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Tini a Tangaroa

Age composition of commercial snapper landings in SNA 1 and SNA 2, 2022–23

New Zealand Fisheries Assessment Report 2024/69

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PLAIN LANGUAGE SUMMARY

Snapper is New Zealand's most important commercial inshore fish species.

This describes a research study conducted in 2022–23 to find out the size and age of snapper from the commercial fishery in SNA 1 and the northern part of the SNA 2 stock, which covers most of the east coast of New Zealand North Island.

Snapper from four different fishing methods were sampled; bottom longline, bottom trawl, Danish seine and modular harvest system. In total, 47 873 snapper were measured and 5040 otolith pairs (fish ear stones) were collected for ageing by sampling 288 commercial fishing vessel catch landings at four fishing companies in SNA 1 and SNA 2, during October 2022 to August 2023.

The current study provides information that contributes to a 34 year time series. This series is used for assessments and fisheries management advice for snapper stocks.

The youngest average age of snapper was 7.4 years from the Bay of Plenty modular harvest system method and the oldest average age was 11.5 years from the Hauraki Gulf Danish seine method, the highest recorded average age in 34 years, indicating substantial improvement in the fishery. However, the average length of snapper was low, ranging from 30 cm to 36 cm, due to slower growth rates as the snapper population increases. SNA 2 north bottom trawl landings had a higher average size and weight for a given age (therefore faster growth) compared with all three SNA 1 fisheries.

The oldest aged snapper sampled in 2022–23 from SNA 1 was 52 years old (Bay of Plenty) and from northern SNA 2 was 57 years old.

EXECUTIVE SUMMARY

Walsh, C.[1]; Parsons, D.; Bian, R.; Armiger, H.; Taylor, R.; Evans, O.; Madden, B.; Bodie, C.; Buckthought, D.; Smith, M.; Wood, B; McKenzie, J; Howarth, M. (2024). Age composition of commercial snapper landings in SNA 1 and SNA 2, 2022–23.

New Zealand Fisheries Assessment Report 2024/69. **130 p.**

This report presents the results of Objectives 2–3 of Fisheries New Zealand project SNA2022-01. The general objective was to determine the age structure of commercial landings from the three snapper (*Chrysophrys auratus*) stocks that constitute SNA 1 (East Northland, Hauraki Gulf, and Bay of Plenty) and the northern stock of SNA 2 (SNA 2 North) by land-based sampling.

The random age frequency sampling approach was employed over four seasons from spring 2022 to winter 2023 to estimate catch-at-age from the three bottom longline fisheries in SNA 1 and over two seasons from spring-summer to autumn-winter for the bottom trawl fishery in northern SNA 2. A length frequency and age-length key sampling approach was employed over spring-summer and autumn-winter to estimate catch-at-length and -age for a range of power method fisheries operating in SNA 1, including bottom trawl, Danish seine, and modular harvest system.

Target sample sizes for numbers of landings by fishing year were achieved across all bottom longline landings, but only fully achieved for one of the eight power method landings. Overall, spatio-temporal comparisons revealed good sample representativeness despite minor disproportionality in the number of sampled landings in some months and in relation to vessel selection and landing size.

Catch-at-age distributions for East Northland, Hauraki Gulf, and Bay of Plenty bottom longline fisheries in 2022–23 have become notably broader since the previous sampling year in 2019–20. There was good representation across all year classes up to 20 years, resulting in the highest estimates of mean age experienced in over 30 years of research: East Northland (11.0 years); Hauraki Gulf (11.5 years); Bay of Plenty (9.9 years). The East Northland longline fishery was dominated by 2018, 2014 and 2011 year classes (5, 9 and 12 year olds in 2022–23), which collectively accounted for almost one in every three snapper landed in 2022–23. East Northland had the highest proportion (10%) of snapper 20 years or older. Hauraki Gulf and Bay of Plenty longline landings were largely dominated by the 2014–2012 (9 to 11 year olds in 2022–23) and 2016 to 2013 year classes (7 to 13 year olds in 2022–23), respectively.

The relative year class strengths inferred from sampling of the SNA 1 power methods (bottom trawl, Danish seine, and modular harvest system) were generally consistent with catch-at-age distributions observed in the respective bottom longline samples. Snapper caught in the Hauraki Gulf Danish seine fishery in 2022–23 had the broadest proportion-at-age distribution across all SNA 1 methods in the past 34 years, with a mean age of 13.3 years, while East Northland bottom trawl with the second broadest proportion-at-age distribution, had a mean age of 11.5 years. Proportions-at-age from Bay of Plenty power method fisheries were dominated by small young snapper, those below 10 years of age making up 61–80% of the landed catch by number, with overall mean age estimates ranging from 7.4–9.3 years—the lowest across SNA 1 and consistent with mean age in Bay of Plenty bottom longline and SNA 2 North bottom trawl fisheries. Mean weighted coefficients of variation (MWCV from bootstrap estimates) for the age compositions of SNA 1 bottom longline were 21–22%, SNA 1 East Northland, Hauraki Gulf and Bay of Plenty power methods 10–19% and SNA 2 bottom trawl 11%. With the exception of bottom longline MWCVs marginally above the target of 20%, all other fisheries were below, indicating a good level of precision across all sampled methods in 2022–23.

With persisting slow growth rates, the mean size across SNA 1 bottom longline fisheries in 2022–23 has continued to remain low (34–36 cm or about 0.866 –1.025 kg). Similar (low) mean lengths were observed for power method fisheries, ranging from 30 cm (Bay of Plenty modular harvest system) to 36 cm (Hauraki Gulf Danish seine).

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1. INTRODUCTION

Snapper (*Chrysophrys auratus*, SNA) is New Zealand's most important commercial inshore fish species. In 2022–23, 66% and 5% of the national Total Allowable Commercial Catch (TACC) of 6797 t was apportioned to SNA 1 (4500 t) and SNA 2 (315 t), respectively, encompassing the entire east coast of the North Island (Figures 1–3). In the past five years the greatest proportion (98%) of the SNA 1 commercial catch has been taken by four methods (bottom longline (44%), bottom trawl (22%), Danish seine (20%), and modular harvest system (12%)), mostly targeting snapper, but also as a bycatch when targeting other species, particularly trevally (*Pseudocaranx dentex*, TRE*),* with bottom trawl and modular harvest system. For the SNA 2 fishery, bottom trawl dominates as the main commercial method making up 99% of the catch over the past five years, with snapper a bycatch to the tarakihi (*Nemadactylus macropterus*, TAR) target fishery. The annual SNA 1 catch over the past decade has, on average, been closely aligned to the TACC, while that for SNA 2 has regularly exceeded the TACC (Fisheries New Zealand 2023).

SNA 1 has been one of the most researched inshore finfish fisheries in New Zealand. Length and age compositions of snapper have been sampled from commercial landings in port (land-based sampling) intermittently since 1963 (Davies et al. 1993). In the 1988–89 fishing year, a structured sampling programme was designed to establish a time series of length and age composition data for the dominant fishing methods in SNA 1 and SNA 8. Because of heterogeneity in snapper biology and fishing patterns, SNA 1 is often further subdivided into three substocks (referred to herein as stocks): East Northland, Hauraki Gulf, and Bay of Plenty (Figure 1). The time series of length and age information from the SNA 1 bottom longline fishery continued uninterrupted for a period of 21 years up until 2009–10. Triennial sampling was adopted after 2009–10 based on research investigating the optimum frequency for land-based sampling (Bian et al. 2009); the last sampling programme being undertaken in 2019–20 (Walsh et al. 2022).

Davies et al. (1993) investigated the relative benefit of catch-at-age precision associated with length frequency and otolith sample sizes in snapper landings to optimise sampling resources. They concluded that there was no major benefit from collecting large length frequency samples. In light of this work, a random age frequency (RAF) sampling approach was trialled for the SNA 1 bottom longline fishery over spring-summer 1997–98 (Walsh et al. 1999). In 2003–04 the approach for sampling SNA 1 longline landings for length and age data was modified from a spring and summer sampling programme to one that encompassed the entire year (see Walsh et al. 2006). This change was introduced so that sampling reflected the seasonal characteristics of the longline fleet and its fishing operations in recent years, in which the snapper catch is landed year-round, rather than predominantly over spring and summer. The sampling undertaken in 2022–23 continued with the year-round RAF approach for SNA 1 bottom longline.

Although bottom longline has been the primary means for monitoring the population age structure of SNA 1, Fisheries New Zealand proposed that, due to the steady decline in Hauraki Gulf and Bay of Plenty snapper growth rates over the past two decades (Walsh et al. 2011a, 2011b, 2014b, 2019b, 2022), it would be timely to also sample SNA 1 power method fisheries (i.e., bottom trawl, Danish seine, and modular harvest system) for length and age data in 2019–20, to estimate selectivity (NINSWG-2019/25b). SNA 1 power methods (bottom trawl and Danish seine) were last sampled in the Bay of Plenty and Hauraki Gulf in the mid-1990s (Walsh et al. 1995, 1997). A length frequency and age-length key approach was successfully used for sampling SNA 1 power method landings in 2019–20, whereby age-length samples collected from the SNA 1 longline fisheries were used to construct the required area-season specific age-length keys for power method fisheries (Walsh et al. 2022).

Catch-at-age sampling of the SNA 2 bottom trawl fishery was first instigated in 1991–92 (Ryan 1993), followed by an intermittent time series of seven further collections up to 2008–09 (Walsh et al. 2012). In 2019–20 a year-round random age frequency sampling approach was instigated north of Mahia Peninsula, denoted as SNA 2 North (Walsh et al. 2022), and repeated for sampling SNA 2 in 2022–23.

The aim of the present study was to estimate the age and length compositions of commercial snapper catches from the main methods operating in each of the snapper stocks in SNA 1 and SNA 2 North during the 2022–23 fishing year. The age composition data are an important input to SNA 1 and SNA 2 stock assessments, where they are used to estimate selectivity and relative year class strength.

This report presents the results of land-based sampling between October 2022 and August 2023. This project was funded by Fisheries New Zealand as SNA2022-01.

The overall objective was to estimate the year class strengths of snapper (*Chrysophrys auratus*) in SNA 1.

The specific objectives of this project for 2022–23 were:

1. To characterise the SNA 1 fishery by analysing existing commercial catch and effort data to the end of 2021–22 fishing year and design a sampling programme for 2022–23.

2. To carry out sampling and estimate the relative proportion at age and length of recruited snapper sampled from the commercial catch in SNA 1 throughout the fishing year 2022–23. The target coefficient of variation (CV) for the catch-at-age will be 20% (mean weighted CV across all age classes).

3. Broader outcomes.

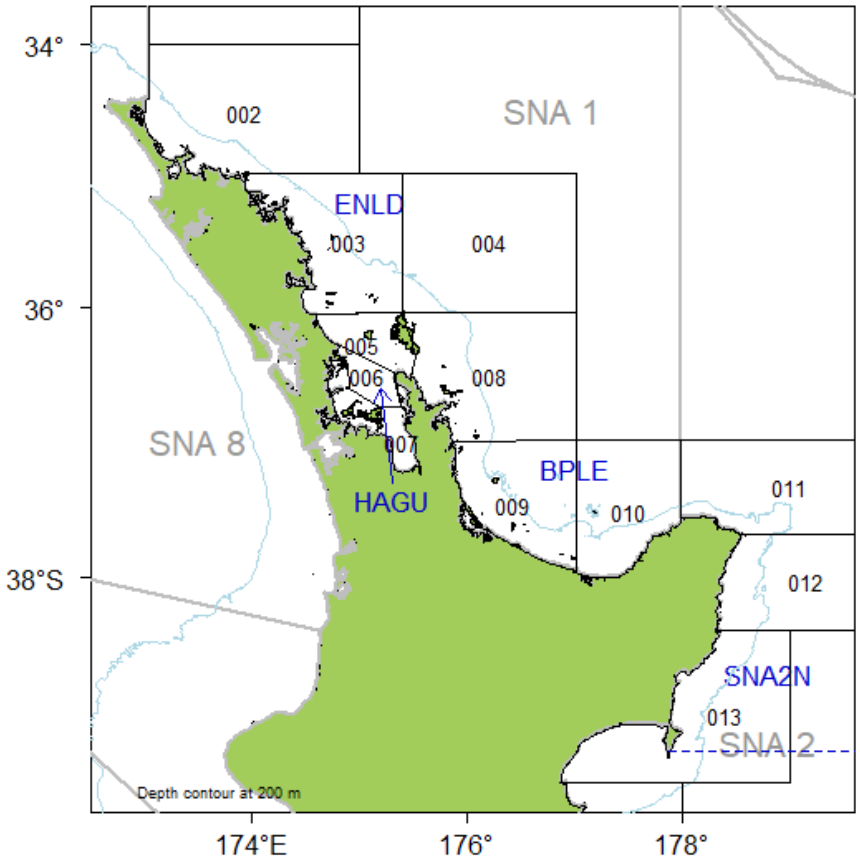

Figure 1: **Quota management areas for the northeast North Island snapper (SNA) stock, SNA 1, and the northern subarea component of SNA 2. The spatial dimensions of the SNA 1 and SNA 2 stocks are: East Northland (ENLD, Statistical Areas 002 and 003); Hauraki Gulf (HAGU, Statistical Areas 005 to 007); Bay of Plenty (BPLE, Statistical Areas 008 to 010); and SNA 2 North (SNA2N, Statistical Areas 011, 012, and northern part of 013 to the southernmost tip of Mahia Peninsula (39.264° S 177.866° E), blue dotted line.**

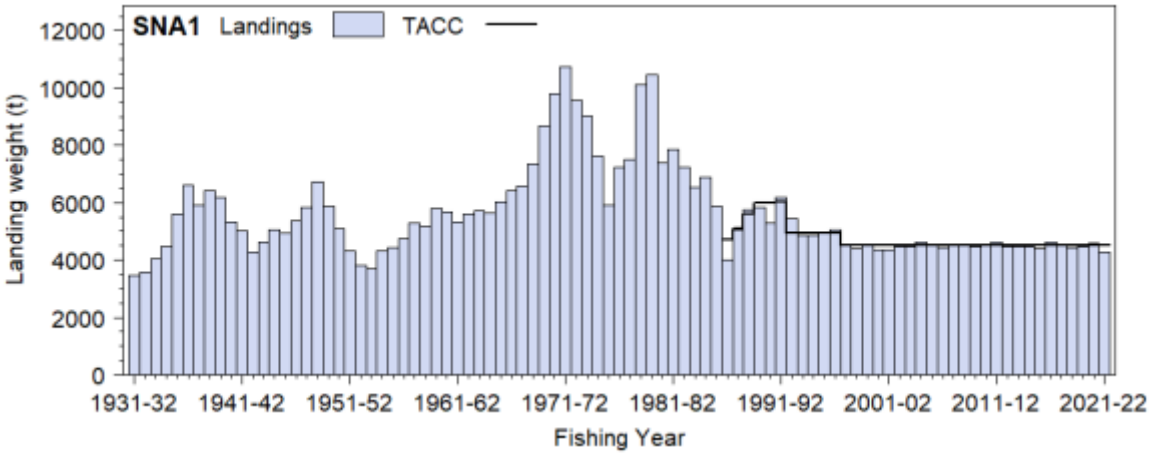

Figure 2: **Reported landings of snapper in SNA 1 and TACCs to 2021–22 (Reproduced from Fisheries New Zealand 2023).**

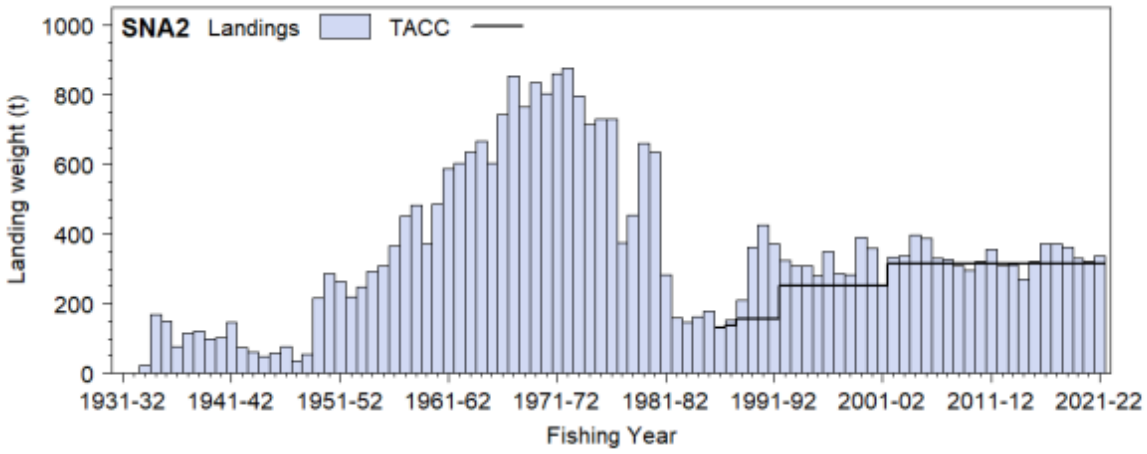

Figure 3: Reported landings of snapper in SNA 2 and TACCs to 2021–22 (Reproduced from Fisheries New Zealand 2023).

2. METHODS

2.1 Characterisation of fishery data

Two characterisations of the spatial, temporal, and operational patterns in the SNA 1 and SNA 2 fisheries were carried out using data extracted from the Fisheries New Zealand commercial catch reporting system. The first, over the period October 2016 to September 2021 (spanning five fishing years), was undertaken to inform the design of a catch sampling programme in 2022–23. The second was over the period October 2018 to September 2023 to provide a comparison of the recent catch with that of the catch sampling programme in 2022–23, i.e. to investigate sample representativeness.

All effort details and associated catch weights (all species including snapper) from all trips landing from SNA 1 were extracted. Data obtained from Fisheries New Zealand were groomed and checked for obvious reporting errors. The data used to inform the characterisation were compiled in two tables:

1. Landed catch weight: A file containing the verified green (unprocessed) landed weight of all SNA 1 and SNA 2 trips.
2. Trip-specific data: A file containing demographic information (location, method, target species, estimated catch, etc.).

Although the trip effort data table provided information on catch, these weights were based on fisher estimates rather than measured weights. The process followed was to prorate the actual trip landed weight totals across the effort information (location, method, target species) based on the estimated catch ratios. The link between the two data tables was the common trip number field (trip_key).

Operational aspects such as fishery timing, gear type, target species, statistical area, fine scale spatial distribution, port of landing, and annual number of vessels and landings were summarised.

2.2 Design of SNA 1 and SNA 2 sampling in 2022–23

SNA 1

The SNA 1 Quota Management Area (QMA) encompasses the northeast coast of the North Island (North Cape to Cape Runaway) and for sampling purposes is divided into three biological stocks: East Northland, Hauraki Gulf, and Bay of Plenty (Figure 1). Although four fishing methods (bottom longline, bottom trawl, Danish seine, and modular harvest system) are currently important in SNA 1, to be consistent with sampling over the past three decades, bottom longline was again chosen as the main fishery to be sampled in 2022–23. Bottom longline operates year-round in each stock with few spatial restrictions and has logistic selectivity, providing a better indication of the recruited population age structure than other methods, and most often catches proportionally more snapper overall. However, noticeable density dependent growth trends in relation to changes in biomass (using derived mean weight-at-age) have been apparent in the Hauraki Gulf and Bay of Plenty fisheries for more than a decade (Walsh et al. 2011a, 2011b, 2014b, 2019b, 2022), meaning that more snapper are now landed than 20–30 years ago to achieve the same harvest weight. So to update selectivity estimates, last determined in the mid-1990s (Walsh et al. 2022), Fisheries New Zealand included power methods (i.e., bottom trawl, Danish seine, and modular harvest system) in the sampling from SNA 1 2019–20 and again in 2022–23.

Bottom longline and power method landings from SNA 1 were stratified by stock and season (e.g., Bay of Plenty–spring). Quarterly seasonal splits for bottom longline were: spring (October–November); summer (December–February); autumn (March–May); and winter (June–August). Seasonal splits were consistent with the time series. Biannual seasonal splits were chosen for power methods: spring-summer (October–February) and autumn-winter (March–August). September was not included in the seasonal stratification. Because limited fishing occurs in September (the last month of the fishing year), its absence from the spring/spring-summer sampling strata was deemed to have a minimal effect on the final results.

SNA 2

The SNA 2 QMA encompasses the central and southeast coast and lower west coast of the North Island (Cape Runaway to Mana Island) and for sampling purposes has been divided into two biological stocks: northern and southern. In 2019, a Northern Inshore Finfish Working Group meeting (NINSWG-2019/25b) recommended the northern subarea (Cape Runaway to Mahia Peninsula) of SNA 2 (see Figure 1) be sampled alongside the proposed SNA 1 catch-at-age sampling project in 2019–20. This recommendation was made because, despite growth differences, year class strengths for ‘SNA 2 North’ sampled from bottom trawl were significantly correlated with those from Bay of Plenty bottom longline snapper in 2007–08 and 2008–09 (Walsh et al. 2012). Nevertheless, sampling SNA 2 North allows for a complete catch-at-age description of the ‘biological stock’ and can therefore be used to further investigate stock relationships with the Bay of Plenty and as a possible input for the SNA 1 stock assessment.

To be consistent with previous SNA 2 catch-at-age sampling programmes only bottom trawl landings were selected in 2022–23, this being the main fishing method operating year-round. Similar to power method samples in SNA 1, bottom trawl landings from SNA 2 were also stratified biannually with seasonal splits over spring-summer (October–February) and autumn-winter (March–August), with no samples collected in September (see Section 2.2 SNA 1).

2.3 Sampling landings

Length and age frequency samples were collected from the SNA 1 and SNA 2 fisheries using a two-stage sampling procedure, similar to that described by West (1978). The random selection of landings and a random sample of bins within landings represent the first and second stages, respectively. In previous years the sampling procedure needed to account for the grading of fish according to length and quality (within-landing strata) by taking a stratified random sample of bins within a landing (Davies et al. 1993), but this was not required in 2022–23. Similarly, because snapper show no differential growth between sexes (Paul 1976), sex was not determined.

Sampling of snapper landings for length frequency and otolith extraction in 2022–23 was conducted at Leigh, Auckland and Gisborne by experienced NIWA science staff or trained sub-contractors with scientific backgrounds.

SNA 1 bottom longline: Random age frequency sampling method (RAF)

The random age frequency sampling method was used for collecting otoliths from each SNA 1 bottom longline landing by taking random otolith samples using a systematic selection interval. This involved taking a random sample of bins from each landing that was roughly proportional to the total number of bins in a landing, hence large samples were taken from large landings and small samples from small landings. A systematic selection of every tenth fish was taken from the sampled bins by counting in a continuous sequence. Unlike most other species, longline caught snapper are 'soldier packed' (upright on their abdomen) in 'iki' bins making the selection of exactly every 10th fish an unequivocal process. The optimum selection interval was determined from simulations using data from historical length and age samples that achieved a desired level of catch-at-age precision, a mean weighted coefficient of variation (MWCV) over all age classes of less than or equal to 20%. This range took account of the expected mean number of fish in a bin and the total number of bins in landings. Sample sizes typically ranged from 20 fish being collected from landings having a total of 15 bins, to 40 fish from landings of over 100 bins. All fish making up the sample were measured to the nearest centimetre below the fork length.

For the past two decades a total sample size of 800 otoliths across forty landings has been targeted from each of the East Northland and Bay of Plenty bottom longline fisheries over the entire year and 1000 otoliths across 40 landings has been targeted from the Hauraki Gulf bottom longline fishery. However, precision in the bottom longline catch-at-age estimates has been found to have decreased through time, now equalling or exceeding the MWCV of 20%. Given that the respective fisheries may continue to change in future, it was decided to increase otolith sample sizes (Walsh et al. 2022). As a result, a revised total sample size of 1000 otoliths across forty landings was targeted from each of the East Northland and Bay of Plenty bottom longline fisheries over the entire 2022–23 year, with about 250 otoliths from 10 landings collected per season and 1200 otoliths across 40 landings from the Hauraki Gulf bottom longline fishery with about 300 from 10 landings per season (Table 1). The East Northland stock was sub-stratified by Statistical Areas 002 and 003 (Figure 1) to improve the precision on catch-at-age estimates (Davies & Walsh 2003).

Table 1: Level of sampling proposed to describe the SNA 1 bottom longline (BLL) fishery in 2022–23 based on historical sampling for catch-at-age data that derived MWCVs below 20%.

Stock area	Method	Annual target number of landings (per season)	Annual target number of otoliths (per season)
East Northland (002)	BLL	20 (5)	500 (125)
East Northland (003)	BLL	20 (5)	500 (125)
Hauraki Gulf	BLL	40 (10)	1 200 (300)
Bay of Plenty	BLL	40 (10)	1 000 (250)

SNA 1 power method: Length frequency and age-length key sampling method

The length frequency and age-length key sampling method was used for collecting length and age information from the SNA 1 power method fisheries (bottom trawl, Danish seine, and modular harvest system). Optimisation of sample sizes (from historical SNA 8 landings) had previously been investigated using simulation, with the aim of achieving a target level of catch-at-age precision with a MWCV over all age classes, of less than or equal to 0.20. The optimisation results indicated that the MWCV was more sensitive to changes in the otolith sample size than the number of landings sampled from the fishery and suggested a sample size of 15 landings and 300–500 otoliths would adequately achieve a MWCV of about 0.15.

A similar approach was implemented for sampling SNA 1 power method fisheries in 2022–23, based on that successfully achieved in 2019–20, with a total target of 15 landings sampled for length frequency (per stock-method-season) in combination with a 500–600 otolith pair age-length key (Walsh et al. 2022). The sample size of 300 fish, measured to the nearest centimetre below the fork length, was found to provide an adequate description of the length distribution of each sampled landing (Walsh et al. 2022).

The age-length key method was used for collecting otoliths, as described by Davies & Walsh (1995). In previous years the sample allocation for each length class interval for an age-length key was made according to the broadest proportion-at-length distribution of the main fishing method. For the SNA 1 fisheries, the length distribution of the bottom longline random age frequency collection for each stock in 2019–20 (Walsh et al. 2022) was the most recent and was chosen to determine the sample allocation for the respective stock (power method) age-length keys. However, because large snapper in particular were often poorly represented or absent in random age frequency length distributions from previous bottom longline collections, it was felt that a proportional allocation age-length key design may under-represent fish in the large length class intervals and over-represent those in the mid-range. Instead, the sample age-length key collection in 2009–10 was altered to a semi-fixed allocation design, as successfully employed in SNA 8 catch sampling for more than two decades (see Figure 4).

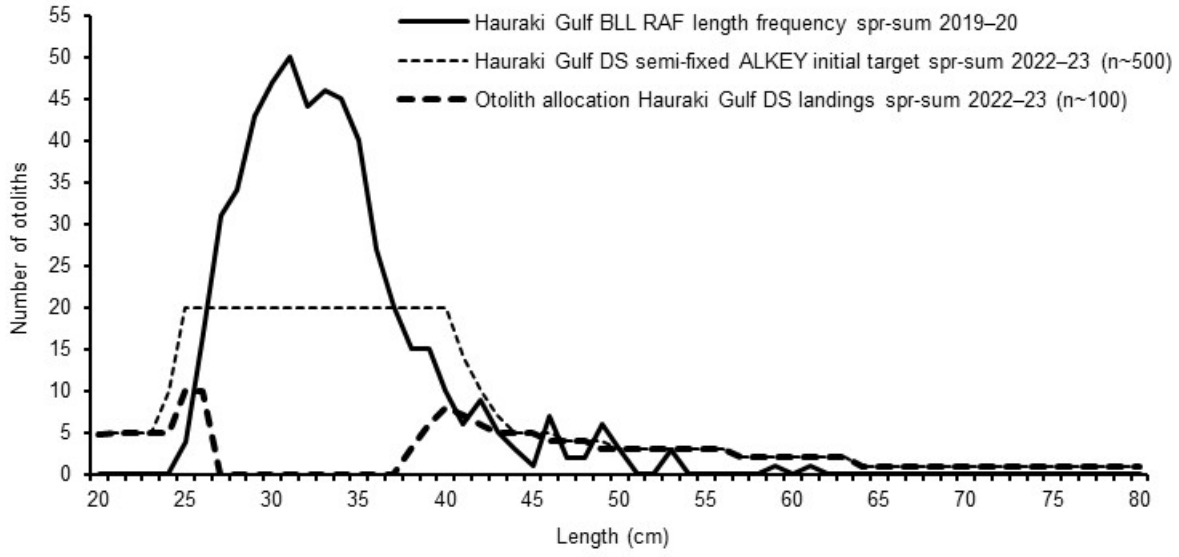

Figure 4: Proposed semi-fixed age-length key collection example for Hauraki Gulf Danish seine spring-summer strata in 2022–23. Note that the majority of otoliths derived from bottom longline otolith spring-summer samples for 2022–23 are incorporated with a power method otolith allocation collected from Hauraki Gulf Danish seine spring-summer samples for 2022–23 to form the overall spring-summer Hauraki Gulf age-length key (BLL, bottom longline; RAF, Random age frequency; spr-sum, spring-summer; DS, Danish seine; ALKEY, age-length key).

Power method age-length keys for each SNA 1 stock half-year (i.e., Hauraki Gulf Danish seine spring-summer) were generated from 500–600 bottom longline spring-summer otoliths from the same stock and expected to suitably describe the mid-range of cohorts currently present in the fishery and, at the same time, reduce the inefficiency of collecting, preparing, and ageing additional otoliths. This sample was

supplemented with approximately 100–150 additional power method otoliths to ensure that the far left- (below 28 cm) and right-hand (above 37 cm) tails of the distribution, comprising small and large snapper, were adequately represented (see Table 2 and Figure 4). It was proposed that roughly 5–10 otoliths would be subsampled from each power method sampling event to ensure temporal representativeness in the half-year age-length key collection.

The collection of two independent age-length keys, temporally stratified by half-years (spring-summer and autumn-winter) was expected to reduce growth bias compared to an age-length key collected over a full year. Each age-length key derived from the age data is assumed to be representative of the temporal period it was collected from. The main assumption to be satisfied for an age-length key is that the sample was taken randomly with respect to age from within each length interval (Southward 1976).

A total sample size of 9000 length measurements and 200 otoliths across thirty landings was targeted from the East Northland bottom trawl fishery over the entire year, 18 000 length measurements and 200 otoliths across sixty landings across Hauraki Gulf bottom trawl and Danish seine fisheries, and 27 000 length measurements and 200 otoliths across ninety landings were targeted from the Bay of Plenty bottom trawl, Danish seine, and modular harvest system fisheries (Table 2).

Table 2: Level of sampling proposed to describe the SNA 1 power method fisheries in 2022–23 based on historical sampling for catch-at-age data that derived MWCVs below 20%.

Stock area	Method*	Annual target number of landings per method (per season)	Annual target number of snapper measured per method (per season)	Annual target number of otoliths per stock (per season)†
East Northland	BT	30 (15)	9 000 (4 500)	200 (100)
Hauraki Gulf	BT, DS	30 (15)	9 000 (4 500)	200 (100)
Bay of Plenty	BT, DS, MHS	30 (15)	9 000 (4 500)	200 (100)

* BT, Bottom trawl; DS, Danish seine; MHS, Modular harvest system.

† Represents total power method age-length key target otoliths from each stock area.

SNA 2 North bottom trawl: Random age frequency sampling method

The random age frequency sampling method was used for collecting otoliths from each SNA 2 North bottom trawl landing by taking random otolith samples using a unique random selection process (described by Parsons et al. 2022), a slight deviation from that described for SNA 1 bottom longline above. Essentially, 15 bulked bins of snapper (i.e., not soldier packed) were chosen from a landing. A sampler would then count through 300 fish from 15 bins and be blindly prompted to select a fish for otolith extraction by another sampler. This sampling process was conducted according to a random sampling form which had 60 of 300 lines randomly highlighted. A unique random sampling form was used for each sampling event, therefore making the selection process unequivocal and without bias, both within and between sampled landings. If the 15 bins selected did not contain 300 fish, the samplers returned to the first bin and began recounting fish until they reached 300 and, in doing so, had set aside the 60 fish required for otoliths. It was estimated that this sampling design should adequately achieve a catch-at-age MWCV approximating 0.20, despite the target being 0.30. All fish making up the otolith sample were measured to the nearest centimetre below the fork length.

Although a total sample size of 1800 otoliths across 30 landings was initially targeted from the SNA 2 North bottom trawl fishery over the entire year, it was proposed that only 1200 of these would be used for ageing, with 600 otoliths from 15 landings collected per half-year season (Table 3).

Table 3: Level of sampling proposed to describe the SNA 2 North bottom trawl fishery in 2022–23 based on historical sampling for catch-at-age data that derived MWCVs below 20%.

Stock	Annual target number of landings (per season)	Annual target number of otoliths (per season)
SNA 2N	30 (15)	1 200 (600)

2.4 Quality assurance of sampling processes

A total of 14 NIWA trained staff or scientific contractors were tasked with the collection of length and age samples from the SNA 1 and SNA 2 fisheries in 2022–23. In September 2022, prior to sampling, NIWA Auckland held a training event on how to use electronic measuring boards (referred to as EBoards) for catch sampling, which included not only the measurement of fish length, but gave options for recording sex, gonad stage, number of bins and measurements accomplished, as well as the preparation of detailed printed labels for otolith envelopes, allowing for reduced sampling time and data entry errors. To ensure that standards were maintained throughout the project, all new NIWA staff initially received specific sampling training by working alongside experienced samplers. Sampling events were conducted by two samplers, one measuring and the other placing fish, cleaning otoliths and labelling envelopes. Scientific contractors undertook quality assurance visits to review the sampling process. For SNA 2N bottom trawl fisheries, the RAF sample selection process was tested by comparing the shape and location of the size frequency distributions for fish selected for otolith extraction to all 300 fish in the sample (Anderson et al. 1994). All samplers passed this length frequency comparison.

2.5 Reader comparison tests for reference readings

To assess reader competency in ageing snapper otoliths, selected readers must first age a subsample of 50 reference otolith preparations, before ageing the 2022–23 otolith collections, with the aim of achieving a score for Index of Average Percentage Error, IAPE (Beamish & Fournier 1981) and mean coefficient of variation (CV) (Chang 1982) of below 1.50% and 2.12%, respectively (Walsh et al. 2014a).

2.6 Age determination

All 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. 2014a). Five readers were used in ageing SNA 1 and SNA 2 otolith samples in 2022–23, with reader 1 ageing all four fishery collections and readers 2 to 5 each ageing one. Each reader read each otolith once without prior knowledge of each other's zone count obtained or of the fish length. For otoliths from each fishery where both readers agreed on the zone count, the age was determined from this count. When readers disagreed, the otolith was re-read together to determine the likely source of error and the count agreed upon. The forced margin method was implemented to anticipate the otolith margin type (wide, line, narrow) *a priori* in the month in which the fish was sampled to provide guidance in determining age. To determine the 'fishing year age class' of fish using the forced margin, 'wide' readings were increased by 1 year (e.g., 3W is aged as a 4 year old) and 'line' and 'narrow' readings remain the same as the zone count (e.g., 4L or 4N are aged as a 4 year old), meaning that regardless of whether the fish was caught before or after the nominal birth date of 1 January, age remains the same throughout, unlike that which would be used for age groups/age classes or in growth rate estimation (see Walsh et al. 2014a).

2.7 Catch-at-age analysis

NIWA's catch-at-length and -age analysis software tool CALA (catch-at-length and -age, Francis & Bian 2011) was used in the calculation of proportion-at-age and variance (bootstrap) estimates for the SNA 1 bottom longline fisheries and the SNA 2 North bottom trawl fishery, from the random age frequency samples collected from each landing. Proportions-at-age for all landings within a season were estimated from sample proportions, weighted by the estimated number of fish in each landing. The weighted mean proportion-at-age and variance across temporal (seasons) and spatial (East Northland only) strata for each fishery was calculated following Blackwell et al. (1999). CALA was also used in the calculation of proportion-at-length and -age and variance (bootstrap) estimates for SNA 1 bottom trawl, Danish seine, and modular harvest system fisheries from the length frequency samples collected from each landing and the age-length key samples collected from each stock.

Calculation of mean weight-at-age for the SNA 1 stock areas was based on length-weight relationships collected in 2019–20 (Walsh et al. 2022) while that for the northern SNA 2 bottom trawl fishery was based on Paul (1976) (Table 4). The purpose of a new length-weight data collection in SNA 1 was to establish whether any change in the length-weight ratio may have occurred over time due to a slowing growth rate in some SNA 1 stocks and the concern relating to the condition of fish (Walsh et al. 2019b), and in doing so, replaces the data from a number of stocks and seasons collected more than 50 years ago (Paul 1976).

Table 4: Snapper length-weight relationship estimates for SNA 1 and SNA 2 stocks.

Stock area	Length-weight relationship	Reference
East Northland	w (g) = 0.0349 $l^{2.8701}$ (cm)	Walsh et al. (2022)
Hauraki Gulf	w (g) = 0.0494 $l^{2.7712}$ (cm)	Walsh et al. (2022)
Bay of Plenty	w (g) = 0.0430 $l^{2.8133}$ (cm)	Walsh et al. (2022)
SNA 2 North	w (g) = 0.04467 $l^{2.793}$ (cm)	Paul (1976)

Mean weight-at-age estimates were calculated as a weighted mean with respect to the total number of fish estimated within each landing sampled (Walsh et al. 2006) and is directly analogous to estimating proportion catch-at-age (Davies et al. 2003). Landing-specific weight-at-age was scaled up to the season-fishery stratum and combined over all seasons (and spatial strata in East Northland). The calculation of estimates of mean length-at-age followed those procedures for estimating weight-at-age outlined by Davies et al. (2003).

Proportions-at-age, mean length-at-age, and derived mean weight-at-age were calculated for the range of fishing year age classes (herein referred to as 'age classes'). The maximum age was a plus group, being an aggregate of all age classes over 29 years, which were assigned an age of 30.

Random age frequency data (i.e., SNA 1 bottom longline fisheries and SNA 2 North bottom trawl) were collected primarily to derive catch-at-age estimates. However, it can be assumed that fish sampled randomly for age were also random observations from within each length interval. Consequently, age-length keys could be derived from the random age frequency otolith samples. However, fish in the larger length classes, collected by the random age frequency method, were infrequently sampled and are likely to be poorly described in the age-length key. Age-length keys are assumed to be representative of the seasonal strata of the samples, that being the entire year, and may not be directly comparable with collections in years when only spring and summer were usually sampled. The main assumption that must be satisfied for an age-length key is that the sample was taken randomly with respect to age from within each length interval (Southward 1976). Age-length keys are included to give the reader an appreciation of the age-at-length differences between the stocks.

Snapper length and age data and landing details were stored on the Fisheries New Zealand *market* and *age* databases, administered by NIWA.

3. RESULTS

3.1 Updated fishery characterisation: 2018–19 to 2022–23

In 2022–23, the Bay of Plenty contributed 48% (2102 t) of the overall SNA 1 commercial catch, East Northland 37% (1593 t), and Hauraki Gulf 15% (671 t). Significant spatial change in the SNA 1 catch over the last five years has occurred with Hauraki Gulf declining by 30% (about 293 t) and Bay of Plenty and East Northland increasing by 34% (about 535 t) and 24% (about 308 t), respectively.

The bottom longline catch from East Northland, the largest across all area-method fisheries, has increased significantly from 826 t in 2018–19 to 1042 t in 2022–23 (Figure 5a). Modular harvest system, operating in its eighth year in the SNA 1 fishery, accounted for the second largest method catch (295 t) in East Northland in 2022–23, effectively replacing conventional bottom trawl.

The Hauraki Gulf bottom longline catch declined noticeably over the last two years, but still remained the most dominant method with a 42% share (280 t) of the snapper catch in 2022–23, followed by Danish seine, the second largest take at 239 t (Figure 5b). Hauraki Gulf bottom trawl was also impacted with a reduction to 117 t in 2022–23. Unlike 2018–19, no snapper was caught by the modular harvest system in the Hauraki Gulf over the previous four years (Figure 5b).

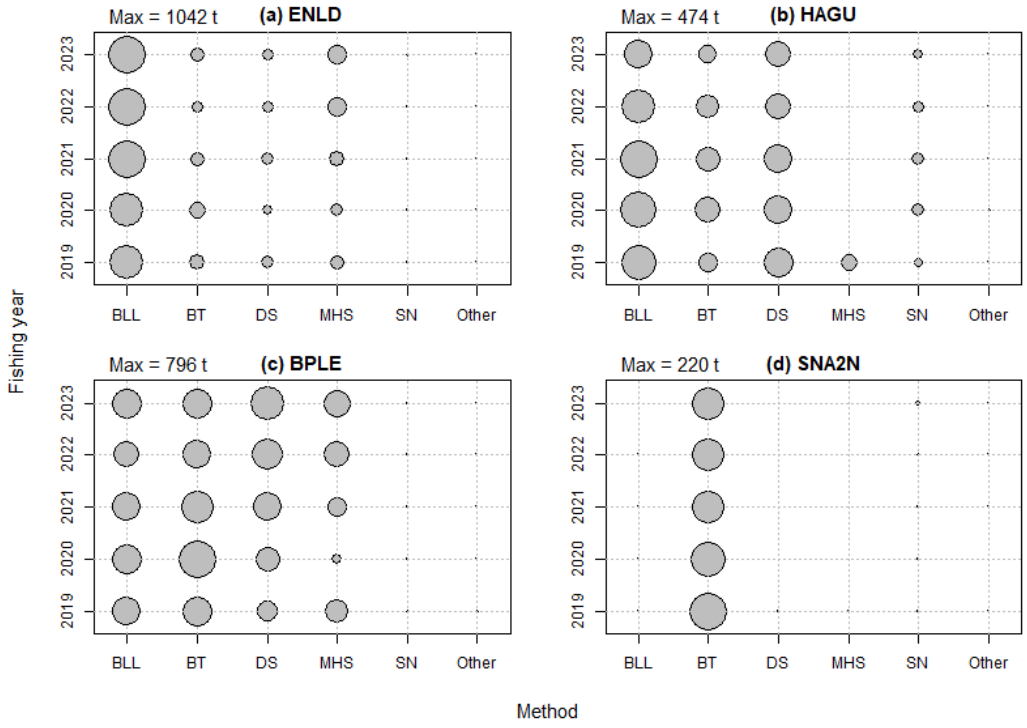

Figure 5: Catch of snapper in SNA 1 and SNA 2N stocks by gear type from fishing years 2018–19 to 2022–23. ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty (d) SNA2N, SNA 2 North; BLL, Bottom longline; BT, Bottom trawl; DS, Danish seine; MHS, Modular harvest system; SN, Set net).

Four main methods operate in the Bay of Plenty snapper fishery, contributing to the largest overall catch in SNA 1 for the past five years: 1567 t in 2018–19 to 2102 t in 2022–23 (Figure 5c). Danish seine dominated for the largest catch (630 t) landing of snapper in 2022–23, followed by bottom trawl (530 t), bottom longline (514 t) and modular harvest system (426 t) (Figure 5c).

The SNA 2 North catch, although small, has remained relatively consistent over time with an average take of 185 t, equating to 59% of the SNA 2 TACC (315 t), 99% caught by bottom trawl (Figure 5d).

3.2 Relative SNA 1 and SNA 2 catch by bottom longline

From 2018–19 to 2022–23, bottom longline operated across seven main coastal Statistical Areas (002–003, East Northland; 005–007, Hauraki Gulf; 008–009, Bay of Plenty) (Figure 6). The largest catch across all five years has consistently been from East Northland, in either Statistical Area 002 or 003. The 2022–23 catch for Statistical Area 002 was 617 t (likely to be the largest annual statistical area catch by bottom longline), and that for Statistical Area 003 was 425 t (Figure 6a).

Despite 2022–23 being the lowest bottom longline catch (202 t) from the northern Hauraki Gulf (Statistical Area 005) over the past five years, the declining catch in central and inner Hauraki Gulf (Statistical Areas 006 and 007) are much more evident with 2022–23 estimates at 30 and 48 t, respectively (Figure 6b). In contrast, the snapper catch from northern and central Bay of Plenty, Statistical Areas 008 and 009, has remained relatively consistent over the same period (Figure 6c).

Negligible bottom longline catch was taken from offshore East Northland (Statistical Area 004), Eastern Bay of Plenty (Statistical Area 010), and SNA 2 North (Statistical Areas 011–013N) (Figures 6a, c, and d).

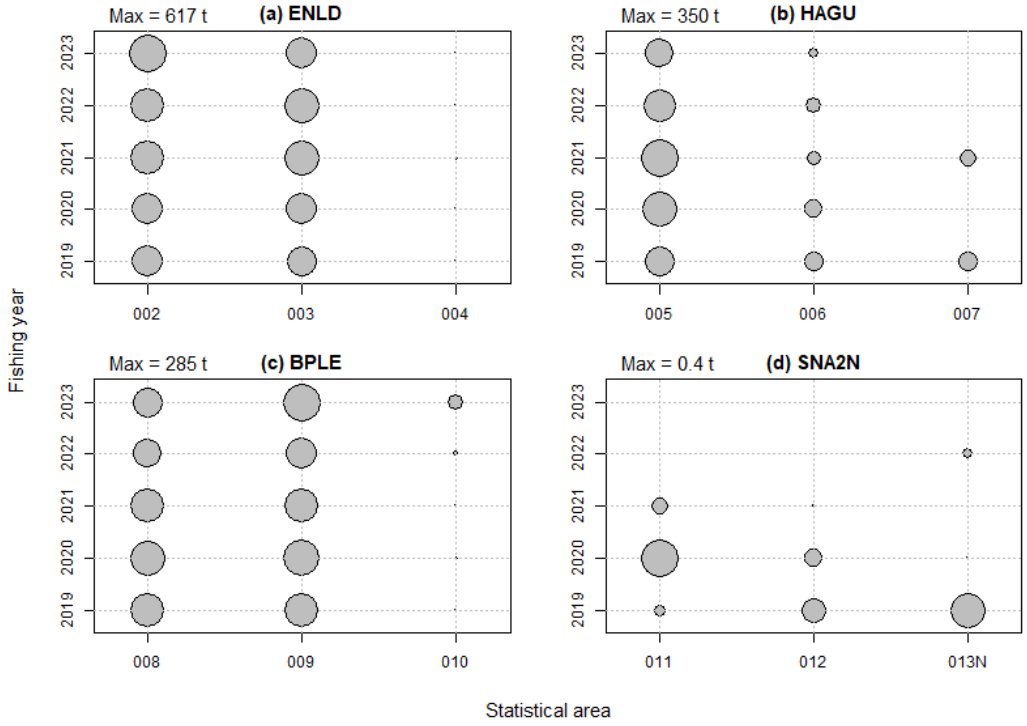

Figure 6: Bottom longline catch of snapper in SNA 1 and SNA 2N stocks by statistical area from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

Despite a declining spring-summer trend over the 5-year period within the Hauraki Gulf bottom longline fishery, the monthly pattern of the East Northland and Bay of Plenty catches was generally consistent, with spring-summer possibly even improving over time (Figures 7a–c). The bottom longline fishery in East Northland tends to operate year-round with fairly uniform monthly catches throughout, although increased volumes over time during spring-summer is apparent. The Hauraki Gulf spring-summer volumes diminished substantially over time with few vessels operating in later years, and small volumes in the Bay of Plenty, mainly over November/December to January, reflecting some vessel migrations to East Northland (Figures 7a–c).

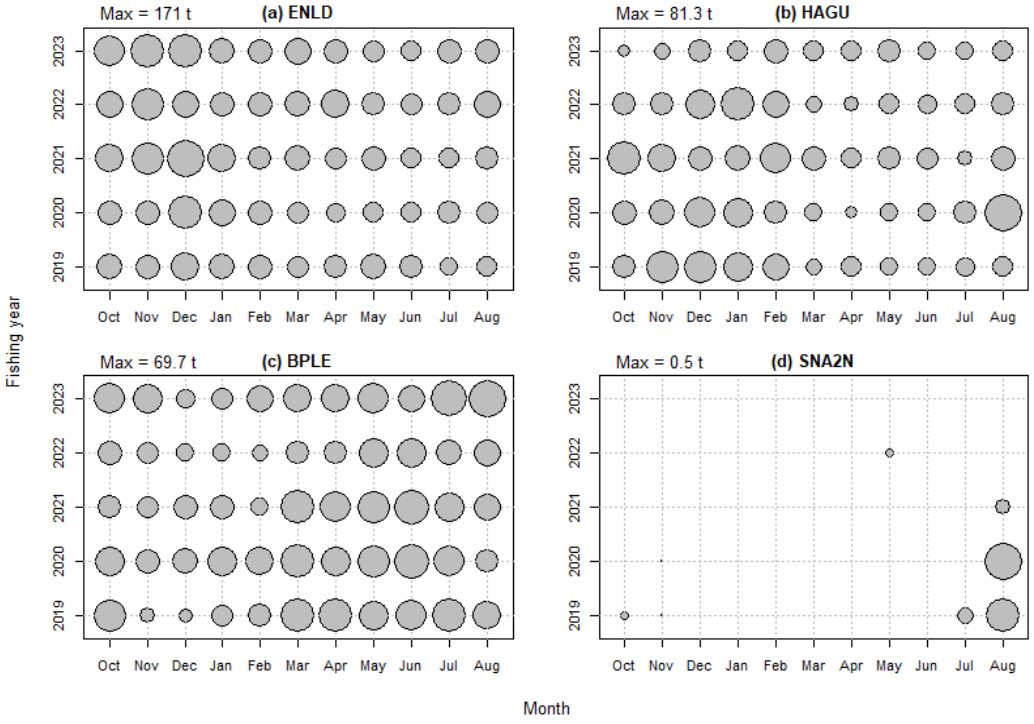

Figure 7: Bottom longline catch of snapper in SNA 1 and SNA 2N stocks by month from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

3.3 Sampling the SNA 1 bottom longline fishery 2022–23

Sample collections

Summaries of the bottom longline sample sizes for stock-season strata are given in Table 5 and summaries of the otolith sample collections are given in Table 6. A total of 120 bottom longline landings were sampled (40 landings per stock) from SNA 1 in 2022–23 from 24 vessels, with 3381 snapper selected randomly for ageing. However, in recent years, longline vessels that regularly fished in the Hauraki Gulf instead directed their effort toward East Northland and Bay of Plenty where snapper are of larger average size and better quality (colour and condition) (Walsh et al. 2019b, 2022). As a result, proportional sampling across the fleet relative to catch was generally good within the East Northland and Bay of Plenty bottom longline fisheries, but sampling is likely to be disproportionate in the Hauraki Gulf. For example, the largest number of times that samples were taken from a single vessel during the study for each of the respective stocks was: 11 times, East Northland (13 vessels available); 9 times, Bay of Plenty (11 vessels available); 19 times, Hauraki Gulf (5 vessels available, two alone accounted for 35 of the 40 landings (87.5%)). Many of these vessels also fished in adjacent SNA 1 stocks.

Table 5: Summary of the bottom longline catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish sampled for otoliths) in stock-method-season strata for the SNA 1 and SNA 2 fisheries from spring 2022 to winter 2023. (Note: ENLD BLL data are presented for Statistical Areas 002, 003, and combined).

			Number of landings			No. of fish	Weight of landings (t)		
Stock*	Method†	Season	Total	Sampled	% total	sampled	Total	Sampled	% total
ENLD (002)	BLL	Spring	145	5	3.4	130	125	5	4.0
		Summer	218	4	1.8	120	181	4	2.2
		Autumn	179	6	3.4	202	148	7	4.7
		Winter	150	5	3.3	136	121	4	3.3
ENLD (003)	BLL	Spring	81	5	6.2	151	128	7	5.5
		Summer	104	5	4.8	150	114	4	3.5
		Autumn	68	5	7.4	150	70	5	7.1
		Winter	76	5	6.6	158	83	6	7.2
ENLD (comb.)	BLL	Spring	226	10	4.4	281	253	12	4.7
		Summer	322	9	2.8	270	295	8	2.7
		Autumn	247	11	4.5	352	220	13	5.9
		Winter	226	10	4.4	294	204	10	4.9
HAGU	BLL	Spring	32	10	31.3	281	26	8	30.8
		Summer	96	9	9.4	251	93	8	8.6
		Autumn	111	11	9.9	295	84	8	9.5
		Winter	78	10	12.8	246	62	6	9.7
BPLE	BLL	Spring	112	10	8.9	275	92	10	10.9
		Summer	122	10	8.2	265	81	7	8.6
		Autumn	145	10	6.9	310	126	12	9.5
		Winter	221	10	4.5	261	172	9	5.2

* ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty.
† BLL, bottom longline.

Table 6: Details of snapper otolith samples collected in 2022–23 from the stock areas of SNA 1 using method bottom longline (Note: ENLD BLL data presented for Statistical Areas 002, 003, and both combined).

Stock*	Method†	Sampling period	Sampling method‡	Length range (cm)	Otoliths
ENLD (002)	BLL	Spring-winter	R	26–65	588
ENLD (003)	BLL	Spring-winter	R	24–54	609
ENLD (comb.)	BLL	Spring-winter	R	24–65	1 197
HAGU	BLL	Spring-winter	R	25–74	1 073
BPLE	BLL	Spring-winter	R	25–67	1 111

* ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty.
† BLL, bottom longline.
‡ R, random sample.

Representativeness

The weight and number of bottom longline landings sampled throughout the 2022–23 fishing year were relatively representative of temporal catch trends of each stock (Figures 8–10).

East Northland accounted for over half (57%) of the 2022–23 SNA 1 bottom longline catch, with a high proportion taken during spring-summer (Figure 8). November experienced the largest monthly catch (139 t) across SNA 1, followed in succession by the two surrounding months, October and December (Figure 8). Although the temporal spread of sampled landings in East Northland showed some disproportionality, all months of the sampled period were represented (Figure 8). The sampled catch represented 4% by weight and 4% by number of landings of the total bottom longline catch in East Northland. The average landing size selected for sampling (1077 kg) was marginally larger than the average landing in the fishery (945 kg).

