 09.55	41 34.51	171 10.17	145	154	3.07	4.4	88.2	18.2	13.4	420
70	0002	1	12-Apr-25	630	41 05.40	171 34.89	41 02.62	171 36.34	132	136	2.98	4.4	86.5	17.8	13.8	370
71	0002	1	12-Apr-25	850	41 04.40	171 46.27	41 01.59	171 47.58	121	126	2.97	4.4	84.6	17.1	13.7	350
72	0001	1	12-Apr-25	1109	41 03.73	171 56.33	41 00.71	171 57.13	95	97	3.07	4.4	79.3	16.9	13.8	270
73	0001	1	12-Apr-25	1311	40 55.28	171 59.94	40 52.54	172 01.59	93	96	3.01	4.4	80	16.8	14.3	265

APPENDIX 4: Catch summary in descending order by weight

* = less than 0.1%.

Species code	Common name	Scientific name	Catch (kg)	% of total catch	No. of stations	% occurren	Depth (m) Min.	Max.
SNA	Snapper	*Pagrus auratus*	9 240.7	35.5	41	65.1	14	199
SPD	Spiny dogfish	*Squalus acanthias*	2 490.1	9.6	42	66.7	26	338
GUR	Gurnard	*Chelidonichthys kumu*	2 261.6	8.7	45	71.4	14	194
RSO	Gemfish	*Rexea solandri*	1 340.4	5.1	29	46	88	392
RCO	Red cod	*Pseudophycis bachus*	1 211.9	4.7	30	47.6	26	338
BAR	Barracouta	*Thyrsites atun*	1 188.3	4.6	50	79.4	16	271
GIZ	Giant stargazer	*Kathetostoma giganteum*	871.2	3.3	26	41.3	56	392
SPO	Rig	*Mustelus lenticulatus*	844.0	3.2	40	63.5	14	316
NMP	Tarakihi	*Nemadactylus macropterus*	790.3	3	39	61.9	29	340
GSH	Ghost shark	*Hydrolagus novaezealandiae*	467.2	1.8	24	38.1	74	338
SCH	School shark	*Galeorhinus galeus*	397.9	1.5	36	57.1	14	271
JMN	Yellowtail jack mackerel	*Trachurus novaezelandiae*	392.7	1.5	33	52.4	14	134
CAR	Carpet shark	*Cephaloscyllium isabellum*	317.0	1.2	36	57.1	34	392
BWH	Bronze whaler shark	*Carcharhinus brachyurus*	300.0	1.2	1	1.6	30	30
JMD	Greenback jack mackerel	*Trachurus declivis*	261.5	1	25	39.7	26	214
SQU	Arrow squid	*Nototodarus sloanii* & *N. gouldi*	255.5	1	43	68.3	14	392
POP	Porcupine fish	*Allomycterus jaculiferus*	249.9	1	20	31.7	30	199
NSD	Northern spiny dogfish	*Squalus griffini*	239.0	0.9	21	33.3	88	392
LIN	Ling	*Genypterus blacodes*	226.2	0.9	15	23.8	26	392
JDO	John dory	*Zeus faber*	218.8	0.8	31	49.2	14	199
CUC	Cucumber fish	*Paraulopus nigripinnis*	175.8	0.7	24	38.1	95	392
SSK	Smooth skate	*Dipturus innominatus*	172.6	0.7	13	20.6	48	392
HOK	Hoki	*Macruronus novaezelandiae*	148.5	0.6	11	17.5	88	338
