Ministry for Primary Industries Manatū Ahu Matua



Fishery characterisation and standardised CPUE analyses for alfonsino, *Beryx splendens*, 1989–90 to 2013–14

New Zealand Fisheries Assessment Report 2015/78

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#### **EXECUTIVE SUMMARY**

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There are currently no reliable tools available for monitoring abundance of alfonsino in New Zealand. Common monitoring methods such as trawl surveys and catch-per-unit-effort analyses were found to be unsuitable for alfonsino in this and past studies. Monitoring of catch-at-age could potentially be useful for detecting a shift in mean age of commercial catches. Overall, catches of alfonsino in New Zealand appear to be relatively steady based on the proportion of trawl tows considered 'large' (five tonnes or more).

Alfonsino landings in New Zealand consist almost entirely of one species, *Beryx splendens*: the other species, *B. decadactylus*, is thought to make up less than 1% of landings. Before 1983 alfonsino were virtually unfished, but two main fisheries now exist in New Zealand. The first to develop was the lower east coast North Island fishery (BYX 2), which developed in the mid-1980s. The other is the eastern Chatham Rise fishery (BYX 3), which developed in the mid-1990s. Alfonsino are caught throughout the New Zealand EEZ but only in small quantities outside of the east coast North Island and eastern Chatham Rise fisheries.

The TACC has undergone a number of changes in all QMAs, including decreases in BYX 2. Landings in BYX 2 peaked in the 1995–96 fishing year at 1 868 t. Landings are now lower but often still slightly exceed the current TACC of 1575 t. Landings from the eastern Chatham Rise (BYX 3) are lower than from the east coast North Island but are still substantial, often slightly more than 1000 t per year, i.e., slightly exceeding the 1010 t TACC. Current TACCs for other QMAs have not been caught aside from the 300 t TACC being reached in BYX 1 in 2005.

Most alfonsino is caught in targeted trawls. When caught as bycatch the most common target species are hoki, orange roughy, bluenose, and black cardinalfish. Bottom trawling has taken most of the catch for the 1989–90 to 2009–10 fishing years, followed by midwater trawling on the bottom (i.e., within 5 m of the sea bed) and midwater trawling (more than 5 m above the sea bed). Within the east coast North Island most is taken by midwater trawling on the bottom, and on the eastern Chatham Rise most is taken by bottom trawling. Small amounts are also taken by bottom longline. They are caught throughout the year but highest catches are made during summer months.

The annual Chatham Rise middle depth species trawl survey is the only research survey that regularly catches and measures alfonsino but it does not produce a good index of abundance. Estimates of abundance show wide inter-annual variation and high coefficients of variation. The aggregated nature of alfonsino means that trawl surveys are unlikely to be useful. Standardised CPUE analyses are poor indicators of alfonsino abundance due to the complex, patchy nature of the fish distribution, and the changing composition of the commercial fleet. Monitoring of the stocks would probably be best achieved through determining the age structure of the catch from the main commercial fishing grounds. There is scope to do this as either a land-based catch-sampling programme or as an at-sea observer-based sampling programme. However, observer coverage of the two main fisheries is patchy and ranges from no sampling to over-sampling depending on year and month. More consistent coverage would be needed.

# 1. INTRODUCTION

Many of New Zealand's fish species caught in middle depth fisheries, other than hoki, hake, ling, and southern blue whiting, are not routinely monitored or assessed despite their moderate size and value. Eighteen such species were selected under the 10-year Research Programme for Deepwater Fisheries (Ministry of Fisheries 2010) to be assessed under a 3 to 4 year rotating schedule. There were three species selected for characterisation in 2014–15: alfonsino (*Beryx splendens*), blue mackerel (*Scomber australasicus*), and white warehou (*Seriolella caerulea*).

The most recent characterizations and standardized CPUE analyses of alfonsino in New Zealand waters was carried out by Starr et al. (2010) for BYX 1 and by MacGibbon (2013) for all stocks. The fishery is concentrated in two main areas: the east coast of the North Island, and the eastern Chatham Rise (Horn 1988, Horn & Massey 1989, Stocker & Blackwell 1991, Langley 1995, Blackwell 2000, Langley & Walker 2002, Mormede 2009). Trawl surveys are not good indices of abundance due to the patchy distributions of alfonsino within areas covered by surveys (MacGibbon 2013). MacGibbon (2013) also found that CPUE was not informative due to the complex patchy nature of alfonsino distribution, changing fleet composition, and apparent violations of model assumptions. Past attempts at developing CPUE analyses for either of the main alfonsino fishery areas have also had very limited success (Horn 1988, Horn & Massey 1989, Stocker & Blackwell 2000, Langley & Walker 2002).

This report summarises the analyses carried out under Ministry of Fisheries (now Ministry for Primary Industries) Project DEE201007BYX, Objectives 1–6: To characterise the New Zealand alfonsino fisheries in all BYX stocks by analysis of commercial catch and effort data up to 2012–13 including:

- Characterise the fisheries by analysis of commercial catch and effort data up to 2012–13.
- Carry out standardised CPUE analyses for the major fisheries (Fishstocks) where appropriate.
- Review the indices from CPUE analyses, trawl surveys and Observer logbooks to determine trends.
- Review stock structure using data accessed above and any other relevant biological or fishery information.
- Assess availability and utility of developing a series of age frequency distributions from otoliths.
- To make recommendations on future data requirements and methods for monitoring the stocks

The project was intended to cover up to the 2012–13 fishing years, but commercial catch and effort data for the 2013–14 fishing year was available and so was included. This report updates the most pertinent findings of MacGibbon (2013), focussing on the main fishing grounds within the two main fishery areas of the east coast North Island and the eastern Chatham Rise. MacGibbon (2013) found that other areas of the New Zealand exclusive economic zone contribute a very minor proportion of the catch. This study found that this is still the case, hence the focus on the two main areas only. Commercial catch-effort data are updated with the addition of data from four years, and focussing primarily on the two main fishery areas, as well as presenting updated information from trawl surveys and the Ministry for Primary Industries' Observer Programme. CPUE analyses were not completed as it has been shown previously that they are not useful to monitor alfonsino abundance.

The report contains sections of text and tables that can be transferred to the Ministry for Primary Industries Plenary Report as appropriate. Tables and figures are provided in three appendices: A, fisheryindependent research survey data; B, Ministry for Primary Industries' observer programme data; and C, commercial fishery characterisation.

#### 2. FISHERY SUMMARY

#### 2.1 Commercial fisheries

There are two relatively common *Beryx* species that occur throughout the world's tropical and temperate waters, in depths of between 25 and 1200 m. More than 99 % of 'alfonsino' landed in New Zealand is *B. splendens*, with the remainder being the red bream, *B. decadactylus*. Alfonsino are believed to mainly be associated with undersea structures such as seamounts and banks on the lower east coast of the North Island and the eastern Chatham Rise in depths of between 300 and 500 m (Ministry of Fisheries 2009). Mormede (2009) found no apparent association between the alfonsino fishery and hills in her characterisation of the BYX 3 (see Figure 1) fishery to 2009 with alfonsino targeted tows generally being between 10 and 50 nautical miles from the nearest known hills. She did concede however that these tows may have occurred in association with smaller features that have not been identified as hills.

Alfonsino was virtually unfished prior to 1983 (Ministry of Fisheries 2009). Development of the fishery in BYX 2 began in 1981 and was focussed on the banks and seamount features on the east coast of the North Island between Gisborne and Cape Palliser. The main grounds in this area were the Palliser Bank, Tuaheni Rise, Ritchie Banks, and Paoanui Ridge. Catches in BYX 3 were historically low until 1994–95 when a target trawl fishery was developed following the discovery of new grounds south-east of the Chatham Islands (Mormede 2009).



Figure 1: Map showing the Quota Management Areas (QMAs) for BYX 1–8, including statistical areas, and the 500 m and 1000 m depth contours.

BYX 2 (FMA 2) within the east coast North Island region has historically been the major alfonsino fishery in the New Zealand EEZ. Landings have exceeded the TACC almost every year despite numerous TACC increases. The highest landing was 1868 t in 1996 (exceeding the TACC at the time by 19%). Landings are usually a little over 1600 t in most years. There are seven sub-regions within the east coast North Island fishery (which also includes BYX 1/FMA 1) which are focussed on bank- and canyon-like features. Most of the catch is taken as a target trawl species, but with moderate amounts taken in trawl fisheries for other targets (i.e., black cardinalfish, hoki, bluenose, orange roughy and gemfish), with differing importance of target species for different sub-regions. Catches are made all year round but decrease during the winter months.

In BYX 3 catches of alfonsino were low in the early 1990s and were mainly bycatch of the hoki fishery. However, the discovery of new grounds in the mid-1990s saw the rapid development of a target trawl alfonsino fishery, most notably south-east and north-west of the Chatham Islands (within FMA 4 of BYX 3), the two distinct sub-regions within BYX 3. Annual landings are usually close to 1000 t. The TACC of 1010 t has been exceeded a number of times. The greatest landing was 1197 t in 2002, exceeding the 1010 t TACC by 19%. Most of the BYX 3 alfonsino catch is now targeted, followed by bycatch in fisheries for orange roughy, bluenose, hoki and hake. Catches are made all year round but decrease during the winter months. Catches of alfonsino in other areas of BYX 3 are negligible.

Catches were found to be low to negligible in other alfonsino QMAs (MacGibbon 2013). The current study found that this is still the case and so it focusses only on the two significant fishery areas. For a description of the other minor alfonsino fishery areas see MacGibbon (2013).



Figure 2: Map showing the New Zealand EEZ, including statistical areas, the 500 m and 1000 m depth contours, and the fishery areas identified in this study. ECNI, east coast North Island; ECSI, east coast South Island; CHAT WEST, western Chatham Rise; CHAT EAST, eastern Chatham Rise; SUBA, Sub-Antarctic; West Coast, west coast North and South Islands.

Table 1: Reported domestic landings (t) of alfonsino by Fishstock from 1985–86 to 2012–13 and TACCs (t) from 1986–87 to 2012–13. Source: Ministry for Primary Industries 2014. \* = FSU data, ‡ = excludes catches taken outside of New Zealand EEZ.

Fishstock FMA (s)		BYX 1 1 & 9		BYX 2	3	BYX 3 4 5 & 6		BYX 7 7
	Landings	TACC	Landings	TACC	Landings	TACC	Landings	TACC
1985-86*	11	-	1 454	-	3	-	1	-
1986-87	3	10	1 387	1 510	75	220	4	30
1987-88	8	27	1 252	1 511	101	1 000	2	30
1989_90	24	31	1 496	1 274	147	1 000	21	80
1990-91	17	31	1 459	1 274	202	1 007	26	81
1991–92	7	31	1 368	1 499	264	1 007	2	81
1992–93	6	31	1 649	1 504	113	1 007	12	81
1993–94	7	31	1 688	1 569	275	1 007	31	81
1994–95	11	31	1 670	1 569	482	1 010	59	81
1995-96	11	31	1 868	1 569	961	1 010	66	81
1996-97	39	31	1 854	1575	983	1 010	11	81
1997-98	14	31	1 652	1 575	1 104 912	1 010	13	81 81
1999_00	25	31	1 856	1 575	743	1 010	24	81
2000-01	25	31	1 665	1 575	890	1 010	21	81
2001-02	123	300	1 574	1 575	1 197	1 010	10	81
2002-03	136	300	1 665	1 575	1 1 1 8	1 010	7	81
2003-04	219	300	1 468	1 575	884	1 010	11	81
2004-05	300	300	1 669	1 575	1 067	1 010	14	81
2005-06	195	300	1 633	1 575	1 068	1 010	7	81
2006-07	66	300	1 644	1 575	945	1 010	21	81
2007-08	154	300	1 532	1575	1 030	1 010	32	81
2008-09	172	300	1 589	1 575	1 016	1 010	10	01 91
2009-10	48	300	1 686	1 575	1 010	1 010	17	81
2010-11	45	300	1 603	1 575	1 037	1 010	14	81
2012–13	22	300	1605	1575	1013	1010	39	81
Fishstock		BYX 10						
FMA (s)				Total				
1005 04*	Landings	TACC	Landings	TACC				
1985-80*	0	- 10	1 469	1 800				
1980-87	0	10	1 364	2 598				
1988-89	1	10	1 663	2 717				
1989-90	0	10	1 688	2 4 2 2				
1990–91	0	10	1 664	2 4 2 3				
1991–92	< 1	10	1 641‡	2 648				
1992–93	< 1	10	1 780‡	2 653				
1993-94	0	10	2 001‡	2 718				
1994-95	0	10	2 2234	2 721				
1995-90	0	10	2 9004	2 7 2 1				
1997-98	0	10	$2,898^{+}$	2,727				
1998–99	Ő	10	2624±	2 727				
1999–00	0	10	2 648‡	2 7 2 7				
2000-01	0	10	2 601‡	2 7 2 7				
2001-02	0	10	2 904‡	2 925				
2002-03	0	10	2 927 ‡	2 925				
2003-04	0	10	2 584 ‡	2 925				
2004-05	0	10	3 U32 I 2 002 ÷	2 925				
2005-00	0	10	2 903 1 2 677 †	2 923 2 925				
2007-08	0	10	2 748 †	3 000				
2008-09	Ő	10	2 674 ±	3 000				
2009-10	0	10	2 865 ‡	3 000				
2010-11	0	10	2 836 ‡	2 996				
2011-12	0	10	2 699 ‡	2 996				
2012-13	0	10	2 679 ‡	2 996				

#### 2.2 Recreational fisheries

Small catches of alfonsino have been recorded from recreational fishers. For all QMAs, the total alfonsino catch reported by recreational fishers since the 1990 fishing year is less than 1.5 tonnes, with around two-thirds of this coming from BYX 1.

# 2.3 Maori customary fisheries

No quantitative information on the level of customary non-commercial catch is available but is likely to be negligible given the location and depth where alfonsino are found.

#### 2.4 Illegal and misreported catch

There is no quantitative information on the current level of illegal and misreported catch for alfonsino.

#### 2.5 Other sources of mortality

There is no quantitative information of non-fishing sources of mortality of alfonsino.

#### 2.6 Regulations affecting the fishery

Current and historical limits on catch in alfonsino fisheries are described in Section 2.1. Trawl codend minimum mesh-size regulations that currently apply are 60 mm for Sub-Antarctic (FMA 6) fisheries and FMA 5 south of 48° S; and 100 mm elsewhere. From 1 October 1977, the trawl codend mesh-size change took effect at the boundary between the Snares and Auckland Islands fisheries (the boundary between areas E and F in the old EEZ area), which was at 48° 30'S. The management area boundary was changed on 1 October 1983 to 49° S (now the FMA5/6 boundary) but the codend mesh size change was at latitude 48° S to allow for targeting of squid around the Snares Islands (Hurst 1988).

Protection of bycatch species in multi-species fisheries is mainly through the QMS. Catch of protected species such as seabirds and fur seals is monitored through the Ministry for Primary Industries observer programme and all trawl vessels have been required to deploy seabird mitigation devices to minimise interactions with trawl warps since April 2006 (Ministry of Fisheries 2009). Bottom longline vessels 7 m or more in length must use streamer lines to deter seabirds when setting lines and no vessel may discharge offal while setting lines. When hauling lines, offal may only be discharged from the opposite side of the vessel from which the line is being hauled.

#### 3. BIOLOGY

See MacGibbon (2013) for a summary of biological information available for New Zealand alfonsino. No new information is available since that review.

#### 4. CURRENT AND ASSOCIATED RESEARCH PROGRAMMES

Recent or ongoing research on or relevant to alfonsino includes: research trawl surveys by *Tangaroa* on the Chatham Rise and fishery characterisations planned every three years under the Ministry of Fisheries 10-year Research Plan for Deepwater Fisheries (Ministry of Fisheries 2010).

# 5. FISHERY INDEPENDENT OBSERVATIONS

#### 5.1 Research survey abundance indices and length frequencies

There have been no surveys designed specifically to estimate alfonsino abundance. The Chatham Rise *Tangaroa* trawl survey time series, started in 1992, is primarily aimed at surveying hoki, hake and ling, as well as a variety of other middle depth species and is the only ongoing trawl survey that regularly catches and measures alfonsino in New Zealand waters. Trends in biomass and length frequencies from these surveys are presented in Appendix A (Table A1, Figures A1–A2). MacGibbon (2013) found that the Chatham Rise time series was not suitable for monitoring alfonsino abundance but summaries have been included here and briefly described to illustrate that there have been no major changes in mean length or sex ratios.

Relative biomass estimates for the Chatham Rise time series range from 566 t to 44 779 t (Table A1, Figure A1). Coefficients of variation fluctuate wildly, ranging from 20 to 99%. Higher biomass estimates are associated with high CVs, particularly in 1994, 2005, 2008–10, and 2013. The Chatham Rise series is not suited to the monitoring of alfonsino abundance. The survey area and depth range is appropriate for this species but biomass appears to be poorly estimated. The patchy nature of alfonsino distribution and its association with particular bottom features means that the chance of a randomly allocated trawl station being in an area of high alfonsino concentration is low.

Numbers of alfonsino measured range from 480 to 1603 per survey. Males contribute slightly more of the total biomass than females for the time series with a mean proportion of 0.51 but this fluctuates from 0.39 to 0.67. Males usually outnumber females with a mean male:female ratio of 1.30 for the time series (range 0.43–2.69). For both sexes, fish range from 15–55 cm fork length (FL) (Figure A2). Virtually all fish of both sexes are 20–35 cm, although females tend to reach slightly larger sizes than males. Length frequencies are usually unimodal and show no obvious trend in mean length over time. Only two individual fish from this survey have been sampled for otoliths and therefore it is not possible to develop a catch-at-age history from the time series.

# 6. FISHERY DEPENDENT OBSERVATIONS

#### 6.1 Observer data

#### Length and age sampling

The Ministry for Primary Industries observer programme have collected alfonsino length, sex, weight, and female gonad stage from various fisheries since 1990. All tables and figures relating to observer data collected from alfonsino catches are contained in Appendix B (Tables B1–8, Figures B1–7). The "Other" fishery category presented in Appendix B includes all observer data for alfonsino samples from outside the east coast North Island or eastern Chatham Rise fishery areas defined in Section 2.1 (Figure 2).

The total number of tows observed for alfonsino catch in the two main fishery areas since 1990 was 2141 for the east coast North Island and 1291 for the eastern Chatham Rise (Table B1a). Total observed catch weights of alfonsino for the two areas were 1253 t and 890 t, respectively (Table B1b). Of tows observed, 253 tows measured alfonsino for length frequency from the east coast North Island and 173 from the eastern Chatham Rise (Table B2). By month, sampling for length and sex is sporadic (Table B3). The month of August has the highest number of tows observed for length and sex (i.e. 206) but nearly one third of these are from 2014 alone. No sampling for length and sex occurred before the 1994 fishing year.

Within the east coast North Island fishery, there was little seasonality in sampling (Table B4a). Slightly more samples are taken generally in the spring to autumn months when there is more commercial fishing for alfonsino compared with winter. No length frequency samples have been taken in March in any year. Most of the total samples for a given winter month are from one or two years with relatively high sampling.

Within the eastern Chatham Rise fishery the majority of tows sampled for length and sex have been taken in summer to autumn, with little in winter (Table B4b). Relatively high numbers of samples are taken outside of the two main fishery areas ('Other'), probably because of reasonably high levels of observer coverage there, particularly in hoki target fisheries elsewhere on the Chatham Rise and west coast South Island.

Of the two main fishery areas, most fish were measured from the east coast North Island fishery with a total of 11 533 fish, followed by the eastern Chatham Rise fishery with 6 752 fish (Table B5). By month, the majority of fish from the east coast North Island were measured in spring to summer months with fewer fish measured in winter (Table B6a). A similar pattern is seen for the eastern Chatham Rise fishery (Table B6b). The more frequent sampling of alfonsino in the two main fishery areas at this time is probably because more target fishing for alfonsino occurs during the summer and autumn months compared with winter (see Section 7.2) so this is when there is more opportunity to take length frequency samples.

The representativeness of observer sampling of trawl-caught alfonsino was evaluated by plotting the total groomed and merged catch for each year and area as circles, and overlaying this with the total observed catch for those same cells as crosses (Figure B1, upper plot). If crosses and circles are aligned, then relative to the total amount of observer coverage in a given year, the level of coverage in that cell was appropriate. However, if over- or under-sampling occurred, the crosses are either larger or smaller than the circles. Catches from the east coast North Island fishery were poorly sampled until the mid-1990s after which coverage for the eastern Chatham Rise has ranged from being very over-sampled particularly before the mid-1990s, after which the target trawl fishery in the area developed (see Section 7.2.3), to somewhat under-sampled in recent years. The low catches and high levels of observer coverage shows that the 'Other' areas are consistently over-sampled every year, probably due to high levels of coverage in areas of low catches, such as in hoki target fisheries on the west coast South Island and western Chatham Rise.

Similarly, the representativeness of observed catches sampled for length was evaluated by plotting the total observer alfonsino catches as circles and overlaying this with the observed catch from which fish were measured for length, as crosses (Figure B1, lower plot). Overall, length frequency coverage for each fishery area was reasonably good relative to the other areas in most years with the odd exception (e.g. east coast North Island in 1998, eastern Chatham Rise in 1994).

The bubble plots described in the previous two paragraphs were repeated for each fishery area, by year and month to look for seasonality in observer coverage.

Observer coverage by month in the east coast North Island fishery has been very patchy over the years with all months receiving years of over- and under-sampling but with the summer months being particularly under-sampled or not sampled at all (Figure B2, upper plot). Where length frequency samples have been taken, the amount of coverage in any given month is about right relative to other months in any given year (Figure B2, lower plot).

Observer coverage of the eastern Chatham Rise fishery has been very inconsistent through the years with wide ranging levels of coverage, from no sampling at all to over sampling, with no apparent seasonality (Figure B3, upper plot). Length frequencies by month for the eastern Chatham Rise are also relatively inconsistent with regular over-sampling but many months not being sampled at all (Figure B3, lower plot).

Observer coverage by month for 'Other' fishery areas is heavily over-represented in the winter and spring months (Figure B4, upper plot). What catches are made in the 'Other' areas are more common in the summer months when presumably there is less observer coverage outside of the hoki and hake spawning seasons. When catches are observed, the amount of length frequency sampling is generally appropriate in each month relative to the others (Figure B4, lower plot).

It should be noted that for Figures B1–4, where crosses and circles are aligned, observer coverage is not necessarily *adequate* in the sense of fishery monitoring. Aligned crosses and circles mean that within a row (months in a given year for example), the amount of sampling in a given cell is correct *relative* to the amount of sampling that was done in the other cells within that year. Adequate levels of observer sampling is dependent on what the intended objectives are of the data being collected. Figure B1–4 only demonstrate the consistency of sampling for one area relative to another (Figure B1) or of one month relative to another (Figure B2–4).

#### Length frequency distributions

Scaled length frequency distributions were determined using the 'catch.at.age' software (Bull 2002) which scales the length frequency distribution from each catch up to the tow catch, sums over catches in each stratum, scales up to the total stratum catch, and then sums across the strata to yield overall length frequency distributions. Length frequency distributions are plotted in Figures B5–6.

For the east coast North Island fishery, the majority of fish were 20-50 cm fork length (FL) with males generally being smaller than females at 20-40 cm FL compared with 20-50 cm FL for females. There are a number of years with no available length frequency data. In years with available data the distributions are often patchy or unimodal and no cohorts can be tracked through time. Scaled population numbers favour males overall with a mean male:female ratio of 1.2 for the years with available data, but a wide range across years (0.67-2.23).

Scaled length frequency distributions from the eastern Chatham Rise fishery are similar to the east coast North Island fishery with most fish being 20–50 cm FL and males being smaller than females (Figure B6). Again, there are a number of years with no data. Distributions are patchy or unimodal in most years, although in 2012 there is a bimodal distribution seen with a smaller cohort from around 15–25 cm FL and the other 25–45 cm FL. There appear to be fewer small fish (less than 30 cm) here compared with the scaled population length frequency distribution from the Chatham Rise summer trawl survey time series (see Appendix A, Figure A2). Scaled population numbers slightly favour females, with an overall mean male:female ratio of 0.93 for the years with available data, but a wide range across years (0.67–1.97).

#### Female maturity

Observer-collected data on female maturity stage has used a 5-stage gonad scale (stages 1–5; immature/resting, maturing, ripe, running ripe, spent). The number of female alfonsino examined for gonad stage by fishery area and fishing year is given in Table B7. Most were from 'Other' fishery areas (8 159 fish) despite the lower level of catch here compared with the two main fishery areas (due to high levels of observer coverage of other target fisheries), followed by the east coast North Island fishery (5 504 fish), then the eastern Chatham Rise fishery (3 624 fish). By month, female gonad sampling for each area followed a similar coverage pattern to length frequency sampling, presumably because fish are often examined for maturity when they are measured (Table B8a–c).

In all areas, most of the fish at any time of year are immature or resting, with the next most common stage at any time of year being maturing (Figure B7). A few cases of spent fish have been reported at various times of the year from all areas. This is not at odds with the observation of ripening fish in early winter that then disappear before spawning which led Horn & Massey (1989) to suggest that spawning takes place (in an unknown location) during June and July. The patterns seen for all areas combined are repeated in all individual areas. There have been few cases of mature fish being observed (in either fishery-dependent or independent data) and the three individual instances of running ripe fish in the Centralised Observer Database are possibly errors in reporting, though it is interesting that they, and some records of ripening fish, all occur on seamounts to the northwest of North Island. Figure B8 shows the location of different stages of maturity around New Zealand waters. There are insufficient data from which to draw conclusions but ripening fish have been observed in a number of locations around the EEZ and in a variety of months covering all seasons. Fish in non-spawning condition have been observed in a number of locations at all times of year.

# 6.2 Catch and effort data sources

Catch and effort data were requested from the Ministry for Primary Industries catch-effort database "warehou" as extract 9843. The data consist of all fishing and landing events associated with a set of fishing trips that reported a positive landing of alfonsino in BYX 1–10 between 1 October 1989 and 30 September 2014. Fishing year is labelled as the most recent year (i.e., the 1998–1999 fishing year is referred to as 1999). The fields from the database tables requested are listed in Table C1.

The estimated catches associated with the fishing events were mainly reported on the general Catch Effort Landing Returns (CELR) and the more detailed Trawl Catch Effort and Processing Returns (TCEPR). CELR forms summarise daily catches, which are further stratified by statistical area, method of capture, and target species. TCEPR forms record tow-by-tow data and summarise the estimated catch for the top five species by weight for individual tows. Trawl vessels less than 28 m in length could use either CELR or TCEPR forms; trawl vessels over 28 m used TCEPR forms. From 1 October 2007, the Trawl Catch Effort Return (TCER) replaced the CELR for trawlers less than 28 m in length. TCER forms summarise estimated catches for up to the top eight species per tow. From 2004 the Lining Catch Effort Return (LCER) and the Lining Trip Catch Effort Return (LTCER) forms were introduced and small amounts of alfonsino caught by bottom longline are also reported on these forms. The majority of alfonsino, however, is reported on TCEPR forms, or where fishing was reported on the TCEPR, TCER, LCER or LTCER, on the associated Catch Landing Return (CLR).

Information on total harvest levels is provided in the plenary report at the resolution of Quota Management Area. The TCEPR forms report catches at the level of individual fishing events, but the fishers are only required to report the top five species in their catch. This led to concerns (e.g., Phillips 2001) that bycatch species may not be well reported at the fishing event level. The daily processed part of the TCEPR contains information regarding the catch (of all quota species) that were caught on that day (irrespective of which day they were processed on), and these data are generally believed to provide a more accurate account of low and zero catch observations. However, daily processed catch data suffer from the inability to assign processed catch to a specific amount of effort because many days will have more than one tow. Fortunately, alfonsino are a common target species in the two main fishery areas and estimated catches are sufficient for analyses where a higher resolution (i.e. tow by tow) is desired.

The extracted data were groomed and restratified to derive the datasets required for the characterisation using a variation of Starr's (2003, 2007) data processing method as implemented by Manning et al. (2004), with refinements by Blackwell et al. (2005), and Manning (2007), and further modified for this study. The procedure was developed for monitoring bycatch species in the Adaptive Management Programme, and was comprehensively described by Manning et al. (2004) and Starr (2007). The major steps used were.

- Step1: The fishing effort and landings data were first groomed separately. Outlier values in key variables that failed a range check were corrected using median imputation. This involved replacing missing or outlier values with a median value calculated over some subset of the data. Where grooming failed to find a replacement, all fishing and landing events associated with the trip were excluded.
- Step 2: The fishing effort within each valid trip was restratified by statistical area, method, and target species.
- Step 3: The greenweight landings for each fish stock for each trip were allocated to the effort strata. The greenweight landings were mapped to the effort strata using the relationship between the statistical area for each effort stratum and the statistical areas contained within each fish stock.
- Step 4: The greenweight landings were allocated to the effort strata using the total estimated catch in each effort stratum as a proportion of the total estimated catch for the trip. If estimated catches

were not recorded for the trip although a landing was recorded for the trip, then the total fishing effort in each effort stratum as a proportion of the total fishing effort for the trip was used to allocate the greenweight landings.

The original intent of the merging process was to allow trip level landings data to be mapped to CELR effort strata. However, many species are captured in fisheries reporting using a combination of form types, and some may use TCEPR forms almost exclusively. The grooming and merging process also allows an evaluation of the amount of catch and effort that is not captured using TCEPR forms at the fishing event level. If significant, the best characterisation dataset is likely to be the merged trip level data. But if the amount of lost catch and effort is predictable, minor, and stable over time and area, the estimated catch at the level of the fishing event provides a much more detailed dataset for characterisation and CPUE analyses.

# 7. DESCRIPTIVE ANALYSIS OF CATCH

Catches by year for the main fishery areas, month, method, and target species are shown in Figure 3. There are two main areas in which alfonsino are caught, the east coast North Island and the eastern Chatham Rise, together comprising around 96% of the total catch for the study period. The east coast North Island fishery is the most important with 68% of the catch for the study period. This area has consistently been the most important of the two. The fishery in the other main area, the eastern Chatham Rise, did not develop until the mid-1990s after which substantial catches have been made in every year. Catches from this area comprise 28% of the total alfonsino catch for the study period. Alfonsino are caught in a variety of other areas around New Zealand's EEZ but only in small amounts. They are almost never caught in the Sub-Antarctic region. Catches are made all year round but decline in the winter months. Catches are made mainly by trawl methods with bottom trawling and midwater trawling on the bottom (defined as being within 5 m of the sea bed in this study) being the most productive. Midwater trawling is also important. Alfonsino is also caught by bottom longline at times but in much smaller quantities compared with trawling methods. Other methods also catch negligible amounts of alfonsino, such as set net and dahn line. The majority by far is taken as a target alfonsino fishery, but also as a bycatch of target trawl fisheries for hoki (Macruronus novaezelandiae), bluenose (Hyperoglyphe antarctica), orange roughy (Hoplostethus atlanticus), and black cardinalfish (Epigonus telescopus).



Figure 3: Alfonsino catches (from groomed and merged data set) by fishing year for the fishery areas identified in this study, month, method, and target species. ECNI, east coast North Island; ChatE, eastern Chatham Rise. BT, bottom trawl; MWB, midwater trawl on the bottom (within 5 m of the sea bed); MW, midwater trawl; BLL, bottom longline. Circle size is proportional to maximum catch indicated within each panel. See Table C48 for species codes.

# 7.1 Summary of catches

All tables and figures relating to the characterisation of commercial alfonsino fisheries are contained in Appendix C (Tables C1–48, Figures C1–50). Table C48 contains a list of species codes used in this report and includes common and scientific names.

