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Tini a Tangaroa

# **A multi vessel inshore trawl survey of FMA 2 (February-March 2026)**

New Zealand Fisheries Assessment Report 2026/19

A.D. Langley

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## **PLAIN LANGUAGE SUMMARY**

The 2026 trawl survey of the inshore area of FMA 2 was the second in a series of pilot surveys conducted using commercial vessels. The 2026 survey demonstrated the repeatability of the survey design. For most species, the 2026 survey yielded estimates of relative abundance that are comparable to the 2025 survey, particularly for snapper and red gurnard and the range of second tier species (trevally, John dory, rig and school shark). The survey results were more equivocal for tarakihi. The design of the next survey, scheduled for March 2027, will be further modified to improve the utility of the survey for monitoring the abundance of tarakihi.

## EXECUTIVE SUMMARY

Langley, A.D.<sup>1</sup> (2026). A multi vessel inshore trawl survey of FMA 2 (February-March 2026).

*New Zealand Fisheries Assessment Report 2026/19. 53 p.*

The Fishery Management Area 2 (FMA 2) inshore trawl fisheries are dominated by catches of tarakihi, red gurnard and snapper, with smaller catches of trevally, rig, John dory, school shark and blue moki. Monitoring the abundance of these species has primarily relied on CPUE indices derived from commercial catch and effort data.

In February-March 2025, the first of three pilot trawl surveys of FMA 2 was conducted using three commercial vessels. The primary objectives of the survey programme are to improve the monitoring of the abundance and age composition of tarakihi, snapper and red gurnard. The 2025 survey area encompassed the area of FMA 2 north of Cape Kidnappers in the 20–300 m depth range. The survey was based on a stratified random design with research trawl stations conducted at pre-determined locations interspersed with commercial fishing. The catches from the individual research trawls were stored separately to enable the collection of accurate catch weights and length composition data following vessel unloading.

The 2025 survey provided trawl survey biomass indices with a high degree of precision (coefficients of variation < 25%) for both snapper and red gurnard. The survey results were less reliable for tarakihi due to the higher degree of temporal and spatial variation in tarakihi catch rates, related to the aggregation of tarakihi prior to spawning. In addition to the main target species, the pilot survey also yielded acceptable biomass indices for trevally, John dory, rig and school shark (CV typically 25–35%).

The second of the series of surveys was conducted in February-March 2026. The survey was conducted using four vessels; the three participating vessels from 2025 and an additional vessel. The participating vessels are similar in size, although there are considerable differences in the configuration of the trawl gear between vessels. For 2026, the survey area was extended southward to Castlepoint. In addition, the survey strata were refined to improve the utility of the survey for monitoring the abundance of tarakihi and the deeper stratum (200–300 m) was excluded.

The 2026 survey demonstrated the repeatability of the survey design. For most species, the 2026 survey yielded estimates of relative abundance (with an acceptable level of precision) that are comparable to the 2025 pilot survey, particularly for snapper and red gurnard and the range of second tier species (trevally, John dory, rig and school shark). The length compositions of snapper and red gurnard sampled from the two surveys are also very similar.

The survey results were less reliable for tarakihi. The revised stratification for 2026 resulted in an improvement in the survey design for the area around East Cape. However, the stratification of the wider survey area did not closely correspond to the distribution of tarakihi, most notably in the area off Gisborne. Further refinements in the survey stratification are considered necessary to improve the utility of the survey for monitoring tarakihi.

An analysis of survey data from 2025 and 2026 detected a significant difference in the catch rates of snapper between vessels, while no such differences were detected in the catch rates of red gurnard. Catch rates of tarakihi were considerably more variable and, hence, lacked the power to detect any difference between vessels. The differences in snapper catch rates are considered to be most likely due to differences in the configuration of the trawl gear (length of sweeps and effective headline height) and

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<sup>1</sup> Trophia

speed of hauling the trawl. The results of the analysis were used to apply a vessel specific correction factor to the catch rates of snapper incorporated in the derivation of the survey biomass indices.

The Inshore Working Group reviewed the results of the 2026 survey and recommended that the programme be continued in 2026–27 with a further survey in March-April 2027. In addition, a number of other recommendations were provided for the design and implementation of the next survey. Following the completion of the third survey, a full review of the survey approach will be conducted to provide recommendations for monitoring the FMA 2 stocks over the medium term (5–10 years).

## 1. INTRODUCTION

The Fishery Management Area 2 (FMA 2) inshore trawl fisheries are dominated by catches of tarakihi, red gurnard and snapper, with smaller catches of trevally, rig, John dory, school shark and blue moki. The current monitoring of the main FMA 2 inshore finfish stocks is principally reliant on CPUE indices derived from the inshore trawl fishery, although some species have no established monitoring. For a number of species, the CPUE indices indicate that abundance has increased in recent years (e.g. snapper, trevally and rig) (Fisheries New Zealand 2026). Catches for some species are increasingly constrained by the TACC and that has the potential to influence the operation of the fishery and the reliability of the resulting CPUE indices.

In 2018–19, 2019–20 and 2022–23, the TACCs for the eastern stock of tarakihi (including TAR 2), were reduced to facilitate stock rebuilding (Fisheries New Zealand 2026). The CPUE indices from the TAR 2 trawl fishery increased over the subsequent years, although the wider eastern stock remains in a depleted state (Fisheries New Zealand 2026). The reductions in TAR 2 TACC have resulted in changes in the operation of the FMA 2 inshore trawl fishery that may reduce the utility of the CPUE indices to monitor trends in tarakihi abundance during the rebuild phase.

A limited series of inshore trawl surveys off the central east coast of the North Island (ECNI) was conducted by *Kaharoa* in the 1990s, primarily during February–March (Stevenson & Hanchet 1999). The trawl surveys were discontinued on the basis that the biomass estimates of the main species were either imprecise or highly variable between surveys and there was concern that the survey did not encompass the large areas deemed to be untrawlable (i.e. foul ground) (Escobar-Flores et al. 2024).

In 2019, Fisheries New Zealand contracted NIWA (now Earth Sciences New Zealand, ESNZ) to investigate the re-instatement of the ECNI (FMA 2) inshore trawl survey. NIWA conducted a thorough review of the results from the previous surveys and refined the extent of trawlable ground within the survey area based on commercial data. The report concluded that it was possible for the survey to monitor the specified target species (snapper, red gurnard, tarakihi, trevally, and John dory), and barracouta, rig, and school shark, with acceptable precision. A series of three consecutive annual surveys using R.V. *Kaharoa* was proposed to provide a direct comparison with the results from the earlier (1990s) trawl surveys. The proposed trawl survey(s) did not proceed due to budgetary constraints.

Internationally, multi vessel trawl surveys utilising commercial vessels have proved to be useful for the monitoring of the abundance of groundfish species, for example in the Gulf of St. Lawrence for the Northwest Atlantic Fisheries Organization (NAFO), surveys off the western Canadian coast monitoring a range of finfish species (including rockfish species), and the United States Northwest Fisheries Science Center West Coast Groundfish Bottom Trawl Survey.

In 2024, the FMA 2 inshore trawl sector recognised the opportunity to develop a trawl survey programme using commercial vessels. A pilot survey was undertaken in February–March 2025 with three vessels conducting a random stratified survey of the northern area of FMA 2 from Cape Kidnappers to Cape Runaway. This area accounts for a large proportion of the catch from the FMA 2 inshore trawl fishery (Langley 2025).

### Programme objectives

The primary objective of the programme is to provide ongoing monitoring of the abundance and age composition of the main FMA 2 inshore finfish species over the medium term (5–10 years). FMA 2 commercial stakeholders have prioritised tarakihi as the primary species for the trawl survey, given the overall magnitude of the TACC and the requirement to monitor the stock during the rebuilding phase. Other species were prioritised based on the magnitude of the TACC and catch and the potential for the trawl survey to provide reliable indices of abundance. The objectives for the programme were:

1. To monitor the relative abundance of tarakihi within northern FMA 2 during 2024–25 to 2029–30 (5 years, annually) (priority 1).
2. To monitor the relative abundance of red gurnard and snapper (priority 2).

3. To monitor the relative abundance of a range of additional species, specifically John dory, rig (immature), school shark (immature) and trevally (priority 3).

The initial pilot survey demonstrated the ability for commercial vessels to undertake a structured research survey with limited direct supervision. The survey provided trawl survey biomass indices with a high degree of precision (coefficients of variation < 25%) for both snapper and red gurnard. The survey results were less reliable for tarakihi due to the higher degree of temporal and spatial variation in tarakihi catch rates, related to the aggregation of tarakihi prior to spawning. In addition to the main target species, the pilot survey also yielded acceptable biomass indices for trevally, John dory, rig and school shark (CV typically 25–35%).

The Inshore Working Group reviewed the results of the pilot survey and recommended that the programme be continued in 2025–26 with a further survey in March 2026, including a number of refinements in the survey design. This would evaluate the repeatability of the survey and enable an evaluation of the utility of the survey approach for monitoring the abundance of key stocks over the medium term (5–10 years).

### **Milestones for 2025–26**

1. Refine the design of the Industry based trawl survey based on the results of the pilot survey (October 2025).
2. Complete operational plan to undertake trawl survey in 2025/26 (January 2026).
3. Conduct survey in 2025/26 (March 2026).
4. Develop a medium term (5 year) survey plan (June 2026).

The 2026 survey was funded by the Inshore Council of Seafood New Zealand and Fisheries New Zealand (under project SEA2015-13) and conducted under Special Permit 978. This report summarises the results of the 2026 survey, compares them with those for 2025, and provides recommendations for ongoing monitoring.

## **2. METHODS**

### **2.1 Survey area**

Within FMA 2, the inshore trawl fishery is concentrated in the areas adjacent to Napier and Gisborne (Figure 1) and extends northwards around East Cape to Cape Runaway and south of Cape Kidnappers. Over the last decade, there has been limited trawling along the Wairarapa coast. Correspondingly, most of the FMA 2 inshore trawl catch is taken north of Cape Kidnappers (Langley 2025).

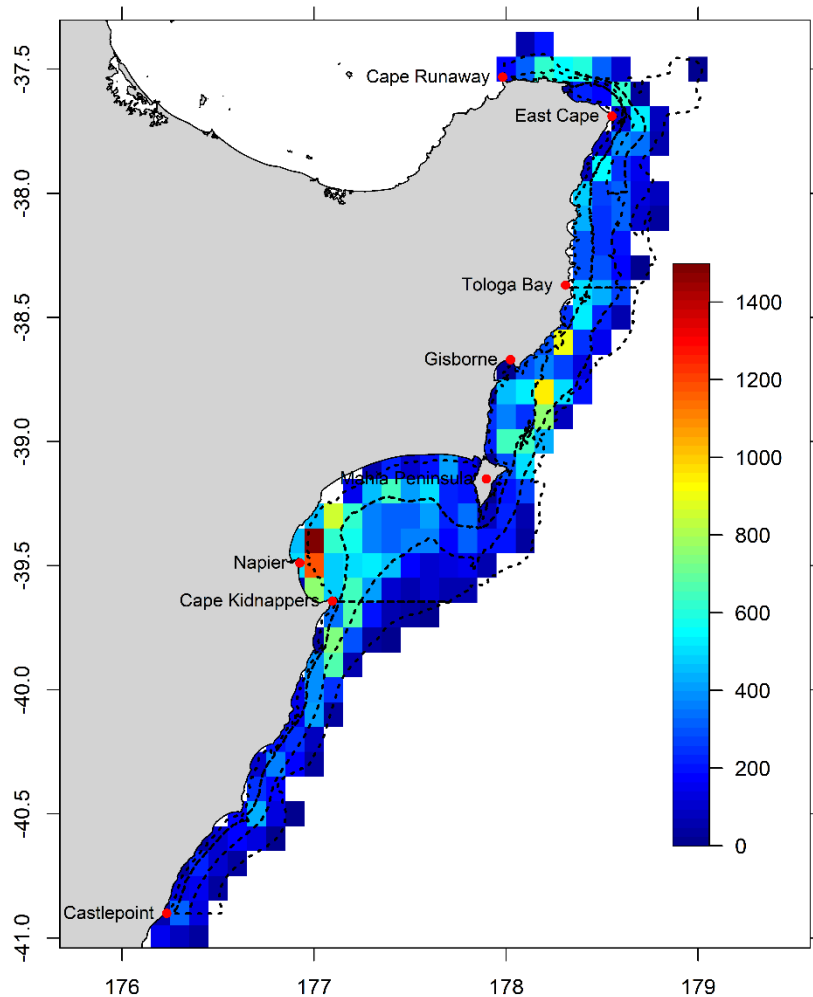
For the 2025 pilot survey, the area was limited to the northern portion of FMA 2 from Cape Kidnappers to Cape Runaway. This restricted area ensured that the vessels participating in the survey remained relatively close to their home ports of Napier and Gisborne and reduced the overall scale of the survey and the associated operational constraints.

For 2026, the area of the survey area was extended southwards from Cape Kidnappers to Castlepoint. The southern area was partitioned into the three strata used in the previous *Kaharoa* trawl surveys. These strata were included on a trial basis to investigate the relative abundance of the main species of interest within the southern area. Only one of the participating vessels was allocated trawl stations in this area.

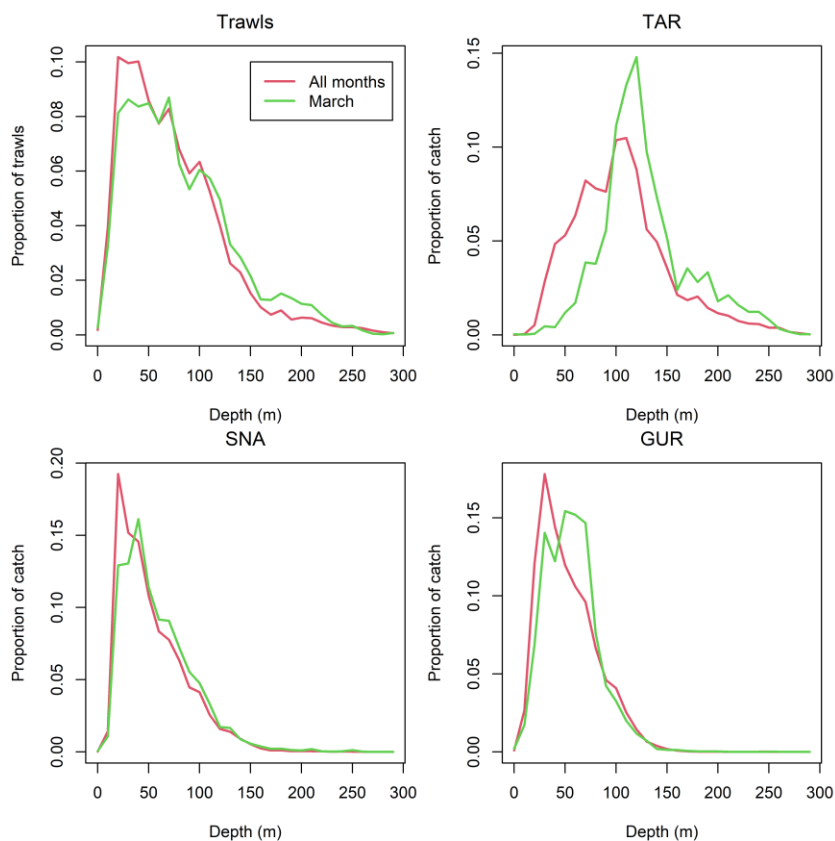
Within the survey area, most of the commercial trawling occurs within the 10–150 m depth range (Figure 2). Catches of snapper and red gurnard are limited to within this depth range. Tarakihi target trawls extend into deeper water, although there is limited trawling and catch taken deeper than 200 m. Nonetheless, commercial catch rates of tarakihi are relatively high in deeper water (200–300 m) indicating a significant abundance of tarakihi in the deeper areas.

For the 2025 survey, the area included the 20–200 m depth range between Cape Kidnappers and Tologa Bay and extended to a depth of 300 m in the area north of Tologa Bay. The 2025 survey highlighted the difficulties associated with identifying a sufficient number of suitable locations to conduct trawling in the northern 200–300 m depth stratum. There are large areas of untrawlable ground in the area and the commercial skippers have limited knowledge of the area. For the 2026 survey, the 200–300 m depth stratum was excluded from the survey area.

During the previous survey design project (Escobar-Flores et al. 2024), it was proposed to extend the survey area to include the shallower areas of Hawke Bay (10–20 m) to improve the monitoring of red gurnard. However, catches of red gurnard are relatively small in depths shallower than 20 m (Figure 2).



**Figure 1: Distribution of inshore trawls (numbers of trawls) from 2015–16 to 2024–25 combined by 0.1 degree of latitude and longitude (trawl start position). Each cell includes records from a minimum of three permit holders. The dashed lines represent the stratum boundaries of the 2026 survey.**



**Figure 2: Depth distribution of trawls and associated catches of tarakihi (TAR), snapper (SNA) and red gurnard (GUR) from the FMA 2 inshore trawl fishery (2015–16 to 2024–25 combined) during March and for all months combined.**

## 2.2 Survey timing

The timing of the 2025 pilot survey was scheduled to correspond to the timing of the previous ECNI *Kaharoa* trawl surveys, which were conducted during February–March. This period was considered to be optimal for the three primary species of the survey (Langley 2025).

The timing was intended to maximise the proportion of the tarakihi stock available to the survey. During February–March, tarakihi migrate to spawn in an area off East Cape from the southern area of FMA 2 and, possibly from eastern Bay of Plenty.

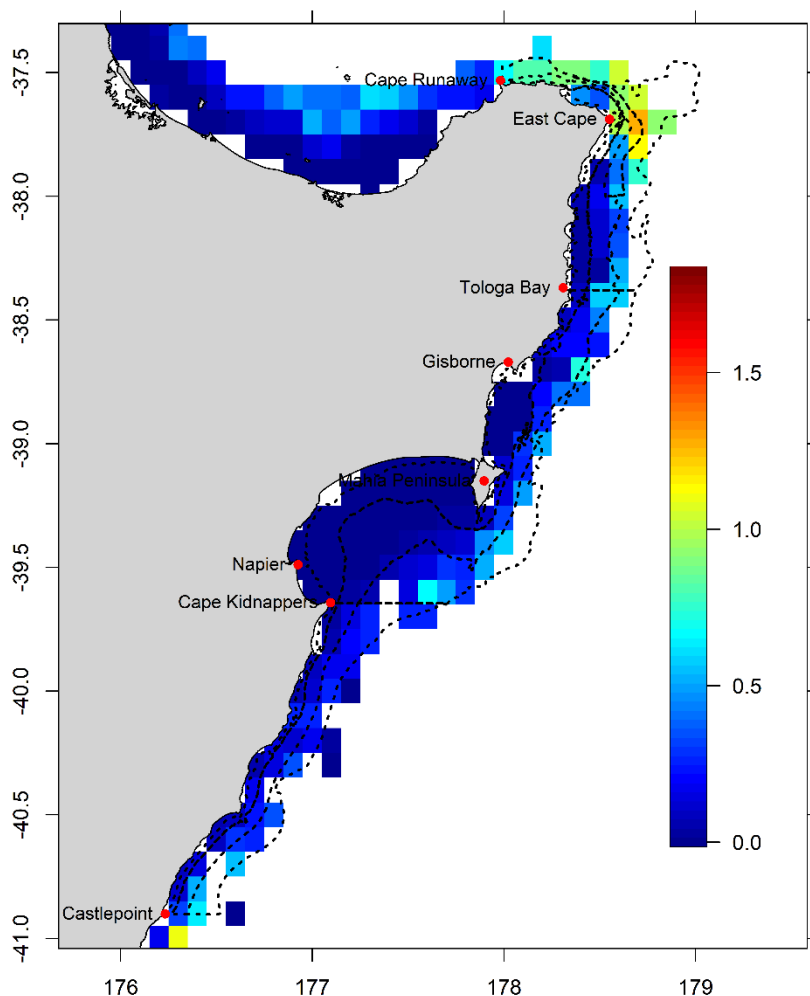
The 2025 survey commenced in mid-February, although tarakihi catches were small prior to mid March (Langley 2025). This indicated that tarakihi may not have begun to aggregate until mid-March and this is further supported by the low proportion of sampled tarakihi with developing gonads during the preceding period. A detailed analysis of commercial tarakihi catch data indicated that catch rates tended to increase from mid-February to reach a peak in late March and then decline during early April. On that basis, the start of the 2026 survey was delayed until the last week of February, while still providing sufficient time to complete the survey prior to Easter.

For 2026, the survey stations were completed between 24 February to 30 March, corresponding closely with the 2025 survey period (20 February to 30 March 2025).

### 2.3 Survey design

The study used a random stratified survey design (single phase). The spatial strata from the previous *Kaharoa* surveys provided the basis for the spatial stratification of the 2025 survey area north of Cape Kidnappers. The strata were partitioned at Tologa Bay (three strata south of Tologa Bay and four strata north of Tologa Bay) and by depth (20–50, 50–100, 100–200, and 200–300 m). For 2026, the 200–300 m deep stratum was excluded from the survey area due to the extent of foul ground in the area.

