



MONTEREY BAY AQUARIUM®

Seafood WATCH

Alfonsino

Beryx splendens and *Beryx decadactylus*



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New Zealand

Midwater and bottom trawl

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Final Seafood Recommendation

Alfonsino is ranked as a **Good Alternative** when sourced from vessels using midwater gear in the New Zealand quota management areas BYX1 and BYX2. It is ranked as **Avoid** for bottom trawl fisheries in all areas assessed and for midwater trawl fisheries in management area BYX3.

Stock	Fishery	Impacts on the stock Rank (score)	Impacts on other species Lowest scoring species Rank* (subscore, score)	Management Rank (score)	Habitat and ecosystem Rank (score)	Overall Recommendation (score)
Alfonsino BYX1	Alfonsino bottom trawl	Yellow (3.05)	Knobbly sandpaper sponge, Bamboo coral, Corals: stony branching, Smooth white cup sponge, Golden coral, Orange frond sponge, Black coral, Airy finger sponge, Stony cup corals, Corals: deepwater branching, Bushy hard coral Red (2.16, 2.16)	Yellow (3)	Red (0.87)	AVOID (2.04)
Alfonsino BYX1	Alfonsino midwater trawl	Yellow (3.05)	Black petrel, Chatham albatross, Buller's albatross, Giant boarfish, Salvin's albatross, White-capped albatross, Campbell albatross, White-chinned petrel, Gibson's albatross, Westland petrel, Frostfish, Alfonsino BYX3 Red (2.16, 2.16)	Yellow (3)	Green (3.87)	GOOD ALTERNATIVE (2.96)

* Rank and color in the 'Impacts on other Species' column is defined based on the subscore rather than the score. See www.seafoodwatch.org for more information about scoring rules.

Alfonsino BYX2	Alfonsino bottom trawl	Green (3.83)	Knobbly sandpaper sponge, Bamboo coral, Corals: stony branching, Smooth white cup sponge, Golden coral, Orange frond sponge, Black coral, Airy finger sponge, Stony cup corals, Corals: deepwater branching, Bushy hard coral Red (2.16, 2.16)	Yellow (3)	Red (0.87)	AVOID (2.16)
Alfonsino BYX2	Alfonsino midwater trawl	Green (3.83)	Black petrel, Chatham albatross, Buller's albatross, Giant boarfish, Salvin's albatross, White- capped albatross, Campbell albatross, White-chinned petrel, Gibson's albatross, Westland petrel, Frostfish, Alfonsino BYX3 Red (2.16, 2.16)	Yellow (3)	Green (3.87)	GOOD ALTERNATIVE (3.13)
Alfonsino BYX3	Alfonsino bottom trawl	Red (2.16)	Knobbly sandpaper sponge, Bamboo coral, Corals: stony branching, Smooth white cup sponge, Golden coral, Orange frond sponge, Black coral, Airy finger sponge, Stony cup corals, Corals: deepwater branching, Bushy hard coral Red (2.16, 2.16)	Yellow (3)	Red (0.87)	AVOID (1.87)

Alfonsino BYX3	Alfonsino midwater trawl	Red (2.16)	Black petrel, Chatham albatross, Buller's albatross, Giant boarfish, Salvin's albatross, White- capped albatross, Campbell albatross, White-chinned petrel, Gibson's albatross, Westland petrel, Frostfish, Alfonsino BYX3 Red (2.16, 2.16)	Yellow (3)	Green (3.87)	AVOID (2.71)
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Scoring note – scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

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Executive Summary

This report evaluates the fishery targeting the species complex known as alfonsino (*Beryx splendens* and *B. decadactylus*), which is caught in New Zealand waters using midwater and bottom trawls. Alfonsino is ranked as a 'Good Alternative' when sourced from vessels using midwater gear in the New Zealand quota management areas BYX1 and BYX2. It is ranked as 'Avoid' for bottom trawl fisheries in all areas assessed and for midwater trawl fisheries in management area BYX3.

The inherent vulnerability of both species comprising the alfonsino complex is high. These species are jointly managed as a complex in three regions. Administrative boundaries divide the three geographic areas in which alfonsino are harvested, although biological stock boundaries are considered to occur on much larger scales. In one area (BYX1), a recent stock assessment concluded that alfonsino is likely to be present at levels of biomass above B_{MSY} . However, for the two other main harvesting areas (BYX2, BYX3), quantitative stock assessments are not available. Fishing mortality has been estimated in one area only (BYX2) and is unknown for rest of the stock. Target species catch comprises 60–80% of landings for the bottom trawl fishery and 68–78% of landings for the midwater trawl fishery.

Most fish species bycaught during alfonsino fishing are caught in very low amounts (<1% of the total catch for midwater and bottom trawl fishing effort). The bycatch species caught in the highest volumes during alfonsino bottom trawling are black cardinal fish, southern boarfish, bluenose, hoki, spiky oreo, ribaldo, shovelnose dogfish, white warehou, sea perch, giant boarfish, and ling. During midwater trawling, the most commonly bycaught fish species are bluenose, white warehou, frostoffish, and hoki. Fishing mortality for most of these species is not well known, and the proportions of catch that these species comprise vary greatly between years. More than 30 species caught during alfonsino fishing are retained, which leads to trawl fisheries with a very small proportion of discards. No seabird or marine mammal captures have been recorded in alfonsino trawls, but coverage of the inshore component of fishing activity by fisheries observers is very low (e.g., 0–5% of effort). Offshore coverage of trawl activity is generally higher for the species with which alfonsino is caught (e.g., hoki, ling) but varies between management areas and years. Bycatch risk is ascertained from spatially coincident trawl fisheries. Seabird species at risk of capture include IUCN-classified albatrosses, petrels, and shearwaters. For some of these species, fishing mortality may not be sustainable. Benthic invertebrates, corals, and sponges have also been returned by observers from bottom trawls.

Legislative and policy frameworks are generally robust for the harvest of alfonsino, but a lack of quantitative data on the stocks, retained species caught alongside alfonsino, and bycatch species limits management efficacy. Stock assessments are available for only a small proportion of the retained species caught with alfonsino. Observer coverage of trawlers catching alfonsino is highly variable and focused on the larger vessels that tend to fish offshore. Where coverage does occur, however, data collection is robust and can be used for enforcement purposes. Opportunities for stakeholder involvement in the management of alfonsino fishing activity are

extensive (e.g., through working groups and public consultations). Management decision-making involves a significant amount of consultation and the promulgation of decision papers. The alfonsino species complex is often caught alongside species of higher commercial value (and harvesting priority, e.g., hoki). Consequently, although information on the outcome status of bycatch species is lacking in the specific context of the alfonsino fishery, more information has sometimes been collected from other fisheries partially overlapping with alfonsino in spatial extent (e.g., hoki, black cardinalfish, ling).

Bottom and midwater trawl fishing for alfonsino occurs over habitats including oceanic banks, ridges, and seamounts. The amount of fishing is managed through catch limits although there are no effort restrictions in place (e.g., on number or duration of tows). Some benthic protection occurs at a nationwide scale through the exclusion of bottom trawling from designated areas. These areas include parts of alfonsino quota management areas (QMAs) but are not representative of habitat types within those QMAs. Ecosystem effect considerations are a specific component of the management approach, but work has not been focused on the alfonsino fishery *per se*. Over time, ecosystem management approaches are planned for fisheries alongside which alfonsino is caught (i.e., where alfonsino is a bycatch species in a higher value commercial fishery). Some ecosystem components are managed across New Zealand fisheries (e.g., seabirds) for which bycatch reduction measures are required on all trawlers ≥ 28 m, which operate in deeper waters rather than inshore areas.