The reported landings, catch-effort landings (un-groomed), and TACCs for BYX 1–8, from 1990 to 2014, are shown in Figure C1. The ungroomed catch-effort landings in the raw dataset are similar to the reported plenary landings for most years in most QMAs. In BYX 1 there were two minor overruns of the TACC prior to the species being placed in the Adaptive Management Programme (AMP) in 2001 (Starr et al. 2010) after which the TACC was increased nearly ten-fold from 31 tonnes to 300 tonnes. Since then the TACC has only been caught once (in 2005). Minor TACC over runs are common in BYX 2 and 3, the QMAs which contain the two main fishery areas for alfonsino. The TACC has never been caught in BYX 7, nor has it ever been caught in BYX 8 where reported catches of alfonsino are rare.

The landings data provide a verified greenweight landed for a fish stock on a trip basis. However, landings data include all final landing events, where a vessel offloads catch to a Licensed Fish Receiver (LFR), and interim landing events, where catch is transferred or retained, and may therefore appear subsequently as a final landing event (SeaFIC 2007). Starr's procedure separates final and interim landings based on the landing destination code, and only landings with destination codes which indicate a final landing are retained (see table 2 in Starr (2007)).

Table C2 summarises the number of landing events for the major destination codes in the dataset. The weight, number of records, and description of each destination code is given in Table C3. For BYX 1–8 (QMAs covered by this study) the vast majority of alfonsino by individual landing events every year is landed in New Zealand to LFRs (recorded as "L") for both CLR and CELR landing forms. Not surprisingly this code also accounts for the vast majority of greenweight landings in each QMA (Table C3). Greenweight landings coded as "L" account for between 90.5% and 99.8% of the total. A variety of other destination codes are seen and vary with QMA but in all instances are minor compared with "L" landing events. Landing events defined as "interim" by Starr (2007) ("B"; stored as bait, "Q"; holding receptacle on land, and "R"; retained on board,) were dropped from the analysis. Figure C2 shows the interim landings dropped from this analysis as well as those for which data grooming could not produce a plausible value, compared with those retained. The data loss is low in all QMAs.

The most common processed state for alfonsino in BYX 1–8 is "Green" (whole), with "Dressed" (includes "Dressed", "Headed and Gutted", and "Trunked") also being relatively common in BYX 2, 3 and 8 though less so than green. Some is also made into fish meal in BYX 7. The conversion factors for alfonsino have been static since its introduction to the QMS except for changes to skin-off fillets and fish meal. This means that different amounts of greenweight catch are associated with the same amount of processed catch for these two product forms throughout the dataset. Although these two product states account for a minor proportion of alfonsino landings the greenweights were standardised using the most recent conversion factor for those processed states for which there have been changes in conversion factor (skin-off fillets and fish meal). This assumes that the changes in conversion factors reflect improving estimates of the actual conversion when processing alfonsino, rather than real changes in processing methodology across the fleet.

The retained landings adjusted for the change of conversion factors were allocated to the effort strata using the relationship between the statistical area for each effort stratum and the statistical areas contained within each fish stock. Difficulties arise with effort strata associated with statistical areas that straddle stock management area boundaries (for example Statistical Areas 018 and 019), as the proportion of catches to be allocated to each QMA cannot be determined. This is less of a problem for species such as alfonsino with only five QMAs and the resulting number of boundary lines decreasing the likelihood that a statistical area will straddle QMAs. However, there are still straddling statistical areas for alfonsino QMAs. For example, in BYX 8 every statistical area apart from area 801 straddles the BYX 8 boundaries with BYX 7 (FMA 7) and BYX 1 (FMAs 1 & 9). The straddle approach when applied to BYX 8 would result in every

statistical area apart from 801 being dropped from the analysis leaving little data. There are two options to address this problem. The first assumes the catches of the straddling statistical area had been taken from a single fish stock if the trip had only reported to that stock, and to exclude all the fishing and landing events from that trip if it had reported to multiple fish stocks ("straddle" method). This may not be ideal if trips often straddle fishstock boundaries. The second option allocates statistical areas to alfonsino fish stocks based on the location of the centroid of each area ("centroid" method). This method was used here and resulted in a closer relationship between reported plenary landings, merged landings, and estimated catch in all areas. Details of the retained landings in unmerged and merged datasets and estimated catches in the groomed and merged datasets, by QMA, are given in Table C4.

The reported landings, retained landings in the unmerged and merged datasets, and estimated catch are shown in Figure C5. In BYX 1–3 in most years the retained landings, merged landings, and estimated catch track each other and the reported QMR landings closely. Estimated catches are significantly lower than retained landings, merged landings, and reported QMR landings in BYX 7. This is likely to be due to alfonsino being a minor bycatch of trawls targeting spawning hoki and hake on the west coast of the South Island and rarely making it into the top five species in any one trawl. In BYX 8 catches of alfonsino are rare and of small quantities (four years with data, two to four tonnes) and there is little useful information. The reporting rate, defined to be the annual estimated catch as a proportion of the retained landings in the groomed and merged dataset, was also calculated (Figure C6). The reporting rate fluctuates somewhat in BYX 1 but is usually more than 0.8. In BYX 2 and BYX 3 where the majority of the alfonsino catch comes from, the reporting rate is good, often more than 0.9. In BYX 7 the reporting rate fluctuates and is often less than 0.5. The reporting rate in BYX 8 is of little use due to a lack of data. Only two years' worth of data are in the retained landings and the reporting rate is 1.0 in 2004 and around 0.5 in 2005.

Annual estimated catches favourably reflect the harvest reported in the 2014 Plenary (Ministry for Primary Industries 2014). Alfonsino is often targeted and caught in large quantities, especially on vessels using TCEPR forms. As such it often features in the top five species caught on any fishing event. Estimated alfonsino catches in BYX 1–8 capture between 0% (BYX 7) and 118% (BYX 3) of the reported plenary landings in any year (Table C4). For the two main QMAs (BYX 2 and 3) the estimated catches are usually more than 80% and often more than 90% of the reported plenary landings each year.

Table C5 and Figure C7a-e show for BYX 1-8 in each fishing year the total number of trips, trips that reported zero estimated catch, and the proportion of trips reporting zero estimated catch, for trips that landed alfonsino for the two main form types. In BYX 1 the proportion of trips with zero estimated catch is relatively low for vessels reporting on CELR forms, often less than 0.2. This form type has been phased out and is now rarely used, having been replaced by the TCER form for trawlers less than 28 m and the LTCER form for longline vessels less than 28 m. Very little of the recent catch is reported on CELR forms. For TCEPR forms the proportion is much higher, often more than 0.5. There is a tendency for vessels to underestimate alfonsino catches in BYX 1 (Figure C7a). In BYX 2 where the largest alfonsino fishery is found, only a minority of trips that landed alfonsino report no estimated catch for both of the main form types, with proportions usually less than 0.25 and sometimes less than 0.2. There is generally a close relationship between estimated catch and landed catch in BYX 2 (Figure C7b). In BYX 3 the proportion of trips reporting zero estimated alfonsino catch is relatively high, especially for vessels reporting on CELR forms where the majority of trips report no estimated catch. This is less pronounced for TCEPR forms but the proportion is still high, often more than 0.5. While BYX 3 contains the second most important alfonsino fishery in the New Zealand EEZ, the QMA covers a large area (FMAs 3-6). The important fishery areas are located in relatively discrete areas north-west and south-east of the Chatham Islands, far from the mainland, although alfonsino are found across much of the Chatham Rise in low numbers (Anderson et al. 1998). Smaller vessels reporting on CELR forms will rarely fish far from the mainland and are not likely to fish the main fishery areas. They are fairly likely, therefore, to encounter alfonsino in small numbers, but not in numbers sufficient to feature in the top five species for a day. Similarly, TCEPR vessels fishing across the Chatham Rise for species such as hoki are likely to encounter small numbers of alfonsino that fail to make the top five species in any one haul. There is a reasonable relationship between estimated and landed catch for trips that catch larger quantities of alfonsino (more than about 50 t) but trips that report small landings tend to underestimate catches (Figure C7b), probably for the reason described above. The majority of trips in BYX 7 report no estimated alfonsino catch, with a proportion often greater than 0.7. Most of the alfonsino here is caught as minor bycatch in spawning hoki and hake fisheries in the winter and fails to make the top five species in a given haul, hence the high proportion of trips that report no estimated catch. The catch is almost entirely on TCEPR forms here. Landings tend to underestimate catches (Figure C7d). Almost all trips in BYX 8 reported zero estimated catch of alfonsino, with a proportion of 1 for most years, other than 0.67 and 0.5 in 2003 and 2004 respectively. Alfonsino catches are minor in BYX 8 and there are only a few trips each year that land this species.

Catches and retained landings by form type for each fishstock are shown in Figures C8a–e. For BYX 1 and 2 catches are mainly reported on TCEPR forms throughout the study period (Figure C8a–b, upper plots). CELR forms were superseded by TCER forms from 2008 but the lack of increase in catches for 'Other' form types suggests that these were not taken up by trawl vessels operating in BYX 2. Although trawl vessels less than 28 m could have switched to TCER forms, Starr et al. (2010) report that a number of vessels decided to use TCEPR forms as policy by some major fishing companies. The landings in BYX 1 and 2 are found on the CLR and CELR forms that correspond to the TCEPR and CELR forms respectively (Figures C8a–b, lower plots). The catch of alfonsino in BYX 3 is almost entirely on TCEPR forms and landings on the corresponding CLR form are very minor in comparison. The same is seen for BYX 7, although the catches are much lower and more sporadic over time compared with BYX 7 (Figure C8d). In BYX 8 the small and sporadic catches are reported on both TECPR forms and CELR forms. The maximum in any one year is 2 t, and many years have no data at all.

Catches for each statistical area summed for the study period are shown in Figure C9 and to more precise locations (summed to 0.2 degree spatial squares) are shown in Figure C10a–b. For the east coast North Island fishery, Statistical Areas 014, 015, and 204 are the most important, followed by areas 010–013. Catches are lower in the upper east coast North Island although Statistical Area 106 is also fairly important. For the eastern Chatham Rise, Statistical Area 051 is the most important area, followed by 404, and 049, 406, and 412. Catches are made in small amounts on the east and west coasts of the South Island and west coast of the North Island. There is almost no catch reported from the Sub-Antarctic region where alfonsino are almost non-existent (Anderson et al. 1998).

# 7.2. Fishery summary

Alfonsino catches for the two main fishery areas within the New Zealand EEZ; east coast North Island and eastern Chatham Rise, are given in Table C6 and Figure C11 (top left plot) as well as all 'Other' regions not included in the two main fisheries. Just over two thirds of the catch for the total study period has come from the east coast North Island fishery (68%). Of the two main fishery areas, this has consistently been the most important. The eastern Chatham Rise fishery did not develop until the mid-1990s after which catches have accounted for between 21 and 41% of the total catch each year, or 28% for the entire study period. Catches from all other areas combined comprise just 5% of the total catch for the study period.

Catches are spread relatively evenly through most of the year (Table C7c, Figure C11, top right plot) aside from a noticeable decrease from June to August. Whether this is due to the redeployment of vessels to hoki spawning grounds during these months or the possible movement of alfonsino to unknown spawning grounds at this time (as suggested by Horn & Massey 1989), or a combination, is unknown.

Throughout the study period the majority of the catch has been taken by bottom trawl with 46% of the total catch, followed by midwater trawl on the bottom (32%), midwater trawl (21%) and bottom longline (2%) (Table C8, Figure C11, bottom left plot). Other fishing methods such as set net and dahn line occasionally catch alfonsino but combine to account for less than 1% of the total catch.

Throughout the study period, 70% of alfonsino has been caught in a target fishery, followed by hoki (15%), bluenose (5%), and orange roughy and black cardinalfish (3% each, Table C9, Figure C11, bottom right plot). A variety of fisheries for other target species also catch alfonsino, comprising 3% of the total catch for the study period.

The proportions of alfonsino catches each year by flag nationality are given in Table C10 and Figure C12 (upper right plot) for BYX 1–8. The majority of the catch is landed by New Zealand flagged vessels (58%), followed by vessels of 'Unknown' flag (but are presumably New Zealand vessels) with 41%, suggesting that 99% of the total alfonsino catch in New Zealand is taken by domestic vessels. Korean and 'Other' vessels have at times reported catching alfonsino but neither catch more than 1% of the total in any given fishing year.

A wide range of engine power is seen for vessels catching alfonsino (Figure C12, upper right plot). Vessels with 300–900 kilowatts (kW) take more than any other, but reasonable amounts are also taken by vessels under 300 kW, as well as with 900–1500 kW, and 1500–2100 kW. Vessels with greater power than 2100 kW contribute much less of the alfonsino catch.

Most alfonsino is taken by vessels 25–35 m, and 35–45 m in overall length, with each of these two categories comprising roughly equal amounts of the catch (Figure C12, lower left plot). Vessels under 25 m are also fairly well represented but taper off from the mid-2000s. In comparison to these three length categories, vessels over 45 m contribute little of the catch.

The majority of the alfonsino catch in the entire study period is taken by vessels under 250 gross tonnes (GT), followed by vessels 250–750 GT. Little of the catch is taken by vessels greater than 750 GT (Figure C12, lower right plot).

# 7.2.1 East coast North Island Fishery

97% of alfonsino from the east coast North Island fishery is caught by trawling. Of these, midwater trawling on the bottom is the most important with 39% for the study period, followed by bottom trawling with 32%, and midwater trawling with 26% (Table C11, Figure C14, upper left). About 2% of the catch is taken by bottom longline, and a variety of other methods such as set net and dahn line together contribute less than 1% of the catch.

Catches are made throughout the year but are highest in the spring and summer months and lowest in autumn and winter (Table C12, Figure C14, upper right). The decrease in winter months could be partly due to redeployment of vessels to the hoki trawl fishery in winter but it has also been suggested that alfonsino migrate to unknown spawning grounds away from the main fishing grounds in June and July (Horn & Massey 1989). They found that the gonadosomatic index of male and female alfonsino sampled on the east coast North Island peaked in June and decreased from September, but no running ripe fish were observed at any time. This led them to hypothesize that alfonsino spawned away from the main fishing grounds in June and July. However, this was surprising given that alfonsino in the Pacific and Atlantic Oceans have been observed spawning in summer to early autumn (Masuzawa et al. 1975, Alekseev et al. 1986, Sherstyukov & Nostov 1986, Uchida & Uchiyama 1986).

Alfonsino are caught across much of the region but the lower east coast North Island is most important. Statistical Area 015 is usually the most important and has accounted for just over one-third (34%) of the total catch for the study period (Table C13, Figure C14, lower left). Other important statistical areas are 013, 014, and 204 with 12%, 19%, and 24% of the total catch for the study period respectively. Other statistical areas within the east coast North Island combined account for 11% of the total catch for the study period.

Alfonsino is caught mainly as a target fishery, i.e. 68% of the total catch for the study period (Table C14, Figure C14, lower right). This value has ranged annually from 48–81%. The next most common target species in which alfonsino are caught as bycatch are hoki, black cardinalfish, bluenose, and orange roughy with 16%, 5%, 5%, and 3% of the total catch for the study period respectively. A variety of other target

fisheries also report catching alfonsino, and combine to account for the remaining 3% of the catch. The proportions are fairly consistent throughout the study period.

By target species, month, and method, catches are made throughout the year, but with a decrease in winter months (Figure C15a–b). The winter decrease is most marked for catches taken in the hoki target fishery for all three trawl methods, which is not surprising given that vessels targeting hoki will focus their efforts in Cook Strait and/or the west coast South Island at this time of year when hoki migrate to spawn. The decrease is least noticeable for bottom longline vessels targeting bluenose (Figure C15b, bottom right plot), although there is still some decrease.

Catches of alfonsino by target species and depth for bottom trawl are shown in Figure C16a. When caught by bottom trawls targeting bluenose, alfonsino, and hoki, most alfonsino is caught between 300 and 600 m, although some catches are made both shallower and deeper than this. When targeting black cardinalfish most is taken at deeper depths from 500–900 m, and is deepest for orange roughy at 700–1100 m. With the exception of target alfonsino fishing, this is likely to be more a function of the depths in which those target fisheries operate, rather than the depths at which alfonsino are most abundant.

Catches of alfonsino taken by target species and depth for midwater trawl and midwater trawl on the bottom are occurring at roughly the same depths for alfonsino, bluenose, and hoki as they do for bottom trawl at 300–600 m (Figure C16b). Depth data for bottom longlines has only been regularly recorded since 2008 when LCER and LTCER forms superseded CELR forms. For bottom longlines targeting bluenose, alfonsino is almost exclusively caught between 300 and 500 m (Figure C16b).

Catches of alfonsino by target species and form type and method are shown in Figures C17a–b. For trawling methods, all species are caught mainly by vessels reporting on TCEPR forms. Little of the catch is taken on CELR forms except for small amounts in the first half of the study period and since their introduction in 2008 little has been reported on TCER forms. Catches made by bottom longline are almost exclusively targeting bluenose and reported on the CELR form that was the standard for that method until 2007 after which most has been reported on LTCER forms. Some had been reported on LCER forms (up to 30 t per year) but no catch by vessels reporting on this form type has been reported in the 2012–13 and 2013–14 fishing years.

Catches of alfonsino by bottom trawl for the main target species and main statistical areas are shown in Figures C18a. Most alfonsino caught in bottom trawls targeting bluenose is taken in Statistical Area 014, followed by 013. For the alfonsino target fishery, most is taken in Statistical Area 204 but reasonable catches are also made in areas 013–015. Black cardinalfish bottom trawls catching alfonsino are relatively evenly spread between areas 013, 015, and 204, with little taken from area 013. Statistical Area 015 has consistently been the most important when targeting hoki, with 014 important earlier on in the study period but little has been taken there after 2005. Reasonable amounts were taken in areas 015 and 204 when targeting orange roughy in the earlier part of the study period but these areas have been less important and fairly sporadic since the early-2000s.

Catches of alfonsino by midwater trawl and midwater trawl on the bottom for the main target species and main statistical areas are shown in Figures C18b. When alfonsino is targeted by either of these methods there seems to be more of an even spread across the main statistical areas compared with bottom trawl which was concentrated in area 204. Hoki is almost exclusively caught in area 015 by these two methods. Trawl bycatch in the bluenose target fishery is only made by midwater trawl on the bottom and occurs sporadically in all of the main statistical areas. For bottom longlines targeting bluenose, statistical areas 009–012 are reasonably important, as well as 013 and 014, but area 204 is the most important.

The proportion of trawl tows that reported no alfonsino catch is presented in Figure C19 for each of the main target species (upper plot). Trawl tows targeted at alfonsino predictably have the lowest proportion of zeros, usually less than 0.2. Tows targeting hoki are usually around 0.5–0.7, 0.4–0.5 for black cardinalfish, fluctuate somewhat for bluenose between 0.1 and 0.7, and appear to have been steadily increasing for tows targeting orange roughy from 0.4 in 1990 to around 0.7–0.8 in most years since 2000. Bottom longline sets

targeting bluenose have a low proportion of zero alfonsino catch and has been steady at around 0.2 throughout the study period.

Unstandardised catch rates of alfonsino for the main target species and method are shown in Figures C20a– d. For orange roughy targeted bottom trawls, the catch per tow of alfonsino varies somewhat but is generally around 40–50 kg, but there have been some spikes in some of the last ten years to more than 150 kg per tow (Figure C20a, upper right plot). For black cardinalfish there is also some fluctuation, but a steady period through the mid-1990s shows catch rates of around 150–200 kg per tow, and, similar to orange roughy, there is a spike in recent years with some years having over 300 kg per tow, and as high as 600 kg per tow in 2013 (Figure C20a, upper left plot). Bottom trawl tows targeting hoki fluctuate widely, ranging from 100 kg per tow to around 600 kg per tow (Figure C20a, middle left plot). For orange roughy, black cardinalfish, and hoki, these increases in catch rate appear to coincide with a reduction in the number of tows. Unstandardised catch rates are unsurprisingly highest for the alfonsino target fishery and appear to have been increasing through the study period from around 1000 kg per tow in the first few years to nearly 3500 kg per tow in the last two years (Figure C20a, middle right plots). The number of tows each year appears to have been steadily increasing for alfonsino. Catch rates for alfonsino caught in the bluenose target bottom trawl fishery fluctuate wildly from no catch at all to over 2500 kg per tow, with no apparent pattern (Figure C20a, bottom right plot).

For midwater trawl gear on the bottom targeting alfonsino, the catch rates are fairly steady from 1990 to 2002 at around 200 kg per tow (Figure C20b, upper left plot). Catch rates then increase dramatically to around 2500 kg per tow to 2010, then to more than 5000 kg per tow thereafter. There appears to be a decrease in the number of tows associated with the increase in catch rate late in the study period. Catches of alfonsino by midwater trawl on the bottom targeting hoki are highly variable with no apparent trend over time from as low as a few kilograms per tow to more than 1500 kg per tow (Figure C20b, upper right plot). Catches by midwater trawl on the bottom targeting bluenose are also variable with no apparent pattern but are often more than 1000 kg per tow (Figure C20b, bottom left plot).

Alfonsino targeted midwater trawls have relatively high catch rates as expected, over 2000 kg per tow until the mid-2000s and then an increase as seen for midwater trawl to over more than 5000 kg per tow (Figure C20c, left plot). This method has the highest single catch rate of any method and target species at almost 10 000 kg per tow in 2012. The increase in catch per tow appears to coincide with a reduction in the number of tows. For midwater trawls targeting hoki, alfonsino catches appeared to increase through the 1990s from negligible to around 500 kg per tow and have since fluctuated from 100 to 1000 kg per tow (Figure C20c, right plot).

It is uncertain why for several target fisheries using trawl methods there appears to be an increase in catch rates of alfonsino in later years that coincide with a reduction in the number of trawls. Possibly, there has been a reduction in the fleet and those that remain in the fishery are more adept and/or experienced at targeting alfonsino in the case of the target fishery, and perhaps fish in areas with higher abundance of alfonsino when targeting other species, thus increasing the average alfonsino catch per tow.

Alfonsino catch rates in the bluenose bottom longline target fishery have been relatively steady for most of the study period, but appear to have increased since 2006 to around 0.02–0.03 kg per hook (Figure C20d).

Effort depth by target species for bottom trawls catching alfonsino for each fishing year is shown in Figure C21a.Within each target species, the depths have been relatively consistent across the study period with most tows being around 800–1000 m for orange roughy, 600–800 m for black cardinalfish, 300–500 m for hoki, 400–600 m for alfonsino, and 300–500 m for bluenose.

For midwater trawl on the bottom, effort depth has been consistent through time for alfonsino at 300–500 m, although there appears to have been some narrowing of this in recent years to around 400–500 m (Figure C21b). Depths in the hoki fishery are more variable for midwater trawl on the bottom compared with bottom trawl but were usually around 200–400 m until the early 2000s and then narrowed to around 150–300 m thereafter. For bluenose there is more variation but depths are generally around 250–500 m.

Depths of midwater trawls targeting alfonsino have been relatively consistent through the study period, mainly 350–450 m (Figure C21c) and also for the hoki fishery at mainly 200–400 m.

Bottom longlines targeting bluenose and catching alfonsino have fished at very consistent depths through time, mainly 350–500 m (Figure C21d).

Fishing duration by target species for bottom trawls catching alfonsino for each fishing year is shown in Figure C22a. Fishing durations are typically short for target species thought to be feature-associated, in this case orange roughy, black cardinalfish, and alfonsino, where most tows are less than one hour in duration. Tows for hoki are longer, mainly two to three hours in duration, and those for bluenose are variable but are usually around one to three hours.

For midwater trawl gear on the bottom, alfonsino targeted tows are again short, usually less than one hour per tow throughout the study period (Figure C22b). Hoki tows are longer, two to three hours mainly, similar to bottom trawls. Some variation is seen for bluenose, but is usually one to two hours.

Midwater trawls targeting alfonsino are again short, usually half an hour to one hour in duration (Figure C22c). Midwater hoki tows are also slightly shorter than seen for bottom trawl and midwater trawl on the bottom, mainly one to two hours.

Bottom longlines targeting bluenose appear to have increased in fishing duration over the study period with most lines being set for less than five hours before 2001 and then increasing with most recent sets now being around 7.5–10 hours (Figure C22d).

Other fishing effort variables for bottom trawls catching alfonsino for the main target species are shown in Figure C23a. Effort width is largest for vessels targeting orange roughy and hoki at around 18–35 m. For black cardinalfish, alfonsino, and bluenose, effort width is mainly between 17 and 20 m. Effort height is around 5–6 m for the main target species apart from hoki which is lower at about 2.5–4 m. For most target species catching alfonsino, vessels are towing at between 3 and 4 knots, but slower for orange roughy at just under 3 knots. Distances towed are unsurprisingly short given that many of the main targets are feature-associated, with most tows being less than 10 km in length for orange roughy, black cardinalfish, alfonsino, and bluenose. The longest tows are seen for hoki, with most being around 10–20 km in length. Most of the alfonsino catch for all target species is taken by vessels under 500 gross tonnes and 30–40 m in overall length.

Other fishing effort variables for midwater trawl on the bottom catching alfonsino for the main target species are shown in Figure C23b. Larger effort widths are seen than for bottom trawl, with around 30–70 m for alfonsino, 50–80 m for hoki, and 50–60 m for bluenose. Effort height is also larger at around 20–25 m for alfonsino, 35–50 m for hoki, and 20–30 m for bluenose. Towing speed for the main targets are around 3–4 knots. Distances towed are typically short for alfonsino and bluenose with most being less than 5 km, but longer for hoki at around 5–20 km. Vessels targeting alfonsino and bluenose are mainly under 500 gross tonnes, and larger for hoki at around 500–750 gross tonnes. Vessels are around 25–40 m in overall length for all target species.

Other fishing effort variables for midwater trawl catching alfonsino for the main target species are shown in Figure C23c. Effort widths for vessels targeting alfonsino vary widely at between 20–60 m for most tows, and around 50–60 m when targeting hoki. Effort height is around 20–40 m for alfonsino and 35–55 m for hoki. Most tows targeting alfonsino have a speed of 3–3.5 knots, and 3.5–4.5 when targeting hoki. Tows are short for alfonsino with most under 5 km in distance, longer for hoki at around 5–20 km. Smaller vessels tend to target alfonsino, i.e. less than 500 gross tonnes and 30–40 m overall length, compared with hoki vessels at around 500–1000 gross tonnes and 35–40 m overall length.

Longline vessels targeting bluenose set around 2500 hooks per set, and tend to be smaller than trawlers, i.e., less than 100 gross tonnes and less than 20 m overall length (Figure C23d).

There has been little change in the location of trawl-caught alfonsino in the east coast North Island fishery since 1990 as recorded on TCEPR forms (Figures C24a–c). The three trawl methods appear to occur in the same areas within the fishery, although midwater methods appear to be less important for the Bay of Plenty and East Northland regions. The most important areas are Wairarapa, Ritchie Bank/Rock Garden, and Madden Canyon/Motukura Bank. Other important areas are the Tuaheni Bank, East Cape, Bay of Plenty, and East Northland (Figure 4). Catches by trawlers reporting on TCER forms since their introduction in 2008 have been minor and sporadic so are not presented here.

There is little locality data for bottom longline catches of alfonsino prior to 2008 before the introduction of LCER and LTCER forms which record at a finer scale resolution than statistical area. Bottom longline vessels appear to fish in similar areas to trawl vessels although Bay of Plenty seems to be more important to bottom longline vessels than it is to trawl vessels (Figure C24d).

Figure C25 shows the location of targeted alfonsino catches (grey squares) and alfonsino bycatch (black squares) for the main target species for the main fishing methods for all years combined. Alfonsino is commonly targeted and caught over most of the east coast North Island hence the grey squares obscure the black squares in every plot. There are two notable exceptions: The first is the Bay of Plenty sub-region where nearly all of the alfonsino catch is bycatch of hoki target fishing, almost none is target alfonsino fishing. The other exception is for anywhere there is bottom longlining. Little alfonsino has been targeted by bottom longline and although the catches are widespread there are few instances of target alfonsino fishing by this method.

# 7.2.2 Sub-regions within the east coast North Island Fishery

Within the east coast North Island fishery seven distinct sub-regions were identified. From north to south these were east Northland, Bay of Plenty, East Cape, Tuaheni Ridge, Ritchie Bank/Rock Garden, Madden Canyon/Motukura Bank, and Wairarapa (see Figure 4). These are much the same areas as found by other studies of alfonsino on the east coast North Island (e.g. Horn and Massey (1989), Langley (1995), Starr et al. (2010)).

The seven sub-regions were investigated to see if there were major differences between them (time of year, target species etc.).

Throughout the study period, the most important sub-region has been Wairarapa with 38% of the total estimated catch for the study period, followed by Ritchie Bank/Rock Garden, Madden Canyon/Motukura Bank, and Tuaheni Bank with 28%, 16%, and 9% respectively (Table C15, Figure C26, upper left plot). Catches are more sporadic heading north to East Cape, Bay of Plenty, and East Northland with 4%, 1%, and 2% of the estimated catch respectively. For all sub-regions, catches are made in all months (Tables C16–22, Figure C26) but most have a drop off in winter months, apart from East Northland and Bay of Plenty, where proportions can be relatively high, particularly in August. Catches are more sporadic here, however, and low in volume, which can result in any month in which catches do occur producing a high proportion for that year.

Trawl methods dominate in all sub-regions (Tables C23–29, Figure C27). Midwater trawl on the bottom is overall most important for most sub-regions, particularly Madden Canyon/Motukura Bank (68%) as well as the lower east coast North Island in general. This method is less important in the upper east coast North Island. Bottom trawl is the next most dominant method, followed by midwater trawl. Bottom longline contributes a minority of the catch in all sub-regions.



Figure 4: Sub-regions within the east coast North Island fishery and estimated alfonsino catches for all form types and fishing methods where latitude and longitude were reported, aggregated into 0.2 degree spatial blocks for the 1990–2014 fishing years combined. EN: east Northland; BOP: Bay of Plenty; CAPE: East Cape; TUAH: Tuaheni Ridge; RCRG: Ritchie Bank/Rock Garden; MCMB: Madden Canyon/Motukura Bank; WAIR: Wairarapa.

Alfonsino is the dominant target species producing alfonsino catch in all sub-regions apart from the Bay of Plenty (Tables C30–36, Figure C28). Other target species can vary with sub-region; hoki and black cardinal fish are common target species catching alfonsino in the lower east coast North Island, as well as orange roughy and bluenose. Black cardinalfish is the dominant target species in the Bay of Plenty sub-region.

Black cardinalfish features as an important target species in all sub-regions apart from Madden Canyon/Motukura Bank.

Estimated catches for each sub-region by vessel length and fishing year are shown in Figure C29. Most of the catch is taken by vessels 25–45 m in the East Cape, Tuaheni Bank, Ritchie Bank/Rock Garden, and Wairarapa sub-regions. Vessels under 25 m also feature in every sub-region, and are the most important length class for the Madden Canyon/Motukura Bank, and Bay of Plenty sub-regions, presumably due to these grounds being closer to convenient ports (e.g. Napier, Tauranga) which is more important for smaller vessels than large. Little catch is taken by vessels over 45 m in any sub-region.

Estimated catches for each sub-region by gross tonnage (GT) and fishing year are shown in Figure C30. Most of the catch is taken by vessels under 600 GT in all sub-regions, except for Wairarapa where a larger proportion is taken by vessels 600–800 GT. This is unsurprising given that more of the catch here was taken by longer vessels (35–45 m).

Estimated catches for each sub-region by vessel power (kW) and fishing year are shown in Figure C31. The majority of the catch in all sub-regions is taken by vessels under 1200 kW, but as seen for vessel length and GT, more powerful vessels in the Wairarapa sub-region are more important with much of the catch being taken by vessels of 1800–2100 kW engine power.

Overall the fishery characteristics of the seven sub-regions within the east coast North Island are broadly similar. The catch is dominated by trawl methods, mainly midwater trawl on the bottom and bottom trawling. Catches are generally made at the same time of year and the dominant target species is alfonsino with black cardinalfish and hoki being common secondary target species. Catches are made throughout the year with a general decline in winter months. 168 unique vessels reported a positive estimated catch of alfonsino from the east coast North Island during the study period. On average, vessels have fished in 3.9 of the seven sub-regions (range 1–7).