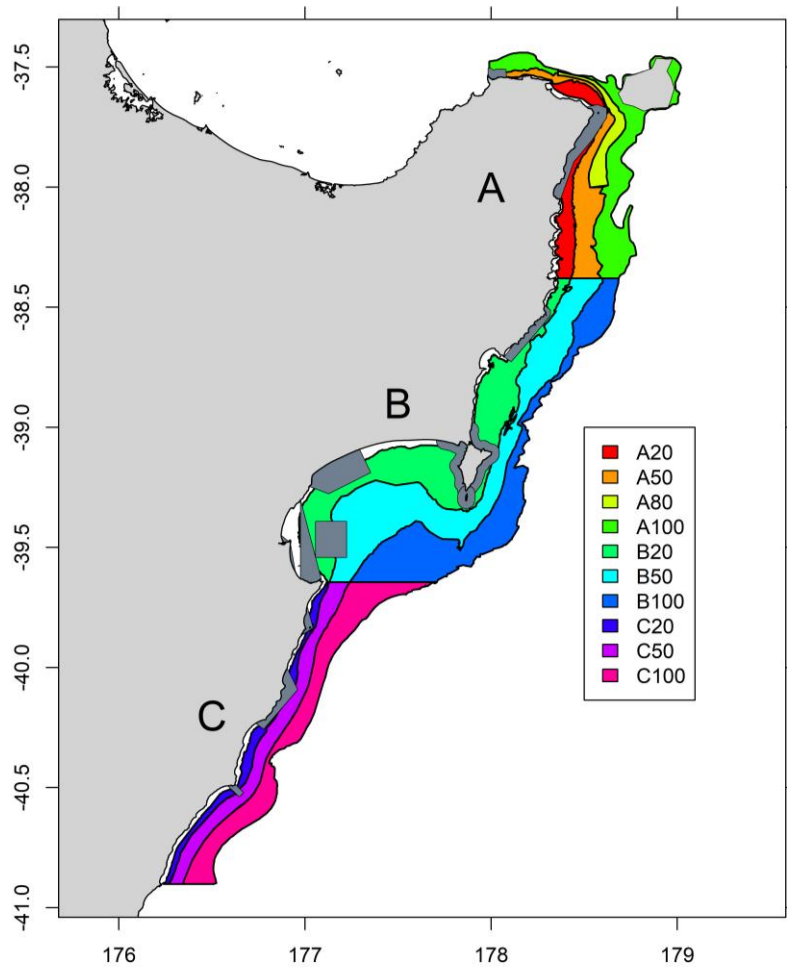
The depth stratification broadly corresponds to the relative distributions of the three priority species: tarakihi, red gurnard and snapper. However, during the March spawning period tarakihi tend to aggregate in an area around East Cape within the 80–120 m depth range. For 2026, this area was defined as a dedicated stratum (stratum A80) to improve survey coverage for tarakihi (Figure 3). This resulted in the modification of the adjacent stratum boundaries (A50 and A100).



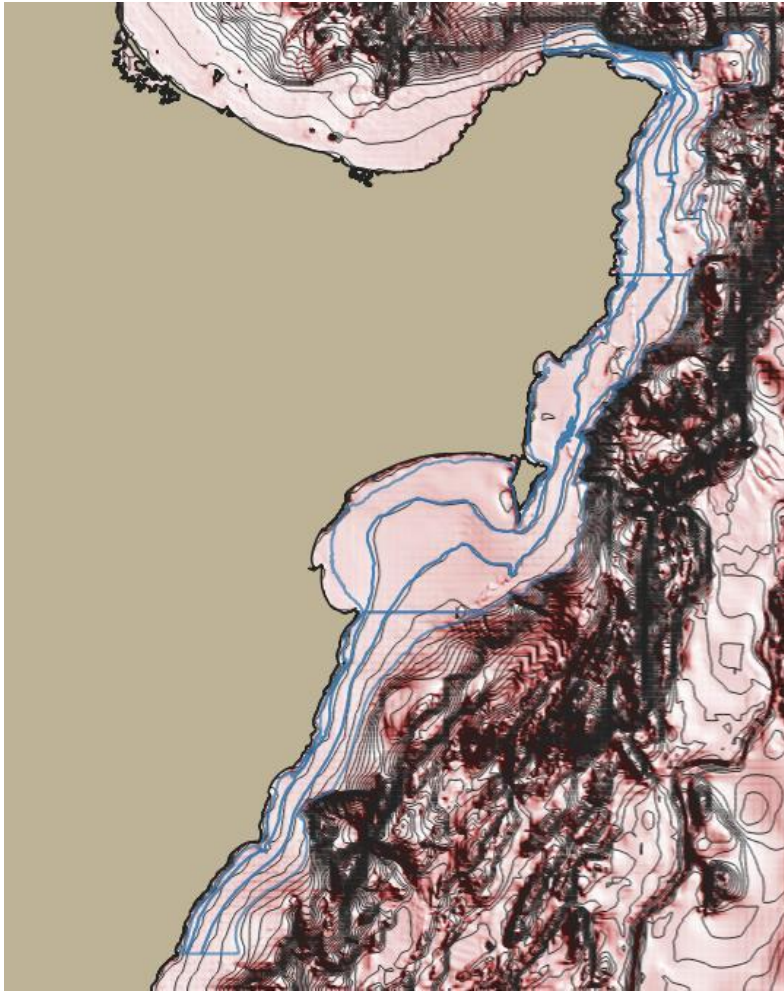
**Figure 3: Average tarakihi catch (t) per trawl from the inshore trawl fishery during March from 2015–16 to 2024–25 combined by 0.1 degree of latitude and longitude (trawl start position). Each cell includes records from a minimum of three permit holders. The dashed lines represent the strata boundaries of the 2026 survey.**

For 2026, the survey area also included three strata between Cape Kidnappers and Castlepoint, partitioned by depth intervals: 20–50 m, 50–100 m, 100–200 m (Figure 4). These strata are equivalent to the strata used in the previous *Kaharoa* surveys.

Within the survey area, there are a number of areas closed to commercial trawling either voluntarily or by regulatory closures (Figure 4). These areas were included in the stratum area definitions but not included in the generation of the survey stations. Similarly, there is a large area of untrawlable ground around Ranfurly Banks that represents a significant proportion of stratum A100 (Figure 5).



**Figure 4:** The trawl survey strata (modified from previous ECNI *Kaharoa* surveys). The grey areas represent areas closed to trawling (regulated and voluntary). The light grey area encompassing Ranfurly Banks was excluding from sampling (foul ground).



**Figure 5: Bathymetry of the survey area (NZ region bathymetry 2016 from Mitchell et al. 2012). The black lines represent the 50 m depth contours. The blue lines are the stratum boundaries.**

The survey area was partitioned into 10 strata (Table 1). The A and B strata north of Cape Kidnappers represented the area included within the 2025 pilot survey and is considered the core area of the survey. Three of the four vessels participating in the survey were assigned three stations in each of the seven strata within the core area, representing 63 stations. The three southern C strata were surveyed by the fourth vessel (*Bianca*) with only three stations allocated per stratum (9 stations). In addition, *Bianca* was allocated three stations in the B strata (9 stations) to provide spatial overlap with the other three vessels. Overall, the survey design allocated a total of 81 trawl stations.

**Table 1: Trawl survey strata and the number of stations completed during the survey. The allocated number of stations is in brackets.**

Stratum	Location	Depth (m)	Area (km <sup>2</sup> )	Number of stations	Density (km <sup>2</sup> per stations)
A20	Tologa-Runaway	20–50 m	589.5	9 (9)	65.5
A50	Tologa-Runaway	50–100 m	819.9	7 (9)	117.1
A80	Tologa-Runaway	80–120 m	303.5	8 (9)	37.9
A100	Tologa-Runaway	100–200 m	1 684.7	6 (9)	280.8
B20	Kidnappers-Tologa	20–50 m	2 585.6	12 (12)	215.5
B50	Kidnappers-Tologa	50–100 m	2 779.6	12 (12)	231.6
B100	Kidnappers-Tologa	100–200 m	2 166.7	12 (12)	180.6
C20	Castlepoint-Kidnappers	20–50 m	418.6	3 (3)	139.5
C50	Castlepoint-Kidnappers	50–100 m	1 002.7	3 (3)	334.2
C100	Castlepoint-Kidnappers	100–200 m	1 576.0	3 (3)	525.3
Total			13 926.8	75 (81)	185.7

## 2.4 Vessels and gear

The survey was conducted using four locally based trawl vessels: *Giovannina*, *Bartolo Zame*, *Bianca* and *Torea II* (Table 2). The vessels are owned and operated by Gisborne Fisheries, Fresh Regional Produce Limited and Star Fish Supply, respectively, with the latter two vessels also contract fishing for Moana New Zealand. Three of the vessels participated in the 2025 survey, the exception being *Bartolo Zame*.

The four vessels are comparable in size and all capable of fishing to depths of at least 200 m, although *Torea II* is considerably more powerful than the other three vessels. The vessels primarily operate in the FMA 2 inshore trawl fishery targeting tarakihi and red gurnard. The skippers who participated in the survey have a wealth of experience in the fishery (typically 30+ years) providing knowledge of the trawl grounds (areas of log debris, foul and known trawl lines) and the distribution and behaviour of the main target species.

**Table 2: Characteristics of the four vessels that participated in the survey.**

	<i>Giovannina</i>	<i>Bartolo Zame</i>	<i>Bianca</i>	<i>Torea II</i>
Vessel length (LOA)	19.4 m	19.4 m	19.15 m	16 m
Vessel power (kW)	223 kW	223 kW	272 kW (370 hp)	368 kW (500 hp)
Winch	Single winch	Single winch	Single winch	Dual winches
Number crew (including skipper)	2	2	3	3
Vessel skipper (s) during survey	Blethyn Hulton	Sean Fitzsimons	Ross Lepper Jason Naidanovich	Forest Brown
Home port	Gisborne	Gisborne	Napier	Napier
LFR	Gisborne Fisheries	Gisborne Fisheries	Moana NZ	Moana NZ/Star Fish
Electronic Reporting	Olrac	Olrac	Deckhand	Deckhand

Three of the vessels had a similar trawl net configuration: a “scraper” or “flats” trawl with a low headline (1.0–1.7 metres) and a wingspread of about 20 m (Table 3). These trawls are routinely used

in the FMA 2 inshore trawl fishery with the low headline height intended to reduce the catch of snapper while maintaining catch rates for other species (primarily tarakihi and red gurnard). *Bartolo Zame* also used a “flats” trawl although the headline height was considerably larger than the other sets of trawl gear (Table 3).

There were considerable differences in the lengths of bridles and sweeps used by the four vessels during the survey. The intention was that vessels used their existing trawl gear rather than attempting to standardise the trawl gear among the vessels. Therefore, the differences in trawl gear set up are simply considered a component of the overall differences in fishing efficiency (fishing power) between the four vessels. The three vessels that participated in the 2025 survey used the equivalent trawl gear in the 2026 survey.

Calculation of the biomass indices requires an estimate of the area swept by individual trawls. Of the four vessels, only *Bianca* was fitted with trawl door sensors enabling direct measurement of door spread. For the other three vessels, a constant theoretical door spread was assumed. A limited number of estimates of door spread were made during the 2026 survey based on warp angle calculations derived from measuring the distance between trawl warps.

**Table 3: Survey trawl gear configuration. The theoretical trawl gear dimensions are identified by an asterisk.**

Metric	<i>Giovannina</i>	<i>Bartolo Zame</i>	<i>Bianca</i>	<i>Torea II</i>
Trawl net design	155 foot “flats trawl” (Motueka Nets)	“Flats” trawl (Milligan Trawls)	130 foot “flats trawl” (Motueka Nets)	Scraper (Napier built)
Doors type, size	Thyboron Type 2	Prices Engineering 2.3 m/380 kg	Thyboron Type 14	Thyboron
Sweeps length (m)	128 m	128 m	210 m	150 m
Bridles length (m)	9 m	27 m	5 m	45 m
Ground rope length (m)	35 m	29 m	39.62 m	37 m
Ground rope config	60 mm rubber cookies over 12 mm wire	40mm rubber cookies over 16mm wire	48 mm rubber cookies over 12 mm wire	60 mm/100 mm rubber cookies over 11 mm wire
Headline height (m)	1 m	5 m	1.5 m	1.7 m
Wing spread (m)	20 m*	12 m	NA	NA
Door spread (m)	120 m*	91 m*	96–149 m	97 m*
Codend mesh size (mm)	100 mm	100 mm	105 mm	114 mm
Codend mesh type	2 panel 6 mm material T45	T45	T90	T90
Sensors	No	No	Door spread	No

## 2.5 Timetable and survey plan

The survey was conducted from 24 February to 30 March 2026. Prior to the survey, each vessel skipper and crew received training in the survey procedures by the survey coordinator (Brent Wood, ESNZ). For the new participants (*Bartolo Zame*), this entailed direct supervision of trial survey trawls conducted during a day trip in close proximity to the home port. For the participants in the 2025 pilot survey, a shoreside refresher briefing was conducted prior to commencement of the first trip. This also provided the opportunity to install survey information (trawl station locations and strata boundaries) on the vessel’s navigational software.

The individual vessels had the flexibility to conduct their allocated trawls at any time during the survey period. This enabled vessels to conduct commercial fishing during the period and minimise disruptions due to weather.

Each vessel completed four or five trips during the survey and typically conducted 4–5 survey trawls per trip.

## 2.6 Trawling procedure

A set of up to 25 random locations was generated within each stratum, excluding the areas closed to trawling by regulation or voluntary agreement. The random locations were separated by a minimum distance of 3 nautical miles. For the smaller strata (A20, A80 and C20), this constraint limited the number of random locations that could be generated. Each random location was identified by a unique Station ID.

For each stratum, five random stations were allocated to each vessel; three primary stations and two reserve stations per stratum. The sets of 5 stations were assigned to each vessel at random.

Within the survey area, there are areas of untrawlable ground due to log debris, typically in the vicinity of river mouths, foul ground and known hazards (e.g. shipwrecks). The initial set of random trawl stations was scrutinised by the vessel skippers and a number of locations were excluded, primarily within strata A20 and B20 (log debris) and A100 and B100 (foul ground). The unsuitability of those locations was corroborated by an examination of the commercial trawl start and end positions provided via statutory reporting. The locations of *Kaharoa* research trawls from previous surveys were also examined to confirm untrawlable ground.

For each fishing trip, typically 4–5 survey trawls were completed, interspersed with commercial trawls. The procedures for survey trawls were similar to the protocols used for ESNZ/NIWA *Kaharoa* inshore trawl surveys. Trawling was limited to daylight hours (between 0600 and 1800 NZST) and restricted to suitable sea conditions (at the discretion of the skipper).

The start position of the trawl was specified to be within 1 nautical mile of the station location. If deemed unsuitable for trawling, the station was replaced with the next substitute station for the stratum.

The survey protocols specified a trawl duration of one hour at a speed of 3.2 knots (over the ground) maintaining adequate bottom contact throughout the duration of the trawl (with a minimum acceptable distance of 1.5 nautical miles). Skippers were instructed to trawl along the depth contour while remaining within the stratum. The general direction of the trawl was at the discretion of the skipper, generally towards the next survey or commercial trawl. The length of trawl warp deployed was also consistent with the normal fishing operation of the vessel. Fishing depth, trawl speed, warp length and door spread (*Bianca*) were recorded at regular (10 minute) intervals during the trawl.

## 2.7 Data collection

At sea, the trawl station data were primarily recorded using *Instructions for NIWA Fisheries Research Trawl Survey Data Forms* (NIWA Fisheries Centre 2003, NIWA Fisheries Centre n.d.). The Station Record form was completed by the vessel skipper for each survey trawl, including the collection of environmental data, including sea state and swell direction.

Statutory reporting via ER provided a complementary set of trawl records (flagged by Station ID) that were available as a daily report from FishServe. This enabled each vessel's survey activity to be monitored with minimal delay and provided (estimated) catches prior to vessel unloading.

The trawl Station Record forms were collated at the end of each fishing trip. The data forms were checked and corroborated with the data provided via the ER system.

For each survey trawl, catches were sorted by species and the estimated catches for all species (retained and discarded) were recorded via the statutory ER system. The conditions of the Special

Permit allowed the retention of tarakihi, snapper and trevally below the Minimum Legal Size (MLS). The main species discarded were porcupine fish (POP), spiny dogfish (SPD), rough skates (RSK) and carpet shark (CAR). Species catches were not sorted by fish size (or condition) on board the vessel or during the unloading or receiving processes. Rig and school shark were landed whole rather than processed (to a trunked state) on board.

The catches from the individual survey trawls were labelled with the unique station ID and stored separately. The survey trawl catches were kept compartmentalised throughout vessel unloading and transportation to the processing facility. Catches from *Giovannina* and *Bartolo Zame* were landed directly to Gisborne Fisheries, while catches from both *Bianca* and *Torea II* were unloaded in Napier and transported to Moana New Zealand's Auckland facility.

## 2.8 Catch and biological sampling

On arrival at the processing facilities, the species catches from each survey trawl were weighed separately and referenced by the station ID. This process provided accurate species catch weights for all commercial species from each survey trawl. The catch weighing procedure was overseen by ESNZ sampling staff. The catch weights were also subsequently corroborated with the estimated catch weights recorded using the statutory Electronic Reporting system.

Catch sampling was conducted by ESNZ staff at Gisborne Fisheries and Moana New Zealand's Auckland facility. For tarakihi, snapper and red gurnard, sampling was conducted of all trawl survey catches following the weighing procedure. For each species, up to 100 fish were sampled per trawl. For smaller catches all fish were sampled, while an approximately random sample was selected from larger catches (exceeding 100 fish). The fish length (fork length or total) and sex were determined for all fish and otoliths were collected from the first 20 fish sampled (per species). Gonad condition was recorded for sampled tarakihi (7 stage scale, see Appendix 2). Data collection was via ESNZ electronic measuring boards.

The catch weight and biological sampling data were compiled in a format compatible with the Fisheries New Zealand *trawl* database. For the species discarded at sea, the estimated catch weights recorded via ER were also included in the station catch records (flagged as estimated catches).

Final data collation, error checking and validation was conducted by ESNZ staff. Data from each vessel were assigned a vessel specific survey code (*Bianca*, BIA2601; *Bartolo Zame*, BTZ2601; *Giovannina*, GIO2601; *Torea II*, TOR2601) and the associated vessel and gear attributes were recorded in the relevant tables of the *trawl* database.

## 2.9 Analysis of data

For the main species of interest (tarakihi, snapper, red gurnard, rig, school shark, John dory, trevally), the species catch rates were determined for each trawl, expressed either as kilograms per trawl or kilograms per square kilometre swept area. Swept area was calculated as the trawl path between the trawl doors with the door spread either measured directly (*Bianca*) or using a default value assumed (*Giovannina*, *Bartolo Zame*, and *Torea II*).

The distributions of species catch or catch rates were examined spatially and relative to fishing depth and day of the survey. For tarakihi, snapper and red gurnard, a simple Generalised Linear Model was configured to investigate the main sources of variation in the station catches from a combined data set from the 2025 and 2026 surveys. The analyses investigated potential differences in the species catch rates between the four survey vessels.

For the main species of interest, stratum and survey biomass indices (and associated coefficients of variation, CV) were derived following Francis & Fu (2012). This included trawls with an acceptable performance (gear performance code 1 or 2) and assumed default door spread values for *Giovannina*

(120 m), *Bartolo Zame* (91 m) and *Torea II* (97 m). All species were assumed to be fully available (1.0) and vulnerable (1.0) to the trawl gear (between the doors).

For each species, biomass indices for the core survey area (strata A and B) were derived separately for individual vessels (*Giovannina* and *Bartolo Zame*) and a combined index was calculated from all stations (all vessels combined). *Torea II* did not complete a sufficient number of trawl stations to enable vessel specific biomass indices to be derived for the core area, while *Bianca* only conducted trawl stations within the B strata of the core area.

For tarakihi, snapper and red gurnard, the length frequency data were used to calculate scaled survey length compositions (and CV) for male, female and all fish (Francis & Fu 2012) by vessel and combined. The resulting length compositions were compared to identify any appreciable differences in the length of fish caught between vessels. In addition, for each species, length compositions were compared between survey strata.

For tarakihi, the ovarian condition of sampled fish was summarised by stratum and date.

### 3. RESULTS

#### 3.1 Trawl station details

A total of 75 of the 81 scheduled survey stations were completed during the survey period (Table 4). One vessel (*Torea II*) was unable to complete five of the 21 allocated stations due to bad weather encountered at the end of the survey period. The survey was extended for an additional two weeks to enable the completion of those stations; however, there were logistical constraints around the Easter period (3–6 April 2026) and weather conditions around East Cape remained unsuitable for fishing, especially during the passage of Cyclone Vaianu (11–12 April 2026). As a result, a reduced number of trawls were completed in strata A50, A80 and A100 (Table 4).

Most of the trawls were completed at the primary stations in each stratum, although there were ten stations substituted, principally due to log debris in shallower strata (A20 and B20) and untrawlable (foul) ground in the deeper strata (A100 and B100) (Table 4). Two additional trawl stations were excluded from the survey due to substantial damage to the trawl gear (*Giovannina* and *Bartolo Zame*). This required the replacement of the trawl nets with identical spare nets.