Introduction

Scope of the analysis and ensuing recommendation

This report evaluates the fishery targeting the species complex known as alfonsino (*Beryx splendens* and *B. decadactylus*) caught in New Zealand waters using midwater and bottom trawls.

Overview of the species and management bodies

Alfonsino (*Beryx splendens* and *B. decadactylus*) is a widespread species group occurring in tropical and temperate waters. These species are typically fished when associated with submarine ridges, banks, and seamounts. However, they can also occur over muddy or sandy substrates (Yamada et al. 1995).

For *B. splendens*, length-frequency distributions of caught fish in different areas imply that age-specific migration occurs. Juveniles are found in pelagic and epipelagic zones. Fish in New Zealand waters are thought to use pelagic systems for reproduction, but the location of their spawning grounds is unknown (Ministry of Fisheries 2011a). Sexual maturity is estimated at 4–5 years of age or ~30 cm fork length, and males grow more slowly than females. The maximum age recorded is 17 years (Ministry of Fisheries 2011a).

The biology of *B. decadactylus* is not well known in New Zealand waters. In other locales (e.g., off the southeastern coast of the USA), females in spawning condition have been found from summer through fall, and males year-round (Friess 2008; Friess and Sedberry 2011). Age estimates of caught fish have ranged from 8 to 69 years (e.g., Friess and Sedberry 2011).

The diet of both species includes small fish, cephalopods, and crustaceans (Goldman 2007; Horn et al. 2010). The stock structure of these species in New Zealand is unknown. However, fish in New Zealand waters may be part of the South Pacific stock (Ministry of Fisheries 2011a). Genetic analyses in other areas suggest that stocks occupy very large areas, with gene flow occurring at inter-oceanic scales (Friess and Sedberry 2011; Hoarau and Borsa 2011).

The alfonsino fishery in New Zealand is managed by the Ministry for Primary Industries under the Fisheries Act (1996). The purpose of the Fisheries Act is to provide for fishery utilization (social, cultural, economic) while ensuring sustainability. Sustainability is interpreted in the Fisheries Act as:

- “maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and,
- avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment.”

The Quota Management System (QMS) limits total commercial catches in accordance with specified areas. Quota owners can buy, sell, and lease their quota, and are free to choose when and where (within the boundaries of the specified Quota Management Area) they harvest. Quota ownership is made operational through Total Allowable Commercial Catches (TACCs), which are reviewed annually (Clement and Associates 2011).

The alfonsino fishery includes the species complex of *B. splendens* and *B. decadactylus*. *B. splendens* comprises more than 99% of alfonsino catch, and *B. decadactylus* makes up the remaining fraction. Most *B. decadactylus* catch occurs in Quota Management Area (QMA) BYX1 (Figure 1; Ministry of Fisheries 2011a). This fishery developed in the 1980s, and catch has been controlled through the QMS since 1986. The TACC for 2011/12 is almost 3,000 tonnes. The full TACC of this species group has not been caught since 2005/06 (Clement and Associates 2011; see Figure 2 for catch landed by New Zealand), although overcatch has consistently occurred in one QMA (BYX2). In New Zealand, catch is taken mainly to the east of the North and South Islands of New Zealand using the bottom and midwater trawl methods. QMAs BYX1, BYX2, and BYX3 (Figure 1) are the most important of the areas. The TACCs are not gear-specific; fishers are free to choose the gear type they use within the corresponding QMA. In the QMA denoted BYX1 (off the northeast coast of New Zealand's North Island), 61% of fish are taken using bottom trawls and 25% using midwater trawls. Alfonsino are also taken in small amounts as a bycatch species in other trawl and bottom longline fisheries off the New Zealand coast (Ministry of Fisheries 2011a).

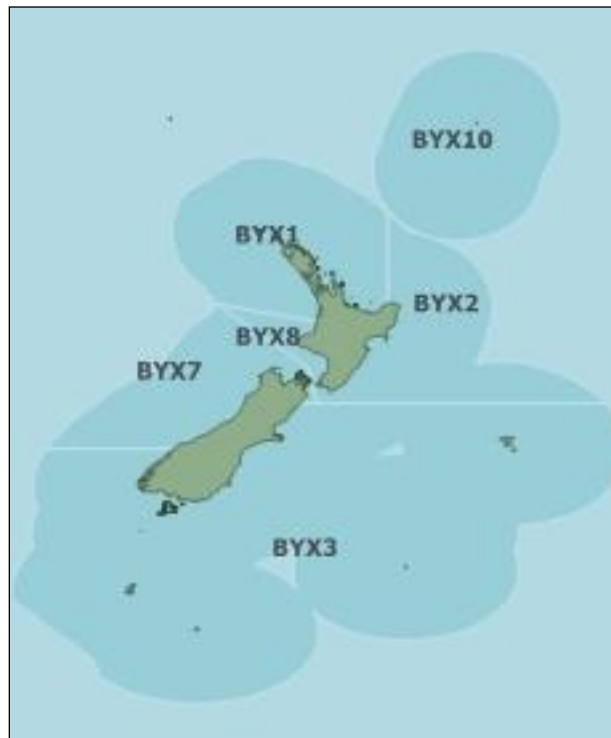


Figure 1. New Zealand Alfonsino Quota Management Areas referred to in the text. (Source: <http://fs.fish.govt.nz/Page.aspx?pk=7&sc=BYX>).

Production statistics

Alfonsino are widely fished in the world's oceans. New Zealand, Chile, Ukraine, Namibia, and Spain have produced the most catch since 1990 (Figure 2; Sabeni and Calderini 2012). Global catch volume peaked in 2003 due to an unusually high Chilean catch, which has since dropped. Catches taken by other countries show some variability over time. Ukrainian, Namibian, and Spanish catches were higher in the

1990s and have since declined. New Zealand catches show a very slight net increase over time (Sabeni and Calderini 2012).