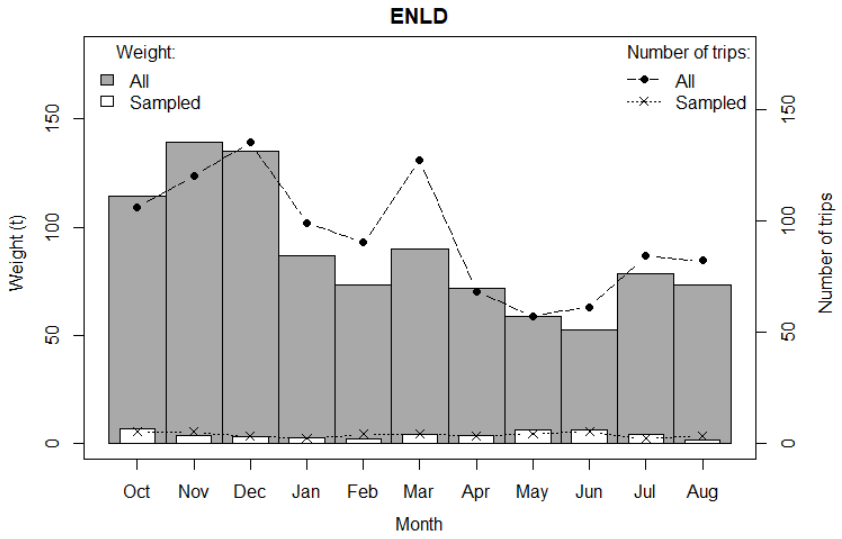

Figure 8: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the East Northland (ENLD) bottom longline fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

Hauraki Gulf landings accounted for just 15% of the overall SNA 1 bottom longline catch in 2022–23, likely to be the lowest in decades (Figure 9). Despite longline catch volumes being lowest in spring with subsequent months sporadic, the temporal spread of sampled landings in the Hauraki Gulf were represented across all months of the sampled period (Figure 9). The sampled catch accounted for 13% by weight and 13% by number of landings of the total bottom longline catch in the Hauraki Gulf. The average landing size selected for sampling (849 kg) was closely aligned to the average landing in the fishery (837 kg).

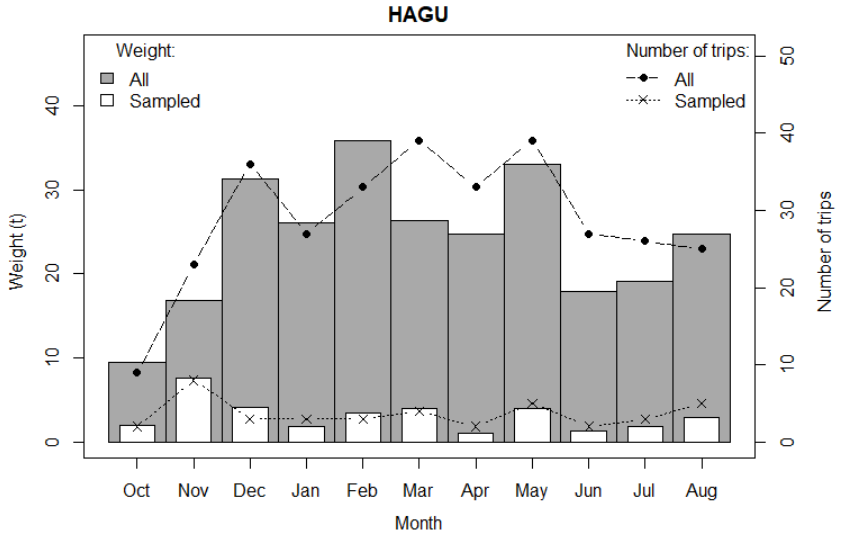

Figure 9: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the Hauraki Gulf (HAGU) bottom longline fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

Bay of Plenty landings accounted for 28% of the overall SNA 1 bottom longline catch in 2022–23. Bottom longline volumes were mostly lowest in summer and highest during winter (Figure 10). Although the temporal spread of sampled landings in the fishery appears slightly disproportionate to the fishery, each month was represented (Figure 10). The sampled catch accounted for 8% by weight and 7% by number of landings of the total bottom longline catch in the Bay of Plenty. The average landing size selected for sampling (952 kg) was marginally larger than the average landing in the fishery (786 kg).

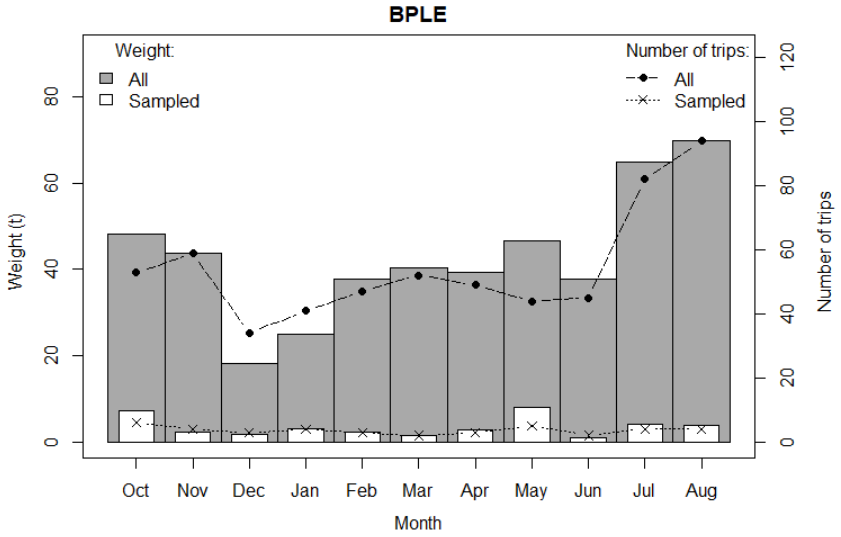

Figure 10: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the Bay of Plenty (BPLE) bottom longline fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

The sampling performance relative to the cumulative proportion of the total number and catch weight of landings throughout the sampling period is illustrated in Figure 11. Sampling was reasonably well distributed in proportion to, and representative of, the bottom longline fisheries in SNA 1.

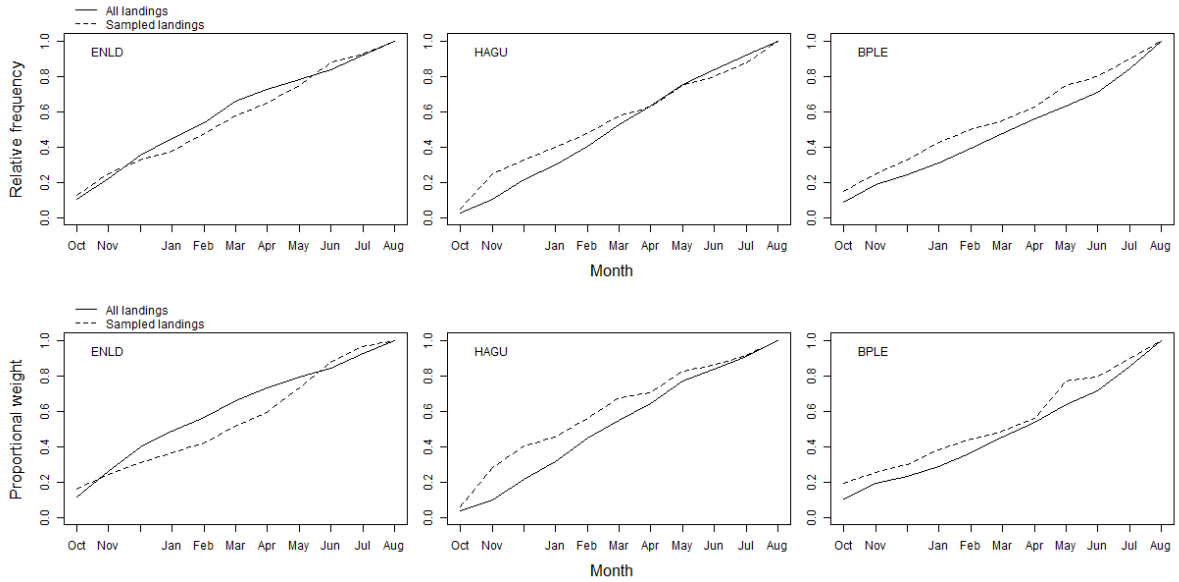

Figure 11: Comparison of the cumulative proportion of the number of landings (top row) and catch weight of landings (bottom row) with cumulative proportions of samples taken from the SNA 1 stock bottom longline fisheries in 2022–23. ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty.

Spatial comparisons (0.1 degree blocks) of the SNA 1 bottom longline fishery catch and sampled catch for 2022–23 are presented in Figure 12 and by statistical area in Figure 13.

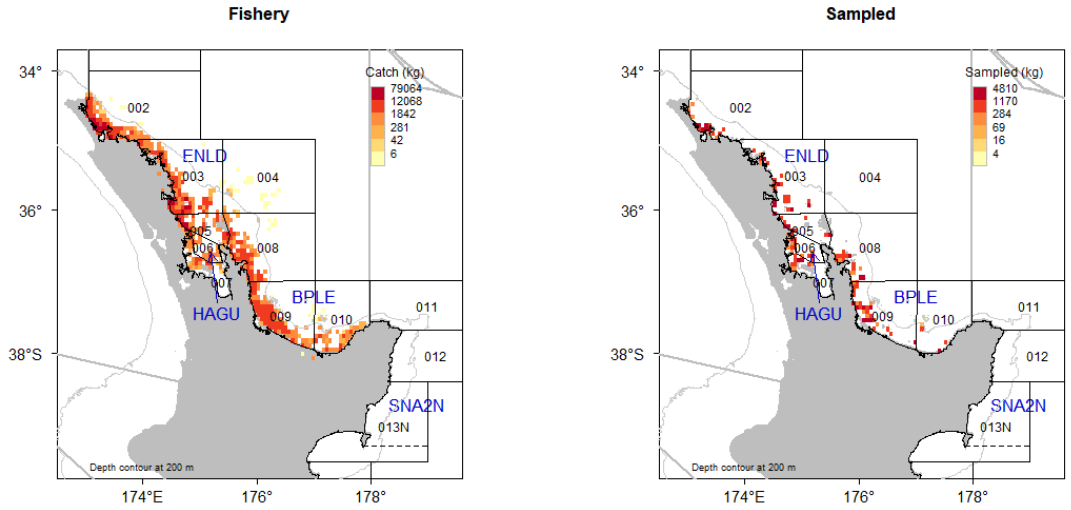

Figure 12: Comparison of the spatial distribution of the bottom longline catch and the sampled component for SNA 1 stocks in 2022–23.

Statistical Areas 002–003, 005 and 008–009 accounted for 93% of the entire bottom longline catch between North Cape and Cape Runaway (Figure 12). Sampling was broadly representative of SNA 1 statistical area catch (Figures 12 and 13).

Although the SNA 1 longline catch in 2022–23 was taken targeting six species, snapper targeting accounted for 99% of the total catch (Figure 13). Sampling in relation to target species was representative.

Aside from under- and over-sampling issues within the Hauraki Gulf Statistical Areas 005 and 007, the proportionality of the sampled component to that of the fishery suggests that the sampled landings, by and large, were representative of the operation of the SNA 1 bottom longline fleet as a whole (Figure 13).

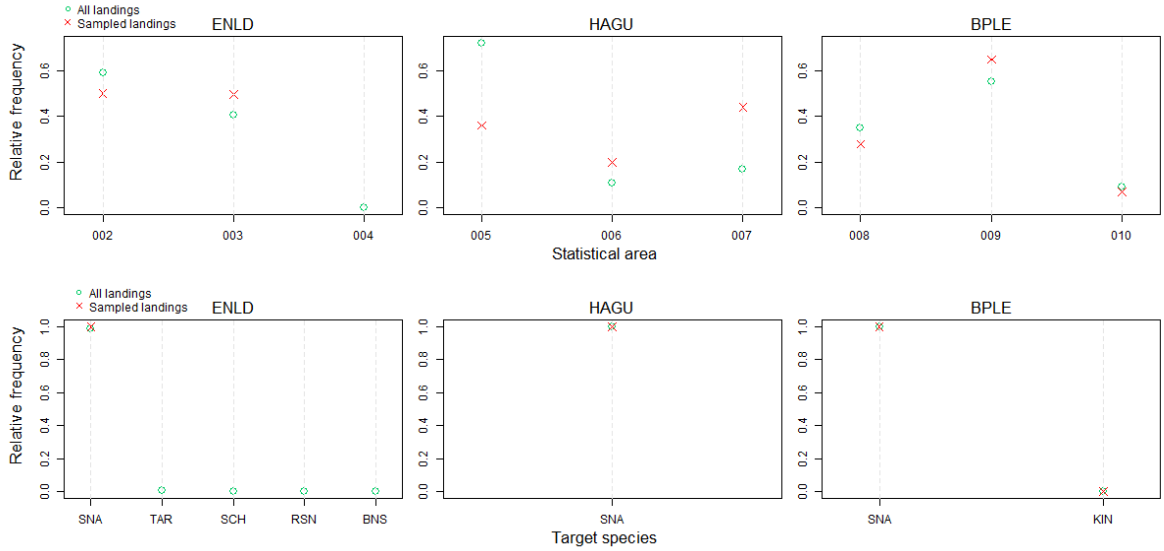

Figure 13: Comparison of the proportional distribution of the estimated bottom longline catch and the sampled component by statistical area (top row) and target species (bottom row) over the sampling period for the SNA 1 stocks in 2022–23. ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty. SNA, snapper; TAR, tarakihi; SCH, school shark (*Galeorhinus galeus*); RSN, red snapper (*Centroberyx affinis*); BNS, bluenose (*Hyperoglyphe antarctica*); KIN, kingfish (*Seriola lalandi*).

3.4 Relative SNA 1 and SNA 2 catch by bottom trawl

From 2018–19 to 2022–23, bottom trawl fisheries operated across seven main SNA 1 Statistical Areas (002–003, East Northland; 005–006, Hauraki Gulf; 008–010, Bay of Plenty) and all three SNA 2 North Statistical Areas (011–013N) (Figure 14). The largest bottom trawl catches in SNA 1 in recent years have occurred in the central and eastern Bay of Plenty Statistical Areas 009 and 010 (Figure 14c). The 2022–23 catch for Statistical Area 009 was 267 t and for Statistical Area 010 was 159 t (Figure 14c).

Significant declines in the snapper catch over the past five years were apparent in East Northland (Statistical Area 002 and 003), central Hauraki Gulf (Statistical Area 006) and eastern Bay of Plenty (Statistical 010) (Figures 14a, b and c). In contrast, the catch from Statistical Area 005 and Statistical Area 009 have remained relatively consistent over most of the same periods (Figure 14b and c).

In 2022–23, SNA 2N, Tairāwhiti Gisborne area, was impacted by 3 months worth of rain in 24 hours followed by Cyclone Gabrielle (February 2023). This resulted in flood and debris impacting commercial fishery operations, particularly bottom trawl, whereby some vessels often towed repeatedly along the same marked tracks to minimise debris being caught in nets. The landed catch of snapper from Statistical Area 012 in 2022–23 was the lowest in five years (56 t) while that from Statistical Area 013N was an average level 79 t (Figure 14d).

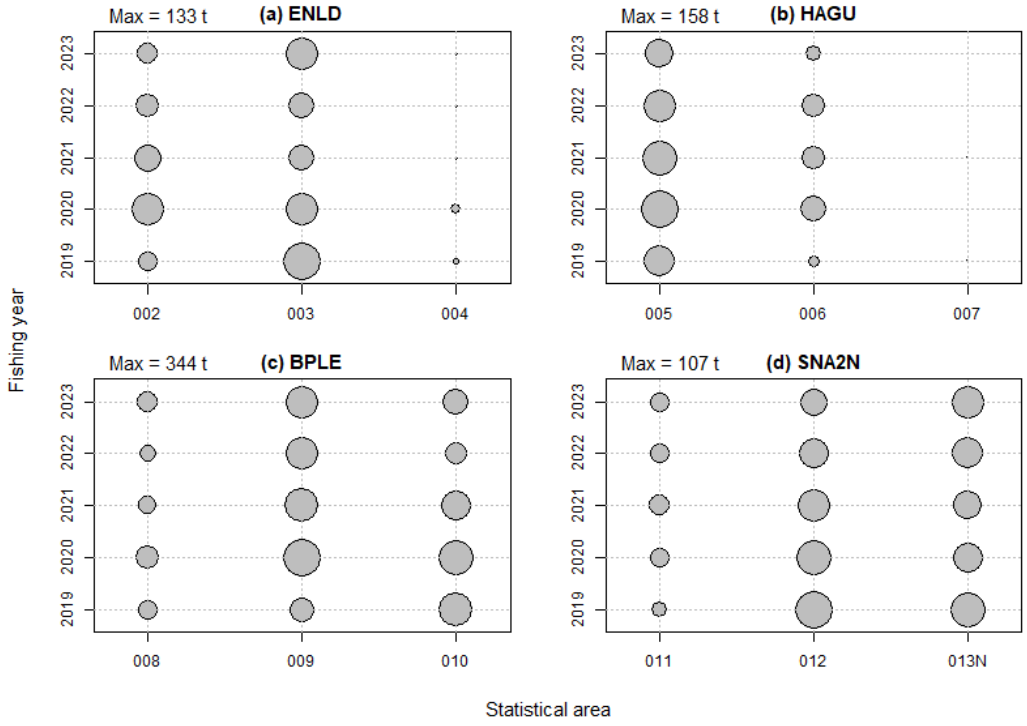

Figure 14: Bottom trawl catch of snapper in SNA 1 and SNA 2 stocks by statistical area from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

Despite variability in the overall annual catch within each stock area, there was some consistency in the monthly patterns in the Bay of Plenty and SNA 2 North (Figures 15a–d). However the decline in catch around 2020–21 and 2022–23 in East Northland and Hauraki Gulf made any comparisons between years challenging (Figures 15a–b).

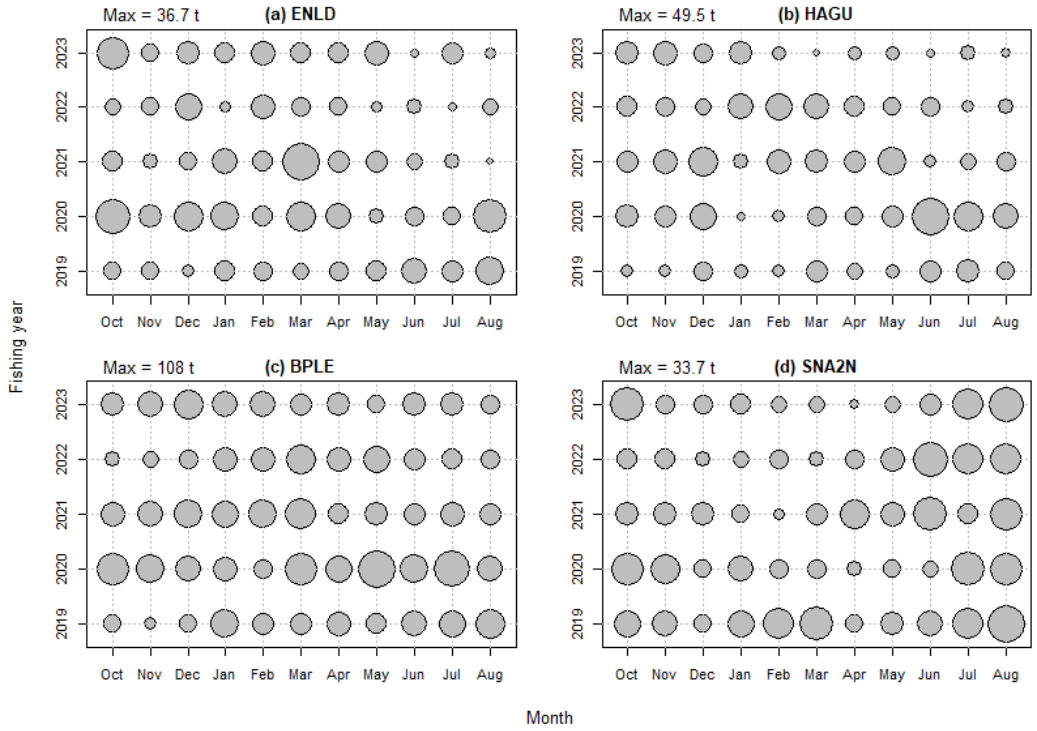

Figure 15: Bottom trawl catch of snapper in SNA 1 and SNA 2 stocks by month from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

3.5 Sampling the SNA 1 and SNA 2 bottom trawl fisheries 2022–23

Sample collections

Summaries of the East Northland, Hauraki Gulf, Bay of Plenty and SNA 2 North bottom trawl sample sizes for stock-season strata are given in Table 7 and summaries of the otolith sample collections are given in Table 8.

Despite a target of 30 landings proposed for each of the three SNA 1 bottom trawl fisheries in 2022–23, none were fully achieved, due to either contamination of catch from adjacent stock, lack of fishing effort within a stock (Hauraki Gulf) or a vessel changing to the modular harvest system during a trip (East Northland). Nevertheless, a total of 50 bottom trawl landings were sampled from SNA 1 in 2022–23 from 8 vessels (two vessels operating in East Northland, four in Hauraki Gulf and four in Bay of Plenty) with 15 000 snapper length measurements recorded and 181 otolith pairs[2] collected using the length frequency and age-length key sampling design (Tables 7 and 8).

A total of 26 bottom trawl landings were sampled from SNA 2 North in 2022–23 (falling short of the target of 30 landings (Table 7)) from 4 vessels, with 1200 snapper selected randomly for age information (Table 8). Some vessels fished both SNA 1 and SNA 2 stocks and the bins were marked at sea to ensure that a SNA 2 North sample was identified.

[2] Otolith samples collected from the length frequency and age-length key sampling design are specific to each stock and may be a combination of otoliths from more than one fishing method (i.e., Bay of Plenty bottom trawl, Danish seine, modular harvest system; see Section 2.3).

Table 7: Summary of the bottom trawl catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish sampled for length frequency) in stock-method-season strata for the SNA 1 and SNA 2 fisheries from spring-summer 2022–23 to autumn-winter 2023.

			Number of landings			No. of fish	Weight of landings (t)		
Stock*	Method†	Season	Total	Sampled	% total	measured	Total	Sampled	% total
ENLD	BT	Spr-sum	40	10	25.0	2 800	77	29	37.7
		Aut-win	32	4	12.5	1 260	57	11	19.3
HAGU	BT	Spr-win	60	8	13.3	2 492	113	28	24.8
BPLE	BT	Spr-sum	82	13	15.9	4 049	270	64	23.7
		Aut-win	69	15	21.7	4 703	227	60	26.4
SNA 2N	BT	Spr-sum	92	11	12.0	600	64	9	14.1
		Aut-win	104	15	14.4	600	83	10	12.0

* ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA 2N, SNA 2 North.
† BT, bottom trawl.

Table 8: Details of snapper otolith samples collected in 2022–23 from the stock areas of SNA 1 and SNA 2 using method bottom trawl.

Stock*	Method†	Season	Sampling method	Length range (cm)	Otoliths
ENLD	BT	Spr-sum	LF+ALK‡	24–71	45
		Aut-win		45–70	13
HAGU	BT	Spr-win	LF+ALK‡	24–59	29
BPLE	BT	Spr-sum	LF+ALK‡	21–71	58
		Aut-win		24–69	36
SNA 2N	BT	Spr-sum	RAF§	24–65	600
		Aut-win		25–63	600

* ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA 2N, SNA 2 North.
† BT, bottom trawl.
‡ LF+ALK, length frequency and age-length key.
§ RAF, random age frequency.

Representativeness

The weight and number of Bay of Plenty and SNA 2N bottom trawl landings sampled throughout 2022–23 were relatively representative of temporal catch trends of each stock whereas that for East Northland and Hauraki Gulf trawl fisheries were either affected by stock contamination, lack of fishing effort, or change in fishing methods (Figures 16–19).

East Northland accounted for 18% of the 2022–23 SNA 1 bottom trawl catch with a high proportion taken during spring-summer, with October having the largest monthly catch of 27 t (Figure 16). Although the temporal spread of sampled landings appears slightly disproportionate to the fishery, there was reasonable representation across spring-summer months (Figure 16). The sampled catch accounted for 29% by weight and 19% by number of landings of the total bottom trawl catch in East Northland. The average landing size selected for sampling (2800 kg) was considerably larger than the average landing in the fishery (1868 kg).

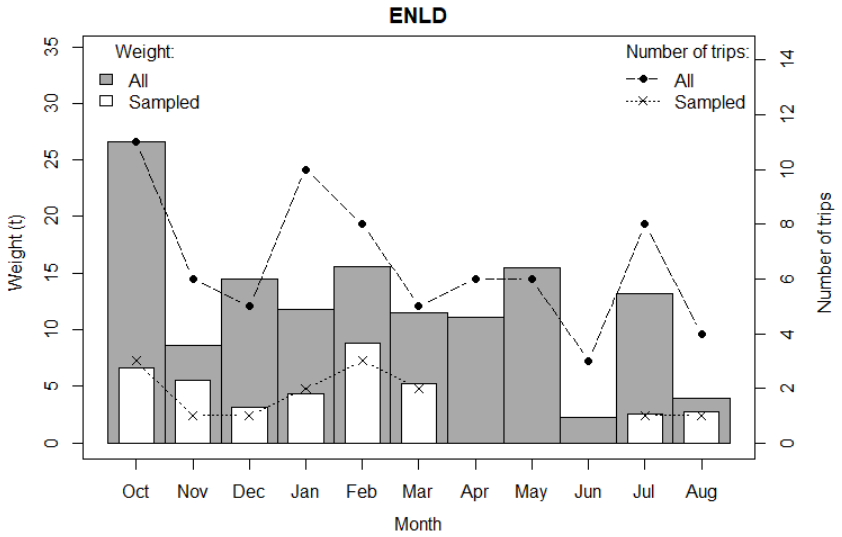

Figure 16: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the East Northland (ENLD) bottom trawl fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

Hauraki Gulf accounted for 15% of the 2022–23 SNA 1 bottom trawl catch with a high proportion taken during spring-summer, and with October, November and January equally dominating the monthly catches (ranging from 19 to 21 t) (Figure 17). The temporal spread of sampled landings was often restricted by landing availability, particularly during autumn-winter, and only six of eleven months were sampled (Figure 17). The sampled catch accounted for 25% by weight and 13% by number of landings of the total bottom trawl catch in Hauraki Gulf. The average landing size selected for sampling (3526 kg) was considerably larger than the average landing in the fishery (1891 kg).

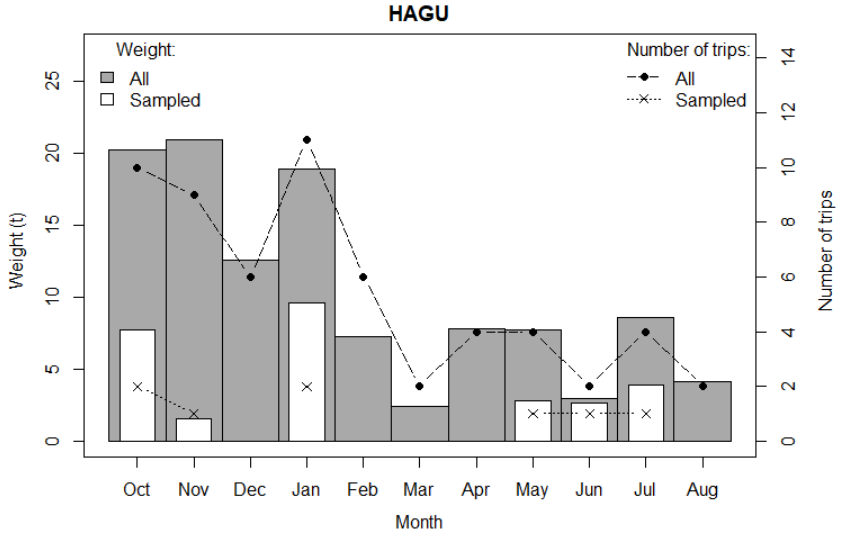

Figure 17: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the Hauraki Gulf (HAGU) bottom trawl fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

Bay of Plenty accounted for two-thirds (67%) of the 2022–23 SNA 1 bottom trawl catch, with a relatively equal proportion during spring-summer and autumn-winter (Figure 18). December experienced the largest monthly catch across SNA 1 bottom trawl. (Figure 18). The temporal spread of sampled landings was reasonably representative of the fishery over all months. The sampled catch accounted for 25% by weight and 19% by number of landings of the total bottom trawl catch in Bay of Plenty. The average landing size selected for sampling (4434 kg) was larger than the average landing in the fishery (3288 kg).

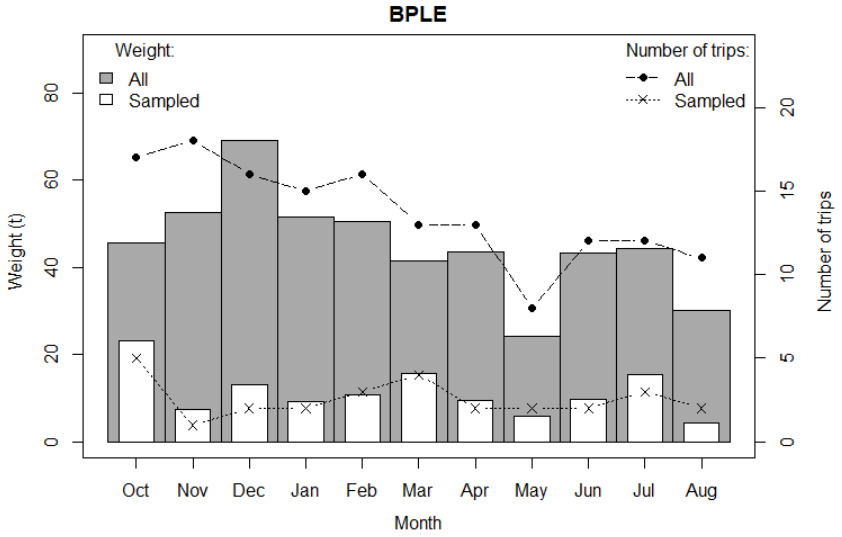

Figure 18: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the Bay of Plenty bottom trawl fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

SNA 2N landings accounted for 46% of the overall SNA 2 bottom trawl catch in 2022–23, with a high proportion of snapper taken during October, July and August. The temporal spread of sampled landings, although often disproportionate to the fishery operation, were represented throughout all months (Figure 19). The sampled catch accounted for 13% by weight and 13% by number of landings of the total bottom trawl catch in SNA 2N. The average landing size selected for sampling (731 kg) was closely aligned with the average landing in the fishery (747 kg).

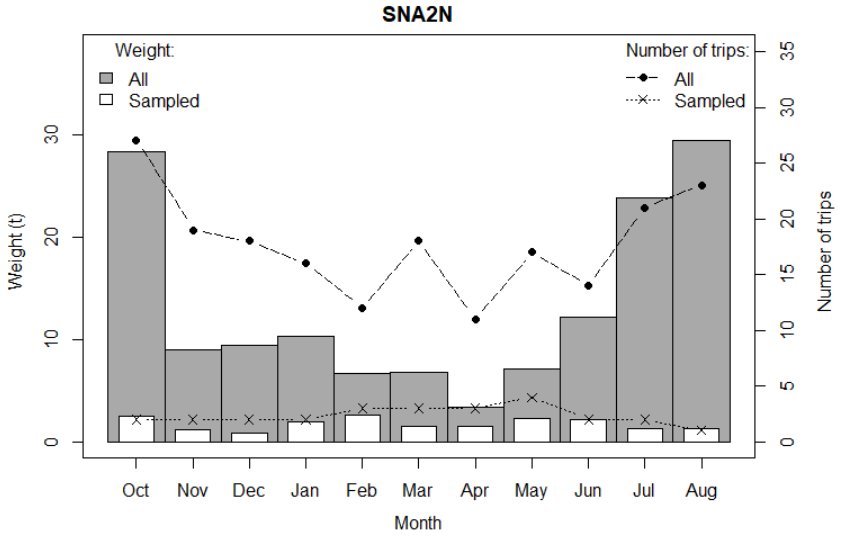

Figure 19: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the SNA 2N bottom trawl fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

The sampling performance relative to the cumulative proportion of the total number and catch weight of landings throughout the sampling period is illustrated in Figure 20. Sampling was best distributed in proportion to, and representative of, the Bay of Plenty bottom trawl fishery, but less so for East Northland, Hauraki Gulf and SNA 2 North, due to insufficient samples (see Section 3.5 Sample collections).

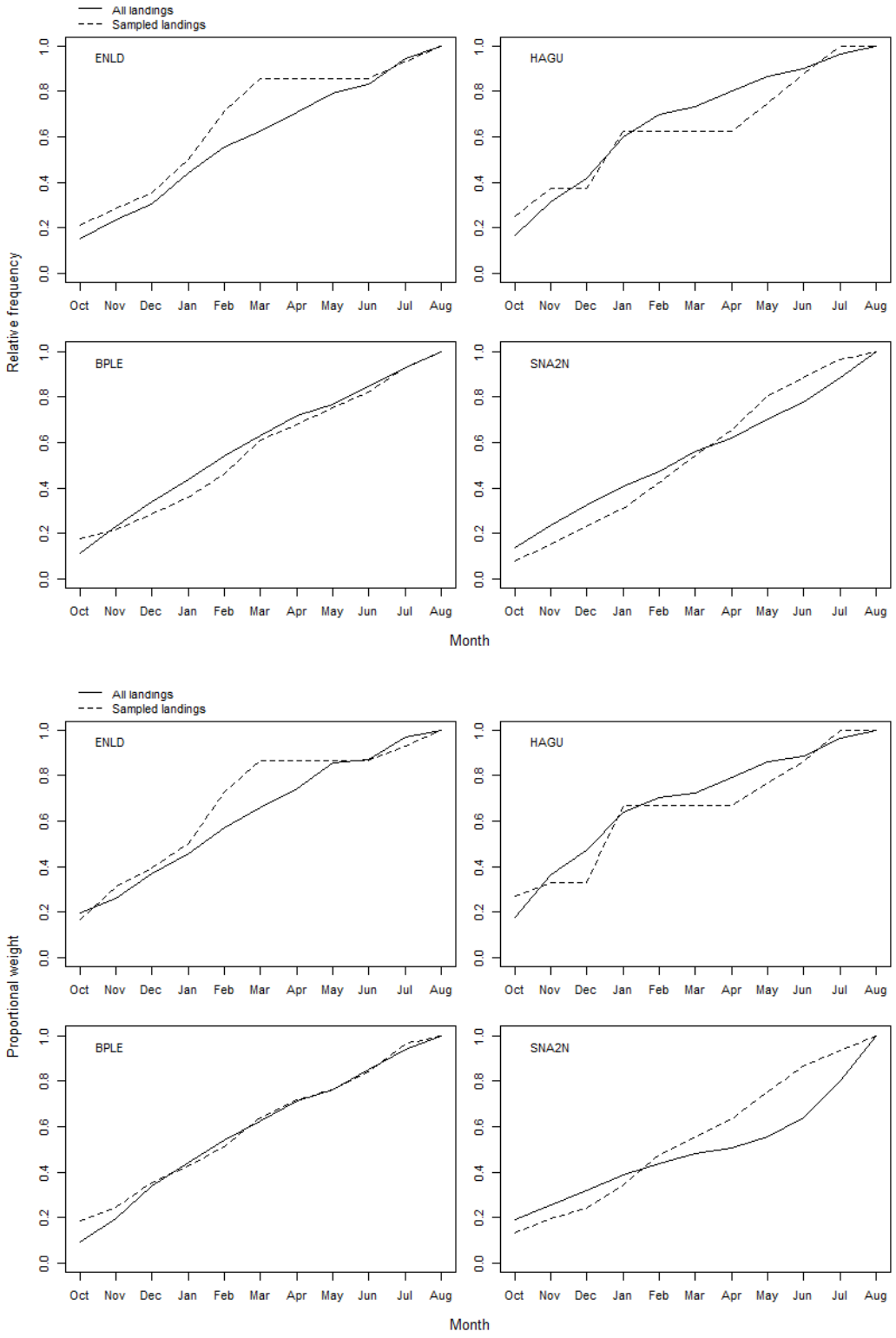

Figure 20: Comparison of the cumulative proportion of the number of landings (top two rows) and catch weight of landings (bottom two rows) with cumulative proportions of samples taken from the SNA 1 and SNA 2 stock bottom trawl fisheries in 2022–23. ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA2N, SNA 2 North.

Spatial comparisons (0.1 degree blocks) of the SNA 1 and SNA 2 North bottom trawl fisheries catch and sampled catch for 2022–23 are presented in Figure 21 and by statistical area in Figure 22.

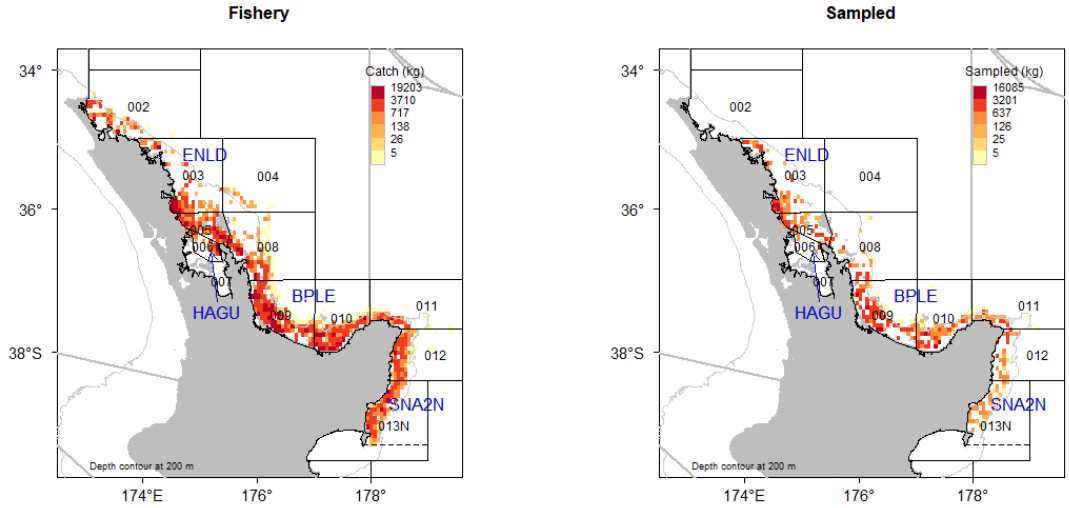

Figure 21: Comparison of the spatial distribution of the bottom trawl catch and the sampled component for the SNA 1 stocks in 2022–23.

The SNA 1 and SNA 2 North bottom trawl fishery in 2022–23 operated throughout Statistical Areas 002–006 and 008–013 (Figure 21). Sampling for bottom trawl was generally representative of the Hauraki Gulf, Bay of Plenty and SNA 2 North statistical area catches, but there was no East Northland catch from Statistical Area 002 (Figures 21 and 22).

Although the SNA 1 bottom trawl catch in 2022–23 was taken targeting eight species, snapper was the main species targeted in East Northland (49%), Hauraki Gulf (57%) and Bay of Plenty (47%) (Figure 22). For the SNA 2 bottom trawl catch, the target species were solely tarakihi, red gurnard, or barracouta (Figure 22).

Aside from over-sampling issues within East Northland Statistical Area 003, and in relation to target species for East Northland and Bay of Plenty, the sampled landings, were largely representative of the operation of the East Northland, Hauraki Gulf, Bay of Plenty, and SNA 2 North bottom trawl fleets as a whole (Figure 22).

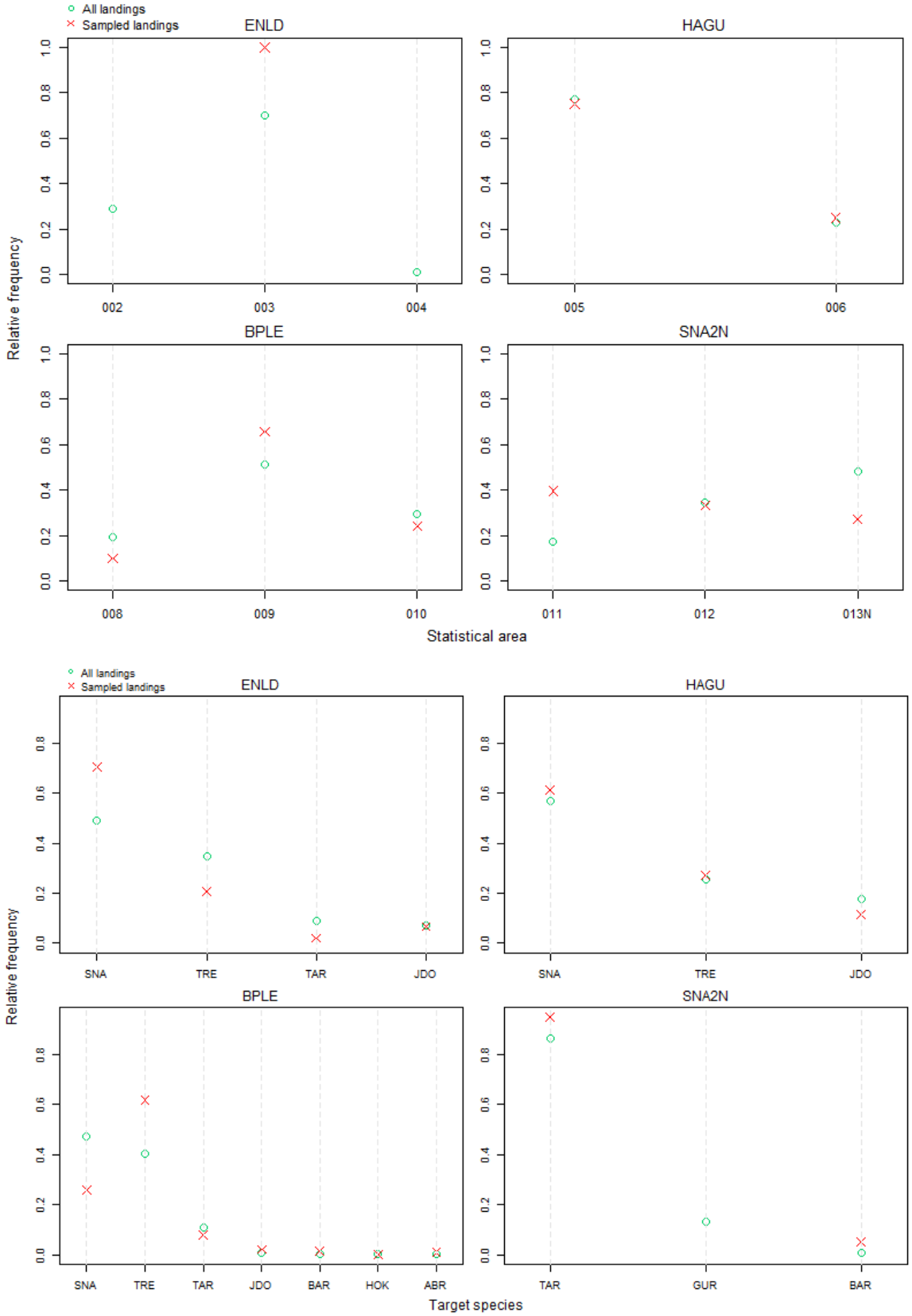

Figure 22: Comparison of the proportional distribution of the estimated bottom trawl catch and the sampled component by statistical area (top two rows) and target species (bottom two rows) over the sampling period for the SNA 1 and SNA 2 stocks in 2022–23. ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA2N, SNA 2 North. SNA, snapper; TRE, trevally; TAR, tarakihi; JDO, John dory (*Zeus faber*); BAR, barracouta (*Thyrsites atun*); HOK, hoki (*Macruronus novaezelandiae*); ABR, shortsnouted lancetfish *(Alepisaurus brevirostris)*; GUR, red gurnard (*Chelidonichthys kumu*).

3.6 Relative SNA 1 and SNA 2 catch by Danish seine

From 2018–19 to 2022–23, Danish seine fisheries operated in six coastal Statistical Areas (003, East Northland; 005–006, Hauraki Gulf; 008–010, Bay of Plenty) (Figure 23). Central East Northland (003), Hauraki Gulf (006) and Bay of Plenty (009) have consistently had the largest catches of snapper. However, by 2022–23, East Northland and Hauraki Gulf had declined to 96 t and 157 t, respectively, while Bay of Plenty increased substantially to 482 t, the largest Danish seine catch across all areas and years.

Limited, or no catch, was taken by Danish seine from Far North or offshore East Northland (Statistical Areas 001, 002 or 004) or SNA 2 North (Statistical Areas 011–013N).

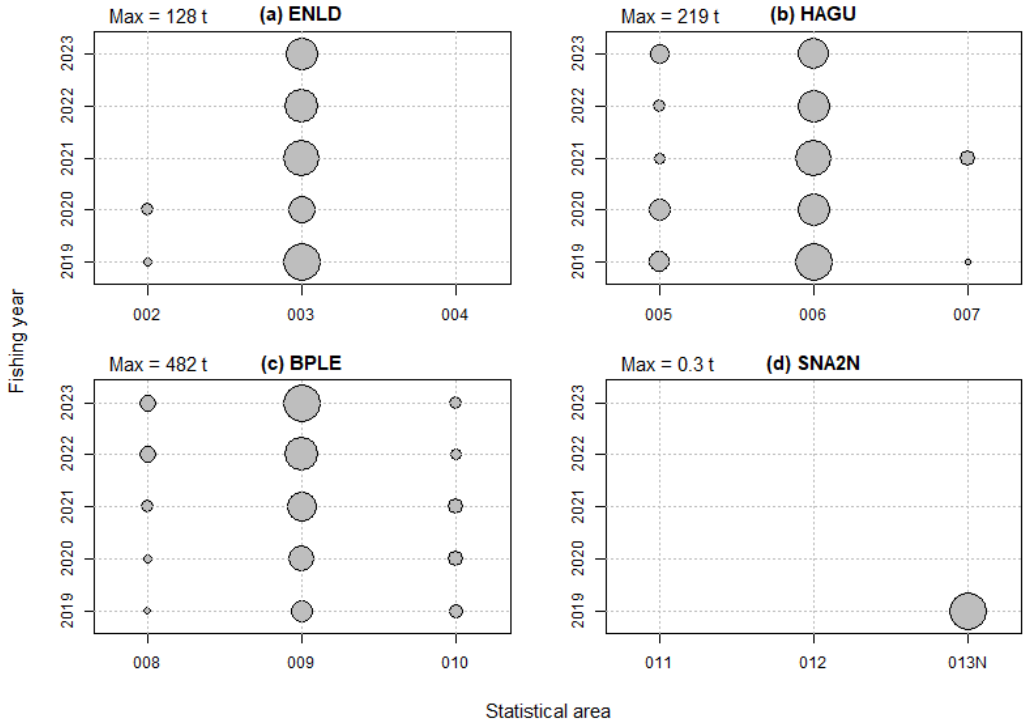

Figure 23: Danish seine catch of snapper in SNA 1 and SNA 2 stocks by statistical area from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

The monthly Danish seine snapper catch in East Northland, although relatively small, was generally consistent across most months from 2018–19 and 2022–23 (Figure 24a). In contrast, moderate and large monthly volumes were taken respectively from the Hauraki Gulf and Bay of Plenty Danish seine fisheries; with those from the Bay of Plenty increasing substantially and uniformly across all months over the five years compared to the Hauraki Gulf, which had lower catches in autumn (Figures 24b and c).

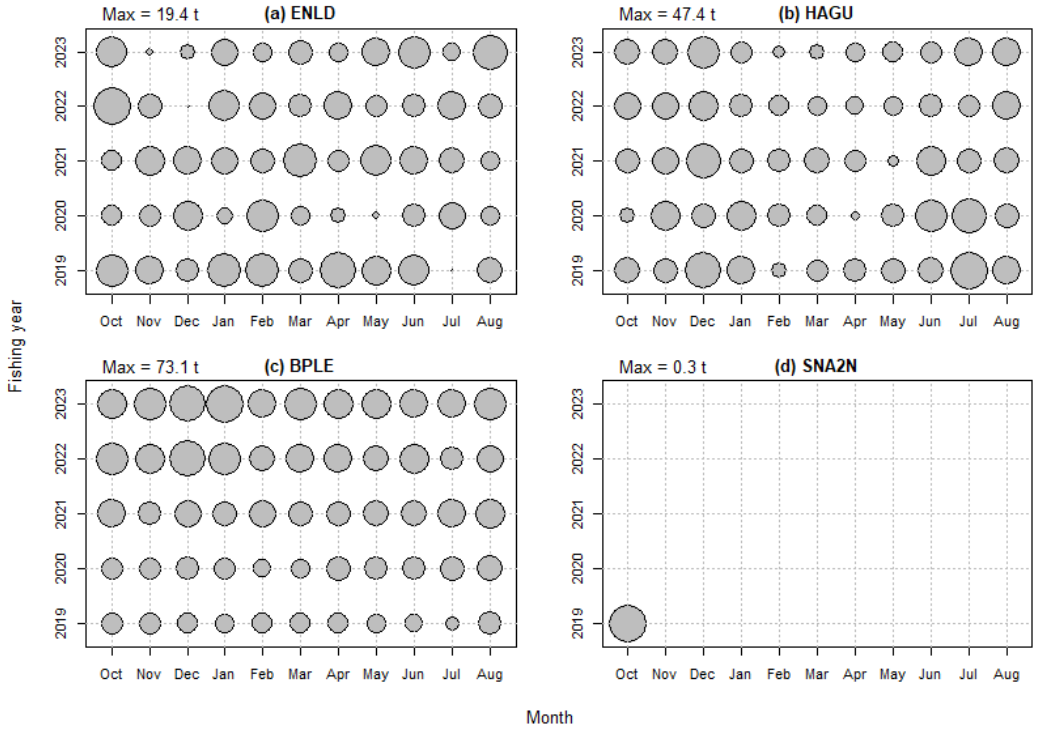

Figure 24: Danish seine catch of snapper in SNA 1 and SNA 2 stocks by month from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

3.7 Sampling the SNA 1 Danish seine fishery 2022–23

Sample collections

Summaries of the Danish seine sample sizes for stock-season strata are given in Table 9, and summaries of the otolith sample collections are given in Table 10. A combined total of 57 Danish seine landings were sampled from SNA 1 (Hauraki Gulf, 27; Bay of Plenty, 30) in 2022–23, with almost 17 000 snapper measured for length frequency and 175 otoliths collected for age-length keys. Proportional sampling across the fleet relative to catch was generally good, given the availability of vessels. For example, the highest number of times that samples were taken from a single vessel during the study for each of the respective sampled stocks was: 12 times, Hauraki Gulf (4 vessels available); 11 times, Bay of Plenty (5 vessels available).

Table 9: Summary of the Danish seine catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish sampled for otoliths) in stock-method-season strata for the SNA 1 fisheries from spring-summer 2022–23 to autumn-winter 2023.

			Number of landings			No. of fish	Weight of landings (t)		
Stock*	Method†	Season	Total	Sampled	% total	measured	Total	Sampled	% total
HAGU	DS	Spr-sum	46	13	28.3	3 658	105	30	28.6
		Aut-win	57	14	24.6	4 312	107	30	28.0
BPLE	DS	Spr-sum	82	15	18.3	3 981	288	53	18.4
		Aut-win	108	15	13.9	4 920	287	44	15.3

* HAGU, Hauraki Gulf; BPLE, Bay of Plenty.
† DS, Danish seine.

Table 10: Details of snapper otolith samples collected in 2022–23 from the stock areas of SNA 1 using method Danish seine.

Stock*	Method†	Season	Sampling method	Length range (cm)	Otolith
HAGU	DS	Spr-sum	LF+ALK‡	26–80	79
		Aut-win		25–77	72
BPLE	DS	Spr-sum	LF+ALK‡	24–67	16
		Aut-win		46–65	8

* HAGU, Hauraki Gulf; BPLE, Bay of Plenty.
† DS, Danish seine.
‡ LF+ALK, length frequency and age-length key.

Representativeness

The weight and number of Danish seine landings sampled throughout the 2022–23 fishing year were generally representative of temporal catch trends of each stock (Figure 25–26).

Hauraki Gulf landings accounted for 25% of the overall SNA 1 Danish seine catch in 2022–23 with a high proportion taken during spring, early summer and late winter (Figure 25). The operation of the Hauraki Gulf Danish seine fishery was, at times, inconsistent, with variable monthly catches throughout the year (Figure 25). The temporal spread of sampled landings was well distributed across the fishery over all months, and combined, accounted for 28% by weight and 26% by number of landings of the total Danish seine catch in the Hauraki Gulf (Figure 25). The average landing size selected for sampling (2224 kg) was marginally larger than the average landing in the fishery (2052 kg).

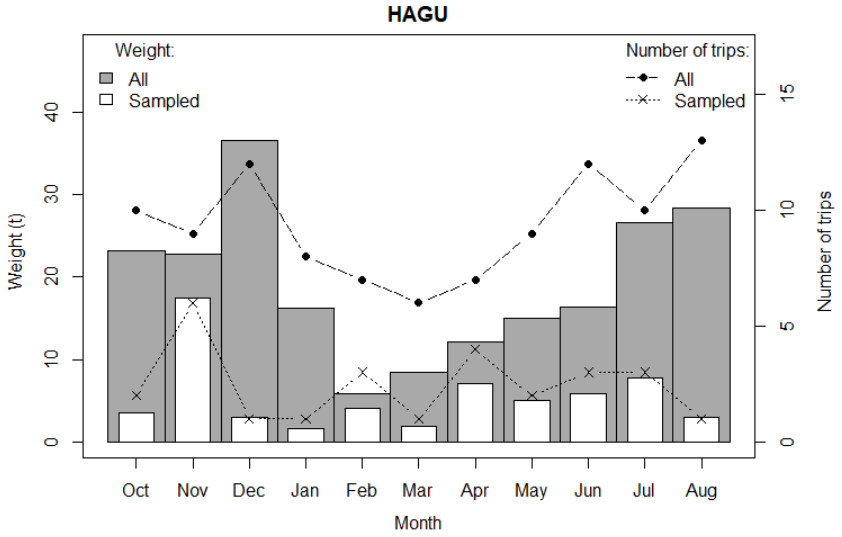

Figure 25: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the Hauraki Gulf (HAGU) Danish seine fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

Bay of Plenty landings accounted for 65% of the overall SNA 1 Danish seine catch in 2022–23. The operation of the Bay of Plenty fishery was generally consistent throughout both half-year seasons, with monthly catches relatively similar in size with the highest in December (70 t) and January (73 t) (Figure 26). The temporal spread of sampled landings was distributed over all months, and combined accounted for 17% by weight and 16% by number of landings of the total Danish seine catch in the Bay of Plenty (Figure 26). The average landing size selected for sampling (3220 kg) was marginally larger than the average landing in the fishery (3028 kg).