FRO	Frostfish	*Lepidopus caudatus*	138.1	0.5	17	27	51	316
WAR	Common warehou	*Seriolella brama*	132.1	0.5	14	22.2	14	132
RSK	Rough skate	*Zearaja nasuta*	127.3	0.5	16	25.4	26	199
ATT	Kahawai	*Arripis trutta*	119.0	0.5	17	27	14	122
EGR	Eagle ray	*Myliobatis tenuicaudatus*	116.0	0.4	9	14.3	14	34
ELE	Elephant fish	*Callorhinchus milii*	108.3	0.4	7	11.1	26	48
TRE	Trevally	*Pseudocaranx georgianus*	105.8	0.4	15	23.8	16	88
HBA	Bigeye sea perch	*Helicolenus barathri*	105.0	0.4	12	19	128	392
LSO	Lemon sole	*Pelotretis flavilatus*	92.4	0.4	30	47.6	14	338
SFL	Sand flounder	*Rhombosolea plebeia*	81.8	0.3	15	23.8	14	46
LEA	Leatherjacket	*Meuschenia scaber*	73.2	0.3	10	15.9	29	60
SCG	Scaly gurnard	*Lepidotrigla brachyoptera*	72.8	0.3	36	57.1	30	214
WIT	Witch	*Arnoglossus scapha*	64.8	0.2	40	63.5	18	392
CDO	Capro dory	*Capromimus abbreviatus*	62.8	0.2	21	33.3	88	392
KIN	Kingfish	*Seriola lalandi*	48.1	0.2	4	6.3	34	128
ERA	Electric ray	*Torpedo fairchildi*	48.1	0.2	5	7.9	30	338
CCX	Small banded rattail	*Coelorinchus parvifasciatus*	46.0	0.2	7	11.1	184	392
CON	Conger eel	*Conger spp.*	41.2	0.2	10	15.9	26	95
BRA	Short-tailed black ray	*Dasyatis brevicaudata*	35.9	0.1	3	4.8	18	34
HPC	Sea perch	*Helicolenus percoides*	30.8	0.1	16	25.4	29	258
ESO	N.Z. sole	*Peltorhamphus novaezeelandiae*	29.4	0.1	8	12.7	14	43
HEP	Sharpnose sevengill shark	*Heptranchias perlo*	19.1	0.1	2	3.2	30	184
SSH	Slender smooth-hound	*Gollum attenuatus*	18.7	0.1	3	4.8	258	392
HAK	Hake	*Merluccius australis*	18.5	0.1	7	11.1	40	236
JGU	Spotted gurnard	*Pterygotrigla picta*	17.6	0.1	5	7.9	271	392
CBI	Two saddle rattail	*Coelorinchus biclinozonalis*	16.7	0.1	7	11.1	51	271
ONG	Sponges	Porifera	16.1	0.1	11	17.5	14	171
CCM	Eleven-arm seastar	*Coscinasterias muricata*	14.6	0.1	8	12.7	14	34
OCT	Octopus	*Pinnoctopus cordiformis*	13.6	0.1	3	4.8	23	171
YBF	Yellowbelly flounder	*Rhombosolea leporina*	12.1	*	4	6.3	14	18
SCC	Sea cucumber	*Stichopus mollis*	11.5	*	10	15.9	18	121
BCO	Blue cod	*Parapercis colias*	10.6	*	7	11.1	30	60
WOD	Wood	Wood	9.9	*	5	7.9	18	271
SPZ	Spotted stargazer	*Genyagnus monopterygius*	9.9	*	6	9.5	14	29
BTS	Prickly deepsea skate	*Brochiraja spinifera*	8.6	*	3	4.8	316	349