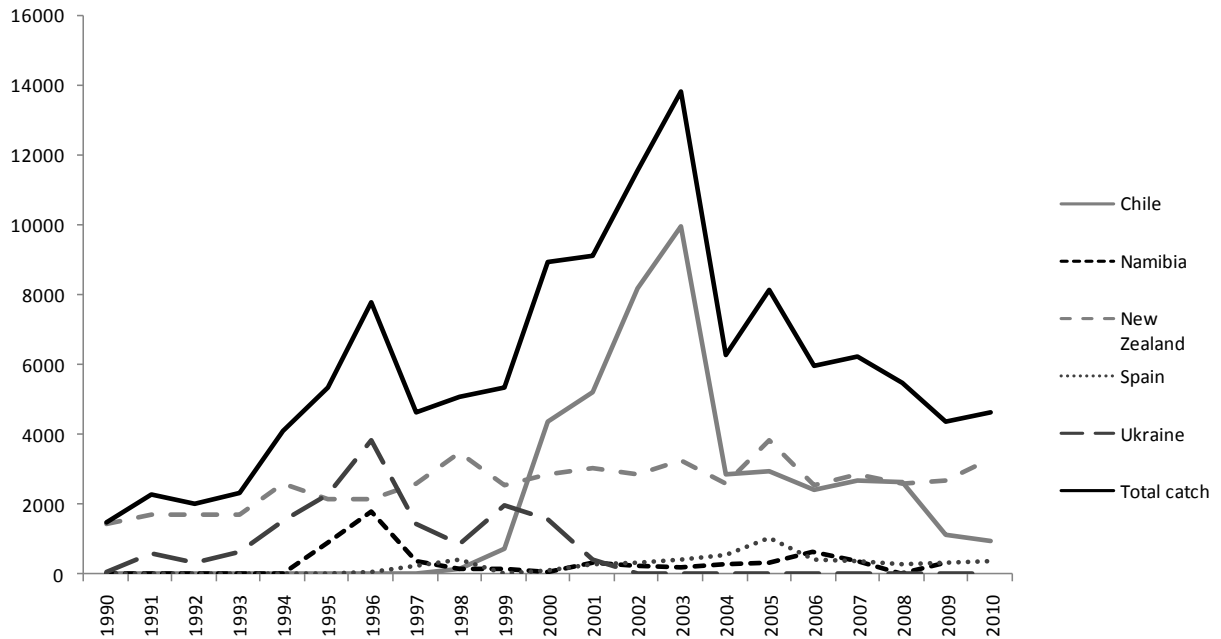


Figure 2. Alfonsino catches (tonnes) by country and total catch for 1990–2010. (Source: Sabeni and Calderini 2012).

Importance to the US/North American market

Alfonsino has not been recorded as imported to the US (NOAA Fisheries Statistics, <http://www.st.nmfs.noaa.gov/st1/>; Sabeni and Calderini 2012).

Common and market names

B. decadactylus, *B. splendens*: alfonsino, beryx (Froese and Pauly 2012)

B. decadactylus: long-finned beryx, red bream, imperador (Froese and Pauly 2012)

B. splendens: Splendid alfonsino, slank beryx, golden eye perch, slender beryx, slender alfonsino (Froese and Pauly 2012)

Primary product forms

Alfonsino is marketed in frozen form and sold whole, headed and gutted, gilled and gutted, skinned and boned, and filleted (e.g., <http://www.wellingtontrawlingcompany.com/pricelist.html>).

Analysis

Scoring guide

- All scores result in a zero to five final score for the criterion and the overall final rank. A zero score indicates poor performance, while a score of five indicates high performance.
- The full Seafood Watch Fisheries Criteria that the following scores relate to are available on our website at www.seafoodwatch.org.

Criterion 1: Stock for which you want a recommendation

Guiding principles

- The stock is healthy and abundant. Abundance, size, sex, age and genetic structure should be maintained at levels that do not impair the long-term productivity of the stock or fulfillment of its role in the ecosystem and food web.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given current abundance and inherent resilience to fishing while accounting for scientific uncertainty, management uncertainty, and non-fishery impacts such as habitat degradation.

Summary

Stock	Fishery	Inherent vulnerability Rank	Stock status Rank (score)	Fishing mortality Rank (score)	Criterion 1 Rank (score)
Alfonsino BYX1	Alfonsino bottom trawl	High	Low concern (4)	Moderate concern (2.33)	Yellow (3.05)
Alfonsino BYX1	Alfonsino midwater trawl	High	Low concern (4)	Moderate concern (2.33)	Yellow (3.05)
Alfonsino BYX2	Alfonsino bottom trawl	High	Low concern (4)	Low concern (3.67)	Green (3.83)

Alfonsino BYX2	Alfonsino midwater trawl	High	Low concern (4)	Low concern (3.67)	Green (3.83)
Alfonsino BYX3	Alfonsino bottom trawl	High	High concern (2)	Moderate concern (2.33)	Red (2.16)
Alfonsino BYX3	Alfonsino midwater trawl	High	High concern (2)	Moderate concern (2.33)	Red (2.16)

Justification of ranking

Factor 1.1. Inherent vulnerability: High

Key relevant information:

B. splendens: FishBase vulnerability score is 57 (Froese and Pauly 2012).

B. decadactylus: FishBase vulnerability score is 72 (Froese and Pauly 2012).

Factor 1.2. Stock status

Key relevant information:

Alfonsino catch is comprised of two *Beryx* species. As noted above, most *B. decadactylus* catch occurs in Quota Management Area BYX1 (Ministry of Fisheries 2011a). Therefore, most catch in BYX2 and BYX 3 consists of *B. splendens*.

BYX1: Low concern

The most recent assessment of alfonsino in BYX1 occurred in 2010 using a standardized catch per unit effort (CPUE) abundance index. The main data sources were catch reporting from government fisheries observers and industry logbooks (Ministry of Fisheries 2011a). The stock is considered to be above B_{MSY}^1 , with $P > 60\%$, based on the assumption that B_{MSY} is 30–50 % of B_0^2 . There is no management target in place, but under current catch limits, the stock is

¹ The average stock biomass that results from taking an average catch of maximum sustainable yield under various types of harvest strategies (Ministry of Fisheries 2011a).

² Virgin biomass: the theoretical carrying capacity of the recruited or vulnerable biomass of the fish stock (Ministry of Fisheries 2011a).

considered likely to decline to B_{MSY} . While not targets, the soft limit³ for harvest is 20% of B_0 and the hard limit is 10% of B_0 . The stock is considered very unlikely ($P < 10\%$) to be below the hard and soft limits, and is unlikely ($P < 40\%$) to decline to a level below the hard limit under current harvesting scenarios. The stock will next be assessed in 2013 (Ministry of Fisheries 2011a). Biomass is above the limit reference point and may be estimated to be above a target reference point, but there is significant uncertainty.

BYX2: Low concern

Catch is considered to be sustainable in the short to medium term based on annual landings at stable levels from 1986–2008/09. However, the TACC has been overcaught almost every season from 2002/03 to 2009/10, and the TACC and reported landings are higher than the maximum constant yield (MCY). However, the value of MCY has not been updated since 1991 for BYX2. No formal assessment has been completed for this Quota Management Area (Ministry of Fisheries 2011a). The stock is classified as not overfished, but a quantitative stock assessment is lacking (and significant uncertainty remains).

BYX3: High concern

The sustainability of catches in this area is unknown. The fishery was lightly exploited until 1995/96. Since then, landings have fluctuated around the TACC (Ministry of Fisheries 2011a). There is no evidence to suggest that this stock is either above or below reference points, and the species' vulnerability is high.

Factor 1.3. Fishing mortality

Key relevant information:

BYX2: Low concern

Estimates of $F_{0.1}$ ⁴ range from 0.25 to 0.32 for alfonsino in BYX2 (the only area for which estimates exist) using estimates of natural mortality (M) of 0.2–0.23. However, estimates of M were derived formulaically (using $M = \log_e 100 / \text{maximum age of 20 years}$) due to age-specific migration preventing population-wide sampling. The $F_{0.1}$ yield has been estimated at 8–9% B_0 (Ministry of Fisheries 2011a).

BYX1, BYX3: Moderate concern

No estimates are available for other QMAs (BYX1, BYX3) and no species or gear-specific estimates have been made (Ministry of Fisheries 2011a).

In accordance with the Seafood Watch criteria, fishery mortality is assessed for BYX1 and BYX3 for both midwater and bottom trawl fisheries as a 'moderate concern'. Stock BYX2 is assessed

³ Biomass below which a formal time-constrained rebuilding plan is required. Fisheries are considered for closure if stocks reach the hard limit (Ministry of Fisheries 2011a).