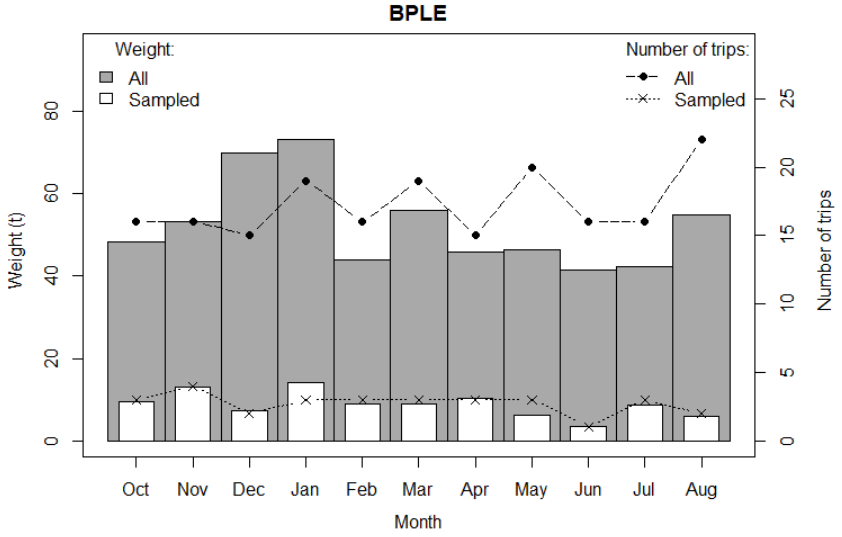

Figure 26: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the Bay of Plenty (BPLE) Danish seine fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

The sampling performance relative to the cumulative proportion of the total number and catch weight of landings throughout the sampling period is illustrated in Figure 27. Sampling was generally well distributed in proportion to, and representative of, the Hauraki Gulf and Bay of Plenty Danish seine fisheries.

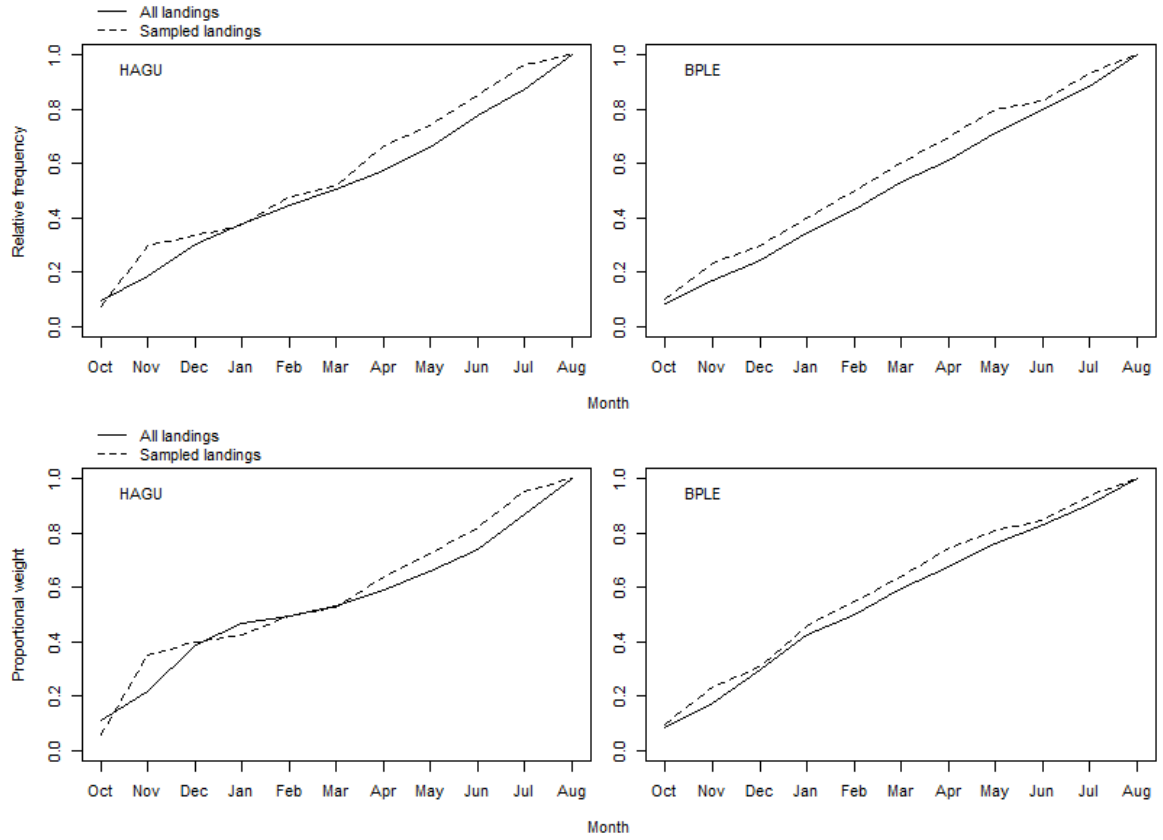

Figure 27: Comparison of the cumulative proportion of the number of landings (top row) and catch weight of landings (bottom row) with cumulative proportions of samples taken from the SNA 1 stock Danish seine fisheries in 2022–23. HAGU, Hauraki Gulf; BPLE, Bay of Plenty.

Spatial comparisons (0.1 degree blocks) of the SNA 1 Danish seine fishery catch and sampled catch for 2022–23 are presented in Figure 28 and by statistical area in Figure 29.

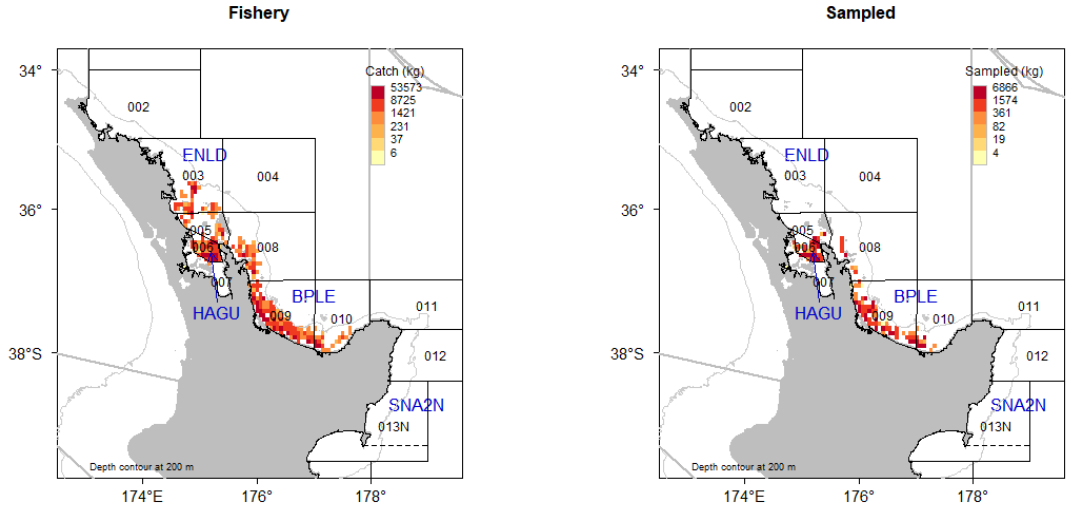

Figure 28: Comparison of the spatial distribution of the Danish seine catch and the sampled component for the SNA 1 stocks in 2022–23.

Almost the entire Danish seine catch (99.2%) in 2019–20 was taken from the coastal regions between Ngunguru Bay and Whitianga Bay, west of Te Kaha (Statistical Areas 003 and 005–006 and 008–010; Figure 28). The spatial distribution of sampled trips was generally representative of the spatial distribution of the fishery for both the Hauraki Gulf and Bay of Plenty (Figures 28 and 29).

Although the combined Hauraki Gulf and Bay of Plenty Danish seine catch in 2022–23 was taken targeting three species, snapper targeting accounted for 93% of the total catch (Figure 29). Sampling in relation to target species was representative.

Aside from slight under- and over-sampling issues within the Hauraki Gulf statistical areas, the sampled landings were largely representative of the operation of the Hauraki Gulf and Bay of Plenty Danish seine fleets as a whole (Figure 29).

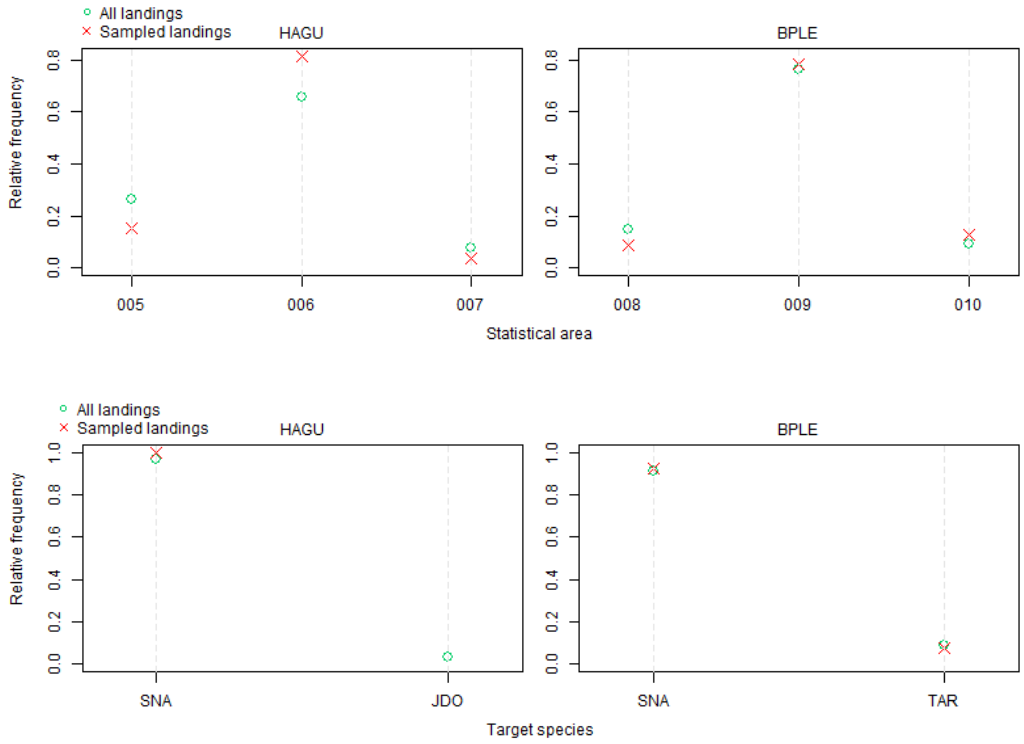

Figure 29: Comparison of the proportional distribution of the estimated Danish seine catch and the sampled component by statistical area (top row) and target species (bottom row) over the sampling period for the SNA 1 and SNA 2 stocks in 2022–23. HAGU, Hauraki Gulf; BPLE, Bay of Plenty. SNA, snapper; JDO, John dory; TAR, tarakihi).

3.8 Relative SNA 1 and SNA 2 catch by modular harvest system

From 2018–19 to 2022–23, the modular harvest system was used intermittently across six Statistical Areas (004, East Northland; 005–006, Hauraki Gulf; 008–010, Bay of Plenty) (Figure 30). Despite inconsistencies, annual catches from the Bay of Plenty and East Northland Statistical Areas 002–003 and 008–009 have been the most significant, often ranging between 100 to almost 300 t (Figure 30). For the 2022–23 fishing year, the modular harvest system fishery only operated within these two stock areas. No modular harvest system catch was taken from SNA 2 North (Statistical Areas 011–013N).

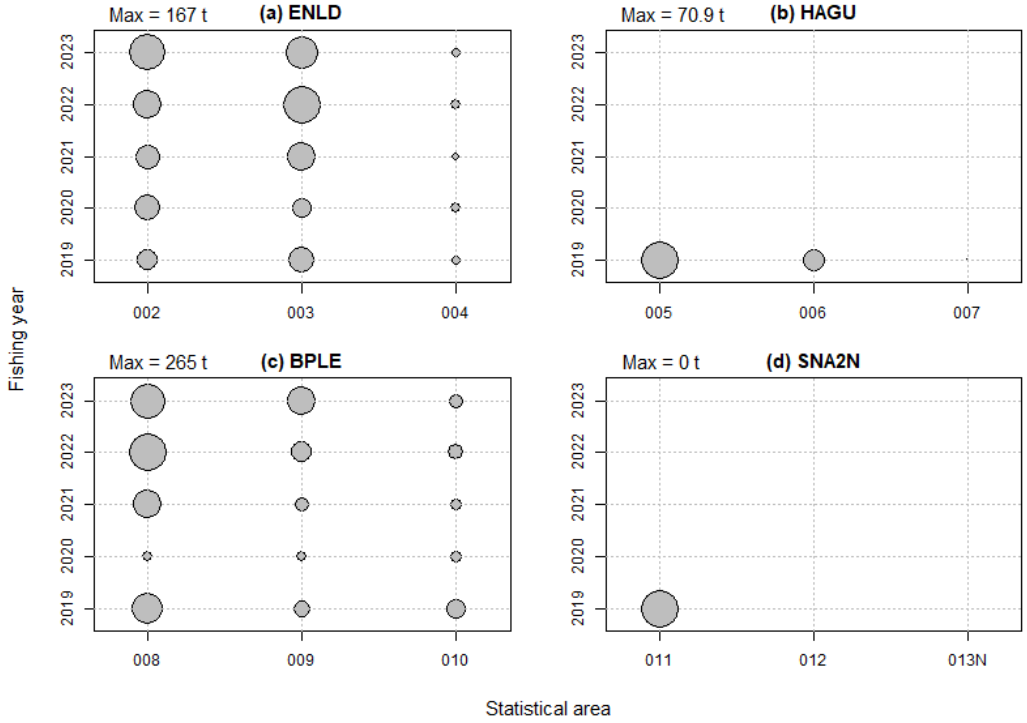

Figure 30: Modular harvest system catch of snapper in SNA 1 and SNA 2 stocks by statistical area from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

Due to its recent introduction, combined with sporadic fishing effort, visible monthly trends are most apparent in the East Northland and Bay of Plenty modular harvest system fisheries from 2021–22 to 2022–23. For East Northland, large catches were most common over winter months, whereas those in the Bay of Plenty in recent years appear more broadly distributed (Figures 31a and c).

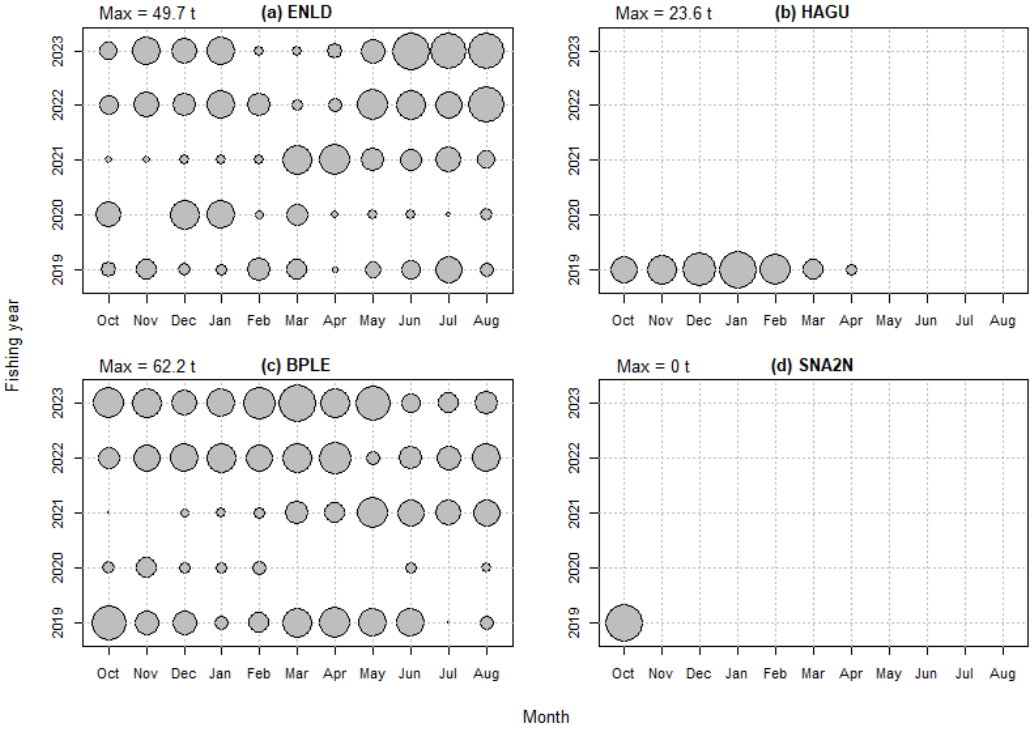

Figure 31: Modular harvest system catch of snapper in SNA 1 and SNA 2 stocks by month from fishing years 2018–19 to 2022–23 ((a) ENLD, East Northland; (b) HAGU, Hauraki Gulf; (c) BPLE, Bay of Plenty; (d) SNA2N, SNA 2 North).

3.9 Sampling the SNA 1 modular harvest system fishery 2022–23

Sample collections

Summaries of the modular harvest system sample sizes for stock-season strata are given in Table 11, and summaries of the otolith sample collections are given in Table 12. Initially, it was proposed that sampling of modular harvest system fishing would operate only within the Bay of Plenty fishery, but sampling was later included in East Northland due to a lack of available bottom trawl autumn-winter landings. As a substitute, Fisheries New Zealand requested that modular harvest system be sampled in East Northland over the autumn-winter season.

A total of 35 modular harvest system landings were sampled from SNA 1 in 2022–23, with over 11 000 snapper measured for length frequency and 103 otoliths collected for age-length keys. Proportional sampling across the fleet relative to catch was generally good, given the availability of vessels and single method East Northland (autumn-winter only) and Bay of Plenty[3] landings. The number of times that samples were taken from each of the two vessels available in each of the respective stocks was 5 and 6 times for East Northland and 8 and 16 times for the Bay of Plenty.

Table 11: Summary of the modular harvest system catch (total number and weight of landings) and samples (number of landings and weight sampled, and number of fish sampled for otoliths) in stock-method-season strata for the SNA 1 fisheries from spring-summer 2022–23 to autumn-winter 2023.

			Number of landings			No. of fish	Weight of landings (t)		
Stock*	Method†	Season	Total	Sampled	% total	measured	Total	Sampled	% total
ENLD	MHS	Aut-win-	47	11	23.4	3 130	175	50	28.6
BPLE	MHS	Spr-sum	41	13	31.7	4 162	197	74	37.6
		Aut-win	48	11	22.9	3 785	215	69	32.1

* ENLD, East Northland; BPLE, Bay of Plenty.
† MHS, modular harvest system.

Table 12: Details of snapper otolith samples collected in 2022–23 from the stock areas of SNA 1 using the modular harvest system method.

Stock*	Method†	Season	Sampling method	Length range (cm)	Otoliths
ENLD	MHS	Aut-win	LF+ALK‡	23–68	45
BPLE	MHS	Spr-sum	LF+ALK‡	23–70	17
		Aut-win		23–56	41

* ENLD, East Northland; BPLE, Bay of Plenty.
† MHS, modular harvest system.
‡ LF+ALK, length frequency and age-length key.

Representativeness

The weight and number of Bay of Plenty modular harvest system landings sampled throughout the 2022–23 fishing year was relatively representative of temporal catch trends whereas that for East Northland, as expected, was not (Figures 32–33).

East Northland landings accounted for 41% of the overall SNA 1 modular harvest system catch in 2022–23, with an inconsistent fishery operation made up of sporadic monthly volumes during spring-autumn and high volumes in winter (Figure 32). The temporal spread of sampled landings occurred mainly in the last quarter of the year and was therefore unlikely to be representative of the fishery (Figure 32). The sampled catch was 18% by weight and 14% by number of landings of the modular harvest system fleet in East Northland. The average landing size selected for sampling (4560 kg) was considerably larger than the average landing in the fishery (3410 kg).

[3] There can be uncertainty in the method used on each trip (Modular harvest system vs. bottom trawl) because restrictions are imposed for modular harvest system in shallow water and cod-end changes may be made on a single trip when targeting different species.

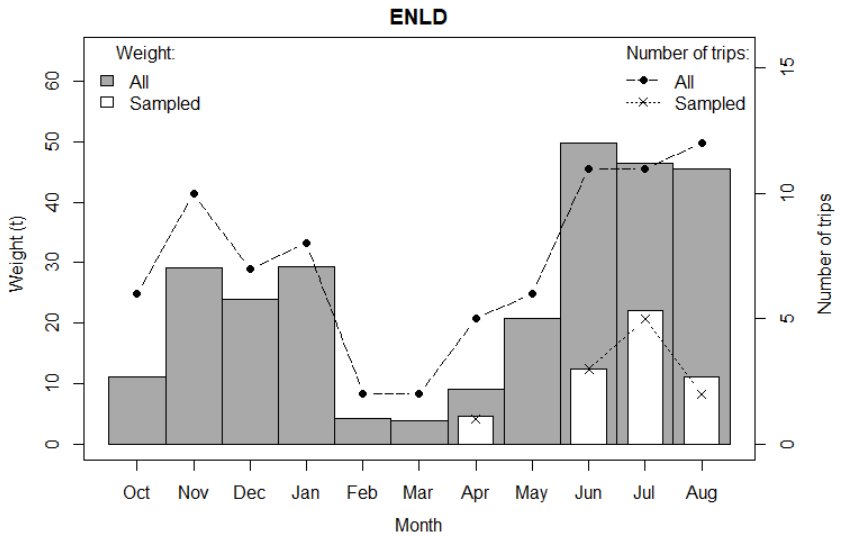

Figure 32: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the East Northland modular harvest system fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

Bay of Plenty landings accounted for 59% of the overall SNA 1 modular harvest system catch in 2022–23 with variable monthly volumes evident across the entire year, the largest taken in March (Figure 33). Although the temporal spread of sampled landings appears slightly disproportionate to the fishery, there was good representation across all months except June, when landings were at their lowest (Figure 33). The sampled catch accounted for 35% by weight and 27% by number of landings of the total modular harvest system catch in the Bay of Plenty, indicative of a high proportion of landings sampled relative to the fishery operation (Figure 33, Table 11). The average landing size selected for sampling (5946 kg) was larger than the average landing in the fishery (4619 kg).

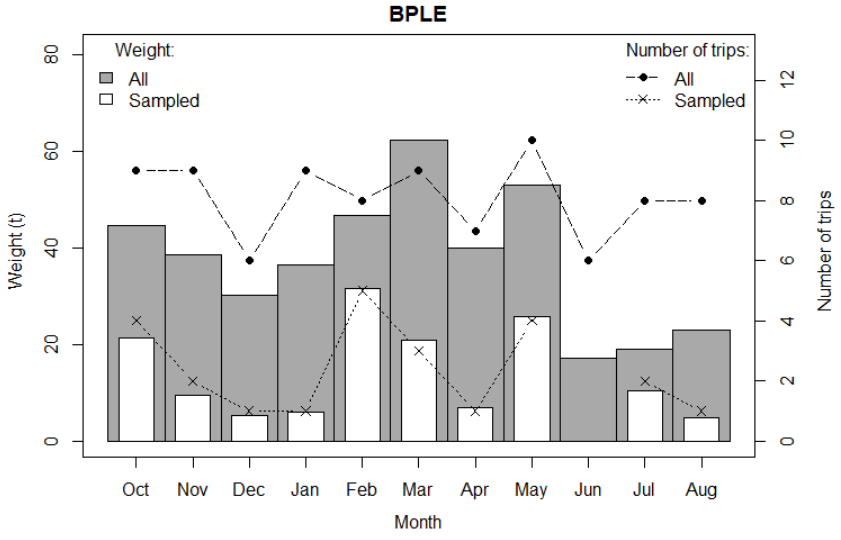

Figure 33: Comparison of the monthly distribution of landed weight (grey bars) and numbers of landings (dashed line) of snapper in the Bay of Plenty modular harvest system fishery for all landings where snapper was caught in the period October to August 2022–23. Corresponding estimates for sampled landings (white bars and dotted line) are also included to show representativeness of sample collections.

The sampling performance relative to the cumulative proportion of the total number and catch weight of landings throughout the sampling period is illustrated in Figure 34. Sampling was reasonably well

distributed in proportion to, and representative of, the Bay of Plenty fishery but not in East Northland, due to sampling not being initiated until half way through the year (see Section 3.9 Sample collections).

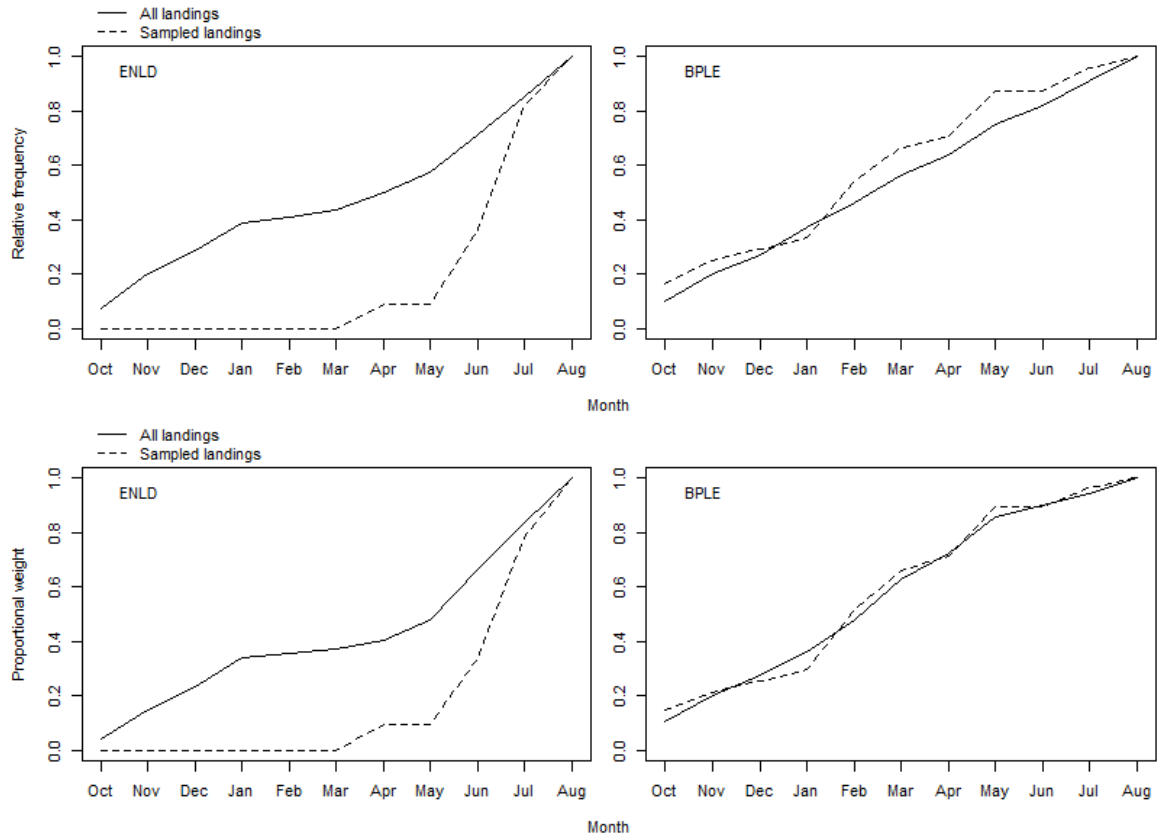

Figure 34: Comparison of the cumulative proportion of the number of landings (top row) and catch weight of landings (bottom row) with cumulative proportions of samples taken from the SNA 1 stock modular harvest system fisheries in 2022–23. ENLD, East Northland; BPLE, Bay of Plenty.

Spatial comparisons (0.1 degree blocks) of the SNA 1 modular harvest system fishery catch and sampled catch for 2022–23 are presented in Figure 35 and by statistical area in Figure 36.

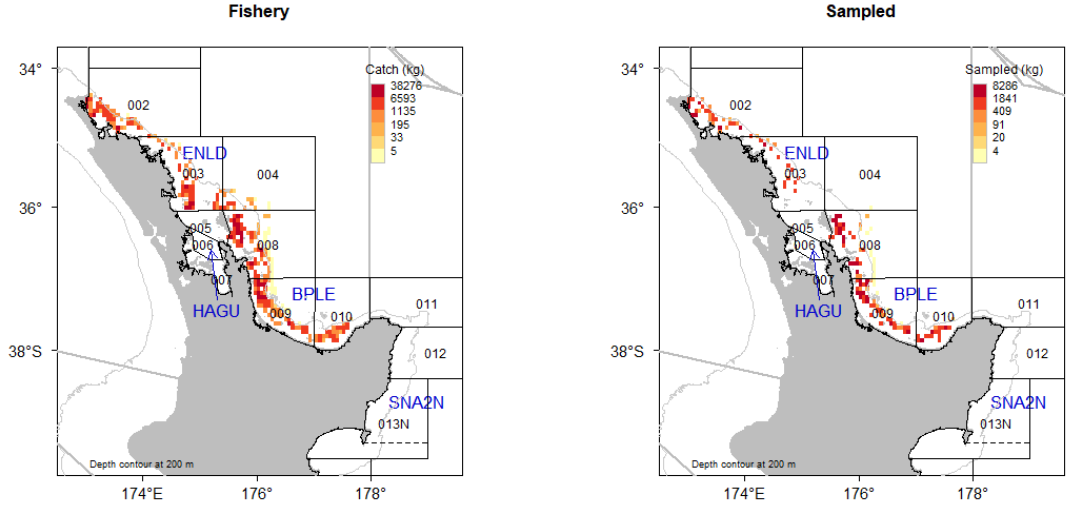

Figure 35: Comparison of the spatial distribution of the modular harvest system catch and the sampled component for the SNA 1 stocks in 2022–23.

Modular harvest system operations are not permitted in the majority of the Hauraki Gulf fishery area (Statistical Areas 005–007), and as such modular harvest system catch was entirely taken from East Northland and Bay of Plenty between North Cape and Cape Runaway (Statistical Areas 002–004 and 008–010; Figure 35). The spatial representativeness of sampling was moderate for the East Northland (Statistical Areas 002–003) and good across all Bay of Plenty Statistical Areas 008–010 (Figure 35 and 36).

Although the modular harvest system catch in 2022–23 was taken targeting six species, snapper targeting accounted for the majority: 45% in East Northland and 86% in Bay of Plenty (Figure 36). Sampling in relation to target species was representative for the Bay of Plenty fishery but less so for East Northland where under- and over-sampling issues were present when snapper, trevally or tarakihi was targeted (Figure 36).

Overall proportionality of the sampled component of the modular harvest system fishery were representative in the Bay of Plenty, but representativeness was only moderate for East Northland (Figure 36).

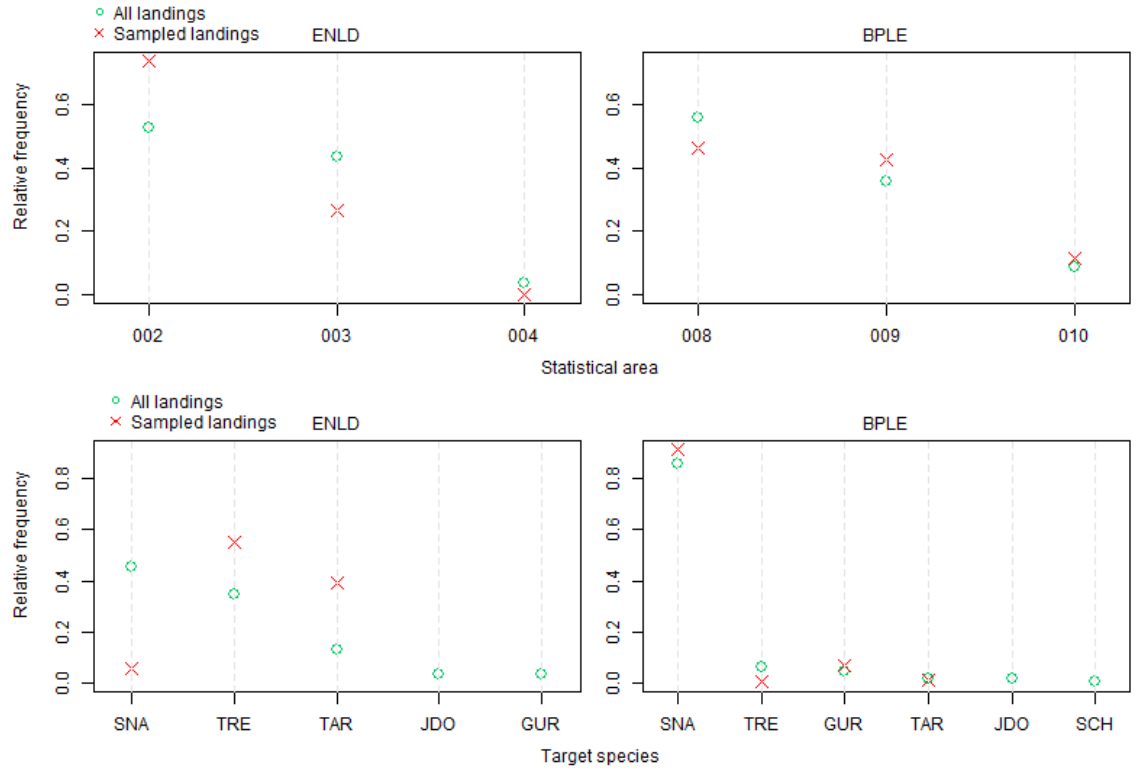

Figure 36: Comparison of the proportional distribution of the estimated modular harvest system catch and the sampled component by statistical area (top row) and target species (bottom row) over the sampling period for the SNA 1 stocks in 2022–23. ENLD, East Northland; BPLE, Bay of Plenty. SNA, snapper; TRE, trevally; TAR, tarakihi; JDO, John dory; GUR, red gurnard; SCH, school shark.

3.10 Snapper otolith readings: reader comparison tests for reference readings

Reader comparison tests of 50 reference otoliths successfully achieved CV and IAPE scores below target, ranging from 0.22 to 1.29% for IAPE and 0.31 to 1.83% for CVs (Table 13).

Table 13: **Reader comparison scores determined from ageing 50 randomly selected snapper reference otolith samples ranging in age from 3 to 30 years. IAPE, Index of Average Percentage Error; CV, coefficient of variation; Agreed age, % agreement for reference readings (reader estimate vs reference age).**

	IAPE	CV	Agreed age	Pass/Fail
Target	1.50%	2.12%	–	–
Reader 1	0.38%	0.54%	90%	Pass (1st attempt)
Reader 2	0.38%	0.53%	90%	Pass (1st attempt)
Reader 3	0.56%	0.79%	82%	Pass (1st attempt)
Reader 4	0.22%	0.31%	92%	Pass (1st attempt)
Reader 5	1.29%	1.83%	70%	Pass (2nd attempt)

3.11 Reader comparison tests for SNA 1 readings

More than 5700 otolith pair samples were collected from the SNA 1 and SNA 2 stocks in 2022–23 (from random age frequency and age-length key sampling methods) with 5060[4] aged successfully by five readers; reader 1 reading all stock samples and readers 2 to 5, each reading a single stock sample. Between-reader tests, based on graphical comparisons, are shown in Figures 37–40 and depict a good level of consistency between readers. The overall percentage agreement between readers was 85% for East Northland, 75% for Hauraki Gulf, 79% for the Bay of Plenty, and 73% for the SNA 2 North, with only minor systematic differences (bias) in first counts of snapper otoliths between the readers. The slight positive weighting of the histograms, the relative clustering of plotted points about the zero lines, and the slight deviation from the one-to-one line on the age-bias plots (Figures 38 to 40a–c) indicate that readers 3, 4 and 5, at times, underestimated age, particularly for older fish. The between-reader CVs ranged from 1.00 to 2.55% and IAPE ranged from 0.71 to 1.80% (Figures 37c–40c) and the profiles show that precision varied across age classes in all stock collections, most often lowest for East Northland and highest for the SNA 2 North (Figures 37d–40d). Comparisons of the age-bias plots for all five readers with the agreed age indicate that readers 1 and 2 showed a high level of precision and consistency in estimating age with CV and IAPE estimates less than 1.00% (Figures 37e,f–40e,f). For readers 3 to 5, precision was slightly lower, with CVs and IAPEs almost identical to the between-reader estimates (Figures 38c–40c), ranging from 1.90 to 2.51% (CV) and 1.34 to 1.77% (IAPE) (Figures 38f–40f).

[4] Approximately 100 SNA 1 and 600 SNA 2N otoliths were not aged in 2022–23 because samples came from vessels fishing across stock boundaries or because the otoliths were superfluous to the collection.

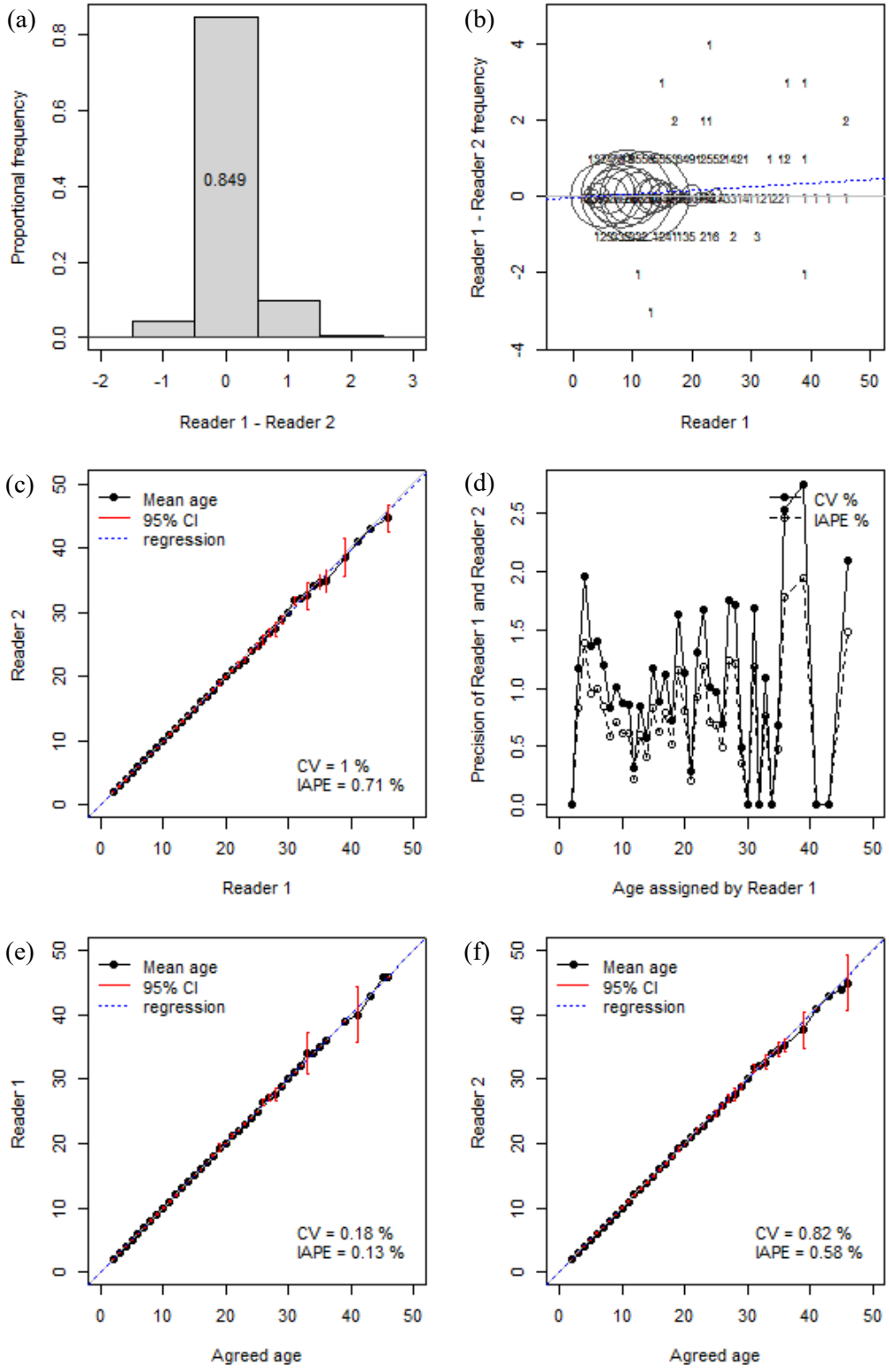

Figure 37: Results of between-reader comparison test (reader 1 and 2) for East Northland otoliths collected in 2022–23 (n = 1308): (a) histogram of differences between readings for the same otolith; (b) differences between readers for a given age assigned by reader 1; (c) bias plot between readers; (d) mean coefficient of variation (CV) and Index of Average Percentage Error (IAPE) profiles (precision) relative to the age assigned by reader 1; (e) bias plot between reader 1 ((f) reader 2) and agreed age. The expected one-to-one (solid line) and actual relationship (dashed line) between readers are overlaid on (b) and (c), and between reader 1 and 2 and the agreed age on (e) and (f).

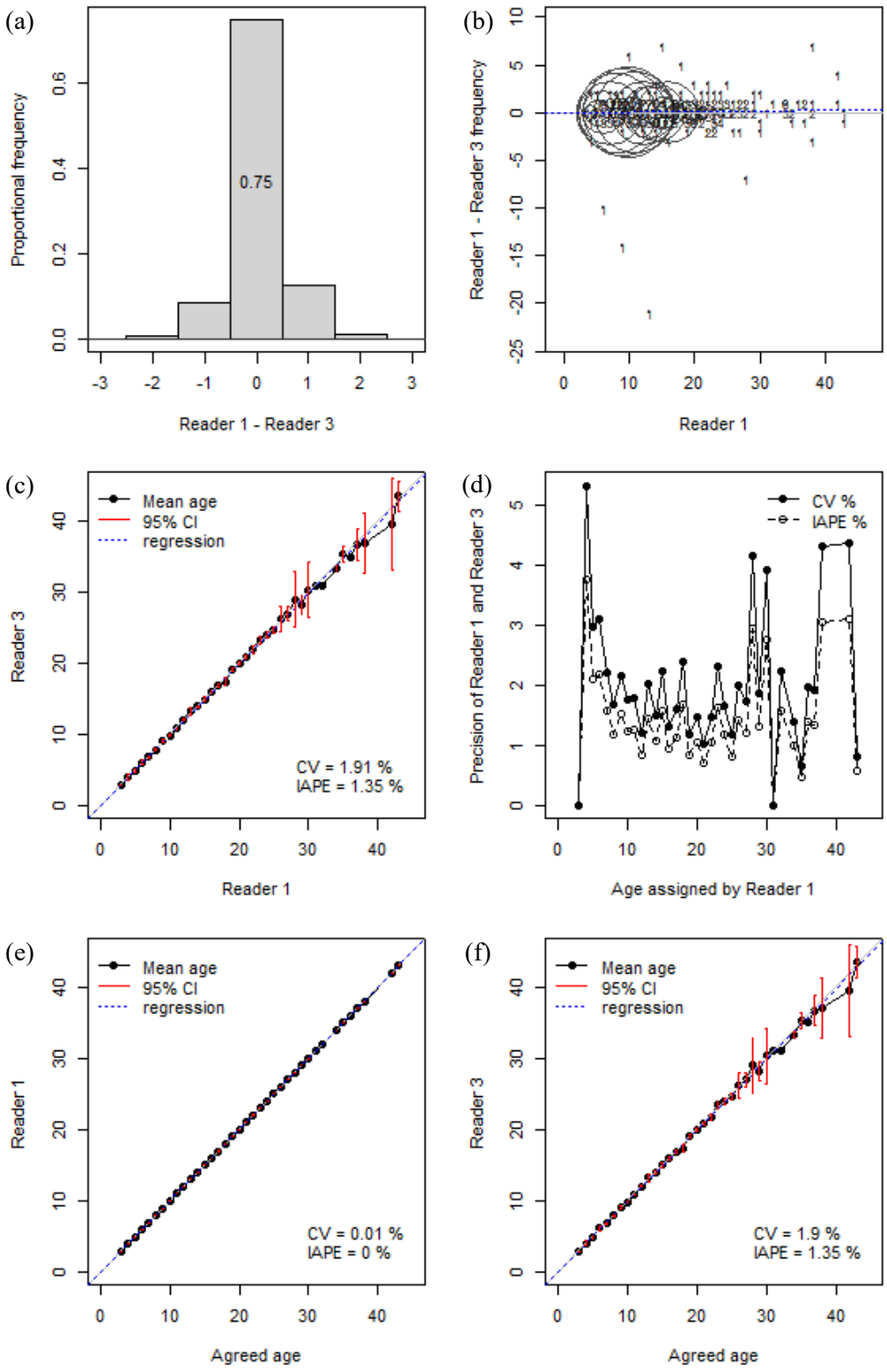

Figure 38: Results of between-reader comparison test (reader 1 and 3) for Hauraki Gulf otoliths collected in 2022–23 (n = 1267): (a) histogram of differences between readings for the same otolith; (b) differences between readers for a given age assigned by reader 1; (c) bias plot between readers; (d) mean coefficient of variation (CV) and Index of Average Percentage Error (IAPE) profiles (precision) relative to the age assigned by reader 1; (e) bias plot between reader 1 ((f) reader 3) and agreed age. The expected one-to-one (solid line) and actual relationship (dashed line) between readers are overlaid on (b) and (c), and between reader 1 and 3 and the agreed age on (e) and (f).

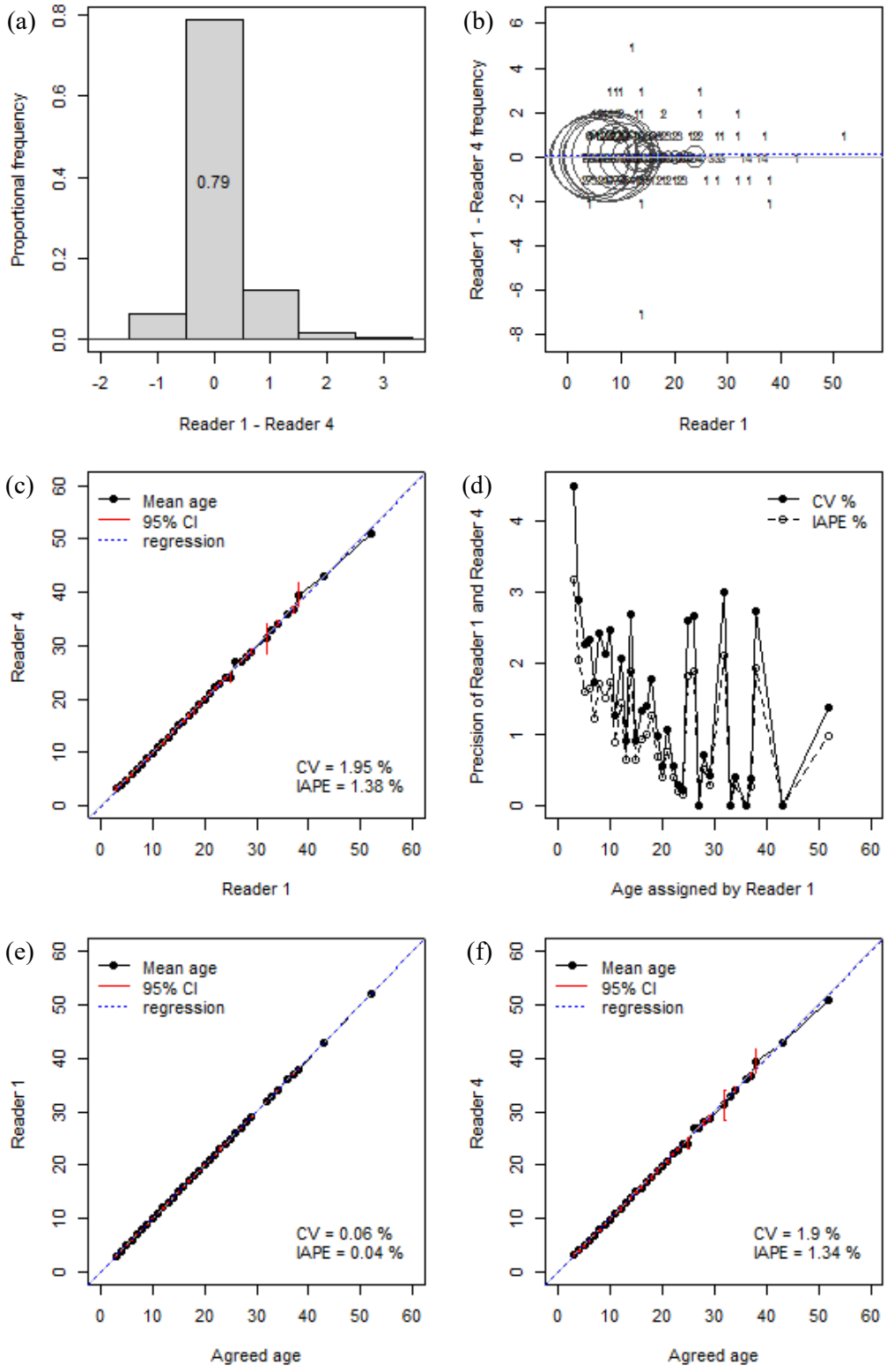

Figure 39: Results of between-reader comparison test (reader 1 and 4) for Bay of Plenty otoliths collected in 2022–23 (n = 1287): (a) histogram of differences between readings for the same otolith; (b) differences between readers for a given age assigned by reader 1; (c) bias plot between readers; (d) mean coefficient of variation (CV) and Index of Average Percentage Error (IAPE) profiles (precision) relative to the age assigned by reader 1; (e) bias plot between reader 1 ((f) reader 4) and agreed age. The expected one-to-one (solid line) and actual relationship (dashed line) between readers are overlaid on (b) and (c), and between reader 1 and 4 and the agreed age on (e) and (f).

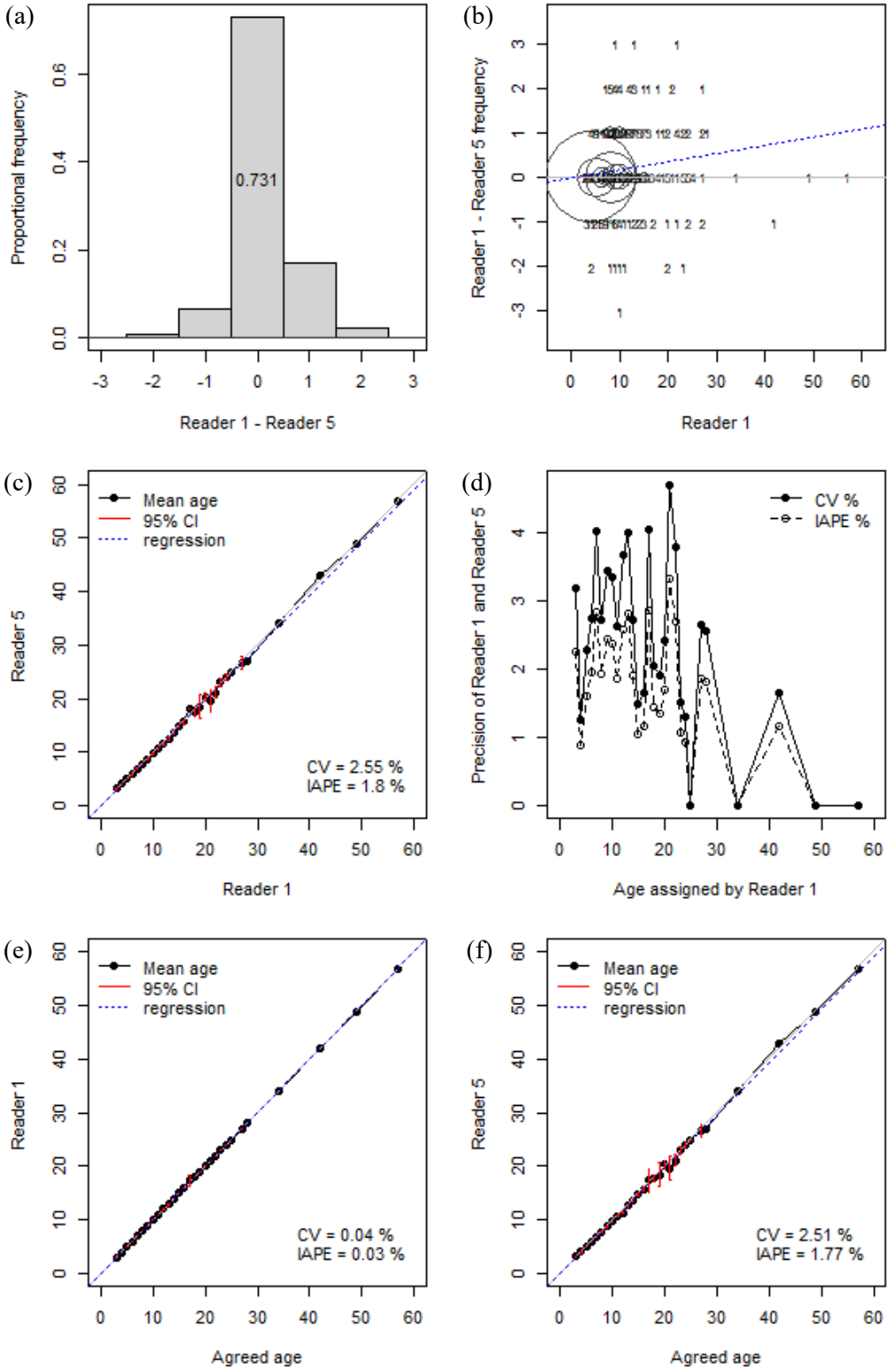

Figure 40: Results of between-reader comparison test (reader 1 and 5) for northern SNA 2 otoliths collected in 2022–23 (n = 1200): (a) histogram of differences between readings for the same otolith; (b) differences between readers for a given age assigned by reader 1; (c) bias plot between readers; (d) mean coefficient of variation (CV) and Index of Average Percentage Error (IAPE) profiles (precision) relative to the age assigned by reader 1; (e) bias plot between reader 1 ((f) reader 5) and agreed age. The expected one-to-one (solid line) and actual relationship (dashed line) between readers are overlaid on (b) and (c), and between reader 1 and 5 and the agreed age on (e) and (f).

3.12 SNA 1 bottom longline catch-at-age estimates

Bottom longline catch-at-age compositions (sampled using the random age frequency sampling approach) with bootstrap variance estimates were derived for each stock and season, and then combined over all seasons (spring to winter) to produce annual compositions (Figure 41). Age distributions are used to compare differences in the age structure of each stock and season stratum and to gauge relative year class strengths (Figures 41 and 42, Appendix 1).

Age-at-length scatterplots (using decimalised ages and not fishing year ages) are given in Appendix 2 to document the stock and fishing method of otolith collections that make up the bottom longline random age frequency samples (Appendix 1).