# 7.2.3 Eastern Chatham Rise fishery

More than 99% of alfonsino from the eastern Chatham Rise fishery is caught by trawling methods with bottom trawling, midwater trawling on the bottom, and midwater trawling accounting for 76%, 15%, and 9% of the catch (Table C37, Figure C32, upper left plot). Midwater trawling (on the bottom and midwater) have increased in their importance since the mid-2000s but were relatively uncommon before then. Bottom trawling has been dominant throughout the study period. Other fishing methods account for less than 1% of the total catch for the study period.

Catches are made throughout the year but are highest in the summer months and lowest in winter (Table C38, Figure C32, upper right plot) as in the east coast North Island fishery. As discussed in Section 7.2.1, the decrease in winter months could be partly due to redeployment of vessels to the hoki trawl fishery in winter but may also be due to migration of alfonsino to unknown spawning grounds at this time.

Alfonsino are caught across much of the region but almost half (49%) comes from Statistical Area 051, southeast of the Chatham Islands (Table C39, Figure C32, lower left plot). Statistical Area 051 has usually been the most important since the mid-1990s when the eastern Chatham Rise alfonsino fishery developed and has at times accounted for up to 84% of the total for the region. Also important is Statistical Area 404 (northwest of the Chatham Islands) with 23% of the catch for the study period, followed by areas 412, 406, and 049 with 12%, 8%, and 7% of the catch respectively. Catches from these 'secondary' statistical areas can fluctuate and vary with importance relative to Statistical Areas 051 and 404 from year to year. Other statistical areas contribute just 2% of the total eastern Chatham Rise alfonsino catch for the study period.

During the study period, 82% of alfonsino was caught as a target fishery (Table C40, Figure C32, lower right). Prior to the development of the fishery from the mid-1990s orange roughy was the dominant target species catching alfonsino but now accounts for little (less than 1% in some years). As much as 99% of

alfonsino caught in the region is targeted. A small amount is also caught in the bluenose target fishery but most of this was during a short period in the early to mid-2000s. A variety of other target fisheries contribute 7% of the alfonsino catch.

More than 99% of the catch is reported on TCEPR forms (Figure C33). This has been consistent throughout the study period. Little of the catch is taken by bottom longline here and the offshore nature of the fishery means that trawlers under 28 m in length that could report on CELR or TCER forms are unlikely to venture so far from the mainland.

By target species, month, and method, catches are made throughout the year, but with a decrease in winter months (Figure C34). The winter decrease is most marked in bottom trawls targeting alfonsino and orange roughy.

Catches of alfonsino by target species and depth for bottom trawl are shown in Figure C35. When caught by bottom trawl targeting bluenose and alfonsino, most alfonsino is caught between 200 and 400 m, although catches are made both shallower and deeper than this. Bottom trawl catches in the orange roughy target fishery are noticeably deeper, mainly 700–1000 m. Midwater trawls targeting alfonsino are made mainly at 300–400 m, and between 200 and 600 m when targeting hoki. For midwater trawling on the bottom, most alfonsino is caught between 300 and 400 m.

Catches of alfonsino by target species and method are shown in Figure C36 for the TCEPR form. Alfonsino is the most common target species for all trawl methods. For bottom trawl, the next most common target species are orange roughy and bluenose, but neither of these target species have accounted for much of the catch since the mid-2000s. Hoki has featured as an important target species for midwater trawling at times in the late-1990s and early 2000s but does not feature in most years. For midwater trawling on the bottom, the catch is almost exclusively taken as targeted alfonsino fishing.

Catches of alfonsino by bottom trawl for the main target species and main statistical areas are shown in Figure C37. Bottom trawls targeting alfonsino are taking most of the catch from Statistical Area 051. Relatively equal amounts are taken from Statistical Areas 404, 406, and 412 but less than 051. For the last four years almost all has come from 051. Almost all of the catch from the orange roughy target bottom trawl fishery came from Statistical Area 412. Relatively equal amounts were taken from Statistical Areas 051 and 404 by bottom trawls targeting bluenose in the early to mid-2000s, with lesser amounts from 049 and 412. Midwater trawling for alfonsino was relatively uncommon before the mid-2000s but has focussed mainly in Statistical Area 404 since then, with sporadic catches from 049, 051, 406, and 412. Sporadic midwater trawling on the bottom targeting alfonsino has occurred mainly since the mid-2000s and focussed primarily on Statistical Area 404, with smaller catches from 049, 051, 406, and 412.

The proportion of trawl tows that reported no alfonsino catch is presented in Figure C38 for each of the main target species. Trawl tows targeted at alfonsino predictably have the lowest proportion of zeros, usually less than 0.2 in most years. The highest proportion is seen for the orange roughy target fishery, usually greater than 0.5. Bluenose target tows are also relatively high, usually more than 0.4.

Unstandardised catch rates of alfonsino for the main target species and methods are shown in Figure C39. For alfonsino targeted bottom trawls, the catch per tow of alfonsino varies but is generally around 1500–1750 kg. For orange roughy, catch rates were initially around 150–350 kg per tow but have declined markedly from 1999 to around 30–50 kg per tow and since 2007 has been negligible. Catch rates in bottom trawls targeting bluenose and midwater trawls targeting hoki have been sporadic and no trend is apparent. Midwater trawl tows (in midwater and on the bottom) targeting alfonsino were relatively uncommon until the mid-2000s. Since then, the number of tows and catch rates appear to have been increasing steadily, with catch rates of around 3000–7000 kg (midwater trawl), and 3000–8000 kg (midwater trawl on the bottom) per tow.

Effort depth by target species and methods catching alfonsino for each fishing year are shown in Figure C40. For all three trawl methods targeting alfonsino, the depth ranges are similar with most tows being around 300–350 m, aside from deeper values in the first two years before the fishery really developed. Depth has also been relatively consistent for bottom trawls targeting orange roughy, but deeper, with most tows being around 700–900 m. Bottom trawls targeting bluenose are shallower, with most around 200–300 m in depth. Midwater trawls targeting hoki are more variable but usually 500–600 m.

Fishing duration by target species and methods catching alfonsino for each fishing year are shown in Figure C41. Fishing durations are typically short (usually less than two hours, and often much less) for all trawl methods targeting alfonsino in most years, particularly after the development of the fishery in the mid-1990s. Bottom trawls targeting orange roughy and catching alfonsino are also short, usually less than one hour. Bluenose targeted bottom trawls are variable, usually between one and five hours in duration, and hoki midwater trawls are also variable but usually two to five hours long.

Other fishing effort variables for bottom trawls catching alfonsino for the main target species are shown in Figure C42a. Effort width is similar among the three main target species at around 15–30 m, although slightly narrower for orange roughy at 15–25 m. Effort height is around 5–6 m for alfonsino and orange roughy targeting, but higher for bluenose at 5–10 m. Towing speed is similar for the three main targets at around 3–3.5 knots. Distance towed is usually short, less than 3 km for all target species. Vessels targeting alfonsino are typically around 500 gross tonnes (GT), around 800–2000 GT for orange roughy, and 500–800 GT for vessels targeting bluenose. Vessels targeting alfonsino and bluenose are usually around 40 m overall length, whereas those targeting orange roughy are larger at around 40–65 m.

Other fishing effort variables for midwater trawls catching alfonsino for the main target species are shown in Figure C42b. Effort width is usually 30–40 m when targeting alfonsino, and wider for hoki at around 50–60 m. Effort height is usually around 25–40 m for alfonsino, and 55–70 m for hoki. Most tows targeting alfonsino are towed at around 3.5–4 knots, while most targeting hoki are towed at around 4 knots. Distance towed is shorter for alfonsino targeted tows with most being less than 3 km. Hoki targeted tows catching alfonsino are longer with most being around 4–10 km. Vessels targeting alfonsino are smaller at around 500 GT and 40 m overall length and most vessels targeting hoki by midwater trawl are around 1000–2000 GT and 60 m in overall length.

Alfonsino is the only significant target species for vessels midwater trawling on the bottom. Other fishing effort variables for this method are shown in Figure C42c. These variables are very similar to those for midwater trawls targeting alfonsino, quite likely because they are the same vessels using the same gear, albeit in a slightly different fashion by fishing the gear near the bottom. Effort width is usually 25–40 m, effort height 25–35 (slightly lower than midwater trawl, probably due to the mouth of the net being 'squashed up' when fished on the bottom), effort speeds are mainly around 3.5 knots, and distances towed under are 2.5 km. Vessels are mainly 400–500 GT and 35–40 m in overall length.

There has been little change in the location of bottom trawl-caught alfonsino in the eastern Chatham Rise fishery since 1990 as recorded on TCEPR forms (Figures C43a). Catches are mainly made to the southeast and east of the Chatham Islands and to a lesser but still important extent northwest of the Chatham Islands.

For midwater trawl-caught alfonsino there is little catch before the 2005 fishing year (Figure C43b). Catches are made in similar locations to bottom trawl-caught alfonsino but not as widespread and with less effort southeast of the Chatham Islands and more northwest of the Chatham Islands compared with bottom trawling. A similar pattern of fishing is seen for midwater trawling on the bottom (Figure C43c). This could be due to the seabed southeast of the Chatham Islands being better suited to the more robust designs of bottom trawls than to midwater trawls.

Figure C44 shows the location of targeted alfonsino catches (grey squares) and alfonsino bycatch (black squares) for the main target species for the main fishing methods for all years combined. When caught as bycatch of orange roughy and bluenose targeted bottom trawls, most alfonsino is taken in a smaller

geographic range than when it is specifically targeted. This also appears to be true of when it is bycatch of midwater trawls targeting hoki.

# 7.2.4 Sub-regions within the eastern Chatham Rise fishery

Two distinct sub-regions were identified within the eastern Chatham Rise fishery and they are referred to as northwest Chatham Islands and southeast Chatham Islands (Figure 5). The two sub-regions were investigated to see if there were major differences between them (e.g., in time of year fished, target species, fleet characteristics).

Throughout the study period, the most important sub-region has been southeast Chatham Islands; it produced 67% of the total estimated catch for the study period compared with 31% from northwest Chatham Island (Table C41, Figure C45, upper left plot). Only 2% of the eastern Chatham Rise catch comes from outside of these two sub-regions. For both sub-regions, catches can be made in all months (Tables C42–43, Figure C45) but have a major drop-off in winter months.

For northwest Chatham Islands, 50% of the catch is taken by bottom trawl, 30% by midwater trawling on the bottom, and the remaining 20% by midwater trawl (Table C44, Figure C46). Bottom trawl was the dominant method here until the mid-2000s (in some years the entire catch was taken by bottom trawl) but midwater methods became prevalent from 2006 and have been dominant since. Just 1% of the estimated catch of alfonsino here has been taken by bottom trawl in the last two fishing years. For southeast Chatham Islands, the catch has been dominated by bottom trawl methods throughout the study period (Table C45, Figure C46), but with midwater trawling occurring from the mid-2000s, but not to the same extent as in the northwest. Bottom trawling has remained the dominant method in the southeast.



Figure 5: Sub-regions within the eastern Chatham Rise fishery and estimated alfonsino catches for all form types and fishing methods where latitude and longitude were reported, aggregated into 0.2 degree spatial blocks for the 1990–2014 fishing years combined. NWCI, northwest Chatham Islands; SECI, southeast Chatham Islands.

Alfonsino is the dominant target species producing alfonsino catch in both sub-regions (Tables C46–47, Figure C47). However, for northwest Chatham Islands this was not the case until after the 2000 fishing year; since then proportions are usually very high (often more than 90%). Before this, most was bycatch of the hake target fishery, and taken in small quantities, usually less than 20 t annually. Prior to the eastern Chatham Rise fishery developing in the mid-1990s, most alfonsino catch from southeast Chatham Island

was taken in small amounts as bycatch in target fisheries for orange roughy and hoki. From 1996, however, most was taken in a target alfonsino fishery, sometimes entirely so (e.g. 2013).

Estimated catches for each sub-region by vessel length and fishing year are shown in Figure C48. In both sub-regions the catch is almost entirely taken by vessels 30–40 m in length, with the next most important size class being 50–60 m in length. Much smaller amounts are also taken by vessels under 30 m, and over 70 m. Estimated catches for each sub-region by gross tonnage (GT) and fishing year are shown in Figure C49. The catch is dominated by vessels 200–400 GT, with lesser amounts taken by vessels 400–1000 GT. Most of the catch is taken by vessels between 600 and 1200 kilowatts in engine power (Figure C50). The similarity in vessel characteristics between the two sub-regions is due to both sub-regions being fished by the same vessels.

Overall the two sub-regions within the eastern Chatham Rise are very similar. The catch is dominated by trawl methods, mainly bottom trawling. At northwest Chatham Islands, however, midwater trawling (on the bottom and in midwater) has dominated in recent years and bottom trawl catches have declined to be less than 10% here each year since 2010, and just 1% in 2013 and 2014. Catches are generally made at the same time of year and the dominant target species has been alfonsino since the target fishery developed in the mid-1990s. Vessels have similar characteristics. Catches are made throughout the year with a general decline in winter months. Estimated catches of alfonsino from the eastern Chatham Rise were reported by 99 vessels during the study period. On average, vessels have fished in 1.5 of the two sub-regions identified.

#### Summary

A summary of the main features of each of the main alfonsino fishery areas from this study is given in Table 4.

Alfonsino is caught throughout much of the New Zealand EEZ but is virtually non-existent in Sub-Antarctic waters. Two main fisheries exist. The first is the east coast North Island fishery which accounts for around 68% of the total catch for the study period and has been the main fishery throughout that time. The second is the eastern Chatham Rise fishery which developed in the mid-1990s and accounts for around 28% of the catch for the study period. Within both fisheries, catches are made throughout the year but with a decline in the winter months. Trawl methods take most of the catch, but of these, midwater trawling on the bottom (within 5 m of the seabed) and bottom trawling are most important, with less being taken by midwater trawls (more than 5 m above the seabed). A very small amount of catch is taken by bottom longline. Most of the catch is taken as a target fishery. When taken as bycatch the main target species are black cardinalfish, orange roughy, hoki, and bluenose. Vessels are mainly mid-sized, 30–40 m overall length and 200–500 gross tonnes. Table 4: Summary of features of the main alfonsino fisheries. MWB; midwater trawl on the bottom (within 5 m of the seabed) BT; bottom trawl, MW; midwater trawl. ECNI; east coast North Island, CHATE; eastern Chatham Rise. Species codes are given in Table C48.

Area	ECNI	CHATE		
FMA	1 & 2	4		
General characteristics				
Key fishery areas	Various banks and other features from east Northland to Wairarapa	Southeast and northwest of the Chatham Islands		
Key Statistical Areas	013–015, 204	051, 404		
Secondary Statistical Areas	001, 002, 004, 106	049, 406, 412		
Season	Year round, winter decline	Year round, winter decline		
Gear type	MWB, BT, MW	BT, MWB, MW		
Target species				
Key target species	BYX	BYX		
Secondary target species	CDL, ORH, HOK, BNS	ORH, BNS		
Target BYX as % of total	68% (range 48–81)	82% (range 0–99)		

#### 8. CPUE ANALYSES

BYX catch for study period

Catch-per-unit-effort analyses have not been updated in this report because past attempt have repeatedly shown that alfonsino are not suited to CPUE. A summary of past studies follows. CPUE analyses were developed for East Northland and Bay of Plenty (the upper east coast North Island region of BYX 1) by Starr et al. (2008). Their attempts at developing bottom and midwater trawl indices for the two sub-regions found that indices were too erratic and relied on too few vessels and observations to be considered reliable. Indices with alfonsino as a bycatch of bottom longlines targeting bluenose and hapuku were also developed and it was thought by the Adaptive Management Programme Working Group that the similarity in indices between the two series might reflect abundance. However, an update by Starr et al. (2010) of these indices (albeit with some refinements) suggested that the two series no longer tracked each other and that the instability of the indices and lack of data meant that the indices should be treated with caution. Moreover, given the voracious predatory nature and much larger size of bluenose and hapuku compared with alfonsino, it is unlikely that alfonsino are likely to be able to compete for baits on hooks in areas where bluenose and hapuku are abundant (which presumably they are in areas where they are being targeted). This would result in a bottom longline not adequately sampling the amount of alfonsino in an area of high bluenose and/or hapuku abundance even if alfonsino are also abundant. Further, the control lines used in a bluenose tagging study by Horn & Massey (1989) caught very few alfonsino relative to bluenose.

CPUE analyses have been produced numerous times for alfonsino in BYX 2 (Horn 1988, Horn & Massey 1989, Stocker & Blackwell 1991, Langley 1995, Blackwell 2000, MacGibbon 2013) with limited success for various reasons including high variability in data sets, changes in areal distribution of fishing, and the inability to reliably include important variables such as search time.

Similarly limited success has been had in attempts to develop CPUE indices for BYX 3. Langley & Walker (2002) found that that the indices they developed were limited by a small data set, a high variation in catch rates, and changes in the distribution of fishing effort over the period their study covered. Despite an extra ten years' worth of data being available, similar difficulties were experienced by MacGibbon (2013), as well as unsatisfactory diagnostics for the model.

The CPUE analyses by Langley & Walker (2002) of BYX 3 stated that "the [then] recent decline in catches, in particular the decline in the proportion of large catches (those exceeding 5 t) suggests that the fishery warrants further monitoring". The percentage of tows targeting alfonsino containing five tonnes or more are plotted in Figure 6 for BYX 2 and 3. This figure suggests that for both areas the proportion of tows containing five tonnes or more is now increasing, and the unstandardised catch rates discussed in Sections 7.2.1 and 7.2.2 also appear to be increasing.



Fishing year

Figure 6: Percentage of tows targeting alfonsino that contained five tonnes or more of alfonsino by fishing year for all trawl methods for the east coast North Island fishery (upper plot) and the eastern Chatham Rise fishery (lower plot). The numbers above each point are the *total* number of alfonsino targeted tows in a given year, irrespective of the quantity of alfonsino caught. Note that there were no *targeted* tows of alfonsino for the eastern Chatham Rise fishery Chatham Rise fishery before 1994.

Of particular concern to trawl CPUE analyses of alfonsino (which are thought to be feature-associated and often congregated) is the lack of ability to reliably quantify search time. Clearly time between one tow being hauled and the next being shot is not satisfactory: was all of that time in the intervening period spent searching for another suitable mark to shoot on or was some of it spent waiting for the previous bag to be processed, gear being repaired, poor weather to improve, or some combination of the above?

In addition, stock structure is poorly understood for New Zealand alfonsino. Horn & Massey (1989) have noted differences in size between areas on the east coast North Island and suggested that there could be size-specific migration between these areas. Further, no spawning alfonsino have been observed in New Zealand waters. Horn & Massey proposed that alfonsino in New Zealand could be part of a large oceanic eddy system and form part of a vegetative population that once mature migrate to an as yet unknown reproductive zone. A similar hypothesis has been proposed by Alekseev et al. (1986) for alfonsino in the north and south Atlantic where three separate populations are thought to occur based on length frequency and maturity data, each in its own eddy system. In each system there was a 'reproductive zone' where large fish predominated and spawning occurred, and a vegetative zone where juveniles and first-maturing fish were found. Eggs and larvae from the reproductive zone are carried back to the vegetative zone, and first-maturing fish join the reproductive zone where they remain. If a similar process is occurring with New Zealand populations of alfonsino the fishery could be more recruitment driven with the catch-per-unit-effort being more a factor of spawning success of an unknown reproductive population than any fishing effort variables traditionally offered as explanatory predictors of catch.

# 9. SUMMARY AND RECOMMENDATIONS

#### 9.1 Commercial and research data

Alfonsino was virtually unfished before 1983 when the east coast North Island target fishery developed. Catches of alfonsino elsewhere were mainly as bycatch of other target fisheries until the mid-1990s when the target fishery on the eastern Chatham Rise developed, mainly concentrated to the southeast and northwest of the Chatham Islands. Both fisheries are of moderate size with landings often more than 1000 t per year, particularly on the east coast North Island. Alfonsino are caught in other areas of New Zealand's EEZ but in small quantities. Most is caught by bottom trawling, midwater trawling on the bottom, and midwater trawling. A small amount is also caught by bottom longline; other fishing methods catch negligible amounts of alfonsino.

No research surveys have been optimised for alfonsino and the only survey that regularly catches them is the Chatham Rise middle depth species survey conducted in January every year since 1992 (with the exception of January 2014). However, this time series poorly estimates alfonsino abundance and estimates are highly variable from year to year with high CVs. The patchy nature of alfonsino means that the chance of a randomly generated trawl survey station occurring on an aggregation is low. Alfonsino are also generally feature-associated and hence not sampled well by this time series which is optimised to survey hoki, hake, and ling on easily trawled ground.

Observer data on reproductive state has found that virtually all fish are immature or resting. No spawning alfonsino have ever been observed in research data and the three running ripe fish observed by the observer programme may be errors. Otolith collection has been relatively sparse.

Many aspects of alfonsino biology are poorly understood both in New Zealand and worldwide. Ageing by zone counts in otoliths has been validated in New Zealand (Massey & Horn 1990). Timing and location of spawning is not known. For the lower east coast of the North Island there have been few fish observed younger than three years. Full recruitment into the commercial fishery is thought to occur at around five years.

The stock structure of alfonsino remains uncertain and this study found no indication of stock boundaries although there were discrete fishery areas. They are found throughout the New Zealand EEZ but are only found in large concentrations on the lower east coast North Island and the eastern Chatham Rise. It has been suggested that alfonsino populations could be associated with large oceanic eddy systems (Alekseev et al. 1986). If New Zealand alfonsino comprise part of such a system then the east coast North Island may be a vegetative, non-reproductive zone where fish grow and mature before leaving for a possible reproductive zone (Horn & Massey 1989). The current QMAs are probably sufficient for management purposes.

# 9.2 Catch sampling

Observer coverage from the commercial fishery is patchy. For all areas including the main fishing areas sampling by the observer programme is inconsistent, ranging from no sampling to over-sampling. Ministry for Primary Industries project BYX200801 aimed to increase observer coverage in BYX 3 to investigate the possibility of developing a catch-at-age history of the fishery but was unfortunately cancelled after two years of insufficient data collection.

In BYX 2 land-based catch sampling occurred in the 1999–2001 fishing years (McMillan et al. 2000, Blackwell et al. 2001, 2002), and again in the 2007–2008 fishing years (Horn & Sutton 2009). Sampling from the 1999–2001 fishing years found the catch was dominated by fish aged 5–9 years. Sampling in the 2007 and 2008 fishing years found that the age classes were noticeably different from those taken between 1999 and 2001 with the catch in the latter years being dominated by younger fish of 4 and 5 years of age. Horn & Sutton (2009) note that earlier ageing work of alfonsino in BYX 2 showed that length and age distributions can vary with fishing ground (Horn & Massey 1989, Massey & Horn 1990) and that this could potentially bias their results if the samples landed were mainly from grounds where younger fish are found. While an investigation of the trips they sampled showed they came from a variety of fishing grounds in BYX 2 it is still possible that fish sampled were from grounds where a contraction in the age range of alfonsino in BYX 2 and further monitoring of the age structure is warranted, especially given the lack of other monitoring tools for the fishery.

Land-based catch sampling for BYX 3 has been conducted in the 2003, 2004, and 2005 fishing years (Blackwell et al. 2004, Horn et al. 2004, 2006) with more than 95% of the BYX 3 catch landed green in Nelson. In the first two years fish of both sexes were mainly 7-10 years old but in 2005 were mainly 4-8 years old. Another land-based catch sampling programme for BYX 3 was proposed in 2008 but after the fishing industry indicated that it would be processing alfonsino at sea from October 2009 an at-sea observer-based sampling programme was developed under the Ministry for Primary Industries project BYX200801 (Mormede 2009). Unfortunately, after two years of insufficient data collection by observers the project was cancelled. However a land-based sampling programme could still be implemented for BYX 3. Despite claims by the fishing industry that alfonsino would be processed at sea from October 2009 much of the catch is still being landed green (see Figure C3). Landing weights of green alfonsino range between 347 and 756 t or 46–94% of alfonsino landings from BYX 3 since 1 October 2009. However, at-sea observer sampling would allow for individual tows to be sampled rather than whole landings from a trip. Tow-level sampling could potentially allow for any possible differences in length, sex, and maturity between features and/or the two main sub-regions of the eastern Chatham Rise fishery to be uncovered. If similar size-specific migration noted by Horn & Massey (1989) for the east coast North Island is occurring in BYX 3 this information could be pertinent to management of the fishery.

# 9.3 Status of the stocks

The status of the stocks is not known. Current trawl surveys do not monitor alfonsino abundance and it is unlikely that any future trawl surveys could be developed to do so. CPUE is also uninformative and reliable indices are unlikely to be able to be developed, at least in the short term. The proportion of alfonsino tows that are considered 'large' (greater than or equal to five tonnes) in both of the main

fishery areas appears to be increasing or steady depending on which of the three main trawling methods are being examined. The size of the fleet has diminished which might account for some of this stability as established and experienced vessels dominate the fisheries. Landings from BYX 2 fluctuate somewhat and landings from BYX 3 are relatively steady.

# 9.4 Future data needs and research requirements

Neither CPUE nor trawl surveys are likely to provide an index of alfonsino abundance. The best method to determine the status of the stocks and to continue monitoring is likely to be a catch-at-age sampling programme.

It has been suggested previously that alfonsino would be best monitored through catch-sampling programmes that collected data on length, age, and sex. Starr et al. (2008) quoted an alfonsino working group report as stating "…in overview, CPUE does not appear to be the best candidate for monitoring BYX 1 abundance, and effort should rather be put into developing an effective and representative length and age sampling programme". However, no catch sampling programme has been put in place for the BYX 1 fishery. Catch sampling programmes have also been suggested for BYX 2 and BYX 3, and previous sampling of these Fishstocks was described in Section 9.2.

Provided the sampling regimes of BYX 2 and 3 from the past were adequate (and they appeared to be) they could most likely be reinstated as it appears that the commercial fisheries from the east coast North Island and eastern Chatham Rise have changed little in the intervening years. However, if the length and age structure has changed during this time simulations such as those carried out by Mormede (2009) for the proposed observer-based sampling programme should be conducted in advance to determine the optimal sampling regime for each area. The data exists for such analyses to be carried out. A large proportion of the alfonsino catch from the two main fisheries is still landed green which would allow for a land-based shed sampling programme for either area, although at-sea observer-based sampling would allow for the detection of any differences in sub-regions within the main fishery areas.

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## APPENDIX A: TRAWL SURVEY SUMMARIES

Table A1: Biomass indices (t) and coefficients of variation (CV) of alfonsino from the summer trawl survey of Chatham Rise by *Tangaroa* (Assumptions: areal availability, vertical availability and vulnerability = 1).

Trip code	Date	Biomass (t)	% CV
TAN9106	Dec 91–Feb 92	6 598	51
TAN9212	Dec 92–Feb 93	5 493	82
TAN9401	Jan 94	25 695	91
TAN9501	Jan–Feb 95	1 386	36
TAN9601	Dec 95–Jan 96	1 807	58
TAN9701	Jan–Jan 97	4 152	63
TAN9801	Jan–Jan 98	2 269	52
TAN9901	Jan-Jan 99	4 216	51
TAN0001	Dec 99–Jan 00	1 216	20
TAN0101	Dec 00–Jan 01	4 867	60
TAN0201	Dec 01–Jan 02	5 565	65
TAN0301	Dec 02–Jan 03	1 151	39
TAN0401	Dec 03–Jan 04	566	33
TAN0501	Dec 04–Jan 05	15 813	79
TAN0601	Dec 05–Jan 06	6 439	86
TAN0701	Dec 06–Jan 07	1 384	57
TAN0801	Dec 07–Jan 08	26 025	91
TAN0901	Dec 08–Jan 09	13 378	83
TAN1001	Jan 10	14 533	65
TAN1101	Jan 11	1 038	50
TAN1201	Jan 12	1 507	32
TAN1301	Jan 13	44 779	99
TAN1401	Jan 14	1 357	44



Figure A1: Doorspread biomass estimates for all alfonsino (top plot, error bars are  $\pm$  two standard deviations) and by sex (bottom panel), from the summer Chatham Rise *Tangaroa* surveys from 1991 to 2014. Biomass estimates are for the core strata only (200–800 m).



Figure A2: Scaled population length frequencies of alfonsino from the summer Chatham Rise time series carried out by *Tangaroa* from 1991 to 1999 for core strata (200–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.



Figure A2 continued: Scaled population length frequencies of alfonsino from the summer Chatham Rise time series carried out by *Tangaroa* from 2000 to 2007 for core strata (200–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.



Figure A2 continued: Scaled population length frequencies of alfonsino from the summer Chatham Rise time series carried out by *Tangaroa* from 2008 to 2014 for core strata (200–800 m). n = number of fish measured; no. = scaled population number; CV = coefficient of variation.

### APPENDIX B. OBSERVER DATA FROM COMMERCIAL TRAWL AND LONGLINE

Table B1: Total number of observed tows (a) and catches in tonnes (b) sampled for alfonsino, by area, for fishing years 1990 to 2014. Areas are defined in Section 2.1 and Figure 2. 'Other' includes all records that do not fall into ECNI (east coast North Island), or ChatE (eastern Chatham Rise).

(a) Tows				
Fishing year	ECNI	ChatE	Other	Total
1990	29	20	295	344
1991	70	34	271	375
1992	37	40	308	385
1993	58	36	434	528
1994	64	53	764	881
1995	87	68	327	482
1996	60	1	260	321
1997	23	24	169	216
1998	72	40	475	587
1999	159	10	234	403
2000	216	12	387	615
2001	66	69	385	520
2002	55	12	153	220
2003	81	110	440	631
2004	43	47	407	497
2005	51	70	247	368
2006	97	48	298	443
2007	60	78	331	469
2008	152	51	321	524
2009	85	33	478	596
2010	145	145	617	907
2011	245	85	625	955
2012	121	144	716	981
2013	28	22	1 558	1 608
2014	37	39	1 475	1 551
Total	2 141	1 291	11 975	15 407

(b) Catches (t)				
Fishing year	ECNI	ChatE	Other	Total
1990	2.4	1.9	2.4	6.6
1991	0.7	10.4	9.4	20.5
1992	0.1	2.0	22.6	24.8
1993	0.3	3.7	35.0	39.1
1994	0.7	67.5	97.5	165.6
1995	20.5	65.8	5.1	91.4
1996	0.7	0.3	5.7	6.7
1997	0.9	3.2	3.8	8.0
1998	51.1	91.3	47.4	189.8
1999	27.0	4.1	12.8	43.9
2000	61.0	2.6	15.5	79.1
2001	9.7	26.1	19.0	54.8
2002	3.3	0.3	2.7	6.2
2003	7.0	100.2	114.5	221.7
2004	19.8	25.4	17.0	62.2
2005	37.6	39.8	12.1	89.5
2006	62.0	11.0	5.6	78.7
2007	85.0	15.5	13.3	113.9
2008	60.7	7.6	25.6	93.9
2009	127.5	9.3	21.3	158.0
2010	255.6	174.5	227.4	657.6
2011	289.3	154.0	204.8	648.0
2012	128.1	61.0	213.0	402.1
2013	1.5	0.5	275.1	277.1
2014	0.5	11.8	80.3	92.6
Total	1 253.0	890.1	1 489.0	3 632.1

Table B2: Total number of observed tows sampled for alfonsino length and sex, by area for fishing years 1990 to 2014. Numbers of tows sampled in the table are higher than values on the length frequency plots because the table includes tows where fewer than three fish were sampled. See Table B1 for fishing year and area descriptions.