⁴ The fishing mortality rate at which the increase in equilibrium yield per recruit in weight per unit of effort is 10% of the yield per recruit resulting from the first unit of effort on the unexploited stock (Ministry of Fisheries 2011a).

as a 'low concern' because it is probable that the fishing mortality rate will allow the stock to be maintained. Nevertheless, there is uncertainty in the assessment.

Criterion 2: Impacts on other retained and bycatch stocks

Guiding principles

- The fishery minimizes bycatch. Seafood Watch® defines bycatch as all fisheries-related mortality or injury other than the retained catch. Examples include discards, endangered or threatened species catch, pre-catch mortality and ghost fishing. All discards, including those released alive, are considered bycatch unless there is valid scientific evidence of high post-release survival and there is no documented evidence of negative impacts at the population level.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given each impacted species' abundance and productivity, accounting for scientific uncertainty, management uncertainty and non-fishery impacts such as habitat degradation.

Summary

Bottom trawl

Stock	Inherent vulnerability	Stock status	Fishing mortality	Subscore	Score (subscore*discard modifier)	Rank (based on subscore)
	Rank	Rank (score)	Rank (score)			
Knobbly sandpaper sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Bamboo coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Corals: stony branching	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Smooth white cup sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Golden coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Orange frond sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Black coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red

Airy finger sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Stony cup corals	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Corals: deepwater branching	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Bushy hard coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Glass sponges	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Gorgonian coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Convuluted ostrich egg sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Floppy tubular sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Bamboo corals	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Black coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Bamboo coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Black coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Bubblegum coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red

Grey fibrous massive sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Chipped fibreglass matt sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Stony corals	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Soft coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Fleshy club sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Bottlebrush coral	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Furry oval sponge	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Black cardinal fish	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Spiky oreo	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Campbell albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Black petrel	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
White-chinned petrel	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Gemfish	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red

Buller's albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Sea perch	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Giant boarfish	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Salvin's albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
White-capped albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Westland petrel	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Chatham albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Gibson's albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Alfonsino BYX3	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Southern boarfish	Medium	Moderate concern (3)	Moderate concern (2.33)	2.64	2.64	Yellow
White warehou	Medium	Moderate concern (3)	Moderate concern (2.33)	2.64	2.64	Yellow
Grey petrel	High	High concern (2)	Low concern (3.67)	2.71	2.71	Yellow
Sooty shearwater	High	High concern (2)	Low concern (3.67)	2.71	2.71	Yellow
Dusky dolphin	High	High concern (2)	Low concern (3.67)	2.71	2.71	Yellow
Alfonsino BYX1	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow

Ribaldo	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Ling	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Shovelnose dogfish	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Anemones	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Deepsea anenome	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Brittlestars	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Armless stars	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Red crab	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Antlered crab	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Urchin	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Hermit crab	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Sea star	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Deepwater octopus	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Echinothuriidae	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Sea cucumbers	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow

Anemones	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Basket star	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Cidarid urchin	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Sea urchin	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Deepsea anenome	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Starfish	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Umbrella octopus	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Brittle star	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Cidarid urchin	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Sea star	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Geometric star	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Sea star	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Pagurid	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Starfish	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Cidaroid urchin	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow

Tam o shanter urchin	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Volute	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Rat-tail star	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Flesh-footed shearwater	High	Very low concern (5)	Moderate concern (2.33)	3.41	3.41	Green
Cape petrel	High	Very low concern (5)	Moderate concern (2.33)	3.41	3.41	Green
Northern giant petrel	High	Very low concern (5)	Moderate concern (2.33)	3.41	3.41	Green
New Zealand fur seal	High	Low concern (4)	Low concern (3.67)	3.83	3.83	Green
Bluenose	High	Low concern (4)	Low concern (3.67)	3.83	3.83	Green
Alfonsino BYX2	High	Low concern (4)	Low concern (3.67)	3.83	3.83	Green
Bottlenose dolphin	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
Common dolphin	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
Common diving petrel	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
White-faced storm petrel	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
Hoki	High	Very low concern (5)	Very low concern (5)	5.00	5.00	Green

Midwater trawl

Stock	Inherent vulnerability	Stock status	Fishing mortality	Subscore	Score (subscore*discard modifier)	Rank (based on subscore)
	Rank	Rank (score)	Rank (score)			
Black petrel	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Chatham albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Buller's albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Giant boarfish	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Salvin's albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
White-capped albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Campbell albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
White-chinned petrel	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Gibson's albatross	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Westland petrel	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Frostfish	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
Alfonsino BYX3	High	High concern (2)	Moderate concern (2.33)	2.16	2.16	Red
White warehou	Medium	Moderate concern (3)	Moderate concern (2.33)	2.64	2.64	Yellow

Silver warehou	Low	Moderate concern (3)	Moderate concern (2.33)	2.64	2.64	Yellow
Ruby fish	Medium	Moderate concern (3)	Moderate concern (2.33)	2.64	2.64	Yellow
Dusky dolphin	High	High concern (2)	Low concern (3.67)	2.71	2.71	Yellow
Sooty shearwater	High	High concern (2)	Low concern (3.67)	2.71	2.71	Yellow
Grey petrel	High	High concern (2)	Low concern (3.67)	2.71	2.71	Yellow
Alfonsino BYX1	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Ling	High	Low concern (4)	Moderate concern (2.33)	3.05	3.05	Yellow
Flesh-footed shearwater	High	Very low concern (5)	Moderate concern (2.33)	3.41	3.41	Green
Northern giant petrel	High	Very low concern (5)	Moderate concern (2.33)	3.41	3.41	Green
Cape petrel	High	Very low concern (5)	Moderate concern (2.33)	3.41	3.41	Green
New Zealand fur seal	High	Low concern (4)	Low concern (3.67)	3.83	3.83	Green
Bluenose	High	Low concern (4)	Low concern (3.67)	3.83	3.83	Green
Alfonsino BYX2	High	Low concern (4)	Low concern (3.67)	3.83	3.83	Green
Bottlenose dolphin	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
White-faced storm petrel	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
Common diving petrel	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
Common dolphin	High	Very low concern (5)	Low concern (3.67)	4.28	4.28	Green
Hoki	High	Very low concern (5)	Very low concern (5)	5.00	5.00	Green

Most fish species bycaught during alfonsino fishing are caught in very low amounts (<1% of the total catch for midwater and bottom trawl fishing effort). Bycatch species caught in the highest volumes during alfonsino bottom trawling are: black cardinal fish, southern boarfish, bluenose, hoki, spiky oreo, ribaldo, shovelnose dogfish, white warehou, sea perch, giant boarfish, and ling. During midwater trawling, the most commonly bycaught fish species are bluenose, white warehou, frostfish, and hoki. Fishing mortality for most of these species is not well known, and the proportions of catch that these species comprise vary greatly among years. More than 30 species caught during alfonsino fishing are retained, which leads to trawl fisheries with a very small proportion of discards. No seabird or marine mammal captures have been recorded in alfonsino trawls, although coverage of the inshore component of fishing activity by fisheries observers is very low (e.g., 0–5% of effort). Offshore coverage of trawl activity is generally higher for species with which alfonsino is caught but varies between management areas and years (e.g., Ramm 2010, 2011). Bycatch risk is ascertained from spatially coincident trawl fisheries. Seabird species at risk of capture include IUCN-classified albatrosses, petrels, and shearwaters. For some of these species, fishing mortality may not be sustainable. Benthic invertebrates, corals, and sponges have also been returned by observers from bottom trawls for alfonsino.