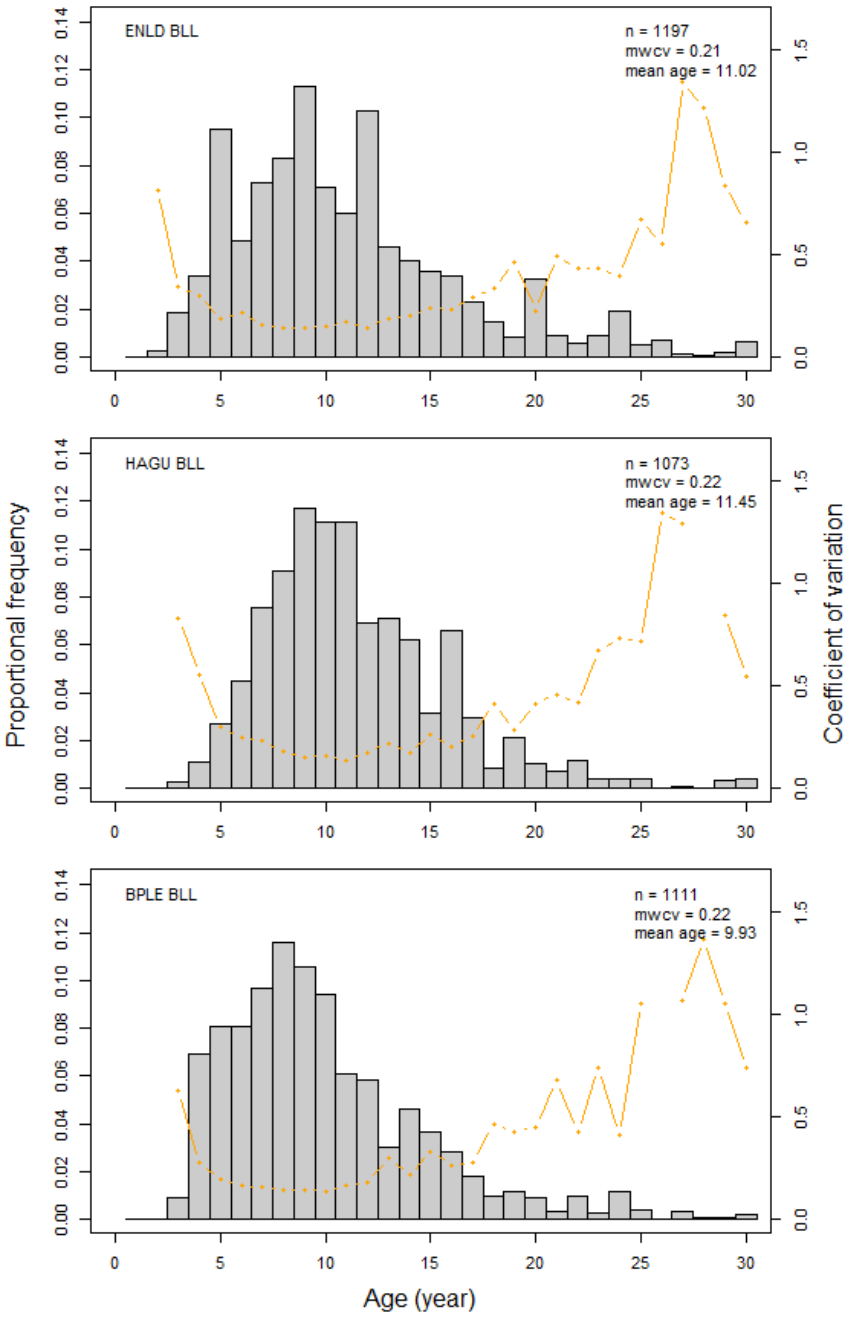

Figure 41: Proportion-at-age distributions (histograms) and CVs (lines) determined from snapper landings sampled from the three SNA 1 stock bottom longline (BLL) fisheries in 2022–23 (ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty amalgamated across all four seasons; *n*, sample size; MWCV, mean weighted CV).

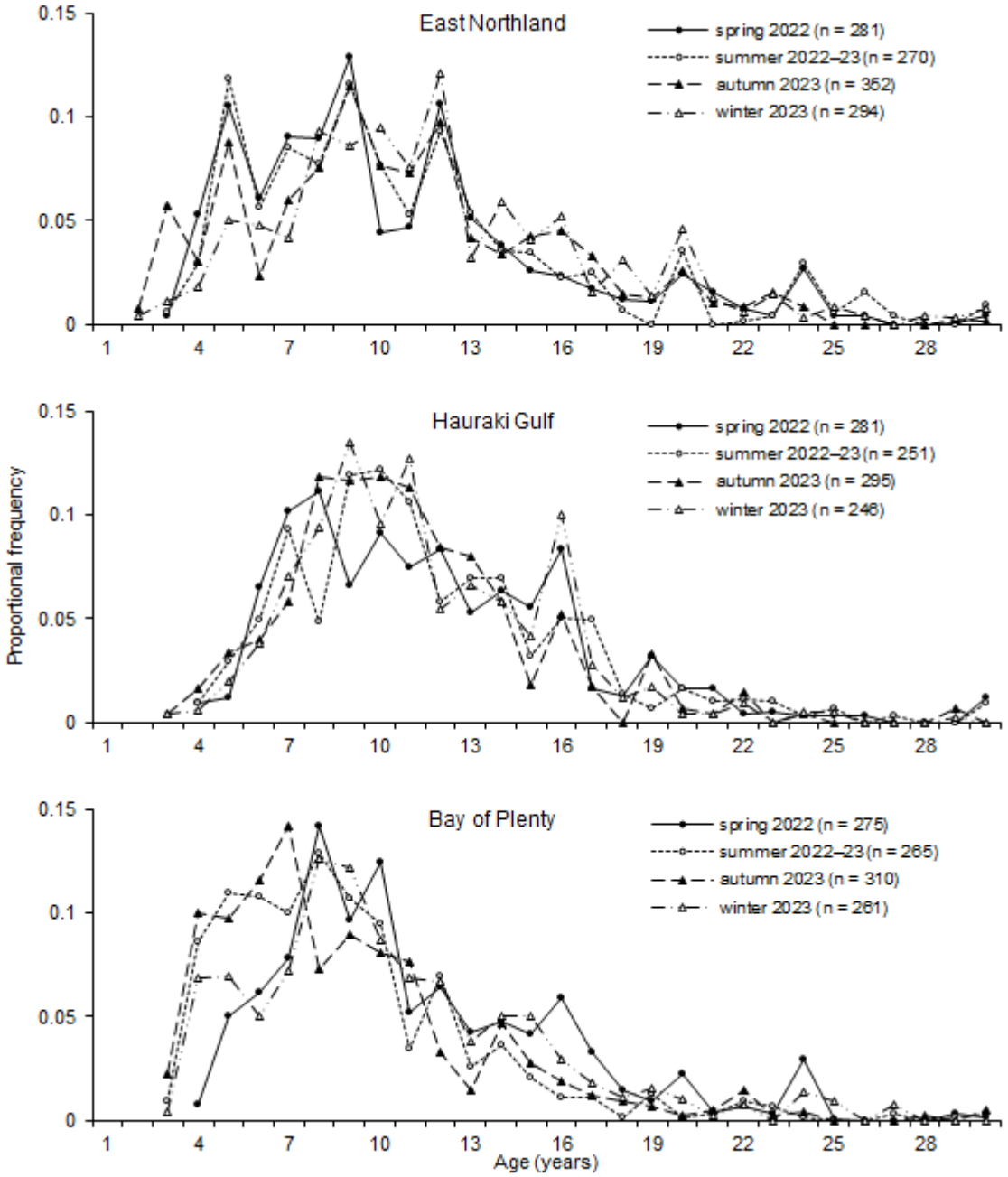

Figure 42: Proportion-at-age by season for SNA 1 bottom longline landings in 2022–23 (*n*, otolith sample size).

East Northland bottom longline

The East Northland bottom longline age distribution in 2022–23 consisted mainly of young to moderate aged fish: those 15 years of age and younger made up 82% of the landed catch by number (Figure 41, see Appendix 1). However, there was representation across almost all recruited age classes up to 30 or more years. Fish 20 years and older accounted for 10% of the landed catch, the highest proportion in SNA 1, most of which were from the northern half of the stock, Statistical Area 002 (see Appendix 1). The oldest fish sampled from the bottom longline fishery during 2022–23 was 36 years (Appendix 2). The 2018, 2014 and 2011 year classes (5, 9 and 12 year olds), the most dominant, accounted for 10%, 11% and 10%, respectively, of all snapper in East Northland landings in 2022–23. Only those age classes over 9 years of age in East Northland are considered fully recruited (here we consider fish over 27 cm as fully recruited), because fish in the 25–27 cm length interval were infrequent in the catch (see age-length key, Appendix 3). The mean age of the East Northland distribution was 11.0 years, the highest ever recorded estimate in over 30 years, and the MWCV was 0.21 (see Appendix 4).

East Northland longline catch-at-age samples showed reasonable seasonal consistency in the relative strengths of the common age classes, although catches in winter had proportionally more older fish (over 11 years) and spring and summer proportionally more younger fish (Figure 42).

Hauraki Gulf bottom longline

The Hauraki Gulf bottom longline age distribution in 2022–23 consisted mainly of young to moderateaged fish with reasonable representation in age classes up to 22 years (Figure 41, see Appendix 1). Collectively, the 2016–2009 year classes (7 to 14 year olds) made up almost three-quarters (71%) of the landed catch by number in 2022–23. The 2014–2012 year classes (9 to 11 year olds) were the most prominent and combined made up for 34% of the catch, whereas those fish over 19 years contributed 5%. The two oldest fish sampled during 2022–23 were 38 years (Appendix 2). Only those age classes over 10 years of age can be considered fully recruited to the fishery because they no longer contain a noticeable proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 3). The mean age of snapper in the Hauraki Gulf fishery was 11.5 years, the highest equal ever recorded estimate in over 30 years, and the MWCV was 0.22 (see Appendix 4).

Hauraki Gulf bottom longline catch-at-age samples showed some seasonal consistency in the relative strengths of some common age classes, and variations in proportions were evident for others, most notably 8 year old snapper from summer samples and 9 and 11 year olds from spring samples (Figure 42). Spring and summer samples also contained proportionally more old fish (over 12 years) than autumn and winter seasons.

Bay of Plenty bottom longline

The Bay of Plenty bottom longline age distribution in 2022–23 was largely dominated by young fish; those 15 years of age and younger made up 88% of the landed catch by number (Figure 41, see Appendix 1). The 2015 year class (8 year olds) was marginally the most dominant year class in the fishery accounting for 12% of the longline catch by number and surrounded by three similar sized year classes, 2016, 2014 and 2013 (7, 9 and 10 year olds) that collectively made up 30% of landed catch. The combined total for fish over 19 years made up 5% of the landed catch. Only age classes greater than 6 years of age appear fully recruited to the fishery, because they no longer contain a proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 3). The two oldest fish sampled during 2022–23 were 34 years (Appendix 2). The mean age of snapper in the Bay of Plenty longline fishery was 9.9 years, the highest ever recorded estimate in over 30 years, and the MWCV was 0.22 (see Appendix 4).

Spring samples from the Bay of Plenty longline fishery contained proportionally more old fish than other seasons (Figure 42). The seasonal differences seen in the relative year class strengths for the 2019 to 2017 year classes (4 to 6 year olds), particularly for summer and autumn seasons is likely to be due to the recruitment of these small young fish into the fishery (Figure 42).

SNA 1 bottom longline stock comparisons

Aside from proportionality differences due to exploitation, few similarities in relative year class strength patterns appear to exist between the three regions of the SNA 1 bottom longline catch-at-age proportions sampled in 2022–23 (Figure 43). The most notable year class strength consistent between SNA 1 bottom longline fisheries in 2022–23 was the 2014 year class (9 year olds) of above average strength, the most dominant in East Northland, and second most dominant in Hauraki Gulf and Bay of Plenty landings. Secondly, moderate aged fish of relatively low proportions, show some consistency in relative year class strengths, from 2007 (16 year olds) to 2000 (23 years olds), appear more notably between Hauraki Gulf and Bay of Plenty bottom longline landings, than in East Northland (Figure 43).

Comparable findings (including 2022–23 samples) in a four decadal time series of bottom longline catch-at-age distributions for each of the three SNA 1 stocks are presented in Appendix 4 and as bubble plots in Appendix 5.

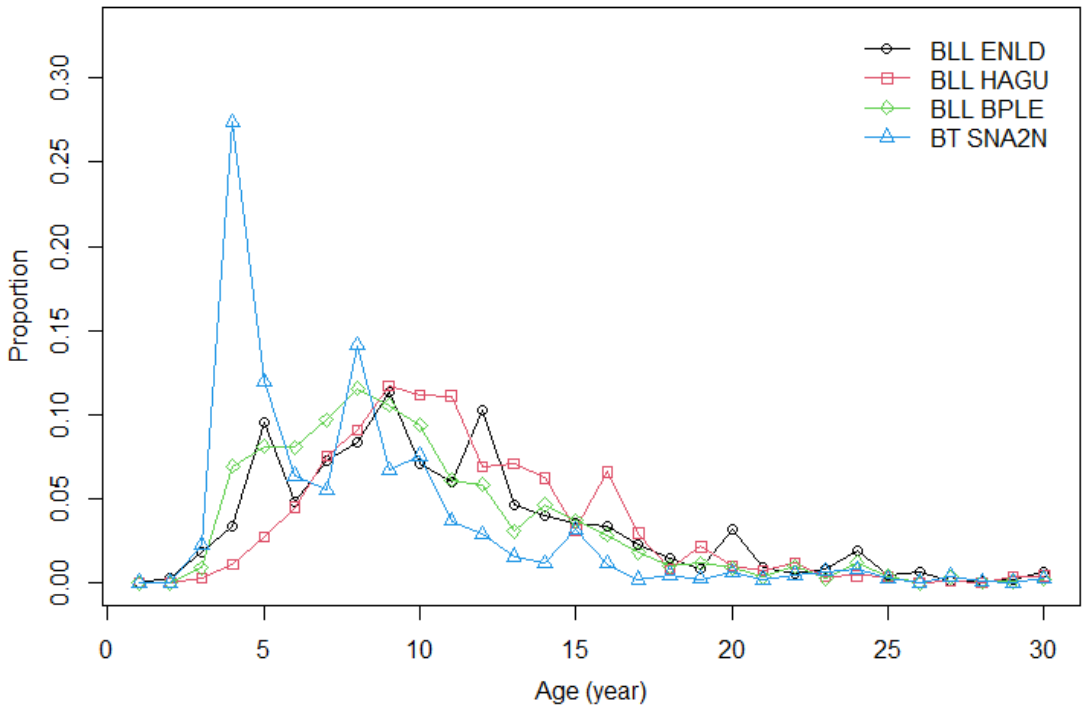

Figure 43: Comparison of proportion-at-age distributions (lines) determined from snapper landings sampled from the three SNA 1 bottom longline fisheries in 2022–23 (BLL, bottom longline; BT, bottom trawl; ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA2N, SNA 2 North). Note: data presented for SNA 2 North bottom trawl included to complete a North-South stock comparison.

SNA 1 bottom longline mean length-at-age and mean weight-at-age estimates

Although a trend of increasing mean length-at-age and mean weight-at-age over successive age classes up to around 20 years of age was generally evident in year-round data collected from the SNA 1 bottom longline fisheries in 2022–23, those estimates for East Northland and Bay of Plenty were on average about 8% longer and 26% heavier than for Hauraki Gulf snapper (Figure 44, Appendices 6 and 7).

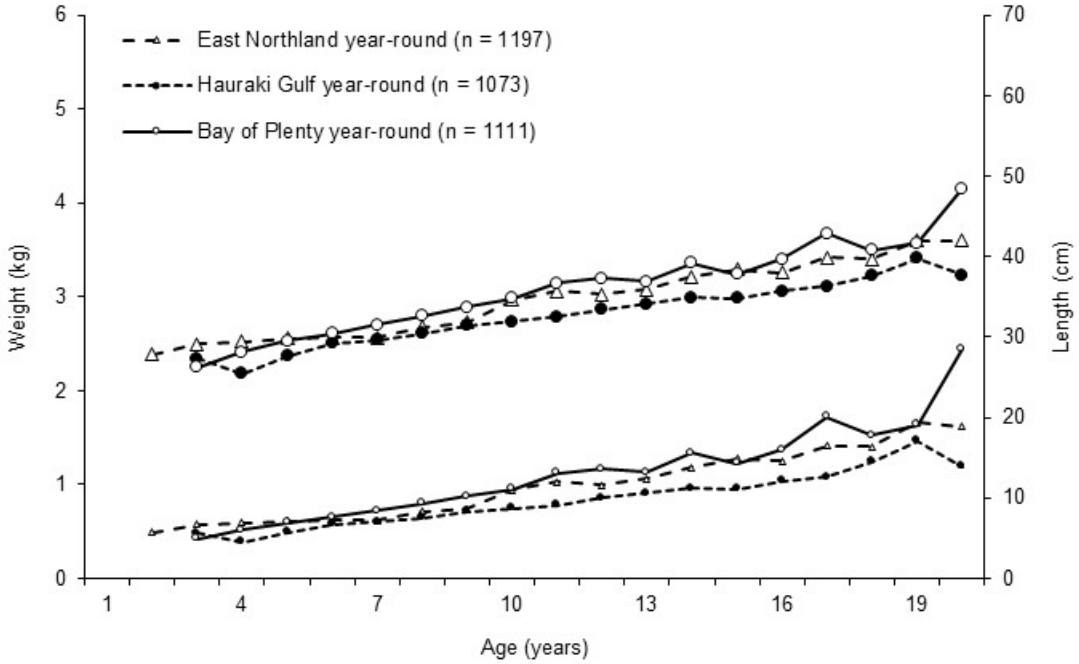

Figure 44: Observed mean length-at-age (large symbols) and mean weight-at-age (small symbols) estimates from snapper landings sampled from the three SNA 1 stock bottom longline fisheries in 2022–23 (*n*, sample size). Note: data presented for ages 2–20 years only.

SNA 1 bottom longline mean weight-at-age time series comparisons

Time series comparisons of spring-summer mean weight-at-age estimates derived from sampling the SNA 1 bottom longline fisheries covering a four decadal period (1990s, 2000s, 2010s and 2020s) show a gradual long-term decrease in the mean weight-at-age for snapper for most of the common age classes, particularly in the Hauraki Gulf and Bay of Plenty stocks, these being indicative of a temporal decline in growth rates (Figures 45–47). It is important to note, however, that annual mean weight-at-age estimates for many of the older age classes (i.e., over 13 years of age) appear highly variable from year to year and are unlikely to provide realistic estimates due to the low number of individuals present.

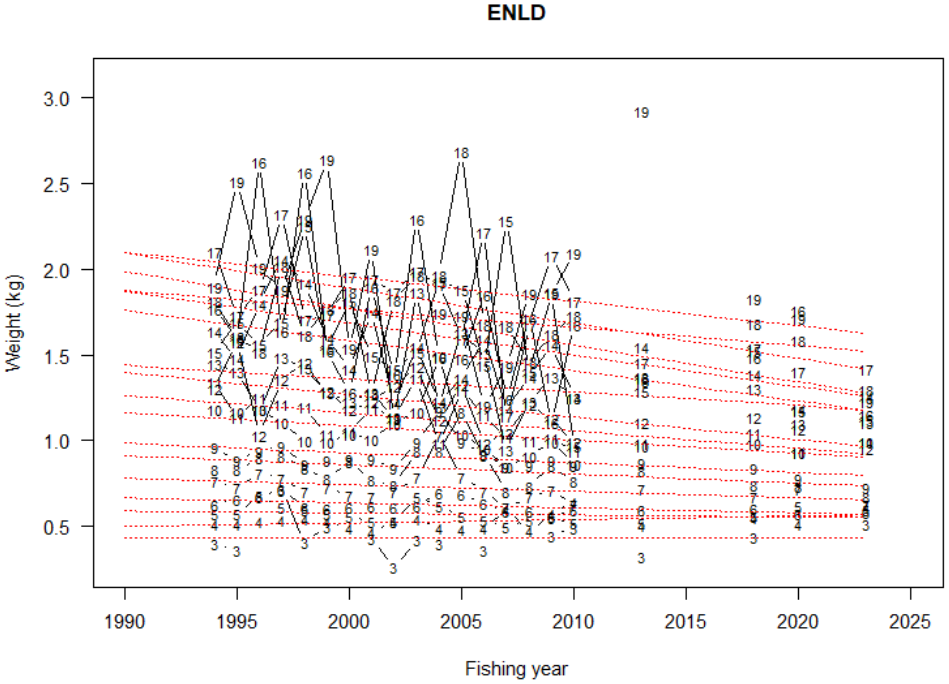

Figure 45: Mean weight-at-age estimates for 3- to 19-year-old snapper sampled from the East Northland (ENLD) bottom longline fishery (during spring-summer) between 1993–94 and 2022–23 with fitted trend lines (dotted) for each age class depicting long-term changes in growth rates over the 30 year period.

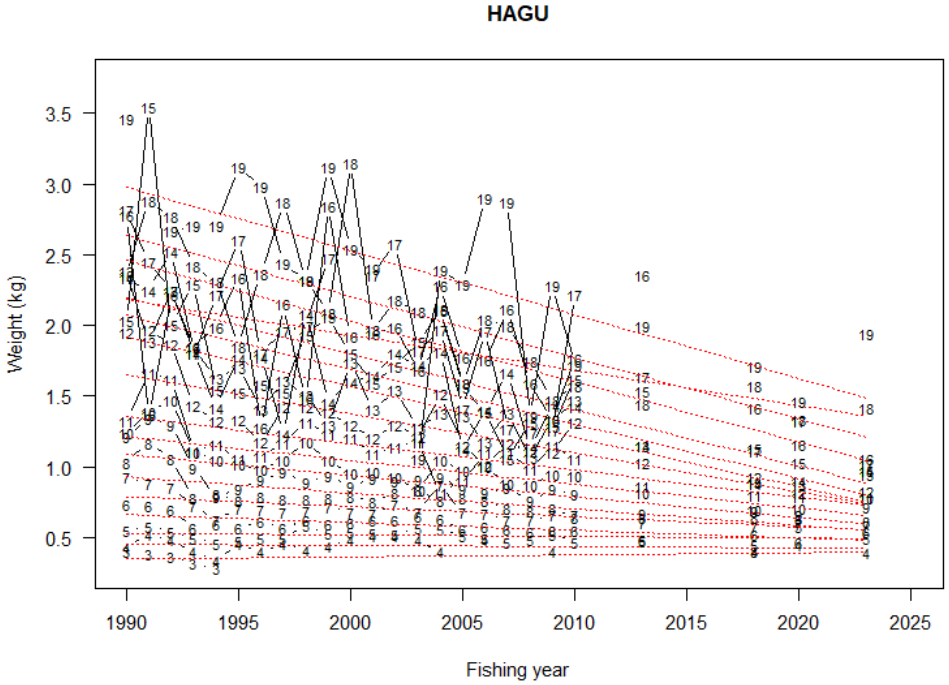

Figure 46: Mean weight-at-age estimates for 3- to 19-year-old snapper sampled from the Hauraki Gulf (HAGU) bottom longline fishery (during spring-summer) between 1989–90 and 2022–23 with fitted trend lines (dotted) for each age class depicting long-term changes in growth rates over the 34 year period.

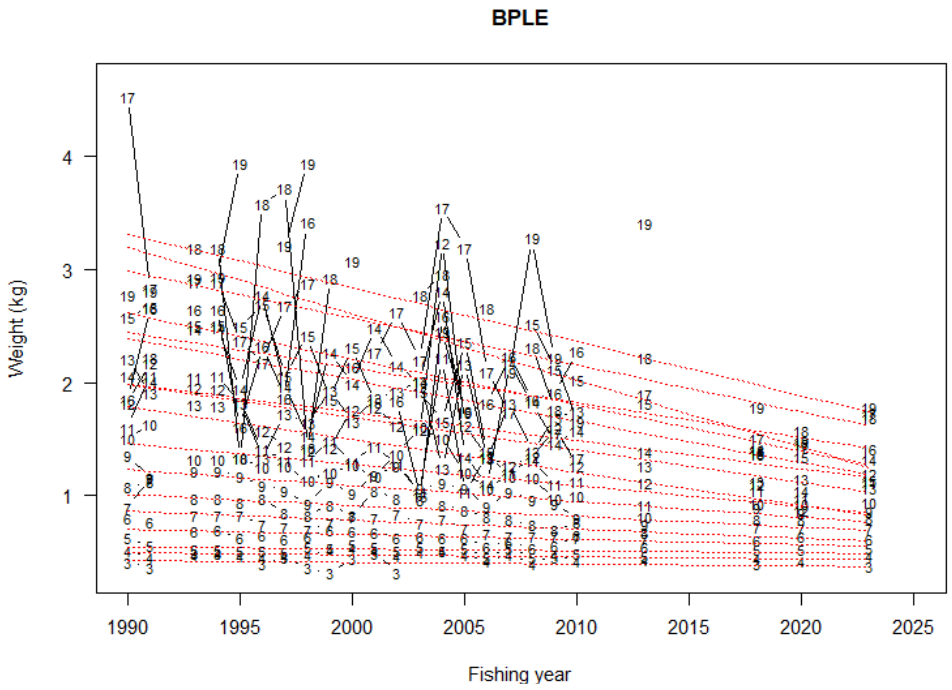

Figure 47: Mean weight-at-age estimates for 3- to 19-year-old snapper sampled from the Bay of Plenty (BPLE) bottom longline fishery (during spring-summer) between 1989–90 and 2022–23 with fitted trend lines (dotted) for each age class depicting long-term changes in growth rates over the 34 year period.

Comparisons of stock bottom longline mean weight-at-age (spring-summer) estimates for snapper comprising the average of a four decadal period (1990s, 2000s, 2010s and 2020s) are presented in Figure 48. Since 2009–10 sampling has only taken place once in every three years, therefore allowing between 3 or 4 events per decade. As a result, the 2022–23 SNA 1 fishing year is the first and only sampling event in the "2020s" decade and therefore just a single year representative is available for comparison.

Aside from a handful of cohorts, estimates of mean weight-at-age of the common age classes of East Northland bottom longline snapper have declined to their lowest estimates in three decades (Figure 48). Mean weight-at-age estimates for young Hauraki Gulf snapper (4 to 10 years) and Bay of Plenty (4 to 12 years) in 2022–23, although marginal at times, are consistently heavier than the 2010 decade estimates, while mean weight-at-age for older fish, despite expected variability, mostly appear similar to 2010 decade estimates (Figure 48).

The difference in mean weight-at-age between the first (1990s) and last (2020s) decades indicates the overall net weight loss/gain to the respective fisheries, estimated conservatively at around -27% for most of the common age classes (i.e., 4 to 19 year olds) in the Hauraki Gulf and Bay of Plenty fisheries, and -19% for East Northland. Only snapper of 4-years-old from East Northland and 4 to 5-years-old from Hauraki Gulf demonstrated a positive gain in the four decadal comparison (Figure 48).

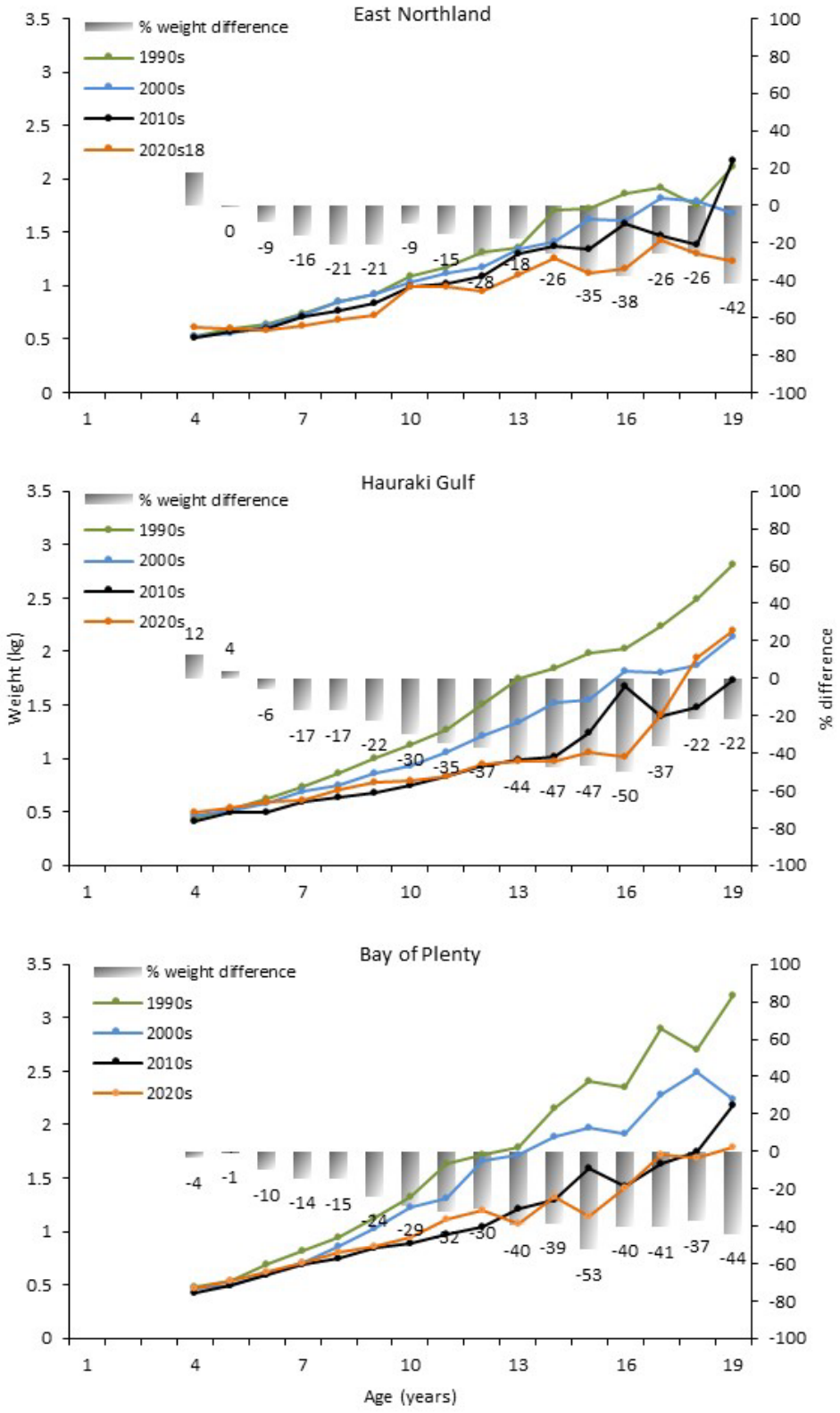

Figure 48: Mean weight-at-age estimates for snapper sampled from the three SNA 1 stock bottom longline fisheries from three distinct decadal time periods and where each period reflects the average mean weight-at-age for those years. The percentage weight difference for each age class (positive or negative) is the difference between the first decade (1990s) and last decade (2020s), and indicative of a net weight gain or loss in mean weight-at-age through time. Note: For comparative purposes over time, only spring-summer samples with age ranging from 4–19 years have been presented.

3.13 SNA 1 and SNA 2 power method catch-at-length and -age estimates

SNA 1 power method catch-at-length and -age compositions (using the length frequency and age-length key sampling approach) and SNA 2 bottom trawl catch-at-age compositions (sampled using the random age frequency sampling approach) were derived for each stock and season, and then combined over seasons (spring-summer and autumn-winter) to produce annual compositions (Figures 49 to 56, Appendices 8 and 9). Age distributions are used to compare differences in the age structure of each stock and season stratum and to gauge relative year class strengths.

Age-at-length scatterplots (using decimalised ages and not fishing year ages) are given in Appendix 2 to document the stock and fishing method of otolith collections that make up power method age-length keys (Appendix 10).

3.14 SNA 1 bottom trawl catch-at-length and -age estimates

East Northland bottom trawl

The East Northland bottom trawl length distribution in 2022–23 was based on 4060 measured snapper from ten landings in spring-summer (n = 2800) and four landings in autumn-winter (n = 1260) and provides a reasonable representation of the annual snapper catch. The length distribution was broad, comprising a moderate length range centred around 33 cm, with a tail extending over 50 cm (Figure 49, Appendix 8). The corresponding age distribution was also broad and characterised by substantial inter-age class variability, the most noticeable being the 2014 and 2011 year classes (9 and 12 year olds), by far the most dominant, accounted for 12% and 14% of the landed catch, respectively (Figure 49, Appendix 9). Mean length and mean age of the distributions were 35.0 cm and 11.5 years, respectively, with MWCVs of 0.14 and 0.15, indicating high precision in sample results.

Hauraki Gulf bottom trawl

The Hauraki Gulf bottom trawl length frequency distribution was based on 2492 snapper and analysed as a single annual (i.e., spring-winter) stratum, as opposed to two seasons, due to a total sample size of only eight landings, which would be unlikely to provide adequate representation of the annual catch. The distribution appears relatively broad in length range, comprising small to moderate sized fish, characterised by two modes, centred around 30 and 33 cm, and a tail extending over 45 cm (Figure 49, Appendix 8). The corresponding age distribution was also broad with reasonable representation in age classes up to 22 years, the most dominant, 2016–2009 year classes (7 to 14 year olds), making made up 69% of the landed catch by number in 2022–23 (Figure 49, Appendix 9). Mean length and mean age of the distributions were 32.7 cm and 11.4 years, respectively, with MWCVs of 0.19 and 0.16, indicating reasonable precision in sample results.

Bay of Plenty bottom trawl

A length frequency distribution of 8752 snapper sampled from the Bay of Plenty bottom trawl fishery in 2022–23 was comprised of a high proportion (92%) of small to moderate sized fish from 25 to 40 cm, with a tail extending over 45 cm (Figure 49, Appendix 8). The corresponding catch comprised mainly young fish, those up to ten years of age of similar proportion, making up three-quarters (75%) of the number of snapper landed (Figure 49, Appendix 9). The mean length and mean age of the Bay of Plenty bottom trawl distributions were 32.7 cm and 8.8 years, respectively, and the MWCVs were 0.10 and 0.13, indicating very high precision in sample results.

Only slight temporal differences were evident in the seasonal length and age distributions for East Northland and Bay of Plenty bottom trawl (Figure 50, Appendices 8 and 9) resulting in similar mean length and age estimates: East Northland spring-summer (35.0 cm and 11.3 years) and autumn-winter and (35.1 cm and 11.6 years); Bay of Plenty spring-summer (33.3 cm and 9.4 years) and autumn-winter and (32.1 cm and 8.2 years). Seasonal catch-at-length and -age MWCVs ranged between 0.13 and 0.24.

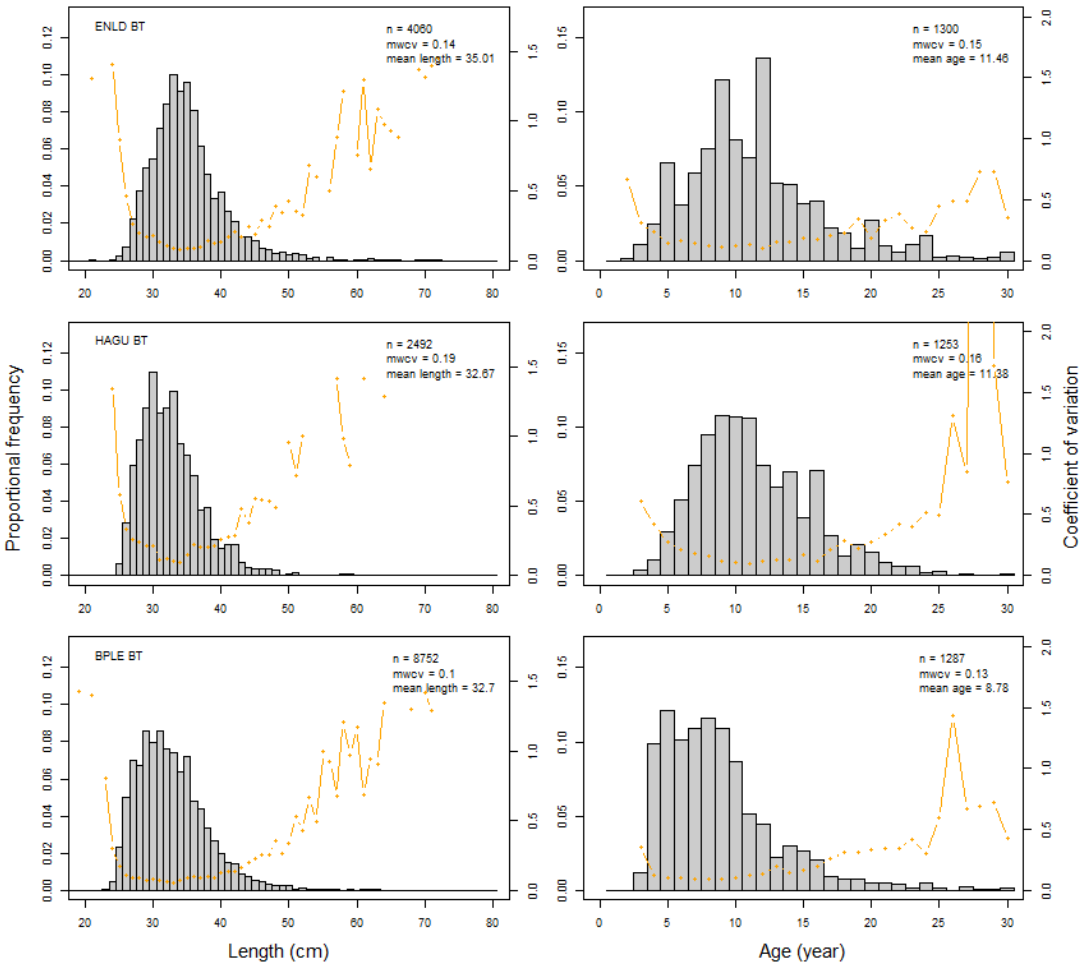

Figure 49: Proportion-at-length and -age distributions (histograms) and CVs (lines) determined from snapper landings sampled from East Northland, Hauraki Gulf and Bay of Plenty bottom trawl (BT) fisheries in 2022–23 (ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty amalgamated across both seasons for ENLD and BPLE and spring-summer only for HAGU; *n*, sample size; MWCV, mean weighted CV).

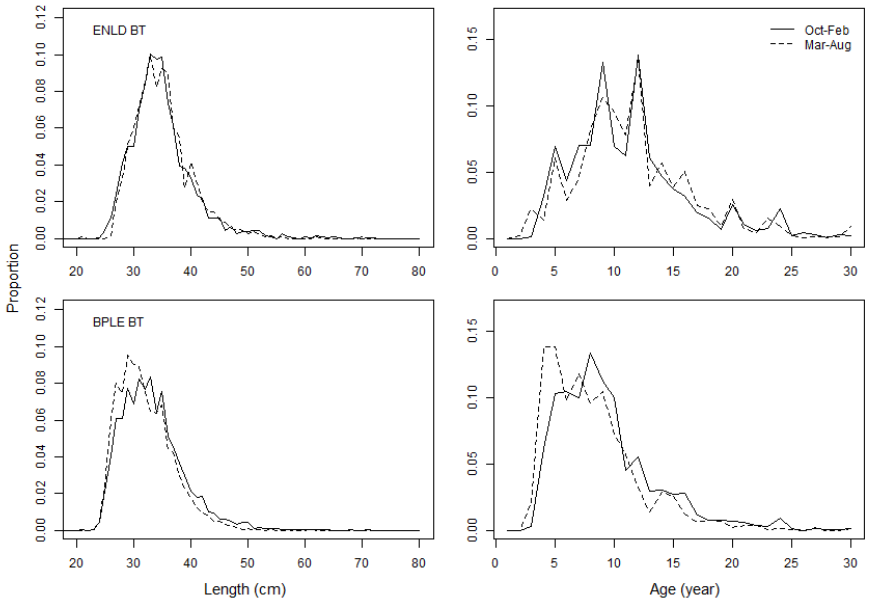

Figure 50: Seasonal proportions-at-length and -age distributions (lines) determined from snapper landings sampled from East Northland and Bay of Plenty bottom trawl (BT) fisheries in 2022–22 (ENLD, East Northland; BPLE, Bay of Plenty). Note: Hauraki Gulf seasonal plot not included as Hauraki Gulf bottom trawl landings were analysed as an annual stratum.

SNA 2 North bottom trawl

The SNA 2 North bottom trawl age distribution in 2022–23, sampled using the random age frequency method, comprised mainly young snapper: those 10 years of age and younger making up 82% of the landed catch by number (Figure 51, Appendix 9). The recently recruited 2019 year class (4 year old) was by far the most dominant in the fishery, making up 27% of catch, two-fold more than other year classes (Figure 51, Appendix 9). Representation of age classes over 15 years was relatively poor, the combined total making up just 6% of the landed catch. Only age classes greater than 5 years of age appear fully recruited to the fishery, because they no longer contain a proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 10). The mean age of the SNA 2 North distribution was 7.8 years and the MWCV was 0.11, indicating high precision in catch-at-age estimates.

Slight temporal differences were evident in the seasonal age distributions for SNA 2 North bottom trawl due to the recruitment of young snapper, particularly the 2019 year class (4 year old), over autumn-winter (Figure 52, Appendix 9). The mean age of snapper landed over the spring-summer period was 8.7 years and during autumn-winter 7.3 years, with respective catch-at-age MWCVs of 0.15 and 0.17.

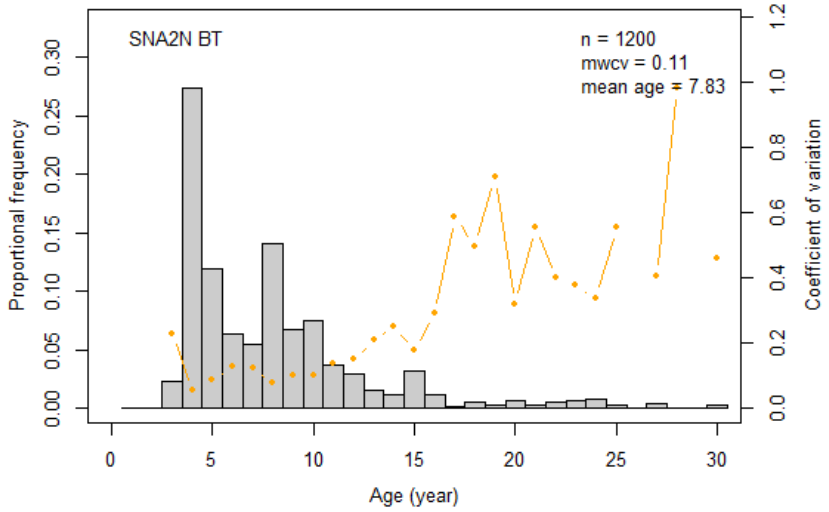

Figure 51: Proportion-at-age distributions (histograms) and CVs (lines) determined from snapper landings sampled from SNA 2N bottom trawl fishery (BT) in 2022–23 (SNA2N, SNA 2 North amalgamated across both seasons; n, sample size; MWCV, mean weighted CV).

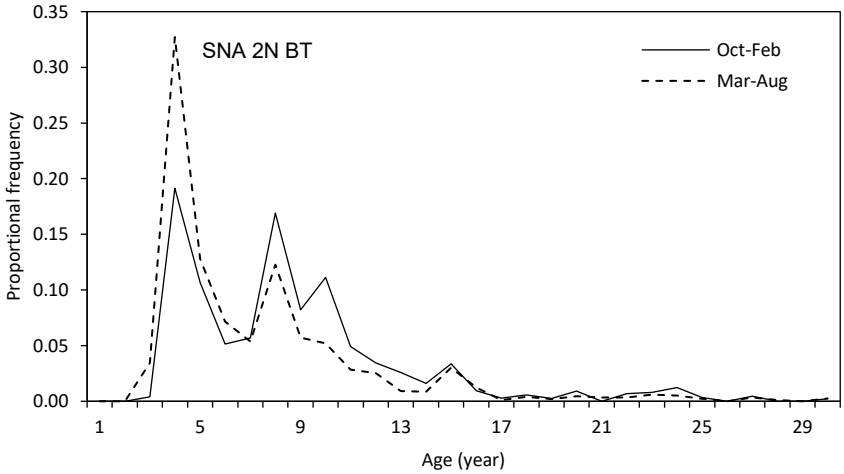

Figure 52: Seasonal proportions-at-age distributions (lines) determined from snapper landings sampled from SNA 2 North bottom trawl fishery (BT) in 2022–23 (SNA 2N, SNA 2 North).

SNA 1 and SNA 2 bottom trawl stock comparisons

Despite exploitation differences between stocks, some relative year class strengths appeared more similar within some SNA 1 stocks than others, particularly for older age classes. For example, there was some consistency in relative year class strengths, from 2011 (12 year olds) to 2004 (19 years olds) between East Northland and Bay of Plenty bottom trawl landings, compared to those from Hauraki Gulf (Figure 49). Few similarities were noticeable between SNA 1 and SNA 2 bottom trawl relative year class strengths in 2022–23 (Figures 49 and 51).

3.15 SNA 1 Danish seine catch-at-length and -age estimates

Hauraki Gulf Danish seine

The length distribution from the Hauraki Gulf Danish seine fishery consisted of few small but predominantly moderate size snapper, ranging from 28 to 42 cm, characterised by one main mode, centred around 35 cm, with a tail extending over 55 cm (Figure 53, Appendix 8). The catch comprised mostly moderate aged fish, those 7 to 17 years of age, making up 80% of the number of snapper landed in 2022–23 (Figure 53, Appendix 9). Although representation up to 17 years of age was good, there was also significant presence in the proportion of fish occupying age classes up to, and over, 20 years. Only age classes greater than 10 years of age appear fully recruited to the fishery, because they no longer contain a noticeable proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 10). The mean length and mean age of the Hauraki Gulf Danish seine distributions were 36.2 cm and 13.3 years and the MWCVs were 0.14 and 0.16, respectively. Both mean length and mean age were the highest recorded estimates across all sampled fishing methods in SNA 1 2022–23.

Slight temporal differences were evident in the seasonal length and age distributions for Hauraki Gulf Danish seine due to the recruitment of young snapper over autumn-winter (Figure 54, Appendices 8 and 9). The mean length and age of snapper landed over the spring-summer period was 37.5 cm and 14.5 years and, during autumn-winter, 35.2 cm and 12.4 years. Seasonal catch-at-length and -age MWCVs ranged between 0.18 and 0.24.

Bay of Plenty Danish seine

Landings from the Bay of Plenty Danish seine fishery comprised mainly small snapper and a lesser proportion of moderate size fish, ranging from 26 to 38 cm, characterised by one mode centred equally around 32–33 cm, with a tail extending to 45 cm (Figure 53, Appendix 8). The catch was dominated by young fish, those up to 10 years of age making up 71% of the number of snapper landed (Figure 53, Appendix 9). The most notable of these were the 2019–2014 year classes (5 to 10 year olds) of relatively similar proportion, accounting for 64% of the landed catch. Although reasonable representation in the age distribution continues to 16 years of age, the combined total of fish 17 years and older makes up just 6% of the catch. Only age classes greater than 8 years of age appear fully recruited to the fishery, because they no longer contain a noticeable proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 10). The mean length and mean age for snapper from the Bay of Plenty Danish seine distributions was 33.6 cm and 9.3 years and the MWCVs were 0.10 and 0.13, respectively, indicating high precision in catch-at-age estimates.

Seasonal length and age distributions for Bay of Plenty Danish seine showed little temporal variability (Figure 54, Appendices 8 and 9). The mean length and age of snapper landed over the spring-summer period were 33.2 cm and 9.2 years and, during autumn-winter, 34.0 cm and 9.4 years. Seasonal catch-at-length and -age MWCVs ranged between 0.14 and 0.19.

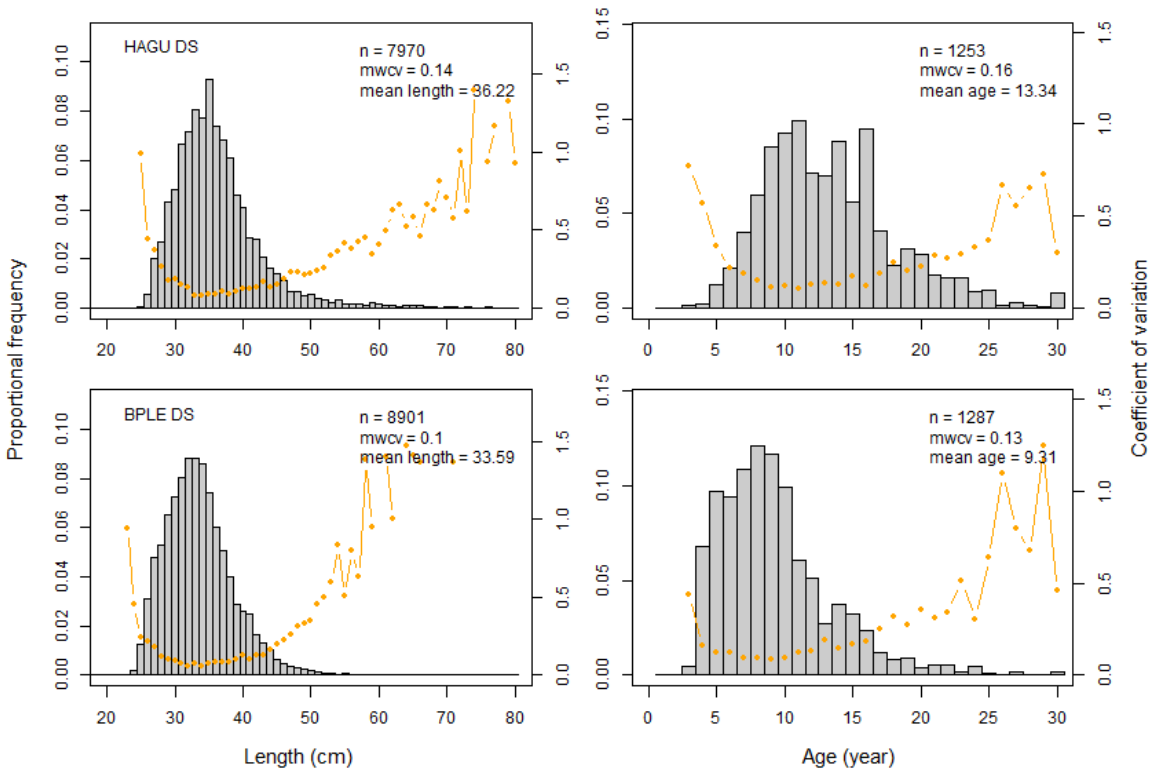

Figure 53: Proportion-at-length and -age distributions (histograms) and CVs (lines) determined from snapper landings sampled from the Hauraki Gulf and Bay of Plenty Danish seine (DS) fisheries in 2022–23 (HAGU, Hauraki Gulf; BPLE, Bay of Plenty amalgamated across both seasons; *n*, sample size; MWCV, mean weighted CV).

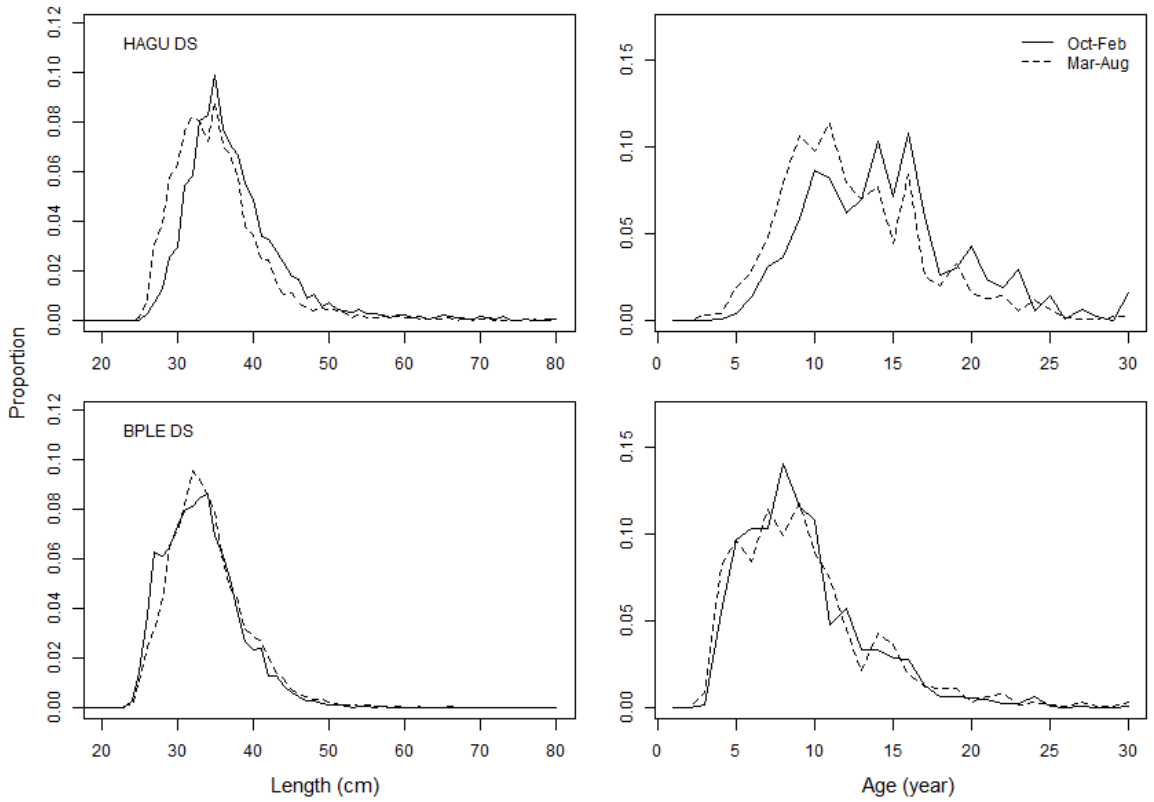

Figure 54: Seasonal proportions-at-length and -age distributions (histograms) and CVs (lines) determined from snapper landings sampled from the Hauraki Gulf and Bay of Plenty Danish seine (DS) fisheries in 2022–23 (HAGU, Hauraki Gulf; BPLE, Bay of Plenty).

SNA 1 Danish seine stock comparisons

Although age compositions appeared different between the Hauraki Gulf and Bay of Plenty Danish seine catches in 2022–23, some similarities in relative year class strengths were evident, particularly for fully recruited age classes. For example, there were some consistencies in relative year class strengths, from the 2013 year class (11 year olds) to the 2005 year class (19 year olds) between Hauraki Gulf and Bay of Plenty Danish seine landings (Figure 53).