Fishing year	ECNI	ChatE	Other	Total
1990	0	0	0	0
1991	0	0	0	0
1992	0	0	0	0
1993	0	0	0	0
1994	2	0	0	2
1995	0	18	1	19
1996	0	0	3	3
1997	1	2	2	5
1998	0	2	0	2
1999	15	0	5	20
2000	16	0	12	28
2001	4	11	21	36
2002	1	1	4	6
2003	13	32	63	108
2004	14	7	13	34
2005	14	10	13	37
2006	24	5	21	50
2007	14	13	28	55
2008	15	2	14	31
2009	16	2	19	37
2010	40	28	47	115
2011	48	20	56	124
2012	16	20	76	112
2013	0	0	66	66
2014	0	0	103	103
Total	253	173	567	993

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	2	0	0	0	0	2
1995	1	3	13	1	0	0	0	0	0	0	0	1	19
1996	2	0	0	0	0	0	0	0	0	0	1	0	3
1997	0	0	1	0	1	0	1	2	0	0	0	0	5
1998	0	0	2	0	0	0	0	0	0	0	0	0	2
1999	0	8	5	0	2	0	0	0	2	3	0	0	20
2000	7	6	0	0	2	1	0	6	3	0	3	0	28
2001	4	7	2	2	3	1	1	0	0	3	13	0	36
2002	1	0	0	1	0	1	0	2	0	0	1	0	6
2003	0	0	1	18	28	10	6	7	14	3	17	4	108
2004	2	3	0	1	3	2	14	2	1	4	2	0	34
2005	5	6	0	1	0	0	0	5	14	1	2	3	37
2006	17	6	0	0	0	0	2	3	2	3	17	0	50
2007	1	3	10	2	9	3	0	3	3	6	15	0	55
2008	3	10	0	0	0	0	0	1	1	5	11	0	31
2009	0	16	1	0	0	0	0	2	2	12	4	0	37
2010	5	24	8	8	6	16	2	1	1	17	16	11	115
2011	20	23	1	13	17	8	25	4	0	0	13	0	124
2012	38	28	15	0	0	0	8	14	2	1	3	3	112
2013	15	2	0	1	1	0	0	2	3	2	21	19	66
2014	11	1	0	0	0	0	0	0	1	18	67	5	103
Total	132	146	59	48	72	42	59	56	49	78	206	46	993

Table B3: Number of observed tows sampled for alfonsino length frequencies, by month for all areas for fishing years 1990 to 2014.

 Table B4: Number of observed tows in each fishery area sampled for alfonsino length frequencies, by month for fishing years 1990 to 2014. See Table B1 for fishing year and area descriptions.

(a) l	East	coast	North	Island	fishery
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Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	2	0	0	0	0	2
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	1	0	0	0	0	0	1
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	8	5	0	2	0	0	0	0	0	0	0	15
2000	7	5	0	0	2	0	0	1	0	0	1	0	16
2001	0	3	1	0	0	0	0	0	0	0	0	0	4
2002	0	0	0	0	0	0	0	0	0	0	1	0	1
2003	0	0	0	0	0	0	0	0	9	0	4	0	13
2004	0	2	0	0	0	0	11	1	0	0	0	0	14
2005	4	6	0	0	0	0	0	0	1	0	0	3	14
2006	0	6	0	0	0	0	0	0	2	1	15	0	24
2007	0	0	10	0	0	0	0	0	2	1	1	0	14
2008	2	10	0	0	0	0	0	0	1	2	0	0	15
2009	0	16	0	0	0	0	0	0	0	0	0	0	16
2010	3	23	0	8	5	0	0	0	0	1	0	0	40
2011	6	9	0	4	17	0	10	2	0	0	0	0	48
2012	10	5	0	0	0	0	1	0	0	0	0	0	16
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	32	93	16	12	26	0	23	6	15	5	22	3	253

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	1	3	13	1	0	0	0	0	0	0	0	0	18
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	1	0	1	0	0	0	0	0	0	0	2
1998	0	0	2	0	0	0	0	0	0	0	0	0	2
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	2	4	0	2	3	0	0	0	0	0	0	0	11
2002	0	0	0	0	0	1	0	0	0	0	0	0	1
2003	0	0	0	13	12	6	0	1	0	0	0	0	32
2004	1	0	0	0	3	0	3	0	0	0	0	0	7
2005	0	0	0	1	0	0	0	5	4	0	0	0	10
2006	0	0	0	0	0	0	2	1	0	2	0	0	5
2007	0	1	0	2	8	2	0	0	0	0	0	0	13
2008	0	0	0	0	0	0	0	1	0	0	1	0	2
2009	0	0	0	0	0	0	0	2	0	0	0	0	2
2010	1	1	8	0	0	16	2	0	0	0	0	0	28
2011	0	0	0	0	0	8	0	0	0	0	12	0	20
2012	0	0	0	0	0	0	6	8	2	0	2	2	20
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	5	9	24	19	27	33	13	18	6	2	15	2	173

# (b) Eastern Chatham Rise fishery

(c) Other areas	5												
Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	1	1
1996	2	0	0	0	0	0	0	0	0	0	1	0	3
1997	0	0	0	0	0	0	0	2	0	0	0	0	2
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	2	3	0	0	5
2000	0	1	0	0	0	1	0	5	3	0	2	0	12
2001	2	0	1	0	0	1	1	0	0	3	13	0	21
2002	1	0	0	1	0	0	0	2	0	0	0	0	4
2003	0	0	1	5	16	4	6	6	5	3	13	4	63
2004	1	1	0	1	0	2	0	1	1	4	2	0	13
2005	1	0	0	0	0	0	0	0	9	1	2	0	13
2006	17	0	0	0	0	0	0	2	0	0	2	0	21
2007	1	2	0	0	1	1	0	3	1	5	14	0	28
2008	1	0	0	0	0	0	0	0	0	3	10	0	14
2009	0	0	1	0	0	0	0	0	2	12	4	0	19
2010	1	0	0	0	1	0	0	1	1	16	16	11	47
2011	14	14	1	9	0	0	15	2	0	0	1	0	56
2012	28	23	15	0	0	0	1	6	0	1	1	1	76
2013	15	2	0	1	1	0	0	2	3	2	21	19	66
2014	11	1	0	0	0	0	0	0	1	18	67	5	103
Total	95	44	19	17	19	9	23	32	28	71	169	41	567

Table B5: Total number of individual alfonsino measured by fishing year and area by the observer programme for fishing years 1990 to 2014. Numbers of fish in the table may differ from those on the length frequency plots for some years because the plots only included tows where more than three fish were measured. See Table B1 for fishing year and area descriptions.

Fishing year	ECNI	ChatE	Other	Total
1990	0	0	0	0
1991	0	0	0	0
1992	0	0	0	0
1993	0	0	0	0
1994	9	0	0	9
1995	0	1 263	6	1 269
1996	0	0	69	69
1997	62	48	10	120
1998	0	219	0	219
1999	780	0	38	818
2000	848	0	158	1 006
2001	107	182	270	559
2002	1	49	28	78
2003	67	1 112	2 123	3 302
2004	395	73	336	804
2005	808	417	76	1 301
2006	1 321	158	137	1 616
2007	492	136	318	946
2008	1 003	19	276	1 298
2009	953	105	416	1 474
2010	2 053	1 751	2 739	6 543
2011	1 907	600	1 718	4 225
2012	727	620	2 182	3 529
2013	0	0	3 617	3 617
2014	0	0	2 497	2 497
Total	11 533	6 752	17 014	35 299

Table B6: Total number of alfonsino measured by month and fishing year for each fishery area, by the observer programme, for fishing years 1990 to 2014. Numbers of fish in the table may differ from those on the length frequency plots for some years because the plots only included tows where more than three fish were measured. See Table B1 for fishing year and area descriptions.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	9	0	0	0	0	9
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	62	0	0	0	0	0	62
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	510	51	0	219	0	0	0	0	0	0	0	780
2000	636	8	0	0	125	0	0	78	0	0	1	0	848
2001	0	97	10	0	0	0	0	0	0	0	0	0	107
2002	0	0	0	0	0	0	0	0	0	0	1	0	1
2003	0	0	0	0	0	0	0	0	63	0	4	0	67
2004	0	4	0	0	0	0	361	30	0	0	0	0	395
2005	433	357	0	0	0	0	0	0	5	0	0	13	808
2006	0	452	0	0	0	0	0	0	8	50	811	0	1 321
2007	0	0	378	0	0	0	0	0	83	11	20	0	492
2008	190	555	0	0	0	0	0	0	80	178	0	0	1 003
2009	0	953	0	0	0	0	0	0	0	0	0	0	953
2010	93	692	0	780	430	0	0	0	0	58	0	0	2 053
2011	361	567	0	120	514	0	285	60	0	0	0	0	1 907
2012	559	150	0	0	0	0	18	0	0	0	0	0	727
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2 272	4 345	439	900	1 288	0	726	177	239	297	837	13	11 533

(a) East coast North Island fishery

### Table B6: continued.

# (b) Eastern Chatham Rise fishery

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	77	269	817	100	0	0	0	0	0	0	0	0	1 263
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	10	0	38	0	0	0	0	0	0	0	48
1998	0	0	219	0	0	0	0	0	0	0	0	0	219
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	22	133	0	2	25	0	0	0	0	0	0	0	182
2002	0	0	0	0	0	49	0	0	0	0	0	0	49
2003	0	0	0	398	344	360	0	10	0	0	0	0	1 112
2004	2	0	0	0	11	0	60	0	0	0	0	0	73
2005	0	0	0	26	0	0	0	384	7	0	0	0	417
2006	0	0	0	0	0	0	105	50	0	3	0	0	158
2007	0	85	0	2	40	9	0	0	0	0	0	0	136
2008	0	0	0	0	0	0	0	9	0	0	10	0	19
2009	0	0	0	0	0	0	0	105	0	0	0	0	105
2010	10	5	240	0	0	1 354	142	0	0	0	0	0	1 751
2011	0	0	0	0	0	240	0	0	0	0	360	0	600
2012	0	0	0	0	0	0	164	240	60	0	81	75	620
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	111	492	1 286	528	458	2 012	471	798	67	3	451	75	6 752

### Table B6: continued.

(c) Other a	reas												
Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	6	6
1996	28	0	0	0	0	0	0	0	0	0	41	0	69
1997	0	0	0	0	0	0	0	10	0	0	0	0	10
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	30	8	0	0	38
2000	0	1	0	0	0	20	0	40	77	0	20	0	158
2001	2	0	1	0	0	34	52	0	0	3	178	0	270
2002	1	0	0	1	0	0	0	26	0	0	0	0	28
2003	0	0	1	333	1 161	119	164	141	39	14	138	13	2 123
2004	80	10	0	106	0	17	0	10	15	8	90	0	336
2005	20	0	0	0	0	0	0	0	44	2	10	0	76
2006	32	0	0	0	0	0	0	11	0	0	94	0	137
2007	31	41	0	0	6	7	0	6	5	62	160	0	318
2008	35	0	0	0	0	0	0	0	0	50	191	0	276
2009	0	0	3	0	0	0	0	0	113	242	58	0	416
2010	8	0	0	0	80	0	0	20	20	672	948	991	2 739
2011	420	461	30	260	0	0	449	42	0	0	56	0	1 718
2012	842	592	409	0	0	0	30	180	0	18	31	80	2 182
2013	943	115	0	22	20	0	0	40	60	22	825	1570	3 617
2014	627	40	0	0	0	0	0	0	10	440	1280	100	2 497
Total	3 069	1260	444	722	1267	197	695	526	413	1541	4120	2760	17 014

Table B7: Number of female alfonsino gonads staged by fishing year sampled from each area by the observer programme for the 1990 to 2014 fishing years. See Table B1 for fishing year and area descriptions.

Fishing year	ECNI	ChatE	Other	Total
1990	0	0	0	0
1991	0	0	0	0
1992	0	0	0	0
1993	0	0	0	0
1994	3	0	0	3
1995	0	672	3	675
1996	0	0	14	14
1997	24	34	7	65
1998	0	103	0	103
1999	359	0	20	379
2000	492	0	71	563
2001	51	60	85	196
2002	1	25	8	34
2003	38	707	1 062	1 807
2004	168	38	175	381
2005	11	255	32	298
2006	719	115	22	856
2007	219	73	138	430
2008	470	7	97	574
2009	506	53	177	736
2010	1 063	932	1 295	3 290
2011	1 002	288	863	2 153
2012	378	262	1 128	1 768
2013	0	0	1 883	1 883
2014	0	0	1 079	1 079
Total	5 504	3 624	8 159	17 287

Table B8: Number of female alfonsino gonads staged by fishing year and month sampled from each area by the observer programme for the trawl fishery for the 1990 to 2014 fishing years. See Table B1 for fishing year and area descriptions.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	3	0	0	0	0	3
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	24	0	0	0	0	0	24
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	223	24	0	112	0	0	0	0	0	0	0	359
2000	378	4	0	0	60	0	0	50	0	0	0	0	492
2001	0	46	5	0	0	0	0	0	0	0	0	0	51
2002	0	0	0	0	0	0	0	0	0	0	1	0	1
2003	0	0	0	0	0	0	0	0	36	0	2	0	38
2004	0	2	0	0	0	0	156	10	0	0	0	0	168
2005	0	0	0	0	0	0	0	0	3	0	0	8	11
2006	0	249	0	0	0	0	0	0	3	30	437	0	719
2007	0	0	166	0	0	0	0	0	47	3	3	0	219
2008	88	245	0	0	0	0	0	0	60	77	0	0	470
2009	0	506	0	0	0	0	0	0	0	0	0	0	506
2010	58	360	0	373	249	0	0	0	0	23	0	0	1 063
2011	214	274	0	60	265	0	160	29	0	0	0	0	1 002
2012	298	73	0	0	0	0	7	0	0	0	0	0	378
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1 036	1 982	195	433	686	0	347	92	149	133	443	8	5 504

### (a) East coast North Island fishery

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	64	183	382	43	0	0	0	0	0	0	0	0	672
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	5	0	29	0	0	0	0	0	0	0	34
1998	0	0	103	0	0	0	0	0	0	0	0	0	103
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	11	32	0	2	15	0	0	0	0	0	0	0	60
2002	0	0	0	0	0	25	0	0	0	0	0	0	25
2003	0	0	0	303	223	172	0	9	0	0	0	0	707
2004	2	0	0	0	10	0	26	0	0	0	0	0	38
2005	0	0	0	20	0	0	0	232	3	0	0	0	255
2006	0	0	0	0	0	0	74	40	0	1	0	0	115
2007	0	38	0	1	28	6	0	0	0	0	0	0	73
2008	0	0	0	0	0	0	0	7	0	0	0	0	7
2009	0	0	0	0	0	0	0	53	0	0	0	0	53
2010	2	5	139	0	0	698	88	0	0	0	0	0	932
2011	0	0	0	0	0	91	0	0	0	0	197	0	288
2012	0	0	0	0	0	0	46	141	28	0	43	4	262
2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	79	258	629	369	305	992	234	482	31	1	240	4	3 624

### (b) Eastern Chatham Rise fishery

areas												
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	3	3
14	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	7	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	19	1	0	0	20
0	1	0	0	0	10	0	20	29	0	11	0	71
1	0	0	0	0	18	18	0	0	0	48	0	85
0	0	0	0	0	0	0	8	0	0	0	0	8
0	0	1	163	603	52	78	61	20	3	75	6	1 062
53	7	0	53	0	8	0	3	8	6	37	0	175
0	0	0	0	0	0	0	0	28	0	4	0	32
15	0	0	0	0	0	0	6	0	0	1	0	22
10	26	0	0	3	5	0	5	0	16	73	0	138
10	0	0	0	0	0	0	0	0	19	68	0	97
0	0	3	0	0	0	0	0	55	95	24	0	177
4	0	0	0	27	0	0	10	10	273	454	517	1 295
197	227	19	143	0	0	230	18	0	0	29	0	863
431	322	225	0	0	0	14	105	0	11	20	0	1 128
455	55	0	9	10	0	0	15	18	9	404	908	1 883
284	18	0	0	0	0	0	0	5	183	556	33	1 079
1 474	656	248	368	643	93	340	258	192	616	1 804	1 467	8 159
	areas Oct 0 0 0 0 0 0 0 14 0 0 0 0 14 0 0 0 14 0 0 0 15 10 10 10 0 4 197 431 455 284 1 474	areasOctNov000000000000000000000000000000537001501026100004019722743132245555284181474656	areasOctNovDec000000000000000000000140000000000000000000010000015001026010001003400197227194313222254555502841801474656248	areasOctNovDecJan00116353705300001500010260010030400019722719143431322225045555092841800	areasOctNovDecJanFeb0010000001026003010000001027191430431322225001474656248368643	areasOctNovDecJanFebMar0010000000000000000000010000001000000010000000100000001022719143004313222250004555509100147465624836864393	areas           Oct         Nov         Dec         Jan         Feb         Mar         Apr           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           14         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0	areas           Oct         Nov         Dec         Jan         Feb         Mar         Apr         May           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           14         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0           0         0         0	areas           Oct         Nov         Dec         Jan         Feb         Mar         Apr         May         Jun           0         0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0           0         0         0         0         0         0         0         0         0         0         0         0         0	areas         Sec         Jan         Feb         Mar         Apr         May         Jun         Jul           0	areas         Sec         Jan         Feb         Mar         Apr         May         Jun         Jul         Aug           0	areas         Sec         Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep           0



Figure B1: Representativeness of observer sampling of alfonsino catch by fishing year and area. Top plot: circles show the processed alfonsino catch by area within a year; crosses show the observed alfonsino catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed trawl catch by area within a year; crosses show the observed alfonsino catch sampled for length frequencies for the same cells. See Table B1 for area descriptions.



Figure B2: Representativeness of observer sampling of alfonsino catch by fishing year and month for the east coast North Island fishery. Top plot: circles show the commercial alfonsino catch by month and year; crosses show the observed alfonsino catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed commercial catch for the east coast North Island fishery by month and year; crosses show the observed alfonsino catch for the same cells. See Table B1 for area descriptions.



Figure B3: Representativeness of observer sampling of alfonsino catch by fishing year and month for the eastern Chatham Rise fishery. Top plot: circles show the commercial alfonsino catch by month and year; crosses show the observed alfonsino catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed catch for the eastern Chatham Rise fishery by month and year; crosses show the observed alfonsino catch sampled for length frequencies for the same cells. See Table B1 for area descriptions.

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Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Figure B4: Representativeness of observer sampling of alfonsino catch by fishing year and month for 'Other' fishery areas. Top plot: circles show the commercial alfonsino catch by month and year; crosses show the observed alfonsino catch for the same cells. Representation is demonstrated by how closely the crosses match the circle diameter. Bottom plot: circles show the total observed catch for the eastern Chatham Rise fishery by month and year; crosses show the observed alfonsino catch sampled for length frequencies for the same cells. See Table B1 for area descriptions.



Figure B5: Scaled population length frequency of alfonsino sampled by observers from commercial trawl catches from the east coast North Island fishery, where there were more than 3 alfonsino per tow, for fishing years with available data between the 1994 and 2012 fishing years. n, number of tows sampled with more than 3 individual alfonsino per tow; no., number of alfonsino sampled. See Table B1 for area descriptions.



Figure B5 continued: Scaled population length frequency of alfonsino sampled by observers from commercial catches from the east coast North Island fishery, where there were more than 3 alfonsino per tow, for fishing years with available data between the 1994 and 2012 fishing years. n, number of tows sampled with more than 3 individual alfonsino per tow; no., number of alfonsino sampled.



Figure B6: Scaled population length frequency of alfonsino sampled by observers from commercial catches from the eastern Chatham Rise fishery, where there were more than 3 alfonsino per tow, for fishing years with available data between the 1995 and 2012 fishing years. n, number of tows sampled with more than 3 individual alfonsino per tow; no., number of alfonsino sampled. See Table B1 for area descriptions.



Figure B6 continued: Scaled population length frequency of alfonsino sampled by observers from commercial catches from the eastern Chatham Rise fishery, where there were more than 3 alfonsino per tow, for fishing years with available data between the 1995 and 2012 fishing years. n, number of tows sampled with more than 3 individual alfonsino per tow; no., number of alfonsino sampled.



Figure B7: Gonad stages of female alfonsino taken in commercial catches, by month and area, sampled by the Observer Programme. Female stages (from the Observer Manual) are: 1, immature/resting/; 2, maturing; 3, ripening; 4; running ripe; 5, spent. See Table B1 for area descriptions.



Figure B8: Location of female alfonsino gonad stages sampled by the Observer Programme for the months of January to June. Grey = stage 1 (immature), stage 2 (maturing), and stage 5 (spent); blue = stage 3 (ripening), red = stage 4 (running ripe).



Figure B8 continued: Location of female alfonsino gonad stages sampled by the Observer Programme for the months of January to June for all fishing methods. Grey = stage 1 (immature), stage 2 (maturing), and stage 5 (spent); blue = stage 3 (ripening), red = stage 4 (running ripe).

### APPENDIX C: CHARACTERISATION

#### Table C1: List of tables and fields requested in the MPI "warehou" extract 9843

#### Fishing\_events table

Event\_Key Version\_seqno DCF\_key Start\_datetime End\_datetime Primary\_method Target\_species Fishing\_duration Catch\_weight Effort\_depth Effort\_height Effort\_num Effort\_num\_2 Effort\_seqno

#### Landing\_events table

Event\_Key Version\_seqno DCF\_key Landing\_datetime Landing\_name Species\_code Species\_name Fishstock\_code (ALL fish stocks) State\_code

#### **Estimated subcatch table**

Event\_Key Version\_seqno DCF\_key

#### Vessel\_history table

Vessel\_key Flag\_nationality\_code Built\_year Engine\_kilowatts Gross\_tonnes Overall\_length\_metres History\_start\_datetime History\_end\_datetime Effort\_total\_num Effort\_width Effort\_speed Total\_net\_length Total\_hook\_num Set\_end\_datetime Haul\_start\_datetime Start\_latitude (full accuracy) Start\_longitude (full accuracy) End\_latitude (full accuracy) End\_longitude (full accuracy) Pair\_trawl\_yn Bottom\_depth

Destination\_type Unit\_type Unit\_num Unit\_weight Conv\_factor Green\_weight Green\_weight\_type Processed\_weight Processed\_weight\_type Form\_type

Species\_code (ALL species for each fishing event) Catch\_weight Column\_a Column\_b Column\_c Column\_d Display\_fishyear Start\_stats\_area\_code Vessel\_key Form\_type Trip Literal\_yn Interp\_yn Resrch\_yn

Trip\_key Trip\_start\_datetime Trip\_end\_datetime Vessel\_key Form\_type Literal\_yn Interp\_yn Resrch\_yn

Literal\_yn Interp\_yn Resrch\_yn

Table C2: Number of landing events by major destination code and form type for BYX 1 for the 1990 to 2014 fishing years. L: landed to NZ; R: retained on board; F: recreational catch; E: eaten; T: transferred to another vessel.

BYX 1		R form				CE	L form	NCE form	Total					
Fishing year	L	R	F	Е	Other	L	R	F	Т	Other	L			
1990	7	_	_	_	_	107	_	_	_	1	-	115		
1991	9	_	_	_	_	168	_	_	_	_	-	177		
1992	6	-	-	_	_	195	_	_	_	1	_	202		
1993	4	-	-	_	_	177	_	_	_	_	_	181		
1994	19	-	-	_	_	171	_	_	_	2	_	192		
1995	23	-	-	_	_	171	_	_	_	4	_	198		
1996	37	_	_	_	_	147	-	_	-	1	_	185		
1997	56	1	-	_	_	237	_	_	2	2	_	298		
1998	82	_	_	_	_	186	-	_	-	2	_	270		
1999	75	_	_	_	_	168	-	_	-	_	_	243		
2000	63	1	_	_	-	289	-	_	-	1	_	354		
2001	45	_	_	_	-	342	-	_	-	1	_	388		
2002	90	3	_	_	1	354	-	1	-	_	_	449		
2003	77	1	_	1	-	312	-	_	-	_	_	391		
2004	71	_	_	1	-	313	-	2	-	_	_	387		
2005	53	_	_	_	-	314	-	5	-	_	_	372		
2006	71	1	_	_	-	320	2	6	-	_	_	400		
2007	44	1	_	_	-	322	1	14	-	_	_	382		
2008	323	_	26	2	2	26	-	1	-	_	_	380		
2009	279	_	18	_	1	32	-	_	-	_	4	334		
2010	345	_	29	2	1	20	-	1	-	_	1	399		
2011	344	2	36	1	2	13	-	3	-	_	_	401		
2012	300	4	30	1	2	2	-	3	-	_	29	371		
2013	244	2	27	_	_	17	-	9	-	_	36	335		
2014	226	_	8	2	1	17	-	12	-	_	60	326		
Total	2 893	16	174	10	10	4 4 2 0	3	57	2	15	130	7 730		
BYX 2					CL	R form				CE	L form	NC	E form	Total
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Fishing year	L	R	С	Α	Н	Other	L	R	С	А	Other	L	Other	
1990	72	3	_	_	_	_	159	1	7	_	_	_	_	242
1991	155	1	_	_	_	_	169	2	14	_	-	-	_	341
1992	171	3	_	_	_	_	218	_	1	_	_	_	_	393
1993	228	_	1	_	_	_	146	_	11	2	2	_	_	390
1994	303	_	_	_	_	_	138	_	1	_	-	_	_	442
1995	294	2	_	_	_	_	152	_	_	_	-	_	_	448
1996	322	_	_	_	_	2	149	_	_	_	1	_	_	474
1997	390	4	_	1	_	1	113	_	_	_	1	_	_	510
1998	366	4	1	_	_	2	134	_	_	_	-	_	_	507
1999	372	4	_	1	_	2	124	_	_	-	_	_	_	503
2000	347	3	_	1	_	2	147	_	_	_	-	_	_	500
2001	263	2	_	1	_	1	155	8	_	_	1	-	_	431
2002	239	2	_	_	_	_	125	_	_	2	-	_	_	368
2003	263	_	_	_	_	1	152	1	_	1	7	-	_	425
2004	217	2	_	_	_	1	152	_	_	_	2	-	_	374
2005	221	2	_	1	1	2	159	_	_	-	5	_	_	391
2006	183	2	_	2	-	5	187	_	_	2	12	_	_	393
2007	196	3	_	1	-	5	220	_	_	-	-	1	_	426
2008	458	1	_	1	-	1	6	_	_	-	-	12	_	479
2009	418	2	_	1	-	13	1	_	_	-	-	15	_	450
2010	468	7	_	3	-	21	2	_	_	-	-	7	_	508
2011	395	8	_	1	_	17	_	_	_	_	_	1	_	422
2012	307	1	_	1	_	9	1	_	_	_	_	1	_	320
2013	330	13	_	1	_	31	1	_	_	_	1	8	3	388
2014	370	7	-	_	-	19	8	_	_	_	3	7	_	414
Total	7348	76	2	16	1	135	2818	12	34	7	35	52	3	10539

Table C2 continued: Number of landing events by major destination code and form type for BYX 2 for the 1990 to 2014 fishing years. L: landed to NZ; R: retained on board; C: disposed to the Crown; A: accidental loss; H: loss from holding pot.

BYX 3					CL	R form	CE	L form		NC	E form	Total
Fishing year	L	R	Т	0	Α	Other	L	Other	L	R	Other	
1990	18	4	9	_	1	_	127	_	_	_	_	159
1991	24	10	12	4	1	2	127	_	_	_	_	180
1992	34	9	12	6	1	4	125	_	_	_	_	191
1993	40	12	17	1	1	7	163	_	_	_	_	241
1994	84	5	8	2	_	2	160	_	_	_	_	261
1995	84	6	13	2	_	13	163	_	_	_	_	281
1996	111	7	6	2	_	15	144	_	_	_	_	285
1997	138	10	4	3	1	9	89	_	_	_	_	254
1998	172	12	4	3	-	19	137	_	_	_	_	347
1999	183	9	2	_	_	12	164	-	_	_	_	370
2000	178	17	-	1	1	31	98	_	_	_	_	326
2001	219	17	-	_	2	31	215	_	_	_	_	484
2002	203	8	-	_	1	32	109	_	_	_	_	353
2003	228	16	_	1	2	40	95	2	_	_	_	384
2004	175	15	_	1	_	37	83	-	_	_	_	311
2005	165	5	_	_	1	33	58	-	_	_	_	262
2006	137	5	_	_	1	25	46	-	_	_	_	214
2007	142	4	_	_	3	47	12	2	16	_	_	226
2008	169	6	_	_	1	44	22	-	17	_	_	259
2009	131	8	_	_	1	51	15	-	26	1	_	233
2010	163	6	_	_	6	51	18	5	41	_	2	292
2011	180	11	_	_	4	46	9	6	27	_	_	283
2012	139	6	-	_	3	45	18	11	24	_	1	247
2013	144	9	_	_	11	43	9	8	35	_	5	264
2014	186	16	_	_	3	43	19	14	32	_	_	313
Total	3 447	233	87	26	45	682	2 2 2 5	48	218	1	8	7 020

Table C2 continued: Number of landing events by major destination code and form type for BYX 3 for the 1990 to 2014 fishing years. L: landed to NZ; R: retained on board; T: transferred to another vessel; O: conveyed outside New Zealand; A: accidental loss.

BYX 7					CL	R form		Cl	EL form	CEL form	Total
Fishing year	L	R	Е	J	Т	Other	Ι	R	Other	L	
1990	5	2	_	_	2	6	2	_	_	_	17
1991	11	3	_	_	1	4	8	_	2	_	29
1992	16	2	2	_	1	4	8	_	-	_	33
1993	11	3	4	_	2	8	11	_	_	_	39
1994	24	25	11	-	6	4	13	_	_	_	83
1995	30	1	7	_	3	8	15	_	_	_	64
1996	21	1	4	-	-	3	20	- (	_	_	49
1997	32	3	7	-	3	3	18	-	_	_	66
1998	38	-	6	-	7	2	21	-	_	_	74
1999	36	6	8	-	-	5	$\epsilon$	. –	1	_	62
2000	73	7	18	-	-	5	12	_	_	_	115
2001	82	8	20	_	5	1	6	-	_	_	122
2002	49	4	15	-	-	1	10	- (	_	_	79
2003	67	8	27	_	_	6	5	_	_	_	113
2004	45	_	24	_	_	5	22	_	_	_	96
2005	43	4	28	_	_	2	ç	_	_	_	86
2006	38	12	31	_	_	1	6	-	_	_	88
2007	74	6	24	_	_	2	16	1	1	1	125
2008	91	3	24	_	_	2	1	-	_	_	121
2009	68	2	29	_	_	2	-	· _	_	_	101
2010	76	1	35	-	-	3	-	· _	_	1	116
2011	93	2	44	-	-	2	-	· _	_	_	141
2012	105	3	38	-	-	4	-	· _	_	_	150
2013	115	2	35	-	-	17	-	· _	_	_	169
2014	138	3	35	16	_	2	-	· _	_	_	194
Total	1 381	111	476	16	30	102	209	1	4	2	2 332

Table C2 continued: Number of landing events by major destination code and form type for BYX 7 for the 1990 to 2014 fishing years. L: landed to NZ; R: retained on board; E: eaten; J: observer authorised discard; T: transferred to another vessel.