Justification of ranking

Bycatch data used for this assessment was collected by fisheries observers from 2006 through 2012 (Ministry for Primary Industries, unpublished). No incidents of seabird or marine mammal bycatch have been reported from trawl tows targeting alfonsino. However, other tows targeting finfish in the same areas as alfonsino have recorded such bycatch; consequently, seabird and marine mammal species are included in this assessment. Fish bycatch species assessed here comprised >1% of the total catch. All species of seabirds, marine mammals, corals, sponges, and benthic invertebrates are assessed. The stock statuses of bycatch species varied considerably. For most bycaught fish species, fishing mortality is poorly known. Among seabirds at risk of capture, there are certain species of albatross and petrel for which fishing mortality may be a threat. Fish species identified as minor bycatch and not assessed further are included, together with catch statistics, in Appendix A (Ministry for Primary Industries, unpublished data). The overall discard rates reported from alfonsino fishing are relatively low (for both midwater and bottom trawling) due to the diversity of retained species (>30 species are retained).

Factor 2.1. Inherent vulnerability

Key relevant information:

The inherent vulnerability of fish bycatch species was assessed using FishBase (Froese and Pauly 2012). The vulnerability of seabirds, marine mammals, benthic invertebrates, and corals and sponges was categorized according to Seafood Watch criteria.

Factor 2.2. Stock status

Key relevant information:

Stock statuses for assessed species and rationale for these assessments are presented in the following tables.

Bottom trawl

Fish				
Common name	Scientific name	Stock status	Rationale for assessment	References
Black cardinal fish	<i>Epigonus telescopus</i>	High concern	Stock assessment available for QMAs CDL 2–4. Species is assessed as very unlikely ($P < 10\%$) to be at or above the management target of $40\% B_0$, likely ($P > 60\%$) to be below the soft limit ($20\% B_0$) and possibly ($P = 40\text{--}60\%$) below the hard limit of $10\% B_0$. B was estimated as $12\% B_0$ for the base case in 2009.	Ministry of Fisheries 2011a
Southern boarfish	<i>Pseudopentaceros richardsoni</i>	Moderate concern	Stock not assessed; no evidence that stock is above or below reference points; inherent vulnerability (Factor 1.1) is moderate	Froese and Pauly 2012
Bluenose	<i>Hyperoglyphe antarctica</i>	Low concern	Full quantitative stock assessment completed. Species is assessed as very unlikely ($P < 10\%$) to be at or above the management target of $40\% B_0$, possibly ($P = 40\text{--}60\%$) below the soft limit ($20\% B_0$) and unlikely ($P < 40\%$) below the hard limit of $10\% B_0$. B was estimated as $14\text{--}27\% B_0$ in 2011.	Ministry of Fisheries 2011a
Hoki	<i>Macruronus novaezealandiae</i>	Very low concern	Full quantitative stock assessment completed. Stock is assessed as virtually certain ($P > 99\%$) to be at or above the lower limit of the management target of $35\text{--}50\% B_0$, and exceptionally unlikely ($P < 1\%$) to be below the hard and soft limits. B was estimated as $53\% B_0$ in 2011.	Ministry of Fisheries 2011a

Gemfish	<i>Rexea solandri</i>	High concern	Stock assessment completed. Stock for QMAs SKI 1–2 assessed as unlikely ($P < 40\%$) to be at or above the management target ($40\% B_0$), but unlikely ($P < 40\%$) to be below the hard and soft limits. B was estimated as $22\% B_0$ in 2008. For QMAs SKI 3&7, there is no recent assessment. Catches appear to have been declining in recent years. Inherent vulnerability (Factor 1.1) is high.	Ministry of Fisheries 2011a
Spiky oreo	<i>Neocyttus rhomboidalis</i>	High concern	Stock not assessed and is managed as part of oreo species complex; no evidence that stock is above or below reference points; inherent vulnerability (Factor 1.1) is high.	Ministry of Fisheries 2011a; Froese and Pauly 2012
Ribaldo	<i>Mora moro</i>	Low concern	Partially quantitative stock assessments are available for QMAs RIB 3–4 and RIB 5–6 that overlap with some of the area in which trawling for alfonsino occurs. The assessment methods use trawl survey indices as indices of abundance. Stock status is considered likely ($P > 60\%$) to remain near current levels under current catches across these areas. In RIB 3–4, the stock is unlikely to be below the soft ($20\% B_0$) and hard ($10\% B_0$) limits. The status relative to the management target ($40\% B_0$) is unknown. In RIB 5–6, the stock is unlikely to be below the hard limit ($P < 40\%$) but the status in relation to the soft limit is unknown.	Ministry of Fisheries 2011a
Shovelnose dogfish	<i>Deania calcea</i>	Low concern	IUCN status: Least concern. No stock assessment is available however trawl surveys in part of the species' habitat in New Zealand waters show no trend in abundance over time. This species is relatively widely distributed, being found in both the northern and southern hemispheres.	IUCN 2012; Blackwell 2010; O'Driscoll et al. 2011; Doonan and Dunn 2011

White warehou	<i>Seriola caerulea</i>	Moderate concern	No information is available with which to assess stock status in New Zealand waters. IUCN status: Least concern. Inherent vulnerability: Moderate.	Ministry of Fisheries 2011a; Froese and Pauly 2012; IUCN 2012
Sea perch	<i>Helicolenus percoides</i>	High concern	Very little information but where information exists, there are indications that allowable catches are not sustainable. Distribution is restricted to Australasia. No evidence exists on stock status relative to reference points; inherent vulnerability (Factor 1.1) is high.	Ministry of Fisheries 2011a; Froese and Pauly 2012
Ling	<i>Genypterus blacodes</i>	Low concern	Availability of stock information varies with QMA. In LIN1, no information is available, which reduces scores for this factor. For LIN 3–4, a quantitative stock assessment shows biomass in 2007 to be ~45% of B_0 . This is likely ($P > 60\%$) to be above the management target of 40% B_0 , very unlikely ($P < 10\%$) to be below the soft limit (20% B_0), and exceptionally unlikely ($P < 1\%$) to be below the hard limit (10% B_0). For LIN 5–6, a quantitative stock assessment shows biomass in 2007 to be 55–95% of B_0 . This is very likely ($P > 90\%$) to be above the management target of 40% B_0 , very unlikely ($P < 10\%$) to be below the soft limit (20% B_0), and exceptionally unlikely ($P < 1\%$) to be below the hard limit (10% B_0). For LIN 2&7, a quantitative stock assessment shows biomass in 2007 to be 54% of B_0 . This is likely ($P > 60\%$) to be above the management target of 40% B_0 , very unlikely ($P < 10\%$) to be below the soft limit (20% B_0), and exceptionally unlikely ($P < 1\%$) to be below the hard limit (10% B_0).	Ministry of Fisheries 2011a

Giant boarfish	<i>Paristiopterus labiosus</i>	High concern	No stock assessment is available. The species distribution is restricted to Australasia. No evidence exists on stock status relative to reference points; inherent vulnerability (Factor 1.1) is low.	Froese and Pauly 2012
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Benthic invertebrates and biogenic habitat-forming species