**Table 4: The number of survey trawl stations completed by each vessel by stratum. The number of substituted trawls is in brackets.**

Stratum	<i>Giovannina</i>	<i>Bartolo Zame</i>	<i>Bianca</i>	<i>Torea II</i>	Total
A20	3 (2)	3 (1)		3	9 (3)
A50	3	3		1	7 (0)
A80	3	3 (1)		2	8 (1)
A100	2	3 (1)		1	6 (1)
B20	3 (1)	3	3	3 (1)	12 (2)
B50	3 (1)	3	3	3	12 (1)
B100	3	3 (1)	3	3 (1)	12 (2)
C20			3		3 (0)
C50			3		3 (0)
C100			3		3 (0)
Total	20 (4) of 21	21 (4) of 21	18 (0) of 18	16 (2) of 21	75 (10) of 81

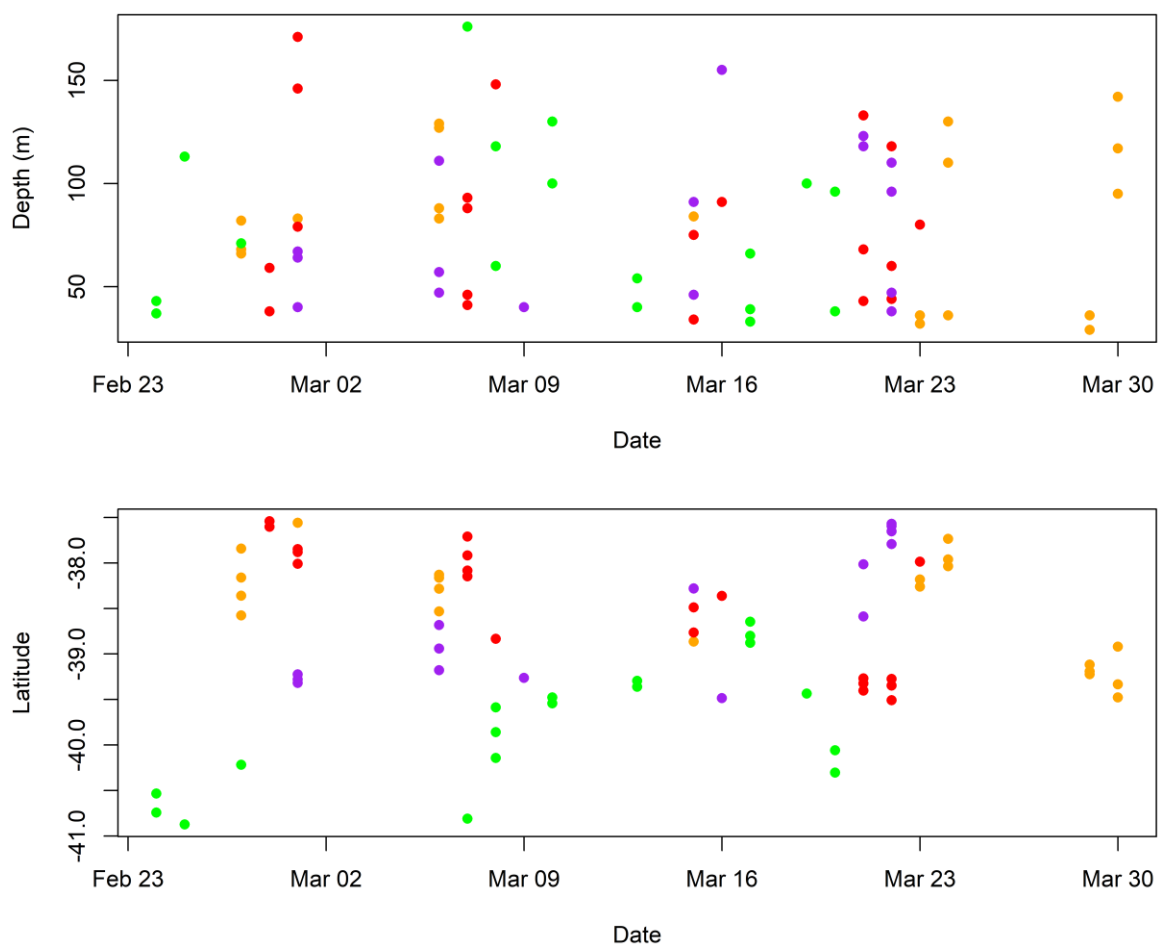
For the four vessels, survey stations were distributed throughout the survey period, punctuated by periods of adverse weather; prevailing southerly conditions in early March and nor'easterly conditions

in late March (Figure 6 and Figure 7). *Bianca* was the only vessel assigned stations in the southern portion of the survey area (Figure 6 and Figure 8).

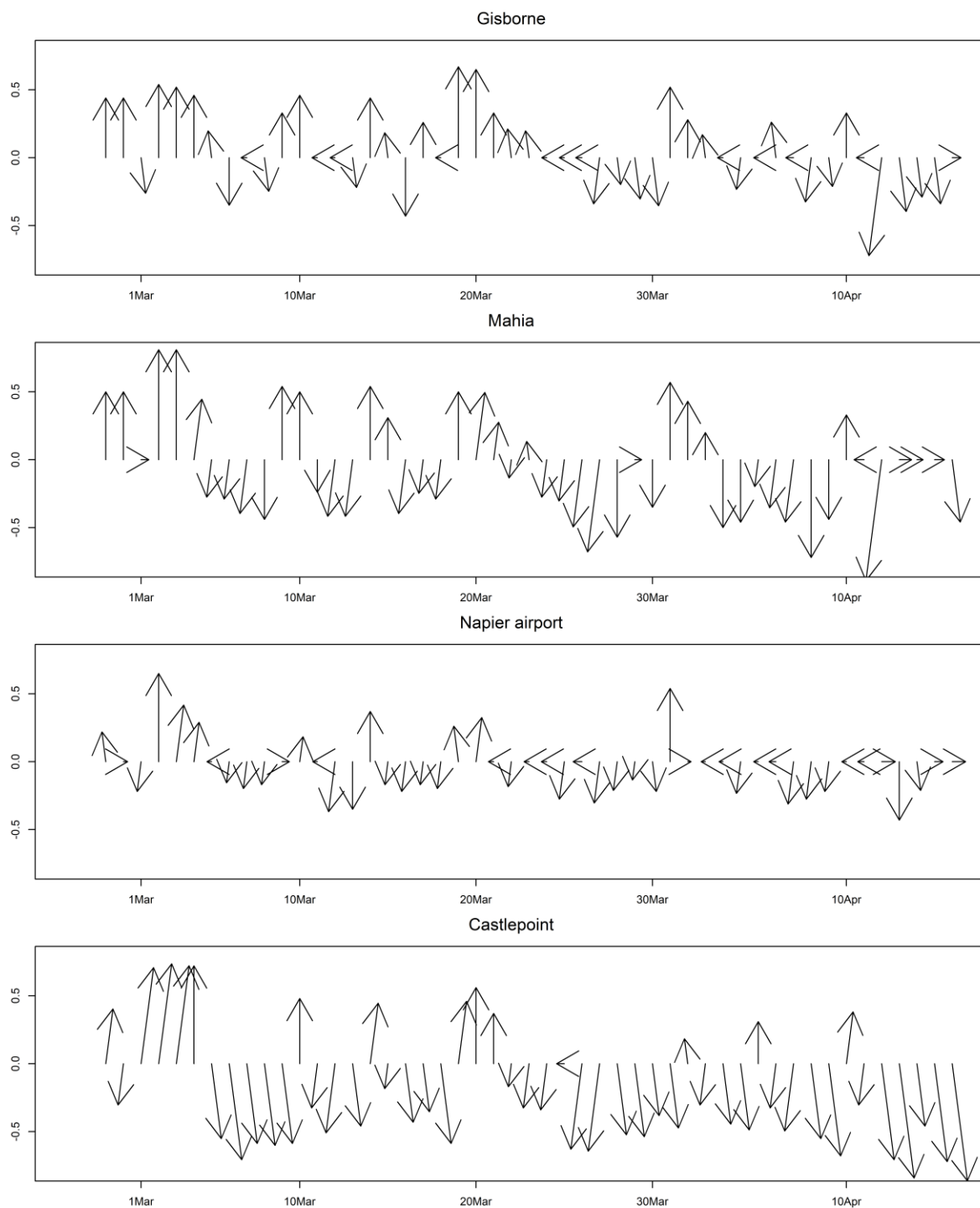
The random allocation of stations resulted in a broad spread of trawl effort, although limited sampling occurred in the northern area of stratum A100 (Figure 8). This area included the area around Ranfurly Banks that was designated as untrawlable ground. The station allocation resulted in a high density of trawl stations in the two smallest strata (A20 and A80) (Table 1). Sample coverage was relatively low in the three southern strata (*Bianca* only) (Figure 8).

Overall, most of the survey trawls were conducted in accordance with the protocols (Table 5). Trawl speeds approximated the target trawl speed of 3.2 knots (SOG) and duration of one hour. A number of trawls by *Bartolo Zame* were at a slower speed, particular for deeper trawls in the vicinity of East Cape where tidal flows are strong. A number of trawls (9) commenced prior to the designated start time of 0600 (NZST).

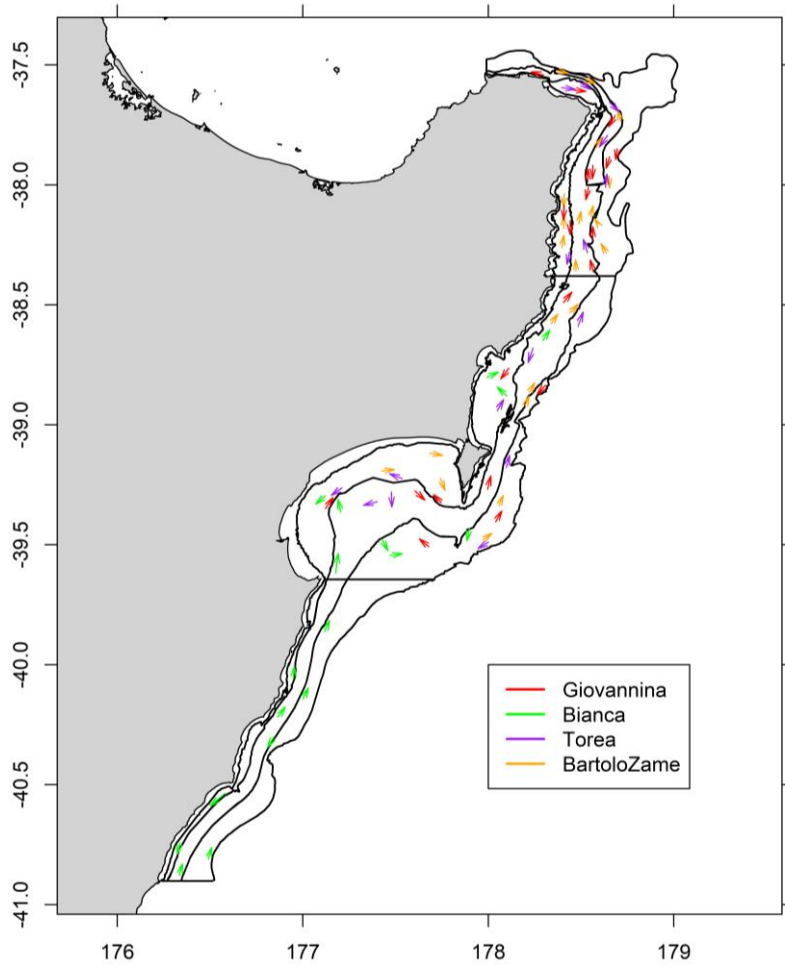
For *Bianca*, door spread measurements from sensors increased with increasing depth and were comparable to the data from the 2025 survey (Figure 9). A limited number of estimates of door spread were available from the other vessels, derived from calculations based on warp angles. The measurements from *Giovannina* were lower than the default door spread value (of 120 m) for the vessel.



**Figure 6:** Start depth (top panel) and latitude (bottom panel) of the vessel's survey trawls by day of the year.



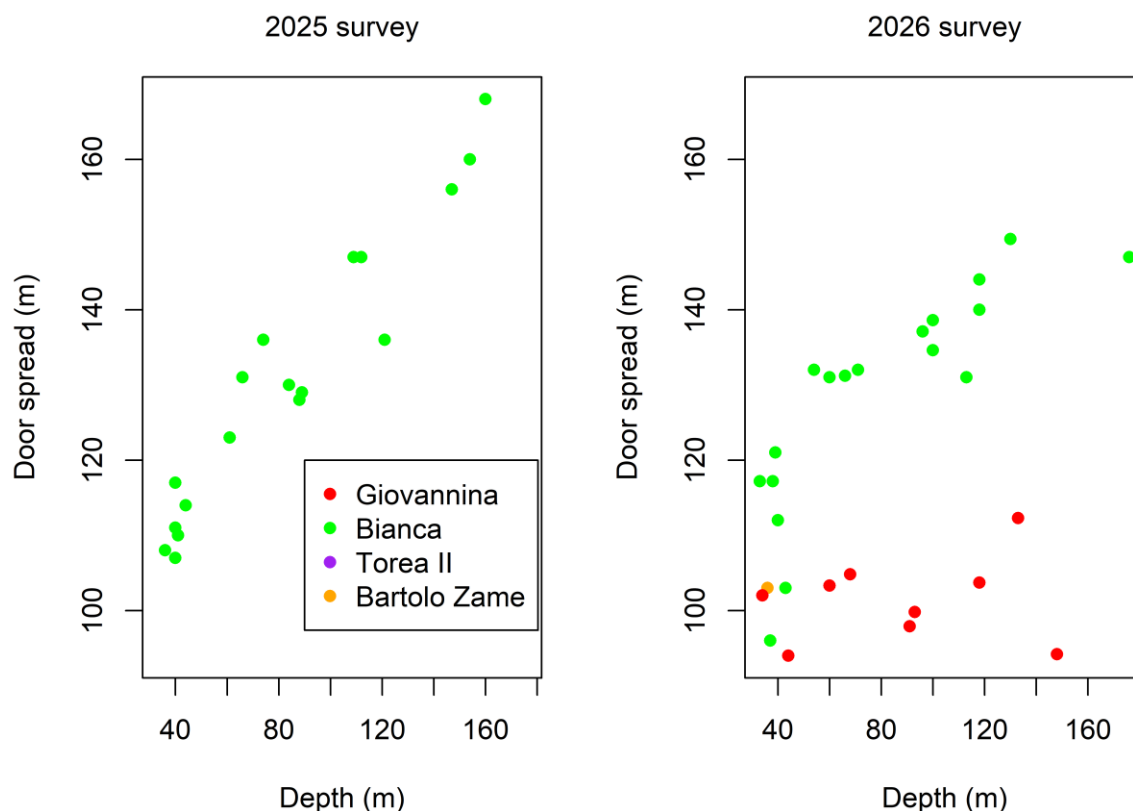
**Figure 7: Daily wind vector plots of the maximum gusts recorded at Gisborne, Mahia, Napier airport and Castlepoint weather stations during the trawl survey period. The vector lengths are proportional to the wind speed with a maximum value of 126 kph.**



**Figure 8:** Survey trawl stations by vessel. The arrow denotes the direction of the trawl from start to end position.

**Table 5: Performance metrics for the individual survey trawls by vessel (average and minimum and maximum values in brackets).**

Metric	<i>Giovannina</i>	<i>Bartolo Zame</i>	<i>Bianca</i>	<i>Torea II</i>
Number of trawls (total)	21	22	18	16
Number of primary stations excluded	1	1	0	0
Number of substitute stations	4	4	0	2
Distance from specified station (km)	0.77 (0.20, 1.85)	0.87 ( 0.10, 2.68)	0.98 (0.08, 1.98)	1.12 (0.06, 2.3)
Trawl speed (knots)	3.3 (3.1, 3.5)	3.0 (2.6,3.4)	3.1 (2.9, 3.2)	3.2 (3.1, 3.5)
Trawl duration	1.0 (0.80,1.1 )	0.98 (0.6, 1.4)	1.0 (1.0,1.0)	1.0 (1.0, 1.1)
Trawl distance (n. mile)	3.2 (2.7, 3.6)	2.9 (1.7,3.4)	3.0 (2.4,3.3)	3.5 (3.0,3.8)
Trawl direction	160 (0, 344)	116 (1, 358)	120 (4,346)	162 (11, 343)
Depth start minus depth end (m)	0.5 (-23, 16)	0.0 (-19, 23)	-1.1 (-27,35)	2 (-7, 7)
Warp/Depth ratio	4.1 (2.7, 6.7)	4.5 (3.1, 7.9)	4.7 (3.1,7.6)	4.7 (3.4, 6.6)
Start time (decimal, NZST)	9.2 (5.1,16.2)	10.4 (5.0, 16.5)	12.1 (6.1,17.4)	12.2 (6.4, 16.9)
Door spread (m) (sensors)	NA	NA	128 (96,149)	NA



**Figure 9: Door spread (m) measurements by depth from 2025 and 2026 by vessel. Measurements for Bianca are from door sensors. Measurements for the other vessels are calculated from measurements of the distance between trawl warps.**

### 3.2 Catch composition

Tarakihi and snapper represented the largest components of the total survey catch, while red gurnard was the most frequently caught species (Table 6, Table 7 and Appendix 1). Total catches of tarakihi and snapper were comparable for the three vessels surveying the northern (A) strata (*Giovannina*,

*Torea II* and *Bartolo Zame*) and considerably lower for *Bianca*. Total catches of red gurnard were comparable between the four vessels and relatively consistent over all trawls. Rig, trevally and John dory were caught in small quantities from a high proportion of trawls. School shark was less frequently caught (Table 6, Table 7 and Appendix 1).

**Table 6: Total survey catches (kg) by species code and vessel for the species with a total catch of at least 100 kg.**

Species code	Vessel				Total
	<i>Bianca</i>	<i>Bartolo Zame</i>	<i>Giovannina</i>	<i>Torea II</i>	
TAR	813.5	3,089.0	2,830.8	2,351.5	9,084.8
SNA	728.0	1,575.0	2,495.9	2,773.5	7,572.4
GUR	989.5	728.2	1,043.7	656.0	3,417.4
TRE	90.0	58.4	550.8	838.5	1,537.7
SPD	553.0	16.0	105.0	0.0	674.0
POP	655.0	9.0	5.0	0.0	669.0
SPO	201.0	148.4	113.0	196.0	658.4
SCH	32.5	155.8	186.4	198.0	572.7
JDO	132.5	95.8	127.0	110.5	465.8
SKI	80.5	88.8	216.0	72.0	457.3
BAR	51.0	72.4	35.4	146.0	304.8
KAH	32.0	6.0	51.6	89.0	178.6
ELE	30.0	0.0	29.6	62.5	122.1
CAR	79.0	27.0	15.0	0.0	121.0
RSK	58.5	28.0	25.0	0.0	111.5

**Table 7: Frequency of species catch (number of survey trawls) by vessel and total for the species with a total catch of at least 100 kg.**

Species code	Vessel				Total
	<i>Bianca</i>	<i>Bartolo Zame</i>	<i>Giovannina</i>	<i>Torea II</i>	
TAR	12	15	13	12	52
SNA	15	19	18	16	68
GUR	17	20	20	15	72
TRE	12	10	15	12	49
SPD	14	7	2	0	23
POP	14	5	1	0	20
SPO	13	10	15	10	48
SCH	5	12	12	8	37
JDO	11	9	15	10	45
SKI	6	5	2	2	15
BAR	4	9	10	8	31
KAH	7	4	6	9	26
ELE	2	0	2	2	6
CAR	12	5	2	0	19
RSK	12	10	2	0	24

For the three main species (tarakihi, snapper and red gurnard), a generic GLM model was used to investigate the variation in the natural logarithm of the species catch rate, expressed as  $\text{kg.km}^2$  (excluding nil catches). The data set combined observations from the 2025 and 2026 surveys, excluding the data from the southern C strata ( $n = 121$  stations). Strata were standardised based on the 2026 strata definitions. The models included the potential explanatory variables *Year* (2), *Stratum* (7) and *Vessel* (4) as categorical variables, while the continuous variables were included as linear functions (*Speed* and *YearDay*) or third order polynomial functions (*TimeStart* and *Depth*).

For all species, *Stratum* accounted for most of the variation explained by the models (Table 8). This provides a degree of support for the existing area, depth, and spatial configuration of the survey strata. For most species, *Depth* accounted for a significant additional proportion of the explained variance, indicating that the stratum boundaries represent a relatively crude delineation of the depth distribution of each species (Figure 10). *Year* was not a significant variable for any of the three species models.

*Vessel* accounted for a significant proportion of the explained variance for snapper only (Table 8), estimating a considerably lower *Vessel* coefficient for *Bianca*, especially compared to *Torea II* (Figure 11 and Table 9).