BYX 8					CL	R form			C	CEL form
Fishing year	L	Е	Т	R	F	L	Е	F	Other	Total
1990	_	_	1	2	_	_	_	_	_	3
1991	_	_	_	_	_	_	_	_	_	0
1992	_	_	_	_	_	_	_	_	_	0
1993	_	_	_	_	_	1	_	_	_	1
1994	1	1	_	1	_	2	_	_	_	5
1995	_	_	_	_	_	7	_	_	_	7
1996	_	_	_	_	_	10	_	_	_	10
1997	1	_	_	_	_	8	_	_	1	10
1998	_	_	_	_	_	7	_	_	_	7
1999	3	_	_	_	_	2	_	_	_	5
2000	_	_	_	_	_	3	_	_	_	3
2001	_	_	_	_	_	2	2	_	_	4
2002	_	_	_	1	_	3	_	_	_	4
2003	3	2	_	_	_	2	_	3	_	10
2004	7	2	_	_	_	6	_	6	_	21
2005	2	1	_	_	_	6	_	3	_	12
2006	5	1	_	_	_	11	_	1	_	18
2007	1	1	_	_	_	13	_	_	_	15
2008	12	2	_	_	1	_	_	_	_	15
2009	6	_	_	_	_	_	_	_	_	6
2010	5	_	_	_	_	_	_	_	_	5
2011	10	1	_	_	_	_	_	_	_	11
2012	3	_	_	_	_	_	_	_	_	3
2013	4	_	_	_	_	_	_	_	_	4
2014	9	_	_	_	_	_	_	_	_	9
Total	72	11	1	4	1	83	2	13	1	188

Table C2 continued: Number of landing events by major destination code and form type for BYX 8 for the 1990 to 2014 fishing years. L: landed to NZ; E; eaten; T: transferred to another vessel; R: retained on board; F: recreational catch.

Greenweight (t)	No. records	Description	Action
1937.127	7443	Landed in New Zealand to a Licensed Fish Receiver	Keep
0.895	231	Recreational catch	Keep
0.071	10	Eaten	Keep
0.07	2	Transferred to another vessel	Keep
0.069	6	Accidental loss	Keep
0.026	7	Used as bait	Keep
0.018	1	Disposed to the Crown	Keep
0.018	1	Discarded	Keep
3.4	19	Retained on board	Drop
0.054	2	Missing destination type code	Drop
0.04	7	Stored as bait	Drop
0.003	1	Invalid destination type code recorded	Drop
	Greenweight (t) 1937.127 0.895 0.071 0.07 0.069 0.026 0.018 0.018 3.4 0.054 0.04 0.04 0.003	Greenweight (t)No. records1937.12774430.8952310.071100.0720.06960.02670.01813.4190.05420.0470.0031	Greenweight (t)No. recordsDescription1937.1277443Landed in New Zealand to a Licensed Fish Receiver0.895231Recreational catch0.07110Eaten0.072Transferred to another vessel0.0696Accidental loss0.0267Used as bait0.0181Disposed to the Crown0.0181Discarded3.419Retained on board0.0542Missing destination type code0.047Stored as bait0.0031Invalid destination type code recorded

Table C3: Destination codes, total landing greenweight, number of landings and if the records were kept or discarded for analyses for all alfonsino catch for the 1990 to 2014 fishing years for BYX 1–8. BYX 1

BYX 2

Destination code	Greenweight (t)	No. records	Description	Action
L	40692.18	10218	Landed in New Zealand to a Licensed Fish Receiver	Keep
С	14.171	36	Disposed to the Crown	Keep
А	13.246	23	Accidental loss	Keep
Н	5	1	Loss from holding pot	Keep
S	1.083	3	Seized by the Crown	Keep
E	1.036	83	Eaten	Keep
F	0.326	69	Recreational catch	Keep
D	0.2	3	Discarded	Keep
U	0.033	1	Used as bait	Keep
W	0.004	2	Sold at wharf	Keep
R	190.178	88	Retained on board	Drop
Q	0.613	9	Holding receptacle on land	Drop
Null	0.127	2	Missing destination type code	Drop
В	0.015	1	Stored as bait	Drop
BYX 3				

Destination code	Greenweight (t)	No. records	Description	Action
L	20076.221	5890	Landed in New Zealand to a Licensed Fish Receiver	Keep
Т	185.326	87	Transferred to another vessel	Keep
0	137.051	26	Conveyed outside New Zealand	Keep
А	24.423	45	Accidental loss	Keep
С	17.281	6	Disposed to the Crown	Keep
E	15.175	642	Eaten	Keep
D	1.599	10	Discarded	Keep
W	0.284	9	Sold at wharf	Keep
F	0.064	12	Recreational catch	Keep
S	0.003	2	Seized by the Crown	Keep
U	0.003	2	Used as bait	Keep
R	592.001	234	Retained on board	Drop
Invalid	1.553	4	Invalid destination type code recorded	Drop
Q	0.352	44	Holding receptacle on land	Drop
Null	0.031	3	Missing destination type code	Drop
В	0.018	4	Stored as bait	Drop

BYX 7				
Destination code	Greenweight (t)	No. records	Description	Action
L	657.155	1592	Landed in New Zealand to a Licensed Fish Receiver	Keep
E	13.781	476	Eaten	Keep
J	11.383	16	Observer authorised discard	Keep
Т	9.251	30	Transferred to another vessel	Keep
А	7.384	58	Accidental loss	Keep
D	3.13	32	Discarded	Keep
0	0.767	8	Conveyed outside New Zealand	Keep
С	0.067	5	Disposed to the Crown	Keep
W	0.002	1	Sold at wharf	Keep
R	22.947	112	Retained on board	Drop
Null	0.013	1	Missing destination type code	Drop
В	0	1	Stored as bait	Drop

Table C3 continued: Destination codes, total landing greenweight, number of landings and if the records were kept or discarded for analyses for all alfonsino catch for the 1990 to 2014 fishing years for BYX 1–8.

BYX 8

21110				
Destination code	e Greenweight (t)	No. records	Description	Action
L	8.677	155	Landed in New Zealand to a Licensed Fish Receiver	Keep
E	0.252	13	Eaten	Keep
Т	0.12	1	Transferred to another vessel	Keep
F	0.036	14	Recreational catch	Keep
R	0.104	4	Retained on board	Drop
L E T F R	(t) 8.677 0.252 0.12 0.036 0.104	<b>records</b> 155 13 1 14 4	Landed in New Zealand to a Licensed Fish Receiver Eaten Transferred to another vessel Recreational catch Retained on board	Action Keep Keep Keep Drop

					BYX 1						BYX 2
					Merged						Merged
		Un-merged	Merged		estimated		τ	Jn-merged	Merged		estimated
Year	MHR	landings	landings	Catch	% MHR	Year	MHR	landings	landings	Catch	% MHR
1990	24	6	6	2	8	1990	1496	1483	1483	1485	99
1991	17	18	18	18	106	1991	1459	1017	1017	1112	76
1992	7	8	8	6	86	1992	1368	1537	1537	1265	92
1993	6	4	4	3	50	1993	1649	1769	1769	1541	93
1994	7	8	8	6	86	1994	1688	1647	1647	1542	91
1995	11	12	12	3	27	1995	1670	1564	1564	1353	81
1996	11	13	13	10	91	1996	1868	1741	1741	1305	70
1997	39	37	37	31	79	1997	1854	1742	1644	1349	73
1998	14	12	12	9	64	1998	1652	1470	1470	1238	75
1999	37	39	39	31	84	1999	1658	1583	1583	1265	76
2000	25	29	29	9	36	2000	1856	1851	1851	1528	82
2001	25	25	25	18	72	2001	1665	1652	1652	1472	88
2002	123	126	126	105	85	2002	1574	1468	1468	1371	87
2003	136	125	125	114	84	2003	1665	1718	1718	1523	91
2004	219	208	208	182	83	2004	1468	1454	1454	1364	93
2005	300	309	309	269	90	2005	1669	1637	1637	1454	87
2006	195	202	202	146	75	2006	1633	1563	1563	1460	89
2007	66	63	63	45	68	2007	1644	1643	1643	1515	92
2008	154	154	154	100	65	2008	1532	1501	1501	1263	82
2009	172	125	125	103	60	2009	1589	1509	1509	1297	82
2010	185	139	139	56	30	2010	1643	1508	1508	1344	82
2011	48	46	46	38	79	2011	1686	1622	1622	1490	88
2012	45	33	33	27	60	2012	1603	1605	1605	1393	87
2013	22	10	10	6	27	2013	1605	1597	1597	1355	84
2014	29	9	9	6	21	2014	1551	1506	1506	1420	92

Table C4: The reported MHR landings, annual retained landings in the groomed and unmerged dataset, and retained landings in the groomed and merged dataset, estimated catch, and percentage of estimated catch in the MHR landings for BYX 1 and BYX 2 for the 1990 to 2014 fishing years.

					BYX 3						BYX 7
					Merged						Merged
		Un-merged	Merged		estimated		Ur	n-merged	Merged		estimated
Year	MHR	landings	landings	Catch	% MHR	Year	MHR	landings	landings	Catch	% MHR
1990	147	140	140	173	118	1990	21	21	21	1	5
1991	202	182	182	166	82	1991	26	26	26	2	8
1992	264	252	252	230	87	1992	2	2	2	2	100
1993	113	109	109	95	84	1993	12	12	12	0	0
1994	275	327	327	237	86	1994	31	31	31	4	13
1995	482	357	357	351	73	1995	59	60	60	0	0
1996	961	915	915	918	96	1996	66	61	61	4	6
1997	983	948	948	1004	102	1997	77	68	68	3	4
1998	1164	947	947	951	82	1998	67	76	76	14	21
1999	912	819	819	835	92	1999	13	13	13	2	15
2000	743	736	736	737	99	2000	24	17	17	7	29
2001	890	835	835	807	91	2001	21	37	37	7	33
2002	1197	1255	1255	1104	92	2002	10	10	10	5	50
2003	1118	1109	1109	1021	91	2003	7	6	6	2	29
2004	884	870	870	786	89	2004	11	10	10	3	27
2005	1067	1061	1061	953	89	2005	14	12	12	6	43
2006	1068	1154	1154	1005	94	2006	7	6	6	2	29
2007	945	936	936	878	93	2007	21	22	22	13	62
2008	1030	1031	1031	978	95	2008	32	33	33	25	78
2009	895	896	896	874	98	2009	18	18	18	11	61
2010	1016	949	949	931	92	2010	21	21	21	10	48
2011	1084	1086	1086	1041	96	2011	17	15	15	8	47
2012	1037	535	535	527	51	2012	14	14	14	4	29
2013	1013	780	780	734	72	2013	39	37	37	9	23
2014	930	803	803	759	82	2014	58	60	60	21	36

Table C4 continued: The reported MHR, annual retained landings in the groomed and unmerged dataset, and retained landings in the groomed and merged dataset, estimated catch, and percentage of estimated catch in the MHR landings for BYX 3 and BYX 7 for the 1990 to 2014 fishing years.

Table C4 continued: The reported MHR, annual retained landings in the groomed and unmerged dataset, and retained landings in the groomed and merged dataset, estimated catch, and percentage of estimated catch in the MHR landings for BYX 8 for the 1990 to 2014 fishing years.

					BYX 8
					Merged
		Un-merged	Merged		estimated
Year	MHR	landings	landings	Catch	% MHR
1990	_	_	_	_	_
1991	_	_	_	_	_
1992	_	_	_	_	_
1993	_	-	_	_	_
1994	_	-	_	_	_
1995	_	-	_	_	_
1996	-	-	-	-	_
1997	-	-	-	-	_
1998	_	-	_	_	_
1999	3	-	-	-	_
2000	-	-	-	-	_
2001	-	-	-	-	_
2002	-	-	-	-	_
2003	2	-	_	-	-
2004	0	2	2	2	_
2005	2	2	2	1	50
2006	-	-	_	-	-
2007	2	-	-	-	_
2008	-	-	_	-	-
2009	_	-	_	_	_
2010	-	-	_	-	-
2011	-	-	_	-	-
2012	-	-	_	-	-
2013	-	-	_	-	-
2014	_	_	_	_	_

BYX 1			CELR form		Т	CEPR form
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion
1990	107	31	0.29	6	5	0.83
1991	161	41	0.25	5	3	0.60
1992	188	34	0.18	6	5	0.83
1993	165	52	0.32	3	2	0.67
1994	165	45	0.27	10	5	0.50
1995	156	30	0.19	22	18	0.82
1996	145	31	0.21	37	23	0.62
1997	229	31	0.14	51	43	0.84
1998	185	40	0.22	81	64	0.79
1999	167	44	0.26	69	47	0.68
2000	285	65	0.23	63	32	0.51
2001	336	41	0.12	44	34	0.77
2002	352	52	0.15	82	48	0.59
2003	308	53	0.17	69	34	0.49
2004	313	36	0.12	69	40	0.58
2005	311	47	0.15	52	23	0.44
2006	317	62	0.20	61	31	0.51
2007	311	47	0.15	29	9	0.31
2008	25	9	0.36	37	17	0.46
2009	24	1	0.04	20	11	0.55
2010	15	5	0.33	23	8	0.35
2011	12	7	0.58	31	16	0.52
2012	3	0	0.00	42	29	0.69
2013	4	1	0.25	23	14	0.61
2014	4	0	0.00	31	23	0.74

Table C5: Total number of trips, number of trips with zero estimated catch, and proportion of trips with zero estimated catch, by form type for BYX 1 for the 1990 to 2014 fishing years.

BYX 2			CELR form		Т	CEPR form
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion
1990	147	35	0.24	62	21	0.34
1991	150	29	0.19	109	49	0.45
1992	214	49	0.23	143	56	0.39
1993	157	63	0.40	197	58	0.29
1994	133	45	0.34	262	63	0.24
1995	138	37	0.27	252	62	0.25
1996	144	45	0.31	284	57	0.20
1997	108	26	0.24	335	55	0.16
1998	117	38	0.32	328	97	0.30
1999	122	25	0.20	334	78	0.23
2000	143	24	0.17	302	51	0.17
2001	140	23	0.16	232	54	0.23
2002	123	14	0.11	220	46	0.21
2003	147	35	0.24	215	45	0.21
2004	152	32	0.21	171	48	0.28
2005	153	28	0.18	177	37	0.21
2006	170	24	0.14	144	26	0.18
2007	200	39	0.20	150	25	0.17
2008	4	1	0.25	155	31	0.20
2009	1	0	0.00	153	23	0.15
2010	0	0	_	132	28	0.21
2011	0	0	_	124	33	0.27
2012	0	0	_	89	23	0.26
2013	1	0	0.00	109	45	0.41
2014	6	0	0.00	114	35	0.31

Table C5 continued: Total number of trips, number of trips with zero estimated catch, and proportion of trips with zero estimated catch, by form type for BYX 2 for the 1990 to 2014 fishing years.

BYX 3			CELR form		Т	CEPR form
Fishing year	Total	Zero	Proportion	Total	Zero	Proportion
1990	127	85	0.67	23	15	0.65
1991	125	86	0.69	33	12	0.36
1992	122	92	0.75	45	21	0.47
1993	163	137	0.84	49	17	0.35
1994	159	133	0.84	83	34	0.41
1995	160	137	0.86	84	32	0.38
1996	142	117	0.82	101	32	0.32
1997	88	57	0.65	110	31	0.28
1998	133	99	0.74	148	37	0.25
1999	163	108	0.66	156	59	0.38
2000	98	62	0.63	156	58	0.37
2001	214	162	0.76	156	64	0.41
2002	109	78	0.72	168	70	0.42
2003	97	81	0.84	179	73	0.41
2004	83	74	0.89	145	63	0.43
2005	58	48	0.83	141	82	0.58
2006	46	38	0.83	110	51	0.46
2007	11	4	0.36	120	61	0.51
2008	22	7	0.32	112	56	0.50
2009	15	8	0.53	115	66	0.57
2010	18	11	0.61	96	51	0.53
2011	11	2	0.18	105	63	0.60
2012	14	10	0.71	91	63	0.69
2013	10	6	0.60	103	74	0.72
2014	18	11	0.61	126	77	0.61

Table C5 continued: Total number of trips, number of trips with zero estimated catch, and proportion of trips with zero estimated catch, by form type for BYX 3 for the 1990 to 2014 fishing years.

BYX 7	TCEPR form		BYX 8		CEPR form		
Fishing year	Total	Zero	Proportion	Fishing year	Total	Zero	Proportion
1990	13	9	0.69	1990	1	1	1.00
1991	14	8	0.57	1991	0	0	-
1992	18	15	0.83	1992	0	0	-
1993	20	19	0.95	1993	0	0	-
1994	33	13	0.39	1994	1	1	1.00
1995	32	15	0.47	1995	0	0	-
1996	24	15	0.63	1996	0	0	-
1997	37	21	0.57	1997	1	1	1.00
1998	47	33	0.70	1998	0	0	-
1999	41	33	0.80	1999	0	0	_
2000	68	55	0.81	2000	0	0	-
2001	81	57	0.70	2001	0	0	-
2002	59	49	0.83	2002	1	1	1.00
2003	74	58	0.78	2003	3	2	0.67
2004	50	38	0.76	2004	6	3	0.50
2005	44	30	0.68	2005	3	3	1.00
2006	51	47	0.92	2006	6	6	1.00
2007	61	30	0.49	2007	1	1	1.00
2008	50	29	0.58	2008	6	6	1.00
2009	56	40	0.71	2009	2	2	1.00
2010	61	38	0.62	2010	2	2	1.00
2011	78	61	0.78	2011	1	1	1.00
2012	67	56	0.84	2012	0	0	-
2013	74	47	0.64	2013	1	1	1.00
2014	89	50	0.56	2014	2	2	1.00

Table C5 continued: Total number of trips, number of trips with zero estimated catch, and proportion of trips with zero estimated catch, by form type for BYX 7–8 for the 1990 to 2014 fishing years.

Table C6: Proportion of total catch for each region from the groomed and merged data for the 1990 to 2014 fishing years. ECNI = east coast North Island, ChatE = eastern Chatham Rise.

Fishing year	ECNI	ChatE	Other	Total (t)
1990	0.91	0.00	0.08	1 628
1991	0.85	0.01	0.14	1 217
1992	0.85	0.04	0.10	1 744
1993	0.95	0.02	0.03	1 849
1994	0.83	0.12	0.06	1 908
1995	0.81	0.10	0.09	1 947
1996	0.64	0.29	0.07	2 602
1997	0.64	0.28	0.09	2 628
1998	0.61	0.31	0.08	2 480
1999	0.66	0.27	0.07	2 427
2000	0.71	0.21	0.08	2 548
2001	0.66	0.28	0.06	2 548
2002	0.55	0.41	0.04	2 836
2003	0.60	0.32	0.08	2 959
2004	0.63	0.33	0.04	2 544
2005	0.64	0.34	0.01	3 019
2006	0.60	0.39	0.00	2 916
2007	0.64	0.35	0.01	2 662
2008	0.61	0.37	0.02	2 717
2009	0.64	0.35	0.01	2 541
2010	0.63	0.33	0.04	2 611
2011	0.62	0.37	0.02	2 705
2012	0.75	0.24	0.02	2 170
2013	0.67	0.31	0.03	2 421
2014	0.64	0.31	0.05	2 377
Total	0.68	0.28	0.05	60 008

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.06	0.17	0.15	0.13	0.05	0.03	0.06	0.07	0.04	0.02	0.07	0.15	1 628
1991	0.07	0.13	0.05	0.11	0.10	0.14	0.06	0.08	0.06	0.02	0.01	0.18	1 217
1992	0.13	0.19	0.05	0.05	0.04	0.04	0.01	0.11	0.06	0.13	0.10	0.09	1 744
1993	0.06	0.26	0.07	0.03	0.06	0.07	0.03	0.08	0.00	0.03	0.17	0.15	1 849
1994	0.10	0.10	0.07	0.15	0.11	0.06	0.04	0.06	0.08	0.03	0.11	0.10	1 908
1995	0.16	0.19	0.12	0.08	0.08	0.05	0.05	0.03	0.03	0.05	0.07	0.08	1 947
1996	0.08	0.13	0.19	0.17	0.12	0.14	0.04	0.03	0.03	0.03	0.01	0.04	2 602
1997	0.07	0.18	0.24	0.14	0.15	0.09	0.03	0.04	0.02	0.02	0.01	0.02	2 628
1998	0.15	0.07	0.09	0.14	0.26	0.08	0.08	0.04	0.03	0.04	0.00	0.01	2 480
1999	0.08	0.10	0.20	0.17	0.13	0.12	0.05	0.05	0.01	0.01	0.04	0.05	2 4 2 7
2000	0.14	0.12	0.10	0.13	0.15	0.10	0.08	0.04	0.02	0.04	0.04	0.05	2 548
2001	0.11	0.13	0.13	0.17	0.09	0.13	0.07	0.04	0.03	0.02	0.02	0.05	2 548
2002	0.17	0.10	0.13	0.15	0.09	0.10	0.05	0.05	0.03	0.02	0.04	0.06	2 836
2003	0.12	0.14	0.08	0.14	0.12	0.09	0.09	0.07	0.06	0.02	0.03	0.03	2 959
2004	0.12	0.14	0.18	0.12	0.12	0.08	0.13	0.03	0.02	0.01	0.01	0.04	2 544
2005	0.06	0.18	0.10	0.10	0.18	0.11	0.08	0.06	0.02	0.01	0.02	0.08	3 019
2006	0.10	0.17	0.16	0.13	0.12	0.07	0.04	0.06	0.01	0.03	0.01	0.09	2 916
2007	0.10	0.08	0.11	0.08	0.04	0.13	0.08	0.06	0.02	0.06	0.10	0.13	2 662
2008	0.10	0.14	0.12	0.13	0.14	0.06	0.11	0.04	0.02	0.01	0.05	0.07	2 717
2009	0.07	0.16	0.07	0.15	0.10	0.11	0.10	0.04	0.02	0.01	0.07	0.10	2 541
2010	0.06	0.14	0.11	0.11	0.11	0.11	0.09	0.06	0.03	0.02	0.02	0.14	2 611
2011	0.11	0.14	0.14	0.08	0.19	0.13	0.13	0.05	0.00	0.00	0.01	0.03	2 705
2012	0.16	0.11	0.09	0.18	0.13	0.05	0.14	0.05	0.01	0.00	0.05	0.04	2 170
2013	0.08	0.16	0.22	0.24	0.11	0.07	0.07	0.02	0.01	0.01	0.00	0.01	2 421
2014	0.09	0.17	0.16	0.14	0.11	0.09	0.04	0.07	0.02	0.01	0.05	0.03	2 377
Total	0.10	0.14	0.13	0.13	0.12	0.09	0.07	0.05	0.03	0.02	0.04	0.07	60 008

Table C7: Proportion of total catch by month from the groomed and merged data for the 1990 to 2014 fishing years.

Table C8: Proportion of total catch by method from the groomed and merged data for the 1990 to 2014 fishing years. BT; bottom trawl, MWB; midwater trawl on the bottom (within 5 m of the sea bed), MW; midwater trawl, BLL; bottom long line. NB: All other fishing methods combined account for less than 1% of the alfonsino catch in any year.

Fishing year	BT	MWB	MW	BLL	Total (t)
1990	0.10	0.27	0.64	0.00	1 628
1991	0.21	0.46	0.33	0.01	1 217
1992	0.17	0.55	0.26	0.01	1 744
1993	0.14	0.69	0.16	0.00	1 849
1994	0.34	0.52	0.13	0.00	1 908
1995	0.41	0.45	0.13	0.00	1 947
1996	0.54	0.38	0.07	0.00	2 602
1997	0.66	0.28	0.06	0.00	2 628
1998	0.56	0.26	0.17	0.00	2 480
1999	0.47	0.24	0.28	0.00	2 427
2000	0.46	0.25	0.27	0.01	2 548
2001	0.47	0.22	0.29	0.01	2 548
2002	0.55	0.18	0.26	0.01	2 836
2003	0.57	0.28	0.14	0.01	2 959
2004	0.49	0.28	0.22	0.01	2 544
2005	0.54	0.25	0.21	0.01	3 019
2006	0.54	0.30	0.15	0.02	2 916
2007	0.51	0.32	0.14	0.03	2 662
2008	0.38	0.42	0.15	0.05	2 717
2009	0.46	0.32	0.17	0.05	2 541
2010	0.47	0.30	0.19	0.03	2 611
2011	0.52	0.25	0.20	0.04	2 705
2012	0.48	0.17	0.32	0.03	2 170
2013	0.27	0.32	0.39	0.02	2 421
2014	0.56	0.28	0.15	0.02	2 377
Total	0.46	0.32	0.21	0.02	60 008

Table C9: Proportion of total catch by target species from the groomed and merged data for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	HOK	BNS	ORH	CDL	Other	Total (t)
1990	0.82	0.00	0.13	0.01	0.01	0.03	1 628
1991	0.66	0.07	0.15	0.02	0.05	0.04	1 217
1992	0.73	0.14	0.04	0.07	0.01	0.02	1 744
1993	0.77	0.09	0.06	0.03	0.02	0.04	1 849
1994	0.64	0.06	0.00	0.21	0.04	0.04	1 908
1995	0.63	0.09	0.01	0.15	0.06	0.05	1 947
1996	0.61	0.19	0.00	0.07	0.06	0.07	2 602
1997	0.55	0.30	0.02	0.04	0.03	0.06	2 628
1998	0.53	0.28	0.01	0.08	0.03	0.07	2 480
1999	0.64	0.21	0.01	0.07	0.05	0.03	2 427
2000	0.63	0.24	0.01	0.04	0.04	0.03	2 548
2001	0.64	0.24	0.04	0.01	0.04	0.03	2 548
2002	0.59	0.15	0.14	0.01	0.03	0.08	2 836
2003	0.60	0.24	0.08	0.01	0.05	0.02	2 959
2004	0.70	0.16	0.09	0.02	0.02	0.01	2 544
2005	0.79	0.10	0.07	0.01	0.02	0.01	3 019
2006	0.77	0.08	0.06	0.04	0.04	0.01	2 916
2007	0.78	0.10	0.03	0.01	0.05	0.03	2 662
2008	0.74	0.10	0.06	0.00	0.04	0.05	2 717
2009	0.75	0.13	0.06	0.00	0.03	0.03	2 541
2010	0.83	0.05	0.05	0.02	0.04	0.02	2 611
2011	0.80	0.11	0.04	0.00	0.03	0.01	2 705
2012	0.82	0.10	0.03	0.02	0.01	0.01	2 170
2013	0.82	0.12	0.02	0.00	0.03	0.01	2 421
2014	0.79	0.13	0.02	0.01	0.04	0.02	2 377
Total	0.70	0.15	0.05	0.03	0.03	0.03	60 008

Table C10: Proportion of total catch by flag nationality from the groomed and merged data for the 199	90 to 2014
fishing years.	

Fishing year	NZ	Unknown	Korea	Other	Total (t)
1990	0.27	0.73	0.00	0.00	1 628
1991	0.55	0.45	0.00	0.00	1 217
1992	0.60	0.40	0.00	0.00	1 744
1993	0.48	0.52	0.00	0.00	1 849
1994	0.35	0.65	0.00	0.00	1 908
1995	0.40	0.58	0.01	0.00	1 947
1996	0.35	0.65	0.00	0.00	2 602
1997	0.39	0.60	0.00	0.01	2 628
1998	0.45	0.55	0.00	0.00	2 480
1999	0.64	0.35	0.00	0.00	2 427
2000	0.59	0.40	0.00	0.00	2 548
2001	0.61	0.38	0.00	0.00	2 548
2002	0.60	0.39	0.00	0.00	2 836
2003	0.59	0.40	0.00	0.01	2 959
2004	0.61	0.39	0.00	0.00	2 544
2005	0.67	0.33	0.00	0.00	3 019
2006	0.69	0.31	0.00	0.00	2 916
2007	0.70	0.28	0.01	0.00	2 662
2008	0.68	0.31	0.01	0.01	2 717
2009	0.70	0.29	0.00	0.00	2 541
2010	0.67	0.32	0.00	0.00	2 611
2011	0.61	0.38	0.00	0.00	2 705
2012	0.70	0.29	0.00	0.00	2 170
2013	0.70	0.28	0.01	0.00	2 421
2014	0.70	0.28	0.01	0.01	2 377
Total	0.58	0.41	< 0.01	< 0.01	60 008

Table C11: Proportion of alfonsino catch reported by gear type from the groomed and merged data from the east coast North Island fishery area for the 1990 to 2014 fishing years. MWB = midwater trawl on the bottom (within 5 m of the sea bed), BT = bottom trawl, MW = midwater trawl, BLL = bottom longline.

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	0.28	0.09	0.63	0.00	1 486
1991	0.54	0.18	0.28	0.01	1 033
1992	0.63	0.09	0.27	0.01	1 491
1993	0.71	0.11	0.17	0.00	1 763
1994	0.62	0.22	0.16	0.00	1 577
1995	0.53	0.34	0.12	0.01	1 577
1996	0.51	0.42	0.06	0.00	1 673
1997	0.41	0.51	0.07	0.00	1 674
1998	0.39	0.35	0.25	0.00	1 519
1999	0.32	0.25	0.42	0.01	1 598
2000	0.33	0.29	0.36	0.01	1 813
2001	0.31	0.25	0.41	0.02	1 675
2002	0.32	0.20	0.47	0.01	1 548
2003	0.45	0.31	0.22	0.01	1 787
2004	0.44	0.21	0.33	0.02	1 613
2005	0.36	0.33	0.30	0.01	1 935
2006	0.41	0.39	0.17	0.03	1 756
2007	0.36	0.45	0.16	0.04	1 703
2008	0.40	0.35	0.18	0.07	1 651
2009	0.35	0.37	0.20	0.08	1 626
2010	0.30	0.45	0.19	0.05	1 641
2011	0.22	0.49	0.23	0.06	1 664
2012	0.15	0.51	0.30	0.04	1 620
2013	0.31	0.27	0.40	0.02	1 614
2014	0.26	0.55	0.16	0.03	1 515
Total	0.39	0.32	0.26	0.02	40 553

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.06	0.19	0.15	0.11	0.05	0.03	0.06	0.08	0.05	0.02	0.04	0.16	1 486
1991	0.07	0.16	0.05	0.11	0.06	0.15	0.05	0.09	0.05	0.02	0.01	0.18	1 033
1992	0.15	0.22	0.06	0.04	0.04	0.01	0.01	0.10	0.05	0.14	0.12	0.04	1 491
1993	0.05	0.27	0.08	0.03	0.06	0.06	0.03	0.08	0.00	0.03	0.17	0.15	1 763
1994	0.11	0.12	0.07	0.13	0.10	0.04	0.04	0.07	0.09	0.03	0.13	0.08	1 577
1995	0.18	0.21	0.10	0.09	0.07	0.05	0.05	0.03	0.03	0.06	0.08	0.05	1 577
1996	0.11	0.18	0.19	0.14	0.09	0.06	0.05	0.04	0.04	0.04	0.01	0.04	1 673
1997	0.09	0.27	0.13	0.10	0.17	0.08	0.03	0.05	0.02	0.01	0.01	0.04	1 674
1998	0.20	0.10	0.06	0.10	0.23	0.11	0.05	0.06	0.03	0.03	0.00	0.02	1 519
1999	0.11	0.15	0.15	0.14	0.15	0.04	0.06	0.07	0.01	0.01	0.07	0.05	1 598
2000	0.19	0.07	0.09	0.15	0.11	0.08	0.07	0.05	0.03	0.05	0.05	0.06	1 813
2001	0.11	0.19	0.12	0.14	0.10	0.10	0.05	0.05	0.04	0.04	0.02	0.03	1 675
2002	0.12	0.08	0.04	0.14	0.12	0.16	0.05	0.07	0.06	0.03	0.06	0.06	1 548
2003	0.15	0.13	0.10	0.12	0.12	0.06	0.04	0.08	0.09	0.03	0.03	0.05	1 787
2004	0.18	0.09	0.13	0.12	0.09	0.12	0.15	0.05	0.02	0.01	0.01	0.04	1 613
2005	0.07	0.24	0.12	0.07	0.12	0.07	0.11	0.08	0.02	0.02	0.03	0.06	1 935
2006	0.14	0.22	0.17	0.12	0.08	0.06	0.03	0.05	0.02	0.05	0.02	0.03	1 756
2007	0.14	0.12	0.12	0.05	0.04	0.07	0.08	0.08	0.03	0.09	0.15	0.02	1 703
2008	0.03	0.13	0.10	0.12	0.12	0.10	0.18	0.06	0.04	0.02	0.06	0.05	1 651
2009	0.10	0.18	0.07	0.17	0.13	0.13	0.09	0.04	0.00	0.02	0.03	0.03	1 626
2010	0.10	0.22	0.12	0.14	0.15	0.07	0.02	0.02	0.03	0.02	0.04	0.07	1 641
2011	0.06	0.22	0.15	0.08	0.16	0.14	0.08	0.06	0.00	0.00	0.01	0.03	1 664
2012	0.20	0.14	0.12	0.21	0.17	0.06	0.04	0.04	0.00	0.00	0.01	0.00	1 620
2013	0.11	0.08	0.27	0.26	0.08	0.10	0.04	0.02	0.02	0.01	0.00	0.01	1 614
2014	0.04	0.20	0.20	0.11	0.08	0.14	0.06	0.11	0.03	0.00	0.01	0.03	1 515
Total	0.12	0.17	0.12	0.12	0.11	0.08	0.06	0.06	0.03	0.03	0.05	0.05	40 553

Table C12: Proportion of alfonsino catch from the groomed and merged data reported each month from the east coast North Island fishery area for the 1990 to 2014 fishing years.