Common name	Scientific name	Stock status	Rationale for assessment
Deepsea anenome	Actinostolidae	Low concern	Seafood Watch criteria
Anemones	Anthozoa	Low concern	Seafood Watch criteria
Knobbly sandpaper sponge	<i>Ecionemia novaezelandiae</i>	High concern	Seafood Watch criteria
Brittlestars	<i>Astrothorax waitei</i>	Low concern	Seafood Watch criteria
Bamboo coral	<i>Keratoisis</i> spp.	High concern	Seafood Watch criteria
Armless stars	Brisingida	Low concern	Seafood Watch criteria
Corals: stony branching	Dendrophylliidae, Oculinidae and some spp. in Caryophyllidae	High concern	Seafood Watch criteria
Smooth white cup sponge	<i>Corallistes fulvodesmus</i>	High concern	Seafood Watch criteria
Red crab	<i>Chaceon bicolor</i>	Low concern	Seafood Watch criteria
Golden coral	<i>Chrysogorgia</i> spp.	High concern	Seafood Watch criteria
Orange frond sponge	<i>Crella incrustans</i>	High concern	Seafood Watch criteria
Black coral	Antipatharia	High concern	Seafood Watch criteria
Airy finger sponge	<i>Callyspongia cf ramosa</i>	High concern	Seafood Watch criteria
Stony cup corals	Flabellidae, Fungiacyathidae and some spp. in Caryophyllidae	High concern	Seafood Watch criteria
Antlered crab	<i>Dagnaudus petterdi</i>	Low concern	Seafood Watch criteria
Coral	<i>Desmophyllum dianthus</i>	High concern	Seafood Watch criteria
Urchin	<i>Dermechinus horridus</i>	Low concern	Seafood Watch criteria
Hermit crab	<i>Diacanthurus rubricatus</i>	Low concern	Seafood Watch criteria
Sea star	<i>Dipsacaster magnificus</i>	Low concern	Seafood Watch criteria

Deepwater octopus	<i>Graneledone</i> spp.	Low concern	Seafood Watch criteria
Echinothuriidae	Echinothuriidae	Low concern	Seafood Watch criteria
Sea cucumbers	<i>Eynpniastes eximia</i>	Low concern	Seafood Watch criteria
Anemones	<i>Epizoanthus</i> spp.	Low concern	Seafood Watch criteria
Deepwater branching coral	<i>Enallopsammia rostrata</i>	High concern	Seafood Watch criteria
Snail	<i>Fusitriton magellanicus</i>	Low concern	Seafood Watch criteria
Bushy hard coral	<i>Goniocorella dumosa</i>	High concern	Seafood Watch criteria
Glass sponges	Hexactinellida	High concern	Seafood Watch criteria
Gorgonian coral	Gorgonacea	High concern	Seafood Watch criteria
Basket star	Gorgonocephalus spp.	Low concern	Seafood Watch criteria
Cidarid urchin	<i>Goniocidaris umbraculum</i>	Low concern	Seafood Watch criteria
Sea urchin	<i>Gracilechinus multidentatus</i>	Low concern	Seafood Watch criteria
Convoluted ostrich egg sponge	<i>Geodinella vestigifera</i>	High concern	Seafood Watch criteria
Deepsea anenome	Hormathiidae	Low concern	Seafood Watch criteria
Floppy tubular sponge	<i>Hyalascus</i> spp.	High concern	Seafood Watch criteria
Bamboo corals	Isididae	High concern	Seafood Watch criteria
Black coral	<i>Leiopathes</i> spp.	High concern	Seafood Watch criteria
Bamboo coral	<i>Lepidisis</i> spp.	High concern	Seafood Watch criteria
Black coral	<i>Leiopathes secunda</i>	High concern	Seafood Watch criteria
Coral	<i>Madrepora oculata</i>	High concern	Seafood Watch criteria
Starfish	<i>Mediaster sladeni</i>	Low concern	Seafood Watch criteria
Umbrella octopus	<i>Opisthoteuthis</i> spp.	Low concern	Seafood Watch criteria
Brittle star	<i>Ophiocreas sibogae</i>	Low concern	Seafood Watch criteria
Bubblegum coral	<i>Paragorgia arborea</i>	High concern	Seafood Watch criteria
Cidarid urchin	<i>Poriocidaris purpurata</i>	Low concern	Seafood Watch criteria
Grey fibrous massive sponge	<i>Phorbas</i> spp.	High concern	Seafood Watch criteria
Sponge	<i>Psammocinia cf hawere</i>	High concern	Seafood Watch criteria
Chipped fibreglass matt sponge	<i>Poecillastra laminaris</i>	High concern	Seafood Watch criteria

Sea star	<i>Proserpinaster neozelanicus</i>	Low concern	Seafood Watch criteria
Geometric star	<i>Psilaster acuminatus</i>	Low concern	Seafood Watch criteria
Sea star	<i>Radiaster gracilis</i>	Low concern	Seafood Watch criteria
Pagurid	<i>Sympagurus dimorphus</i>	Low concern	Seafood Watch criteria
Starfish	Asteroidea & Ophiuroidea	Low concern	Seafood Watch criteria
Stony corals	Scleractinia	High concern	Seafood Watch criteria
Soft coral	Alcyonacea	High concern	Seafood Watch criteria
Cidaroid urchin	<i>Stereocidarid</i> spp.	Low concern	Seafood Watch criteria
Fleshy club sponge	<i>Suberites affinis</i>	High concern	Seafood Watch criteria
Coral	<i>Solenosmilia variabilis</i>	High concern	Seafood Watch criteria
Tam o shanter urchin	Echinothuriidae & Phormosomatidae	Low concern	Seafood Watch criteria
Bottlebrush coral	<i>Thouarella</i> spp.	High concern	Seafood Watch criteria
Furry oval sponge	<i>Tetilla leptoderma</i>	High concern	Seafood Watch criteria
Volute	Volutidae	Low concern	Seafood Watch criteria
Rat-tail star	<i>Zoroaster</i> spp.	Low concern	Seafood Watch criteria

Midwater trawl

Fish				
Common name	Scientific name	Stock status	Rationale for assessment	References
Bluenose	<i>Hyperoglyphe antarctica</i>	See bottom trawl fishery text		
Hoki	<i>Macruronus novaezealandiae</i>	See bottom trawl fishery text		
White warehou	<i>Seriola caerulea</i>	See bottom trawl fishery text		
Giant boarfish	<i>Paristiopterus labiosus</i>	See bottom trawl fishery text		
Ling	<i>Genypterus blacodes</i>	See bottom trawl fishery text		

Frostfish	<i>Lepidopus caudatus</i>	High concern	Stock not assessed; no evidence that stock is above or below reference points; inherent vulnerability (Factor 1.1) is high.	Seafood Watch criteria
Silver warehou	<i>Seriolella punctata</i>	Moderate concern	Stock not assessed; no evidence that stock is above or below reference points; inherent vulnerability (Factor 1.1) is low.	Seafood Watch criteria
Ruby fish	<i>Plagiogeneion rubiginosum</i>	Moderate concern	Stock not assessed; no evidence that stock is above or below reference points; inherent vulnerability (Factor 1.1) is moderate.	Seafood Watch criteria