APPENDIX 4: CONTINUED

* = less than 0.1%.

Species code	Common name	Scientific name	Catch (kg)	% of total catch	No. of stations	% occurren	Depth (m) Min.	Max.
GLB	Globefish	*Contusus richei*	6.6	*	3	4.8	26	34
JAV	Javelin fish	*Lepidorhynchus denticulatus*	5.9	*	4	6.3	271	392
RHY	Common roughy	*Paratrachichthys trailli*	5.8	*	2	3.2	236	271
SSI	Silverside	*Argentina elongata*	5.6	*	23	36.5	74	392
SWA	Silver warehou	*Seriolella punctata*	5.3	*	9	14.3	30	128
OCP	Octopod	NA	5.3	*	3	4.8	30	55
ASC	Sea squirt	Ascidiacea	5.0	*	5	7.9	30	60
BRI	Brill	*Colistium guntheri*	4.8	*	2	3.2	26	34
PTU	Sea pens	Pennatuloidea (Superfamily)	4.7	*	2	3.2	184	236
RMU	Red mullet	*Upeneichthys lineatus*	4.4	*	2	3.2	34	34
STY	Spotty	*Notolabrus celidotus*	4.1	*	7	11.1	18	34
MDO	Mirror dory	*Zenopsis nebulosa*	3.3	*	1	1.6	349	349
TUR	Turbot	*Colistium nudipinnis*	3.2	*	2	3.2	26	40
ALL	Alcithoe larochei	*Alcithoe larochei*	3.1	*	5	7.9	30	338
SDO	Silver dory	*Cyttus novaezealandiae*	2.9	*	13	20.6	88	349
CRM	Airy finger sponge	*Callyspongia cf ramosa*	2.3	*	8	12.7	16	48
BSQ	Broad squid	*Sepioteuthis australis*	1.8	*	6	9.5	14	88
BOA	Sowfish	*Paristiopterus labiosus*	1.7	*	2	3.2	29	30
PRK	Prawn killer	*Ibacus alticrenatus*	1.6	*	9	14.3	128	349
EMA	Blue mackerel	*Scomber australasicus*	1.6	*	4	6.3	14	60
WHU	Whale (unspecified)	NA	1.4	*	1	1.6	36	36
EUC	Eucla cod	*Euclichthys polynemus*	1.4	*	2	3.2	340	392
FHD	Deepsea flathead	*Hoplichthys haswelli*	1.3	*	2	3.2	316	338
CRS	Airy finger sponge	*Callyspongia ramosa*	1.3	*	2	3.2	34	60
HDR	Hydroid	Hydrozoa	1.2	*	4	6.3	18	60
JFI	Jellyfish	NA	1.1	*	2	3.2	29	214
ANC	Anchovy	*Engraulis australis*	1.0	*	5	7.9	51	122
SYC	Clubbed tunicate	*Styela clava*	0.8	*	1	1.6	16	16
SCA	Scallop	*Pecten novaezelandiae*	0.7	*	3	4.8	23	34
OPE	Orange perch	*Lepidoperca aurantia*	0.7	*	1	1.6	258	258
BRZ	Brown stargazer	*Xenocephalus armatus*	0.7	*	2	3.2	60	134
BRC	Northern bastard cod	*Pseudophycis breviuscula*	0.7	*	2	3.2	97	121
STP	Solitary bowl coral	*Stephanocyathus platypus*	0.6	*	2	3.2	258	271
PAG	Pagurid	Paguroidea	0.5	*	5	7.9	34	258
SPS	Speckled sole	*Peltorhamphus latus*	0.4	*	2	3.2	16	16
PAT	Patiriella spp.	*Patiriella* spp.	0.4	*	1	1.6	16	16
MMU	Pearlside	*Maurolicus australis*	0.4	*	4	6.3	214	392
GLM	Green-lipped mussel	*Perna canaliculus*	0.4	*	1	1.6	16	16
CTS	Spengler's trumpet	*Cabestana spengleri*	0.4	*	1	1.6	60	60
YBO	Yellow boarfish	*Pentaceros decacanthus*	0.3	*	3	4.8	236	392
GAS	Gastropods	Gastropoda	0.3	*	3	4.8	112	236
FMA	Fusitriton spp	*Fusitriton* spp	0.3	*	3	4.8	112	236
PCH	Penion chathamensis	*Penion chathamensis*	0.3	*	1	1.6	171	171
OYS	Oysters dredge	*Ostrea chilensis*	0.3	*	1	1.6	30	30
SRH	Silver roughy	*Hoplostethus mediterraneus*	0.2	*	1	1.6	338	338
SCI	Scampi	*Metanephrops challengeri*	0.2	*	1	1.6	338	338
SBN	Stalked barnacle	Scalpellidae	0.2	*	2	3.2	349	392
PSI	Geometric star	*Psilaster acuminatus*	0.2	*	2	3.2	271	392
PIL	Pilchard	*Sardinops sagax*	0.2	*	2	3.2	56	122
PIG	Pigfish	*Congiopodus leucopaecilus*	0.2	*	2	3.2	171	214
PCO	Ahuru	*Auchenoceros punctatus*	0.2	*	2	3.2	26	34
EGC	Egg case	NA	0.2	*	2	3.2	56	60
DMG	Dipsacaster magnificus	*Dipsacaster magnificus*	0.2	*	2	3.2	194	392
BRN	Barnacle	Cirripedia	0.2	*	1	1.6	88	88
ASH	Circular saw shell	*Astraea heliotropium*	0.2	*	2	3.2	55	60
ZSQ	Stomatopod	*Squilla sp.*	0.1	*	1	1.6	122	122
TOD	Dark toadfish	*Neophrynichthys latus*	0.1	*	1	1.6	271	271
SSQ	Bobtail squid	*Sepioloidea* spp.	0.1	*	1	1.6	56	56

APPENDIX 4: CONTINUED

* = less than 0.1%.