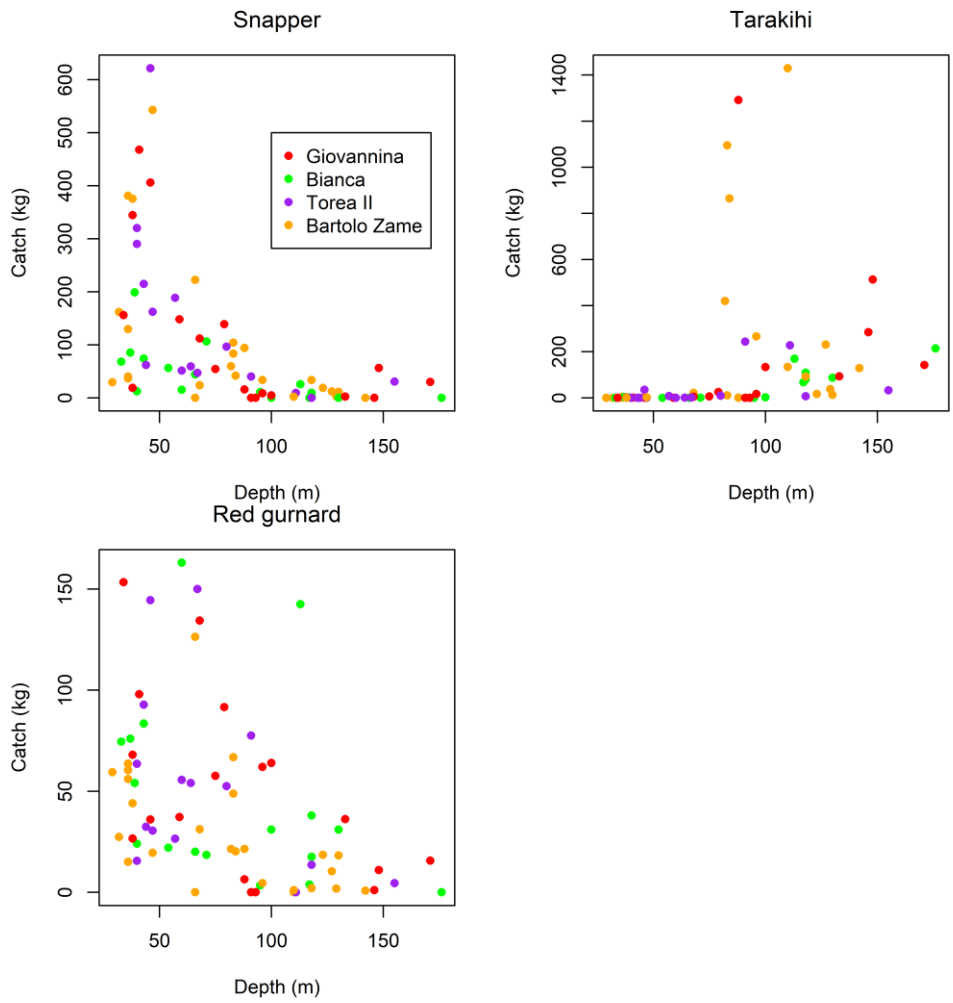
*Bianca* is the only vessel that provides accurate measurements of door spread via acoustic sensors. The measured door spread values are larger than the assumed default value for *Torea II*, particularly with increasing depths (Figure 9). The door spread values are used to derive the area swept for each trawl and, hence, catch rates expressed in  $\text{kg.km}^2$ . The lower snapper catch rates for *Bianca*, particularly at increasing depth, may be influenced by the door spread data from the vessel (Figure 9). Nonetheless, a trial model with a fixed door spread value for *Bianca* equivalent to the *Torea II* default value did not appreciably change the differential between the vessel coefficients. Further, limiting the analysis to the central strata (B) surveyed by all vessels in 2026 did not appreciably change the result for snapper.

For red gurnard, the vessel coefficients were estimated to be comparable between the four vessels (Figure 11 and Table 9).

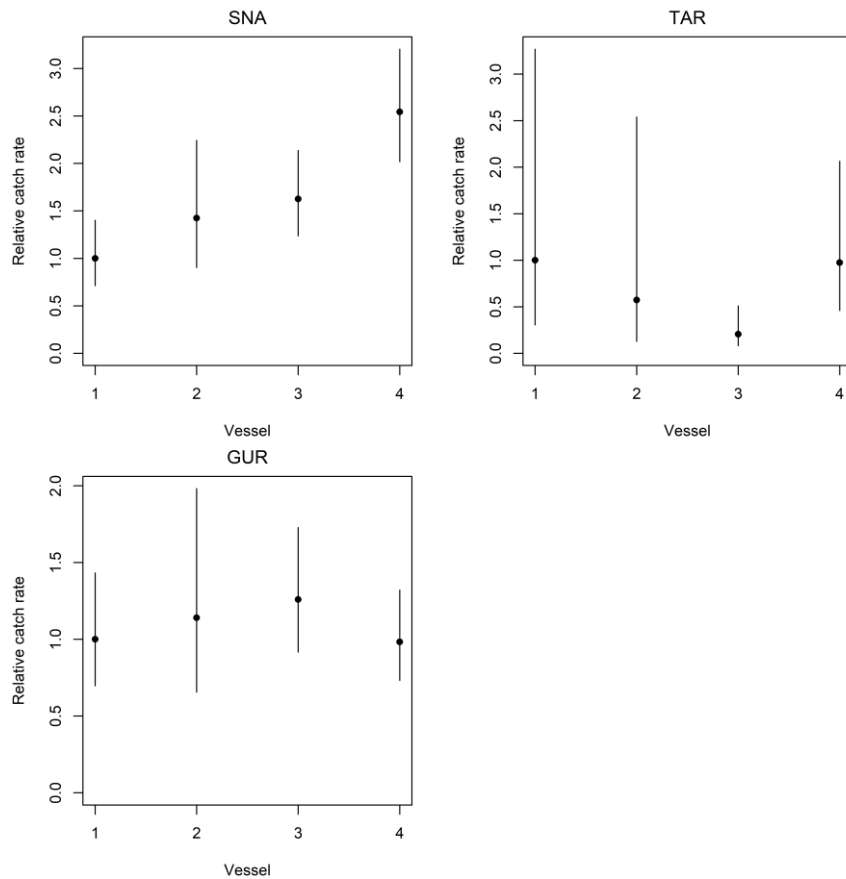
For tarakihi, the estimates of the vessel coefficients are imprecise, corresponding to the high overall variation in tarakihi catch rates (Figure 11 and Table 9). The lower vessel coefficient estimated for *Giovannina* is strongly influenced by the data from the 2025 survey. The model also estimated a significant diurnal effect for the catch rate of tarakihi with higher catch rates at dawn and dusk and lower catch rates during the middle of the day (Figure 12).

**Table 8: Total (Null) deviance in the natural logarithm of species trawl catches (positive only) and the deviance explained by each variable included in the generic explanatory model. Levels of significance: 0 ‘\*\*\*’, 0.001 ‘\*\*’, 0.01 ‘\*’.**

	Species		
	SNA	TAR	GUR
Total Dev.	211.5	414.5	167.1
Variable			
<i>Stratum</i>	132.1***	158.9***	65.2***
<i>Vessel</i>	7.3**	9.2	4.0
<i>Year</i>	0.1	4.4	0.2
<i>TimeStart</i>	1.5	44.0**	0.9
<i>YearDay</i>	0.8	2.4	0.9
<i>Depth</i>	16.9***	34.3*	13.7**
<i>Speed</i>	1.1	1.2	0.0



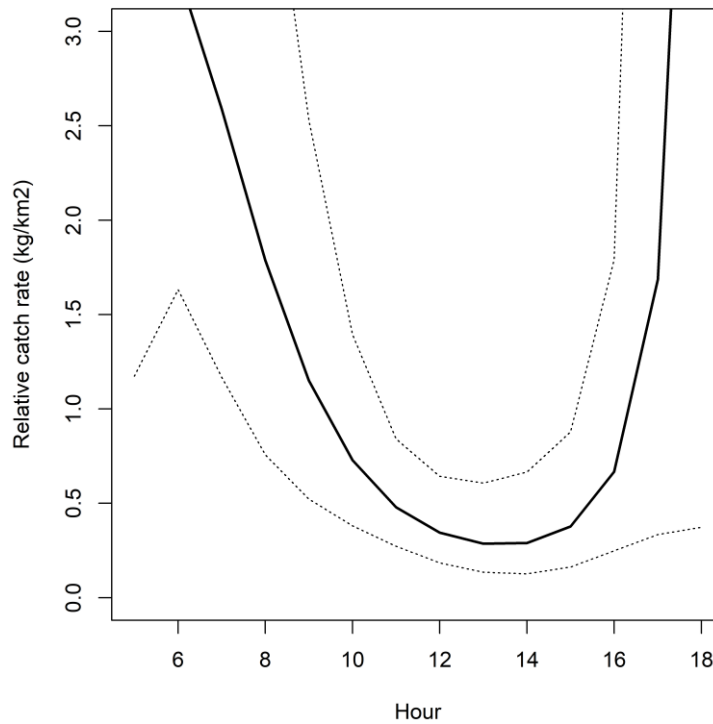
**Figure 10: Depth distribution of trawl survey station catches by vessel for snapper, tarakihi, red gurnard and rig.**



**Figure 11:** Vessel coefficients (and 95% confidence intervals) for each species derived from exploratory GLMs of trawl station species catches (Vessel 1, *Bianca*; Vessel 2, *Bartolo Zame*; Vessel 3, *Giovannina*; Vessel 4, *Torea II*).

**Table 9:** Vessel coefficients (and standard errors) derived for each species from exploratory GLMs of trawl station species catches. Vessel was a significant variable in the snapper model only.

Species	Vessel	Coefficient	Standard Error
Snapper	<i>Bianca</i>	0.597	0.172
	<i>Bartolo Zame</i>	0.850	0.232
	<i>Giovannina</i>	0.971	0.139
	<i>Torea II</i>	1.518	0.118
Tarakihi	<i>Bianca</i>	1.733	0.604
	<i>Bartolo Zame</i>	0.992	0.760
	<i>Giovannina</i>	0.357	0.464
	<i>Torea II</i>	1.689	0.383
Red gurnard	<i>Bianca</i>	0.914	0.184
	<i>Bartolo Zame</i>	1.042	0.282
	<i>Giovannina</i>	1.151	0.162
	<i>Torea II</i>	0.899	0.150



**Figure 12. Diurnal effect for catch rates of tarakihi (and 95% confidence interval) derived from exploratory GLMs of trawl survey station data.**

For the main species of interest, trawl survey biomass indices were generated for the two vessels (*Giovannina* and *Bartolo Zame*) completing sufficient stations in the core survey area (strata A- and B-). For all vessels, estimates of biomass were also derived for each stratum completed (minimum of 2 trawls) (Table 10).

In addition, the amalgamated data set from the four vessels was used to derive combined biomass indices. The amalgamated data set included trawl stations completed by *Bianca* in strata B20, B50 and B100 and all trawl stations completed by the other three vessels. Two separate analyses were conducted: either assuming no difference in fishing power between vessels, or accounting for vessel specific fishing power for snapper, tarakihi and red gurnard using the coefficients derived from the previous analysis (Table 9). The latter indices incorporated the uncertainty associated with the vessel specific approach using a bootstrapping approach, resampling the stations from each stratum and from the distribution of the individual coefficient.

**Table 10: Parameter settings for derivation of survey biomass indices and scaled length compositions.**

Attribute	<i>Bianca</i>	<i>Giovannina</i>	<i>Torea II</i>	<i>Bartolo Zame</i>	Combined
Strata	B20, 50, 100 C20, 50, 100	A20, 50, 80, 100 B20, 50, 100	A20, 50, 80, 100 B20, 50, 100	A20, 50, 80, 100 B20, 50, 100	A20, 50, 80, 100 B20, 50, 100
Gear perf	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2
N. stations	18	20	16	21	75
Door spread	128 m (96–149)	120 m (default)	97 m (default)	91 m (default)	Vessel specific
Distance	Start/end pos	Start/end pos	Start/end pos	Start/end pos	Start/end pos
Vulnerability	1	1	1	1	1
Availability	1	1	1	1	1

For snapper and red gurnard, biomass indices were comparable between the two vessels and for the amalgamated data set (all vessels, uncorrected), with a relatively low associated CV for all indices (Table 11). There was no appreciable difference between the all vessel combined biomass indices with or without the vessel specific correction factors applied.

For tarakihi, there is considerably more uncertainty in the biomass indices, with higher associated CVs and greater variability between the individual vessels. The vessel coefficients for tarakihi have low precision and this inflates the uncertainty associated with the all vessel corrected indices (relative to the uncorrected indices) (Table 11). The corrected indices for tarakihi are not considered sufficiently robust and are presented for comparative purposes only.

For the second tier species (SPO, SCH, JDO, TRE), the biomass indices were estimated with a moderate level of precision, typically CVs of 20–30% (Table 11). No vessel correction factors are available for the second tier species.

**Table 11: Trawl survey biomass indices (t) for the core survey area and coefficient of variation (CV, %) for selected species by vessel and all vessels combined (uncorrected and corrected for vessel effects).**

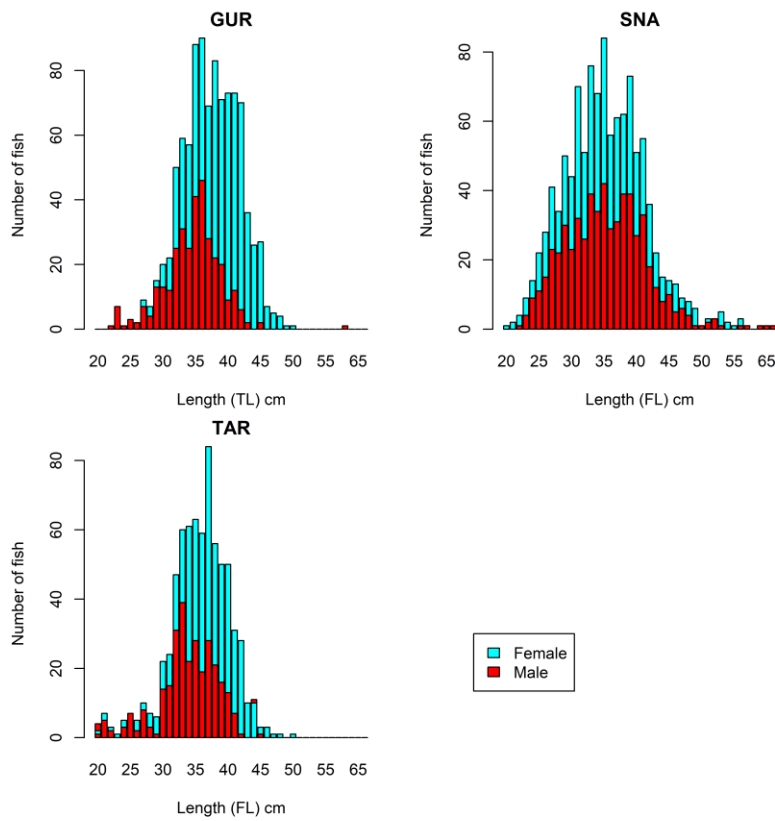
Species	<i>Giovannina</i>		<i>Bartolo Zame</i>		All Vessels (uncorrected)		All Vessels (corrected)	
	Biomass	CV	Biomass	CV	Biomass	CV	Biomass	CV
TAR	1 483	37	2 860	61	1 581	29	2 682	52
SNA	1 393	16	1 044	16	1 421	11	1 387	12
GUR	864	18	692	10	741	10	741	14
SPO	87	27	59	47	121	33	-	-
SCH	210	27	137	37	147	20	-	-
JDO	58	28	125	51	105	18	-	-
RCO	63	74	4	60	18	66	-	-
SKI	301	99	141	73	158	66	-	-
TRE	207	31	41	29	318	26	-	-
MOK	4	100	2	100	4	42	-	-

### 3.3 Length compositions

For the three main species of interest, almost all the individual trawl catches were sampled. A small number (8) of species catches were not sampled, principally from catches unloaded in Gisborne (*Giovannina* and *Bartolo Zame*) (Table 12). Four of the unsampled catches were relatively small (less than 20 kg), although a couple of larger catches were not sampled or sampling data were lost. Regardless, the sampling encompassed a high proportion of the total catch of the three species (97% for red gurnard, 98% snapper, and 96% tarakihi), resulting in the collection of comprehensive compositional data from the catch of each vessel and a comprehensive set of otoliths for each of those species (Table 12 and Figure 13).

**Table 12: The number of trawls sampled, the number of fish measured and the number of fish sampled for otoliths by species and vessel. The total number of catches for each species is in brackets.**

Species	Metric	<i>Bianca</i>	<i>Giovannina</i>	<i>Torea II</i>	<i>Bartolo Zame</i>	Total
SNA	N. Trawls	15 (15)	18 (18)	15 (16)	18 (19)	66 (68)
	N LF & Bio	465	1,314	938	861	3,578
	N otoliths	198	329	276	298	1,101
TAR	N. Trawls	12 (12)	12 (13)	12 (12)	14 (15)	50 (52)
	N LF & Bio	639	591	595	703	2,528
	N otoliths	149	164	171	216	700
GUR	N. Trawls	17 (17)	17 (20)	15 (15)	19 (20)	68 (72)
	N LF & Bio	1,212	1,283	793	1,012	4,300
	N otoliths	340	213	235	190	978



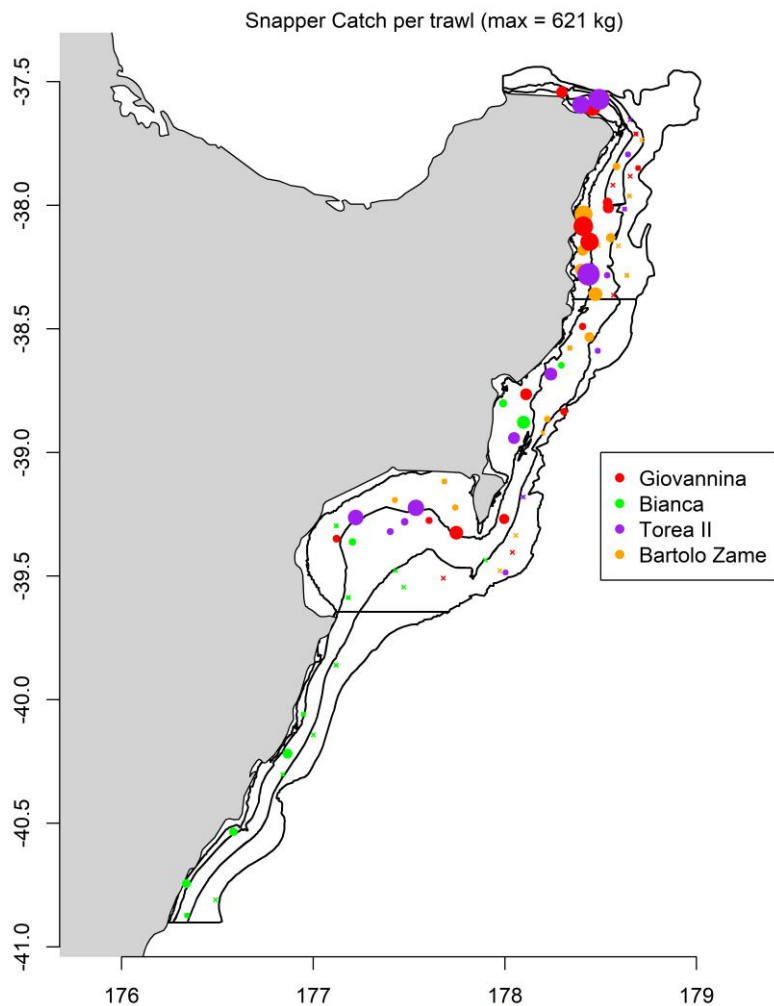
**Figure 13: The number of fish sampled for otoliths by length class and sex for each of the sampled species (GUR, red gurnard; SNA, snapper; TAR, tarakihi).**

### 3.4 Snapper

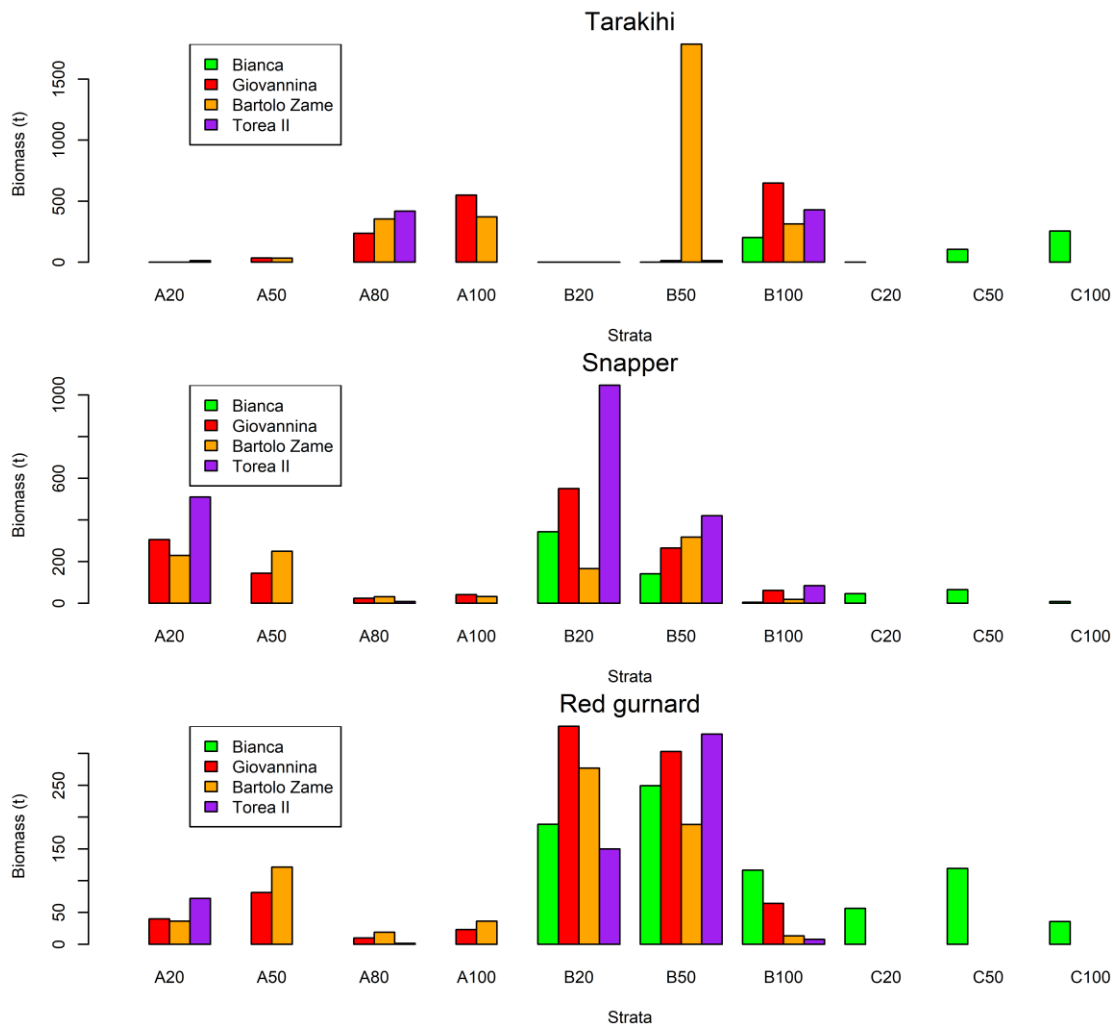
Snapper was caught in most of the survey trawls (68 of 75 stations) with the highest catch rates in the shallow northern stratum (A20) (Figure 14). Catch rates were lowest in the deeper strata, beyond 100 m (strata A100, B100 and C100). Catch rates were considerably lower south of Cape Kidnappers.