3.16 SNA 1 modular harvest system catch-at-length and -age estimates

East Northland modular harvest system

The East Northland modular harvest system length distribution was based on 3130 snapper sampled during autumn-winter 2022–23 and is unlikely to provide adequate representation of the annual snapper catch. The distribution appears relatively broad in length range, comprising small to moderate sized fish, possibly characterised by a number of modes, centred between 29 and 35 cm, and with a tail extending close to 50 cm (Figure 55, Appendix 8). The corresponding age distribution was broad with representation up to at least 20 years and characterised by substantial inter-age class variability, the most dominant being the 2014 and 2011 year classes (9 and 12 year olds), accounting for 12% and 11% of the landed catch, respectively (Figure 55, Appendix 9). Mean length and mean age of the autumn-winter distributions were 33.8 cm and 10.9 years, respectively, with MWCVs of 0.17 and 0.19, indicating reasonable precision in autumn-winter sample results.

Bay of Plenty modular harvest system

Landings from the Bay of Plenty modular harvest system fishery was comprised primarily of small snapper with a lesser proportion of moderate size snapper, ranging from 25 to 32 cm, characterised by one mode, centred around 27 cm, with a tail extending to about 45 cm (Figure 55, Appendix 8). The catch was dominated by young fish, those up to 10 years of age making up 86% of the number of snapper landed (Figure 55, Appendix 9). The 2019 and 2018 year classes (4 and 5 year olds) were dominant in the fishery, accounting for 35% of the landed catch. The combined total of fish 15 years and older made up just 5% of the catch, the lowest power method estimate in SNA 1 in 2022–23. Only age classes greater than 8 years of age appear fully recruited to the fishery, because they no longer contain a noticeable proportion of fish in the 25–27 cm length intervals (see age-length key, Appendix 10). The mean length and mean age for snapper from the Bay of Plenty modular harvest system catch were 30.4 cm and 7.4 years, also the lowest recorded estimates in SNA 1 power methods 2022–23, and the MWCVs of the distributions were 0.10 and 0.13 respectively, indicating very high precision in sample results.

Seasonal length and age distributions for Bay of Plenty modular harvest system showed little temporal variability (Figure 56, Appendix 8 and 9). The mean length and age of snapper landed over the spring-summer period were 30.5 cm and 7.7 years and, during autumn-winter, 30.3 cm and 7.2 years. Seasonal catch-at-length and -age MWCVs ranged between 0.12 and 0.18.

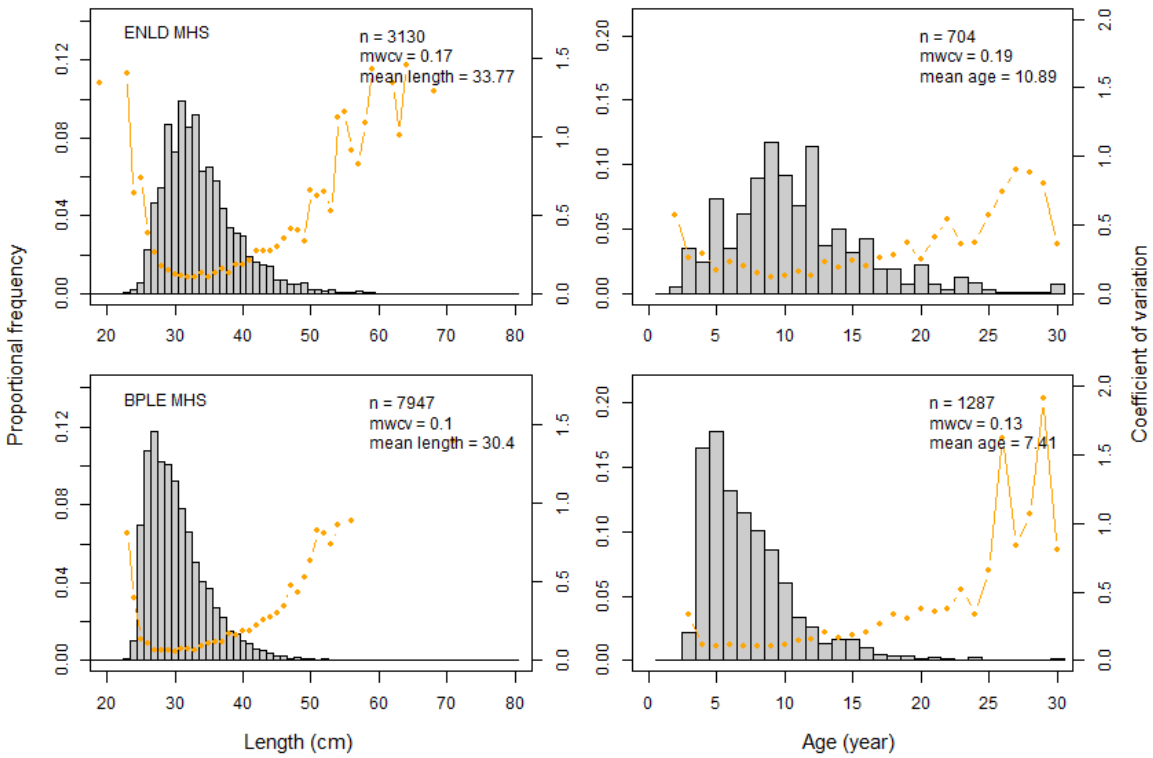

Figure 55: Proportion-at-length and -age distributions (histograms) and CVs (lines) determined from snapper landings sampled from the East Northland and Bay of Plenty modular harvest system (MHS) fisheries in 2022–23 (ENLD, East Northland; BPLE, Bay of Plenty amalgamated across both seasons for BPLE and autumn-winter only for ENLD; *n*, sample size; MWCV, mean weighted CV).

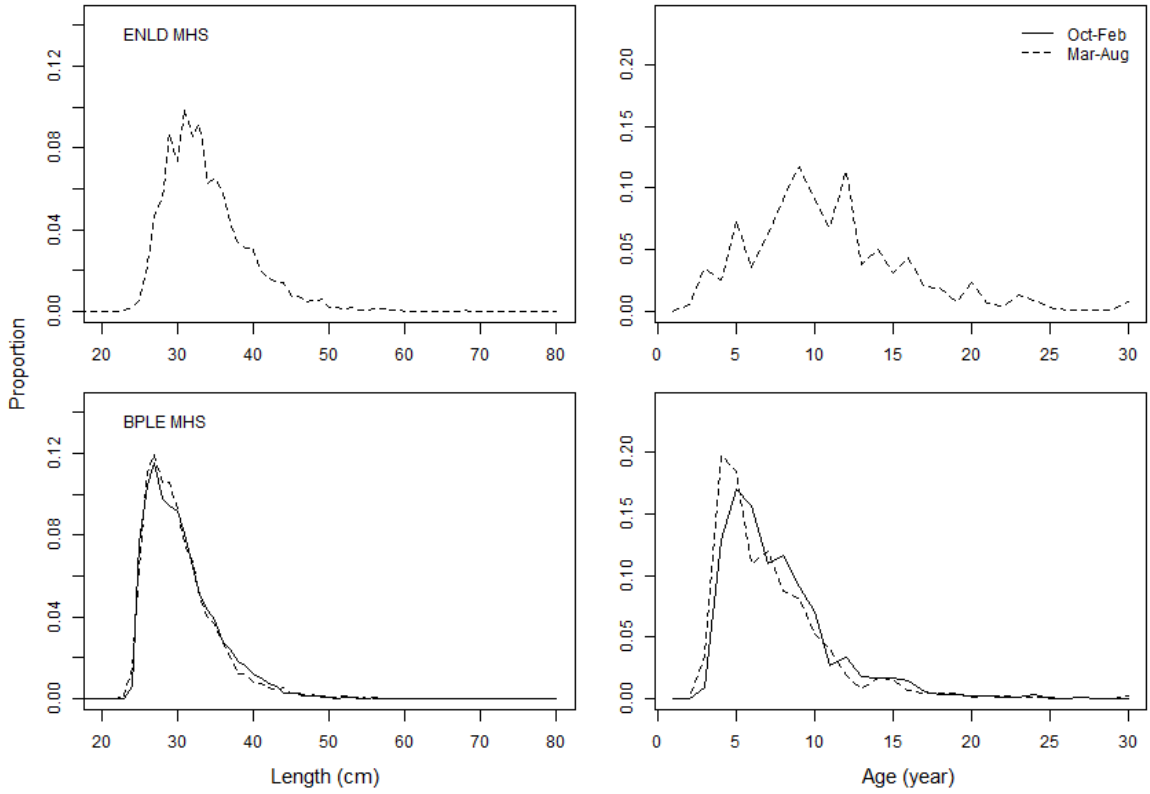

Figure 56: Seasonal proportions-at-length and -age distributions (histograms) and CVs (lines) determined from snapper landings sampled from the East Northland and Bay of Plenty modular harvest system (MHS) fisheries in 2022–23 (ENLD, East Northland; BPLE, Bay of Plenty).

SNA 1 modular harvest system stock comparisons

Although age compositions appeared different between the East Northland and Bay of Plenty modular harvest system catches in 2022–23, some similarities in relative year class strengths were evident, particularly for fully recruited older age classes. For example, there seems to be some consistency in relative year class strengths, from the 2011 year class (12 year olds) to the 2005 year class (18 year olds) (Figure 55).

3.17 SNA 1 and SNA 2 power method stock comparisons

Despite differences in catch-at-age proportions due to exploitation, growth rates and method selectivity, a few broad similarities in relative year class strengths exist between regions for the main power methods operating across the SNA 1 and SNA 2 stocks in 2022–23. For example, SNA 1 power method year classes occupying the mid-age range of the distributions (i.e., 2011 to 2005 year classes; 12 to 18 year olds) generally have similar patterns of relative year class strength across methods and stocks, but less consistency with SNA 2 North bottom trawl, possibly due to lower catch-at-age proportions (Figure 57).

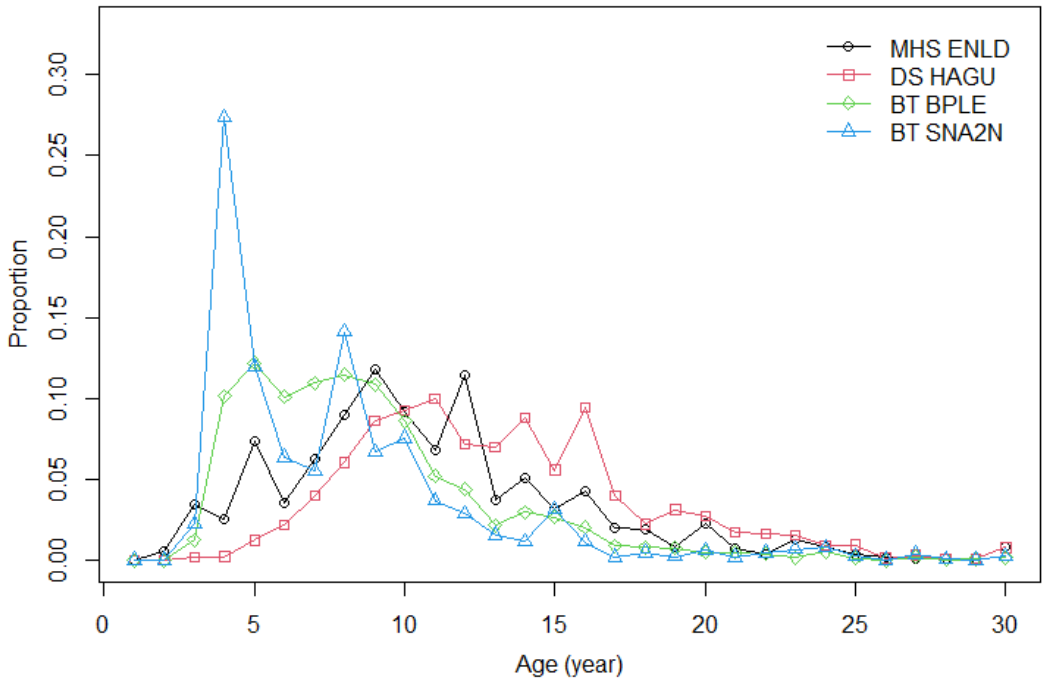

Figure 57: Comparison of proportion-at-age distributions (lines) determined from snapper landings sampled from the SNA 1 and SNA 2 power method fisheries in 2022–23 (BT, bottom trawl; DS, Danish seine; MHS, modular harvest system; ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA2N, SNA 2 North). Note that where there was a choice of data sets in an area, the data set that was considered to be most representative was used for comparison in this plot.

3.18 SNA 1 power method mean weight-at-age and mean length-at-age estimates

Within-method comparisons of mean weight-at-age and mean length-at-age for the SNA 1 and SNA 2 power method fisheries in 2022–23 are presented in Figure 58. For the four bottom trawl fisheries (East Northland, Hauraki Gulf, Bay of Plenty, SNA 2N), snapper below 7 years caught from East Northland were heavier and longer at the same age than in the other areas. But this changed with snapper 7 years and older caught from SNA 2N being heavier and longer at a given age than those caught from Bay of Plenty, which in turn, were heavier and longer than those caught from the Hauraki Gulf (Figure 58, Appendices 11 and 12).

For the Danish seine fisheries, marginal differences exist with slightly heavier and longer snapper caught from Bay of Plenty than Hauraki Gulf. For MHS data the Bay of Plenty had lighter and shorter

snapper below 7 years, and heavier and larger snapper over 11 years, than East Northland (Figure 58, Appendices 11 and 12).

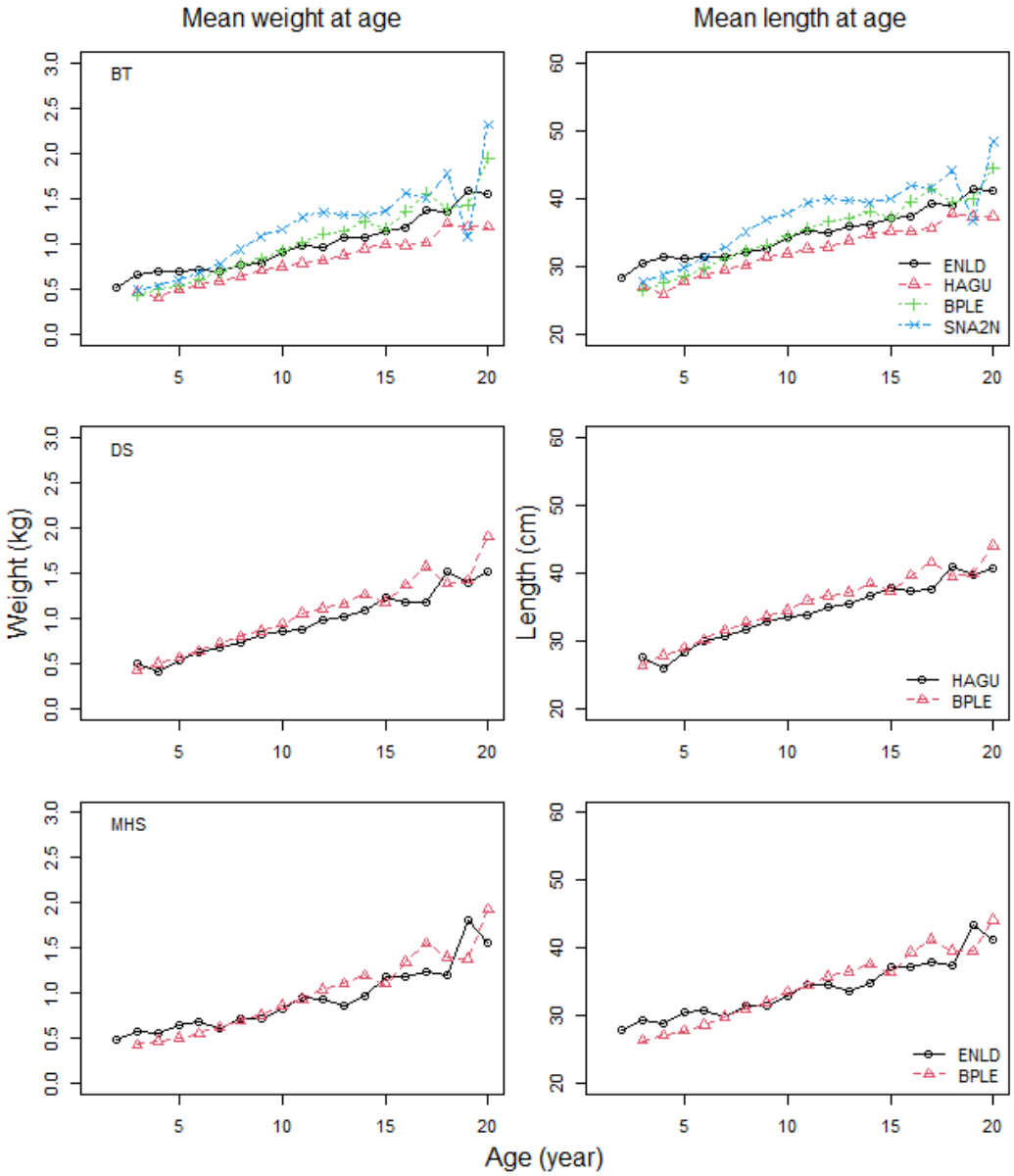

Figure 58: Observed mean length-at-age and mean weight-at-age estimates from snapper landings sampled from the three SNA 1 and SNA 2 power method fisheries in 2022–23 (BT, bottom trawl; DS, Danish seine; MHS, modular harvest system; ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA2N, SNA 2 North). Note: data presented for ages 2–20 years only.

4. BROADER OUTCOMES

As required under Government Procurement rules[5], Fisheries New Zealand considered broader outcomes (secondary benefits such as environmental, social, economic or cultural benefits) that would be generated by this project. The following broader outcomes were delivered:

(1) Land-based sampling projects require extensive engagement with and support from the fishing industry. This engagement provides an opportunity to expose a number of industry staff, across multiple companies, to the scientific process that is required to obtain representative samples that are subsequently used to inform fishery assessments and the fishery management process. Through this process we engage with these industry staff prior to projects being set up (to ensure that sampling can be conducted in a way that minimises impact on industry operations), on a sample-by-sample basis throughout the project (to organise specific logistics to enable sample access), and after the project is finished (so that we can feedback results from the project). Further, some industry staff receive specific training so they can assist with sampling to tag bins of fish at sea so that they are set aside for sampling, and also to select bins for sampling at the fish sheds. This exposure, interaction and engagement creates a strong relationship with the fishing industry and raises the level of understanding as to why sampling is needed and more generally why fish stocks need to be assessed to ensure sustainability.

(2) Land-based sampling often requires a number of staff to cover all of the sampling events, with some sheds in relatively remote locations. As such we need to employ sub-contractors and/or casual staff in these locations. This employment and its associated training increases research capability and exposes a diversity of community members to the science and research process. In 2022–23 four casual staff were involved in sampling and therefore exposed to the fishery research process. In addition, two University of Auckland interns assisted with sampling during a one week mini-internship and also received exposure to the fishery research process as well.

(3) Land-based sampling provides a sampling platform that can support other forms of research, including student projects. For the SNA2022-01 project land-based sampling supported investigations into milky-fleshed snapper (Johnson et al. 2024).

(4) For any research, it is important that results are communicated with as broad an audience as possible. Beyond this report and associated working group presentations we also attempt to divulge results more broadly through different communication channels aimed at the general public. For example, we have produced a short video (and associated webpage) describing the purpose and value of the land-based sampling programme that Fisheries New Zealand supports https://niwa.co.nz/news/catch-sampling. Land-based sampling is also one of the key topic areas featured in lectures given to University of Auckland undergraduate students annually.

(5) Up to 60 fish from sampling events are damaged through the sampling process (otoliths removed and gut cavity opened to determine sex). Where possible these fish are returned to the production line so they can be sold as a filleted product (rather than whole) to avoid wastage. Where this is not possible, we purchase the fish and distribute amongst the community. In 2022–23 we distributed close to a tonne of premium snapper amongst two iwi.

[5] https://www.procurement.govt.nz/procurement/principles-charter-and-rules/government-procurement-rules/planning-your-procurement/broader-outcomes/

5. DISCUSSION

Considerable development has occurred within the SNA 1 fishing industry over the past three decades, with downsizing and rationalisation of the commercial inshore fleet, and more recently, the inclusion of a new fishing method, the modular harvest system. Significant spatial change has also occurred, most notably in recent years where vessels that previously fished in the Hauraki Gulf have instead directed their effort toward East Northland and Bay of Plenty where snapper are of larger average size and of better quality (Walsh et al. 2019b, 2022). For example, the Hauraki Gulf catch declined by 30% between 2018–19 and 2022–23 from about 964 t to about 671 t, while the Bay of Plenty and East Northland catch increased by 34% (from about 1567 t to 2102 t) and 24% (from about 1285 t to about 1593 t), respectively. Appendix 13 has images of fish of poor colour and condition caught in the inner Hauraki Gulf. In 2022–23, NIWA was requested by Fisheries New Zealand to investigate the skinny "Milky White Flesh Syndrome" snapper issue, known to be in a state of chronic malnutrition (starvation), although the root cause remained uncertain (Johnson et al. 2024). They found that the highest incidence quantities of "Milky White Flesh Syndrome" snapper were caught in the central inner Hauraki Gulf and the southern portion of East Northland, particularly Doubtless Bay, with the total commercial catch close to 50 tonnes (Johnson et al. 2024).

SNA 1 bottom longline random age frequency sampling

In 2022–23, bottom longline was overall the most dominant method in the SNA 1 fishery, catching as much snapper (1835 t) as Danish seine (965 t) and bottom trawl (793 t) combined. Unlike other methods, longlining operates extensively in most spatial strata of SNA 1, across a wide range of habitats (soft and hard substrates), and has few fine-scale management (area and effort) restrictions imposed on its use. Catch-at-age data from the longline fishery provide a particularly useful tool for stock monitoring, and for the past three decades has been believed to be the most uniform of all the fishing methods in its selection of fish across both size and age.

The relative year class strengths inferred from the bottom longline age distributions sampled from the SNA 1 fisheries in the 2022–23 fishing year are generally consistent with trends observed over the previous decade (Walsh et al. 2011a, 2011b, 2014b, 2019b, 2022) despite fewer vessels operating within the Hauraki Gulf in recent years.

East Northland bottom longline

The East Northland bottom longline fishery caught more snapper in 2022–23 than both the Hauraki Gulf and the Bay of Plenty longline fisheries combined. The East Northland age composition has remained in a healthy state, with 10% of snapper 20 years of age and older and a mean age of 11 years, the highest experienced over 30 years. The average size in East Northland remains reasonable at about 36 cm (about 1.022 kg), despite restrictions due to relatively slow growth rates in the fishery.

Hauraki Gulf bottom longline

In the past, the Hauraki Gulf has been regarded as the mainstay of the SNA 1 fishery, comprising the largest biomass and usually producing the largest commercial and recreational harvest (Walsh et al. 2014b, Francis & McKenzie 2015). More recently however, commercial fishing in the Hauraki Gulf has declined substantially (particularly bottom longline) with the 2022–23 fishing year contributing the lowest proportion of the catch (15%) since the introduction of the QMA in 1986. Despite slow growth rates due to increased snapper biomass and problems with the recent "Milky White Flesh Syndrome", the average size of bottom longline snapper in Hauraki Gulf 2022–23 was 34 cm (about 0.866 kg), slightly higher than the lowest estimate in 2017–18 (Walsh et al. 2019b). The Hauraki Gulf mean age for 2022–23 was 11.5 years, the highest equal estimate in 34 years of research.

Bay of Plenty bottom longline

For more than a decade, Walsh et al. (2011a, 2011b, 2014b, 2019b, 2022) have reported a broadening in the Bay of Plenty age distribution over successive sampling years (2008–09, 2009–10, 2012–13, 2017–18 and 2019–20). Recruitment into the Bay of Plenty snapper fishery in recent years has been delayed by a slowing growth rate (Walsh et al. 2011b, 2014b, 2019b, 2022), similar to that seen in the Hauraki Gulf. The current average sized snapper landed by bottom longline in the Bay of Plenty in

2022–23 has increased slightly to 36 cm (about 1.028 kg) and the age composition broadened considerably, resulting in the mean age increasing to 9.9 years, the largest in 34 years.

Variability in catch-at-age between stocks

Since 1989–90, consistency in relative year class strengths and recruitment patterns have been evident between the SNA 1 stocks, particularly for extremely strong and weak year classes. Variability in relative year class proportions between the SNA 1 stocks has mostly been associated with variable recruitment (a reflection of unique environmental conditions), as well as differences in growth and fishing mortality (Walsh et al. 2003). However, as the SNA 1 population has broadened in age composition in recent years, this consistency in relative year class strengths, has become less apparent. In 2022–23 there was some consistency in relative year class strengths, from the 2007 (16 year olds) to 2000 (23 year olds) year classes between Hauraki Gulf and Bay of Plenty bottom longline landings, but less consistency with East Northland.

The catch at age in Statistical Area 003 has often been observed to be more aligned to the Hauraki Gulf fishery than with East Northland. An updated analysis of tagging, age composition, and commercial and survey catch and effort data has suggested that the northern Hauraki Gulf boundary should actually include the majority of Statistical Areas 003 & 004 (with a boundary just south of the Bay of Islands) (Fisheries New Zealand 2023).

The most notable year class strength consistencies between SNA 1 bottom longline fisheries (and some power methods) in 2022–23 was the 2014 year class (9 year olds) of above average strength, which was the most dominant in East Northland, and the second most dominant in Hauraki Gulf and Bay of Plenty landings. However, unlike other SNA 1 stocks, the East Northland catch-at-age analysis is based on a weighted combination of statistical area estimates (Davies & Walsh 2003), and viewed independently, the 2014 year class was most dominant in Statistical Area 003 (south East Northland), but is only the third largest cohort in Statistical Area 002 (north East Northland).

In contrast to the 2019–20 results (Walsh et al. 2022), the 2022–23 SNA 2 North bottom trawl fishery relative year class strength did not show a strong correlation with Bay of Plenty power method estimates. This may be because there was a problem with the methodology for the Eastern Bay of Plenty. Because a Random Age Frequency analysis was not possible, the Bay of Plenty power method age composition was generated using an Age Length Key approach based on otoliths predominantly from the western Bay of Plenty (Statistical Areas 008 and 009) but length frequencies from the eastern Bay of Plenty (Statistical Area 009 and 010). Analysis of data from the Bay of Plenty trawl survey (undertaken as part of the 2023 SNA 1 stock assessment, Fisheries New Zealand 2023) suggests that the boundary between the Hauraki Gulf and Bay of Plenty stocks may occur in the middle of the Bay of Plenty. Since distributions of length around age vary by stock, the application of an ALK mainly from the western Bay of Plenty stock to the length frequencies largely from the eastern stock is likely to result in a biased age distribution for the eastern stock, and therefore comparison of the eastern stock with SNA 2N is not valid.

It is also worth noting that the mean age in SNA 2 North was only marginally greater than previous estimates (7.8 years in 2022–23 compared with 6.8, 7.4, and 7.4 years in 2007–08, 2008–09, and 2019–20) which may be because of the recently recruited 2019 year class (4 year olds) which is by far the most dominant year class in the fishery.

Although some differences in relative year class strengths were present between SNA 1 stocks, comparisons between methods within stocks (using random age frequency and length frequency age-length key sampling designs), demonstrate a high level of consistency between estimates (Appendix 14). It is worth noting that of all the stocks and methods sampled, Danish seine from the Hauraki Gulf had the greatest estimate of mean age (13.3 years), which is slightly older than the 2019–20 estimate (Walsh et al. 2022). This could potentially be due to an increase in cod-end (on-the-square or -diamond) mesh size from 5 to 6 inches (7 inches rarely) in recent years (pers. comm. with fishers) by some Hauraki Gulf Danish seine fishers (Walsh et al. 2022).

Seasonal differences in catch-at-age

In the bottom longline fisheries, older and larger fish were found to be more common during spring in Bay of Plenty and Hauraki Gulf, and winter in East Northland. High numbers of small young snapper were most common during autumn, reflecting a time of strong seasonal recruitment into the commercial fisheries. For power method fisheries in SNA 1 and SNA 2 (apart from East Northland), older snapper were only marginally more common in spring-summer landings than those from autumn-winter.

Precision in catch-at-age

The bootstrap MWCV estimates for the age distributions sampled from the SNA 1 bottom longline fisheries in 2022–23 ranged between 0.21 and 0.22, indicating a good level of precision. Although approximating the target MWCVs of 20%, this was partly because of an increase in otolith sample size in East Northland and Bay of Plenty, to levels slightly higher that in recent years (Walsh et al. 2014b, 2019b, 2022). To achieve a target catch-at-age precision (MWCV) of 20% for the three SNA 1 bottom longline stocks in future years, otolith sample sizes will need to be increased to at least 1200 otoliths across all SNA 1 stocks.

In the two decades preceding 2009–10, sampling of the SNA 1 longline fisheries was conducted over successive years, and comparisons of inter-annual catch-at-age estimates indicated a high level of consistency in relative year class strength, where cohorts were easily tracked from one year to the next, providing many 'looks' at each year class (see Appendices 4 and 5). Cohorts are less easy to follow in more recent years, largely due to the less frequent triennial sampling.

Bootstrap MWCV estimates for length and age distributions sampled from the SNA 1 power method fisheries in 2022–23 ranged between 0.10 and 0.19, and that for SNA 2 bottom trawl catch-at-age was 0.11. The Bay of Plenty power method fisheries (bottom trawl, Danish seine, modular harvest system) had the narrowest length and age range of all SNA 1 methods, and had similarly low MWCVs, 0.10 and 0.13 respectively. High precision is influenced by the homogeneity between sampled landings and by achievement of targeted sample sizes.

Figure 59: Small snapper were often common in Bay of Plenty landings 2022–23, particular from the modular harvest system fishery, where mean length was estimated at 30.4 cm (~0.6 kg) and mean age estimated at 7.4 years.

Recent change in snapper growth rates

Using the time series of bottom longline catch sampling data available from SNA 1, Walsh et al. (2011a, 2011b, 2014b, 2019b, 2022) documented temporal trends in the growth rates of snapper by comparing changes in mean weight-at-age over time. They found that growth rates for Hauraki Gulf and Bay of

Plenty snapper were fastest during the 1990s and steadily declined throughout the 2000 and 2010 decades. This trend was correlated with broadening age distributions, and as the Hauraki Gulf and Bay of Plenty stock assessments suggested that biomass had increased over this period (Francis & McKenzie 2015), it was attributed to compensatory density dependence (Rose et al. 2001) rather than to temperature related effects or bias in the sampling design or fishing method selectivity (Walsh et al. 2019b).

In the 2022–23 data, mean weight-at-age estimates for the common age classes (i.e., 4 to 19 year olds) in the Hauraki Gulf and Bay of Plenty bottom longline fisheries were found to be marginally heavier than those in the 2010 decade for snapper 4 to 10 year old and 4 to 12 years old, respectively, but still close to the lowest records in four decades of catch sampling, with an overall net weight loss conservatively estimated at around -27%.

After three decades (1990s, 2000s and 2010s) of little change in the East Northland mean weight-at-age estimates, a notable decline across a number of age classes has recently become evident, resulting in an overall net weight loss of around -19%, twice that of estimates from 2017–18 and 2019–20.

The current slow growth rates observed in the SNA 1 fisheries in recent years, the resulting drop in yield-per-recruit compared with the 1990s, and the impact on productivity of the stock have been reported a number of times (Walsh et al. 2007, 2008, 2009, 2011a, 2011b, 2014b, 2019b, 2022) and mean that the fishery will now land considerably greater numbers of snapper than it did 10–30 years ago to achieve the same harvest weight. Similar density-dependent growth trends in relation to changes in biomass have also recently been documented for SNA 8 (Walsh et al. 2014c, 2017, 2019a, 2024 and Langley 2020).

Inshore Working Group recommendations for future SNA 1 catch-at-age programmes

- The Inshore Working Group concluded that the next SNA 1 catch-at-age project should be designed to robustly test stock relationships, which would require a RAF approach with sufficient samples from each of western Bay of Plenty, eastern Bay of Plenty and SNA 2 North.

- Spatial stratification for future SNA 1 catch-at-age projects should also be adjusted to be consistent with current understanding of the boundary between East Northland and Hauraki Gulf, which is now half-way through Statistical Area 003.

- A recommendation from the Plenary in 2023 was to conduct SNA 1 catch-at-age on a two consecutive year in five cycle instead of every third year. This project was let before this recommendation was made. Future SNA 1 catch-at-age programmes will be conducted two consecutive years in five, if sampling is not replaced by the longline survey that is currently being investigated with a pilot project.

- The Working Group concluded that SNA 1 catch-at-age projects should continue to focus on commercial bottom longline age composition to monitor recruitment strength, even though bottom longline catch per unit effort is no longer accepted as a reliable index of abundance. Age composition of power methods (bottom trawl, Danish seine and modular harvest system), would be given a lower priority, except when required to investigate stock relationships or to monitor substocks without bottom longline fisheries, as they are largely sampled to provide information on gear selectivity.

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8. APPENDICES

Appendix 1: Estimated seasonal proportion at age and coefficients of variation (CVs) for snapper bottom longline fisheries in SNA 1 in 2022–23.

Estimates of proportion at age with coefficients of variation for snapper from the East Northland bottom longline fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n*, otolith sample size

	Random age frequency Longline									
Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
2	0.0000	0.00	0.0000	0.00	0.0076	0.96	0.0046	1.42	0.0026	0.80
3	0.0043	1.33	0.0062	1.27	0.0574	0.39	0.0115	0.75	0.0185	0.34
4	0.0527	0.61	0.0297	0.56	0.0301	0.40	0.0181	0.58	0.0340	0.30
5	0.1053	0.35	0.1184	0.26	0.0876	0.39	0.0504	0.40	0.0950	0.17
6	0.0612	0.47	0.0567	0.32	0.0234	0.52	0.0474	0.30	0.0485	0.21
7	0.0902	0.34	0.0851	0.24	0.0601	0.29	0.0419	0.33	0.0727	0.16
8	0.0898	0.26	0.0775	0.28	0.0756	0.23	0.0926	0.23	0.0832	0.13
9	0.1286	0.24	0.1159	0.25	0.1145	0.23	0.0857	0.28	0.1135	0.13
10	0.0441	0.39	0.0768	0.33	0.0766	0.22	0.0951	0.21	0.0712	0.14
11	0.0470	0.42	0.0532	0.41	0.0733	0.25	0.0758	0.28	0.0603	0.18
12	0.1059	0.29	0.0934	0.31	0.0970	0.25	0.1206	0.21	0.1027	0.14
13	0.0510	0.35	0.0539	0.28	0.0413	0.32	0.0322	0.43	0.0462	0.17
14	0.0378	0.45	0.0352	0.38	0.0334	0.42	0.0595	0.39	0.0400	0.21
15	0.0260	0.69	0.0352	0.41	0.0428	0.38	0.0405	0.41	0.0354	0.22
16	0.0231	0.56	0.0229	0.60	0.0454	0.39	0.0523	0.41	0.0336	0.23
17	0.0170	0.66	0.0250	0.71	0.0326	0.45	0.0156	0.62	0.0228	0.32
18	0.0124	0.87	0.0072	0.96	0.0148	0.62	0.0314	0.43	0.0149	0.35
19	0.0110	0.78	0.0000	0.00	0.0128	0.64	0.0137	0.70	0.0085	0.41
20	0.0241	0.59	0.0359	0.52	0.0259	0.37	0.0464	0.36	0.0323	0.24
21	0.0153	0.87	0.0000	0.00	0.0105	0.72	0.0133	0.69	0.0091	0.48
22	0.0073	0.83	0.0020	1.31	0.0088	0.70	0.0060	1.02	0.0058	0.44
23	0.0046	1.33	0.0039	1.33	0.0152	0.59	0.0145	0.60	0.0087	0.40
24	0.0269	0.61	0.0298	0.70	0.0089	0.93	0.0031	1.41	0.0192	0.40
25	0.0046	1.29	0.0062	1.22	0.0000	0.00	0.0083	0.86	0.0047	0.66
26	0.0043	1.29	0.0158	0.71	0.0000	0.00	0.0046	1.38	0.0069	0.58
27	0.0000	0.00	0.0045	1.33	0.0000	0.00	0.0000	0.00	0.0014	1.33
28	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0041	1.30	0.0008	1.29
29	0.0010	1.82	0.0000	0.00	0.0026	1.31	0.0036	1.28	0.0016	0.84
>29	0.0046	1.29	0.0095	1.06	0.0018	1.46	0.0074	0.97	0.0060	0.63
n	281		270		352		294		1 197	

Appendix 1 – continued:
Estimates of proportion at age with coefficients of variation for snapper from the East Northland bottom longline fishery (Statistical Area 002) in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n*, otolith sample size

	Random age frequency								Longline	
Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
2	0.0000	0.00	0.0000	0.00	0.0131	0.90	0.0091	1.26	0.0051	0.75
3	0.0111	1.30	0.0110	1.33	0.0988	0.37	0.0091	1.32	0.0340	0.34
4	0.1066	0.74	0.0394	0.63	0.0479	0.44	0.0091	1.39	0.0500	0.37
5	0.1756	0.29	0.1690	0.30	0.1318	0.41	0.0708	0.44	0.1424	0.18
6	0.0290	0.57	0.0509	0.49	0.0198	0.61	0.0378	0.47	0.0357	0.30
7	0.0725	0.44	0.0593	0.42	0.0421	0.54	0.0142	0.84	0.0492	0.25
8	0.0520	0.47	0.0588	0.37	0.0419	0.45	0.0961	0.33	0.0598	0.20
9	0.0595	0.41	0.0809	0.42	0.0793	0.37	0.0392	0.54	0.0684	0.23
10	0.0487	0.53	0.0755	0.55	0.0746	0.32	0.0736	0.37	0.0694	0.24
11	0.0238	0.77	0.0552	0.56	0.0655	0.35	0.0594	0.43	0.0522	0.26
12	0.1232	0.44	0.0814	0.46	0.0937	0.35	0.1423	0.27	0.1045	0.20
13	0.0394	0.62	0.0672	0.36	0.0288	0.51	0.0233	0.67	0.0432	0.25
14	0.0249	0.70	0.0189	0.82	0.0206	0.66	0.0597	0.56	0.0281	0.34
15	0.0249	0.76	0.0273	0.61	0.0418	0.52	0.0544	0.45	0.0356	0.29
16	0.0145	1.04	0.0168	1.11	0.0282	0.48	0.0392	0.73	0.0235	0.41
17	0.0145	0.97	0.0252	0.99	0.0392	0.53	0.0198	0.80	0.0257	0.43
18	0.0033	1.75	0.0126	0.96	0.0189	0.75	0.0510	0.47	0.0194	0.37
19	0.0145	0.98	0.0000	0.00	0.0137	0.69	0.0181	0.80	0.0100	0.46
20	0.0475	0.66	0.0347	0.74	0.0412	0.41	0.0802	0.35	0.0475	0.28
21	0.0111	1.33	0.0000	0.00	0.0097	0.87	0.0181	0.85	0.0082	0.56
22	0.0149	0.97	0.0000	0.00	0.0152	0.70	0.0074	1.33	0.0085	0.54
23	0.0119	1.30	0.0000	0.00	0.0176	0.67	0.0219	0.69	0.0112	0.48
24	0.0391	0.83	0.0524	0.73	0.0120	1.12	0.0062	1.30	0.0304	0.50
25	0.0119	1.36	0.0110	1.24	0.0000	0.00	0.0164	0.87	0.0093	0.66
26	0.0111	1.29	0.0278	0.73	0.0000	0.00	0.0091	1.30	0.0135	0.57
27	0.0000	0.00	0.0079	1.29	0.0000	0.00	0.0000	0.00	0.0027	1.30
28	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
29	0.0026	1.67	0.0000	0.00	0.0046	1.33	0.0000	0.00	0.0017	1.07
>29	0.0119	1.30	0.0168	1.08	0.0000	0.00	0.0145	0.94	0.0109	0.68
n	130		120		202		136		588	

Appendix 1 – continued:
Estimates of proportion at age with coefficients of variation for snapper from the East Northland bottom longline fishery (Statistical Area 003) in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n*, otolith sample size

	Random age frequency								Longline	
Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
3	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0140	0.92	0.0026	0.95
4	0.0193	1.12	0.0170	0.82	0.0054	1.40	0.0273	0.64	0.0174	0.51
5	0.0618	0.85	0.0518	0.46	0.0263	0.95	0.0295	0.82	0.0460	0.43
6	0.0812	0.57	0.0643	0.44	0.0284	0.79	0.0571	0.35	0.0617	0.30
7	0.1011	0.47	0.1191	0.29	0.0849	0.31	0.0703	0.33	0.0970	0.20
8	0.1132	0.29	0.1020	0.41	0.1222	0.28	0.0891	0.31	0.1075	0.17
9	0.1713	0.28	0.1620	0.30	0.1633	0.28	0.1332	0.32	0.1601	0.15
10	0.0412	0.56	0.0786	0.33	0.0794	0.31	0.1170	0.27	0.0730	0.18
11	0.0614	0.49	0.0505	0.50	0.0841	0.34	0.0926	0.37	0.0688	0.23
12	0.0952	0.39	0.1091	0.42	0.1016	0.36	0.0983	0.31	0.1008	0.21
13	0.0582	0.42	0.0363	0.45	0.0588	0.40	0.0414	0.54	0.0493	0.24
14	0.0458	0.57	0.0567	0.44	0.0512	0.52	0.0593	0.49	0.0524	0.27
15	0.0267	0.97	0.0455	0.58	0.0441	0.58	0.0263	0.84	0.0352	0.37
16	0.0284	0.71	0.0310	0.61	0.0691	0.57	0.0657	0.46	0.0441	0.30
17	0.0186	0.82	0.0248	0.70	0.0234	0.76	0.0113	0.97	0.0199	0.40
18	0.0181	0.89	0.0000	0.00	0.0091	1.23	0.0113	0.96	0.0102	0.63
19	0.0089	1.27	0.0000	0.00	0.0115	1.26	0.0092	1.22	0.0071	0.76
20	0.0097	1.34	0.0374	0.61	0.0046	1.43	0.0118	0.94	0.0165	0.45
21	0.0178	1.10	0.0000	0.00	0.0115	1.28	0.0083	1.29	0.0100	0.78
22	0.0027	1.61	0.0047	1.40	0.0000	0.00	0.0046	1.32	0.0030	0.88
23	0.0000	0.00	0.0091	1.28	0.0119	1.15	0.0069	1.32	0.0061	0.73
24	0.0194	0.83	0.0000	0.00	0.0046	1.45	0.0000	0.00	0.0076	0.74
25	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
26	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
27	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
28	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0083	1.22	0.0015	1.20
29	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0072	1.33	0.0014	1.35
>29	0.0000	0.00	0.0000	0.00	0.0044	1.42	0.0000	0.00	0.0009	1.42
n	151		150		150		158		609	

Appendix 1 – continued:
Estimates of proportion at age with coefficients of variation for snapper from the Hauraki Gulf bottom longline fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n*, otolith sample size

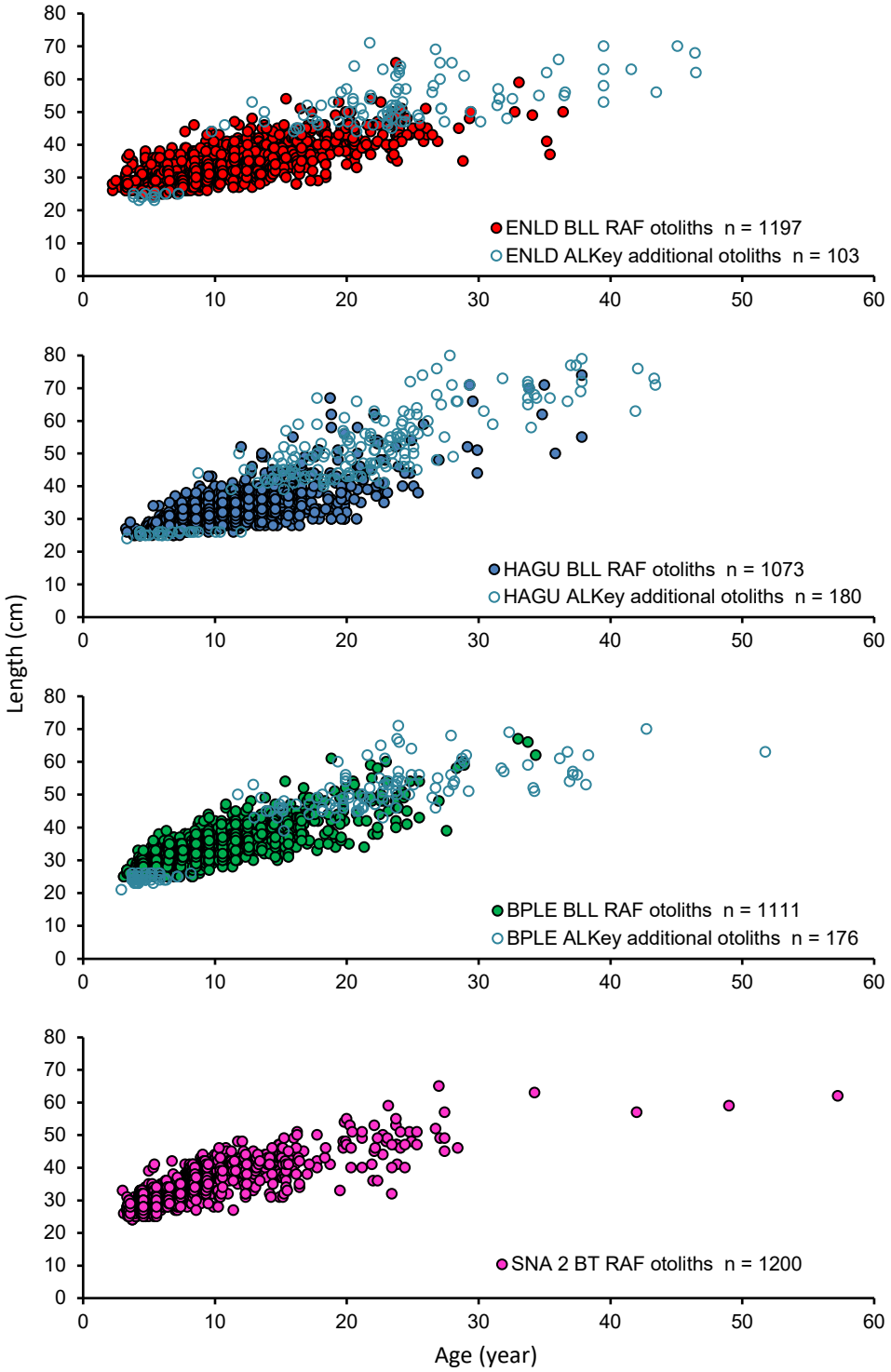
	Random age frequency								Longline	
Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
3	0.0000	0.00	0.0000	0.00	0.0046	0.77	0.0046	1.00	0.0028	0.61
4	0.0092	0.69	0.0092	0.58	0.0165	0.41	0.0056	1.03	0.0110	0.30
5	0.0124	0.57	0.0297	0.39	0.0338	0.31	0.0196	0.44	0.0272	0.20
6	0.0655	0.25	0.0497	0.31	0.0401	0.30	0.0386	0.33	0.0449	0.16
7	0.1019	0.19	0.0929	0.24	0.0581	0.24	0.0702	0.23	0.0754	0.13
8	0.1113	0.18	0.0490	0.30	0.1182	0.17	0.0938	0.21	0.0909	0.11
9	0.0657	0.23	0.1194	0.19	0.1167	0.16	0.1346	0.17	0.1173	0.10
10	0.0915	0.19	0.1219	0.19	0.1179	0.17	0.0958	0.20	0.1114	0.10
11	0.0750	0.22	0.1064	0.19	0.1127	0.16	0.1274	0.18	0.1110	0.10
12	0.0839	0.21	0.0579	0.25	0.0842	0.20	0.0550	0.27	0.0692	0.13
13	0.0530	0.25	0.0692	0.24	0.0796	0.22	0.0664	0.23	0.0709	0.13
14	0.0638	0.23	0.0698	0.22	0.0585	0.23	0.0584	0.25	0.0623	0.12
15	0.0558	0.25	0.0321	0.36	0.0182	0.45	0.0420	0.34	0.0315	0.19
16	0.0837	0.20	0.0501	0.25	0.0523	0.26	0.0995	0.20	0.0659	0.12
17	0.0165	0.45	0.0498	0.30	0.0172	0.46	0.0282	0.39	0.0295	0.21
18	0.0133	0.48	0.0137	0.49	0.0000	0.00	0.0124	0.60	0.0083	0.34
19	0.0321	0.30	0.0071	0.68	0.0333	0.32	0.0172	0.45	0.0214	0.21
20	0.0168	0.38	0.0165	0.43	0.0073	0.62	0.0046	1.04	0.0102	0.29
21	0.0168	0.39	0.0101	0.58	0.0046	0.51	0.0039	0.97	0.0072	0.32
22	0.0046	0.88	0.0115	0.53	0.0148	0.47	0.0091	0.70	0.0115	0.30
23	0.0051	0.77	0.0107	0.56	0.0000	0.00	0.0000	0.00	0.0036	0.50
24	0.0036	0.97	0.0034	0.96	0.0041	0.92	0.0055	0.91	0.0042	0.51
25	0.0031	1.01	0.0072	0.70	0.0000	0.00	0.0052	0.94	0.0037	0.53
26	0.0036	0.89	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0003	0.88
27	0.0000	0.00	0.0030	1.03	0.0000	0.00	0.0000	0.00	0.0009	1.03
28	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
29	0.0000	0.00	0.0000	0.00	0.0073	0.68	0.0025	0.89	0.0033	0.57
>29	0.0119	0.40	0.0099	0.56	0.0000	0.00	0.0000	0.00	0.0040	0.43
n	281		251		295		246		1 073	

Appendix 1 – continued:
Estimates of proportion at age with coefficients of variation for snapper from the Bay of Plenty bottom longline fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n*, otolith sample size

	Random age frequency								Longline	
Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV	*P.j.*	CV
1	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
2	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
3	0.0000	0.00	0.0096	0.76	0.0222	0.47	0.0039	1.03	0.0090	0.38
4	0.0081	0.74	0.0863	0.24	0.1002	0.20	0.0689	0.22	0.0691	0.13
5	0.0508	0.31	0.1092	0.19	0.0970	0.19	0.0693	0.23	0.0808	0.11
6	0.0616	0.24	0.1082	0.19	0.1153	0.17	0.0504	0.28	0.0806	0.10
7	0.0786	0.22	0.0996	0.19	0.1414	0.15	0.0724	0.22	0.0967	0.09
8	0.1419	0.16	0.1284	0.17	0.0726	0.23	0.1259	0.18	0.1157	0.10
9	0.0963	0.20	0.1069	0.18	0.0894	0.18	0.1215	0.18	0.1056	0.10
10	0.1243	0.16	0.0947	0.20	0.0805	0.20	0.0871	0.23	0.0938	0.11
11	0.0522	0.27	0.0348	0.29	0.0761	0.20	0.0687	0.25	0.0608	0.13
12	0.0644	0.26	0.0692	0.24	0.0329	0.30	0.0671	0.25	0.0582	0.14
13	0.0430	0.32	0.0261	0.37	0.0147	0.46	0.0379	0.39	0.0305	0.22
14	0.0482	0.29	0.0363	0.31	0.0471	0.26	0.0503	0.31	0.0463	0.16
15	0.0416	0.30	0.0209	0.46	0.0276	0.33	0.0500	0.34	0.0369	0.20
16	0.0587	0.26	0.0112	0.54	0.0188	0.40	0.0295	0.42	0.0286	0.20
17	0.0326	0.35	0.0113	0.55	0.0117	0.51	0.0182	0.44	0.0178	0.23
18	0.0147	0.40	0.0015	0.99	0.0096	0.67	0.0115	0.69	0.0096	0.37
19	0.0099	0.67	0.0134	0.58	0.0067	0.74	0.0155	0.46	0.0117	0.29
20	0.0222	0.42	0.0019	0.92	0.0027	1.00	0.0106	0.71	0.0090	0.36
21	0.0047	0.98	0.0033	0.67	0.0049	1.00	0.0023	0.98	0.0036	0.51
22	0.0072	0.88	0.0093	0.51	0.0145	0.54	0.0079	0.63	0.0097	0.31
23	0.0032	0.98	0.0073	0.61	0.0027	0.93	0.0000	0.00	0.0027	0.45
24	0.0299	0.38	0.0019	1.00	0.0040	0.73	0.0137	0.64	0.0119	0.32
25	0.0011	0.96	0.0000	0.00	0.0000	0.00	0.0099	0.69	0.0038	0.66
26	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
27	0.0000	0.00	0.0037	0.95	0.0000	0.00	0.0075	0.99	0.0034	0.82
28	0.0000	0.00	0.0000	0.00	0.0025	0.91	0.0000	0.00	0.0006	0.91
29	0.0033	0.90	0.0015	0.94	0.0000	0.00	0.0000	0.00	0.0009	0.68
>29	0.0017	0.88	0.0037	0.95	0.0049	0.97	0.0000	0.00	0.0023	0.63
n	275		265		310		261		1 111	

Appendix 2: Scatterplots of age-at-length data for snapper sampled from the SNA 1 bottom longline (Random age frequency samples) and power method (Age-length key samples) fisheries and the SNA 2 bottom trawl (Random age frequency samples) fishery in 2022–23. Age is decimalised as of the month of collection relative to an assumed January 1 "birthdate" (ENLD, East Northland; HAGU, Hauraki Gulf; BPLE, Bay of Plenty; SNA 2N, SNA 2 North; BLL, bottom longline; BT, bottom trawl; RAF, Random age frequency; ALKey, Age-length key; *n*, sample size).



Appendix 3: Age-length keys derived from snapper otolith samples collected from bottom longline fisheries in SNA 1 in 2022–23.