Bottom and midwater trawl

Seabirds				
Common name	Scientific name	Stock status	Rationale for assessment	References
Flesh-footed shearwater	<i>Puffinus carneipes</i>	Very low concern	IUCN status: Least concern	IUCN 2012
Black petrel	<i>Procellaria parkinsoni</i>	High concern	IUCN status: Vulnerable	IUCN 2012
Salvin's albatross	<i>Thalassarche salvini</i>	High concern	IUCN status: Vulnerable	IUCN 2012
White-capped albatross	<i>Thalassarche steadi</i>	High concern	IUCN status: Near threatened	IUCN 2012
Campbell albatross	<i>Thalassarche impavida</i>	High concern	IUCN status: Vulnerable	IUCN 2012
Sooty shearwater	<i>Puffinus griseus</i>	High concern	IUCN status: Near threatened	IUCN 2012
White-chinned petrel	<i>Procellaria aequinoctialis</i>	High concern	IUCN status: Vulnerable	IUCN 2012
Northern giant petrel	<i>Macronectes halli</i>	Very low concern	IUCN status: Least concern	IUCN 2012
Cape petrel	<i>Daption capense</i>	Very low concern	IUCN status: Least concern	IUCN 2012
Buller's albatross	<i>Thalassarche bulleri bulleri</i>	High concern	IUCN status: Near threatened	IUCN 2012

Grey petrel	<i>Procellaria cinerea</i>	High concern	IUCN status: Near threatened	IUCN 2012
Chatham albatross	<i>Thalassarche eremita</i>	High concern	IUCN status: Vulnerable	IUCN 2012
Common diving petrel	<i>Pelecanoides urinatrix</i>	Very low concern	IUCN status: Least concern	IUCN 2012
White-faced storm petrel	<i>Pelagodroma marina</i>	Very low concern	IUCN status: Least concern	IUCN 2012
Gibson's albatross	<i>Diomedea antipodensis gibsoni</i>	High concern	IUCN status: Vulnerable	IUCN 2012
Westland petrel	<i>Procellaria westlandica</i>	High concern	IUCN status: Vulnerable	IUCN 2012
Marine mammals				
Common name	Scientific name	Stock status	Rationale for assessment	References
Bottlenose dolphin	<i>Tursiops truncatus</i>	Very low concern	IUCN status: Least concern	IUCN 2012
Common dolphin	<i>Delphinus delphis</i>	Very low concern	IUCN status: Least concern	IUCN 2012
New Zealand fur seal	<i>Arctocephalus forsteri</i>	Low concern	IUCN status: Least concern; species is thought to be increasing but is not currently close to historic high or virgin biomass	IUCN 2012
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	High concern	IUCN status: Data deficient; inherent vulnerability high, no evidence of stock status	IUCN 2012

Factor 2.3. Fishing mortality

Key relevant information:

Fishing mortality for assessed species and the rationale for assessments are presented in the following tables.

Bottom trawl

Fishing mortality of benthic invertebrates and habitat-forming organisms (see 2.2 above for species list) was assessed as a moderate concern in accordance with Seafood Watch criteria

due to uncertain stock or population statuses, unknown management efficacy, and susceptibility to the fishery.

Fish				
Common name	Scientific name	Fishing mortality	Rationale for assessment	References
Black cardinal fish	<i>Epigonus telescopus</i>	Moderate concern	Fishery contribution is unknown.	Ministry of Fisheries 2011a
Southern boarfish	<i>Pseudopentaceros richardsoni</i>	Moderate concern	Fishery contribution is unknown. No management measures are in place.	
Bluenose	<i>Hyperoglyphe antarctica</i>	Low concern	Exploitation rates have fluctuated from 0 to 0.08 from the 1970s to 2008, peaking in 2005. Natural mortality is estimated as 0.09–0.15. At the 2005 peak, fishery mortality was of questionable sustainability. At 2008 exploitation levels (<0.05), trawl fishing mortality should be sustainable.	Ministry of Fisheries 2011a
Hoki	<i>Macruronus novaezealandiae</i>	Very low concern	Fishing intensity is estimated to have decreased continuously since 2004, coincident with an ongoing increase in spawning stock biomass. Model runs show fishing intensity is consistently below that required to maintain a spawning biomass of 50% B ₀ .	Ministry of Fisheries 2011a
Gemfish	<i>Rexea solandri</i>	Moderate concern	Fishing pressure has declined in QMAs SKI 1&2 since 1999/2000. For QMAs SKI 3&7, there is no recent assessment.	Ministry of Fisheries 2011a
Spiky oreo	<i>Neocyttus rhomboidalis</i>	Moderate concern	Fishery contribution is unknown. Species-level management is not in place.	Ministry of Fisheries 2011a
Ribaldo	<i>Mora moro</i>	Moderate concern	Fishery contribution is unknown.	Ministry of Fisheries 2011a
Shovelnose dogfish	<i>Deania calcea</i>	Moderate concern	Fishery contribution is unknown. No species-specific management measures are in place.	
White warehou	<i>Seriolella caerulea</i>	Moderate concern	Fishery contribution is unknown.	Ministry of Fisheries

				2011a
Sea perch	<i>Helicolenus percoides</i>	Moderate concern	Fishery contribution is unknown.	Ministry of Fisheries 2011a
Giant boarfish	<i>Paristiopterus labiosus</i>	Moderate concern	Fishery contribution is unknown. No species-specific management measures are in place.	
Ling	<i>Genypterus blacodes</i>	Moderate concern	Fishing mortality is unknown for LIN1. Fishing pressure is estimated to have been declining since 1998 (and always low) in LIN 5&6. In LIN 2&7, fishing pressure has decreased in trawl fisheries in recent years. For LIN 3-6, stock size is likely to increase until 2015 with current catch levels.	Ministry of Fisheries 2011a

Midwater trawl

Fish				
Common name	Scientific name	Fishing mortality	Rationale for assessment	References
Bluenose	<i>Hyperoglyphe antarctica</i>	See bottom trawl fishery text.	Separate method-based assessments are not available.	
Hoki	<i>Macruronus novaezealandiae</i>	See bottom trawl fishery text.	Separate method-based assessments are not available.	
White warehou	<i>Seriolella caerulea</i>	See bottom trawl fishery text.	Separate method-based assessments are not available.	
Giant boarfish	<i>Paristiopterus labiosus</i>	See bottom trawl fishery text.	Separate method-based assessments are not available.	

Ling	<i>Genypterus blacodes</i>	See bottom trawl fishery text.	Separate method-based assessments are not available.	
Silver warehou	<i>Seriolella punctata</i>	Moderate concern	Fishery contribution is unknown.	Ministry of Fisheries 2011a
Frostfish	<i>Lepidopus caudatus</i>	Moderate concern	Fishery contribution is unknown.	Ministry of Fisheries 2011a
Ruby fish	<i>Plagiogeneion rubiginosum</i>	Moderate concern	Fishery contribution is unknown.	Ministry of Fisheries 2011a

Bottom and midwater trawl

Seabirds				
Common name	Scientific name	Fishing mortality	Rationale for assessment	References
Flesh-footed shearwater	<i>Puffinus carneipes</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Black petrel	<i>Procellaria parkinsoni</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Salvin's albatross	<i>Thalassarche salvini</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
White-capped albatross	<i>Thalassarche steadi</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a possible population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Campbell albatross	<i>Thalassarche impavida</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a possible population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011

Sooty shearwater	<i>Puffinus griseus</i>	Low concern	Risk assessment that shows fishery mortalities of this species are unlikely to represent a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
White-chinned petrel	<i>Procellaria aequinoctialis</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a possible population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Northern giant petrel	<i>Macronectes halli</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a possible population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Cape petrel	<i>Daption capense</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a possible population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Buller's albatross	<i>Thalassarche bulleri bulleri</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a possible population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Grey petrel	<i>Procellaria cinerea</i>	Low concern	Risk assessment that shows fishery mortalities of this species are unlikely to represent a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Chatham albatross	<i>Thalassarche eremita</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Common diving petrel	<i>Pelecanoides urinatrix</i>	Low concern	Risk assessment that shows fishery mortalities of this species are unlikely to represent a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011