Trawl survey biomass indices for snapper for the core survey area, either by vessel or combined, were determined with high precision (Table 11) reflecting relatively consistent catch rates within individual strata. The two shallow strata (A20 and B20) accounted for 61% of the total biomass from the combined analysis (Figure 15). The distribution of biomass amongst survey strata was very similar to the 2025 trawl survey.

The southern area of the survey (C strata) yielded relatively low estimates of stratum biomass for snapper (Figure 15). The southern strata accounted for 8% of the snapper biomass derived for the entire survey area (all vessels combined).



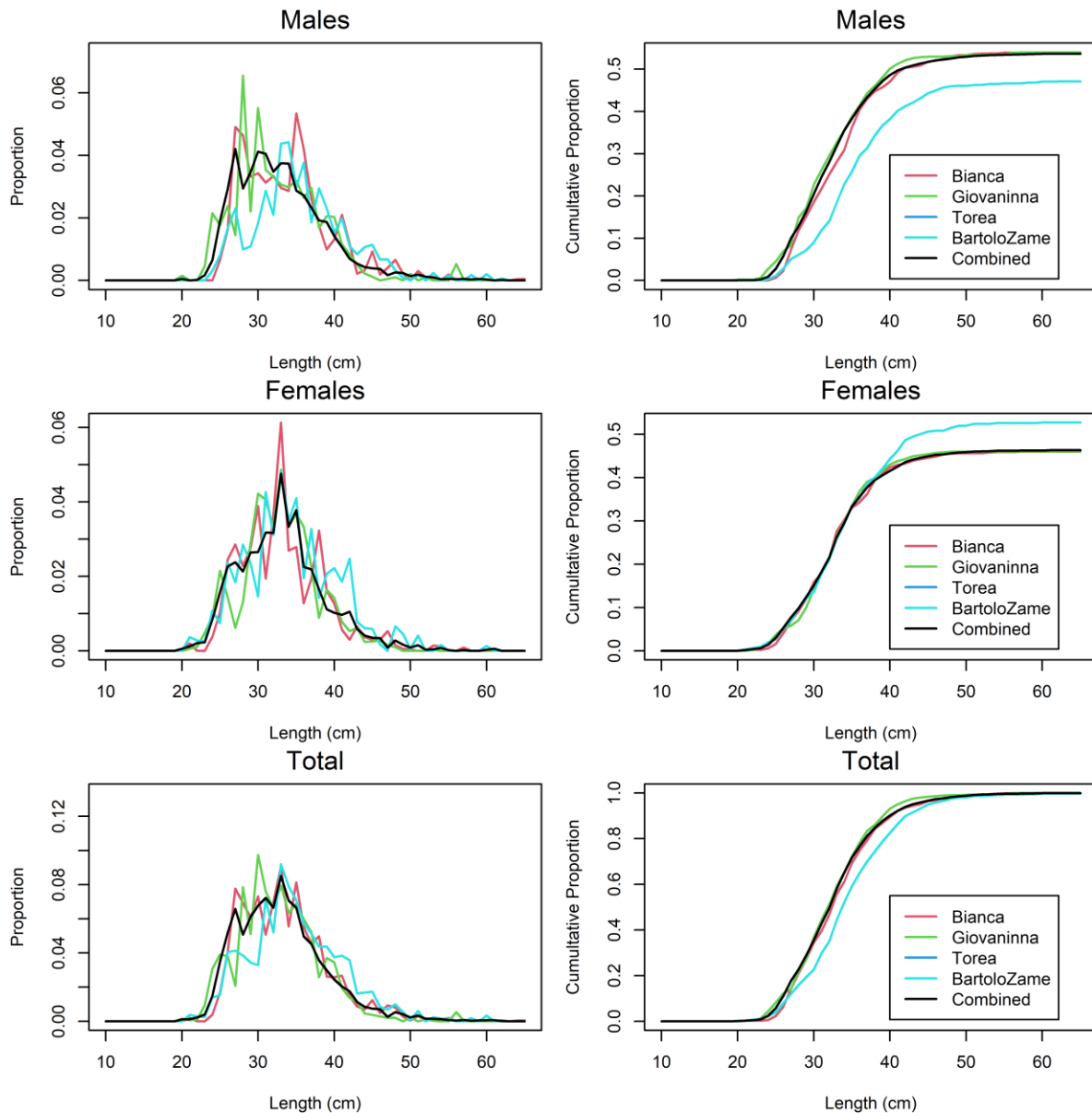
**Figure 14:** The relative catch (kilograms per trawl) of snapper from the individual survey trawls by vessel. The area of the circle is proportional to the magnitude of the catch. The boundaries of the survey strata (black lines) are also shown.



**Figure 15: The distribution of trawl survey biomass (by vessel and combined) between strata for snapper, tarakihi and red gurnard.**

Scaled length compositions of snapper were derived for the combined fleet and individual vessels, with the exception of *Torea II* which completed insufficient stations in some strata.

The length compositions were broadly comparable between vessels, although *Bartolo Zame* samples were comprised of a lower proportion of smaller (< 34 cm) male snapper. The length compositions were dominated by 28–38 cm (fork length) fish with the tail of the distribution extending to about 50 cm (fork length) (Figure 16).

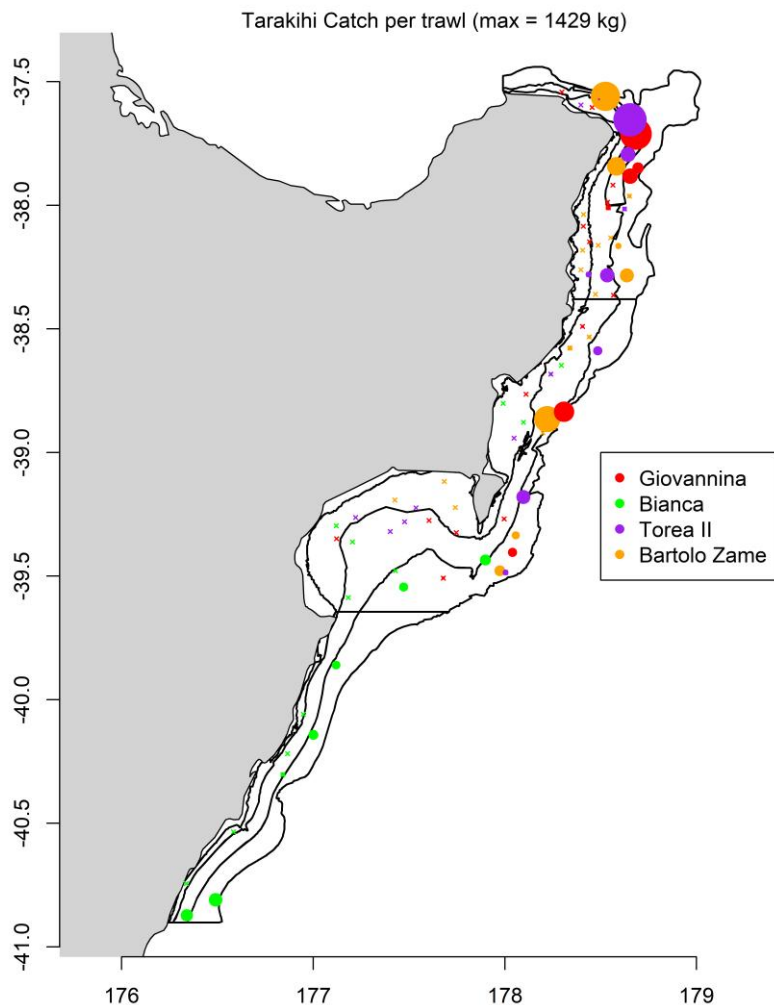


**Figure 16: Scaled proportional length compositions (left) and cumulative proportions (right) derived for male, female and all (total) snapper by vessel and combined. The combined length composition excludes the southern strata.**

### 3.5 Tarakihi

The largest catches of tarakihi were taken in stratum A80 around East Cape in 80–120 m depth (Figure 17). In addition, two stations off Gisborne (in strata B50 and B100) also yielded relatively high catches of tarakihi. The station in stratum B50 resulted in the high tarakihi biomass estimated for *Bartolo Zame* and the high associated CV (Table 11) contributed to the relatively high CV (29%) for the combined fleet tarakihi biomass index.

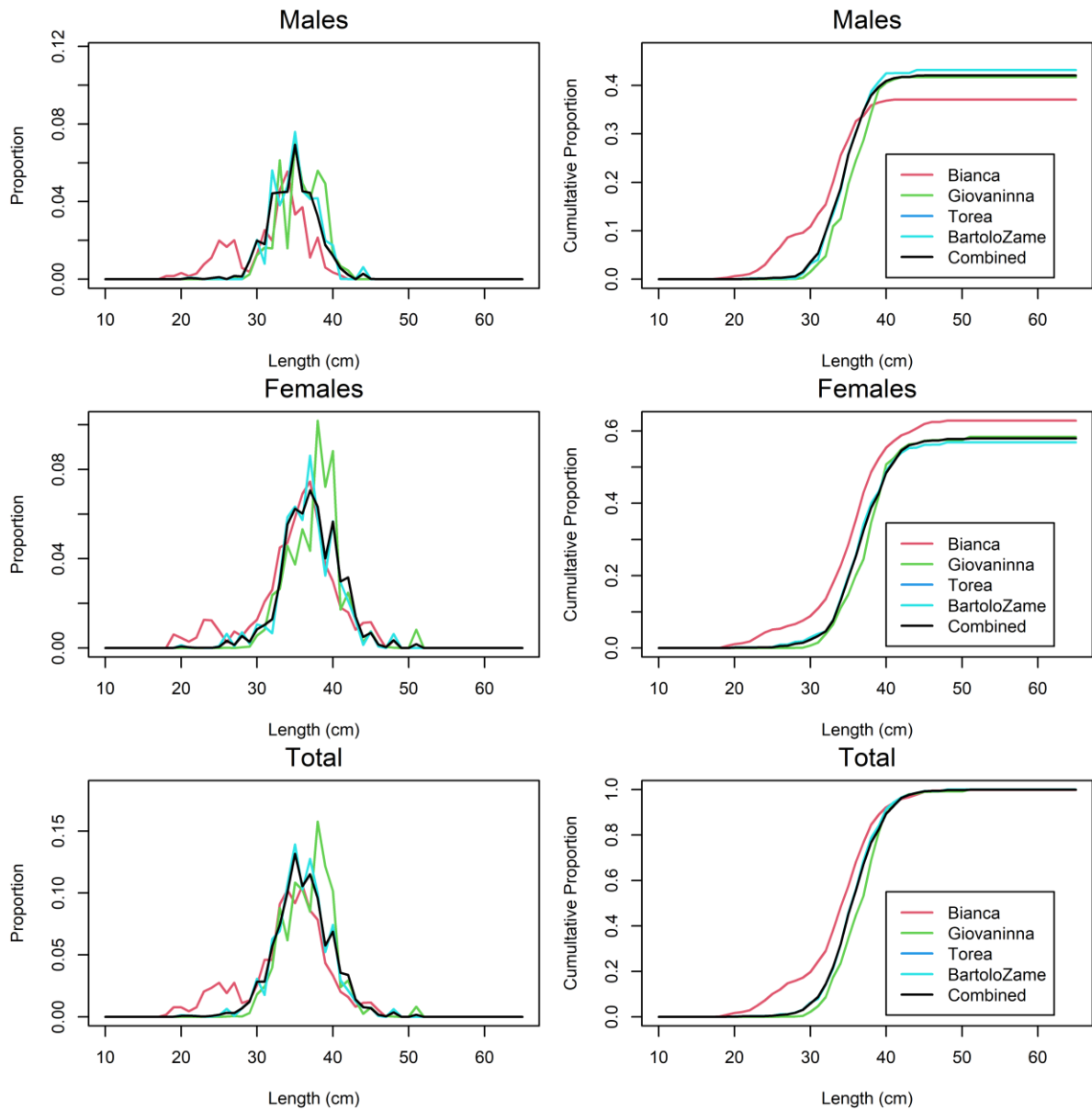
For the total survey area, the southern strata accounted for 18% of the total tarakihi biomass, predominantly from the deeper stratum (C100) (Figure 17).



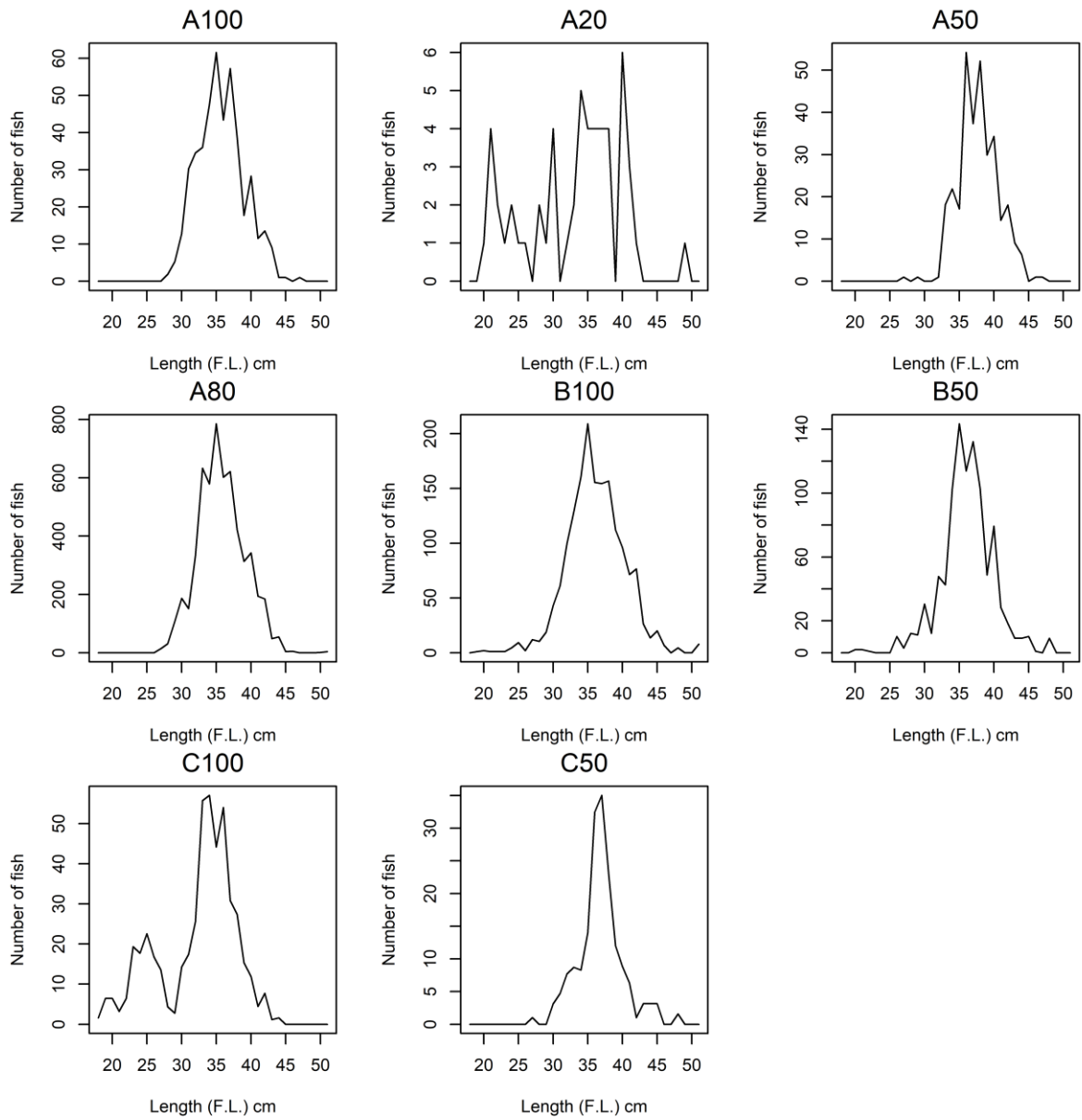
**Figure 17:** The relative catch (kilograms per trawl) of tarakihi from the individual survey trawls by vessel. The area of the circle is proportional to the magnitude of the catch. Trawls with no catch are represented by a plus symbol. The boundaries of the survey strata (black lines) are also shown.

The scaled length compositions of tarakihi were dominated by 32–42 cm (fork length) fish (Figure 18). The length compositions for *Bianca* also included a mode of smaller (22–28 cm fork length) fish, dominated by male fish (Figure 18). Most of the small fish were sampled from one trawl station (station 7) in stratum C100 (Figure 19).

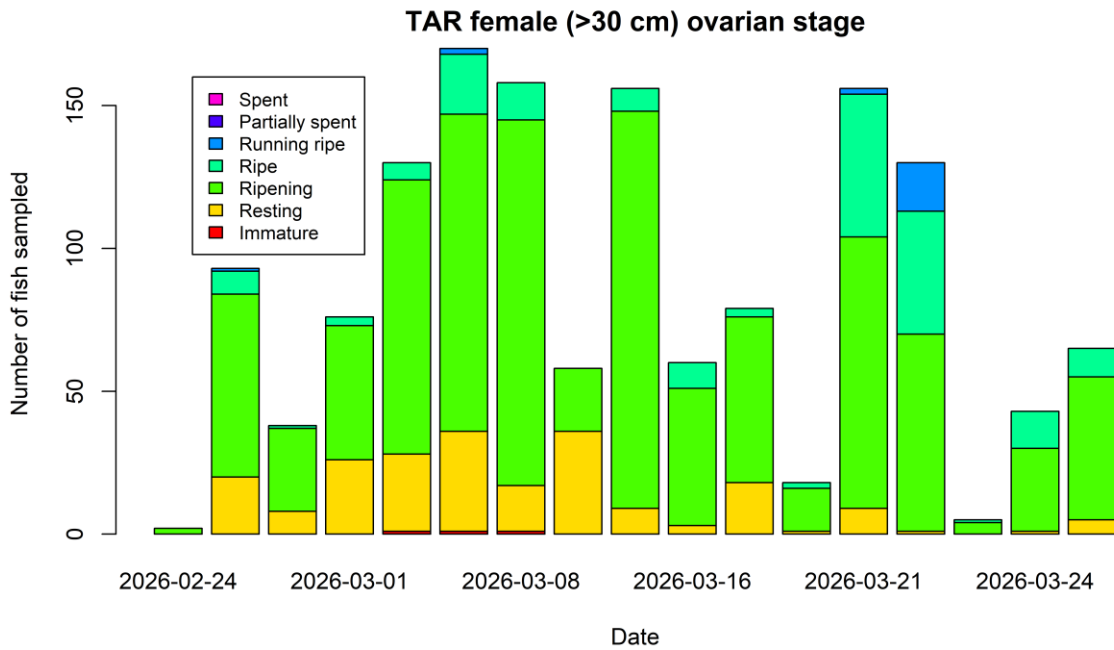
Most of the sampled female tarakihi had ovaries in a ripening state (Figure 20). Over the survey period there was a decline in the proportion of fish with resting ovaries and an increasing proportion of ripe (and running ripe) tarakihi from mid-March (Figure 20). The highest proportions of ripe and running ripe female tarakihi were sampled from stations around East Cape (A80) and from stratum B100.



**Figure 18:** Scaled proportional length compositions (left) and cumulative proportions (right) derived for male, female and all (total) tarakihi by vessel and combined. The combined length composition excludes the southern strata.