Species code	Common name	Scientific name	Catch (kg)	% of total catch	No. of stations	% occurren	Depth (m) Min.	Max.
SPA	Slender sprat	*Sprattus antipodum*	0.1	*	1	1.6	26	26
SDF	Spotted flounder	*Azygopus pinnifasciatus*	0.1	*	1	1.6	392	392
OPP	Oplophorus spp.	*Oplophorus* spp.	0.1	*	1	1.6	30	30
LOF	Large ostrich foot	*Struthiolaria papulosa*	0.1	*	1	1.6	14	14
LEH	Leech - generic	Hirudinea	0.1	*	1	1.6	338	338
DIR	Pagurid	*Diacanthurus rubricatus*	0.1	*	1	1.6	184	184
CFL	Crested flounder	*Lophonectes gallus*	0.1	*	1	1.6	34	34
BCA	Barracudina	*Magnisudis prionosa*	0.1	*	1	1.6	349	349

APPENDIX 5: Benthic macro-invertebrates taken as bycatch during the survey

Species	Common name	Scientific name	No. of stations
ALL	*Alcithoe larochei*	*Alcithoe larochei*	5
ASC	Sea squirt	Ascidiacea	5
ASH	Circular saw shell	*Astraea heliotropium*	2
BRN	Barnacle	Cirripedia	1
BSQ	Broad squid	*Sepioteuthis australis*	6
CCM	Eleven-arm seastar	*Cosci-sterias muricata*	8
CRM	Airy finger sponge	*Callyspongia cf ramosa*	8
CRS	Airy finger sponge	*Callyspongia ramosa*	2
CTS	Spengler's trumpet	*Cabesta- spengleri*	1
DIR	Pagurid	*Diacanthurus rubricatus*	1
DMG	*Dipsacaster magnificus*	*Dipsacaster magnificus*	2
EGC	Egg case	–	2
FMA	*Fusitriton* spp.	*Fusitriton* spp.	3
GAS	Gastropods	Gastropoda	3
GLM	Green-lipped mussel	Pernacanaliculus	1
HDR	Hydroid	Hydrozoa	4
JFI	Jellyfish	–	2
LEH	Leech - generic	Hirudinea	1
LOF	Large ostrich foot	*Struthiolaria papulosa*	1
OCP	Octopod	–	3
OCT	Octopus	*Pinnoctopus cordiformis*	3
ONG	Sponges	Porifera	11
OPP	*Oplophorus* spp.	*Oplophorus* spp.	1
OYS	Oysters dredge	*Ostrea chilensis*	1
PAG	Pagurid	Paguroidea	5
PAT	Patiriella spp.	*Patiriella* spp.	1
PCH	*Penion chathamensis*	*Penion chathamensis*	1
PRK	Prawn killer	*Ibacus alticrenatus*	9
PSI	Geometric star	*Psilaster acuminatus*	2
PTU	Sea pens	Pennatuloidea (Superfamily)	2
SBN	Stalked barnacle	Scalpellidae	2
SCA	Scallop	*Pecten novaezelandiae*	3
SCC	Sea cucumber	*Stichopus mollis*	10
SCI	Scampi	*Metanephrops challengeri*	1
SQU	Arrow squid	*Nototodarus sloanii* & *N. gouldi*	43
SSQ	Bobtail squid	*Sepioloidea* spp.	1
STP	Solitary bowl coral	*Stephanocyathus platypus*	2
SYC	Clubbed tunicate	*Styela clava*	1
ZSQ	Stomatopod	*Squilla* spp.	1