Estimates of proportion of length at age for snapper sampled from the East Northland bottom longline fishery (Statistical Areas 002 and 003 combined), spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	0	0	0.20	0.30	0.40	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	10
26	0	0.02	0.07	0.17	0.19	0.14	0.21	0.12	0.07	0	0	0	0	0	0	0	0	0	0	0	42
27	0	0	0.10	0.06	0.17	0.13	0.21	0.17	0.08	0.02	0.03	0.02	0.02	0	0	0	0	0	0	0	63
28	0	0.03	0.05	0.04	0.17	0.09	0.15	0.18	0.18	0.04	0	0.04	0.01	0	0	0.03	0	0	0	0	78
29	0	0.01	0.04	0.05	0.16	0.04	0.14	0.16	0.23	0.04	0.02	0.04	0.02	0.01	0	0	0.01	0.01	0	0	97
30	0	0	0.03	0.04	0.13	0.09	0.09	0.09	0.29	0.09	0.03	0.03	0.04	0.01	0.01	0	0	0.01	0	0	68
31	0	0	0.01	0.03	0.06	0.05	0.05	0.12	0.18	0.16	0.04	0.16	0.06	0.02	0.01	0.01	0	0.01	0	0	93
32	0	0	0.02	0.01	0.07	0.06	0.09	0.10	0.15	0.14	0.11	0.13	0.05	0.03	0.01	0.02	0.01	0	0	0	94
33	0	0	0	0.03	0.10	0.01	0.07	0.10	0.14	0.07	0.07	0.18	0.01	0.10	0.04	0.06	0.01	0	0	0.01	72
34	0	0	0	0.04	0.08	0.06	0.06	0.06	0.11	0.11	0.06	0.14	0.06	0.11	0.03	0.06	0	0.03	0	0.01	72
35	0	0	0	0.03	0.03	0.02	0.03	0.10	0.10	0.08	0.10	0.19	0.10	0.05	0.06	0.03	0.02	0.02	0	0.05	62
36	0	0	0.02	0	0.07	0.05	0.03	0.03	0.11	0.10	0.15	0.20	0.05	0.02	0.05	0.07	0.02	0.03	0	0.02	61
37	0	0	0.02	0	0.02	0.02	0.04	0.04	0.10	0.14	0.06	0.20	0.02	0.06	0.06	0.02	0.10	0	0.02	0.10	51
38	0	0	0	0	0.02	0.02	0	0.05	0.11	0.11	0.11	0.28	0.05	0.07	0.04	0.04	0.02	0.02	0.02	0.07	57
39	0	0	0	0	0	0	0.02	0.04	0.06	0.06	0.18	0.14	0.16	0.10	0.06	0.02	0.02	0	0.04	0.12	51
40	0	0	0	0	0	0	0	0	0	0.07	0.13	0.16	0.04	0.11	0.07	0.07	0.02	0.09	0.02	0.22	45
41	0	0	0	0	0	0	0	0	0.02	0.05	0.09	0.14	0.07	0.05	0.05	0.09	0.12	0.02	0.02	0.28	43
42	0	0	0	0	0	0	0	0	0	0	0	0.09	0.09	0.04	0.13	0.22	0.04	0.04	0.04	0.30	23
43	0	0	0	0	0	0	0	0	0.03	0.06	0	0.03	0	0.03	0.16	0.16	0	0.03	0.03	0.45	31
44	0	0	0	0	0	0	0	0.05	0	0.05	0	0.05	0	0.10	0.10	0.15	0.05	0.20	0	0.25	20
45	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0.11	0.06	0.06	0.17	0	0.06	0.44	18
46	0	0	0	0	0	0	0	0.06	0	0	0	0.06	0	0.06	0.06	0	0.12	0.12	0	0.53	17
47	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0.75	4
48	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0	0	0.80	5
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0.67	3
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0	0.86	7
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0.67	3
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	2
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0.50	2
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					1 197

Appendix 3 – continued:
Estimates of proportion of length at age for snapper sampled from the East Northland bottom longline fishery (Statistical Area 002), spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0.09	0.27	0.27	0.27	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
27	0	0	0.40	0.13	0.40	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
28	0	0.09	0.09	0.14	0.41	0.14	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	22
29	0	0.03	0.13	0.13	0.39	0	0.10	0.10	0.06	0.03	0	0.03	0	0	0	0	0	0	0	0	31
30	0	0	0.08	0.12	0.36	0.16	0.08	0	0.08	0	0.04	0	0.04	0	0	0	0	0.04	0	0	25
31	0	0	0.03	0.09	0.19	0.03	0.06	0.09	0.13	0.13	0.06	0.16	0	0	0	0	0	0.03	0	0	32
32	0	0	0.05	0.03	0.19	0.08	0.14	0.14	0.14	0.05	0.03	0.14	0.03	0	0	0	0	0	0	0	37
33	0	0	0	0.06	0.20	0.03	0.11	0.11	0.09	0.06	0.09	0.11	0	0.03	0.03	0.06	0.03	0	0	0	35
34	0	0	0	0.10	0.16	0.10	0.06	0.06	0.16	0.06	0	0.19	0.03	0	0	0.03	0	0.03	0	0	31
35	0	0	0	0.06	0.06	0.03	0.03	0.15	0.12	0.12	0.06	0.12	0.09	0.06	0	0	0	0.03	0	0.06	33
36	0	0	0.02	0	0.10	0.05	0.05	0.05	0.17	0.15	0.12	0.17	0.05	0	0.02	0.02	0	0	0	0.02	41
37	0	0	0.03	0	0.03	0.03	0.03	0.03	0.10	0.16	0.06	0.23	0.03	0.03	0.06	0	0.10	0	0	0.06	31
38	0	0	0	0	0.02	0.02	0	0.07	0.11	0.11	0.11	0.32	0.02	0.07	0.02	0	0.02	0.02	0	0.07	44
39	0	0	0	0	0	0	0.03	0.05	0.05	0.08	0.19	0.16	0.14	0.05	0.03	0	0.03	0	0.05	0.14	37
40	0	0	0	0	0	0	0	0	0	0.07	0.10	0.17	0.03	0.10	0.10	0.10	0	0.03	0.03	0.24	29
41	0	0	0	0	0	0	0	0	0.03	0.03	0.06	0.18	0.09	0.06	0.06	0.06	0.12	0.03	0	0.27	33
42	0	0	0	0	0	0	0	0	0	0	0	0.06	0.12	0.06	0.18	0.12	0	0.06	0.06	0.35	17
43	0	0	0	0	0	0	0	0	0	0.09	0	0.04	0	0.04	0.17	0.04	0	0.04	0	0.57	23
44	0	0	0	0	0	0	0	0.06	0	0.06	0	0	0	0.11	0.11	0.11	0.06	0.22	0	0.28	18
45	0	0	0	0	0	0	0	0	0	0	0	0	0.18	0	0.09	0.09	0.18	0	0.09	0.36	11
46	0	0	0	0	0	0	0	0.08	0	0	0	0.08	0	0.08	0	0	0.17	0.08	0	0.50	12
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
48	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0.75	4
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	2
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0	0.80	5
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	2
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					588

Appendix 3 – continued:

Estimates of proportion of length at age for snapper sampled from the East Northland bottom longline fishery (Statistical Area 003), spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	0	0	0.20	0.30	0.40	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	10
26	0	0	0	0.13	0.16	0.16	0.29	0.16	0.10	0	0	0	0	0	0	0	0	0	0	0	31
27	0	0	0	0.04	0.10	0.15	0.27	0.23	0.10	0.02	0.04	0.02	0.02	0	0	0	0	0	0	0	48
28	0	0	0	0	0.07	0.07	0.16	0.25	0.25	0.05	0	0.05	0.02	0	0	0.04	0	0	0	0	56
29	0	0	0	0.02	0.06	0.06	0.17	0.20	0.30	0.05	0.03	0.05	0.03	0.02	0	0	0.02	0.02	0	0	66
30	0	0	0	0	0	0.05	0.09	0.14	0.42	0.14	0.02	0.05	0.05	0.02	0.02	0	0	0	0	0	43
31	0	0	0	0	0	0.07	0.05	0.13	0.21	0.18	0.03	0.16	0.10	0.03	0.02	0.02	0	0	0	0	61
32	0	0	0	0	0	0.05	0.05	0.07	0.16	0.19	0.16	0.12	0.07	0.05	0.02	0.04	0.02	0	0	0	57
33	0	0	0	0	0	0	0.03	0.08	0.19	0.08	0.05	0.24	0.03	0.16	0.05	0.05	0	0	0	0.03	37
34	0	0	0	0	0.02	0.02	0.05	0.05	0.07	0.15	0.10	0.10	0.07	0.20	0.05	0.07	0	0.02	0	0.02	41
35	0	0	0	0	0	0	0.03	0.03	0.07	0.03	0.14	0.28	0.10	0.03	0.14	0.07	0.03	0	0	0.03	29
36	0	0	0	0	0	0.05	0	0	0	0	0.20	0.25	0.05	0.05	0.10	0.15	0.05	0.10	0	0	20
37	0	0	0	0	0	0	0.05	0.05	0.10	0.10	0.05	0.15	0	0.10	0.05	0.05	0.10	0	0.05	0.15	20
38	0	0	0	0	0	0	0	0	0.08	0.08	0.08	0.15	0.15	0.08	0.08	0.15	0	0	0.08	0.08	13
39	0	0	0	0	0	0	0	0	0.07	0	0.14	0.07	0.21	0.21	0.14	0.07	0	0	0	0.07	14
40	0	0	0	0	0	0	0	0	0	0.06	0.19	0.13	0.06	0.13	0	0	0.06	0.19	0	0.19	16
41	0	0	0	0	0	0	0	0	0	0.10	0.20	0	0	0	0	0.20	0.10	0	0.10	0.30	10
42	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0.50	0.17	0	0	0.17	6
43	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0.13	0.50	0	0	0.13	0.13	8
44	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0.50	0	0	0	0	2
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29	0	0	0.14	0	0	0.57	7
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0	0.20	0	0.60	5
47	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	1
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	1
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0	0.50	2
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					609

Appendix 3 – continued:
Estimates of proportion of length at age for snapper sampled from the Hauraki Gulf bottom longline fishery, spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0.62	0.08	0	0.31	0	0	0	0	0	0	0	0	0	0	0	0	0	13
26	0	0	0.05	0.21	0.21	0.11	0.16	0.16	0.05	0	0.05	0	0	0	0	0	0	0	0	0	19
27	0	0	0.02	0.02	0.14	0.12	0.18	0.24	0.14	0.08	0.04	0.02	0	0	0	0	0	0	0	0	50
28	0	0	0	0	0.13	0.16	0.13	0.13	0.10	0.11	0.10	0.04	0.03	0.03	0.01	0.03	0	0	0	0	70
29	0	0	0.01	0	0.07	0.11	0.16	0.15	0.18	0.09	0.05	0.06	0.07	0.02	0.01	0.01	0	0	0	0	99
30	0	0	0	0	0	0.09	0.10	0.14	0.12	0.13	0.11	0.08	0.02	0.05	0.04	0.04	0.01	0.01	0.03	0.03	107
31	0	0	0	0	0	0.04	0.13	0.13	0.13	0.13	0.14	0.10	0.05	0.04	0.05	0.07	0	0	0	0	124
32	0	0	0	0	0	0.02	0.03	0.08	0.12	0.19	0.13	0.12	0.07	0.11	0.02	0.06	0.02	0.01	0.01	0.01	95
33	0	0	0	0	0	0	0.02	0.08	0.16	0.14	0.17	0.07	0.08	0.06	0.03	0.08	0.06	0.02	0.01	0	86
34	0	0	0	0	0.01	0.01	0.04	0.04	0.13	0.09	0.19	0.10	0.09	0.11	0	0.10	0.06	0	0.01	0.01	70
35	0	0	0	0	0	0.01	0.03	0.04	0.04	0.10	0.12	0.08	0.15	0.11	0.07	0.15	0.03	0	0.04	0.03	73
36	0	0	0	0	0	0	0	0.04	0.08	0.08	0.14	0.10	0.08	0.16	0.06	0.08	0.06	0.02	0.04	0.08	51
37	0	0	0	0	0	0	0.03	0.03	0.08	0.11	0.08	0.03	0.03	0.19	0.14	0.11	0.11	0.03	0	0.05	37
38	0	0	0	0	0	0	0	0.05	0.05	0.13	0.03	0.13	0.10	0.03	0.10	0.18	0.05	0.03	0.05	0.10	40
39	0	0	0	0	0	0	0	0	0.04	0.04	0.17	0.17	0.13	0.04	0.04	0.17	0	0.04	0	0.17	24
40	0	0	0	0	0	0	0	0	0.04	0.09	0.04	0	0.09	0.17	0.09	0.13	0.04	0.04	0.04	0.22	23
41	0	0	0	0	0	0	0	0	0	0	0.10	0.10	0	0.10	0	0.30	0	0	0.10	0.30	10
42	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0.30	0.10	0	0	0	0.20	0.30	10
43	0	0	0	0	0	0	0	0	0.11	0.11	0	0	0	0.11	0	0.11	0	0.11	0.33	0.11	9
44	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0.08	0.08	0.17	0.25	0	0.08	0.25	12
45	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0.20	0	0.20	0	0	0	0.40	5
46	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0	0.14	0	0	0	0.71	7
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0	1
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	4
49	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.25	0	0	0.50	0	0	0	4
50	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0.67	3
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.25	0.25	4
52	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0	0.67	3
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0	0.50	2
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	2
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	4
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	1
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					1 073

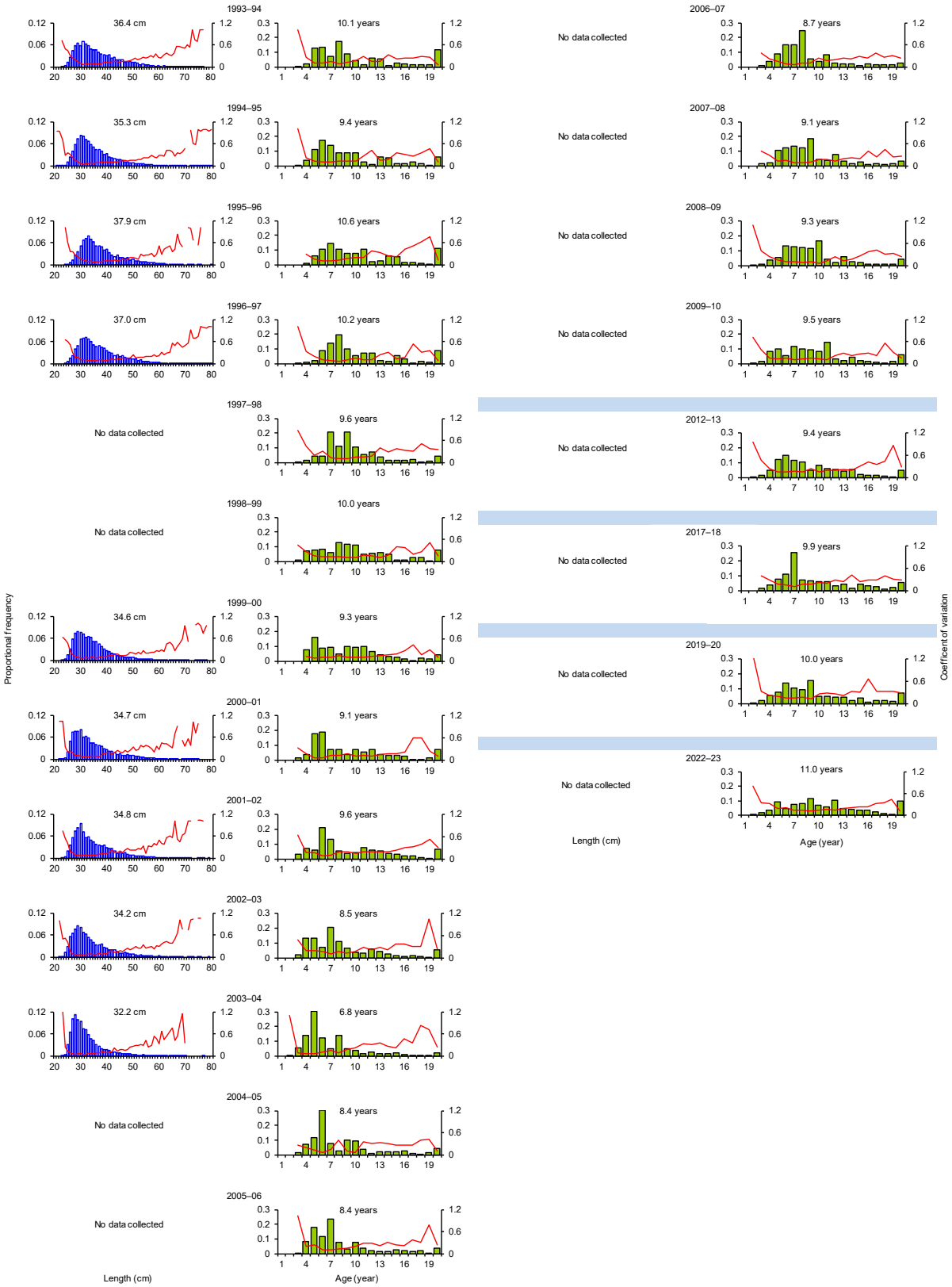
Appendix 3 – continued:

Estimates of proportion of length at age for snapper sampled from the Bay of Plenty bottom longline fishery, spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0.11	0.37	0.11	0.11	0.21	0.11	0	0	0	0	0	0	0	0	0	0	0	0	19
26	0	0	0.10	0.20	0.25	0.35	0.05	0	0.05	0	0	0	0	0	0	0	0	0	0	0	20
27	0	0	0.09	0.27	0.25	0.25	0.05	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	44
28	0	0	0	0.33	0.20	0.12	0.18	0.12	0.02	0.02	0.02	0	0	0	0	0	0	0	0	0	51
29	0	0	0	0.25	0.30	0.08	0.13	0.07	0.13	0.02	0.02	0	0	0	0	0	0	0	0	0	60
30	0	0	0	0.10	0.21	0.19	0.17	0.10	0.07	0.10	0.02	0.01	0.01	0	0.01	0	0	0	0	0	81
31	0	0	0	0.02	0.13	0.20	0.16	0.20	0.16	0.07	0	0.02	0	0.01	0.01	0	0	0	0	0	83
32	0	0	0	0	0.06	0.11	0.15	0.22	0.11	0.16	0.09	0.04	0	0.02	0.05	0	0	0	0	0	82
33	0	0	0	0.02	0.05	0.10	0.26	0.15	0.18	0.07	0.07	0.05	0.03	0	0	0	0	0.01	0	0	97
34	0	0	0	0	0.01	0.08	0.14	0.18	0.16	0.19	0.05	0.04	0.05	0.03	0.02	0.01	0	0	0.01	0.01	91
35	0	0	0	0	0.01	0.01	0.12	0.18	0.24	0.12	0.08	0.07	0.01	0.04	0.04	0.01	0.01	0.03	0.01	0.01	76
36	0	0	0	0	0.02	0.03	0.02	0.15	0.18	0.24	0.10	0.10	0.06	0.03	0.03	0.02	0.02	0	0.02	0	62
37	0	0	0	0	0	0	0.05	0.13	0.13	0.15	0.15	0.11	0.05	0.07	0.05	0.08	0.02	0	0.02	0	61
38	0	0	0	0	0	0.02	0	0.08	0.10	0.11	0.16	0.13	0.03	0.13	0.10	0.05	0.02	0.02	0.02	0.03	61
39	0	0	0	0	0	0.05	0	0.05	0.05	0.23	0.05	0.14	0.09	0.09	0	0.14	0	0.05	0.05	0.05	22
40	0	0	0	0	0	0	0	0	0.06	0.13	0.19	0.13	0.10	0.10	0.13	0.10	0	0	0	0.06	31
41	0	0	0	0	0	0	0	0	0.03	0.08	0.14	0.14	0.03	0.27	0.14	0.08	0.05	0	0.03	0.03	37
42	0	0	0	0	0	0	0	0	0.07	0.07	0.11	0.07	0.04	0.11	0.07	0.14	0.07	0.07	0.04	0.14	28
43	0	0	0	0	0	0	0	0	0.05	0	0	0.11	0.16	0.11	0	0.32	0.16	0	0.05	0.05	19
44	0	0	0	0	0	0	0	0	0.05	0	0.05	0.16	0.05	0.16	0.11	0.00	0.21	0.05	0.05	0.11	19
45	0	0	0	0	0	0	0	0	0	0	0.08	0.08	0	0.17	0	0.17	0.08	0	0	0.42	12
46	0	0	0	0	0	0	0	0	0	0	0.14	0.14	0	0	0	0.14	0.14	0	0	0.43	7
47	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0.33	0	0.33	0	0	0	0	3
48	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0.08	0.17	0	0.67	12
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0	0	0.22	0.11	0.11	0.44	9
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0.50	2
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50	0	0	0.50	2
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0	0	0	0.80	5
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	0	1
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					1 111

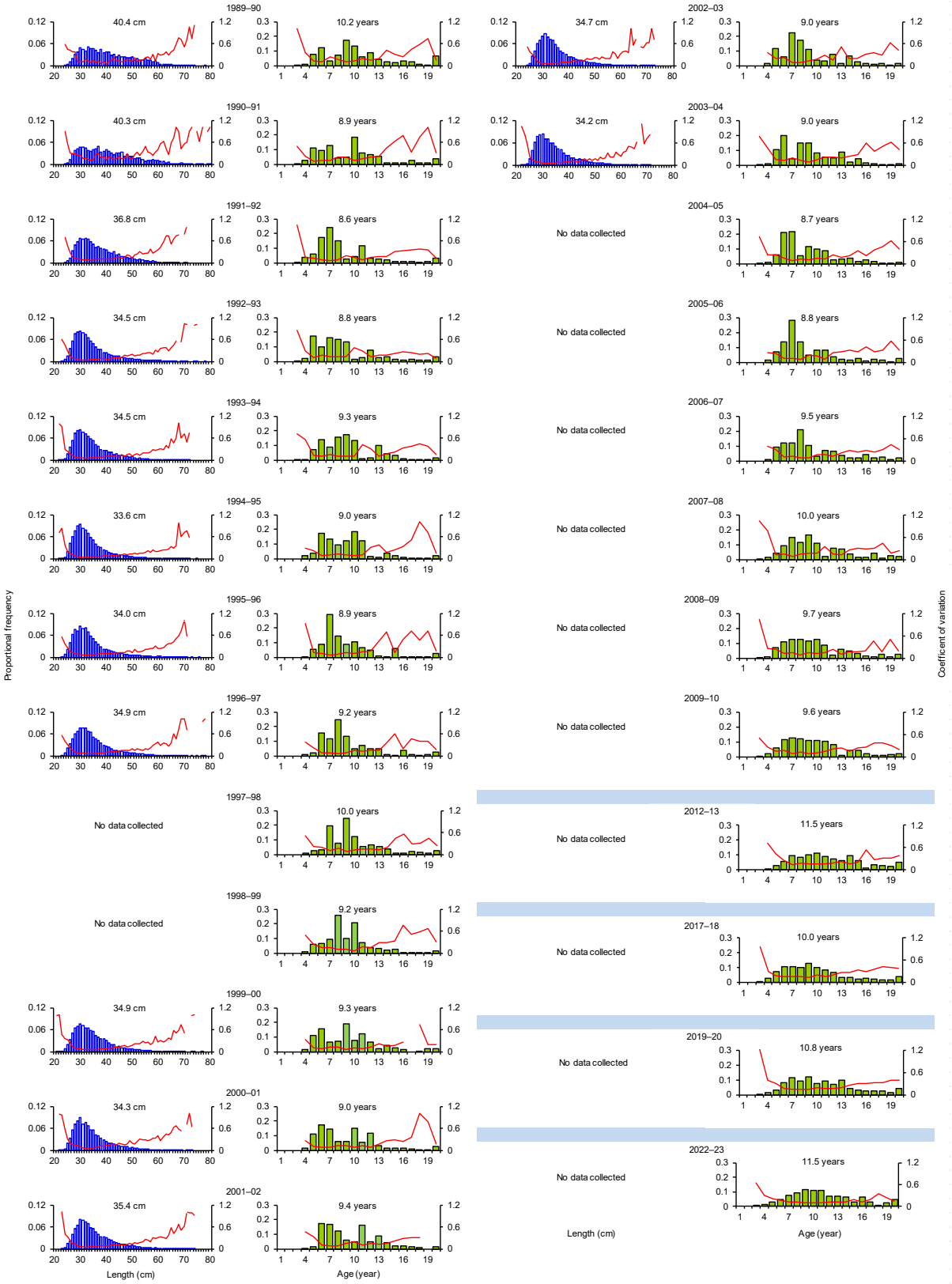
Appendix 4: Time series of proportion at length and age distributions for the snapper bottom longline fisheries in SNA 1. Length frequency sampling was not conducted after 2003–04.

Proportion at length and age distributions and coefficients of variation (CVs) for snapper from the East Northland bottom longline fishery, 1993–94 to 2022–23. Data are from spring-summer up until 2002–03 and year-round thereafter. Plots are annotated with estimates of mean length and/or mean age. The blue line indicates a break in the continuous time series of data.



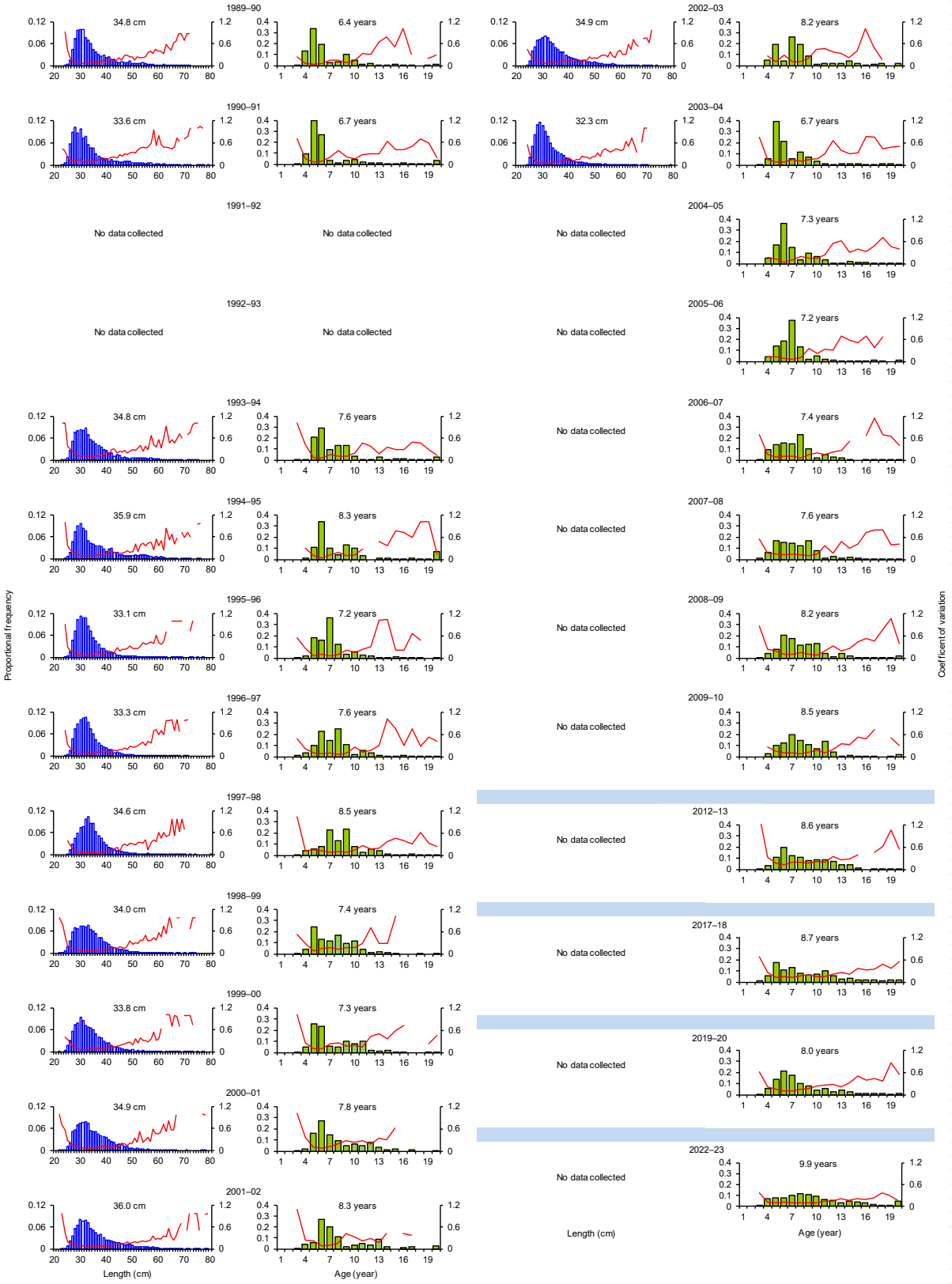
Appendix 4 – continued:

Proportion at length and age distributions and coefficients of variation (CVs) for snapper from the Hauraki Gulf bottom longline fishery, 1989–90 to 2022–23. Data are from spring-summer up until 2002–03 and year-round thereafter. Plots are annotated with estimates of mean length and/or mean age. The blue line indicates a break in the continuous time series of data.



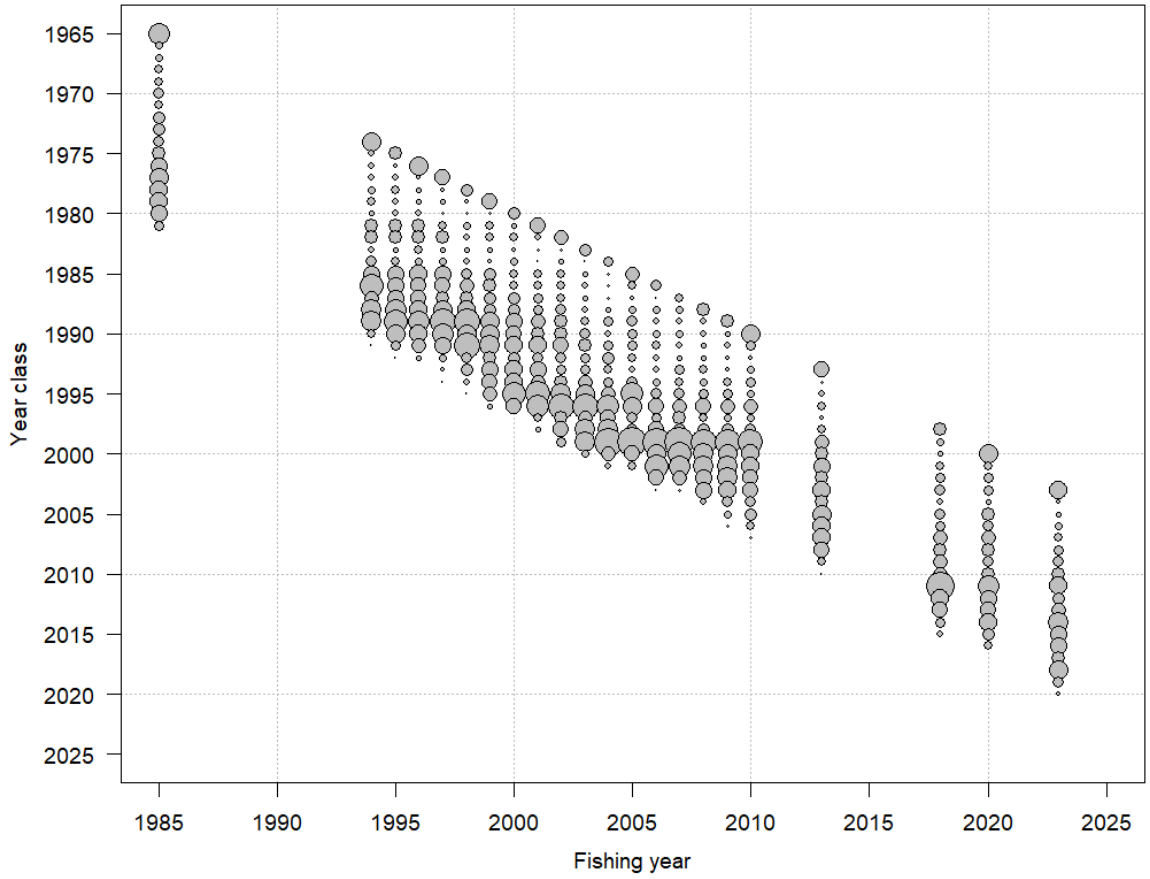
Appendix 4 – continued:

Proportion at length and age distributions and coefficients of variation (CVs) for snapper from the Bay of Plenty bottom longline fishery, 1989–90 to 2022–23. Data are from spring-summer up until 2002–03 and year-round thereafter. Plots are annotated with estimates of mean length and/or mean age. The blue line indicates a break in the continuous time series of data.

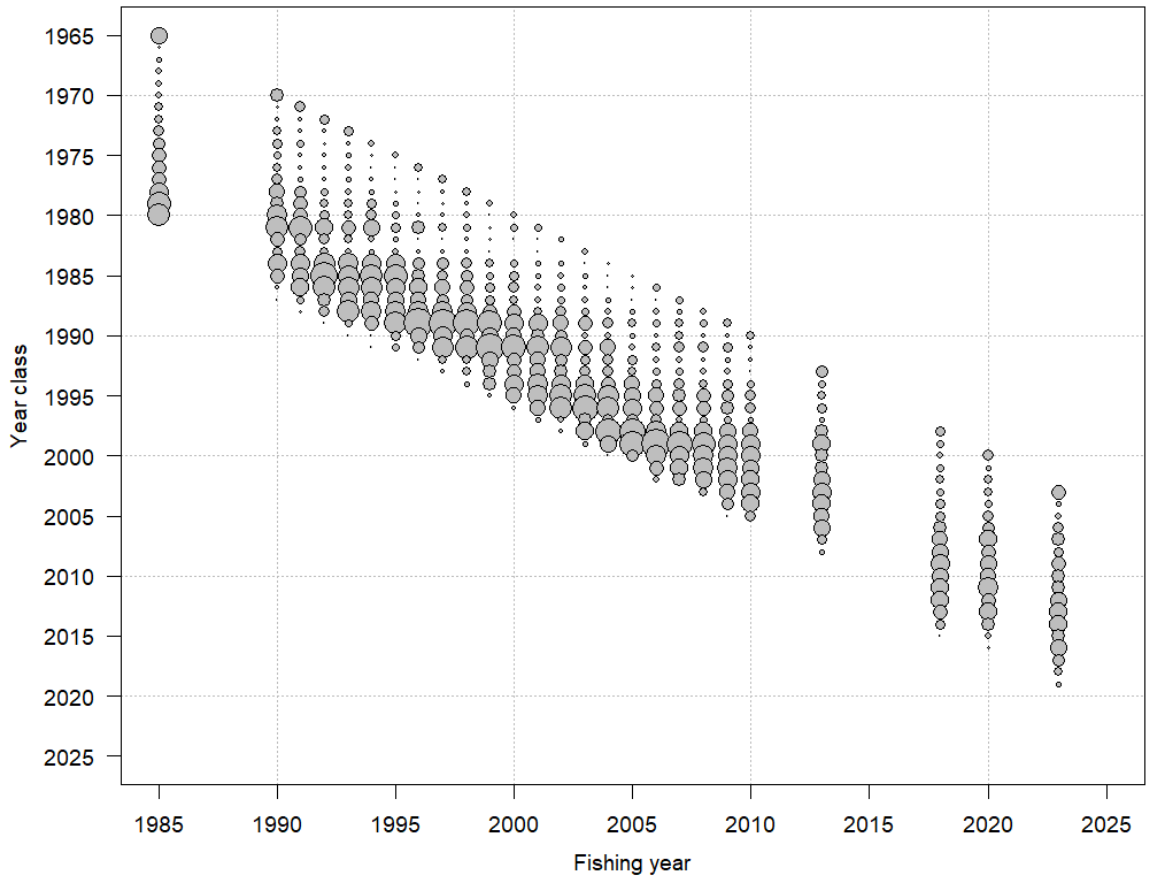


Appendix 5: Time series of age frequency distributions by year class and year from the SNA 1 bottom longline fisheries.

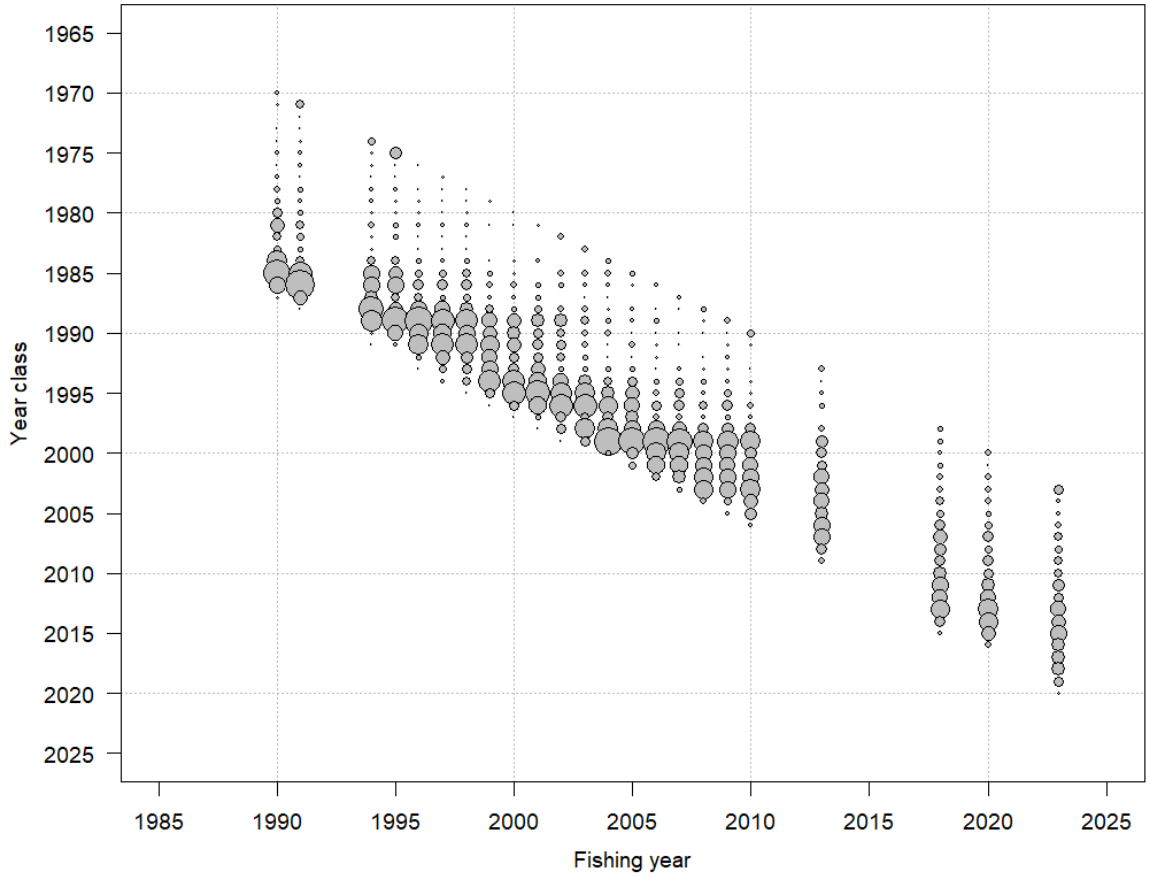
Time series of age frequency distributions by year class and year from the East Northland bottom longline spring-summer fishery, 1984–85 to 2022–23. Symbol area is proportional to the proportion at age. The proportion of the oldest year class in each year is represented by an aggregate (over 19 years) age group.



Appendix 5 – continued:
Time series of age frequency distributions by year class and year from the Hauraki Gulf bottom longline spring-summer fishery, 1984–85 to 2022–23. Symbol area is proportional to the proportion at age. The proportion of the oldest year class in each year is represented by an aggregate (over 19 years) age group.



Appendix 5 – continued:
Time series of age frequency distributions by year class and year from the Bay of Plenty bottom longline spring-summer fishery, 1989–90 to 2022–23. Symbol area is proportional to the proportion at age. The proportion of the oldest year class in each year is represented by an aggregate (over 19 years) age group.



Appendix 6: Estimated mean weight-at-age (kg) and coefficients of variation (CVs) for snapper bottom longline fisheries in SNA 1 in 2022–23.

Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the East Northland bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	0.46	0.50	0.55	1.04	0.49	0.35
3	0.45	0.99	0.55	0.97	0.56	0.13	0.74	0.50	0.57	0.11
4	0.70	0.30	0.48	0.08	0.57	0.10	0.46	0.26	0.59	0.11
5	0.66	0.17	0.54	0.07	0.65	0.10	0.65	0.12	0.61	0.06
6	0.61	0.16	0.56	0.08	0.64	0.19	0.73	0.12	0.62	0.06
7	0.66	0.09	0.59	0.09	0.61	0.08	0.62	0.13	0.62	0.05
8	0.71	0.13	0.64	0.07	0.63	0.08	0.89	0.13	0.71	0.06
9	0.66	0.08	0.79	0.09	0.76	0.07	0.76	0.12	0.74	0.05
10	0.96	0.14	1.00	0.13	0.92	0.08	0.87	0.08	0.94	0.05
11	0.90	0.09	1.07	0.10	1.04	0.09	1.07	0.15	1.03	0.05
12	1.01	0.10	0.89	0.05	1.01	0.07	1.09	0.10	0.99	0.05
13	1.14	0.19	1.08	0.13	1.00	0.13	0.93	0.21	1.06	0.08
14	1.27	0.16	1.25	0.18	1.05	0.15	1.14	0.14	1.18	0.08
15	1.05	0.23	1.17	0.11	1.34	0.13	1.57	0.14	1.28	0.07
16	1.06	0.17	1.24	0.19	1.11	0.16	1.54	0.15	1.25	0.08
17	1.13	0.30	1.60	0.26	1.45	0.17	1.29	0.36	1.41	0.09
18	1.10	0.29	1.61	0.55	1.54	0.26	1.44	0.20	1.41	0.11
19	1.23	0.37	–	–	1.60	0.31	2.24	0.41	1.66	0.16
20	1.60	0.15	1.59	0.17	1.76	0.14	1.55	0.07	1.62	0.06
21	1.13	0.56	–	–	1.31	0.36	1.62	0.37	1.31	0.13
22	1.71	0.40	3.27	0.92	1.67	0.37	2.71	0.62	2.05	0.17
23	1.70	1.02	1.38	1.02	1.61	0.27	1.98	0.33	1.71	0.13
24	2.39	0.37	1.84	0.38	2.07	0.50	2.02	0.77	2.08	0.15
25	1.70	1.02	1.94	0.95	–	–	1.86	0.52	1.85	0.22
26	1.48	0.97	2.20	0.45	–	–	1.70	1.02	2.02	0.28
27	–	–	1.48	0.98	–	–	–	–	1.48	0.98
28	–	–	–	–	–	–	1.94	1.05	1.94	1.05
29	0.94	1.01	–	–	2.33	1.01	2.62	0.98	2.21	0.48
>29	2.62	1.04	3.35	0.81	1.48	1.02	2.23	0.70	2.81	0.28

Appendix 6 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the East Northland (Statistical Area 002) bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	0.46	0.48	0.55	0.94	0.49	0.32
3	0.45	0.98	0.55	1.00	0.56	0.13	1.11	0.95	0.58	0.12
4	0.78	0.42	0.47	0.14	0.59	0.10	0.67	1.01	0.64	0.12
5	0.78	0.16	0.57	0.07	0.67	0.11	0.70	0.17	0.66	0.06
6	0.91	0.27	0.65	0.07	0.76	0.26	0.85	0.21	0.75	0.08
7	0.83	0.20	0.67	0.12	0.78	0.12	0.79	0.39	0.75	0.07
8	1.27	0.24	0.74	0.09	0.84	0.15	1.07	0.17	0.95	0.09
9	0.90	0.09	0.90	0.10	0.98	0.11	0.99	0.22	0.93	0.06
10	1.31	0.21	1.07	0.20	1.13	0.07	1.04	0.14	1.12	0.07
11	1.03	0.27	1.03	0.13	1.29	0.05	1.06	0.11	1.12	0.05
12	1.21	0.08	0.97	0.06	1.19	0.05	1.13	0.12	1.12	0.05
13	1.60	0.24	1.14	0.16	1.40	0.16	1.36	0.30	1.29	0.11
14	1.66	0.24	1.27	0.51	1.48	0.24	1.37	0.23	1.42	0.08
15	1.40	0.22	1.11	0.30	1.56	0.20	1.60	0.16	1.43	0.06
16	1.29	0.62	1.14	0.83	1.59	0.09	1.50	0.33	1.41	0.10
17	0.95	0.63	1.55	0.72	1.66	0.19	1.56	0.58	1.53	0.13
18	1.38	1.01	1.61	0.55	1.54	0.36	1.49	0.25	1.53	0.13
19	1.36	0.57	–	–	1.67	0.41	2.63	0.56	1.90	0.21
20	1.49	0.18	1.56	0.39	1.74	0.16	1.53	0.08	1.58	0.06
21	1.59	1.03	–	–	1.34	0.54	1.72	0.54	1.56	0.17
22	1.88	0.55	–	–	1.67	0.37	3.10	0.97	1.98	0.20
23	1.70	0.96	–	–	1.32	0.35	2.20	0.41	1.73	0.18
24	2.87	0.58	1.84	0.39	2.23	0.76	2.02	0.78	2.16	0.19
25	1.70	1.03	1.94	1.00	–	–	1.86	0.50	1.85	0.24
26	1.48	1.00	2.20	0.47	–	–	1.70	0.97	2.02	0.25
27	–	–	1.48	0.95	–	–	–	–	1.48	0.95
28	–	–	–	–	–	–	–	–	–	–
29	0.94	0.99	–	–	2.33	1.01	–	–	1.91	0.72
>29	2.62	1.01	3.35	0.81	–	–	2.23	0.68	2.91	0.31

Appendix 6 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the East Northland (Statistical Area 003) bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	–	–	0.50	0.57	0.50	0.57
4	0.42	0.85	0.50	0.55	0.36	0.98	0.40	0.27	0.43	0.09
5	0.45	0.44	0.43	0.12	0.51	0.51	0.51	0.41	0.45	0.06
6	0.54	0.19	0.47	0.11	0.53	0.48	0.64	0.13	0.54	0.06
7	0.58	0.10	0.54	0.12	0.49	0.04	0.59	0.14	0.55	0.06
8	0.55	0.07	0.56	0.06	0.53	0.06	0.70	0.12	0.57	0.04
9	0.60	0.08	0.72	0.13	0.62	0.07	0.69	0.11	0.65	0.05
10	0.71	0.09	0.92	0.18	0.64	0.05	0.76	0.10	0.77	0.07
11	0.87	0.13	1.12	0.20	0.77	0.11	1.08	0.24	0.95	0.09
12	0.85	0.14	0.81	0.06	0.77	0.07	1.01	0.15	0.85	0.06
13	0.95	0.23	0.95	0.17	0.72	0.12	0.68	0.15	0.85	0.10
14	1.14	0.25	1.24	0.24	0.80	0.22	0.90	0.13	1.05	0.11
15	0.84	0.72	1.21	0.25	1.04	0.27	1.53	0.57	1.12	0.13
16	0.99	0.27	1.30	0.29	0.84	0.31	1.56	0.23	1.16	0.12
17	1.21	0.56	1.66	0.45	0.96	0.51	0.82	0.56	1.26	0.14
18	1.07	0.39	–	–	1.54	0.85	1.17	0.60	1.17	0.19
19	1.11	1.00	–	–	1.48	1.00	1.45	0.78	1.31	0.34
20	1.94	1.07	1.63	0.36	2.06	1.05	1.69	0.56	1.73	0.17
21	0.95	0.79	–	–	1.29	1.02	1.38	1.00	1.09	0.34
22	1.11	1.00	3.27	1.01	–	–	2.06	0.98	2.28	0.51
23	–	–	1.38	1.01	2.20	0.83	1.24	0.82	1.67	0.38
24	1.79	0.57	–	–	1.48	1.03	–	–	1.76	0.43
25	–	–	–	–	–	–	–	–	–	–
26	–	–	–	–	–	–	–	–	–	–
27	–	–	–	–	–	–	–	–	–	–
28	–	–	–	–	–	–	1.94	0.98	1.94	0.98
29	–	–	–	–	–	–	2.62	1.00	2.62	1.00
>29	–	–	–	–	1.48	0.97	–	–	1.48	0.97

Appendix 6 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the Hauraki Gulf bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	0.43	0.39	0.56	0.74	0.48	0.23
4	0.39	0.38	0.39	0.21	0.38	0.02	0.41	0.77	0.39	0.02
5	0.49	0.20	0.49	0.04	0.49	0.06	0.51	0.05	0.49	0.03
6	0.56	0.05	0.54	0.04	0.58	0.04	0.64	0.07	0.57	0.03
7	0.55	0.05	0.60	0.04	0.55	0.05	0.70	0.04	0.60	0.03
8	0.62	0.06	0.61	0.04	0.64	0.03	0.70	0.06	0.65	0.02
9	0.68	0.08	0.72	0.04	0.73	0.04	0.69	0.06	0.71	0.03
10	0.77	0.07	0.78	0.05	0.69	0.04	0.79	0.06	0.75	0.03
11	0.76	0.05	0.80	0.04	0.80	0.04	0.73	0.05	0.78	0.02
12	0.70	0.04	0.88	0.12	0.87	0.07	0.88	0.07	0.86	0.04
13	0.99	0.13	0.94	0.05	0.84	0.06	0.96	0.13	0.91	0.04
14	0.91	0.12	0.99	0.06	0.95	0.08	0.94	0.07	0.96	0.04
15	0.84	0.07	1.04	0.11	1.12	0.19	0.83	0.10	0.96	0.06
16	0.92	0.08	1.13	0.15	0.91	0.05	1.11	0.07	1.03	0.05
17	1.31	0.25	0.99	0.07	1.11	0.16	1.21	0.22	1.08	0.07
18	1.67	0.24	1.34	0.37	–	–	0.93	0.24	1.24	0.19
19	2.19	0.28	1.61	0.38	1.41	0.17	1.07	0.14	1.47	0.11
20	1.26	0.32	1.07	0.14	1.47	0.25	1.01	0.81	1.19	0.09
21	1.96	0.26	1.60	0.32	1.59	0.22	1.27	0.76	1.63	0.11
22	1.88	0.68	3.45	0.37	2.38	0.22	1.80	0.45	2.57	0.16
23	1.09	0.41	1.54	0.29	–	–	–	–	1.48	0.20
24	2.81	0.77	2.00	0.74	1.36	0.73	1.77	0.71	1.76	0.18
25	1.77	0.75	2.19	0.50	–	–	1.18	0.73	1.81	0.28
26	3.99	0.72	–	–	–	–	–	–	3.99	0.72
27	–	–	2.25	0.80	–	–	–	–	2.25	0.80
28	–	–	–	–	–	–	–	–	–	–
29	–	–	–	–	4.08	0.50	5.44	0.77	4.33	0.34
>29	5.13	0.19	3.55	0.44	–	–	–	–	3.96	0.24

Appendix 6 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the Bay of Plenty bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	0.37	0.41	0.45	0.05	0.41	0.77	0.43	0.03
4	0.52	0.42	0.46	0.04	0.54	0.03	0.54	0.05	0.52	0.02
5	0.53	0.05	0.54	0.03	0.61	0.05	0.65	0.03	0.60	0.02
6	0.71	0.07	0.57	0.05	0.63	0.05	0.76	0.04	0.66	0.03
7	0.80	0.04	0.64	0.05	0.69	0.04	0.78	0.04	0.72	0.02
8	0.80	0.04	0.81	0.04	0.70	0.05	0.83	0.05	0.80	0.02
9	0.91	0.06	0.82	0.05	0.80	0.04	0.94	0.05	0.88	0.03
10	0.97	0.04	0.91	0.05	0.90	0.04	1.00	0.08	0.95	0.03
11	1.18	0.08	1.01	0.06	1.02	0.06	1.21	0.09	1.12	0.05
12	1.28	0.09	1.12	0.06	1.21	0.08	1.12	0.06	1.17	0.04
13	1.06	0.10	1.09	0.11	1.06	0.13	1.21	0.12	1.13	0.06
14	1.36	0.08	1.27	0.11	1.35	0.06	1.34	0.12	1.34	0.05
15	1.19	0.10	1.04	0.12	1.59	0.21	1.14	0.08	1.23	0.07
16	1.41	0.06	1.42	0.22	1.47	0.07	1.28	0.09	1.37	0.04
17	1.73	0.13	1.70	0.33	1.64	0.20	1.76	0.06	1.72	0.05
18	1.76	0.18	0.95	0.75	1.74	0.45	1.27	0.26	1.52	0.12
19	1.73	0.50	1.83	0.39	1.43	0.50	1.57	0.19	1.63	0.11
20	2.06	0.06	2.89	0.72	0.95	0.76	3.10	0.37	2.44	0.11
21	1.81	0.78	2.03	0.41	0.88	0.76	1.59	0.75	1.47	0.21
22	2.59	0.46	2.12	0.26	2.19	0.44	2.11	0.26	2.21	0.15
23	2.31	0.77	3.77	0.37	1.93	0.74	–	–	2.98	0.20
24	1.99	0.08	2.05	0.77	2.56	0.42	2.01	0.25	2.05	0.06
25	3.22	0.76	–	–	–	–	2.46	0.50	2.50	0.33
26	–	–	–	–	–	–	–	–	–	–
27	–	–	2.31	0.75	–	–	1.29	0.77	1.50	0.47
28	–	–	–	–	3.93	0.74	–	–	3.93	0.74
29	4.33	0.71	4.13	0.78	–	–	–	–	4.26	0.38
>29	5.66	0.75	5.90	0.80	4.75	0.79	–	–	5.23	0.25

Appendix 7: Estimated mean length-at-age (cm) and coefficients of variation (CVs) for snapper bottom longline fisheries in SNA 1 in 2022–23.

Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the East Northland bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	27.21	0.49	29.00	1.04	27.79	0.34
3	27.00	0.99	29.00	0.97	28.99	0.04	31.59	0.39	29.16	0.03
4	31.20	0.23	27.58	0.07	29.31	0.05	27.17	0.20	29.44	0.04
5	30.39	0.06	28.76	0.02	30.48	0.04	30.47	0.07	29.79	0.02
6	29.70	0.05	29.08	0.03	30.27	0.08	31.61	0.04	29.89	0.02
7	30.62	0.03	29.48	0.03	29.75	0.03	29.93	0.04	29.97	0.02
8	31.03	0.04	30.42	0.02	30.11	0.03	33.78	0.04	31.23	0.02
9	30.61	0.03	32.66	0.03	32.16	0.02	31.90	0.04	31.80	0.02
10	34.70	0.05	35.41	0.04	34.27	0.03	33.74	0.03	34.59	0.02
11	34.34	0.03	36.38	0.03	35.84	0.03	36.05	0.06	35.71	0.02
12	35.36	0.04	34.19	0.02	35.48	0.03	36.38	0.04	35.28	0.02
13	36.62	0.07	36.36	0.05	35.15	0.05	34.05	0.06	35.89	0.03
14	38.46	0.06	38.13	0.06	35.87	0.07	36.98	0.05	37.46	0.03
15	35.96	0.10	37.59	0.07	39.04	0.06	41.16	0.06	38.42	0.02
16	36.28	0.10	38.17	0.14	36.28	0.06	40.96	0.05	38.02	0.03
17	37.02	0.25	41.87	0.24	40.07	0.06	38.44	0.24	39.84	0.03
18	36.38	0.23	42.00	0.52	41.08	0.21	40.03	0.09	39.72	0.04
19	38.35	0.36	–	–	41.80	0.24	46.70	0.33	42.03	0.05
20	41.96	0.12	41.61	0.09	43.16	0.06	41.54	0.02	41.95	0.02
21	36.95	0.51	–	–	39.29	0.36	42.09	0.34	38.97	0.06
22	42.82	0.36	54.00	0.92	42.54	0.33	50.36	0.60	45.37	0.07
23	43.00	1.02	40.00	1.02	41.88	0.22	44.68	0.22	42.65	0.04
24	46.71	0.21	44.15	0.36	45.71	0.47	45.50	0.76	45.34	0.05
25	43.00	1.02	45.00	0.95	–	–	44.34	0.51	44.25	0.22
26	41.00	0.97	46.77	0.41	–	–	43.00	1.02	45.32	0.22
27	–	–	41.00	0.98	–	–	–	–	41.00	0.98
28	–	–	–	–	–	–	45.00	1.05	45.00	1.05
29	35.00	1.01	–	–	48.00	1.01	50.00	0.98	46.57	0.40
>29	50.00	1.04	54.00	0.79	41.00	1.02	46.64	0.60	50.55	0.18

Appendix 7 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the East Northland (Statistical Area 002) bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	27.21	0.47	29.00	0.94	27.79	0.31
3	27.00	0.98	29.00	1.00	28.99	0.04	37.00	0.95	29.25	0.04
4	32.58	0.39	27.41	0.13	29.66	0.05	31.00	1.01	30.39	0.04
5	32.35	0.06	29.28	0.02	30.86	0.04	31.42	0.14	30.65	0.02
6	34.29	0.18	30.72	0.05	32.17	0.18	33.30	0.11	32.04	0.03
7	33.28	0.16	30.97	0.06	32.56	0.07	32.62	0.30	32.12	0.02
8	38.42	0.14	32.04	0.03	33.44	0.10	36.07	0.07	34.65	0.03
9	34.38	0.03	34.27	0.03	35.34	0.04	35.09	0.09	34.71	0.02
10	38.79	0.13	36.34	0.12	37.14	0.02	35.95	0.05	36.85	0.02
11	35.85	0.21	36.00	0.09	38.94	0.02	36.29	0.04	37.03	0.02
12	37.94	0.03	35.34	0.04	37.88	0.02	36.98	0.05	36.99	0.02
13	41.55	0.12	36.99	0.06	40.16	0.14	39.23	0.18	38.63	0.04
14	42.27	0.14	38.75	0.50	40.94	0.24	39.63	0.17	40.17	0.03
15	39.94	0.17	37.02	0.29	41.61	0.18	42.03	0.16	40.28	0.02
16	38.93	0.58	37.00	0.79	41.94	0.05	40.94	0.25	40.03	0.04
17	34.83	0.56	41.33	0.70	42.27	0.11	41.34	0.53	40.96	0.05
18	40.00	1.01	42.00	0.51	41.11	0.31	40.56	0.15	41.00	0.05
19	39.69	0.56	–	–	42.29	0.32	49.75	0.52	44.01	0.09
20	40.97	0.15	41.59	0.38	42.93	0.07	41.35	0.03	41.69	0.02
21	42.00	1.03	–	–	39.53	0.54	43.03	0.52	41.64	0.14
22	44.50	0.54	–	–	42.54	0.33	53.00	0.97	44.93	0.12
23	43.00	0.96	–	–	39.38	0.34	46.59	0.33	42.79	0.08
24	49.63	0.42	44.15	0.38	47.00	0.74	45.50	0.77	45.96	0.09
25	43.00	1.03	45.00	1.00	–	–	44.34	0.49	44.25	0.23
26	41.00	1.00	46.77	0.43	–	–	43.00	0.97	45.32	0.20
27	–	–	41.00	0.95	–	–	–	–	41.00	0.95
28	–	–	–	–	–	–	–	–	–	–
29	35.00	0.99	–	–	48.00	1.01	–	–	44.00	0.62
>29	50.00	1.01	54.00	0.78	–	–	46.64	0.57	51.29	0.22

Appendix 7 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the East Northland (Statistical Area 003) bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	–	–	28.00	0.57	28.00	0.57
4	26.50	0.84	28.08	0.54	25.00	0.98	25.87	0.27	26.64	0.06
5	26.94	0.44	26.49	0.08	27.80	0.40	28.16	0.40	27.05	0.02
6	28.69	0.14	27.37	0.05	28.43	0.43	30.46	0.05	28.60	0.02
7	29.44	0.04	28.50	0.04	27.82	0.01	29.38	0.04	28.84	0.02
8	28.93	0.02	29.18	0.02	28.53	0.02	31.23	0.04	29.26	0.01
9	29.80	0.03	31.60	0.04	30.01	0.02	30.94	0.03	30.51	0.02
10	31.71	0.05	34.25	0.06	30.54	0.02	32.31	0.03	32.37	0.02
11	33.98	0.09	36.92	0.11	32.49	0.04	35.89	0.09	34.68	0.03
12	33.29	0.05	33.06	0.02	32.40	0.03	35.48	0.05	33.44	0.02
13	34.55	0.11	34.83	0.09	31.76	0.06	31.06	0.13	33.40	0.04
14	37.18	0.17	37.87	0.10	33.05	0.21	34.25	0.05	35.96	0.04
15	33.67	0.71	38.04	0.20	35.68	0.21	39.30	0.40	36.48	0.04
16	35.44	0.22	39.00	0.25	33.08	0.21	40.97	0.13	36.92	0.04
17	38.08	0.54	42.58	0.44	34.96	0.47	33.21	0.55	38.36	0.06
18	35.97	0.35	–	–	41.00	0.80	37.57	0.57	37.20	0.12
19	37.00	1.00	–	–	41.00	1.00	40.50	0.77	39.13	0.32
20	45.00	1.07	41.64	0.26	46.00	1.05	42.88	0.55	42.72	0.08
21	35.00	0.77	–	–	39.00	1.02	40.00	1.00	36.69	0.31
22	37.00	1.00	54.00	1.01	–	–	46.00	0.98	46.62	0.39
23	–	–	40.00	1.01	47.00	0.83	38.50	0.82	42.39	0.33
24	43.06	0.47	–	–	41.00	1.03	–	–	42.81	0.34
25	–	–	–	–	–	–	–	–	–	–
26	–	–	–	–	–	–	–	–	–	–
27	–	–	–	–	–	–	–	–	–	–
28	–	–	–	–	–	–	45.00	0.98	45.00	0.98
29	–	–	–	–	–	–	50.00	1.00	50.00	1.00
>29	–	–	–	–	41.00	0.97	–	–	41.00	0.97

Appendix 7 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the Hauraki Gulf bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	–	–	26.30	0.39	29.00	0.74	27.38	0.21
4	25.50	0.38	25.58	0.20	25.22	0.01	26.00	0.77	25.42	0.01
5	27.74	0.19	27.63	0.01	27.54	0.02	28.01	0.03	27.66	0.01
6	28.86	0.02	28.58	0.01	29.29	0.02	30.34	0.02	29.22	0.01
7	28.75	0.02	29.64	0.01	28.75	0.02	31.34	0.01	29.66	0.01
8	29.80	0.02	29.91	0.02	30.29	0.01	31.32	0.02	30.43	0.01
9	30.89	0.03	31.60	0.02	31.83	0.01	30.92	0.02	31.46	0.01
10	32.24	0.02	32.53	0.02	31.08	0.02	32.56	0.02	31.95	0.01
11	32.18	0.02	32.86	0.01	32.79	0.01	31.71	0.02	32.47	0.01
12	31.43	0.01	33.48	0.03	33.70	0.02	33.87	0.03	33.43	0.01
13	34.79	0.05	34.87	0.02	33.37	0.02	34.32	0.04	34.12	0.01
14	33.87	0.03	35.40	0.02	34.78	0.03	34.77	0.03	34.90	0.01
15	33.31	0.03	36.02	0.04	36.81	0.08	33.14	0.03	34.83	0.02
16	34.19	0.03	36.48	0.04	34.41	0.02	36.67	0.03	35.68	0.01
17	38.77	0.12	35.44	0.02	36.90	0.09	37.24	0.08	36.34	0.02
18	42.40	0.12	38.20	0.18	–	–	34.84	0.23	37.58	0.06
19	44.09	0.10	42.50	0.37	39.55	0.06	36.37	0.06	39.84	0.04
20	37.17	0.10	36.48	0.09	41.09	0.24	36.00	0.81	37.74	0.03
21	43.96	0.10	41.83	0.25	42.35	0.21	39.00	0.76	42.02	0.04
22	45.00	0.68	54.18	0.24	47.89	0.12	44.02	0.42	48.92	0.06
23	36.76	0.37	41.33	0.21	–	–	–	–	40.76	0.08
24	52.00	0.77	46.00	0.74	40.00	0.73	44.00	0.71	43.67	0.13
25	44.00	0.75	46.57	0.41	–	–	38.00	0.73	43.47	0.13
26	59.00	0.72	–	–	–	–	–	–	59.00	0.72
27	–	–	48.00	0.80	–	–	–	–	48.00	0.80
28	–	–	–	–	–	–	–	–	–	–
29	–	–	–	–	58.26	0.39	66.00	0.77	59.68	0.23
>29	63.61	0.10	54.53	0.26	–	–	–	–	56.91	0.09

Appendix 7 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the Bay of Plenty bottom longline fishery in 2022–23.

Age	Spring		Summer		Autumn		Winter		Spr-win	
(years)	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–	–	–	–	–
2	–	–	–	–	–	–	–	–	–	–
3	–	–	25.00	0.41	26.78	0.05	26.00	0.77	26.28	0.01
4	28.25	0.41	27.01	0.01	28.54	0.01	28.49	0.02	28.14	0.01
5	28.41	0.02	28.50	0.01	29.72	0.02	30.58	0.01	29.51	0.01
6	31.25	0.02	29.02	0.02	30.08	0.02	32.22	0.01	30.45	0.01
7	32.80	0.01	30.16	0.02	31.04	0.01	32.59	0.01	31.55	0.01
8	32.64	0.02	32.93	0.01	31.24	0.02	33.11	0.02	32.66	0.01
9	34.11	0.02	32.95	0.02	32.70	0.01	34.54	0.02	33.75	0.01
10	35.00	0.01	34.34	0.02	34.22	0.01	35.21	0.03	34.77	0.01
11	37.44	0.03	35.59	0.02	35.63	0.02	37.67	0.03	36.74	0.02
12	38.41	0.03	36.91	0.02	37.81	0.03	36.86	0.02	37.33	0.01
13	36.05	0.03	36.38	0.04	36.11	0.06	37.74	0.04	36.87	0.02
14	39.48	0.03	38.41	0.04	39.47	0.02	39.06	0.04	39.15	0.02
15	37.52	0.04	35.98	0.09	40.94	0.07	37.10	0.03	37.80	0.02
16	40.00	0.02	40.36	0.21	40.64	0.03	38.79	0.05	39.69	0.01
17	42.81	0.04	42.45	0.25	42.15	0.14	43.53	0.05	42.91	0.02
18	42.96	0.09	35.00	0.75	42.86	0.38	38.62	0.21	40.84	0.04
19	42.24	0.26	43.07	0.25	39.94	0.42	41.41	0.13	41.70	0.04
20	45.98	0.04	52.00	0.72	35.00	0.76	53.29	0.37	48.46	0.04
21	44.00	0.78	45.50	0.37	34.00	0.76	42.00	0.75	40.32	0.11
22	49.67	0.39	45.68	0.15	45.47	0.24	46.36	0.24	46.35	0.05
23	48.00	0.77	57.00	0.36	45.00	0.74	–	–	51.96	0.12
24	45.28	0.03	46.00	0.77	49.75	0.42	45.47	0.22	45.77	0.02
25	54.00	0.76	–	–	–	–	48.50	0.44	48.80	0.25
26	–	–	–	–	–	–	–	–	–	–
27	–	–	48.00	0.75	–	–	39.00	0.77	40.90	0.40
28	–	–	–	–	58.00	0.74	–	–	58.00	0.74
29	60.00	0.71	59.00	0.78	–	–	–	–	59.68	0.38
>29	66.00	0.75	67.00	0.80	62.00	0.79	–	–	64.10	0.24

Appendix 8: Estimated seasonal proportion at length and coefficients of variation (CVs) for snapper power method fisheries in SNA 1 in 2022–23.

Estimates of proportion at length with CVs (bootstrap estimates) for snapper from the East Northland bottom trawl fishery in 2022–23.

P.i. = proportion of fish in length class. *Nt* = total number of fish caught.
CV = coefficient of variation. *n* = total number of fish sampled.

Length	Spring-summer		Autumn-winter		Spring-winter	
(cm)	*P.i.*	CV	*P.i.*	CV	*P.i.*	CV
20	0.0000	0.00	0.0000	0.00	0.0000	0.00
21	0.0000	0.00	0.0009	1.30	0.0004	1.30
22	0.0000	0.00	0.0000	0.00	0.0000	0.00
23	0.0000	0.00	0.0000	0.00	0.0000	0.00
24	0.0007	1.41	0.0000	0.00	0.0004	1.41
25	0.0046	0.87	0.0000	0.00	0.0026	0.87
26	0.0109	0.51	0.0017	0.88	0.0069	0.46
27	0.0244	0.40	0.0203	0.31	0.0227	0.26
28	0.0411	0.25	0.0323	0.35	0.0372	0.20
29	0.0498	0.20	0.0505	0.31	0.0501	0.17
30	0.0504	0.14	0.0602	0.34	0.0546	0.18
31	0.0699	0.15	0.0728	0.26	0.0711	0.14
32	0.0843	0.10	0.0850	0.23	0.0846	0.11
33	0.1001	0.08	0.0999	0.16	0.1000	0.08
34	0.0975	0.08	0.0821	0.16	0.0908	0.08
35	0.0985	0.11	0.0922	0.15	0.0957	0.09
36	0.0737	0.13	0.0896	0.11	0.0806	0.09
37	0.0614	0.11	0.0610	0.18	0.0612	0.10
38	0.0395	0.19	0.0552	0.21	0.0463	0.14
39	0.0382	0.14	0.0278	0.25	0.0337	0.13
40	0.0331	0.14	0.0415	0.22	0.0367	0.13
41	0.0235	0.14	0.0303	0.30	0.0264	0.17
42	0.0219	0.19	0.0196	0.43	0.0209	0.21
43	0.0110	0.22	0.0148	0.25	0.0126	0.17
44	0.0109	0.38	0.0145	0.29	0.0125	0.24
45	0.0112	0.22	0.0100	0.33	0.0107	0.19
46	0.0043	0.35	0.0091	0.43	0.0064	0.29
47	0.0066	0.29	0.0056	0.41	0.0061	0.25
48	0.0030	0.56	0.0048	0.52	0.0038	0.39
49	0.0040	0.53	0.0047	0.44	0.0043	0.35
50	0.0037	0.56	0.0025	0.64	0.0031	0.42
51	0.0042	0.50	0.0039	0.48	0.0041	0.35
52	0.0042	0.36	0.0024	0.64	0.0034	0.33
53	0.0014	0.78	0.0008	1.32	0.0011	0.68
54	0.0013	0.80	0.0017	0.89	0.0015	0.60
55	0.0000	0.00	0.0000	0.00	0.0000	0.00
56	0.0027	0.53	0.0009	1.32	0.0019	0.50
57	0.0009	0.89	0.0000	0.00	0.0005	0.89
58	0.0004	1.22	0.0000	0.00	0.0002	1.22
59	0.0000	0.00	0.0000	0.00	0.0000	0.00
60	0.0011	0.75	0.0000	0.00	0.0006	0.75
61	0.0003	1.30	0.0000	0.00	0.0002	1.30
62	0.0014	0.71	0.0008	1.38	0.0011	0.65
63	0.0010	1.08	0.0000	0.00	0.0006	1.08
64	0.0005	0.97	0.0000	0.00	0.0003	0.97
65	0.0010	0.93	0.0000	0.00	0.0006	0.93
66	0.0007	0.89	0.0000	0.00	0.0004	0.89
67	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0003	1.37	0.0000	0.00	0.0002	1.37
70	0.0000	0.00	0.0008	1.31	0.0003	1.31
71	0.0003	1.40	0.0000	0.00	0.0002	1.40
72	0.0003	1.46	0.0000	0.00	0.0002	1.46
73	0.0000	0.00	0.0000	0.00	0.0000	0.00
74	0.0000	0.00	0.0000	0.00	0.0000	0.00
75	0.0000	0.00	0.0000	0.00	0.0000	0.00
76	0.0000	0.00	0.0000	0.00	0.0000	0.00
77	0.0000	0.00	0.0000	0.00	0.0000	0.00
78	0.0000	0.00	0.0000	0.00	0.0000	0.00
79	0.0000	0.00	0.0000	0.00	0.0000	0.00
80	0.0000	0.00	0.0000	0.00	0.0000	0.00
Nt	81 663		60 982		142 645	
n	2 800		1 260		4 060	

Appendix 8 – continued:
Estimates of proportion at length with CVs (bootstrap estimates) for snapper from the Hauraki Gulf bottom trawl fishery in 2022–23.

P.i. = proportion of fish in length class. *Nt* = total number of fish caught.
CV = coefficient of variation. *n* = total number of fish sampled.

Length	Spring-summer		Autumn-winter		Spring-winter	
(cm)	*P.i.*	CV	*P.i.*	CV	*P.i.*	CV
20	–	–	–	–	0.0000	0.00
21	–	–	–	–	0.0000	0.00
22	–	–	–	–	0.0000	0.00
23	–	–	–	–	0.0000	0.00
24	–	–	–	–	0.0002	1.35
25	–	–	–	–	0.0062	0.58
26	–	–	–	–	0.0280	0.33
27	–	–	–	–	0.0596	0.26
28	–	–	–	–	0.0732	0.23
29	–	–	–	–	0.0899	0.21
30	–	–	–	–	0.1093	0.21
31	–	–	–	–	0.0874	0.11
32	–	–	–	–	0.0901	0.12
33	–	–	–	–	0.0988	0.10
34	–	–	–	–	0.0708	0.09
35	–	–	–	–	0.0649	0.15
36	–	–	–	–	0.0536	0.22
37	–	–	–	–	0.0350	0.21
38	–	–	–	–	0.0364	0.20
39	–	–	–	–	0.0192	0.21
40	–	–	–	–	0.0144	0.26
41	–	–	–	–	0.0165	0.28
42	–	–	–	–	0.0167	0.29
43	–	–	–	–	0.0072	0.48
44	–	–	–	–	0.0040	0.37
45	–	–	–	–	0.0038	0.55
46	–	–	–	–	0.0034	0.54
47	–	–	–	–	0.0036	0.53
48	–	–	–	–	0.0031	0.49
49	–	–	–	–	0.0000	0.00
50	–	–	–	–	0.0005	0.96
51	–	–	–	–	0.0012	0.72
52	–	–	–	–	0.0004	1.01
53	–	–	–	–	0.0000	0.00
54	–	–	–	–	0.0000	0.00
55	–	–	–	–	0.0000	0.00
56	–	–	–	–	0.0000	0.00
57	–	–	–	–	0.0002	1.42
58	–	–	–	–	0.0011	0.99
59	–	–	–	–	0.0009	0.79
60	–	–	–	–	0.0000	0.00
61	–	–	–	–	0.0003	1.42
62	–	–	–	–	0.0000	0.00
63	–	–	–	–	0.0000	0.00
64	–	–	–	–	0.0003	1.29
65	–	–	–	–	0.0000	0.00
66	–	–	–	–	0.0000	0.00
67	–	–	–	–	0.0000	0.00
68	–	–	–	–	0.0000	0.00
69	–	–	–	–	0.0000	0.00
70	–	–	–	–	0.0000	0.00
71	–	–	–	–	0.0000	0.00
72	–	–	–	–	0.0000	0.00
73	–	–	–	–	0.0000	0.00
74	–	–	–	–	0.0000	0.00
75	–	–	–	–	0.0000	0.00
76	–	–	–	–	0.0000	0.00
77	–	–	–	–	0.0000	0.00
78	–	–	–	–	0.0000	0.00
79	–	–	–	–	0.0000	0.00
80	–	–	–	–	0.0000	0.00
Nt					154 914	
n					2 492	

Appendix 8 – continued:
Estimates of proportion at length with CVs (bootstrap estimates) for snapper from the Bay of Plenty bottom trawl fishery in 2022–23.

P.i. = proportion of fish in length class. *Nt* = total number of fish caught.
CV = coefficient of variation. *n* = total number of fish sampled.

Length	Spring-summer		Autumn-winter		Spring-winter	
(cm)	*P.i.*	CV	*P.i.*	CV	*P.i.*	CV
20	0.0000	0.00	0.0000	0.00	0.0000	0.00
21	0.0003	1.40	0.0000	0.00	0.0001	1.40
22	0.0000	0.00	0.0000	0.00	0.0000	0.00
23	0.0006	0.97	0.0002	1.35	0.0004	0.80
24	0.0045	0.37	0.0048	0.50	0.0047	0.31
25	0.0211	0.22	0.0250	0.24	0.0231	0.17
26	0.0408	0.16	0.0604	0.16	0.0509	0.11
27	0.0611	0.15	0.0799	0.11	0.0709	0.09
28	0.0609	0.15	0.0745	0.12	0.0680	0.09
29	0.0774	0.11	0.0951	0.11	0.0866	0.07
30	0.0689	0.11	0.0903	0.13	0.0800	0.08
31	0.0822	0.09	0.0891	0.12	0.0858	0.07
32	0.0767	0.08	0.0757	0.08	0.0762	0.06
33	0.0837	0.07	0.0646	0.08	0.0738	0.06
34	0.0643	0.09	0.0634	0.12	0.0638	0.08
35	0.0754	0.09	0.0684	0.15	0.0718	0.09
36	0.0515	0.10	0.0445	0.18	0.0479	0.10
37	0.0458	0.13	0.0424	0.14	0.0440	0.09
38	0.0367	0.14	0.0296	0.14	0.0330	0.10
39	0.0300	0.11	0.0232	0.14	0.0265	0.09
40	0.0212	0.14	0.0181	0.22	0.0196	0.13
41	0.0183	0.17	0.0122	0.23	0.0151	0.14
42	0.0186	0.14	0.0094	0.30	0.0139	0.14
43	0.0102	0.20	0.0078	0.29	0.0089	0.17
44	0.0098	0.25	0.0049	0.30	0.0072	0.20
45	0.0059	0.25	0.0048	0.40	0.0053	0.23
46	0.0064	0.30	0.0032	0.48	0.0047	0.25
47	0.0049	0.30	0.0020	0.47	0.0034	0.26
48	0.0035	0.43	0.0015	0.59	0.0025	0.35
49	0.0043	0.29	0.0007	0.68	0.0024	0.27
50	0.0042	0.43	0.0014	0.55	0.0028	0.34
51	0.0009	0.66	0.0005	0.83	0.0007	0.53
52	0.0018	0.52	0.0008	0.83	0.0013	0.43
53	0.0013	0.66	0.0000	0.00	0.0006	0.66
54	0.0011	0.70	0.0006	0.68	0.0009	0.49
55	0.0013	1.00	0.0000	0.00	0.0006	1.00
56	0.0003	1.35	0.0002	0.99	0.0002	0.90
57	0.0005	0.95	0.0004	0.99	0.0005	0.67
58	0.0004	1.21	0.0000	0.00	0.0002	1.21
59	0.0007	0.97	0.0000	0.00	0.0003	0.97
60	0.0003	1.32	0.0000	1.50	0.0002	1.15
61	0.0004	0.95	0.0004	1.01	0.0004	0.69
62	0.0004	1.05	0.0000	1.44	0.0002	0.94
63	0.0007	0.91	0.0000	0.00	0.0003	0.91
64	0.0003	1.35	0.0000	0.00	0.0001	1.35
65	0.0000	0.00	0.0000	0.00	0.0000	0.00
66	0.0000	0.00	0.0000	0.00	0.0000	0.00
67	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0003	1.30	0.0000	0.00	0.0001	1.30
69	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	1.42	0.0000	1.42
71	0.0003	1.29	0.0000	0.00	0.0001	1.29
72	0.0000	0.00	0.0000	0.00	0.0000	0.00
73	0.0000	0.00	0.0000	0.00	0.0000	0.00
74	0.0000	0.00	0.0000	0.00	0.0000	0.00
75	0.0000	0.00	0.0000	0.00	0.0000	0.00
76	0.0000	0.00	0.0000	0.00	0.0000	0.00
77	0.0000	0.00	0.0000	0.00	0.0000	0.00
78	0.0000	0.00	0.0000	0.00	0.0000	0.00
79	0.0000	0.00	0.0000	0.00	0.0000	0.00
80	0.0000	0.00	0.0000	0.00	0.0000	0.00
Nt	332 330		303 305		666 321	
n	4 049		4 703		8 752	

Appendix 8 – continued:
Estimates of proportion at length with CVs (bootstrap estimates) for snapper from the Hauraki Gulf Danish seine fishery in 2022–23.

P.i. = proportion of fish in length class. *Nt* = total number of fish caught.
CV = coefficient of variation. *n* = total number of fish sampled.

Length	Spring-summer		Autumn-winter		Spring-winter	
(cm)	*P.i.*	CV	*P.i.*	CV	*P.i.*	CV
20	0.0000	0.00	0.0000	0.00	0.0000	0.00
21	0.0000	0.00	0.0000	0.00	0.0000	0.00
22	0.0000	0.00	0.0000	0.00	0.0000	0.00
23	0.0000	0.00	0.0000	0.00	0.0000	0.00
24	0.0000	0.00	0.0000	0.00	0.0000	0.00
25	0.0000	0.00	0.0008	0.99	0.0005	0.99
26	0.0029	0.79	0.0083	0.51	0.0060	0.44
27	0.0073	0.52	0.0303	0.44	0.0204	0.38
28	0.0125	0.46	0.0386	0.32	0.0274	0.27
29	0.0256	0.28	0.0573	0.22	0.0437	0.18
30	0.0294	0.29	0.0630	0.24	0.0486	0.19
31	0.0544	0.19	0.0762	0.22	0.0669	0.16
32	0.0583	0.14	0.0821	0.21	0.0719	0.14
33	0.0808	0.13	0.0807	0.11	0.0808	0.08
34	0.0830	0.10	0.0723	0.12	0.0769	0.08
35	0.0987	0.12	0.0884	0.12	0.0928	0.09
36	0.0772	0.12	0.0708	0.12	0.0736	0.09
37	0.0709	0.13	0.0667	0.15	0.0685	0.10
38	0.0664	0.10	0.0571	0.13	0.0611	0.09
39	0.0555	0.11	0.0377	0.18	0.0453	0.11
40	0.0488	0.12	0.0345	0.21	0.0406	0.13
41	0.0336	0.15	0.0245	0.18	0.0284	0.12
42	0.0327	0.15	0.0242	0.20	0.0278	0.13
43	0.0276	0.23	0.0151	0.23	0.0205	0.17
44	0.0235	0.16	0.0106	0.22	0.0161	0.13
45	0.0175	0.19	0.0109	0.21	0.0137	0.15
46	0.0167	0.23	0.0070	0.30	0.0111	0.19
47	0.0089	0.27	0.0049	0.37	0.0066	0.23
48	0.0106	0.28	0.0040	0.35	0.0068	0.23
49	0.0057	0.27	0.0050	0.32	0.0053	0.21
50	0.0074	0.27	0.0043	0.39	0.0056	0.23
51	0.0042	0.34	0.0038	0.34	0.0040	0.24
52	0.0038	0.34	0.0035	0.37	0.0036	0.26
53	0.0033	0.38	0.0011	0.65	0.0021	0.33
54	0.0046	0.51	0.0020	0.46	0.0031	0.36
55	0.0025	0.54	0.0010	0.66	0.0016	0.42
56	0.0029	0.46	0.0011	0.61	0.0019	0.38
57	0.0021	0.71	0.0018	0.47	0.0019	0.42
58	0.0008	0.76	0.0016	0.55	0.0012	0.45
59	0.0023	0.43	0.0017	0.53	0.0020	0.35
60	0.0020	0.45	0.0011	0.74	0.0015	0.41
61	0.0010	0.75	0.0010	0.65	0.0010	0.49
62	0.0016	0.72	0.0003	1.20	0.0009	0.63
63	0.0003	1.39	0.0006	0.76	0.0005	0.66
64	0.0013	0.69	0.0005	0.79	0.0008	0.52
65	0.0021	0.68	0.0004	0.94	0.0011	0.58
66	0.0014	0.56	0.0008	0.72	0.0010	0.46
67	0.0012	0.71	0.0001	1.34	0.0006	0.66
68	0.0007	0.93	0.0008	0.81	0.0008	0.63
69	0.0004	0.97	0.0001	1.42	0.0002	0.81
70	0.0013	0.86	0.0003	1.38	0.0007	0.71
71	0.0008	0.75	0.0005	0.82	0.0006	0.58
72	0.0004	1.01	0.0000	0.00	0.0002	1.01
73	0.0015	0.66	0.0001	1.43	0.0007	0.61
74	0.0001	1.40	0.0000	0.00	0.0001	1.40
75	0.0000	0.00	0.0000	0.00	0.0000	0.00
76	0.0005	1.28	0.0002	1.35	0.0003	0.93
77	0.0002	1.51	0.0003	1.50	0.0003	1.18
78	0.0000	0.00	0.0000	0.00	0.0000	0.00
79	0.0003	1.32	0.0000	0.00	0.0001	1.32
80	0.0006	0.93	0.0000	0.00	0.0002	0.93
Nt	95 463		113 783		208 227	
n	3 658		4 312		7 970	

Appendix 8 – continued:
Estimates of proportion at length with CVs (bootstrap estimates) for snapper from the Bay of Plenty Danish seine fishery in 2022–23.

P.i. = proportion of fish in length class. *Nt* = total number of fish caught.
CV = coefficient of variation. *n* = total number of fish sampled.

Length	Spring-summer		Autumn-winter		Spring-winter	
(cm)	*P.i.*	CV	*P.i.*	CV	*P.i.*	CV
20	0.0000	0.00	0.0000	0.00	0.0000	0.00
21	0.0000	0.00	0.0000	0.00	0.0000	0.00
22	0.0000	0.00	0.0000	0.00	0.0000	0.00
23	0.0000	0.00	0.0004	0.94	0.0002	0.94
24	0.0028	0.49	0.0010	1.07	0.0019	0.46
25	0.0144	0.29	0.0103	0.42	0.0125	0.24
26	0.0375	0.25	0.0244	0.35	0.0313	0.21
27	0.0627	0.23	0.0315	0.27	0.0479	0.18
28	0.0611	0.15	0.0438	0.18	0.0529	0.11
29	0.0647	0.14	0.0656	0.16	0.0651	0.10
30	0.0734	0.13	0.0718	0.15	0.0726	0.09
31	0.0796	0.12	0.0809	0.10	0.0802	0.07
32	0.0813	0.09	0.0954	0.08	0.0880	0.06
33	0.0847	0.12	0.0921	0.08	0.0882	0.07
34	0.0861	0.07	0.0857	0.10	0.0859	0.06
35	0.0695	0.10	0.0788	0.10	0.0739	0.07
36	0.0610	0.10	0.0593	0.11	0.0602	0.08
37	0.0526	0.12	0.0491	0.11	0.0509	0.09
38	0.0372	0.12	0.0433	0.11	0.0401	0.08
39	0.0264	0.12	0.0317	0.16	0.0289	0.10
40	0.0236	0.21	0.0290	0.14	0.0262	0.13
41	0.0238	0.16	0.0265	0.14	0.0251	0.10
42	0.0129	0.22	0.0204	0.15	0.0164	0.12
43	0.0126	0.19	0.0141	0.18	0.0133	0.13
44	0.0088	0.25	0.0116	0.21	0.0101	0.16
45	0.0063	0.28	0.0071	0.28	0.0067	0.20
46	0.0045	0.33	0.0054	0.31	0.0049	0.22
47	0.0029	0.44	0.0044	0.31	0.0037	0.26
48	0.0026	0.41	0.0031	0.47	0.0028	0.31
49	0.0016	0.60	0.0036	0.38	0.0025	0.33
50	0.0013	0.57	0.0022	0.46	0.0017	0.35
51	0.0009	0.66	0.0018	0.60	0.0013	0.45
52	0.0009	0.74	0.0008	0.65	0.0009	0.50
53	0.0002	1.49	0.0011	0.65	0.0006	0.60
54	0.0003	1.35	0.0004	1.03	0.0003	0.84
55	0.0008	0.85	0.0011	0.66	0.0009	0.51
56	0.0002	1.42	0.0003	1.00	0.0003	0.80
57	0.0006	0.79	0.0004	0.99	0.0005	0.63
58	0.0000	0.00	0.0002	1.38	0.0001	1.38
59	0.0000	0.00	0.0004	0.95	0.0002	0.95
60	0.0000	0.00	0.0000	0.00	0.0000	0.00
61	0.0000	0.00	0.0002	1.40	0.0001	1.40
62	0.0000	0.00	0.0003	1.00	0.0002	1.00
63	0.0000	0.00	0.0000	0.00	0.0000	0.00
64	0.0000	0.00	0.0002	1.47	0.0001	1.47
65	0.0000	0.00	0.0002	1.41	0.0001	1.41
66	0.0003	1.36	0.0000	0.00	0.0001	1.36
67	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	0.00	0.0000	0.00
71	0.0000	0.00	0.0001	1.36	0.0001	1.36
72	0.0000	0.00	0.0000	0.00	0.0000	0.00
73	0.0000	0.00	0.0000	0.00	0.0000	0.00
74	0.0000	0.00	0.0000	0.00	0.0000	0.00
75	0.0000	0.00	0.0000	0.00	0.0000	0.00
76	0.0000	0.00	0.0000	0.00	0.0000	0.00
77	0.0000	0.00	0.0000	0.00	0.0000	0.00
78	0.0000	0.00	0.0000	0.00	0.0000	0.00
79	0.0000	0.00	0.0000	0.00	0.0000	0.00
80	0.0000	0.00	0.0000	0.00	0.0000	0.00
Nt	358 450		327 923		715 113	
n	4 289		4 920		9 209	

Appendix 8 – continued:
Estimates of proportion at length with CVs (bootstrap estimates) for snapper from the East Northland modular harvest system fishery in 2022–23.

P.i. = proportion of fish in length class. *Nt* = total number of fish caught.
CV = coefficient of variation. *n* = total number of fish sampled.

Length	Spring-summer		Autumn-winter		Spring-winter	
(cm)	*P.i.*	CV	*P.i.*	CV	*P.i.*	CV
20	–	–	0.0000	0.00	–	–
21	–	–	0.0000	0.00	–	–
22	–	–	0.0000	0.00	–	–
23	–	–	0.0004	1.40	–	–
24	–	–	0.0018	0.64	–	–
25	–	–	0.0053	0.74	–	–
26	–	–	0.0224	0.38	–	–
27	–	–	0.0463	0.27	–	–
28	–	–	0.0546	0.18	–	–
29	–	–	0.0870	0.15	–	–
30	–	–	0.0731	0.12	–	–
31	–	–	0.0989	0.11	–	–
32	–	–	0.0856	0.11	–	–
33	–	–	0.0918	0.10	–	–
34	–	–	0.0627	0.13	–	–
35	–	–	0.0651	0.11	–	–
36	–	–	0.0581	0.13	–	–
37	–	–	0.0437	0.16	–	–
38	–	–	0.0339	0.13	–	–
39	–	–	0.0311	0.19	–	–
40	–	–	0.0300	0.19	–	–
41	–	–	0.0192	0.21	–	–
42	–	–	0.0163	0.27	–	–
43	–	–	0.0148	0.27	–	–
44	–	–	0.0141	0.27	–	–
45	–	–	0.0074	0.30	–	–
46	–	–	0.0072	0.35	–	–
47	–	–	0.0050	0.42	–	–
48	–	–	0.0053	0.40	–	–
49	–	–	0.0060	0.33	–	–
50	–	–	0.0018	0.66	–	–
51	–	–	0.0023	0.62	–	–
52	–	–	0.0013	0.65	–	–
53	–	–	0.0021	0.52	–	–
54	–	–	0.0007	1.12	–	–
55	–	–	0.0004	1.16	–	–
56	–	–	0.0009	0.91	–	–
57	–	–	0.0011	0.82	–	–
58	–	–	0.0006	1.09	–	–
59	–	–	0.0004	1.43	–	–
60	–	–	0.0000	0.00	–	–
61	–	–	0.0000	0.00	–	–
62	–	–	0.0001	1.35	–	–
63	–	–	0.0002	1.01	–	–
64	–	–	0.0001	1.46	–	–
65	–	–	0.0000	0.00	–	–
66	–	–	0.0000	0.00	–	–
67	–	–	0.0000	0.00	–	–
68	–	–	0.0003	1.29	–	–
69	–	–	0.0000	0.00	–	–
70	–	–	0.0000	0.00	–	–
71	–	–	0.0000	0.00	–	–
72	–	–	0.0000	0.00	–	–
73	–	–	0.0000	0.00	–	–
74	–	–	0.0000	0.00	–	–
75	–	–	0.0000	0.00	–	–
76	–	–	0.0000	0.00	–	–
77	–	–	0.0000	0.00	–	–
78	–	–	0.0000	0.00	–	–
79	–	–	0.0000	0.00	–	–
80	–	–	0.0000	0.00	–	–
Nt			220 183			
n			3 130			

Appendix 8 – continued:
Estimates of proportion at length with CVs (bootstrap estimates) for snapper from the Bay of Plenty modular harvest system fishery in 2022–23.

P.i. = proportion of fish in length class. *Nt* = total number of fish caught.
CV = coefficient of variation. *n* = total number of fish sampled.

Length	Spring-summer		Autumn-winter		Spring-winter	
(cm)	*P.i.*	CV	*P.i.*	CV	*P.i.*	CV
20	0.0000	0.00	0.0000	0.00	0.0000	0.00
21	0.0000	0.00	0.0000	0.00	0.0000	0.00
22	0.0000	0.00	0.0000	0.00	0.0000	0.00
23	0.0003	1.35	0.0015	0.93	0.0009	0.82
24	0.0058	0.31	0.0146	0.53	0.0107	0.41
25	0.0758	0.13	0.0644	0.24	0.0694	0.14
26	0.1046	0.11	0.1105	0.19	0.1079	0.12
27	0.1151	0.09	0.1196	0.10	0.1176	0.07
28	0.0979	0.08	0.1058	0.09	0.1023	0.06
29	0.0947	0.09	0.1058	0.09	0.1009	0.07
30	0.0920	0.08	0.0928	0.09	0.0925	0.06
31	0.0808	0.10	0.0762	0.10	0.0782	0.07
32	0.0646	0.09	0.0669	0.11	0.0659	0.08
33	0.0513	0.10	0.0502	0.10	0.0507	0.07
34	0.0430	0.11	0.0388	0.14	0.0407	0.09
35	0.0385	0.12	0.0363	0.17	0.0372	0.11
36	0.0273	0.16	0.0277	0.16	0.0275	0.11
37	0.0240	0.17	0.0210	0.17	0.0223	0.12
38	0.0182	0.19	0.0124	0.29	0.0150	0.18
39	0.0159	0.18	0.0121	0.28	0.0138	0.17
40	0.0122	0.21	0.0081	0.34	0.0099	0.19
41	0.0101	0.23	0.0075	0.31	0.0087	0.19
42	0.0074	0.28	0.0052	0.36	0.0061	0.22
43	0.0062	0.30	0.0042	0.44	0.0051	0.26
44	0.0030	0.44	0.0051	0.35	0.0042	0.28
45	0.0026	0.40	0.0026	0.47	0.0026	0.31
46	0.0029	0.34	0.0019	0.66	0.0023	0.36
47	0.0010	0.62	0.0012	0.72	0.0011	0.49
48	0.0011	0.55	0.0020	0.58	0.0016	0.45
49	0.0011	0.63	0.0007	0.94	0.0009	0.54
50	0.0007	0.77	0.0010	0.92	0.0008	0.65
51	0.0002	1.40	0.0007	0.98	0.0005	0.84
52	0.0004	1.03	0.0016	0.97	0.0011	0.82
53	0.0004	0.98	0.0006	1.00	0.0005	0.75
54	0.0003	1.46	0.0009	1.03	0.0006	0.88
55	0.0000	0.00	0.0000	0.00	0.0000	0.00
56	0.0004	1.21	0.0002	1.33	0.0003	0.89
57	0.0000	0.00	0.0000	0.00	0.0000	0.00
58	0.0000	0.00	0.0000	0.00	0.0000	0.00
59	0.0000	0.00	0.0000	0.00	0.0000	0.00
60	0.0000	0.00	0.0000	0.00	0.0000	0.00
61	0.0000	0.00	0.0000	0.00	0.0000	0.00
62	0.0000	0.00	0.0000	0.00	0.0000	0.00
63	0.0000	0.00	0.0000	0.00	0.0000	0.00
64	0.0000	0.00	0.0000	0.00	0.0000	0.00
65	0.0000	0.00	0.0000	0.00	0.0000	0.00
66	0.0000	0.00	0.0000	0.00	0.0000	0.00
67	0.0000	0.00	0.0000	0.00	0.0000	0.00
68	0.0000	0.00	0.0000	0.00	0.0000	0.00
69	0.0000	0.00	0.0000	0.00	0.0000	0.00
70	0.0000	0.00	0.0000	0.00	0.0000	0.00
71	0.0002	1.40	0.0000	0.00	0.0001	1.40
72	0.0000	0.00	0.0000	0.00	0.0000	0.00
73	0.0000	0.00	0.0000	0.00	0.0000	0.00
74	0.0000	0.00	0.0000	0.00	0.0000	0.00
75	0.0000	0.00	0.0000	0.00	0.0000	0.00
76	0.0000	0.00	0.0000	0.00	0.0000	0.00
77	0.0000	0.00	0.0000	0.00	0.0000	0.00
78	0.0000	0.00	0.0000	0.00	0.0000	0.00
79	0.0000	0.00	0.0000	0.00	0.0000	0.00
80	0.0000	0.00	0.0000	0.00	0.0000	0.00
Nt	319 501		348 639		668 140	
n	4 162		3 785		7 947	

Appendix 9: Estimated seasonal proportion at age and coefficients of variation (CVs) for snapper power method fisheries in SNA 1 and SNA 2 in 2022–23.

Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the East Northland bottom trawl fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
2	0.0000	0.00	–	0.0026	0.66	4	0.0011	0.66	4
3	0.0018	0.79	2	0.0230	0.33	22	0.0110	0.30	24
4	0.0319	0.28	21	0.0141	0.42	19	0.0242	0.23	40
5	0.0698	0.18	53	0.0606	0.24	47	0.0658	0.14	100
6	0.0440	0.21	34	0.0288	0.27	25	0.0374	0.17	59
7	0.0703	0.18	47	0.0450	0.25	39	0.0593	0.14	86
8	0.0704	0.18	48	0.0822	0.19	52	0.0755	0.13	100
9	0.1334	0.14	73	0.1068	0.18	69	0.1219	0.11	142
10	0.0698	0.17	35	0.0955	0.15	56	0.0809	0.12	91
11	0.0624	0.19	28	0.0780	0.16	46	0.0691	0.13	74
12	0.1382	0.13	64	0.1347	0.12	71	0.1367	0.09	135
13	0.0614	0.19	31	0.0396	0.25	24	0.0519	0.15	55
14	0.0470	0.21	24	0.0574	0.19	30	0.0515	0.15	54
15	0.0373	0.26	17	0.0387	0.25	24	0.0379	0.18	41
16	0.0316	0.29	14	0.0510	0.20	34	0.0400	0.17	48
17	0.0195	0.31	12	0.0246	0.29	17	0.0217	0.21	29
18	0.0153	0.34	10	0.0228	0.30	15	0.0185	0.23	25
19	0.0069	0.56	4	0.0091	0.40	10	0.0079	0.35	14
20	0.0255	0.25	19	0.0294	0.28	26	0.0272	0.19	45
21	0.0110	0.45	6	0.0080	0.43	7	0.0097	0.33	13
22	0.0062	0.50	8	0.0043	0.58	5	0.0054	0.38	13
23	0.0075	0.41	8	0.0157	0.36	14	0.0111	0.27	22
24	0.0227	0.28	20	0.0091	0.37	12	0.0168	0.24	32
25	0.0019	0.72	2	0.0031	0.58	4	0.0025	0.44	6
26	0.0047	0.55	4	0.0010	0.94	3	0.0031	0.49	7
27	0.0032	0.60	4	0.0014	0.85	2	0.0024	0.49	6
28	0.0003	1.55	1	0.0018	0.82	2	0.0010	0.73	3
29	0.0031	0.93	2	0.0013	0.80	3	0.0023	0.73	5
>29	0.0026	0.72	5	0.0094	0.39	22	0.0055	0.36	27
			596			704			1 300

Appendix 9 – continued:
Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the Hauraki Gulf bottom trawl fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	–	–	–	–	–	–	0.0000	0.00	–
2	–	–	–	–	–	–	0.0000	0.00	–
3	–	–	–	–	–	–	0.0031	0.60	4
4	–	–	–	–	–	–	0.0103	0.42	19
5	–	–	–	–	–	–	0.0294	0.27	32
6	–	–	–	–	–	–	0.0507	0.21	56
7	–	–	–	–	–	–	0.0739	0.18	82
8	–	–	–	–	–	–	0.0949	0.16	99
9	–	–	–	–	–	–	0.1073	0.11	113
10	–	–	–	–	–	–	0.1065	0.10	113
11	–	–	–	–	–	–	0.1055	0.09	111
12	–	–	–	–	–	–	0.0741	0.11	82
13	–	–	–	–	–	–	0.0597	0.13	69
14	–	–	–	–	–	–	0.0702	0.12	78
15	–	–	–	–	–	–	0.0384	0.17	50
16	–	–	–	–	–	–	0.0710	0.12	88
17	–	–	–	–	–	–	0.0266	0.21	35
18	–	–	–	–	–	–	0.0133	0.28	23
19	–	–	–	–	–	–	0.0208	0.22	31
20	–	–	–	–	–	–	0.0160	0.28	29
21	–	–	–	–	–	–	0.0086	0.33	20
22	–	–	–	–	–	–	0.0063	0.42	23
23	–	–	–	–	–	–	0.0066	0.40	16
24	–	–	–	–	–	–	0.0020	0.52	16
25	–	–	–	–	–	–	0.0030	0.50	15
26	–	–	–	–	–	–	0.0002	1.31	4
27	–	–	–	–	–	–	0.0007	0.85	6
28	–	–	–	–	–	–	0.0001	10.29	5
29	–	–	–	–	–	–	0.0001	1.73	4
>29	–	–	–	–	–	–	0.0009	0.77	30
									1 253

Appendix 9 – continued:
Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the Bay of Plenty bottom trawl fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
2	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
3	0.0028	0.71	3	0.0213	0.40	6	0.0124	0.36	9
4	0.0615	0.22	38	0.1383	0.15	66	0.1012	0.12	104
5	0.1034	0.16	46	0.1390	0.15	63	0.1218	0.10	109
6	0.1047	0.15	50	0.0976	0.16	50	0.1010	0.11	100
7	0.1004	0.15	51	0.1181	0.14	65	0.1096	0.09	116
8	0.1340	0.12	70	0.0963	0.14	56	0.1145	0.09	126
9	0.1126	0.13	58	0.1053	0.13	65	0.1088	0.09	123
10	0.1000	0.13	58	0.0730	0.15	49	0.0860	0.10	107
11	0.0455	0.19	28	0.0581	0.16	45	0.0520	0.13	73
12	0.0552	0.17	35	0.0331	0.22	28	0.0438	0.14	63
13	0.0301	0.25	20	0.0137	0.30	14	0.0216	0.20	34
14	0.0305	0.21	24	0.0293	0.21	28	0.0299	0.15	52
15	0.0274	0.24	20	0.0258	0.24	23	0.0266	0.17	43
16	0.0282	0.23	20	0.0125	0.32	15	0.0201	0.19	35
17	0.0120	0.31	12	0.0059	0.38	11	0.0089	0.26	23
18	0.0079	0.45	7	0.0077	0.45	9	0.0078	0.32	16
19	0.0081	0.48	8	0.0070	0.37	11	0.0076	0.30	19
20	0.0073	0.36	14	0.0023	0.79	5	0.0047	0.34	19
21	0.0061	0.43	7	0.0037	0.52	8	0.0048	0.34	15
22	0.0035	0.46	8	0.0041	0.50	10	0.0038	0.35	18
23	0.0028	0.50	8	0.0009	0.72	4	0.0018	0.41	12
24	0.0090	0.34	19	0.0016	0.56	6	0.0052	0.29	25
25	0.0018	0.80	5	0.0007	0.85	3	0.0013	0.58	8
26	0.0000	0.00	–	0.0001	1.43	1	0.0000	1.43	1
27	0.0017	0.71	4	0.0023	1.03	1	0.0020	0.69	5
28	0.0008	0.84	4	0.0001	1.10	3	0.0004	0.69	7
29	0.0009	0.79	5	0.0002	1.46	1	0.0005	0.72	6
>29	0.0017	0.62	9	0.0019	0.57	10	0.0018	0.42	19
			631			656			1 287

Appendix 9 – continued:
Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the Hauraki Gulf Danish seine fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
2	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
3	0.0000	0.00	–	0.0030	0.77	4	0.0017	0.77	4
4	0.0005	1.03	5	0.0036	0.62	14	0.0023	0.57	19
5	0.0039	0.48	14	0.0189	0.39	18	0.0125	0.34	32
6	0.0137	0.34	33	0.0275	0.28	23	0.0216	0.22	56
7	0.0308	0.28	44	0.0472	0.26	38	0.0402	0.19	82
8	0.0361	0.27	43	0.0785	0.19	56	0.0604	0.15	99
9	0.0586	0.20	46	0.1065	0.15	67	0.0860	0.12	113
10	0.0867	0.19	53	0.0974	0.16	60	0.0928	0.12	113
11	0.0814	0.18	47	0.1131	0.14	64	0.0995	0.11	111
12	0.0616	0.20	43	0.0794	0.17	39	0.0717	0.13	82
13	0.0701	0.20	32	0.0696	0.17	37	0.0698	0.13	69
14	0.1028	0.19	42	0.0766	0.18	36	0.0878	0.13	78
15	0.0712	0.23	28	0.0442	0.24	22	0.0558	0.17	50
16	0.1078	0.16	49	0.0842	0.18	39	0.0943	0.12	88
17	0.0593	0.25	20	0.0255	0.28	15	0.0400	0.19	35
18	0.0257	0.31	14	0.0198	0.38	9	0.0223	0.25	23
19	0.0301	0.31	14	0.0322	0.27	17	0.0313	0.20	31
20	0.0430	0.27	19	0.0159	0.37	10	0.0275	0.22	29
21	0.0241	0.31	14	0.0124	0.52	6	0.0174	0.29	20
22	0.0191	0.37	13	0.0140	0.39	10	0.0162	0.27	23
23	0.0295	0.34	10	0.0051	0.52	6	0.0155	0.29	16
24	0.0052	0.51	6	0.0119	0.41	10	0.0091	0.33	16
25	0.0143	0.46	10	0.0060	0.64	5	0.0096	0.37	15
26	0.0008	1.04	2	0.0019	0.84	2	0.0014	0.67	4
27	0.0062	0.62	4	0.0008	1.04	2	0.0031	0.55	6
28	0.0019	0.82	3	0.0005	0.99	2	0.0011	0.65	5
29	0.0000	0.00	–	0.0019	0.72	4	0.0011	0.72	4
>29	0.0154	0.34	23	0.0023	0.63	7	0.0079	0.30	30
			631			622			1 253

Appendix 9 – continued:
Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the Bay of Plenty Danish seine fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
2	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
3	0.0017	0.80	3	0.0084	0.51	6	0.0049	0.44	9
4	0.0547	0.26	38	0.0820	0.21	66	0.0676	0.16	104
5	0.0970	0.18	46	0.0968	0.16	63	0.0969	0.12	109
6	0.1033	0.18	50	0.0841	0.16	50	0.0942	0.12	100
7	0.1033	0.15	51	0.1140	0.13	65	0.1084	0.09	116
8	0.1410	0.12	70	0.0992	0.14	56	0.1212	0.09	126
9	0.1158	0.13	58	0.1172	0.13	65	0.1165	0.09	123
10	0.1079	0.13	58	0.0899	0.14	49	0.0994	0.10	107
11	0.0478	0.20	28	0.0748	0.15	45	0.0606	0.12	73
12	0.0571	0.17	35	0.0453	0.20	28	0.0515	0.13	63
13	0.0331	0.24	20	0.0212	0.29	14	0.0275	0.19	34
14	0.0329	0.21	24	0.0428	0.21	28	0.0376	0.15	52
15	0.0287	0.24	20	0.0364	0.23	23	0.0323	0.17	43
16	0.0275	0.24	20	0.0202	0.29	15	0.0240	0.18	35
17	0.0124	0.34	12	0.0119	0.33	11	0.0122	0.25	23
18	0.0063	0.50	7	0.0112	0.42	9	0.0086	0.32	16
19	0.0067	0.49	8	0.0114	0.34	11	0.0089	0.28	19
20	0.0052	0.37	14	0.0034	0.66	5	0.0044	0.35	19
21	0.0046	0.42	7	0.0064	0.45	8	0.0055	0.31	15
22	0.0023	0.56	8	0.0089	0.41	10	0.0054	0.34	18
23	0.0021	0.74	8	0.0018	0.66	4	0.0019	0.51	12
24	0.0062	0.39	19	0.0034	0.50	6	0.0049	0.31	25
25	0.0005	1.01	5	0.0012	0.79	3	0.0008	0.64	8
26	0.0000	0.00	–	0.0005	1.10	1	0.0002	1.10	1
27	0.0011	0.69	4	0.0032	1.06	1	0.0021	0.79	5
28	0.0003	1.00	4	0.0006	0.89	3	0.0004	0.68	7
29	0.0000	5.85	5	0.0006	1.25	1	0.0003	1.24	6
>29	0.0005	0.97	9	0.0029	0.51	10	0.0016	0.46	19
			631			656			1 287

Appendix 9 – continued:
Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the East Northland modular harvest system fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	–	–	–	0.0000	0.00	–	–	–	–
2	–	–	–	0.0054	0.57	4	–	–	–
3	–	–	–	0.0349	0.26	22	–	–	–
4	–	–	–	0.0250	0.29	19	–	–	–
5	–	–	–	0.0735	0.17	47	–	–	–
6	–	–	–	0.0354	0.23	25	–	–	–
7	–	–	–	0.0622	0.20	39	–	–	–
8	–	–	–	0.0900	0.15	52	–	–	–
9	–	–	–	0.1177	0.12	69	–	–	–
10	–	–	–	0.0917	0.13	56	–	–	–
11	–	–	–	0.0684	0.16	46	–	–	–
12	–	–	–	0.1145	0.13	71	–	–	–
13	–	–	–	0.0377	0.23	24	–	–	–
14	–	–	–	0.0505	0.19	30	–	–	–
15	–	–	–	0.0317	0.24	24	–	–	–
16	–	–	–	0.0430	0.20	34	–	–	–
17	–	–	–	0.0197	0.27	17	–	–	–
18	–	–	–	0.0193	0.28	15	–	–	–
19	–	–	–	0.0079	0.37	10	–	–	–
20	–	–	–	0.0229	0.25	26	–	–	–
21	–	–	–	0.0070	0.41	7	–	–	–
22	–	–	–	0.0035	0.54	5	–	–	–
23	–	–	–	0.0130	0.36	14	–	–	–
24	–	–	–	0.0086	0.37	12	–	–	–
25	–	–	–	0.0033	0.57	4	–	–	–
26	–	–	–	0.0015	0.75	3	–	–	–
27	–	–	–	0.0010	0.91	2	–	–	–
28	–	–	–	0.0012	0.89	2	–	–	–
29	–	–	–	0.0012	0.80	3	–	–	–
>29	–	–	–	0.0079	0.36	22	–	–	–

Appendix 9 – continued:
Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the Bay of Plenty modular harvest system fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
2	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
3	0.0089	0.71	3	0.0338	0.39	6	0.0229	0.34	9
4	0.1283	0.19	38	0.1985	0.14	66	0.1677	0.11	104
5	0.1696	0.14	46	0.1843	0.15	63	0.1779	0.11	109
6	0.1567	0.15	50	0.1095	0.18	50	0.1302	0.11	100
7	0.1095	0.16	51	0.1194	0.15	65	0.1151	0.10	116
8	0.1168	0.13	70	0.0874	0.17	56	0.1003	0.11	126
9	0.0908	0.15	58	0.0814	0.15	65	0.0855	0.10	123
10	0.0702	0.15	58	0.0523	0.16	49	0.0602	0.11	107
11	0.0266	0.21	28	0.0402	0.19	45	0.0342	0.15	73
12	0.0333	0.19	35	0.0191	0.23	28	0.0253	0.15	63
13	0.0182	0.26	20	0.0082	0.32	14	0.0126	0.21	34
14	0.0163	0.24	24	0.0168	0.24	28	0.0166	0.17	52
15	0.0166	0.27	20	0.0161	0.25	23	0.0163	0.19	43
16	0.0141	0.25	20	0.0067	0.33	15	0.0099	0.21	35
17	0.0056	0.34	12	0.0041	0.37	11	0.0048	0.26	23
18	0.0037	0.52	7	0.0045	0.43	9	0.0041	0.33	16
19	0.0035	0.54	8	0.0045	0.40	11	0.0041	0.30	19
20	0.0027	0.39	14	0.0016	0.71	5	0.0021	0.39	19
21	0.0020	0.46	7	0.0022	0.54	8	0.0021	0.37	15
22	0.0010	0.60	8	0.0025	0.48	10	0.0019	0.38	18
23	0.0011	0.74	8	0.0010	0.72	4	0.0010	0.52	12
24	0.0033	0.41	19	0.0013	0.63	6	0.0021	0.34	25
25	0.0004	0.99	5	0.0005	0.93	3	0.0005	0.67	8
26	0.0000	0.00	–	0.0001	1.62	1	0.0001	1.62	1
27	0.0005	0.79	4	0.0012	1.11	1	0.0009	0.86	5
28	0.0002	1.28	4	0.0002	1.86	3	0.0002	1.09	7
29	0.0000	0.00	5	0.0001	1.91	1	0.0001	1.91	6
>29	0.0001	2.21	9	0.0022	0.82	10	0.0012	0.81	19
			631			656			1 287

Appendix 9 – continued:
Estimates of proportion at age with CVs (bootstrap estimates) for snapper from the SNA 2N bottom trawl fishery in 2022–23.