**Figure 19: Length compositions of tarakihi by stratum. The number of fish represent the total number of fish in the sampled catches.**



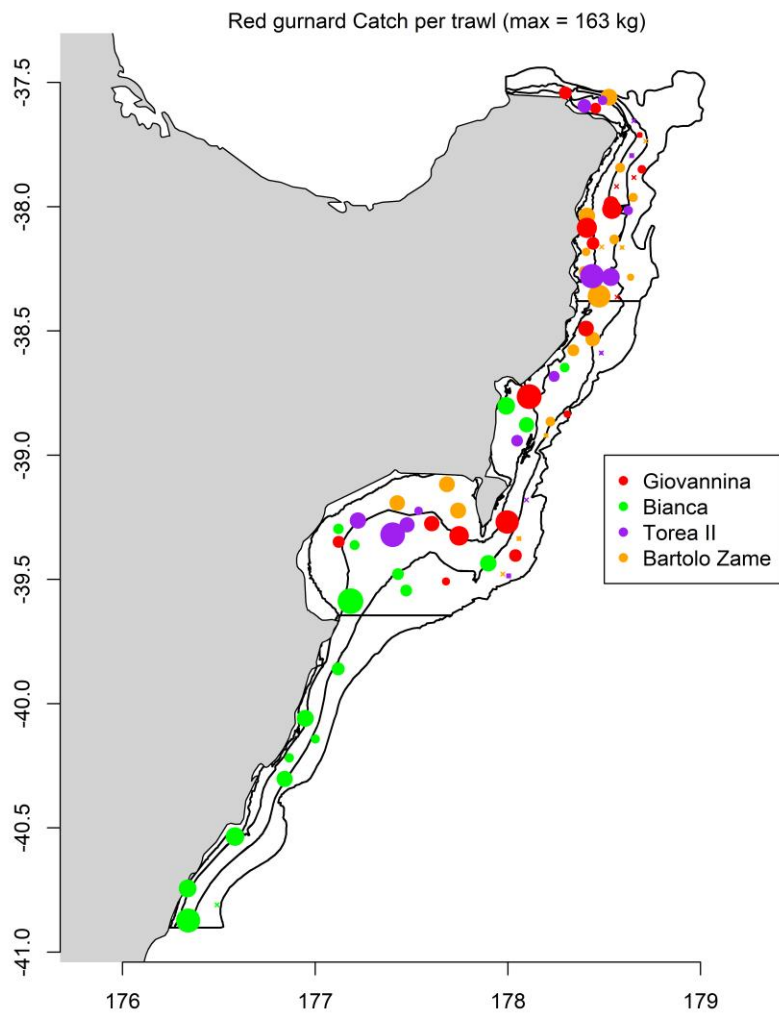
**Figure 20:** Number of female tarakihi in each stage of ovarian development (fish > 30 cm) sampled by survey fishing date (all samples combined).

### 3.6 Red gurnard

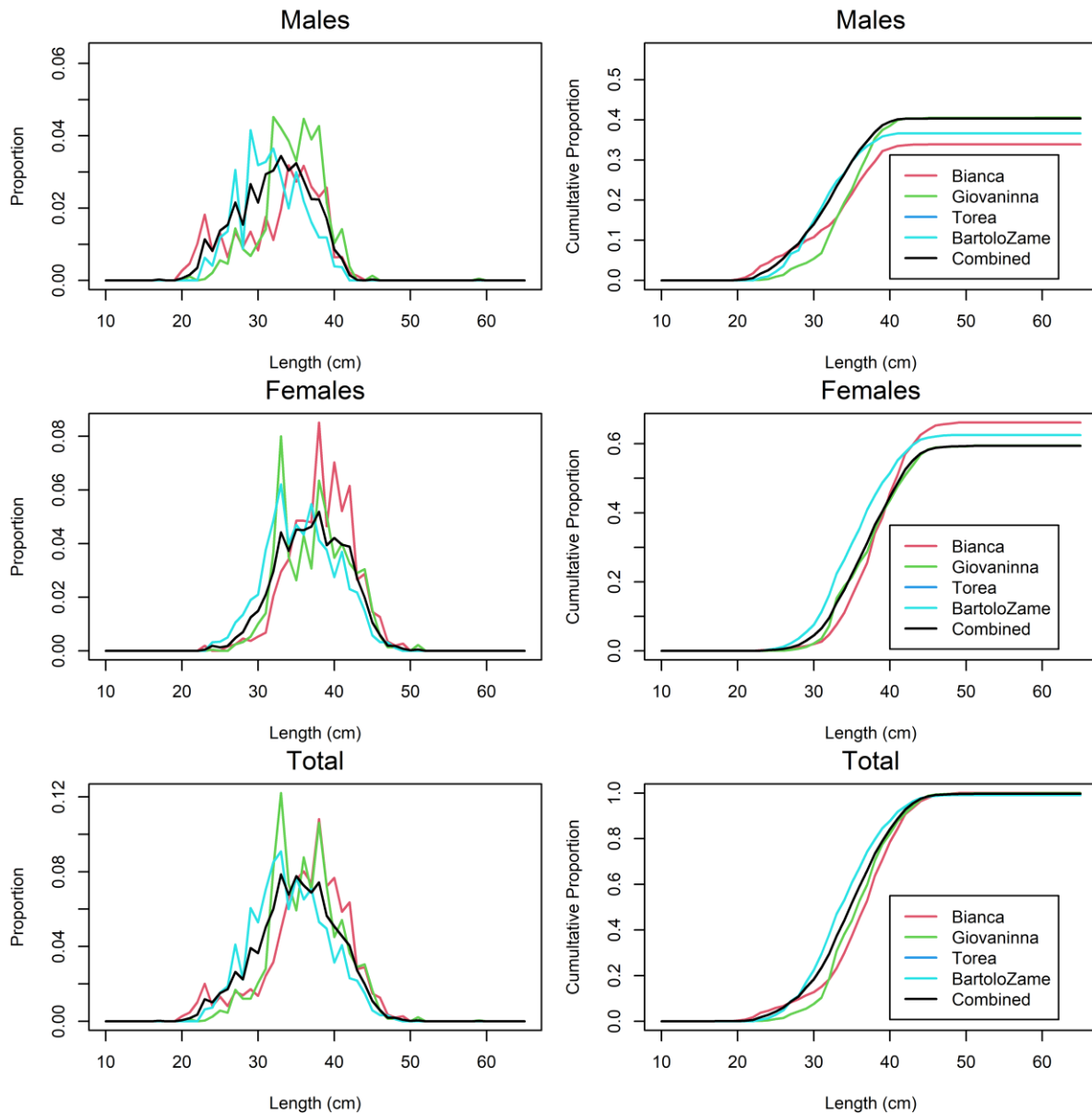
Red gurnard were caught in most survey trawls (72 of 75 trawls) and catch rates were relatively consistent in the 20–100 m depth range throughout the survey area (Figure 21). Correspondingly, the survey biomass indices for red gurnard, by vessel and combined, were derived with a high level of precision (CV 10–20%) (Table 11).

As in the 2025 survey, the survey biomass was dominated by the two larger southern inshore strata (B20 and B50) which accounted for 67% of the combined index for the core area (Figure 15). For the wider survey area, the southern (C) strata accounted for 22% of the total biomass (Figure 15).

The scaled length compositions of male and female red gurnard are similar between vessels (Figure 22). The length compositions from *Bianca* include a higher proportion of larger fish, reflecting the larger average length of male and female red gurnard in the southern (C) strata.



**Figure 21:** The relative catch (kilograms per trawl) of red gurnard from the individual survey trawls by vessel. The area of the circle is proportional to the magnitude of the catch. The boundaries of the survey strata (black lines) are also shown.

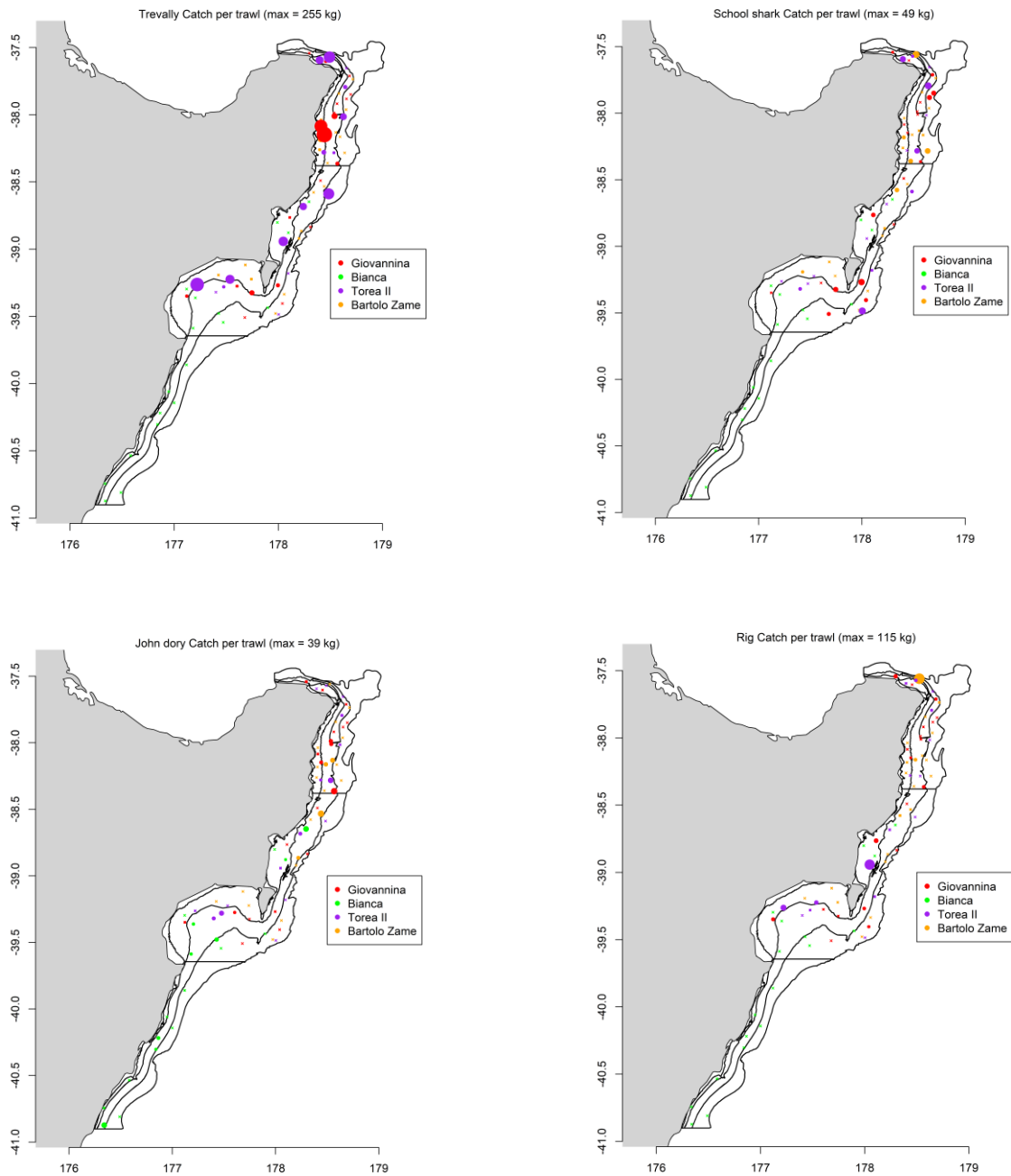


**Figure 22:** Scaled proportional length compositions (left) and cumulative proportions (right) derived for male, female and all (total) red gurnard by vessel and combined. The combined length composition excludes the southern strata.

### 3.7 Other species

Trevally was caught frequently during the survey and catch rates were highest in the northern shallow stratum (A20) (Figure 23). Overall, the catch was dominated by *Torea II* (Table 6) and the vessel's catch rates of trevally were consistently higher throughout the shallower areas of the survey. Trevally biomass indices, for individual vessels and all vessels combined, were determined with moderate precision (CV of 26–31%) (Table 11).

John dory, rig and school shark were caught in small quantities at a relatively high proportion of trawl stations (Figure 23). The resulting biomass indices for those species were low with moderate precision for the combined indices (CV 18%, 33% and 20%, respectively) (Table 11).



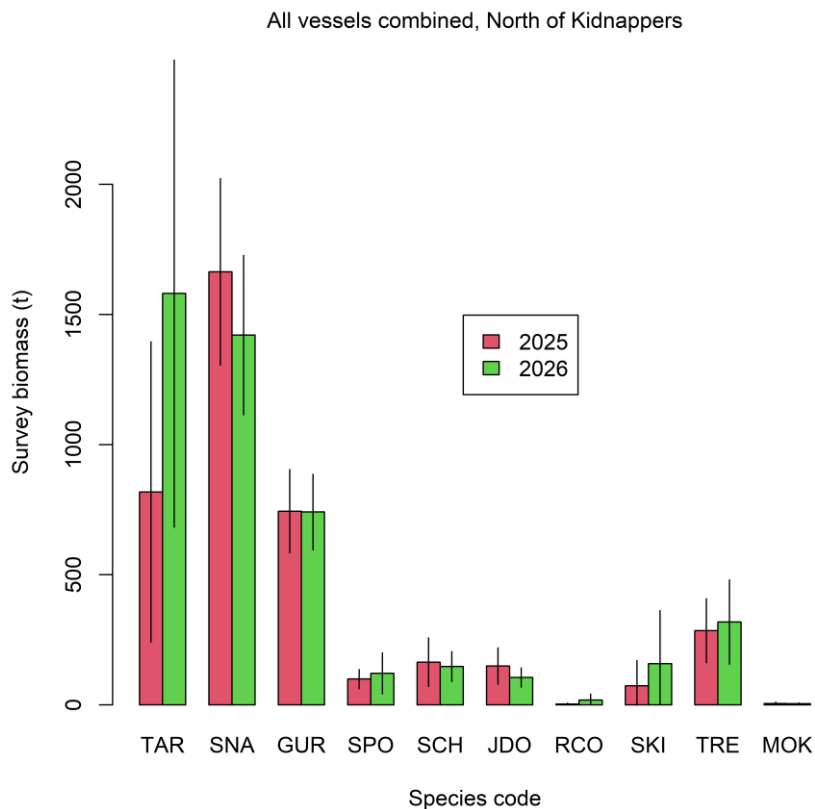
**Figure 23:** The relative catch (kilograms per trawl) of trevally, school shark, John dory and rig from the individual survey trawls by vessel. The area of the circle is proportional to the magnitude of the catch. The plus symbol represents no species catch from the trawl. The boundaries of the survey strata (black lines) are also shown.

### 3.8 Comparison with 2025 pilot survey

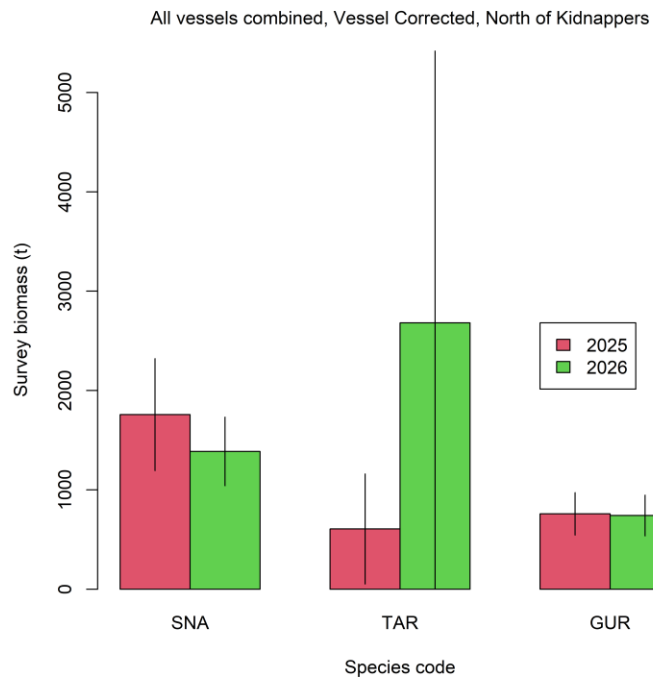
For most species, the biomass estimates from the 2026 survey are very similar to the results of the 2025 survey (Figure 24). Tarakihi is the exception, with the biomass indices from both surveys determined with a lower level of precision. The lower biomass of tarakihi from 2025 was attributed to the relatively coarse stratification of the survey area around East Cape, whereas the higher tarakihi biomass from 2026 was strongly influenced by a single large catch within stratum B50.

An analysis of the combined data sets from the 2025 and 2026 surveys identified significant differences in the catch rate of snapper between the participating vessels, while differences in catch rates were not significant for red gurnard and tarakihi. Applying those results to correct (or standardise) the vessel effects between the two surveys did not appreciably change the relative differences in species biomass indices between the 2025 and 2026 surveys (Figure 25), at least for snapper and red gurnard. The vessel coefficients are highly uncertain for tarakihi and hence the resulting corrected indices are not considered useful.

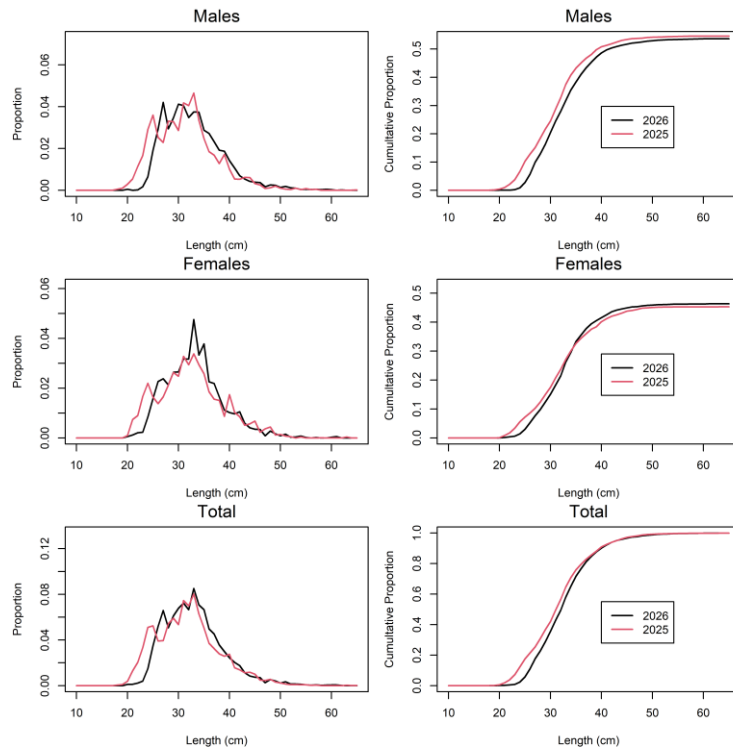
The scaled length compositions for snapper, tarakihi and red gurnard are very similar for the 2025 and 2026 surveys (Figure 26, Figure 27, Figure 28) indicating that the two surveys monitored a consistent component of the population of the three species. For snapper and tarakihi, there is a small (2–3 cm) increase in the lower range of the length distributions between surveys that is likely to be attributable to the annual growth of a younger year class.



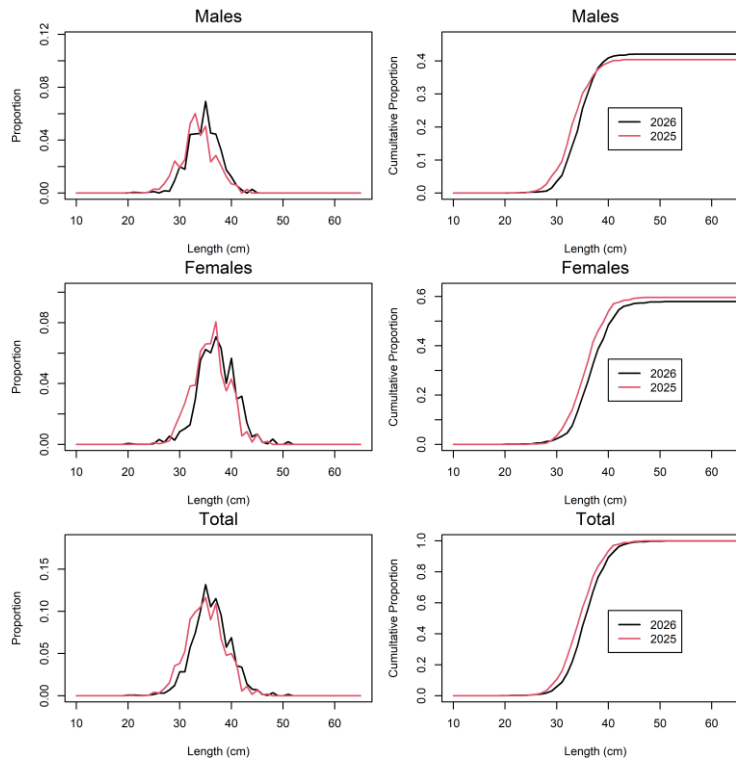
**Figure 24: Trawl survey biomass estimates (all vessels combined) for a range of species for the core survey area (north of Cape Kidnappers) from 2025 and 2026. The lines represent the 95% confidence interval of the biomass estimates.**



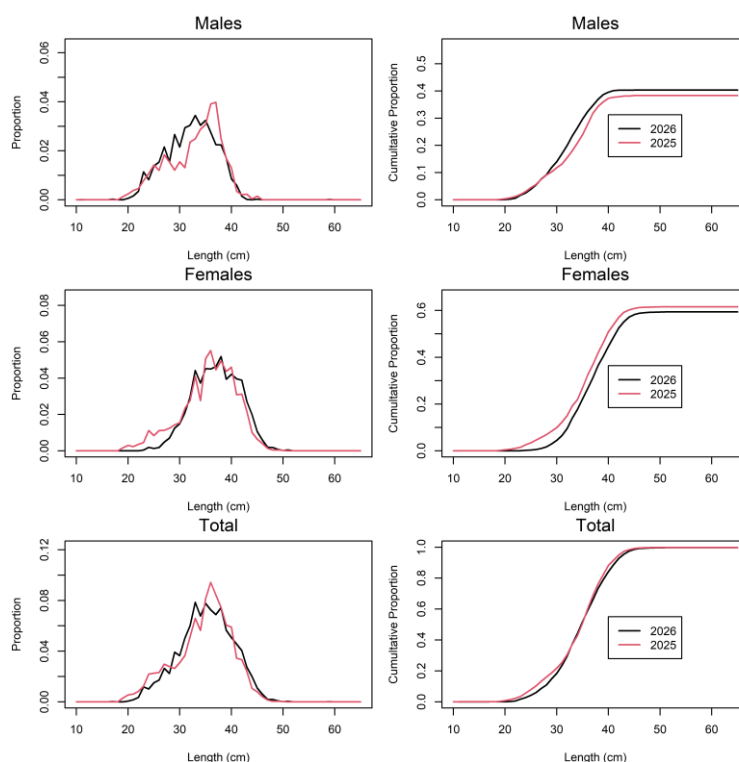
**Figure 25:** Trawl survey biomass estimates (all vessels combined) for snapper, tarakihi and red gurnard for the core survey area (north of Cape Kidnappers) from 2025 and 2026 corrected for vessel fishing power. The lines represent the 95% confidence interval of the biomass estimates.