Table C13: Proportion of alfonsino catch from the groomed and merged data reported for each statistical area from the east coast North Island fishery area for the 1990 to 2014 fishing years.

Fishing year	013	014	015	204	Other	Total (t)
1990	0.03	0.42	0.22	0.32	0.00	1 486
1991	0.11	0.17	0.13	0.57	0.02	1 033
1992	0.18	0.09	0.26	0.45	0.02	1 491
1993	0.06	0.15	0.41	0.36	0.03	1 763
1994	0.12	0.23	0.29	0.27	0.10	1 577
1995	0.05	0.21	0.28	0.29	0.16	1 577
1996	0.10	0.29	0.26	0.14	0.21	1 673
1997	0.12	0.42	0.23	0.09	0.15	1 674
1998	0.09	0.45	0.21	0.10	0.17	1 519
1999	0.27	0.16	0.27	0.13	0.18	1 598
2000	0.13	0.26	0.32	0.13	0.16	1 813
2001	0.14	0.29	0.34	0.09	0.15	1 675
2002	0.17	0.17	0.35	0.15	0.16	1 548
2003	0.14	0.14	0.35	0.29	0.09	1 787
2004	0.18	0.14	0.43	0.13	0.12	1 613
2005	0.12	0.19	0.36	0.15	0.18	1 935
2006	0.14	0.10	0.35	0.25	0.16	1 756
2007	0.11	0.12	0.44	0.26	0.06	1 703
2008	0.08	0.11	0.38	0.23	0.21	1 651
2009	0.06	0.11	0.42	0.24	0.16	1 626
2010	0.03	0.14	0.41	0.29	0.13	1 641
2011	0.16	0.07	0.38	0.31	0.07	1 664
2012	0.06	0.09	0.46	0.35	0.04	1 620
2013	0.20	0.09	0.44	0.22	0.05	1 614
2014	0.06	0.06	0.49	0.34	0.04	1 515
Total	0.12	0.19	0.34	0.24	0.11	40 553

Table C14: Proportion of alfonsino catch from the groomed and merged data reported by target species from the east coast North Island fishery area for the 1990 to 2014 fishing years. See Table C48 for an explanation of species codes used in this report.

Fishing year	BYX	HOK	CDL	BNS	ORH	Other	Total (t)
1990	0.81	0.00	0.01	0.14	0.01	0.02	1 486
1991	0.69	0.05	0.04	0.18	0.03	0.02	1 033
1992	0.81	0.08	0.01	0.05	0.04	0.02	1 491
1993	0.80	0.06	0.02	0.06	0.03	0.02	1 763
1994	0.77	0.03	0.05	0.01	0.13	0.03	1 577
1995	0.71	0.05	0.08	0.02	0.10	0.03	1 577
1996	0.55	0.22	0.09	0.01	0.05	0.09	1 673
1997	0.48	0.34	0.05	0.03	0.02	0.06	1 674
1998	0.53	0.31	0.05	0.02	0.02	0.08	1 519
1999	0.56	0.28	0.08	0.01	0.05	0.02	1 598
2000	0.57	0.27	0.06	0.02	0.04	0.04	1 813
2001	0.61	0.27	0.06	0.04	0.01	0.02	1 675
2002	0.67	0.22	0.06	0.04	0.00	0.01	1 548
2003	0.57	0.25	0.08	0.08	0.01	0.01	1 787
2004	0.67	0.22	0.03	0.06	0.01	0.01	1 613
2005	0.77	0.13	0.04	0.05	0.00	0.01	1 935
2006	0.73	0.14	0.06	0.05	0.00	0.02	1 756
2007	0.71	0.15	0.07	0.05	0.01	0.01	1 703
2008	0.65	0.15	0.06	0.10	0.00	0.05	1 651
2009	0.66	0.18	0.05	0.09	0.00	0.02	1 626
2010	0.79	0.03	0.06	0.07	0.03	0.02	1 641
2011	0.71	0.17	0.05	0.06	0.00	0.01	1 664
2012	0.79	0.13	0.02	0.04	0.02	0.00	1 620
2013	0.78	0.15	0.04	0.02	0.00	0.00	1 614
2014	0.76	0.13	0.06	0.03	0.01	0.02	1 515
Total	0.68	0.16	0.05	0.05	0.03	0.03	40 553

Table C15: Proportion of alfonsino catch from the groomed estimated catch data from the east coast North Island sub regions identified in this study for the 1990 to 2014 fishing years. EN = East Northland, BOP = Bay of Plenty, CAPE = East Cape, TUAH = Tuaheni Bank, RCRG = Ritchie Bank/Rock Garden, MCMB = Motukura Bank/Madden Canyon, WAIR = Wairarapa. Total catch values are lower than in the groomed and merged data because only data recorded at the fishing event level with latitude and longitude recorded can be assigned to a sub region (i.e. CELR data cannot be included).

Fishing year	EN	BOP	CAPE	TUAH	RCRG	MCMB	WAIR	Other	Total (t)
1990	0	0	0.00	0.03	0.70	0.00	0.26	0.00	683
1991	0	0.02	0.00	0.13	0.71	0.01	0.14	0.02	929
1992	0	0	0.00	0.16	0.48	0.07	0.29	0.00	1 100
1993	0	0	0.00	0.05	0.41	0.15	0.39	0.01	1 461
1994	0	0	0.05	0.11	0.30	0.25	0.27	0.02	1 514
1995	0	0	0.14	0.03	0.34	0.22	0.23	0.03	1 317
1996	0.01	0	0.08	0.08	0.17	0.39	0.26	0.02	1 282
1997	0.02	0	0.02	0.09	0.09	0.39	0.33	0.08	1 347
1998	0	0	0.03	0.09	0.12	0.50	0.24	0.02	1 222
1999	0.01	0.02	0.10	0.09	0.17	0.16	0.43	0.05	942
2000	0	0	0.05	0.06	0.18	0.21	0.47	0.03	1 192
2001	0	0	0.09	0.04	0.11	0.28	0.45	0.02	1 160
2002	0.01	0.01	0.07	0.06	0.24	0.13	0.46	0.04	1 073
2003	0	0.01	0.01	0.11	0.33	0.11	0.40	0.04	1 476
2004	0.07	0	0.00	0.08	0.17	0.13	0.53	0.09	1 299
2005	0.12	0.01	0.01	0.07	0.18	0.18	0.43	0.13	1 482
2006	0.07	0	0.02	0.12	0.29	0.08	0.40	0.09	1 462
2007	0.01	0.01	0.01	0.08	0.30	0.11	0.47	0.04	1 481
2008	0.04	0.04	0.06	0.07	0.26	0.12	0.40	0.09	1 365
2009	0.04	0.04	0.06	0.05	0.27	0.12	0.42	0.09	1 408
2010	0.03	0.01	0.03	0.03	0.31	0.13	0.43	0.07	1 397
2011	0.02	0	0.03	0.20	0.32	0.06	0.35	0.04	1 527
2012	0.02	0	0.01	0.07	0.38	0.10	0.41	0.03	1 419
2013	0	0	0.00	0.21	0.22	0.07	0.48	0.01	1 361
2014	0	0	0.02	0.06	0.33	0.06	0.52	0.01	1 428
Total	0.02	0.01	0.04	0.09	0.28	0.16	0.38	0.04	32 326

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
_	_	_	_	_	_	_	_	_	_	_	_	_
_	_	_	_	_	_	_	_	_	_	_	_	_
_	_	_	_	_	_	_	_	_	_	_	_	-
_	_	_	_	_	_	_	_	_	_	_	_	-
_	_	_	-	-	_	_	_	_	-	-	_	-
_	_	_	_	_	_	_	_	_	_	_	_	-
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.03	24
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.02	1
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.67	9
0.89	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.02	0.00	1
0.86	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	1
0.88	0.01	0.01	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.01	6
0.91	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.07	0.00	0.00	< 1
0.00	0.00	0.00	0.00	0.00	0.20	0.14	0.04	0.00	0.00	0.19	0.42	96
0.18	0.16	0.00	0.00	0.02	0.12	0.00	0.02	0.03	0.01	0.28	0.17	171
0.00	0.35	0.00	0.12	0.01	0.00	0.07	0.05	0.09	0.09	0.16	0.06	109
0.00	0.00	0.36	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.21	0.00	20
0.03	0.00	0.02	0.00	0.00	0.00	0.74	0.00	0.04	0.03	0.00	0.12	49
0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.22	0.00	0.07	50
0.00	0.03	0.00	0.00	0.00	0.64	0.00	0.00	0.01	0.02	0.00	0.28	37
0.01	0.10	0.01	0.15	0.52	0.10	0.01	0.02	0.01	0.01	0.01	0.04	29
0.09	0.34	0.06	0.09	0.01	0.09	0.09	0.05	0.01	0.00	0.16	0.00	22
0.07	0.00	0.03	0.02	0.03	0.01	0.00	0.06	0.00	0.77	0.00	0.00	5
0.04	0.11	0.02	0.02	0.37	0.03	0.03	0.10	0.24	0.01	0.01	0.03	3
0.08	0.12	0.02	0.03	0.03	0.11	0.16	0.03	0.03	0.05	0.19	0.16	639
	Oct 	Oct Nov   - -   - -   - -   - -   - -   - -   - -   - -   1.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.88 0.01   0.86 0.00   0.88 0.01   0.91 0.00   0.88 0.01   0.91 0.00   0.020 0.35   0.00 0.00   0.03 0.00   0.00 0.03   0.01 0.10   0.02 0.34   0.07 0.00   0.04 0.11   0.08 0.12	Oct Nov Dec   - - -   - - -   - - -   - - -   - - -   - - -   - - -   - - -   - - -   1.00 0.00 0.00   0.00 0.00 0.00   0.00 0.00 0.00   0.00 0.00 0.00   0.89 0.00 0.00   0.86 0.00 0.01   0.86 0.00 0.01   0.91 0.00 0.00   0.88 0.01 0.01   0.91 0.00 0.00   0.00 0.00 0.00   0.00 0.00 0.02   0.00 0.00 0.01   0.00 0.03 0.00   0.01 0.10 0.01	Oct Nov Dec Jan   - - - -   - - - -   - - - -   - - - -   - - - -   - - - -   - - - -   - - - -   - - - -   1.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00   0.89 0.00 0.00 0.00   0.86 0.00 0.01 0.00   0.88 0.01 0.01 0.00   0.91 0.00 0.00 0.00   0.18 0.16 0.00 0.00   0.00 0.00 0.00 0.00	Oct Nov Dec Jan Feb   - - - - -   - - - - -   - - - - -   - - - - -   - - - - -   - - - - -   - - - - -   - - - - -   1.00 0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00 0.00   0.86 0.00 0.11 0.00 0.00   0.88 0.01 0.01 0.00 0.00   0.88 0.01 0.00 0.00 0.00   0.00 0.35 0.00 0.00	Oct Nov Dec Jan Feb Mar   - - - - - -   - - - - - -   - - - - - -   - - - - - -   - - - - - -   - - - - - -   - - - - - -   1.00 0.00 0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00 0.00 0.00   0.00 0.00 0.00 0.00 0.00 0.00   0.88 0.01 0.01 0.00 0.00 0.00   0.88 0.01 0.01 0.00 0.00 0.00   0.18 0.16 <	Oct Nov Dec Jan Feb Mar Apr   - - - - - - - -   - - - - - - - -   - - - - - - - -   - - - - - - - -   - - - - - - - -   - - - - - - - - -   1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00 0	OctNovDecJanFebMarAprMay $   -$	OctNovDecJanFebMarAprMayJun $   -$ <td>OctNovDecJanFebMarAprMayJunJul<math>  -</math><td>OctNovDecJanFebMarAprMayJunJulAug<math>   -</math>&lt;</td><td>OctNovDecJanFebMarAprMayJunJulAugSep<math>  -</math>&lt;</td></td>	OctNovDecJanFebMarAprMayJunJul $  -$ <td>OctNovDecJanFebMarAprMayJunJulAug<math>   -</math>&lt;</td> <td>OctNovDecJanFebMarAprMayJunJulAugSep<math>  -</math>&lt;</td>	OctNovDecJanFebMarAprMayJunJulAug $   -$ <	OctNovDecJanFebMarAprMayJunJulAugSep $  -$ <

Table C16: Proportion of alfonsino catch from the groomed estimated catch data by month from the East Northland sub region for the 1990 to 2014 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	_	_	_	_	_	_	_	_	_	_	_	_	_
1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	14
1992	_	_	_	_	_	_	_	_	_	_	_	_	_
1993	_	_	_	_	_	_	_	_	_	_	_	_	_
1994	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.27	0.23	< 1
1995	_	_	_	_	_	_	_	_	_	_	_	_	_
1996	0.44	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.12	< 1
1997	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.92	< 1
1998	0.03	0.00	0.00	0.00	0.00	0.01	0.34	0.00	0.00	0.00	0.34	0.28	1
1999	0.08	0.00	0.00	0.83	0.00	0.01	0.00	0.07	0.00	0.00	0.00	0.01	19
2000	0.17	0.07	0.09	0.00	0.03	0.04	0.28	0.22	0.01	0.00	0.01	0.09	1
2001	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.04	0.93	0.00	0.00	0.00	3
2002	0.09	0.00	0.00	0.00	0.40	0.26	0.24	0.00	0.00	0.00	0.00	0.00	12
2003	0.00	0.00	0.00	0.02	0.00	0.06	0.01	0.00	0.09	0.02	0.01	0.79	14
2004	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.25	0.00	0.00	0.00	0.00	< 1
2005	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.93	0.03	16
2006	0.84	0.00	0.05	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.09	0.00	2
2007	0.16	0.00	0.10	0.03	0.00	0.14	0.21	0.01	0.00	0.00	0.36	0.00	13
2008	0.02	0.02	0.04	0.04	0.01	0.33	0.00	0.09	0.00	0.01	0.43	0.01	48
2009	0.01	0.01	0.01	0.23	0.71	0.01	0.00	0.00	0.00	0.01	0.00	0.00	51
2010	0.08	0.03	0.08	0.07	0.01	0.07	0.04	0.02	0.04	0.10	0.45	0.03	9
2011	0.08	0.02	0.03	0.02	0.01	0.01	0.02	0.65	0.08	0.03	0.01	0.04	7
2012	0.01	0.03	0.02	0.08	0.14	0.14	0.09	0.06	0.09	0.08	0.23	0.04	4
2013	0.19	0.15	0.15	0.06	0.01	0.13	0.05	0.02	0.05	0.03	0.13	0.03	1
2014	0.22	0.21	0.02	0.00	0.10	0.03	0.02	0.00	0.01	0.00	0.18	0.20	1
Total	0.05	0.01	0.02	0.14	0.20	0.11	0.03	0.05	0.03	0.08	0.21	0.06	217

Table C17: Proportion of alfonsino catch from the groomed estimated catch data by month from Bay of Plenty sub region for the 1990 to 2014 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	_	_	_	_	_	_	_	_	_	_	_	_	_
1991	_	_	_	_	_	_	_	_	_	_	_	_	_
1992	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
1993	_	_	_	_	_	_	_	_	_	_	_	_	_
1994	0.00	0.00	0.05	0.00	0.20	0.25	0.21	0.30	0.00	0.00	0.00	0.00	74
1995	0.08	0.19	0.10	0.02	0.02	0.14	0.24	0.02	0.00	0.05	0.09	0.05	190
1996	0.04	0.19	0.05	0.39	0.06	0.10	0.14	0.04	0.00	0.00	0.00	0.00	107
1997	0.70	0.16	0.00	0.10	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	22
1998	0.15	0.02	0.01	0.02	0.36	0.19	0.14	0.05	0.03	0.00	0.00	0.02	42
1999	0.20	0.13	0.10	0.17	0.13	0.02	0.04	0.13	0.01	0.02	0.04	0.00	91
2000	0.15	0.03	0.04	0.12	0.17	0.00	0.04	0.04	0.10	0.22	0.08	0.00	61
2001	0.11	0.38	0.33	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110
2002	0.31	0.10	0.00	0.27	0.13	0.15	0.00	0.02	0.00	0.00	0.00	0.00	80
2003	0.10	0.00	0.24	0.00	0.00	0.03	0.33	0.29	0.01	0.00	0.00	0.00	9
2004	0.55	0.00	0.00	0.00	0.00	0.02	0.32	0.10	0.00	0.00	0.00	0.00	1
2005	0.00	0.00	0.00	0.00	0.00	0.12	0.07	0.26	0.10	0.00	0.00	0.44	14
2006	0.00	0.05	0.01	0.09	0.25	0.02	0.18	0.29	0.07	0.01	0.01	0.01	29
2007	0.05	0.20	0.08	0.37	0.17	0.02	0.07	0.02	0.00	0.00	0.01	0.00	14
2008	0.01	0.01	0.00	0.03	0.75	0.01	0.02	0.15	0.00	0.01	0.00	0.00	84
2009	0.00	0.40	0.10	0.15	0.08	0.09	0.00	0.01	0.00	0.02	0.01	0.13	78
2010	0.07	0.20	0.24	0.23	0.12	0.03	0.02	0.02	0.03	0.02	0.01	0.04	41
2011	0.25	0.10	0.05	0.06	0.30	0.02	0.05	0.18	0.00	0.00	0.00	0.00	49
2012	0.05	0.06	0.00	0.60	0.23	0.05	0.00	0.00	0.00	0.00	0.00	0.01	12
2013	0.04	0.01	0.18	0.11	0.12	0.36	0.00	0.14	0.02	0.03	0.00	0.00	6
2014	0.00	0.01	0.00	0.13	0.65	0.07	0.02	0.00	0.00	0.00	0.11	0.01	25
Total	0.11	0.15	0.09	0.13	0.18	0.08	0.09	0.08	0.01	0.02	0.03	0.03	1 137

## Table C18: Proportion of alfonsino catch from the groomed estimated catch data by month from the East Cape sub region for the 1990 to 2014 fishing years.

Table C19: Proportion of alfonsino catch from the groomed estimated catch data by month from the Tuaheni Bank sub region for the 1990 to 2014 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.00	0.02	0.00	0.60	0.08	0.00	0.02	0.00	0.00	0.00	0.00	0.28	22
1991	0.00	0.05	0.04	0.17	0.00	0.00	0.24	0.50	0.00	0.00	0.00	0.00	116
1992	0.21	0.00	0.01	0.13	0.07	0.00	0.00	0.23	0.00	0.00	0.29	0.05	179
1993	0.03	0.04	0.00	0.02	0.24	0.34	0.08	0.05	0.00	0.16	0.00	0.05	74
1994	0.18	0.13	0.01	0.14	0.07	0.10	0.01	0.02	0.07	0.06	0.21	0.00	171
1995	0.10	0.03	0.00	0.03	0.00	0.04	0.07	0.07	0.21	0.32	0.01	0.12	43
1996	0.03	0.25	0.29	0.23	0.03	0.10	0.00	0.04	0.01	0.00	0.01	0.00	99
1997	0.02	0.15	0.05	0.07	0.36	0.15	0.01	0.13	0.02	0.03	0.00	0.01	128
1998	0.00	0.03	0.00	0.44	0.34	0.00	0.01	0.07	0.10	0.00	0.00	0.00	105
1999	0.07	0.37	0.08	0.06	0.05	0.02	0.12	0.17	0.00	0.00	0.03	0.03	84
2000	0.05	0.00	0.05	0.22	0.33	0.02	0.14	0.05	0.00	0.11	0.03	0.00	72
2001	0.11	0.04	0.00	0.20	0.17	0.00	0.01	0.09	0.38	0.00	0.00	0.01	50
2002	0.05	0.02	0.00	0.03	0.03	0.01	0.00	0.16	0.26	0.00	0.38	0.05	61
2003	0.04	0.00	0.03	0.00	0.00	0.02	0.07	0.29	0.43	0.01	0.11	0.00	166
2004	0.00	0.00	0.00	0.00	0.00	0.02	0.73	0.14	0.02	0.08	0.00	0.00	109
2005	0.00	0.59	0.03	0.02	0.00	0.00	0.16	0.06	0.06	0.02	0.06	0.01	102
2006	0.05	0.47	0.25	0.08	0.04	0.01	0.00	0.02	0.01	0.06	0.00	0.00	181
2007	0.00	0.01	0.05	0.04	0.01	0.01	0.15	0.18	0.06	0.00	0.36	0.12	116
2008	0.03	0.13	0.04	0.05	0.02	0.19	0.02	0.08	0.05	0.09	0.27	0.02	94
2009	0.06	0.15	0.02	0.37	0.11	0.13	0.00	0.02	0.00	0.06	0.07	0.01	67
2010	0.08	0.08	0.02	0.04	0.07	0.03	0.00	0.01	0.01	0.34	0.33	0.00	42
2011	0.06	0.09	0.07	0.11	0.30	0.18	0.11	0.08	0.00	0.00	0.00	0.00	301
2012	0.01	0.05	0.02	0.63	0.26	0.01	0.01	0.00	0.00	0.00	0.00	0.00	95
2013	0.00	0.08	0.62	0.21	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	289
2014	0.01	0.60	0.12	0.08	0.01	0.09	0.00	0.07	0.00	0.00	0.01	0.01	85
Total	0.05	0.14	0.12	0.14	0.11	0.06	0.08	0.11	0.06	0.04	0.08	0.02	2 850

Table C20: Proportion of alfonsino catch from the groomed estimated catch data by month from the Ritchie Bank/Rock Garden sub region for the 1990 to 2014 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.09	0.36	0.15	0.06	0.00	0.00	0.01	0.13	0.00	0.00	0.01	0.19	480
1991	0.11	0.17	0.07	0.14	0.08	0.21	0.00	0.01	0.00	0.00	0.00	0.22	659
1992	0.45	0.19	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.12	0.17	0.04	529
1993	0.21	0.05	0.07	0.03	0.02	0.04	0.02	0.01	0.00	0.00	0.26	0.27	597
1994	0.21	0.15	0.02	0.02	0.00	0.00	0.04	0.02	0.06	0.00	0.18	0.30	456
1995	0.34	0.46	0.00	0.03	0.04	0.04	0.00	0.02	0.03	0.01	0.02	0.00	450
1996	0.34	0.51	0.00	0.02	0.00	0.00	0.01	0.01	0.09	0.01	0.00	0.01	224
1997	0.22	0.44	0.15	0.03	0.01	0.01	0.01	0.06	0.02	0.00	0.00	0.05	117
1998	0.18	0.17	0.04	0.08	0.29	0.02	0.03	0.01	0.02	0.12	0.00	0.03	145
1999	0.00	0.01	0.15	0.22	0.36	0.07	0.04	0.06	0.01	0.00	0.06	0.02	159
2000	0.37	0.03	0.12	0.05	0.07	0.05	0.09	0.07	0.00	0.00	0.00	0.14	210
2001	0.29	0.17	0.21	0.01	0.10	0.03	0.10	0.05	0.03	0.00	0.00	0.02	125
2002	0.16	0.04	0.02	0.16	0.22	0.21	0.01	0.04	0.03	0.01	0.00	0.09	258
2003	0.31	0.11	0.19	0.08	0.01	0.01	0.10	0.05	0.06	0.00	0.00	0.08	486
2004	0.19	0.05	0.02	0.06	0.02	0.36	0.09	0.20	0.00	0.00	0.00	0.00	217
2005	0.05	0.22	0.01	0.06	0.03	0.04	0.38	0.20	0.00	0.01	0.00	0.00	264
2006	0.15	0.23	0.19	0.02	0.10	0.13	0.04	0.06	0.02	0.03	0.00	0.03	425
2007	0.26	0.06	0.12	0.12	0.06	0.08	0.06	0.04	0.01	0.16	0.03	0.01	438
2008	0.01	0.05	0.12	0.28	0.09	0.22	0.11	0.04	0.04	0.00	0.00	0.03	350
2009	0.10	0.16	0.03	0.16	0.27	0.23	0.02	0.00	0.00	0.00	0.01	0.01	379
2010	0.16	0.29	0.11	0.11	0.12	0.07	0.01	0.02	0.03	0.01	0.07	0.01	436
2011	0.10	0.19	0.14	0.08	0.08	0.13	0.11	0.06	0.00	0.00	0.00	0.10	488
2012	0.17	0.11	0.05	0.46	0.04	0.15	0.00	0.00	0.00	0.00	0.00	0.00	533
2013	0.02	0.04	0.17	0.22	0.27	0.20	0.06	0.01	0.00	0.00	0.00	0.00	305
2014	0.00	0.13	0.19	0.11	0.02	0.27	0.04	0.14	0.09	0.00	0.00	0.00	474
Total	0.18	0.17	0.09	0.11	0.08	0.11	0.05	0.05	0.02	0.02	0.04	0.08	9 203

Table C21: Proportion of alfonsino catch from the groomed estimated catch data by month from the Motukura Bank/Madden Canyon sub region for the 1990 to 2014 fishing years.

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
0.00	0.00	0.00	0.58	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.41	1
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	7
0.00	0.01	0.87	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73
0.00	0.16	0.00	0.03	0.21	0.09	0.04	0.01	0.00	0.09	0.28	0.07	215
0.00	0.01	0.13	0.28	0.15	0.04	0.04	0.03	0.09	0.05	0.16	0.02	374
0.10	0.00	0.30	0.18	0.11	0.00	0.00	0.02	0.00	0.18	0.11	0.00	291
0.12	0.13	0.20	0.09	0.00	0.06	0.05	0.03	0.11	0.10	0.04	0.06	499
0.06	0.24	0.14	0.16	0.19	0.12	0.01	0.07	0.00	0.01	0.00	0.01	528
0.30	0.21	0.00	0.06	0.19	0.10	0.07	0.01	0.00	0.03	0.00	0.02	616
0.22	0.16	0.29	0.05	0.12	0.02	0.05	0.06	0.00	0.02	0.00	0.00	154
0.09	0.02	0.11	0.27	0.22	0.08	0.05	0.09	0.00	0.00	0.01	0.07	248
0.07	0.18	0.07	0.04	0.04	0.32	0.07	0.09	0.05	0.02	0.00	0.07	324
0.00	0.00	0.00	0.28	0.17	0.23	0.06	0.03	0.12	0.03	0.08	0.01	142
0.04	0.00	0.00	0.13	0.27	0.03	0.03	0.00	0.01	0.13	0.22	0.14	161
0.44	0.01	0.02	0.04	0.03	0.28	0.04	0.00	0.11	0.01	0.00	0.01	165
0.00	0.03	0.38	0.14	0.06	0.03	0.11	0.19	0.01	0.00	0.00	0.06	269
0.21	0.42	0.02	0.09	0.00	0.07	0.00	0.00	0.00	0.09	0.09	0.01	111
0.07	0.04	0.00	0.00	0.00	0.00	0.06	0.04	0.03	0.38	0.33	0.05	167
0.01	0.22	0.18	0.00	0.00	0.02	0.01	0.16	0.00	0.06	0.17	0.16	169
0.10	0.03	0.07	0.11	0.10	0.10	0.14	0.08	0.00	0.07	0.05	0.14	168
0.08	0.24	0.07	0.21	0.12	0.00	0.00	0.13	0.00	0.08	0.01	0.05	176
0.13	0.39	0.10	0.04	0.19	0.11	0.00	0.04	0.00	0.00	0.00	0.00	96
0.00	0.00	0.18	0.73	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	146
0.00	0.00	0.06	0.33	0.22	0.01	0.09	0.05	0.18	0.05	0.00	0.00	100
0.01	0.21	0.22	0.10	0.04	0.09	0.02	0.18	0.02	0.00	0.10	0.02	79
0.10	0.12	0.13	0.14	0.12	0.09	0.04	0.05	0.03	0.06	0.06	0.04	5 279
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Table C22: Proportion of alfonsino catch from the groomed estimated catch data by month from the Wairarapa sub region for the 1990 to 2014 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.58	0.15	0.00	0.12	0.11	180
1991	0.00	0.00	0.00	0.22	0.13	0.16	0.00	0.23	0.15	0.00	0.00	0.11	133
1992	0.03	0.03	0.06	0.03	0.09	0.03	0.01	0.05	0.15	0.35	0.09	0.09	315
1993	0.12	0.21	0.12	0.08	0.05	0.03	0.08	0.05	0.00	0.01	0.19	0.08	567
1994	0.29	0.10	0.01	0.23	0.05	0.00	0.08	0.05	0.14	0.00	0.03	0.02	403
1995	0.33	0.04	0.06	0.15	0.10	0.00	0.05	0.02	0.06	0.00	0.02	0.16	302
1996	0.14	0.21	0.10	0.24	0.14	0.02	0.04	0.06	0.00	0.00	0.00	0.05	327
1997	0.10	0.36	0.09	0.13	0.15	0.07	0.01	0.02	0.00	0.01	0.00	0.05	447
1998	0.24	0.02	0.14	0.18	0.30	0.03	0.05	0.04	0.00	0.00	0.00	0.01	292
1999	0.14	0.13	0.10	0.29	0.12	0.06	0.06	0.04	0.01	0.00	0.00	0.05	405
2000	0.25	0.11	0.17	0.12	0.11	0.09	0.05	0.05	0.01	0.04	0.00	0.00	564
2001	0.24	0.20	0.04	0.10	0.20	0.08	0.09	0.03	0.00	0.00	0.00	0.02	526
2002	0.19	0.07	0.10	0.11	0.14	0.13	0.12	0.09	0.01	0.00	0.03	0.01	493
2003	0.15	0.16	0.11	0.19	0.13	0.11	0.07	0.04	0.03	0.00	0.00	0.00	588
2004	0.27	0.14	0.13	0.25	0.11	0.05	0.04	0.00	0.00	0.00	0.00	0.02	690
2005	0.19	0.34	0.08	0.11	0.16	0.09	0.03	0.00	0.00	0.00	0.00	0.01	640
2006	0.21	0.19	0.15	0.28	0.10	0.00	0.03	0.04	0.00	0.00	0.00	0.00	587
2007	0.16	0.18	0.14	0.02	0.07	0.12	0.11	0.03	0.02	0.01	0.14	0.01	692
2008	0.07	0.20	0.14	0.08	0.09	0.09	0.24	0.03	0.04	0.00	0.01	0.02	544
2009	0.18	0.23	0.09	0.20	0.07	0.10	0.07	0.05	0.00	0.00	0.01	0.01	591
2010	0.12	0.26	0.16	0.20	0.10	0.01	0.02	0.01	0.03	0.00	0.01	0.06	598
2011	0.02	0.29	0.18	0.20	0.14	0.07	0.09	0.00	0.00	0.00	0.01	0.00	539
2012	0.27	0.29	0.17	0.07	0.03	0.07	0.04	0.05	0.00	0.01	0.00	0.00	588
2013	0.27	0.32	0.18	0.12	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.01	650
2014	0.11	0.24	0.21	0.10	0.08	0.15	0.03	0.07	0.00	0.00	0.00	0.03	744
Total	0.17	0.19	0.12	0.15	0.11	0.07	0.06	0.05	0.02	0.01	0.03	0.03	12 404

Table C23: Proportion of alfonsino catch from t	the groomed	estimated	catch	data b	y method	from	the l	East
Northland sub region for the 1990 to 2014 fishing	years.							