P.j., proportion of fish in age class; CV, coefficient of variation; *n* , otolith sample size

Age	Spring-summer			Autumn-winter			Spring-winter		
(years)	*P.j.*	CV	*n*	*P.j.*	CV	*n*	*P.j.*	CV	*n*
1	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
2	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
3	0.0040	0.70	2	0.0344	0.24	17	0.0224	0.23	19
4	0.1914	0.10	95	0.3273	0.07	163	0.2738	0.05	258
5	0.1067	0.13	57	0.1279	0.12	68	0.1195	0.09	125
6	0.0516	0.19	32	0.0715	0.17	39	0.0637	0.13	71
7	0.0569	0.18	36	0.0539	0.18	37	0.0551	0.12	73
8	0.1689	0.10	103	0.1229	0.11	85	0.1410	0.08	188
9	0.0822	0.14	55	0.0571	0.15	45	0.0670	0.10	100
10	0.1113	0.12	71	0.0520	0.18	38	0.0753	0.10	109
11	0.0492	0.16	35	0.0285	0.24	18	0.0366	0.13	53
12	0.0346	0.22	23	0.0254	0.21	22	0.0290	0.15	45
13	0.0259	0.25	18	0.0091	0.38	7	0.0157	0.21	25
14	0.0161	0.30	12	0.0087	0.41	7	0.0116	0.25	19
15	0.0337	0.23	21	0.0303	0.25	18	0.0316	0.18	39
16	0.0095	0.43	6	0.0125	0.37	8	0.0113	0.29	14
17	0.0027	0.71	2	0.0012	0.98	1	0.0018	0.59	3
18	0.0058	0.61	3	0.0040	0.74	2	0.0047	0.50	5
19	0.0026	1.00	1	0.0020	0.97	1	0.0022	0.71	2
20	0.0091	0.39	6	0.0045	0.50	4	0.0063	0.32	10
21	0.0000	0.00	–	0.0034	0.55	3	0.0021	0.55	3
22	0.0070	0.49	4	0.0034	0.62	3	0.0048	0.40	7
23	0.0081	0.49	4	0.0061	0.53	4	0.0069	0.38	8
24	0.0124	0.38	7	0.0051	0.66	2	0.0080	0.34	9
25	0.0034	0.79	2	0.0022	0.75	2	0.0027	0.55	4
26	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
27	0.0045	0.56	3	0.0034	0.53	3	0.0038	0.40	6
28	0.0000	0.00	–	0.0011	0.98	1	0.0007	0.98	1
29	0.0000	0.00	–	0.0000	0.00	–	0.0000	0.00	–
>29	0.0023	0.61	2	0.0025	0.62	2	0.0025	0.46	4
			600			600			1 200

Appendix 10: Age-length keys derived from snapper otolith samples collected from bottom longline and power method fisheries in SNA 1 and SNA 2 in 2022–23.

Estimates of proportion of length at age for snapper sampled from East Northland bottom longline, modular harvest system and bottom trawl fisheries, spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
24	0	0	0	0.50	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
25	0	0	0	0.18	0.29	0.35	0.18	0	0	0	0	0	0	0	0	0	0	0	0	0	17
26	0	0.02	0.07	0.17	0.19	0.14	0.21	0.12	0.07	0	0	0	0	0	0	0	0	0	0	0	42
27	0	0	0.10	0.06	0.17	0.13	0.21	0.17	0.08	0.02	0.03	0.02	0.02	0	0	0	0	0	0	0	63
28	0	0.03	0.05	0.04	0.17	0.09	0.15	0.18	0.18	0.04	0	0.04	0.01	0	0	0.03	0	0	0	0	78
29	0	0.01	0.04	0.05	0.16	0.04	0.14	0.16	0.23	0.04	0.02	0.04	0.02	0.01	0	0	0.01	0.01	0	0	97
30	0	0	0.03	0.04	0.13	0.09	0.09	0.09	0.29	0.09	0.03	0.03	0.04	0.01	0.01	0	0	0.01	0	0	68
31	0	0	0.01	0.03	0.06	0.05	0.05	0.12	0.18	0.16	0.04	0.16	0.06	0.02	0.01	0.01	0	0.01	0	0	93
32	0	0	0.02	0.01	0.07	0.06	0.09	0.10	0.15	0.14	0.11	0.13	0.05	0.03	0.01	0.02	0.01	0	0	0	94
33	0	0	0	0.03	0.10	0.01	0.07	0.10	0.14	0.07	0.07	0.18	0.01	0.10	0.04	0.06	0.01	0	0	0.01	72
34	0	0	0	0.04	0.08	0.06	0.06	0.06	0.11	0.11	0.06	0.14	0.06	0.11	0.03	0.06	0	0.03	0	0.01	72
35	0	0	0	0.03	0.03	0.02	0.03	0.10	0.10	0.08	0.10	0.19	0.10	0.05	0.06	0.03	0.02	0.02	0	0.05	62
36	0	0	0.02	0	0.07	0.05	0.03	0.03	0.11	0.10	0.15	0.20	0.05	0.02	0.05	0.07	0.02	0.03	0	0.02	61
37	0	0	0.02	0	0.02	0.02	0.04	0.04	0.10	0.14	0.06	0.20	0.02	0.06	0.06	0.02	0.10	0	0.02	0.10	51
38	0	0	0	0	0.02	0.02	0	0.05	0.11	0.11	0.11	0.28	0.05	0.07	0.04	0.04	0.02	0.02	0.02	0.07	57
39	0	0	0	0	0	0	0.02	0.04	0.06	0.06	0.18	0.14	0.16	0.10	0.06	0.02	0.02	0	0.04	0.12	51
40	0	0	0	0	0	0	0	0	0	0.07	0.13	0.16	0.04	0.11	0.07	0.07	0.02	0.09	0.02	0.22	45
41	0	0	0	0	0	0	0	0	0.02	0.05	0.09	0.14	0.07	0.05	0.05	0.09	0.12	0.02	0.02	0.28	43
42	0	0	0	0	0	0	0	0	0	0	0	0.09	0.09	0.04	0.13	0.22	0.04	0.04	0.04	0.30	23
43	0	0	0	0	0	0	0	0	0.03	0.06	0	0.03	0	0.03	0.16	0.16	0	0.03	0.03	0.45	31
44	0	0	0	0	0	0	0	0.04	0	0.09	0	0.04	0	0.09	0.09	0.17	0.04	0.17	0	0.26	23
45	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0.10	0.05	0.14	0.14	0	0.05	0.43	21
46	0	0	0	0	0	0	0	0.05	0	0	0.05	0.05	0	0.05	0.05	0	0.10	0.14	0	0.52	21
47	0	0	0	0	0	0	0	0	0	0	0.07	0	0	0.07	0	0	0	0.07	0.07	0.71	14
48	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0	0	0	0.11	0	0	0.78	9
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0.10	0.80	10
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0.09	0	0	0.82	11
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0.88	8
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0.20	0	0.60	5
53	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0	0	0	0	0.29	0.57	7
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0	0	0	0.86	7
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0.80	5
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	4
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	4
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					1 300

Appendix 10 – continued:
Estimates of proportion of length at age for snapper sampled from the Hauraki Gulf bottom longline, bottom trawl and Danish seine fisheries, spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	0	0	0.43	0.17	0.22	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0	23
26	0	0	0.03	0.23	0.11	0.11	0.17	0.17	0.06	0.06	0.03	0.03	0	0	0	0	0	0	0	0	35
27	0	0	0.02	0.02	0.14	0.12	0.18	0.24	0.14	0.08	0.04	0.02	0	0	0	0	0	0	0	0	50
28	0	0	0	0	0.13	0.16	0.13	0.13	0.10	0.11	0.10	0.04	0.03	0.03	0.01	0.03	0	0	0	0	70
29	0	0	0.01	0	0.07	0.11	0.16	0.15	0.18	0.09	0.05	0.06	0.07	0.02	0.01	0.01	0	0	0	0	99
30	0	0	0	0	0	0.09	0.10	0.14	0.12	0.13	0.11	0.08	0.02	0.05	0.04	0.04	0.01	0.01	0.03	0.03	107
31	0	0	0	0	0	0.04	0.13	0.13	0.13	0.13	0.14	0.10	0.05	0.04	0.05	0.07	0	0	0	0	124
32	0	0	0	0	0	0.02	0.03	0.08	0.12	0.19	0.13	0.12	0.07	0.11	0.02	0.06	0.02	0.01	0.01	0.01	95
33	0	0	0	0	0	0	0.02	0.08	0.16	0.14	0.17	0.07	0.08	0.06	0.03	0.08	0.06	0.02	0.01	0	86
34	0	0	0	0	0.01	0.01	0.04	0.04	0.13	0.09	0.19	0.10	0.09	0.11	0	0.10	0.06	0	0.01	0.01	70
35	0	0	0	0	0	0.01	0.03	0.04	0.04	0.10	0.12	0.08	0.15	0.11	0.07	0.15	0.03	0	0.04	0.03	73
36	0	0	0	0	0	0	0	0.04	0.08	0.08	0.14	0.10	0.08	0.16	0.06	0.08	0.06	0.02	0.04	0.08	51
37	0	0	0	0	0	0	0.03	0.03	0.08	0.11	0.08	0.03	0.03	0.19	0.14	0.11	0.11	0.03	0	0.05	37
38	0	0	0	0	0	0	0	0.05	0.05	0.13	0.03	0.13	0.10	0.03	0.10	0.18	0.05	0.03	0.05	0.10	40
39	0	0	0	0	0	0	0	0	0.04	0.04	0.19	0.15	0.12	0.04	0.08	0.15	0	0.04	0	0.15	26
40	0	0	0	0	0	0	0	0	0.04	0.08	0.04	0	0.08	0.17	0.08	0.13	0.04	0.08	0.04	0.21	24
41	0	0	0	0	0	0	0	0	0	0	0.07	0.07	0.07	0.13	0	0.27	0	0.07	0.07	0.27	15
42	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0.28	0.11	0	0.06	0.11	0.22	0.17	18
43	0	0	0	0	0	0	0	0	0.06	0.06	0	0	0	0.06	0.11	0.06	0.11	0.06	0.17	0.33	18
44	0	0	0	0	0	0	0	0	0.06	0	0	0	0.06	0.06	0.06	0.22	0.17	0	0.17	0.22	18
45	0	0	0	0	0	0	0	0	0	0	0	0.07	0.14	0.07	0.21	0.14	0	0.07	0	0.29	14
46	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0.17	0	0	0	0.75	12
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0.11	0.11	0	0	0	0.67	9
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0.11	0	0.11	0.67	9
49	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0.10	0.10	0.10	0.30	0.10	0	0.20	10
50	0	0	0	0	0	0	0	0	0	0	0	0.10	0.10	0	0	0	0	0.20	0.10	0.50	10
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.11	0	0.22	0.11	0.56	9
52	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0.13	0	0.13	0	0	0.63	8
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0.80	5
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	7
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0.88	8
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	7
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0.75	4
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	4
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0	0.20	0	0.60	5
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0.83	6
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	4
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	5
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.20	0.20	0.60	5
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	6
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
Total																					1 253

Appendix 10 – continued:

Estimates of proportion of length at age for snapper sampled from the Bay of Plenty bottom longline, bottom trawl, Danish seine and modular harvest system fisheries, spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0.88	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
24	0	0	0	0.71	0.17	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
25	0	0	0.05	0.43	0.22	0.08	0.16	0.05	0	0	0	0	0	0	0	0	0	0	0	0	37
26	0	0	0.05	0.21	0.42	0.24	0.03	0.03	0.03	0	0	0	0	0	0	0	0	0	0	0	38
27	0	0	0.09	0.27	0.25	0.25	0.05	0.05	0.05	0	0	0	0	0	0	0	0	0	0	0	44
28	0	0	0	0.33	0.20	0.12	0.18	0.12	0.02	0.02	0.02	0	0	0	0	0	0	0	0	0	51
29	0	0	0	0.25	0.30	0.08	0.13	0.07	0.13	0.02	0.02	0	0	0	0	0	0	0	0	0	60
30	0	0	0	0.10	0.21	0.19	0.17	0.10	0.07	0.10	0.02	0.01	0.01	0	0.01	0	0	0	0	0	81
31	0	0	0	0.02	0.13	0.20	0.16	0.20	0.16	0.07	0	0.02	0	0.01	0.01	0	0	0	0	0	83
32	0	0	0	0	0.06	0.11	0.15	0.22	0.11	0.16	0.09	0.04	0	0.02	0.05	0	0	0	0	0	82
33	0	0	0	0.02	0.05	0.10	0.26	0.15	0.18	0.07	0.07	0.05	0.03	0	0	0	0	0.01	0	0	97
34	0	0	0	0	0.01	0.08	0.14	0.18	0.16	0.19	0.05	0.04	0.05	0.03	0.02	0.01	0	0	0.01	0.01	91
35	0	0	0	0	0.01	0.01	0.12	0.18	0.24	0.12	0.08	0.07	0.01	0.04	0.04	0.01	0.01	0.03	0.01	0.01	76
36	0	0	0	0	0.02	0.03	0.02	0.15	0.18	0.24	0.10	0.10	0.06	0.03	0.03	0.02	0.02	0	0.02	0	62
37	0	0	0	0	0	0	0.05	0.13	0.13	0.15	0.15	0.11	0.05	0.07	0.05	0.08	0.02	0	0.02	0	61
38	0	0	0	0	0	0.02	0	0.08	0.10	0.11	0.16	0.13	0.03	0.13	0.10	0.05	0.02	0.02	0.02	0.03	61
39	0	0	0	0	0	0.04	0	0.04	0.04	0.22	0.04	0.13	0.09	0.09	0.04	0.13	0	0.04	0.04	0.04	23
40	0	0	0	0	0	0	0	0	0.06	0.13	0.19	0.13	0.10	0.10	0.13	0.10	0	0	0	0.06	31
41	0	0	0	0	0	0	0	0	0.03	0.08	0.14	0.14	0.03	0.27	0.14	0.08	0.05	0	0.03	0.03	37
42	0	0	0	0	0	0	0	0	0.07	0.07	0.11	0.07	0.04	0.11	0.07	0.14	0.07	0.07	0.04	0.14	28
43	0	0	0	0	0	0	0	0	0.04	0	0	0.09	0.17	0.09	0.04	0.26	0.13	0	0.09	0.09	23
44	0	0	0	0	0	0	0	0	0.05	0	0.05	0.15	0.05	0.15	0.10	0	0.25	0.05	0.05	0.10	20
45	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0	0.20	0.05	0.10	0.05	0.10	0	0.40	20
46	0	0	0	0	0	0	0	0	0	0	0.06	0.06	0	0	0.13	0.06	0.06	0.06	0.06	0.50	16
47	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0.09	0.09	0.18	0.09	0	0.09	0.36	11
48	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0	0.07	0	0.07	0.13	0.07	0.60	15
49	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0.06	0	0	0.12	0.12	0.06	0.59	17
50	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0	0	0	0	0.10	0	0.80	10
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0.88	8
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0.17	0.67	6
53	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0.88	8
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.92	12
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	5
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	6
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	4
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	4
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0.75	4
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	4
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					1 287

Appendix 10 – continued:
Estimates of proportion of length at age for snapper sampled from the SNA 2N bottom trawl fishery, spring-winter 2022–23. (Note: Aged to 01/01/23)

Length	Age (years)																				No.
(cm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	>19	aged
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25	0	0	0.15	0.38	0.46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
26	0	0	0.13	0.79	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
27	0	0	0.08	0.73	0.11	0.02	0.03	0.02	0	0	0	0	0	0	0	0	0	0	0	0	62
28	0	0	0.03	0.59	0.24	0.06	0.05	0.01	0	0.02	0	0	0	0	0	0	0	0	0	0	103
29	0	0	0.02	0.57	0.22	0.12	0.00	0.05	0.02	0	0	0	0	0	0	0	0	0	0	0	83
30	0	0	0.03	0.41	0.30	0.14	0.08	0.04	0	0	0	0	0	0	0	0	0	0	0	0	73
31	0	0	0.01	0.33	0.23	0.12	0.11	0.12	0.01	0.02	0	0.01	0	0.01	0.02	0	0	0	0	0	84
32	0	0	0	0.21	0.15	0.13	0.13	0.21	0.06	0.03	0.01	0.03	0	0.01	0.01	0	0	0	0	0.01	71
33	0	0	0.01	0.09	0.09	0.17	0.20	0.30	0.04	0.04	0	0	0.01	0	0.01	0	0	0	0.01	0	69
34	0	0	0	0	0.08	0.13	0.15	0.30	0.13	0.13	0	0.02	0.02	0	0.02	0.02	0	0	0	0	53
35	0	0	0	0	0.03	0.04	0.14	0.51	0.16	0.04	0	0.04	0	0.01	0	0.01	0	0	0	0	69
36	0	0	0	0	0	0.04	0.09	0.36	0.26	0.14	0.03	0.01	0.01	0	0.01	0	0	0	0	0.03	69
37	0	0	0	0	0	0	0.03	0.25	0.21	0.37	0.05	0.01	0.01	0.01	0.05	0	0	0	0	0	73
38	0	0	0	0	0	0	0.02	0.27	0.23	0.18	0.07	0.08	0.03	0.02	0.07	0.02	0.02	0	0	0	60
39	0	0	0	0	0.02	0	0	0.22	0.13	0.18	0.22	0.05	0.05	0.02	0.09	0.02	0	0	0	0	55
40	0	0	0	0	0.02	0	0	0.14	0.10	0.25	0.12	0.14	0.12	0.02	0	0	0	0.02	0	0.08	51
41	0	0	0	0	0.02	0	0	0.07	0.09	0.16	0.22	0.13	0.05	0.05	0.09	0.04	0.02	0	0.02	0.04	55
42	0	0	0	0	0	0	0.03	0	0.17	0.14	0.21	0.14	0.14	0.03	0.07	0.03	0	0.03	0	0	29
43	0	0	0	0	0	0	0	0	0.08	0.12	0.08	0.24	0.04	0.16	0.16	0.08	0	0.04	0	0	25
44	0	0	0	0	0	0	0	0	0.09	0.18	0	0.09	0.09	0.27	0.18	0	0	0	0	0.09	11
45	0	0	0	0	0	0	0	0	0	0	0.20	0.10	0.10	0	0.20	0.10	0.10	0	0	0.20	10
46	0	0	0	0	0	0	0	0	0	0.08	0.08	0	0	0.08	0.17	0.08	0	0.08	0	0.42	12
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0.75	8
48	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0	0.67	6
49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0.14	0	0	0	0.71	7
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0.33	0	0.33	3
51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0.83	6
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	3
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	1
66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total																					1 200

Appendix 11: Estimated mean weight-at-age (kg) and coefficients of variation (CVs) for snapper power method fisheries in SNA 1 and SNA 2 in 2022–23.

Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the East Northland bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	0.51	0.19	0.51	0.19
3	0.51	0.35	0.67	0.10	0.66	0.10
4	0.73	0.07	0.62	0.03	0.70	0.06
5	0.68	0.06	0.74	0.05	0.70	0.04
6	0.66	0.07	0.80	0.06	0.71	0.05
7	0.69	0.05	0.72	0.08	0.70	0.04
8	0.72	0.06	0.80	0.06	0.76	0.04
9	0.78	0.03	0.79	0.06	0.78	0.03
10	0.95	0.05	0.88	0.05	0.91	0.03
11	0.97	0.04	1.00	0.05	0.98	0.03
12	0.96	0.03	0.98	0.04	0.97	0.03
13	1.14	0.07	0.93	0.09	1.07	0.06
14	1.15	0.07	0.98	0.06	1.07	0.05
15	1.09	0.06	1.20	0.07	1.14	0.05
16	1.15	0.08	1.21	0.07	1.18	0.05
17	1.46	0.12	1.27	0.08	1.37	0.07
18	1.51	0.14	1.23	0.11	1.36	0.09
19	1.49	0.28	1.69	0.13	1.59	0.12
20	1.58	0.09	1.52	0.07	1.55	0.06
21	1.54	0.21	1.57	0.12	1.55	0.13
22	2.10	0.29	1.72	0.18	1.97	0.20
23	2.24	0.17	1.61	0.12	1.85	0.11
24	2.48	0.14	2.16	0.10	2.40	0.11
25	1.83	0.37	2.15	0.16	2.00	0.07
26	2.01	0.22	2.14	0.68	2.03	0.17
27	3.51	0.44	2.52	0.43	3.26	0.30
28	5.57	0.97	2.31	0.45	2.96	0.46
29	1.13	0.96	2.49	0.29	1.46	0.48
>29	3.53	0.31	2.77	0.24	2.97	0.19

Appendix 11 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the Hauraki Gulf bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	–	–	–	–	0.46	0.20
4	–	–	–	–	0.41	0.02
5	–	–	–	–	0.50	0.04
6	–	–	–	–	0.56	0.03
7	–	–	–	–	0.59	0.04
8	–	–	–	–	0.63	0.04
9	–	–	–	–	0.71	0.04
10	–	–	–	–	0.75	0.04
11	–	–	–	–	0.79	0.04
12	–	–	–	–	0.81	0.05
13	–	–	–	–	0.87	0.04
14	–	–	–	–	0.95	0.05
15	–	–	–	–	0.99	0.07
16	–	–	–	–	0.98	0.05
17	–	–	–	–	1.01	0.05
18	–	–	–	–	1.22	0.11
19	–	–	–	–	1.19	0.10
20	–	–	–	–	1.18	0.10
21	–	–	–	–	1.52	0.13
22	–	–	–	–	1.70	0.13
23	–	–	–	–	1.50	0.10
24	–	–	–	–	2.04	0.17
25	–	–	–	–	2.07	0.27
26	–	–	–	–	3.93	0.64
27	–	–	–	–	2.25	0.43
28	–	–	–	–	–	–
29	–	–	–	–	2.81	1.02
>29	–	–	–	–	3.06	0.25

Appendix 11 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the Bay of Plenty bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	0.35	0.34	0.44	0.05	0.43	0.03
4	0.45	0.03	0.51	0.02	0.50	0.02
5	0.52	0.02	0.56	0.03	0.54	0.02
6	0.58	0.03	0.64	0.05	0.61	0.03
7	0.70	0.03	0.69	0.03	0.69	0.02
8	0.78	0.03	0.77	0.04	0.78	0.02
9	0.83	0.03	0.84	0.04	0.83	0.03
10	0.92	0.03	0.92	0.04	0.92	0.02
11	1.07	0.05	0.98	0.05	1.02	0.04
12	1.13	0.06	1.08	0.05	1.11	0.04
13	1.14	0.06	1.15	0.08	1.14	0.05
14	1.28	0.05	1.20	0.06	1.24	0.04
15	1.19	0.08	1.13	0.08	1.16	0.06
16	1.36	0.04	1.36	0.07	1.36	0.04
17	1.52	0.10	1.63	0.09	1.56	0.07
18	1.35	0.19	1.43	0.14	1.39	0.10
19	1.50	0.20	1.36	0.15	1.43	0.11
20	2.17	0.09	1.29	0.46	1.95	0.13
21	1.98	0.09	1.57	0.23	1.82	0.11
22	2.29	0.18	1.66	0.15	1.94	0.13
23	2.42	0.19	2.21	0.26	2.37	0.14
24	2.32	0.14	2.06	0.17	2.28	0.12
25	3.14	0.25	2.06	0.41	2.82	0.19
26	–	–	2.45	0.80	2.45	0.80
27	2.53	0.22	1.29	0.77	1.80	0.28
28	4.08	0.42	3.22	0.51	3.97	0.25
29	4.48	0.23	2.74	0.84	4.22	0.18
>29	4.28	0.18	3.48	0.12	3.85	0.09

Appendix 11 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the Hauraki Gulf Danish seine fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	–	–	0.50	0.26	0.50	0.26
4	0.44	0.42	0.40	0.05	0.41	0.02
5	0.51	0.03	0.54	0.08	0.54	0.07
6	0.60	0.09	0.63	0.05	0.62	0.05
7	0.74	0.09	0.64	0.05	0.67	0.05
8	0.78	0.09	0.71	0.05	0.73	0.05
9	0.91	0.07	0.78	0.05	0.82	0.05
10	0.94	0.05	0.80	0.05	0.86	0.04
11	0.89	0.04	0.87	0.05	0.88	0.04
12	0.93	0.06	1.01	0.06	0.98	0.05
13	1.09	0.06	0.96	0.07	1.02	0.05
14	1.11	0.05	1.07	0.05	1.09	0.03
15	1.18	0.06	1.29	0.10	1.23	0.06
16	1.20	0.06	1.15	0.06	1.17	0.04
17	1.14	0.06	1.25	0.11	1.18	0.06
18	1.66	0.15	1.40	0.10	1.53	0.09
19	1.48	0.11	1.33	0.08	1.39	0.07
20	1.48	0.12	1.62	0.10	1.53	0.09
21	1.82	0.13	1.59	0.16	1.73	0.09
22	2.18	0.12	1.95	0.18	2.07	0.10
23	1.73	0.13	2.65	0.09	1.90	0.12
24	2.76	0.12	2.37	0.17	2.46	0.12
25	2.21	0.19	2.09	0.41	2.17	0.17
26	4.26	0.62	3.83	0.43	3.94	0.23
27	2.88	0.48	4.36	0.54	3.09	0.33
28	4.91	0.54	5.44	0.49	5.05	0.31
29	–	–	4.15	0.31	4.15	0.31
>29	4.73	0.13	6.42	0.16	5.01	0.12

Appendix 11 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the Bay of Plenty Danish seine fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	0.37	0.40	0.44	0.05	0.43	0.03
4	0.46	0.03	0.54	0.03	0.51	0.02
5	0.52	0.03	0.61	0.04	0.57	0.02
6	0.59	0.04	0.72	0.05	0.64	0.04
7	0.71	0.04	0.74	0.03	0.72	0.02
8	0.79	0.03	0.82	0.04	0.80	0.02
9	0.84	0.04	0.89	0.04	0.87	0.03
10	0.92	0.03	0.97	0.04	0.94	0.02
11	1.07	0.05	1.04	0.04	1.05	0.03
12	1.10	0.05	1.12	0.05	1.11	0.04
13	1.12	0.06	1.22	0.08	1.16	0.05
14	1.26	0.05	1.27	0.05	1.27	0.04
15	1.17	0.08	1.20	0.07	1.19	0.05
16	1.34	0.04	1.41	0.06	1.37	0.04
17	1.48	0.09	1.70	0.07	1.58	0.06
18	1.22	0.22	1.49	0.12	1.39	0.10
19	1.38	0.17	1.45	0.13	1.42	0.10
20	2.08	0.08	1.62	0.36	1.91	0.13
21	1.91	0.07	1.72	0.21	1.80	0.11
22	1.95	0.22	2.10	0.17	2.07	0.13
23	1.98	0.20	2.35	0.18	2.14	0.11
24	2.15	0.13	2.08	0.17	2.13	0.10
25	2.84	0.42	1.96	0.43	2.23	0.25
26	–	–	2.45	0.77	2.45	0.77
27	2.48	0.21	1.29	0.77	1.63	0.30
28	2.98	0.50	4.00	0.36	3.64	0.19
29	–	–	2.74	0.76	2.74	0.76
>29	4.23	0.45	3.37	0.12	3.50	0.10

Appendix 11 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the East Northland modular harvest system fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	0.49	0.17	–	–
3	–	–	0.58	0.07	–	–
4	–	–	0.55	0.06	–	–
5	–	–	0.66	0.05	–	–
6	–	–	0.68	0.08	–	–
7	–	–	0.62	0.07	–	–
8	–	–	0.72	0.05	–	–
9	–	–	0.72	0.04	–	–
10	–	–	0.82	0.04	–	–
11	–	–	0.95	0.05	–	–
12	–	–	0.93	0.04	–	–
13	–	–	0.87	0.07	–	–
14	–	–	0.96	0.06	–	–
15	–	–	1.18	0.08	–	–
16	–	–	1.18	0.08	–	–
17	–	–	1.24	0.10	–	–
18	–	–	1.21	0.12	–	–
19	–	–	1.81	0.13	–	–
20	–	–	1.56	0.06	–	–
21	–	–	1.61	0.13	–	–
22	–	–	1.87	0.18	–	–
23	–	–	1.66	0.11	–	–
24	–	–	2.29	0.10	–	–
25	–	–	2.18	0.16	–	–
26	–	–	2.75	0.43	–	–
27	–	–	2.46	0.44	–	–
28	–	–	2.26	0.47	–	–
29	–	–	2.46	0.26	–	–
>29	–	–	2.76	0.17	–	–

Appendix 11 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the Bay of Plenty modular harvest system fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	0.37	0.39	0.44	0.05	0.43	0.03
4	0.44	0.02	0.49	0.02	0.47	0.02
5	0.50	0.02	0.51	0.03	0.51	0.02
6	0.53	0.03	0.58	0.05	0.55	0.03
7	0.62	0.04	0.62	0.04	0.62	0.03
8	0.72	0.03	0.68	0.05	0.70	0.03
9	0.75	0.05	0.77	0.05	0.76	0.03
10	0.86	0.04	0.86	0.05	0.86	0.03
11	1.03	0.05	0.89	0.07	0.94	0.05
12	1.03	0.06	1.05	0.05	1.04	0.04
13	1.09	0.08	1.14	0.09	1.11	0.06
14	1.22	0.06	1.17	0.07	1.20	0.05
15	1.08	0.10	1.12	0.10	1.10	0.07
16	1.34	0.04	1.36	0.08	1.35	0.04
17	1.45	0.10	1.66	0.09	1.55	0.07
18	1.22	0.23	1.52	0.14	1.40	0.12
19	1.32	0.18	1.42	0.14	1.38	0.11
20	2.10	0.10	1.69	0.40	1.93	0.17
21	1.90	0.08	1.59	0.24	1.71	0.14
22	1.83	0.22	1.80	0.13	1.81	0.11
23	2.04	0.21	2.50	0.21	2.29	0.12
24	2.25	0.19	2.24	0.19	2.25	0.14
25	3.04	0.37	2.41	0.50	2.65	0.21
26	–	–	2.45	0.97	2.45	0.97
27	2.24	0.31	1.29	0.77	1.53	0.32
28	3.28	0.65	3.22	1.02	3.25	0.41
29	–	–	2.74	0.95	2.74	0.95
>29	3.22	1.47	2.94	0.24	2.94	0.16

Appendix 11 – continued:
Estimates of mean weight-at-age (kg) with coefficients of variation for snapper from the SNA 2N bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	0.58	0.47	0.48	0.04	0.48	0.04
4	0.49	0.01	0.55	0.02	0.53	0.01
5	0.58	0.04	0.61	0.04	0.60	0.03
6	0.68	0.04	0.68	0.03	0.68	0.03
7	0.80	0.06	0.77	0.03	0.78	0.03
8	0.94	0.02	0.95	0.03	0.94	0.02
9	1.09	0.03	1.07	0.04	1.08	0.02
10	1.15	0.02	1.17	0.05	1.16	0.02
11	1.33	0.03	1.26	0.07	1.30	0.04
12	1.47	0.04	1.24	0.06	1.35	0.04
13	1.29	0.04	1.39	0.09	1.32	0.04
14	1.50	0.04	1.11	0.16	1.32	0.07
15	1.46	0.05	1.29	0.08	1.37	0.05
16	1.60	0.10	1.55	0.14	1.57	0.09
17	1.55	0.46	1.43	0.74	1.50	0.27
18	1.70	0.30	1.85	0.39	1.78	0.13
19	1.43	0.75	0.78	0.71	1.08	0.42
20	2.40	0.10	2.22	0.22	2.32	0.08
21	–	–	2.08	0.29	2.08	0.29
22	1.76	0.28	1.64	0.34	1.71	0.17
23	2.18	0.19	1.75	0.41	1.95	0.20
24	2.44	0.11	1.71	0.44	2.16	0.12
25	2.53	0.39	2.27	0.41	2.40	0.15
26	–	–	–	–	–	–
27	3.23	0.33	2.59	0.28	2.89	0.15
28	–	–	1.97	0.78	1.97	0.78
29	–	–	–	–	–	–
>29	3.76	0.42	4.63	0.37	4.31	0.18

Appendix 12: Estimated mean length-at-age (kg) and coefficients of variation (CVs) for snapper power method fisheries in SNA 1 and SNA 2 in 2022–23.

Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the East Northland bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	28.31	0.18	28.31	0.18
3	28.23	0.35	30.77	0.03	30.54	0.03
4	31.73	0.03	30.17	0.01	31.34	0.02
5	30.86	0.02	31.96	0.02	31.30	0.01
6	30.63	0.02	32.90	0.02	31.38	0.02
7	31.23	0.02	31.52	0.03	31.33	0.01
8	31.54	0.02	32.75	0.02	32.11	0.01
9	32.50	0.01	32.61	0.02	32.54	0.01
10	34.70	0.02	33.88	0.02	34.28	0.01
11	35.13	0.01	35.44	0.02	35.28	0.01
12	34.98	0.01	35.21	0.02	35.08	0.01
13	36.80	0.02	34.43	0.03	36.02	0.02
14	37.01	0.02	35.17	0.02	36.12	0.01
15	36.62	0.02	37.63	0.03	37.07	0.02
16	37.17	0.03	37.62	0.03	37.42	0.02
17	40.17	0.04	38.34	0.03	39.27	0.02
18	40.49	0.05	37.75	0.04	39.04	0.03
19	40.52	0.15	42.46	0.04	41.50	0.04
20	41.41	0.03	40.98	0.02	41.21	0.02
21	40.71	0.11	41.57	0.06	41.02	0.05
22	44.71	0.10	42.90	0.11	44.08	0.06
23	46.64	0.05	41.61	0.04	43.55	0.04
24	47.54	0.05	46.44	0.03	47.28	0.04
25	44.05	0.36	46.53	0.14	45.42	0.02
26	45.23	0.16	45.96	0.57	45.33	0.09
27	53.25	0.25	49.24	0.42	52.23	0.11
28	65.00	0.97	47.64	0.43	51.09	0.32
29	36.34	0.57	49.08	0.29	39.41	0.22
>29	54.53	0.18	49.09	0.08	50.53	0.07

Appendix 12 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the Hauraki Gulf bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	–	–	–	–	27.09	0.19
4	–	–	–	–	25.85	0.01
5	–	–	–	–	27.81	0.01
6	–	–	–	–	28.85	0.01
7	–	–	–	–	29.48	0.01
8	–	–	–	–	30.16	0.01
9	–	–	–	–	31.38	0.02
10	–	–	–	–	31.96	0.02
11	–	–	–	–	32.58	0.01
12	–	–	–	–	32.93	0.02
13	–	–	–	–	33.79	0.02
14	–	–	–	–	34.78	0.02
15	–	–	–	–	35.23	0.02
16	–	–	–	–	35.15	0.02
17	–	–	–	–	35.64	0.02
18	–	–	–	–	37.83	0.04
19	–	–	–	–	37.44	0.03
20	–	–	–	–	37.45	0.03
21	–	–	–	–	40.94	0.05
22	–	–	–	–	42.91	0.04
23	–	–	–	–	41.02	0.03
24	–	–	–	–	45.75	0.07
25	–	–	–	–	45.10	0.09
26	–	–	–	–	58.66	0.64
27	–	–	–	–	48.00	0.38
28	–	–	–	–	–	–
29	–	–	–	–	52.00	1.01
>29	–	–	–	–	53.02	0.17

Appendix 12 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the Bay of Plenty bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	24.56	0.33	26.72	0.05	26.48	0.01
4	26.81	0.01	28.04	0.01	27.68	0.01
5	28.20	0.01	28.76	0.01	28.53	0.01
6	29.21	0.01	30.21	0.02	29.71	0.01
7	31.21	0.01	30.95	0.01	31.07	0.01
8	32.46	0.01	32.14	0.02	32.32	0.01
9	33.12	0.01	33.17	0.01	33.14	0.01
10	34.41	0.01	34.39	0.02	34.40	0.01
11	36.27	0.02	34.98	0.02	35.52	0.01
12	36.82	0.02	36.41	0.02	36.66	0.01
13	36.99	0.02	37.16	0.03	37.04	0.02
14	38.64	0.02	37.70	0.02	38.16	0.02
15	37.51	0.03	36.86	0.03	37.18	0.02
16	39.62	0.01	39.53	0.03	39.59	0.01
17	40.99	0.04	42.17	0.03	41.40	0.03
18	38.93	0.07	40.02	0.05	39.49	0.04
19	40.46	0.06	39.24	0.05	39.87	0.04
20	46.70	0.03	38.00	0.21	44.53	0.05
21	45.31	0.05	40.97	0.09	43.60	0.04
22	47.03	0.07	42.35	0.05	44.43	0.05
23	48.23	0.06	47.10	0.22	47.94	0.05
24	47.31	0.04	45.76	0.08	47.06	0.04
25	53.10	0.17	45.63	0.31	50.89	0.08
26	–	–	49.00	0.80	49.00	0.80
27	49.32	0.18	39.00	0.77	43.26	0.14
28	57.90	0.31	54.00	0.49	57.40	0.12
29	60.74	0.23	51.00	0.84	59.24	0.14
>29	59.61	0.15	55.30	0.07	57.28	0.03

Appendix 12 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the Hauraki Gulf Danish seine fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	–	–	27.76	0.25	27.76	0.25
4	26.61	0.42	25.84	0.05	25.91	0.01
5	28.03	0.01	28.52	0.03	28.45	0.02
6	29.66	0.03	30.16	0.02	30.02	0.02
7	31.83	0.03	30.36	0.02	30.84	0.02
8	32.43	0.03	31.43	0.02	31.69	0.02
9	34.21	0.03	32.49	0.02	32.99	0.02
10	34.73	0.02	32.81	0.02	33.58	0.01
11	34.21	0.01	33.74	0.02	33.90	0.01
12	34.38	0.02	35.52	0.02	35.10	0.02
13	36.53	0.02	34.89	0.02	35.59	0.02
14	36.87	0.02	36.34	0.02	36.60	0.01
15	37.64	0.02	38.43	0.03	38.00	0.02
16	37.68	0.02	37.13	0.02	37.40	0.01
17	37.25	0.02	38.11	0.04	37.56	0.02
18	41.85	0.05	40.04	0.03	40.93	0.03
19	40.53	0.04	39.15	0.03	39.71	0.02
20	40.18	0.04	42.19	0.03	40.84	0.03
21	43.69	0.04	42.06	0.08	43.03	0.03
22	46.72	0.04	44.55	0.06	45.64	0.04
23	42.77	0.04	50.85	0.07	44.29	0.04
24	51.40	0.06	48.05	0.06	48.88	0.05
25	46.78	0.07	45.21	0.19	46.22	0.06
26	60.17	0.55	58.12	0.43	58.64	0.18
27	51.27	0.24	60.59	0.50	52.61	0.13
28	60.74	0.35	66.00	0.48	62.09	0.15
29	–	–	58.75	0.18	58.75	0.18
>29	61.22	0.06	69.81	0.13	62.65	0.05

Appendix 12 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the Bay of Plenty Danish seine fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	25.00	0.40	26.71	0.05	26.40	0.01
4	26.98	0.01	28.55	0.01	27.88	0.01
5	28.24	0.01	29.77	0.01	28.96	0.01
6	29.32	0.01	31.40	0.02	30.20	0.01
7	31.38	0.01	31.81	0.01	31.60	0.01
8	32.57	0.01	33.05	0.01	32.75	0.01
9	33.31	0.01	33.94	0.01	33.61	0.01
10	34.41	0.01	34.93	0.01	34.63	0.01
11	36.21	0.02	35.85	0.02	36.00	0.01
12	36.56	0.02	36.89	0.02	36.70	0.01
13	36.80	0.02	37.86	0.03	37.19	0.02
14	38.45	0.02	38.48	0.02	38.47	0.01
15	37.31	0.03	37.57	0.03	37.45	0.02
16	39.42	0.02	40.03	0.02	39.66	0.01
17	40.61	0.03	42.83	0.03	41.64	0.02
18	37.60	0.09	40.65	0.04	39.48	0.04
19	39.47	0.07	40.21	0.05	39.92	0.03
20	46.06	0.03	40.98	0.17	44.16	0.05
21	44.75	0.05	42.31	0.08	43.40	0.04
22	44.41	0.09	45.45	0.06	45.22	0.05
23	45.23	0.12	48.09	0.13	46.47	0.04
24	46.15	0.05	45.93	0.09	46.08	0.03
25	51.58	0.40	44.86	0.32	46.95	0.15
26	–	–	49.00	0.77	49.00	0.77
27	48.99	0.16	39.00	0.77	41.87	0.13
28	52.50	0.48	58.30	0.35	56.25	0.16
29	–	–	51.00	0.76	51.00	0.76
>29	59.21	0.42	54.65	0.07	55.34	0.06

Appendix 12 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the East Northland modular harvest system fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	27.90	0.16	–	–
3	–	–	29.28	0.02	–	–
4	–	–	28.93	0.02	–	–
5	–	–	30.65	0.02	–	–
6	–	–	30.85	0.03	–	–
7	–	–	29.85	0.02	–	–
8	–	–	31.46	0.02	–	–
9	–	–	31.58	0.01	–	–
10	–	–	33.06	0.01	–	–
11	–	–	34.65	0.02	–	–
12	–	–	34.55	0.01	–	–
13	–	–	33.62	0.02	–	–
14	–	–	34.91	0.02	–	–
15	–	–	37.35	0.03	–	–
16	–	–	37.16	0.03	–	–
17	–	–	37.95	0.04	–	–
18	–	–	37.47	0.04	–	–
19	–	–	43.45	0.05	–	–
20	–	–	41.36	0.02	–	–
21	–	–	41.88	0.06	–	–
22	–	–	44.04	0.09	–	–
23	–	–	42.05	0.04	–	–
24	–	–	47.27	0.04	–	–
25	–	–	46.78	0.14	–	–
26	–	–	49.83	0.33	–	–
27	–	–	48.80	0.43	–	–
28	–	–	47.28	0.45	–	–
29	–	–	48.88	0.26	–	–
>29	–	–	49.52	0.07	–	–

Appendix 12 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the Bay of Plenty modular harvest system fishery in 2022–23.

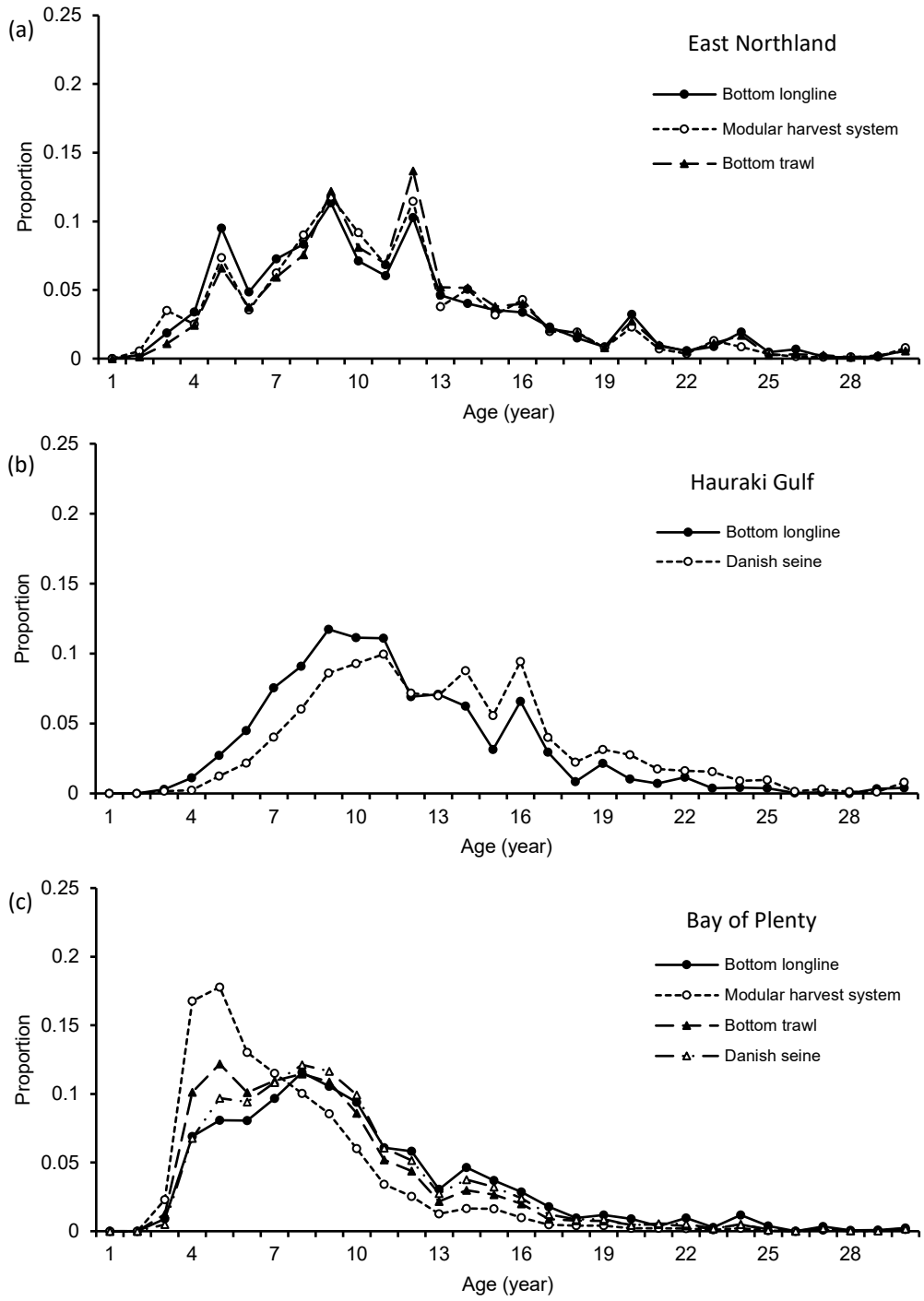
Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	25.00	0.39	26.67	0.05	26.39	0.01
4	26.46	0.01	27.48	0.01	27.14	0.01
5	27.69	0.01	27.91	0.01	27.82	0.01
6	28.20	0.01	29.13	0.02	28.64	0.01
7	29.92	0.02	29.91	0.01	29.91	0.01
8	31.49	0.01	30.72	0.02	31.12	0.01
9	31.81	0.02	32.19	0.02	32.01	0.01
10	33.56	0.01	33.51	0.02	33.53	0.01
11	35.77	0.02	33.84	0.03	34.50	0.02
12	35.67	0.02	36.05	0.02	35.83	0.02
13	36.31	0.03	36.98	0.03	36.55	0.02
14	37.98	0.02	37.34	0.03	37.62	0.02
15	36.13	0.04	36.58	0.03	36.38	0.02
16	39.42	0.01	39.49	0.03	39.45	0.01
17	40.32	0.04	42.46	0.03	41.36	0.03
18	37.57	0.08	40.85	0.05	39.57	0.04
19	39.00	0.08	39.82	0.05	39.51	0.04
20	46.19	0.03	41.48	0.19	44.14	0.07
21	44.65	0.05	41.11	0.09	42.56	0.06
22	43.57	0.10	43.59	0.05	43.59	0.04
23	45.61	0.13	49.13	0.17	47.53	0.04
24	46.41	0.06	47.11	0.12	46.64	0.04
25	52.79	0.35	48.06	0.42	49.89	0.13
26	–	–	49.00	0.97	49.00	0.97
27	47.40	0.29	39.00	0.77	41.10	0.21
28	54.32	0.64	54.00	1.02	54.18	0.40
29	–	–	51.00	0.95	51.00	0.95
>29	54.00	1.47	52.26	0.24	52.29	0.15

Appendix 12 – continued:
Estimates of mean length-at-age (cm) with coefficients of variation for snapper from the SNA 2N bottom trawl fishery in 2022–23.

Age	Spring-summer		Autumn-winter		Spring-winter	
(years)	Mean	CV	Mean	CV	Mean	CV
1	–	–	–	–	–	–
2	–	–	–	–	–	–
3	29.40	0.40	27.61	0.01	27.74	0.02
4	27.96	0.01	29.03	0.01	28.73	0.00
5	29.56	0.01	29.98	0.01	29.83	0.01
6	31.30	0.01	31.36	0.01	31.35	0.01
7	33.00	0.02	32.70	0.01	32.82	0.01
8	35.12	0.01	35.15	0.01	35.13	0.01
9	36.98	0.01	36.81	0.01	36.89	0.01
10	37.83	0.01	37.81	0.02	37.82	0.01
11	39.89	0.01	38.85	0.03	39.40	0.02
12	41.29	0.01	38.68	0.02	39.91	0.01
13	39.38	0.01	40.39	0.04	39.74	0.01
14	41.63	0.01	36.89	0.06	39.48	0.03
15	41.10	0.02	39.15	0.03	39.97	0.02
16	42.55	0.05	41.55	0.05	41.88	0.03
17	42.01	0.42	41.00	0.74	41.60	0.24
18	43.29	0.24	44.91	0.38	44.13	0.08
19	41.00	0.75	33.00	0.71	36.66	0.36
20	49.16	0.05	47.51	0.16	48.45	0.03
21	–	–	46.46	0.23	46.46	0.23
22	43.37	0.17	42.43	0.27	42.96	0.07
23	47.57	0.17	41.87	0.20	44.52	0.09
24	49.30	0.05	43.50	0.40	47.06	0.04
25	50.27	0.38	48.35	0.40	49.32	0.14
26	–	–	–	–	–	–
27	54.23	0.24	50.33	0.21	52.12	0.05
28	–	–	46.00	0.78	46.00	0.78
29	–	–	–	–	–	–
>29	58.00	0.42	62.50	0.37	60.81	0.17

Appendix 13: Depiction of exceptionally poor conditioned "skinny" snapper caught from the Bay of Plenty fishery (February 2023).

Appendix 14: Comparison of area-method proportion-at-age distributions (lines) determined from snapper landings sampled from the SNA 1 stock fisheries in 2022–23.


(a)
East Northland
Bottom longline
Modular harvest system
Bottom trawl
Proportion
Age (year)
(b)
Hauraki Gulf
Bottom longline
Danish seine
Proportion
Age (year)
(c)
Bay of Plenty
Bottom longline
Modular harvest system
Bottom trawl
Danish seine
Proportion
Age (year)