**Figure 26:** A comparison between the scaled length compositions of male, female and all snapper from the 2025 pilot survey and the current 2026 survey for the core strata (north of Cape Kidnappers).



**Figure 27:** A comparison between the scaled length compositions of male, female and all tarakihi from the 2025 pilot survey and the current 2026 survey for the core strata (north of Cape Kidnappers).



**Figure 28:** A comparison between the scaled length compositions of male, female and all red gurnard from the 2025 pilot survey and the current 2026 survey for the core strata (north of Cape Kidnappers).

#### 4. DISCUSSION

The 2026 survey built on the success of the 2025 pilot survey. The surveys have demonstrated the ability for commercial vessels to undertake a structured research survey where survey trawls are completed with limited direct supervision. The approach also requires the catches from individual survey trawls to be compartmentalised on board to enable subsequent shore-based sampling following vessel unloading. The approach requires a high level of cooperation between all parties; i.e., vessel operators, skippers, scientific staff (Earth Sciences New Zealand), factory staff and managers.

The 2026 survey demonstrated the repeatability of the survey design. For most species, the 2026 survey yielded estimates of relative abundance (with an acceptable level of precision) that are comparable to the 2025 pilot survey, particularly for snapper and red gurnard and the range of second tier species (trevally, John dory, rig and school shark). The length compositions of snapper and red gurnard sampled from the two surveys are also very similar. The completion of a third survey in 2027 will provide a base line for the ongoing monitoring of these species. In addition, the 2026 survey reaffirmed the higher abundance of snapper compared to the series of ECNI trawl surveys conducted by *Kaharoa* in the mid 1990s.

The survey results were more equivocal for tarakihi. The revised stratification for 2026 resulted in an improvement in the survey design for the area around East Cape. However, the stratification of the wider survey area did not closely correspond to the distribution of tarakihi, most notably in the area off Gisborne where two larger catches of tarakihi were taken in 80–150 m.

Further refinements in the survey stratification are considered necessary to improve the utility of the survey for the monitoring of tarakihi. One option is to subdivide the larger B50 and B100 strata, partitioning the strata at Mahia Peninsula. Alternatively, an additional tarakihi strata could be configured encompassing the 80–200 m depth range between Gisborne and Mahia. In addition, the utility of spatial modelling approaches should be investigated (e.g. Thorson 2025) to improve

estimates of species abundance. These approaches also have the benefit of more explicitly modelling the differences in fishing power between individual vessels.

The timing of the survey appears to be suitable for monitoring both snapper and red gurnard. The timing also corresponds with the pre-spawning period for tarakihi with an increased aggregation of the species, particularly around the East Cape area. Based on commercial catch and effort data, the timing of the spawning period appears to be relatively consistent between years, with a peak in catch rates during the last two weeks of March and first week of April. This indicates that the timing of the survey is also appropriate for tarakihi as a substantial proportion of the wider tarakihi stock accumulates in the area prior to spawning. However, variability in the timing of spawning and/or proportion of fish within the survey area would reduce the reliability of the survey abundance indices.

In 2025 and 2026, the timing of the surveys coincided with periods of adverse weather conditions that limited the operation of the survey vessels, particularly around the East Cape area. The survey period also coincides with the Easter long weekend which restricts the unloading and processing of catches through both facilities. This effectively reduces the time available to complete the survey stations, especially when fishing trips are restricted by fixed unloading days. For 2026, this resulted in a number of the scheduled trawl station not being completed.

The current study identified significant differences in the catch rates of snapper among the fleet, specifically considerably higher catch rates for *Torea II* relative to *Bianca*. There is also an indication that *Torea II* has a higher catch rate of trevally compared to the other vessels. *Torea II* is considerably more powerful than the other three vessels enabling more consistent trawling speeds. Vessel skippers highlighted the influence of the headline height of the trawl on the catch of snapper and trevally (and other faster swimming species). The net used by *Torea II* has a higher effective headline height during hauling as the additional volume of the net tends to “balloon up”. *Torea II* also has a faster hauling speed, reducing the ability of snapper to swim out of the net during hauling. The shorter sweeps of the *Torea II* trawl gear are also considered to be more effective for faster swimming species. No appreciable difference in catch rates was detected for red gurnard, while data for tarakihi were highly variable. Estimates of vessel specific fishing power will be improved as data accumulate from subsequent surveys. It may also be possible to augment the analysis with the addition of commercial catch and effort data.

The 2026 survey extended southwards to include the Wairarapa coast (representing 22% of the survey area). This area accounted for a relatively small proportion (8%) of the total snapper biomass, although this area was surveyed by the vessel with the lowest catch rates of snapper (*Bianca*). Hence, the relative abundance of snapper in the southern area may be underestimated. For red gurnard and tarakihi, the southern strata accounted for approximately 20% of the total survey biomass. This indicates that the inclusion of the area is worthwhile for future surveys, especially as the spatial distribution of snapper extends further southwards.

The analysis of tarakihi catch rates indicated a significant diurnal trend with higher catches taken during the morning and evening and lower catch rates around midday. The result was based on higher catches achieved from a relatively small number of trawls that commenced around dawn (0600 NZST). The magnitude of the diurnal variation in the catch rate of tarakihi is not well determined from the available survey data. However, the result was corroborated by an analysis of commercial catch and effort data from the FMA 2 trawl fishery, albeit with trawls of a longer duration so the effect is likely to be less pronounced. The diurnal distribution of survey stations should be monitored and potentially incorporated into the standardisation of tarakihi survey catch rates.

## 5. FURTHER WORK

The Inshore Working Group reviewed the results of the 2025 and 2026 surveys and recommended that the programme be continued in 2026–27. The main recommendations for 2026–27 are as follow.

- Repeat the survey in 2027 to determine the comparability of survey biomass estimates for key species between surveys in a third successive year. The intention is to retain the three of the vessels that participated in the 2025 and 2026 surveys (*Bianca*, *Giovannina* and *Torea II*) and include a new Gisborne Fisheries' vessel (*Stromboli*).
- Refine the survey stratification to improve the utility of the survey for tarakihi, potentially dividing the central strata (B20, B50, B100) at Mahia Peninsula to partition Hawke Bay. This would also serve to delineate the northern and southern biological substocks of snapper in SNA 2.
- Consider a two phase survey design to ensure that stations are allocated to areas of strata with higher tarakihi abundance and improve the precision of the overall survey abundance index.
- Extend the survey period to mid-April to provide sufficient allowance for adverse weather conditions and other disruptions due to operational constraints (particularly around the Easter holiday weekend).
- Formulate a detailed survey plan for 2027 with vessel sampling effort allocated amongst the survey strata (including southern strata) and throughout the survey period. The survey plan will be reviewed by INS WG.
- To collect data on the dimensions of the trawl gear (using door spread sensors) to accurately determine effective door (and wing) spread and, thereby, determine the swept area for individual trawls. Direct measurements of door spread are only available for *Bianca*. Ideally, all vessels would use door spread sensors during future surveys.
- Refine the analysis of species-specific differences in fishing power between the participating vessels ("vessel effect"), potentially augmented by catch and effort data from commercial trawls. The analysis can be incorporated within a spatial-temporal modelling framework (e.g. VAST) to integrate the vessel effects within the derivation of survey biomass indices.
- There is potential to standardise the gear between vessels, including the purchase of survey specific sets of trawl gear for each vessel. This may be appropriate over the longer term once the survey becomes embedded as an established monitoring programme. Otherwise, the differences in the efficiency of the trawl gear are likely to be encompassed in the overall species specific "vessel effect".
- During the 2026 survey, two vessels severely damaged trawl gear while conducting survey trawls in the deeper strata (A100 and B100). These areas are not routinely fished during commercial operations. A more comprehensive set of known trawl stations will be compiled, including trawl locations from the 2025 and 2026 surveys, previous *Kaharoa* surveys and commercial trawls. This will enable a more definitive map of untrawlable ground in those strata.
- Refine the survey protocols and instructions and the provision of at-sea training for all participating vessels at the commencement of each survey.
- There is also potential to collect temperature depth profiles from all survey trawls using the data loggers developed under the Moana project.
- Maintain the sampling of tarakihi, snapper and red gurnard. The sampling of catches (for length, sex and stage) could be extended to other species (i.e. TRE, SPO, SCH and JDO). This would improve the monitoring of rig and school shark as both species were landed in an unprocessed state during the survey to enable accurate catch weights to be determined.
- Review the frequency and intensity of otolith sampling for each species.

Until the utility of the survey has been demonstrated for tarakihi, it is premature to develop a medium term plan for the FMA 2 survey programme. Following the completion of the 2027 survey, a full review of the survey results (three years) will be undertaken. An outcome of the review will include recommendations regarding the continuation of the survey and frequency of future surveys.

## 6. ACKNOWLEDGMENTS

The project was funded directly by Seafood New Zealand and Fisheries New Zealand (SEA2025-13) with the additional funding and support from FMA 2 commercial operators and processors. The

success of the project was attributable to the high level of cooperation amongst the various organisations and individual, most notably:

- Skippers of *Giovannina* (Blethyn “Footy” Hulton), *Bianca* (Ross Lepper, Jason Naidanovich), *Torea II* (Forrest Brown) and *Bartolo Zame* (Sean Fitzsimons) and crew.
- Gisborne Fisheries and Moana New Zealand.
- Brent Wood (ESNZ) – training, coordinator, sampling, data management.
- Vessel owners and managers: Salvatore Zame & Hilton Slement (Gisborne Fisheries), Hamish Quested (Fresh Regional Produce Fishing), Andy Claudatos & Dean Gulbransen (Star Fish), Nathan Reid (Moana NZ).
- Project managers: Tiff Bock & Tama Wells (Seafood NZ Inshore Council), Nathan Reid (Moana NZ) and Darren Parsons (ESNZ).
- Factory staff at Moana NZ Auckland and Gisborne Fisheries.
- Sampling staff: Helena Armiger, Oliver Evans and team (ESNZ, Auckland), Staci King (Gisborne).
- Vessel unloading crews (Napier).
- FishServe: the provision of daily reports of survey trawls.
- Snapper age determination by Oliver Evans (ESNZ), Cam Walsh (Stock Monitoring Services) and Matt Smith (ESNZ).
- Inshore Working Group: the review of survey design and results.
- Marc Griffiths (Inshore Working Group Chair): project coordination and review of the final report.

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## APPENDIX 1: STATION DATA

Table A1: Summary of the trawl survey station data from each vessel.

Vessel	Station	Stratum	Date	Time	Start Lat/Long		End Lat/Long		Gear depth (m)		Distance (n.miles)	Door spread	Gear perf
					° ' S	° ' E	° ' S	° ' E	Min.	Max.			
<i>Bianca</i>	1	C20	24/02/2026	1024	403211	1763498	403419	1763210	40	45	3.01	103	2
<i>Bianca</i>	2	C20	24/02/2026	1625	404464	1762026	404728	1761938	37	46	2.72	96	1
<i>Bianca</i>	3	C50	25/02/2026	1725	405236	1762043	405003	1762102	78	113	2.37	131	1
<i>Bianca</i>	4	C50	27/02/2026	615	401312	1765195	401057	1765428	70	71	3.1	132	1
<i>Bianca</i>	5	C100	7/03/2026	1053	404859	1762946	404556	1763053	169	176	3.13	147	1
<i>Bianca</i>	6	C100	8/03/2026	1056	400854	1770003	400582	1770178	118	123	3.03	140	1
<i>Bianca</i>	7	C100	8/03/2026	1415	395162	1770715	394875	1770870	110	118	3.1	144	1
<i>Bianca</i>	8	B50	8/03/2026	1718	393522	1771097	393209	1771144	56	60	3.15	131	1
<i>Bianca</i>	9	B100	10/03/2026	1411	392871	1772573	393150	1772748	100	122	3.09	134.6	1
<i>Bianca</i>	10	B100	10/03/2026	1543	393266	1772828	393228	1773218	130	131	3.03	149.4	1
<i>Bianca</i>	11	B50	13/03/2026	1038	392172	1771226	391871	1771133	51	54	3.09	132	1
<i>Bianca</i>	12	B20	13/03/2026	1219	391779	1770720	391986	1770403	35	40	3.2	112	1
<i>Bianca</i>	13	B20	17/03/2026	609	385267	1780580	385055	1780286	39	48	3.12	121	1
<i>Bianca</i>	14	B20	17/03/2026	754	384809	1775948	384679	1780332	31	33	3.26	117.2	1
<i>Bianca</i>	15	B50	17/03/2026	1053	383883	1781771	383629	1781992	66	73	3.07	131.2	1
<i>Bianca</i>	16	B100	19/03/2026	1630	392611	1775389	392900	1775301	100	127	2.96	138.6	1
<i>Bianca</i>	17	C50	20/03/2026	614	401820	1765050	402070	1764860	96	96	2.88	137.1	1
<i>Bianca</i>	18	C20	20/03/2026	1345	400354	1765688	400045	1765723	38	42	3.1	117.2	1
<i>Bartolo Zame</i>	2	B50	27/02/2026	525	383466	1782036	383227	1782253	68	70	2.93	<NA>	1
<i>Bartolo Zame</i>	3	A50	27/02/2026	828	382161	1782835	381874	1782823	63	66	2.87	<NA>	2
<i>Bartolo Zame</i>	4	A50	27/02/2026	1132	380971	1782924	380663	1782997	66	66	3.13	<NA>	2
<i>Bartolo Zame</i>	5	A80	27/02/2026	1513	375055	1783491	374812	1783661	82	82	2.77	<NA>	1
<i>Bartolo Zame</i>	6	A80	1/03/2026	500	373356	1783148	373469	1783470	83	102	2.79	<NA>	1
<i>Bartolo Zame</i>	7	B50	6/03/2026	605	383197	1782639	382982	1782908	83	89	3	<NA>	1
<i>Bartolo Zame</i>	8	A100	6/03/2026	938	381702	1783820	381466	1783648	126	129	2.71	<NA>	1
<i>Bartolo Zame</i>	9	A100	6/03/2026	1158	380985	1783555	380845	1783437	106	129	1.67	<NA>	2
<i>Bartolo Zame</i>	10	A50	6/03/2026	1342	380789	1783311	380525	1783395	88	88	2.72	<NA>	1
<i>Bartolo Zame</i>	12	B50	15/03/2026	629	385188	1781324	384949	1781501	78	86	2.75	<NA>	1
<i>Bartolo Zame</i>	13	A20	23/03/2026	1428	381565	1782382	381245	1782445	32	32	3.23	<NA>	1
<i>Bartolo Zame</i>	14	A20	23/03/2026	1630	381092	1782434	380765	1782443	36	36	3.27	103	1
<i>Bartolo Zame</i>	15	A80	24/03/2026	616	374415	1784288	374135	1784195	110	115	2.89	<NA>	1
<i>Bartolo Zame</i>	16	A100	24/03/2026	1023	375774	1783898	380079	1783920	130	133	3.05	<NA>	1

Vessel	Station	Stratum	Date	Time	Start Lat/Long		End Lat/Long		Gear depth (m)		Distance (n.miles)	Door spread	Gear perf
					° ' S	° ' E	° ' S	° ' E	Min.	Max.			
<i>Bartolo Zame</i>	17	A20	24/03/2026	1338	380222	1782462	380561	1782425	36	39	3.4	-	1
<i>Bartolo Zame</i>	18	B20	29/03/2026	827	391156	1772555	391114	1772966	30	36	3.21	-	1
<i>Bartolo Zame</i>	19	B20	29/03/2026	1119	390705	1774104	390724	1774524	29	29	3.26	-	1
<i>Bartolo Zame</i>	20	B20	29/03/2026	1345	391336	1774448	391641	1774597	36	38	3.26	-	1
<i>Bartolo Zame</i>	21	B100	30/03/2026	700	392872	1775842	392708	1780118	142	142	2.68	-	1
<i>Bartolo Zame</i>	22	B100	30/03/2026	953	392011	1780343	391768	1780483	117	119	2.66	-	1
<i>Bartolo Zame</i>	23	B100	30/03/2026	1445	385524	1781191	385286	1781318	93	96	2.57	-	1
<i>Giovannina</i>	1	A50	28/02/2026	516	373252	1781785	373174	1781396	53	65	3.18	-	1
<i>Giovannina</i>	2	A20	28/02/2026	910	373623	1782731	373659	1783160	36	39	3.41	-	2
<i>Giovannina</i>	3	A100	1/03/2026	831	375096	1784171	375364	1784119	164	179	2.71	-	1
<i>Giovannina</i>	4	A100	1/03/2026	1037	375292	1783923	375585	1783807	130	146	3.06	-	1
<i>Giovannina</i>	5	A50	1/03/2026	1305	380060	1783238	380368	1783151	71	79	3.15	-	1
<i>Giovannina</i>	6	A80	7/03/2026	510	374268	1784102	374544	1783888	81	88	3.23	-	1
<i>Giovannina</i>	7	A80	7/03/2026	805	375509	1783385	375846	1783366	92	94	3.37	99.8	1
<i>Giovannina</i>	8	A20	7/03/2026	1102	380510	1782454	380874	1782432	36	41	3.64	-	1
<i>Giovannina</i>	9	A20	7/03/2026	1335	380884	1782649	381235	1782640	45	47	3.51	-	1
<i>Giovannina</i>	10	B100	8/03/2026	515	385010	1781848	385235	1781581	138	171	3.06	94.2	1
<i>Giovannina</i>	11	B50	15/03/2026	527	382941	1782433	382682	1782701	73	75	3.33	-	1
<i>Giovannina</i>	12	B20	15/03/2026	1441	384586	1780662	384855	1780397	34	39	3.39	102	1
<i>Giovannina</i>	13	A50	16/03/2026	504	382182	1783402	381874	1783296	85	91	3.19	97.9	1
<i>Giovannina</i>	15	B50	21/03/2026	901	391611	1775975	391278	1780082	67	68	3.43	104.8	1
<i>Giovannina</i>	16	B100	21/03/2026	1237	392424	1780236	392155	1780438	133	135	3.11	112.3	1
<i>Giovannina</i>	17	B20	21/03/2026	1612	391946	1774478	391746	1774229	43	43	2.77	-	1
<i>Giovannina</i>	18	B20	22/03/2026	517	392093	1770730	391818	1770978	44	46	3.35	94	1
<i>Giovannina</i>	19	B50	22/03/2026	925	391650	1773627	391886	1773949	60	60	3.43	103.3	1
<i>Giovannina</i>	20	B100	22/03/2026	1236	393048	1774073	392852	1773772	112	118	3.03	103.7	1
<i>Giovannina</i>	21	A80	23/03/2026	533	375927	1783212	375609	1783226	80	82	3.18	-	1
<i>Torea II</i>	1	B20	1/03/2026	1219	391346	1773218	391217	1772776	34	40	3.65	-	2
<i>Torea II</i>	2	B50	1/03/2026	1424	391682	1772862	392047	1772884	64	71	3.65	-	2
<i>Torea II</i>	3	B50	1/03/2026	1652	391920	1772409	392013	1771961	64	67	3.58	-	1
<i>Torea II</i>	4	B100	6/03/2026	645	391080	1780579	390776	1780681	110	112	3.14	-	1
<i>Torea II</i>	5	B20	6/03/2026	1015	385651	1780287	385378	1780485	43	48	3.13	-	1
<i>Torea II</i>	6	B50	6/03/2026	1430	384096	1781439	384436	1781281	53	57	3.61	-	1
<i>Torea II</i>	7	B20	9/03/2026	1138	391576	1771328	391765	1770919	40	44	3.68	-	1
<i>Torea II</i>	8	A50	15/03/2026	1240	381697	1783200	381366	1783074	84	91	3.45	-	1
<i>Torea II</i>	9	A20	15/03/2026	1555	381677	1782620	381984	1782542	40	46	3.13	-	1