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	_	_	_	_	-
1991	_	_	_	_	-
1992	_	_	_	_	-
1993	_	_	_	_	-
1994	_	_	_	_	-
1995	_	_	_	_	-
1996	0.00	0.38	0.62	0.00	6
1997	0.00	0.00	1.00	0.00	24
1998	0.00	1.00	0.00	0.00	1
1999	0.00	1.00	0.00	0.00	9
2000	0.00	0.98	0.00	0.00	1
2001	0.00	0.97	0.00	0.00	1
2002	0.00	1.00	0.00	0.00	6
2003	0.00	0.98	0.00	0.02	< 1
2004	0.00	1.00	0.00	0.00	96
2005	0.00	1.00	0.00	0.00	171
2006	0.00	1.00	0.00	0.00	109
2007	0.01	0.32	0.65	0.02	20
2008	0.00	0.66	0.31	0.03	49
2009	0.00	0.96	0.00	0.04	50
2010	0.00	0.95	0.00	0.05	37
2011	0.00	0.86	0.00	0.14	29
2012	0.00	0.47	0.31	0.22	22
2013	0.00	0.01	0.00	0.99	5
2014	0.00	0.42	0.04	0.54	3
Total	< 0.01	0.87	0.10	0.03	639

Table C24: Proportion of alfonsino catch from the groomed estimated catch data by method it	from the	Bay o	f
Plenty sub region for the 1990 to 2014 fishing years.			

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	_	_	_	_	-
1991	0.00	1.00	0.00	0.00	14
1992	_	_	_	_	-
1993	_	_	_	_	-
1994	0.00	0.69	0.00	0.31	<1
1995	_	_	_	_	-
1996	0.00	1.00	0.00	0.00	< 1
1997	0.00	1.00	0.00	0.00	< 1
1998	0.00	1.00	0.00	0.00	1
1999	0.78	0.22	0.00	0.00	19
2000	0.00	0.78	0.00	0.00	1
2001	0.00	1.00	0.00	0.00	3
2002	0.08	0.10	0.82	0.00	12
2003	0.00	1.00	0.00	0.00	14
2004	0.00	1.00	0.00	0.00	< 1
2005	0.00	0.99	0.00	0.01	16
2006	0.95	0.05	0.00	0.00	2
2007	0.17	0.31	0.45	0.07	13
2008	0.47	0.39	0.00	0.14	48
2009	0.00	0.65	0.25	0.10	51
2010	0.42	0.13	0.00	0.45	9
2011	0.63	0.06	0.00	0.31	7
2012	0.00	0.37	0.00	0.63	4
2013	0.00	0.33	0.00	0.67	1
2014	0.00	0.15	0.00	0.85	1
Total	0.24	0.53	0.13	0.11	217

Table C25: Proportion of alfonsino catch from the groomed estimated catch data by method from the East Cape sub region for the 1990 to 2014 fishing years.

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	_	_	_	_	_
1991	_	_	_	_	_
1992	0.00	1.00	0.00	0.00	1
1993	_	_	_	_	_
1994	0.00	1.00	0.00	0.00	74
1995	0.42	0.45	0.13	0.00	190
1996	0.37	0.63	0.00	0.00	107
1997	0.24	0.76	0.00	0.00	22
1998	0.56	0.40	0.04	0.00	42
1999	0.50	0.27	0.23	0.00	91
2000	0.45	0.29	0.26	0.00	61
2001	0.95	0.01	0.04	0.00	110
2002	0.84	0.15	0.01	0.00	80
2003	0.15	0.85	0.00	0.00	9
2004	0.02	0.98	0.00	0.00	1
2005	0.00	1.00	0.00	0.00	14
2006	0.02	0.98	0.01	0.00	29
2007	0.00	1.00	0.00	0.00	14
2008	0.00	0.98	0.00	0.01	84
2009	0.00	0.95	0.01	0.05	78
2010	0.00	0.92	0.00	0.08	41
2011	0.00	0.94	0.02	0.04	49
2012	0.00	0.97	0.00	0.03	12
2013	0.00	0.83	0.00	0.17	6
2014	0.00	0.94	0.00	0.05	25
Total	0.35	0.58	0.06	0.01	1 137

Table C26: Proportion of alfonsino catch from the groomed estimated catch data by method from the Tuaheni Bank sub region for the 1990 to 2014 fishing years.

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	0.80	0.19	0.01	0.00	22
1991	0.00	0.34	0.66	0.00	116
1992	0.71	0.03	0.26	0.00	179
1993	0.60	0.09	0.31	0.00	74
1994	0.49	0.13	0.38	0.00	171
1995	0.19	0.30	0.52	0.00	43
1996	0.75	0.23	0.02	0.00	99
1997	0.62	0.27	0.11	0.00	128
1998	0.54	0.02	0.44	0.00	105
1999	0.52	0.12	0.36	0.00	84
2000	0.57	0.19	0.24	0.00	72
2001	0.38	0.62	0.00	0.00	50
2002	0.13	0.49	0.38	0.00	61
2003	0.60	0.39	0.02	0.00	166
2004	0.88	0.10	0.02	0.00	109
2005	0.12	0.86	0.02	0.00	102
2006	0.41	0.39	0.20	0.00	181
2007	0.59	0.32	0.08	0.00	116
2008	0.61	0.25	0.01	0.13	94
2009	0.22	0.11	0.44	0.23	67
2010	0.40	0.33	0.00	0.27	42
2011	0.51	0.39	0.07	0.03	301
2012	0.43	0.09	0.37	0.12	95
2013	0.36	0.07	0.54	0.02	289
2014	0.50	0.26	0.16	0.08	85
Total	0.49	0.25	0.24	0.03	2 850

Table C27: Proportion of alfonsino catch from the groomed estimated catch data by method from the Ritchie Bank/Rock Garden sub region for the 1990 to 2014 fishing years.

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	0.57	0.02	0.42	0.00	480
1991	0.84	0.02	0.14	0.00	659
1992	0.81	0.03	0.16	0.00	529
1993	0.82	0.02	0.16	0.00	597
1994	0.64	0.07	0.29	0.00	456
1995	0.77	0.13	0.10	0.00	450
1996	0.70	0.07	0.23	0.00	224
1997	0.66	0.33	0.02	0.00	117
1998	0.37	0.22	0.41	0.00	145
1999	0.04	0.39	0.57	0.00	159
2000	0.44	0.43	0.13	0.00	210
2001	0.49	0.33	0.15	0.02	125
2002	0.51	0.31	0.17	0.01	258
2003	0.56	0.33	0.11	0.00	486
2004	0.76	0.11	0.13	0.00	217
2005	0.50	0.37	0.11	0.02	264
2006	0.36	0.61	0.03	0.00	425
2007	0.21	0.78	0.01	0.00	438
2008	0.28	0.47	0.04	0.21	350
2009	0.05	0.74	0.00	0.21	379
2010	0.06	0.76	0.09	0.09	436
2011	0.03	0.89	0.00	0.08	488
2012	0.04	0.91	0.00	0.05	533
2013	0.04	0.77	0.14	0.05	305
2014	0.11	0.83	0.02	0.04	474
Total	0.44	0.40	0.13	0.03	9 203

Table C28: Proportion of alfonsino catch from the groomed estimated catch data by method from the Motukura Bank/Madden Canyon sub region for the 1990 to 2014 fishing years.

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	0.01	0.58	0.41	0.00	1
1991	1.00	0.00	0.00	0.00	7
1992	0.57	0.00	0.43	0.00	73
1993	0.44	0.17	0.39	0.00	215
1994	0.92	0.06	0.03	0.00	374
1995	0.82	0.06	0.12	0.00	291
1996	0.74	0.24	0.01	0.00	499
1997	0.84	0.15	0.01	0.00	528
1998	0.53	0.34	0.13	0.00	616
1999	0.83	0.13	0.03	0.00	154
2000	0.22	0.36	0.42	0.00	248
2001	0.43	0.33	0.24	0.00	324
2002	0.51	0.18	0.32	0.00	142
2003	0.75	0.24	0.00	0.00	161
2004	0.92	0.08	0.00	0.00	165
2005	0.92	0.04	0.04	0.00	269
2006	0.90	0.10	0.00	0.00	111
2007	0.63	0.37	0.01	0.00	167
2008	0.63	0.26	0.10	0.02	169
2009	0.77	0.20	0.01	0.02	168
2010	0.84	0.08	0.06	0.03	176
2011	0.47	0.42	0.09	0.02	96
2012	0.18	0.73	0.08	0.00	146
2013	0.96	0.04	0.00	0.00	100
2014	0.56	0.38	0.01	0.05	79
Total	0.68	0.21	0.10	0<0.0100	5 279
Table C29: Proportion of alfonsino catch from the groomed estimated catch data by method from the Wairarapa sub region for the 1990 to 2014 fishing years.

Fishing year	MWB	BT	MW	BLL	Total (t)
1990	0.81	0.01	0.18	0.00	180
1991	0.53	0.08	0.39	0.00	133
1992	0.67	0.11	0.22	0.00	315
1993	0.81	0.09	0.10	0.00	567
1994	0.62	0.35	0.03	0.00	403
1995	0.21	0.71	0.08	0.00	302
1996	0.35	0.63	0.02	0.00	327
1997	0.13	0.78	0.09	0.00	447
1998	0.35	0.37	0.27	0.00	292
1999	0.51	0.35	0.14	0.00	405
2000	0.49	0.29	0.23	0.00	564
2001	0.28	0.26	0.45	0.00	526
2002	0.30	0.28	0.42	0.00	493
2003	0.34	0.32	0.33	0.00	588
2004	0.36	0.20	0.44	0.00	690
2005	0.38	0.25	0.37	0.00	640
2006	0.57	0.20	0.23	0.00	587
2007	0.38	0.35	0.27	0.00	692
2008	0.39	0.26	0.34	0.01	544
2009	0.54	0.11	0.34	0.00	591
2010	0.34	0.27	0.38	0.00	598
2011	0.20	0.26	0.52	0.02	539
2012	0.21	0.23	0.55	0.01	588
2013	0.30	0.12	0.58	0.01	650
2014	0.33	0.38	0.28	0.00	744
Total	0.40	0.29	0.31	< 0.01	12 404

Fishing year	BYX	BNS	CDL	Other	Total
1990	_	_	_	_	_
1991	_	_	_	_	_
1992	_	_	_	_	-
1993	_	_	_	_	-
1994	_	_	_	_	-
1995	_	_	_	_	-
1996	1.00	0.00	0.00	0.00	6
1997	0.00	1.00	0.00	0.00	24
1998	0.00	0.02	0.00	0.98	1
1999	0.00	0.00	1.00	0.00	9
2000	0.91	0.06	0.00	0.02	1
2001	0.97	0.03	0.00	0.00	1
2002	0.96	0.00	0.00	0.04	6
2003	0.91	0.02	0.00	0.07	< 1
2004	0.99	0.00	0.00	0.01	96
2005	0.99	0.00	0.00	0.01	171
2006	0.98	0.00	0.01	0.01	109
2007	0.94	0.02	0.04	0.00	20
2008	0.76	0.03	0.00	0.21	49
2009	0.96	0.04	0.00	0.00	50
2010	0.95	0.05	0.00	0.01	37
2011	0.86	0.13	0.00	0.00	29
2012	0.74	0.22	0.05	0.00	22
2013	0.00	0.97	0.00	0.03	5
2014	0.45	0.52	0.00	0.03	3
Total	0.89	0.07	0.02	0.02	639

Table C30: Proportion of alfonsino catch from the groomed estimated catch data by target species from the East Northland sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Table C31: Proportion of alfonsino catch from the groomed estimated catch data by target species from the Bay of Plenty sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	CDL	RBY	BYX	BNS	Other	Total
1990	_	_	_	_	_	_
1991	0.00	0.00	1.00	0.00	0.00	14
1992	_	_	_	_	_	-
1993	_	_	_	_	_	-
1994	0.00	0.00	0.00	0.31	0.69	< 1
1995	_	_	_	_	_	-
1996	0.00	0.44	0.00	0.00	0.56	< 1
1997	0.00	0.00	0.00	0.08	0.92	< 1
1998	0.72	0.00	0.00	0.00	0.28	1
1999	1.00	0.00	0.00	0.00	0.00	19
2000	0.63	0.00	0.09	0.13	0.15	1
2001	0.93	0.00	0.00	0.00	0.07	3
2002	0.09	0.12	0.76	0.02	0.01	12
2003	0.75	0.02	0.16	0.00	0.07	14
2004	1.00	0.00	0.00	0.00	0.00	< 1
2005	0.03	0.96	0.00	0.01	0.00	16
2006	0.00	0.95	0.00	0.00	0.05	2
2007	0.10	0.62	0.01	0.07	0.20	13
2008	0.34	0.51	0.00	0.14	0.01	48
2009	0.41	0.03	0.42	0.10	0.04	51
2010	0.06	0.01	0.42	0.44	0.07	9
2011	0.00	0.64	0.01	0.30	0.04	7
2012	0.01	0.13	0.06	0.63	0.16	4
2013	0.00	0.15	0.00	0.67	0.18	1
2014	0.00	0.03	0.00	0.85	0.12	1
Total	0.35	0.27	0.24	0.11	0.04	217

Table C32: Proportion of alfonsino catch from the groomed estimated catch data by target species from the East Cape sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	CDL	ORH	Other	Total (t)
1990	_	_	_	_	_
1991	_	_	_	_	-
1992	0.00	1.00	0.00	0.00	1
1993	_	_	_	_	-
1994	0.00	0.09	0.91	0.00	74
1995	0.52	0.25	0.18	0.05	190
1996	0.43	0.53	0.04	0.00	107
1997	0.80	0.01	0.18	0.02	22
1998	0.61	0.31	0.07	0.01	42
1999	0.74	0.18	0.06	0.02	91
2000	0.63	0.12	0.16	0.09	61
2001	0.98	0.01	0.00	0.01	110
2002	0.94	0.03	0.03	0.00	80
2003	0.01	0.61	0.23	0.14	9
2004	0.02	0.98	0.00	0.00	1
2005	0.00	0.54	0.02	0.44	14
2006	0.33	0.55	0.08	0.03	29
2007	0.05	0.95	0.00	0.00	14
2008	0.90	0.05	0.04	0.01	84
2009	0.83	0.10	0.02	0.05	78
2010	0.33	0.57	0.00	0.10	41
2011	0.35	0.61	0.00	0.04	49
2012	0.37	0.37	0.00	0.27	12
2013	0.22	0.59	0.01	0.18	6
2014	0.62	0.31	0.02	0.06	25
Total	0.60	0.24	0.12	0.04	1 137

Table C33: Proportion of alfonsino catch from the groomed estimated catch data by target species from the Tuaheni Bank sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	CDL	BNS	Other	Total (t)
1990	0.53	0.18	0.28	0.00	22
1991	0.66	0.34	0.00	0.00	116
1992	0.96	0.04	0.00	0.01	179
1993	0.91	0.07	0.02	0.00	74
1994	0.89	0.06	0.00	0.06	171
1995	0.63	0.19	0.14	0.04	43
1996	0.90	0.10	0.00	0.01	99
1997	0.75	0.08	0.01	0.16	128
1998	0.98	0.02	0.00	0.00	105
1999	0.88	0.08	0.00	0.04	84
2000	0.78	0.13	0.00	0.09	72
2001	0.38	0.51	0.00	0.11	50
2002	0.51	0.48	0.00	0.01	61
2003	0.62	0.36	0.02	0.00	166
2004	0.72	0.10	0.18	0.00	109
2005	0.86	0.12	0.02	0.00	102
2006	0.90	0.02	0.08	0.00	181
2007	0.85	0.14	0.01	0.00	116
2008	0.59	0.17	0.23	0.00	94
2009	0.68	0.02	0.26	0.04	67
2010	0.40	0.33	0.27	0.00	42
2011	0.97	0.00	0.03	0.00	301
2012	0.86	0.02	0.12	0.00	95
2013	0.97	0.01	0.02	0.00	289
2014	0.89	0.03	0.08	0.00	85
Total	0.82	0.11	0.05	0.02	2 850

Table C34: Proportion of alfonsino catch from the groomed estimated catch data by target species from the Ritchie Bank/Rock Garden sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	CDL	BNS	Other	Total (t)
1990	0.97	0.00	0.02	0.01	480
1991	0.96	0.00	0.02	0.02	659
1992	0.96	0.01	0.00	0.03	529
1993	0.92	0.00	0.01	0.06	597
1994	0.94	0.01	0.00	0.06	456
1995	0.83	0.06	0.00	0.11	450
1996	0.94	0.03	0.00	0.03	224
1997	0.83	0.09	0.00	0.08	117
1998	0.77	0.10	0.01	0.12	145
1999	0.65	0.16	0.00	0.19	159
2000	0.63	0.13	0.00	0.24	210
2001	0.68	0.16	0.06	0.09	125
2002	0.83	0.13	0.02	0.02	258
2003	0.90	0.05	0.04	0.01	486
2004	0.87	0.02	0.07	0.04	217
2005	0.81	0.04	0.12	0.02	264
2006	0.83	0.13	0.03	0.00	425
2007	0.88	0.10	0.00	0.02	438
2008	0.72	0.06	0.22	0.01	350
2009	0.71	0.06	0.22	0.01	379
2010	0.82	0.08	0.10	0.00	436
2011	0.83	0.09	0.08	0.00	488
2012	0.92	0.03	0.05	0.00	533
2013	0.92	0.03	0.05	0.00	305
2014	0.87	0.07	0.04	0.02	474
Total	0.87	0.05	0.05	0.03	9 203

Table C35: Proportion of alfonsino catch from the groomed estimated catch data by target species from the Motukura Bank/Madden Canyon sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	HOK	SKI	Other	Total (t)
1990	0.42	0.00	0.00	0.58	1
1991	1.00	0.00	0.00	0.00	7
1992	0.92	0.00	0.00	0.08	73
1993	0.83	0.03	0.00	0.13	215
1994	0.93	0.02	0.05	0.00	374
1995	0.92	0.00	0.06	0.02	291
1996	0.82	0.07	0.09	0.03	499
1997	0.80	0.08	0.11	0.01	528
1998	0.69	0.23	0.06	0.01	616
1999	0.92	0.00	0.05	0.02	154
2000	0.74	0.12	0.08	0.06	248
2001	0.87	0.02	0.06	0.05	324
2002	0.92	0.00	0.02	0.06	142
2003	0.83	0.00	0.03	0.15	161
2004	0.84	0.02	0.01	0.13	165
2005	0.91	0.00	0.00	0.09	269
2006	0.90	0.00	0.05	0.06	111
2007	0.93	0.00	0.00	0.07	167
2008	0.93	0.00	0.00	0.07	169
2009	0.90	0.00	0.03	0.07	168
2010	0.90	0.02	0.00	0.09	176
2011	0.94	0.04	0.00	0.03	96
2012	0.98	0.00	0.00	0.01	146
2013	1.00	0.00	0.00	0.00	100
2014	0.74	0.03	0.00	0.23	79
Total	0.85	0.05	0.05	0.05	5 279

 Table C36: Proportion of alfonsino catch from the groomed estimated catch data by target species from the

 Wairarapa sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	HOK	CDL	Other	Total (t)
1990	0.91	0.00	0.00	0.09	180
1991	0.19	0.32	0.00	0.48	133
1992	0.74	0.15	0.01	0.10	315
1993	0.78	0.10	0.02	0.10	567
1994	0.72	0.04	0.14	0.11	403
1995	0.58	0.09	0.07	0.26	302
1996	0.23	0.48	0.13	0.16	327
1997	0.28	0.54	0.11	0.07	447
1998	0.42	0.52	0.00	0.06	292
1999	0.30	0.59	0.04	0.07	405
2000	0.50	0.43	0.04	0.03	564
2001	0.38	0.53	0.06	0.04	526
2002	0.41	0.54	0.04	0.01	493
2003	0.36	0.60	0.03	0.01	588
2004	0.54	0.43	0.03	0.00	690
2005	0.69	0.28	0.02	0.00	640
2006	0.61	0.35	0.03	0.01	587
2007	0.65	0.30	0.05	0.01	692
2008	0.72	0.21	0.02	0.04	544
2009	0.61	0.35	0.03	0.01	591
2010	0.90	0.04	0.02	0.04	598
2011	0.58	0.36	0.02	0.04	539
2012	0.72	0.22	0.01	0.06	588
2013	0.77	0.19	0.03	0.01	650
2014	0.71	0.23	0.05	0.01	744
Total	0.59	0.32	0.04	0.05	12 404

Table C37: Proportion of alfonsino catch reported by gear type from the groomed and merged data from the eastern Chatham Rise fishery area for the 1990 to 2014 fishing years. BT = bottom trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed), MW = midwater trawl.

Fishing year	BT	MWB	MW	Other	Total (t)
1990	0.94	0.00	0.00	0.06	4
1991	1.00	0.00	0.00	0.00	17
1992	1.00	0.00	0.00	0.00	76
1993	0.85	0.12	0.03	0.00	40
1994	0.98	0.02	0.00	0.00	225
1995	0.93	0.01	0.06	0.00	188
1996	0.78	0.12	0.10	0.00	747
1997	0.95	0.00	0.04	0.00	729
1998	0.97	0.01	0.02	0.00	758
1999	0.96	0.03	0.01	0.00	655
2000	0.99	0.01	0.00	0.00	539
2001	0.98	0.00	0.02	0.00	726
2002	0.99	0.01	0.00	0.00	1 175
2003	0.97	0.03	0.00	0.00	946
2004	0.99	0.00	0.01	0.00	833
2005	0.92	0.04	0.04	0.00	1 040
2006	0.75	0.13	0.11	0.00	1 150
2007	0.64	0.24	0.12	0.00	920
2008	0.43	0.45	0.12	0.00	1 007
2009	0.62	0.26	0.11	0.00	886
2010	0.52	0.32	0.16	0.00	867
2011	0.55	0.30	0.15	0.00	999
2012	0.38	0.22	0.40	0.00	513
2013	0.25	0.35	0.40	0.00	740
2014	0.56	0.31	0.13	0.00	744
Total	0.76	0.15	0.09	< 0.01	16 527

Fishing	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Total (t)	
year												~•p	1 otur (t)	
1990	0.00	0.47	0.38	0.09	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	4	
1991	0.27	0.00	0.17	0.01	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	
1992	0.00	0.00	0.01	0.01	0.05	0.61	0.00	0.27	0.04	0.00	0.01	0.00	76	
1993	0.01	0.18	0.01	0.08	0.12	0.55	0.00	0.06	0.00	0.00	0.00	0.00	40	
1994	0.05	0.02	0.16	0.23	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.21	225	
1995	0.09	0.14	0.40	0.01	0.22	0.00	0.04	0.10	0.00	0.00	0.00	0.01	188	
1996	0.00	0.03	0.22	0.27	0.18	0.28	0.01	0.01	0.01	0.00	0.00	0.00	747	
1997	0.00	0.01	0.50	0.19	0.12	0.13	0.01	0.03	0.01	0.00	0.00	0.00	729	
1998	0.06	0.03	0.16	0.24	0.38	0.03	0.11	0.00	0.00	0.00	0.00	0.00	758	
1999	0.02	0.01	0.36	0.19	0.11	0.29	0.00	0.00	0.00	0.00	0.00	0.01	655	
2000	0.00	0.31	0.12	0.13	0.19	0.13	0.08	0.01	0.00	0.00	0.00	0.03	539	
2001	0.09	0.00	0.16	0.27	0.05	0.22	0.12	0.01	0.00	0.00	0.00	0.08	726	
2002	0.23	0.13	0.24	0.18	0.05	0.03	0.04	0.03	0.00	0.00	0.03	0.04	1 175	
2003	0.10	0.18	0.06	0.17	0.12	0.17	0.11	0.06	0.00	0.00	0.02	0.01	946	
2004	0.03	0.25	0.26	0.12	0.17	0.01	0.10	0.00	0.01	0.00	0.00	0.04	833	
2005	0.03	0.07	0.07	0.15	0.30	0.19	0.02	0.02	0.01	0.00	0.01	0.12	1 040	
2006	0.02	0.08	0.16	0.14	0.18	0.10	0.05	0.08	0.00	0.00	0.00	0.19	1 150	
2007	0.02	0.01	0.08	0.14	0.05	0.24	0.09	0.02	0.02	0.00	0.00	0.32	920	
2008	0.22	0.16	0.15	0.14	0.18	0.00	0.00	0.02	0.00	0.00	0.00	0.12	1 007	
2009	0.00	0.12	0.08	0.11	0.04	0.07	0.11	0.05	0.05	0.00	0.14	0.23	886	
2010	0.00	0.00	0.10	0.06	0.01	0.19	0.21	0.12	0.03	0.00	0.00	0.28	867	
2011	0.18	0.00	0.12	0.07	0.24	0.12	0.22	0.04	0.00	0.00	0.00	0.01	999	
2012	0.00	0.00	0.00	0.09	0.01	0.00	0.45	0.10	0.03	0.00	0.17	0.15	513	
2013	0.00	0.34	0.12	0.21	0.18	0.00	0.15	0.00	0.00	0.00	0.00	0.00	740	
2014	0.20	0.15	0.10	0.23	0.20	0.00	0.00	0.00	0.00	0.00	0.09	0.03	744	
Total	0.07	0.10	0.16	0.16	0.15	0.12	0.09	0.03	0.01	0.00	0.02	0.09	16 527	

Table C38: Proportion of alfonsino catch from the groomed and merged data reported each month from the eastern Chatham Rise fishery area for the 1990 to 2014 fishing years.

Table C39: Proportion of alfonsino catch from the groomed and merged data reported for each statistical area from the eastern Chatham Rise fishery area for the 1990 to 2014 fishing years.

Fishing year	049	051	404	406	412	Other	Total (t)
1990	0.00	0.06	0.92	0.00	0.00	0.02	4
1991	0.55	0.00	0.45	0.00	0.00	0.00	17
1992	0.00	0.00	0.09	0.00	0.89	0.02	76
1993	0.00	0.54	0.35	0.00	0.11	0.00	40
1994	0.00	0.19	0.08	0.00	0.71	0.03	225
1995	0.05	0.02	0.28	0.00	0.57	0.08	188
1996	0.00	0.57	0.01	0.14	0.26	0.01	747
1997	0.01	0.61	0.01	0.15	0.20	0.01	729
1998	0.02	0.30	0.09	0.26	0.34	0.01	758
1999	0.00	0.32	0.05	0.14	0.34	0.15	655
2000	0.00	0.52	0.14	0.21	0.13	0.00	539
2001	0.01	0.61	0.16	0.06	0.15	0.01	726
2002	0.05	0.40	0.41	0.02	0.10	0.03	1 175
2003	0.04	0.66	0.16	0.00	0.03	0.11	946
2004	0.01	0.84	0.10	0.03	0.02	0.00	833
2005	0.32	0.42	0.18	0.03	0.06	0.00	1 040
2006	0.20	0.28	0.28	0.09	0.15	0.00	1 1 5 0
2007	0.09	0.49	0.40	0.00	0.01	0.01	920
2008	0.01	0.36	0.45	0.15	0.02	0.01	1 007
2009	0.17	0.54	0.25	0.04	0.00	0.00	886
2010	0.05	0.52	0.42	0.00	0.00	0.00	867
2011	0.02	0.69	0.26	0.00	0.00	0.01	999
2012	0.02	0.49	0.38	0.10	0.01	0.00	513
2013	0.09	0.39	0.14	0.17	0.20	0.01	740
2014	0.00	0.57	0.35	0.06	0.02	0.00	744
Total	0.07	0.49	0.23	0.08	0.12	0.02	16 527

Table C40: Proportion of alfonsino catch from the groomed and merged data reported by target species from the eastern Chatham Rise fishery area for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	ORH	BNS	Other	Total (t)
1990	0.00	0.01	0.00	0.99	4
1991	0.00	0.00	0.00	1.00	17
1992	0.00	0.89	0.00	0.11	76
1993	0.00	0.11	0.00	0.89	40
1994	0.07	0.84	0.00	0.09	225
1995	0.18	0.43	0.00	0.39	188
1996	0.84	0.14	0.00	0.02	747
1997	0.82	0.06	0.00	0.12	729
1998	0.66	0.21	0.00	0.13	758
1999	0.83	0.12	0.00	0.05	655
2000	0.96	0.03	0.00	0.01	539
2001	0.80	0.03	0.07	0.11	726
2002	0.51	0.02	0.28	0.20	1 175
2003	0.72	0.02	0.09	0.16	946
2004	0.78	0.03	0.15	0.04	833
2005	0.84	0.01	0.11	0.04	1 040
2006	0.84	0.09	0.07	0.01	1 150
2007	0.95	0.01	0.00	0.05	920
2008	0.93	0.01	0.01	0.05	1 007
2009	0.94	0.00	0.01	0.06	886
2010	0.97	0.00	0.00	0.02	867
2011	0.98	0.00	0.01	0.01	999
2012	0.99	0.00	0.00	0.01	513
2013	0.99	0.00	0.00	0.00	740
2014	0.99	0.00	0.00	0.01	744
Total	0.82	0.06	0.05	0.07	16 527

Table C41: Proportion of alfonsino catch from the groomed estimated catch data from the eastern Chatham Rise sub regions identified in this study for the 1990 to 2014 fishing years. NWCI = northwest Chatham Islands, SECI = southeast Chatham Islands. Total catch values are lower than in the groomed and merged data because only data recorded at the fishing event level with latitude and longitude recorded can be assigned to a sub region (i.e. CELR data cannot be included).

Fishing year	NWCI	SECI	Other	Total (t)
1990	1.00	0.00	0.00	3
1991	0.60	0.00	0.40	16
1992	0.08	0.88	0.05	64
1993	0.34	0.66	0.00	38
1994	0.08	0.92	0.00	155
1995	0.40	0.59	0.01	151
1996	0.01	0.93	0.06	663
1997	0.02	0.96	0.02	785
1998	0.18	0.81	0.00	698
1999	0.05	0.82	0.13	632
2000	0.14	0.86	0.00	509
2001	0.16	0.82	0.01	704
2002	0.46	0.51	0.03	1 051
2003	0.22	0.65	0.13	895
2004	0.11	0.89	0.00	742
2005	0.49	0.51	0.00	929
2006	0.53	0.47	0.00	1 003
2007	0.51	0.49	0.00	867
2008	0.47	0.52	0.01	942
2009	0.43	0.57	0.00	857
2010	0.45	0.55	0.00	778
2011	0.28	0.69	0.03	955
2012	0.39	0.61	0.00	475
2013	0.21	0.79	0.00	635
2014	0.36	0.63	0.01	696
Total	0.31	0.67	0.02	15 242

Fishing year Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Total (t) 1990 3 0.57 0.14 0.29 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9 1991 0.00 0.00 0.24 0.02 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.74 1992 0.00 0.14 0.04 0.82 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5 1993 0.37 0.29 0.02 0.20 0.00 0.00 0.00 0.00 0.00 0.01 0.00 0.12 13 1994 0.00 0.21 0.26 0.21 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.32 12 1995 0.06 0.12 0.00 0.50 0.14 0.17 0.00 0.00 0.00 0.00 0.00 0.01 60 7 1996 0.00 0.30 0.28 0.43 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1997 0.00 0.13 0.74 0.00 0.00 0.13 0.00 0.00 0.00 0.00 0.00 0.00 15 128 1998 0.00 0.05 0.39 0.05 0.00 0.47 0.03 0.00 0.00 0.00 0.00 0.00 1999 0.16 0.25 0.06 0.06 0.02 0.13 0.00 0.00 0.00 0.00 0.00 0.33 31 2000 0.67 0.02 0.05 0.00 0.12 0.03 0.00 0.04 0.00 0.00 0.00 0.06 69 2001 0.03 0.00 0.00 0.35 0.00 0.23 0.00 0.00 0.00 0.00 0.00 0.39 114 2002 484 0.28 0.04 0.23 0.10 0.04 0.05 0.06 0.05 0.00 0.01 0.06 0.07 2003 199 0.30 0.21 0.12 0.01 0.02 0.10 0.13 0.06 0.00 0.00 0.04 0.00 2004 0.20 0.27 0.19 0.15 0.04 0.00 0.01 0.04 0.00 0.00 0.01 0.10 84 2005 0.02 0.06 0.06 0.15 0.24 0.22 0.00 0.00 0.00 0.00 0.06 0.19 451 2006 0.03 0.00 0.11 0.03 0.07 0.12 0.12 0.09 0.01 0.00 0.04 0.38 533 2007 0.04 0.05 0.00 0.00 0.12 0.05 0.01 0.04 0.02 0.00 0.03 0.63 439 2008 0.54 0.08 0.04 0.05 0.01 0.00 0.00 0.01 0.00 0.00 0.00 0.27 439 2009 0.06 0.05 0.00 0.00 0.05 0.00 0.04 0.04 0.00 0.09 0.40 0.27 370 2010 0.00 0.01 0.10 0.02 0.01 0.15 0.25 0.02 0.00 0.00 0.00 0.44 346 2011 0.52 0.27 0.01 0.00 0.00 0.07 0.08 0.00 0.00 0.00 0.00 0.06 272 2012 0.00 0.02 187 0.00 0.00 0.00 0.01 0.20 0.05 0.03 0.00 0.41 0.27 2013 0.01 0.00 0.00 0.00 0.36 0.00 0.63 0.00 0.00 0.00 0.00 0.01 131 2014 249 0.12 0.11 0.11 0.00 0.37 0.00 0.00 0.00 0.00 0.00 0.20 0.08 0.07 0.08 0.06 0.09 0.09 0.07 0.03 0.01 0.08 0.24 4 6 5 1 Total 0.16 < 0.01

Table C42: Proportion of alfonsino catch from the groomed estimated catch data by month from the northwest Chatham Island sub region for the 1990 to 2014 fishing years.