Vessel	Station	Stratum	Date	Time	<u>Start Lat/Long</u>		<u>End Lat/Long</u>		<u>Gear depth (m)</u>		Distance (n.miles)	Door spread	Gear perf
					° ' S	° ' E	° ' S	° ' E	Min.	Max.			
<i>Torea II</i>	10	B100	16/03/2026	1240	392915	1780022	393097	1775664	152	157	3.3	-	1
<i>Torea II</i>	11	B100	21/03/2026	934	383529	1782905	383178	1783066	116	119	3.72	-	1
<i>Torea II</i>	12	A100	21/03/2026	1526	380090	1783746	375746	1783836	123	127	3.51	-	1
<i>Torea II</i>	13	A20	22/03/2026	625	373566	1782379	373680	1782730	38	41	3	-	2
<i>Torea II</i>	14	A20	22/03/2026	856	373428	1782948	373694	1783294	40	47	3.81	-	1
<i>Torea II</i>	15	A80	22/03/2026	1156	373927	1783918	374169	1784225	103	111	3.42	-	1
<i>Torea II</i>	16	A80	22/03/2026	1444	374765	1783854	375041	1783594	95	98	3.44	-	1

**Table A2: Station catches (kg) for the priority species, by species code.**

Vessel	Station	Species code							
		GUR	JDO	SCH	SKI	SNA	SPO	TAR	TRE
<i>Bianca</i>	1	83.5	1.5	0.0	0.0	74.0	0.0	0.0	7.5
<i>Bianca</i>	2	76.0	3.0	0.0	0.0	85.0	25.5	2.5	0.5
<i>Bianca</i>	3	142.5	30.5	0.0	11.5	25.5	23.5	169.0	0.0
<i>Bianca</i>	4	18.5	13.5	0.0	0.0	106.0	34.0	0.5	10.5
<i>Bianca</i>	5	0.0	0.0	11.5	15.5	0.0	5.5	214.0	0.0
<i>Bianca</i>	6	17.5	0.0	0.0	45.0	3.0	0.0	109.0	13.5
<i>Bianca</i>	7	38.0	2.5	3.0	2.5	9.5	2.5	79.0	0.0
<i>Bianca</i>	8	163.0	9.0	0.0	0.0	15.0	2.5	0.0	4.5
<i>Bianca</i>	9	31.0	18.0	0.0	0.0	0.0	0.0	2.0	2.0
<i>Bianca</i>	10	31.0	0.0	14.0	1.0	0.0	3.5	86.5	0.0
<i>Bianca</i>	11	22.0	9.5	0.0	0.0	56.0	6.0	0.0	24.5
<i>Bianca</i>	12	24.0	0.0	0.0	0.0	12.0	14.0	0.0	1.5
<i>Bianca</i>	13	54.0	6.5	0.0	0.0	198.5	6.5	1.0	4.0
<i>Bianca</i>	14	74.5	0.0	2.0	0.0	68.0	5.5	0.0	10.0
<i>Bianca</i>	15	20.0	30.5	0.0	0.0	44.0	0.0	0.0	5.5
<i>Bianca</i>	16	64.0	0.0	2.0	5.0	4.5	10.5	132.5	6.0
<i>Bianca</i>	17	62.0	8.0	0.0	0.0	8.5	0.0	16.5	0.0
<i>Bianca</i>	18	68.0	0.0	0.0	0.0	18.5	61.5	1.0	0.0
<i>Bartolo Zame</i>	2	31.2	0.0	18.8	0.0	23.4	6.0	21.0	0.0
<i>Bartolo Zame</i>	3	126.4	0.0	19.8	0.0	222.2	0.0	0.0	0.0
<i>Bartolo Zame</i>	4	71.8	17.6	0.0	0.0	131.0	12.2	65.8	0.6
<i>Bartolo Zame</i>	5	21.4	0.8	1.0	0.0	59.4	0.0	420.0	0.0
<i>Bartolo Zame</i>	6	66.8	0.6	45.8	0.0	83.0	115.0	1 094.6	0.0
<i>Bartolo Zame</i>	7	48.8	38.8	0.0	0.0	104.0	4.0	10.2	0.0
<i>Bartolo Zame</i>	8	10.4	0.4	30.2	2.6	12.0	0.4	230.8	0.0
<i>Bartolo Zame</i>	9	1.8	1.0	4.2	0.0	2.4	0.0	37.2	0.0
<i>Bartolo Zame</i>	10	21.4	21.8	2.6	0.0	94.0	0.0	0.2	0.0
<i>Bartolo Zame</i>	12	20.2	13.6	4.8	14.0	41.6	0.0	864.2	1.2
<i>Bartolo Zame</i>	13	27.4	0.0	3.2	0.0	161.8	1.2	0.0	6.6
<i>Bartolo Zame</i>	14	15.0	0.0	14.0	0.0	129.4	2.4	0.2	32.2
<i>Bartolo Zame</i>	15	0.0	0.0	0.0	4.2	2.6	3.0	133.6	0.0
<i>Bartolo Zame</i>	16	18.2	1.2	0.0	0.0	11.2	0.0	12.2	1.8
<i>Bartolo Zame</i>	17	63.6	0.0	0.0	0.0	380.8	0.0	3.6	1.6
<i>Bartolo Zame</i>	18	56.0	0.0	9.2	0.0	36.4	0.0	0.0	3.0
<i>Bartolo Zame</i>	19	59.4	0.0	2.2	0.0	29.0	2.2	0.0	2.4
<i>Bartolo Zame</i>	20	60.4	0.0	0.0	0.0	40.0	2.0	0.0	5.6
<i>Bartolo Zame</i>	21	0.8	0.0	0.0	63.6	0.0	0.0	128.6	0.0
<i>Bartolo Zame</i>	22	3.8	0.0	0.0	4.4	0.0	0.0	66.8	0.0
<i>Bartolo Zame</i>	23	3.4	0.0	0.0	0.0	10.8	0.0	0.0	3.4
<i>Giovannina</i>	1	37.2	6.8	5.6	0.0	147.8	16.8	0.0	1.2
<i>Giovannina</i>	2	26.6	3.0	0.0	0.0	344.4	1.0	0.0	8.6
<i>Giovannina</i>	3	15.6	0.0	23.0	214.0	29.8	0.0	141.8	0.0
<i>Giovannina</i>	4	1.0	0.0	24.4	0.0	0.0	0.0	284.2	0.0
<i>Giovannina</i>	5	91.6	15.4	0.0	0.0	138.8	3.6	24.4	34.6
<i>Giovannina</i>	6	6.4	2.6	10.0	0.0	15.6	9.2	1 291.6	1.0
<i>Giovannina</i>	7	11.0	2.0	0.0	0.0	56.0	2.2	392.4	1.0
<i>Giovannina</i>	8	98.0	5.6	0.0	0.0	467.8	1.6	0.6	172.4
<i>Giovannina</i>	9	36.0	13.4	0.0	0.0	406.0	5.6	0.0	255.2
<i>Giovannina</i>	10	11.0	2.0	0.0	0.0	56.0	2.2	513.0	1.0
<i>Giovannina</i>	11	57.6	0.4	2.4	0.0	54.1	0.0	6.0	0.0
<i>Giovannina</i>	12	153.4	0.0	18.2	0.0	156.0	20.0	0.0	5.2
<i>Giovannina</i>	13	80.8	39.4	6.0	0.0	86.0	11.8	65.0	13.8
<i>Giovannina</i>	15	134.4	4.0	38.8	0.0	111.6	11.6	4.4	14.8
<i>Giovannina</i>	16	36.2	1.4	15.0	0.0	2.2	8.2	92.4	0.0
<i>Giovannina</i>	17	92.8	0.0	25.4	0.0	214.8	2.6	0.0	24.8

Vessel	Station	Species code							
		GUR	JDO	SCH	SKI	SNA	SPO	TAR	TRE
<i>Giovannina</i>	18	32.4	4.8	2.6	0.0	61.6	14.0	0.0	9.6
<i>Giovannina</i>	19	55.6	9.0	0.0	0.0	51.2	2.6	0.0	6.6
<i>Giovannina</i>	20	13.6	0.0	15.0	2.0	0.0	0.0	6.6	0.0
<i>Giovannina</i>	21	52.5	17.2	0.0	0.0	96.2	0.0	8.4	1.0
<i>Torea II</i>	1	15.5	0.0	0.0	0.0	320.0	17.5	0.0	82.5
<i>Torea II</i>	2	54.0	24.5	0.0	0.0	59.0	4.0	0.5	9.0
<i>Torea II</i>	3	150.0	14.0	12.0	0.0	47.0	0.0	1.0	0.0
<i>Torea II</i>	4	0.0	0.0	6.5	15.5	9.0	5.5	227.5	0.0
<i>Torea II</i>	5	30.5	4.5	0.0	0.0	162.0	106.5	0.0	92.5
<i>Torea II</i>	6	26.5	13.5	0.0	0.0	188.5	4.5	7.5	51.0
<i>Torea II</i>	7	63.5	3.5	0.0	0.0	290.0	33.5	0.0	192.5
<i>Torea II</i>	8	77.5	29.0	28.5	0.0	40.0	0.0	243.0	7.0
<i>Torea II</i>	9	144.5	7.5	0.0	0.0	621.5	2.0	34.5	21.0
<i>Torea II</i>	10	4.5	0.0	49.5	56.5	30.5	0.0	32.0	0.0
<i>Torea II</i>	11	2.0	1.0	12.0	0.0	33.5	0.0	92.0	124.5
<i>Torea II</i>	12	18.5	4.5	0.0	0.0	18.5	0.0	16.5	45.0
<i>Torea II</i>	13	44.0	0.0	36.0	0.0	375.5	4.5	0.0	62.5
<i>Torea II</i>	14	19.5	0.0	8.5	0.0	543.0	10.5	2.0	135.5
<i>Torea II</i>	15	1.0	0.0	0.0	0.0	2.0	0.0	1 429.0	0.0
<i>Torea II</i>	16	4.5	8.5	45.0	0.0	33.5	7.5	266.0	15.5

## APPENDIX 2: GONAD MATURITY STAGES

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

### APPENDIX 3: SNAPPER AGE COMPOSITIONS FOR 2025 SURVEY

Oliver Evans (ESNZ), Cam Walsh (Stock Monitoring Services), Matt Smith (ESNZ), Darren Parsons (ESNZ) and Adam Langley

Age compositions for snapper were derived for the 2025 FMA 2 trawl survey (Langley 2025) partitioned by snapper sub stock: SNA 2 North and SNA 2 South.

Initially, scaled length compositions for snapper (both sexes combined) were derived for the two areas (following Francis & Fu 2012). The sub stocks are delineated by a boundary at Mahia Peninsula. This does not correspond to the boundaries of the 2025 trawl survey strata and, hence, it was necessary to post stratify the three strata (S9, S10 and S11) that include the area between Cape Kidnappers and Tologa Bay. The SNA 2 South area was defined by the area of the three strata south of Mahia Peninsula. The SNA 2 North area included the northern portion of the three strata and the remaining northern strata (S12, S13 and S14). Overall, the SNA 2 South sub stock accounted for 19.6% of the total survey snapper population (by number).

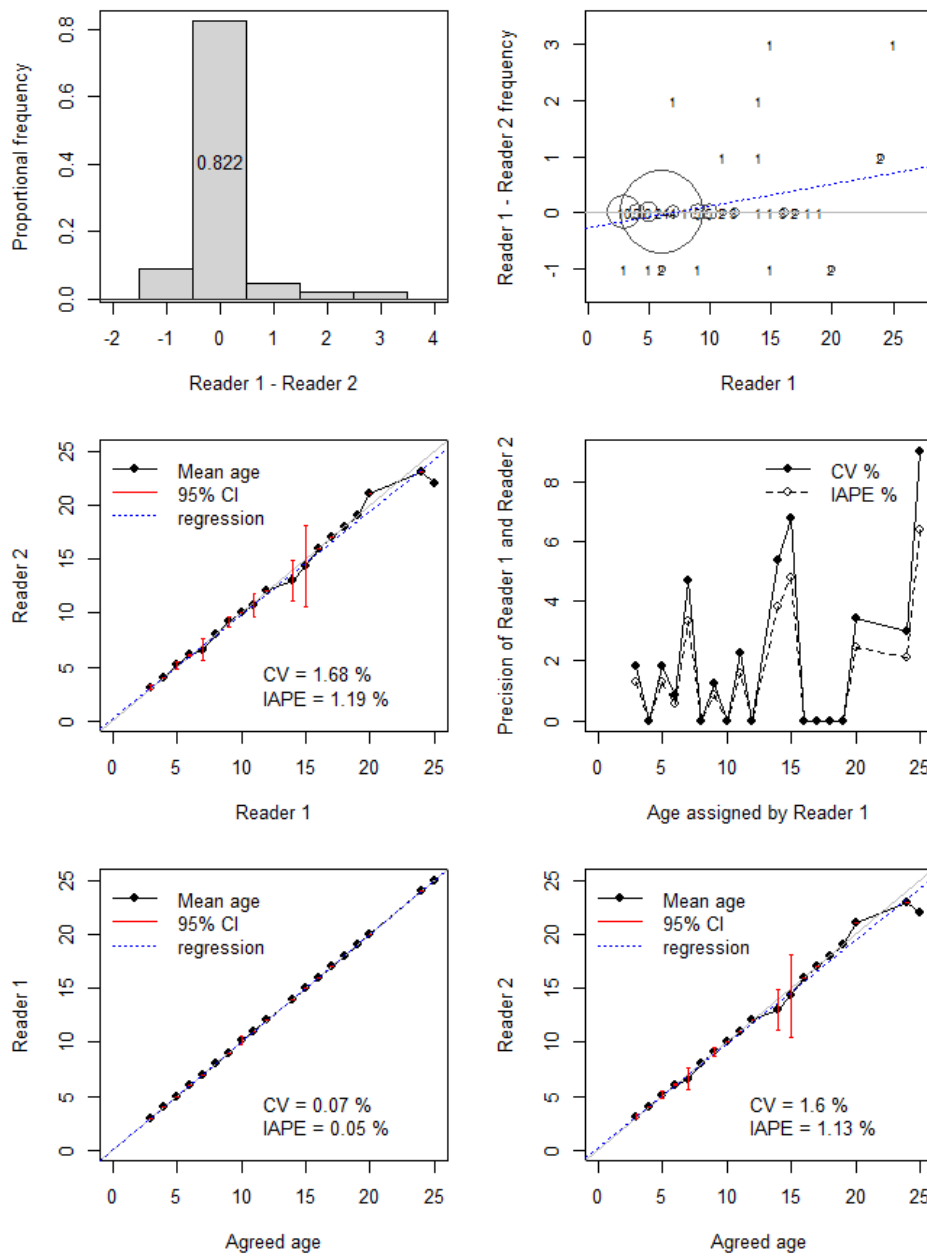
The 2025 FMA 2 trawl survey collected 792 snapper otoliths (at random) from all sampled catches of snapper. A subset of the otoliths was selected for ageing based on fish length class. For the main length range (26–43 cm fork length), a random set of 19 otoliths were selected for each 1 cm length class (342 otoliths). This was augmented by including all the otoliths collected from fish outside the main length range (112 otoliths between 19–25 and 44–65 cm).

The selection of the otoliths did not account for the spatial distribution of the samples. Of the total set of 454 otoliths, 296 otoliths were from the SNA2 North area and 158 were from SNA 2 South.

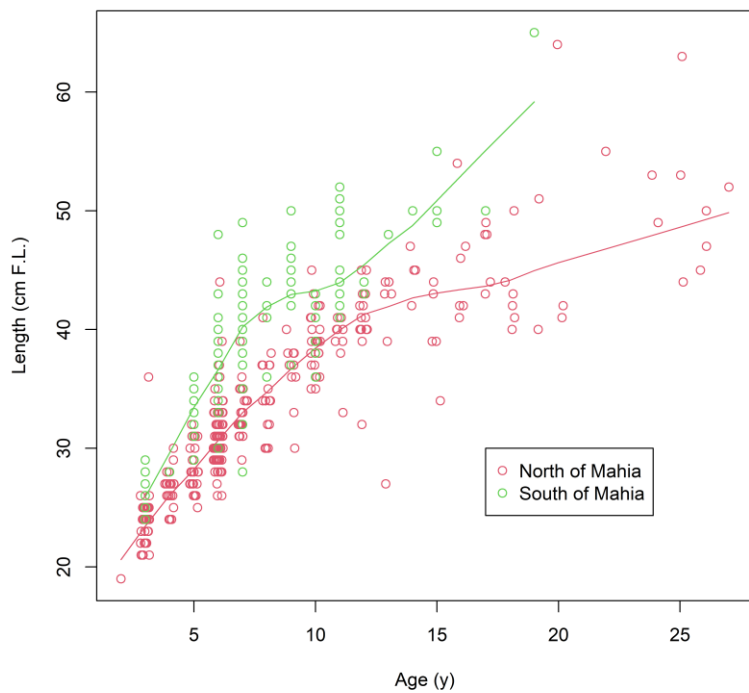
Otoliths were prepared for ageing using the break and burn approach. Age determination followed the established snapper ageing protocol (Walsh et al. 2014). All otoliths were read by a single reader (Reader 1) with a subset (20%) of the otoliths read by a second reader (Reader 2). Any differences between the two readings were evaluated to derive a final agreed age. Overall, Reader 1 achieved an agreement rate against the final agreed age of 98.9% (89/90 audited otoliths) (Figure A1).

Growth rates for snapper aged 4–10 y were higher for SNA 2 South than SNA 2 North (Figure A2), while limited numbers of fish older than 10 y were sampled from SNA 2 South.

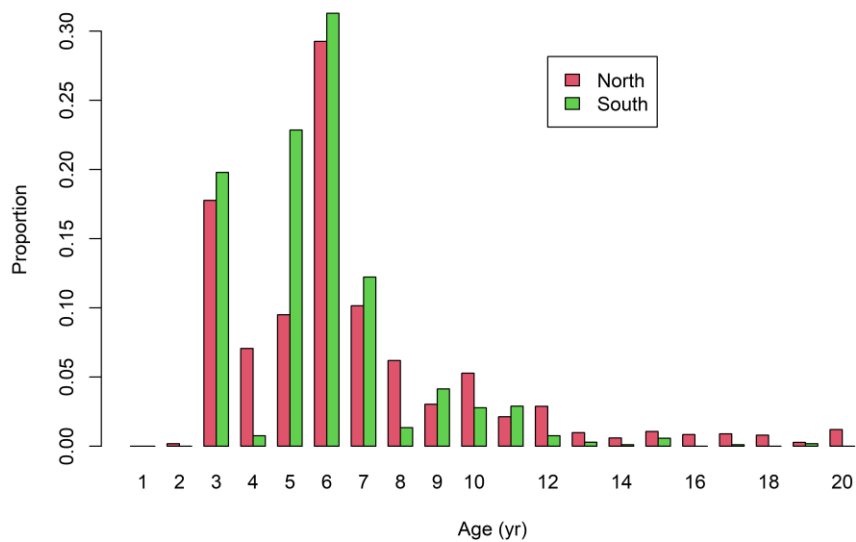
Separate age-length keys were derived for the two sub stock areas. The age-length keys were applied to the respective scaled survey length composition to derive an age composition for each sub stock (Figure A3). Both age compositions are dominated by fish in the 3–7 year age classes, although the relative proportion of individual age classes varied between sub stocks. Fish aged 3 and 6 years (2022 and 2019 year classes) are prominent in both age compositions, while the 5 year age class is considerably more prominent in the SNA 2 South age composition. Age 4 year fish accounts for a negligible proportion of the SNA 2 South age composition, while the age class also appears weak in the SNA 2 North age composition (Figure A3). There is a lower proportion of fish older than 10 years in SNA 2 South compared to the SNA 2 North age composition.



**Figure A1: Between reader comparisons of the snapper ages for a subset of the otolith collection.**



**Figure A2:** Relationship between length (FL, cm) and age (years) for snapper sampled from the 2025 FMA 2 survey by sub stock area. The lines represent a lowess smoothed fit to the data sets.



**Figure A3:** Proportional age compositions of snapper (both sexes combined) by sub stock area from the 2025 FMA 2 trawl survey. The 20 year age class includes fish 20 years and older ("plus group").

**Table A3: Proportional age compositions of snapper (both sexes combined) by sub stock area from the 2025 FMA 2 trawl survey. The 20 year age class includes fish 20 years and older (“plus group”).**

Age (y)	SNA 2 South	SNA 2 North
1	0.0000	0.0000
2	0.0000	0.0018
3	0.1978	0.1776
4	0.0075	0.0706
5	0.2285	0.0950
6	0.3129	0.2925
7	0.1222	0.1015
8	0.0133	0.0619
9	0.0414	0.0302
10	0.0277	0.0528
11	0.0289	0.0212
12	0.0075	0.0287
13	0.0028	0.0098
14	0.0010	0.0059
15	0.0057	0.0106
16	0.0000	0.0084
17	0.0010	0.0089
18	0.0000	0.0080
19	0.0017	0.0027
20+	0.0000	0.0120