Fishing year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (t)
1990	_	_	_	_	_	_	_	_	_	_	_	_	_
1991	_	_	_	_	_	_	_	_	_	_	_	_	-
1992	0.00	0.00	0.00	0.01	0.50	0.13	0.30	0.04	0.00	0.01	0.00	0.00	56
1993	0.00	0.00	0.00	0.05	0.86	0.01	0.08	0.00	0.00	0.00	0.00	0.00	26
1994	0.02	0.00	0.30	0.42	0.24	0.00	0.01	0.00	0.00	0.00	0.00	0.00	143
1995	0.10	0.36	0.47	0.02	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.02	89
1996	0.00	0.03	0.20	0.19	0.34	0.20	0.02	0.01	0.00	0.00	0.00	0.00	618
1997	0.01	0.37	0.19	0.19	0.10	0.13	0.00	0.01	0.00	0.00	0.00	0.00	750
1998	0.10	0.09	0.15	0.27	0.36	0.03	0.00	0.00	0.00	0.00	0.00	0.00	568
1999	0.01	0.15	0.20	0.17	0.15	0.31	0.00	0.00	0.00	0.00	0.00	0.02	519
2000	0.10	0.01	0.14	0.16	0.27	0.14	0.01	0.00	0.00	0.00	0.00	0.17	439
2001	0.02	0.02	0.16	0.29	0.05	0.28	0.06	0.00	0.00	0.01	0.00	0.11	580
2002	0.18	0.24	0.20	0.25	0.02	0.03	0.00	0.00	0.00	0.00	0.01	0.08	540
2003	0.19	0.02	0.02	0.26	0.14	0.22	0.06	0.07	0.00	0.00	0.01	0.01	583
2004	0.07	0.32	0.11	0.18	0.14	0.01	0.10	0.00	0.01	0.00	0.03	0.02	657
2005	0.01	0.10	0.05	0.39	0.23	0.07	0.04	0.03	0.02	0.00	0.01	0.05	477
2006	0.00	0.20	0.02	0.32	0.32	0.05	0.02	0.05	0.00	0.00	0.00	0.02	467
2007	0.01	0.02	0.12	0.31	0.05	0.32	0.16	0.01	0.00	0.00	0.00	0.00	425
2008	0.00	0.29	0.19	0.27	0.24	0.00	0.00	0.02	0.00	0.00	0.00	0.00	492
2009	0.05	0.06	0.12	0.19	0.04	0.13	0.15	0.13	0.00	0.00	0.01	0.11	485
2010	0.00	0.00	0.09	0.13	0.09	0.33	0.19	0.03	0.00	0.00	0.00	0.13	429
2011	0.02	0.07	0.00	0.18	0.24	0.17	0.25	0.05	0.00	0.00	0.00	0.01	659
2012	0.00	0.00	0.00	0.16	0.01	0.27	0.32	0.18	0.00	0.00	0.00	0.07	288
2013	0.16	0.29	0.18	0.26	0.10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	502
2014	0.27	0.19	0.11	0.32	0.09	0.00	0.00	0.00	0.00	0.00	0.03	0.00	439
Total	0.06	0.14	0.13	0.23	0.16	0.13	0.07	0.03	< 0.01	< 0.01	< 0.01	0.04	10 232

Table C43: Proportion of alfonsino catch from the groomed estimated catch data by month from the southeast Chatham Island sub region for the 1990 to 2014 fishing years.

Table C44: Proportion of alfonsino catch from the groomed estimated catch data by method from the northwest Chatham Island sub region for the 1990 to 2014 fishing years.

Fishing year	MWB	BT	MW	Total (t)
1990	0.00	1.00	0.00	3
1991	0.00	1.00	0.00	9
1992	0.00	1.00	0.00	5
1993	0.37	0.54	0.09	13
1994	0.41	0.59	0.00	12
1995	0.00	0.99	0.01	60
1996	0.00	1.00	0.00	7
1997	0.11	0.89	0.00	15
1998	0.00	1.00	0.00	128
1999	0.03	0.97	0.00	31
2000	0.05	0.95	0.00	69
2001	0.00	1.00	0.00	114
2002	0.02	0.98	0.00	484
2003	0.05	0.95	0.00	199
2004	0.00	1.00	0.00	84
2005	0.06	0.87	0.07	451
2006	0.02	0.77	0.21	533
2007	0.48	0.26	0.26	439
2008	0.65	0.09	0.26	439
2009	0.43	0.30	0.27	370
2010	0.58	0.08	0.34	346
2011	0.80	0.04	0.16	272
2012	0.46	0.09	0.45	186
2013	0.18	0.01	0.82	131
2014	0.62	0.01	0.37	249
Total	0.30	0.50	0.20	4 649

Table C45: Proportion of alfonsino catch from the groomed estimated catch data by method from the southeast Chatham Island sub region for the 1990 to 2014 fishing years.

Fishing year	MWB	BT	MW	Total (t)
1990	_	_	-	-
1991	_	_	-	-
1992	0.00	1.00	0.00	56
1993	0.00	1.00	0.00	26
1994	0.00	1.00	0.00	143
1995	0.02	0.94	0.04	89
1996	0.08	0.82	0.10	618
1997	0.00	0.94	0.06	750
1998	0.02	0.97	0.02	568
1999	0.03	0.97	0.00	519
2000	0.00	1.00	0.00	439
2001	0.00	0.98	0.02	580
2002	0.00	1.00	0.00	540
2003	0.03	0.97	0.00	583
2004	0.00	1.00	0.00	657
2005	0.01	0.98	0.01	477
2006	0.28	0.70	0.02	467
2007	0.00	0.99	0.01	425
2008	0.32	0.68	0.00	492
2009	0.15	0.85	0.00	485
2010	0.09	0.91	0.00	429
2011	0.10	0.75	0.15	659
2012	0.05	0.60	0.35	288
2013	0.41	0.33	0.26	502
2014	0.13	0.87	0.00	439
Total	0.08	0.87	0.05	10 226

Table C46: Proportion of alfonsino catch from the groomed estimated catch data by target species from the northwest Chatham Island sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	BNS	HAK	Other	Total (t)
1990	0.00	0.00	1.00	0.00	3
1991	0.00	0.00	0.24	0.76	9
1992	0.00	0.00	0.16	0.84	5
1993	0.00	0.00	0.99	0.01	13
1994	0.00	0.00	0.73	0.27	12
1995	0.00	0.00	0.50	0.50	60
1996	0.00	0.00	0.93	0.07	7
1997	0.00	0.00	0.52	0.48	15
1998	0.00	0.00	0.39	0.61	128
1999	0.15	0.00	0.77	0.08	31
2000	0.92	0.00	0.02	0.06	69
2001	0.61	0.28	0.02	0.09	114
2002	0.16	0.42	0.28	0.14	484
2003	0.35	0.26	0.15	0.24	199
2004	0.54	0.31	0.08	0.07	84
2005	0.82	0.10	0.02	0.07	451
2006	0.97	0.02	0.00	0.02	533
2007	0.93	0.00	0.04	0.03	439
2008	0.93	0.00	0.02	0.05	439
2009	0.98	0.00	0.01	0.01	370
2010	0.97	0.00	0.00	0.03	346
2011	1.00	0.00	0.00	0.00	272
2012	0.99	0.01	0.00	0.00	187
2013	0.99	0.00	0.00	0.01	131
2014	1.00	0.00	0.00	0.00	249
Total	0.77	0.08	0.08	0.08	4 651

Table C47: Proportion of alfonsino catch from the groomed estimated catch data by target species from the southeast Chatham Island sub region for the 1990 to 2014 fishing years. See Table C48 for species codes used in this report.

Fishing year	BYX	ORH	HOK	Other	Total (t)
1990	_	_	_	_	-
1991	_	_	_	_	-
1992	0.00	1.00	0.00	0.00	56
1993	0.00	0.14	0.86	0.00	26
1994	0.05	0.95	0.00	0.00	143
1995	0.27	0.72	0.02	0.00	89
1996	0.91	0.09	0.00	0.00	618
1997	0.83	0.03	0.15	0.00	750
1998	0.84	0.13	0.02	0.01	568
1999	0.88	0.11	0.00	0.00	519
2000	0.97	0.03	0.00	0.00	439
2001	0.85	0.03	0.10	0.02	580
2002	0.81	0.03	0.03	0.13	540
2003	0.86	0.03	0.08	0.03	583
2004	0.81	0.03	0.04	0.12	657
2005	0.89	0.03	0.00	0.09	477
2006	0.83	0.02	0.00	0.15	467
2007	0.99	0.01	0.00	0.00	425
2008	0.98	0.01	0.00	0.01	492
2009	0.92	0.00	0.03	0.05	485
2010	0.99	0.00	0.01	0.00	429
2011	0.99	0.00	0.00	0.01	659
2012	0.99	0.00	0.00	0.00	288
2013	1.00	0.00	0.00	0.00	502
2014	0.99	0.00	0.01	0.00	439
Total	0.88	0.06	0.03	0.03	10 232

## Table C48: Species codes used in the report.

Code	Common name	Scientific name
BNS	Bluenose	Hyperoglyphe antarctica
BYX	Alfonsino	Beryx splendens
CDL	Black cardinalfish	Epigonus telescopus
HAK	Hake	Merluccius australis
HOK	Hoki	Macruronus novaezelandiae
ORH	Orange roughy	Hoplostethus atlanticus
RBY	Rubyfish	Plagiogeneion rubiginosum
SKI	Gemfish	Rexea solandri



Figure C1: The QMR/MHR landings (grey bars), un-groomed catch effort landings (blue line), and TACC (black line) for BYX 1–3 from the 1990 to 2014 fishing years.



Figure C1 continued: The QMR/MHR landings (grey bars), un-groomed catch effort landings (blue line), and TACC (black line) for BYX 7–8 from the 1990 to 2014 fishing years.



Figure C2: The retained landings (grey bars), interim landings (white bars), and landings dropped during data grooming (black bars), and MHR landings (blue line) for BYX 1–3 from the 1990 to 2014 fishing years.



Figure C2 continued: The retained landings (grey bars), interim landings (white bars), and landings dropped during data grooming (black bars), and MHR landings (blue line) for BYX 7–8 from the 1990 to 2014 fishing years.



Figure C3: Retained landings (greenweight in tonnes) by processed state for BYX 1–3 for the 1990 to 2014 fishing years in the groomed and unmerged dataset. GRE, Green; DRE, dressed or headed, gutted, and tailed.



Figure C3 continued: Retained landings (greenweight in tonnes) by processed state for BYX 7–8 for the 1990 to 2014 fishing years in the groomed and unmerged dataset. GRE, Green; MEA, fish meal; DRE, dressed or headed, gutted, and tailed.



Figure C4: Conversion factor (CF) corrections (by the centroid method), defined as the ratio of annual green weight recalculated using the most recent correction factors for each processed state to the reported green weight, and the recovery rate, defined as the ratio of annual landings in the groomed and merged dataset to those in the groomed and unmerged dataset, for BYX 1–3 for the 1990–2014 fishing years.



Figure C4 continued: Conversion factor (CF) corrections (by the centroid method), defined as the ratio of annual green weight recalculated using the most recent correction factors for each processed state to the reported green weight, and the recovery rate, defined as the ratio of annual landings in the groomed and merged dataset to those in the groomed and unmerged dataset, for BYX 7–8 for the 1990–2014 fishing years.



Figure C5: The QMR/MHR landings (white bars), retained landings in the groomed and unmerged dataset (blue dashed line), retained landings in groomed and merged dataset (blue solid line), and estimated catch from (grey dashed line), using the centroid method, for BYX 3–5 for the 1990–2014 fishing years.



Figure C5 continued: The QMR/MHR landings (white bars), retained landings in the groomed and unmerged dataset (blue dashed line), retained landings in groomed and merged dataset (blue solid line), and estimated catch from (grey dashed line), using the centroid method for BYX 7–8 for the 1990–2014 fishing years.



Figure C6: The reporting rate, defined as the ratio of greenweight from estimated catches to retained landings in the groomed and merged dataset, for BYX 1–3 for the 1990–2014 fishing years.



Figure C6 continued: The reporting rate, defined as the ratio of greenweight from estimated catches to retained landings in the groomed and merged dataset, for BYX 7–8 for the 1990–2014 fishing years.



Figure C7a: Estimated catch vs. reported landings on a trip basis in the groomed dataset, for BYX 1 for the 1990–2014 fishing years.



Figure C7b: Estimated catch vs. reported landings on a trip basis in the groomed dataset, for BYX 2 for the 1990–2014 fishing years.



Figure C7c: Estimated catch vs. reported landings on a trip basis in the groomed dataset, for BYX 3 for the 1990–2014 fishing years.



Figure C7d: Estimated catch vs. reported landings on a trip basis in the groomed dataset, for BYX 7 for the 1990–2014 fishing years.



Figure C7e: Estimated catch vs. reported landings on a trip basis in the groomed dataset, for BYX 8 for the 1990–2014 fishing years.


Figure C8a: Estimated catch by form type in the groomed and unmerged dataset, and landed catch by form type in the groomed and merged dataset, for BYX 1 for the 1990–2014 fishing years, where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; CLR is Catch Landing Return.

BYX 1



Figure C8b: Estimated catch by form type in the groomed and unmerged dataset, and landed catch by form type in the groomed and merged dataset, for BYX 2 for the 1990–2014 fishing years, where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; CLR is Catch Landing Return.

BYX 2



Figure C8c: Estimated catch by form type in the groomed and unmerged dataset, and landed catch by form type in the groomed and merged dataset, for BYX 3 for the 1990–2014 fishing years, where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; CLR is Catch Landing Return.

BYX 3



Figure C8d: Estimated catch by form type in the groomed and unmerged dataset, and landed catch by form type in the groomed and merged dataset, for BYX 7 for the 1990–2014 fishing years, where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; CLR is Catch Landing Return.

BYX 7



Figure C8e: Estimated catch by form type in the groomed and unmerged dataset, and landed catch by form type in the groomed and merged dataset, for BYX 8 for the 1990–2014 fishing years, where TCP is Trawl Catch Effort Processing Return; CEL is Catch, Effort, Landing Return; CLR is Catch Landing Return.

Figure C9: Combined estimated catch (in tonnes) of all commercial alfonsino catches by statistical area for the 1990–2014 fishing years combined.



Figure C10a: Estimated alfonsino catch as reported on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks for the 1990–1993 fishing years.



Figure C10a continued: Estimated alfonsino catch as reported on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks for the 1994–1997 fishing years.



Figure C10a continued: Estimated alfonsino catch as reported on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks for the 1998–2001 fishing years.



Figure C10a continued: Estimated alfonsino catch as reported on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks for the 2001–2005 fishing years.



Figure C10a continued: Estimated alfonsino catch as reported on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks for the 2006–2009 fishing years.



Figure C10a continued: Estimated alfonsino catch as reported on TCEPR forms (in tonnes) by fishing year, aggregated into 0.2 degree spatial blocks for the 2010–2013 fishing years.



Figure C10a continued: Estimated alfonsino catch as reported on TCEPR forms (in tonnes) by fishing year aggregated into 0.2 degree spatial blocks for the 2014 fishing year.



Figure C10b: Estimated alfonsino catch as reported on TCER forms (in tonnes) by fishing year aggregated into 0.2 degree spatial blocks for the 2008–2011 fishing years.



Figure C10b continued: Estimated alfonsino catch as reported on TCER forms (in tonnes) by fishing year aggregated into 0.2 degree spatial blocks for the 2012–2014 fishing years.



Figure C11: Distribution of annual alfonsino catch by fishery area, month, method, and target species for the groomed and merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot. Fishery areas are shown in Figure 2. BT is bottom trawl; MWB is midwater trawl on the bottom (within 5 m of the seabed); MW is midwater trawl; BLL is bottom longline. Species codes are defined in Table C48.



Figure C12: Distribution of annual alfonsino catch by nationality, vessel power (kW), overall length (m), and gross tonnage for the groomed and merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.



Figure C13: Distribution of annual alfonsino catch by month, statistical area, method, and target species for the east coast North Island fishery for the groomed and merged data. Circle size is proportional to catch; maximum circle size is indicated on each plot.



Figure C14: Distribution of annual alfonsino catch (t) from the groomed and merged data or the east coast North Island fishery by month, statistical area, method and target species. MWB = midwater trawl within 5 m of the sea bed, BT = bottom trawl, MW = midwater trawl, BLL = bottom longline. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C15a: Distribution of annual alfonsino catch (t) from the groomed and merged data for the east coast North Island fishery by month and method for the main target species. BT = bottom trawl. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.







Figure C16a: Distribution of annual alfonsino catch (t) from the groomed and merged data for the east coast North Island fishery by depth and method for the main target species. BT = bottom trawl. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C16b: Distribution of annual alfonsino catch (t) from the groomed and merged data for the east coast North Island fishery by depth and method for the main target species. MW = midwater trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed). See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C17a: Distribution of annual alfonsino catch (t) from the groomed and merged data for the east coast North Island fishery by method and form type for the main target species. BT = bottom trawl, MW = midwater trawl. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C17b: Distribution of annual alfonsino catch (t) from the groomed and merged data for the east coast North Island fishery by method and form type for the main target species. MWB = midwater trawl on the bottom (within 5 m of the sea bed), BLL = bottom longline. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C18a: Distribution of annual alfonsino catch (t) from the groomed and merged data for the east coast North Island fishery by method and target species for the main statistical areas. BT = bottom trawl. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.







Figure C19: Proportion of tows that recorded no alfonsino catch for the main target species for all trawl methods (top plot), and bottom long line sets (bottom plot).

1998 2000 2002 2004 2006 2008 2010 2012 2014

0

1990 1992 1994

1996



Fishing year

Figure C20a: Unstandardised catch rates of alfonsino by main target species (kg/tow) and the number of tows by fishing year for the east coast North Island fishery using bottom trawl gear.



Figure C20b: Unstandardised catch rates of alfonsino by main target species (kg/tow) and the number of tows by fishing year for the east coast North Island fishery using midwater trawl gear on the bottom (within 5 m of the sea bed).



Figure C20c: Unstandardised catch rates of alfonsino by main target species (kg/tow) and the number of tows by fishing year for the east coast North Island fishery using midwater trawl.



Figure C20d: Unstandardised catch rates of alfonsino by main target species (kg/hook) and the number of hooks set by fishing year for the east coast North Island fishery using bottom long line.



Figure C21a: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for effort depth (m) reported by main target species when catching alfonsino in the east coast North Island fishery using bottom trawl gear.



Figure C21b: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for effort depth (m) reported by main target species when catching alfonsino in the east coast North Island fishery using midwater trawl gear on the bottom (within 5 m of the sea bed).



Figure C21c: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for effort depth (m) reported by main target species when catching alfonsino in the east coast North Island fishery using midwater trawl gear.



Figure C21d: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for effort depth (m) reported by main target species when catching alfonsino in the east coast North Island fishery using bottom long line.



Figure C22a: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for fishing duration (hours) reported by main target species when catching alfonsino in the east coast North Island fishery using bottom trawl gear.



Figure C22b: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for fishing duration (hours) reported by main target species when catching alfonsino in the east coast North Island fishery using midwater trawl gear on the bottom (within 5 m of the sea bed).


Figure C22c: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for fishing duration (hours) reported by main target species when catching alfonsino in the east coast North Island fishery using midwater trawl gear.



Figure C22d: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for fishing duration (hours) reported by main target species when catching alfonsino in the east coast North Island fishery using bottom long line.



Figure C23a: Median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for the distribution of other fishing effort variables and vessel characteristics for the east coast North Island fishery by main target species catching alfonsino using bottom trawl gear.



Figure C23b: Median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for the distribution of other fishing effort variables and vessel characteristics for the east coast North Island fishery by main target species catching alfonsino using midwater trawl gear on the bottom (within 5 m of the sea bed).



Figure C23c: Median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for the distribution of other fishing effort variables and vessel characteristics for the east coast North Island fishery by main target species catching alfonsino using midwater trawl gear.



Figure C23d: Median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for the distribution of other fishing effort variables and vessel characteristics for the east coast North Island fishery by main target species catching alfonsino using bottom long line.



Figure C24a: Distribution of estimated alfonsino catch taken by bottom trawl gear for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1990 to 1998 fishing years on the TCEPR form.



Figure C24a continued: Distribution of estimated alfonsino catch taken by bottom trawl gear for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1999 to 2007 fishing years on the TCEPR form.



Figure C24a continued: Distribution of estimated alfonsino catch taken by bottom trawl gear for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 2008 to 2014 fishing years on the TCEPR form.



Figure C24b: Distribution of estimated alfonsino catch taken by midwater trawl gear on the bottom (within 5 m of the sea bed) for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1990 to 1998 fishing years on the TCEPR form.



Figure C24b continued: Distribution of estimated alfonsino catch taken by midwater trawl gear on the bottom (within 5 m of the sea bed) for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1999 to 2007 fishing years on the TCEPR form.



Figure C24b continued: Distribution of estimated alfonsino catch taken by midwater trawl gear on the bottom (within 5 m of the sea bed) for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 2008 to 2014 fishing years on the TCEPR form.



Figure C24c: Distribution of estimated alfonsino catch taken by midwater trawl for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1990 to 1998 fishing years on the TCEPR form.



Figure C24c continued: Distribution of estimated alfonsino catch taken by midwater trawl for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1999 to 2007 fishing years on the TCEPR form.



Figure C24c continued: Distribution of estimated alfonsino catch taken by midwater trawl for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 2008 to 2014 fishing years on the TCEPR form.



Figure C24d: Distribution of estimated alfonsino catch taken by bottom long line for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1990 to 1998 fishing years for all form types.



Figure C24d continued: Distribution of estimated alfonsino catch taken by bottom long line for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 1999 to 2007 fishing years for all form types.



Figure C24d continued: Distribution of estimated alfonsino catch taken by bottom long line for the east coast North Island fishery aggregated into 0.2 degree spatial blocks in the 2008 to 2014 fishing years for all form types.



Figure C25: Location of targeted alfonsino catches (grey squares) and alfonsino bycatch (black squares) for the main target species using bottom trawl for all years combined for the east coast North Island.



Figure C25 continued: Location of targeted alfonsino catches (grey squares) and alfonsino bycatch (black squares) for the main target species for all years combined for the east coast North Island. MW = midwater trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed), BLL = bottom long line.



Figure C26: Estimated catches of alfonsino by sub-region and fishing year (top left plot) and fishing year and month for the sub regions identified within the east coast North Island. EN = East Northland, BOP = Bay of Plenty, CAPE = East Cape, TUAH = Tuaheni Bank, RCRG = Ritchie Bank/Rock Garden, MCMB = Madden Canyon/Motukura Bank, WAIR = Wairarapa.



Figure C27: Estimated catches of alfonsino by method and fishing year for the sub regions identified within the east coast North Island. EN = East Northland, BOP = Bay of Plenty, CAPE = East Cape, TUAH = Tuaheni Bank, RCRG = Ritchie Bank/Rock Garden, MCMB = Madden Canyon/Motukura Bank, WAIR = Wairarapa.



Figure C28: Estimated catches of alfonsino by target species and fishing year for the sub regions identified within the east coast North Island. CAPE = East Cape, TUAH = Tuaheni Bank, RCRG = Ritchie Bank/Rock Garden, MCMB = Madden Canyon/Motukura Bank, WAIR = Wairarapa.







Figure C30: Estimated catches of alfonsino by vessel gross tonnage and fishing year for the sub regions identified within the east coast North Island. CAPE = East Cape, TUAH = Tuaheni Bank, RCRG = Ritchie Bank/Rock Garden, MCMB = Madden Canyon/Motukura Bank, WAIR = Wairarapa.



Figure C31: Estimated catches of alfonsino by vessel engine kilowatts and fishing year for the sub regions identified within the east coast North Island. CAPE = East Cape, TUAH = Tuaheni Bank, RCRG = Ritchie Bank/Rock Garden, MCMB = Madden Canyon/Motukura Bank, WAIR = Wairarapa.



Figure C32: Distribution of annual alfonsino catch (t) from the groomed and merged data for the eastern Chatham Rise fishery by month, statistical area, method and target species. MWB= midwater trawl within 5 m of the sea bed, BT= bottom trawl, MW = midwater trawl. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C33: Distribution of annual alfonsino catch (t) from the groomed and merged data for the eastern Chatham Rise fishery by form type. TCP = Trawl Catch Effort and Processing Return.



Figure C34: Distribution of annual alfonsino catch (t) from the groomed and merged data for the eastern Chatham Rise fishery by month and method for the main target species. BT = bottom trawl. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C35: Distribution of annual alfonsino catch (t) from the groomed and merged data for the eastern Chatham Rise fishery by depth and method for the main target species. BT = bottom trawl. See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C36: Distribution of annual alfonsino catch (t) from the groomed and merged data for the eastern Chatham Rise fishery by method for the main target species as reported on TCEPR forms (TCEPR forms account for >99% of the catch for the eastern Chatham Rise fishery). BT = bottom trawl, MW = midwater trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed). See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C37: Distribution of annual alfonsino catch (t) from the groomed and merged data for the eastern Chatham Rise fishery by method and target species for the main statistical areas. BT = bottom trawl, MW = midwater trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed). See Table C48 for species codes. Circle size is proportional to catch; maximum circle size is indicated on the top left hand corner of each plot.



Figure C38: Proportion of tows that recorded no alfonsino catch for the main target species for all trawl methods.



Figure C39: Unstandardised catch rates of alfonsino by main target species (kg/tow) and the number of tows by fishing year for the eastern Chatham Rise fishery. BT = bottom trawl, MW = midwater trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed).



Figure C40: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for effort depth (m) reported by main target species when catching alfonsino in the eastern Chatham Rise fishery. BT = bottom trawl, MW = midwater trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed).



Figure C41: Annual median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for fishing duration (hours) reported by main target species when catching alfonsino in the eastern Chatham Rise fishery. BT = bottom trawl, MW = midwater trawl, MWB = midwater trawl on the bottom (within 5 m of the sea bed).



Figure C42a: Median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for the distribution of other fishing effort variables and vessel characteristics for the eastern Chatham Rise fishery by main target species catching alfonsino using bottom trawl gear.


Figure C42b: Median (horizontal line), inter-quartile ranges (box), and range (vertical lines) for the distribution of other fishing effort variables and vessel characteristics for the eastern Chatham Rise fishery by main target species catching alfonsino using midwater trawl.







Figure C43a: Distribution of estimated alfonsino catch taken by bottom trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 1990 to 1995 fishing years on the TCEPR form.



Figure C43a continued: Distribution of estimated alfonsino catch taken by bottom trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 1996 to 2001 fishing years on the TCEPR form.



Figure C43a continued: Distribution of estimated alfonsino catch taken by bottom trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2002 to 2007 fishing years on the TCEPR form.



Figure C43a continued: Distribution of estimated alfonsino catch taken by bottom trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2008 to 2013 fishing years on the TCEPR form.



Figure C43a continued: Distribution of estimated alfonsino catch taken by bottom trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2014 fishing year on the TCEPR form.



Figure C43b: Distribution of estimated alfonsino catch taken by midwater trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 1990 to 1995 fishing years on the TCEPR form.



Figure C43b continued: Distribution of estimated alfonsino catch taken by midwater trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 1996 to 2001 fishing years on the TCEPR form.



Figure C43b continued: Distribution of estimated alfonsino catch taken by midwater trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2002 to 2007 fishing years on the TCEPR form.



Figure C43b continued: Distribution of estimated alfonsino catch taken by midwater trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2008 to 2013 fishing years on the TCEPR form.



Figure C43b continued: Distribution of estimated alfonsino catch taken by midwater trawl gear for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks for the 2014 fishing year on the TCEPR form.







Figure C43c continued: Distribution of estimated alfonsino catch taken by midwater trawl gear on the bottom (within 5 m of the sea bed) for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 1996 to 2001 fishing years on the TCEPR form.



Figure C43c continued: Distribution of estimated alfonsino catch taken by midwater trawl gear on the bottom (within 5 m of the sea bed) for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2002 to 2007 fishing years on the TCEPR form.



Figure C43c continued: Distribution of estimated alfonsino catch taken by midwater trawl gear on the bottom (within 5 m of the sea bed) for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2008 to 2013 fishing years on the TCEPR form.



Figure C43c continued: Distribution of estimated alfonsino catch taken by midwater trawl gear on the bottom (within 5 m of the sea bed) for the eastern Chatham Rise fishery aggregated into 0.2 degree spatial blocks in the 2014 fishing year on the TCEPR form.



Figure C44: Location of targeted alfonsino catches (grey squares) and alfonsino bycatch (black squares) for the main target species for all years combined.



Figure C45: Estimated catches of alfonsino by sub-region and fishing year (top left plot) and fishing year and month for the sub regions identified within the eastern Chatham Rise. NWCI = northwest Chatham Islands, SECI= southeast Chatham Islands.



Figure C46: Estimated catches of alfonsino by method and fishing year for the sub regions identified within the eastern Chatham Rise. NWCI = northwest Chatham Islands, SECI= southeast Chatham Islands.



Figure C47: Estimated catches of alfonsino by target species and fishing year for the sub regions identified within the eastern Chatham Rise. NWCI = northwest Chatham Islands, SECI= southeast Chatham Islands.



Figure C48: Estimated catches of alfonsino by vessel overall length (metres) and fishing year for the sub regions identified within the eastern Chatham Rise. NWCI = northwest Chatham Islands, SECI= southeast Chatham Islands.



Figure C49: Estimated catches of alfonsino by vessel gross tonnage and fishing year for the sub regions identified within the eastern Chatham Rise. NWCI = northwest Chatham Islands, SECI= southeast Chatham Islands.



Figure C50: Estimated catches of alfonsino by vessel engine kilowatts and fishing year for the sub regions identified within the eastern Chatham Rise. NWCI = northwest Chatham Islands, SECI= southeast Chatham Islands.