White-faced storm petrel	<i>Pelagodroma marina</i>	Low concern	Risk assessment that shows fishery mortalities of this species are unlikely to represent a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Gibson's albatross	<i>Diomedea antipodensis gibsoni</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a possible population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Westland petrel	<i>Procellaria westlandica</i>	Moderate concern	Risk assessment that identifies fishery mortalities of this species as a population-level threat in New Zealand. Contribution of this fishery is unknown.	Richard et al. 2011
Marine mammals				
Common name	Scientific name	Fishing mortality	Rationale for assessment	References
Bottlenose dolphin	<i>Tursiops truncatus</i>	Low concern	Single capture in trawl targeting john dory between 2002/03 and 2010/11. No captures reported from alfonsino tows, but observer coverage low in inshore trawl fisheries. Assessment based on trawl fisheries occurring in areas overlapping alfonsino fishing activity. Species not of special concern.	Abraham and Thompson 2011; IUCN 2012

Common dolphin	<i>Delphinus delphis</i>	Low concern	Single capture in trawl targeting barracouta between 2002/03 and 2010/11. No captures reported from alfonsino tows, but observer coverage low in inshore trawl fisheries. Assessment based on trawl fisheries occurring in areas overlapping alfonsino fishing activity. Species not of special concern.	Abraham and Thompson 2011; IUCN 2012
New Zealand fur seal	<i>Arctocephalus forsteri</i>	Low concern	No captures reported from alfonsino tows, but observer coverage low in inshore trawl fisheries. Some captures occurring in areas that may overlap with alfonsino fishing (e.g., east coast of South Island). Assessment based on trawl fisheries occurring in areas overlapping alfonsino fishing activity. Species not of special concern. Population increasing.	Abraham and Thompson 2011; IUCN 2012
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	Low concern	Single capture in trawl targeting jack mackerel between 2002/03 and 2010/11. No captures reported from alfonsino tows, but observer coverage low in inshore trawl fisheries. Assessment based on trawl fisheries occurring in areas overlapping alfonsino fishing activity. Species not of special concern although it is classified as 'data deficient'.	Abraham and Thompson 2011; IUCN 2012

Factor 2.4. Overall discard rate

Key relevant information:

Non-retained species comprise relatively small proportions of total catches in these fisheries. The proportions of discards relative to total catch, based on Ministry for Primary Industries fisheries observer data (Ministry for Primary Industries, unpublished), are as follows:

- Bottom trawl: 3–6 % (2008/09–2009/10)
- Midwater trawl: 0.3–0.8% (2008/09–2009/10)

In the same period, alfonsino catch comprised ~60–80% of landings for the bottom trawl fishery and 68–78% of landings for the midwater trawl fishery. Landings of more than 30 other retained species comprised the remainder of the catch.

Criterion 3: Management effectiveness

Guiding principle

- The fishery is managed to sustain the long-term productivity of all impacted species. Management should be appropriate for the inherent resilience of affected marine life and should incorporate data sufficient to assess the affected species and manage fishing mortality to ensure little risk of depletion. Measures should be implemented and enforced to ensure that fishery mortality does not threaten the long-term productivity or ecological role of any species in the future.

Summary

Fishery	Management: Harvest strategy Rank (score)	Management: Bycatch Rank (score)	Criterion 3 Rank (score)
Alfonsino bottom trawl	Moderate concern (3)	Moderate concern (3)	Yellow (3)
Alfonsino midwater trawl	Moderate concern (3)	Moderate concern (3)	Yellow (3)

Factor 3.1

Fishery	Critical?	Mgmt strategy and implementation	Scientific research and monitoring	Scientific advice	Enforcement	Track record	Stakeholder inclusion
Bottom trawl	No	Moderately effective	Moderately effective	Moderately effective	Moderately effective	Moderately effective	Highly effective
Midwater trawl	No	Moderately effective	Moderately effective	Moderately effective	Moderately effective	Moderately effective	Highly effective

Factor 3.2

Fishery	All Species Retained?	Critical?	Mgmt strategy and implementation	Scientific research and monitoring	Scientific advice	Enforcement
Bottom trawl	No	No	Moderately effective	Moderately effective	Moderately effective	Moderately effective
Midwater trawl	No	No	Moderately effective	Moderately effective	Moderately effective	Moderately effective

Legislative and policy frameworks are generally robust for the harvest of alfonsino, but a lack of quantitative data on the stock, retained species caught alongside alfonsino, and bycatch species limits management efficacy. Stock assessments are available for only a small proportion of retained species. Observer coverage of trawl vessels is highly variable and focused on the larger vessels that tend to fish offshore. Where coverage does occur, however, data collection is robust and can be used for enforcement purposes. Opportunities for stakeholder involvement in the management of alfonsino fishing activity are extensive (e.g., through working groups and public consultations). Management decision-making involves a significant amount of consultation and the promulgation of decision papers. The alfonsino species complex is often caught alongside species of higher commercial value (and harvesting priority, e.g., oreos and hoki). Consequently, although information on the outcome status of bycatch species is lacking in the specific context of the alfonsino fishery, more information has sometimes been collected from other fisheries partially overlapping with alfonsino in spatial extent (e.g., hoki).

Justification of ranking**Factor 3.1. Management of fishing impacts on retained species: Moderate concern**Key relevant information:

Management approaches to retained catch are not based on gear type. Rather, management is developed on a per-species basis by QMA. Consequently, the scores for midwater and bottom trawl fisheries catching alfonsino are identical. A large number of retained species are caught in the alfonsino fishery (Table 1), though some in very small amounts (e.g., <0.05% of catch weight, see Criterion 2). Comprehensive stock assessments are available for some retained species (see Criterion 2.1), but for most species, management is based on less fulsome approaches, informed through observer and fisher-reported data on catch weight and composition (Ministry of Fisheries 2011a). Levels of monitoring by fisheries observers are highly variable (e.g., <5%–25% observer coverage), depending on vessel size, target species sought, and the area in which fishing occurs (Rowe 2008; Ramm 2010, 2011; Abraham and Thompson 2011). This renders the development of informed management approaches challenging.

Assessment of the long-term efficacy of management approaches is not possible for most retained species. Incorporation of scientific advice into management is transparent, and management decision-making includes multiple opportunities for stakeholder involvement.

Table 1. Retained species caught in the alfonsino fishery. MW = reported by observers from alfonsino-target midwater trawls, BT = reported by observers from alfonsino-target bottom trawls.

Common name	Scientific name	MW/BT
Barracouta	<i>Thyrsites atun</i>	MW/BT
Bass	<i>Polyprion oxygeneios</i> <i>P. americanus</i>	MW/BT
Bigeye tuna	<i>Thunnus obesus</i>	MW
Black cardinal fish	<i>Epigonus telescopus</i>	MW/BT
Blue moki	<i>Latridopsis ciliaris</i>	BT
Bluenose	<i>Hyperoglyphe antarctica</i>	MW/BT
Dark ghost shark	<i>Hydrolagus novaezelandiae</i>	BT
Frostfish	<i>Lepidopus caudatus</i>	MW/BT
Gemfish	<i>Rexea solandri</i>	MW/BT
Hake	<i>Merluccius australis</i>	MW/BT
Hoki	<i>Macruronus novaezelandiae</i>	MW/BT
John dory	<i>Zeus faber</i>	BT
Ling	<i>Genypterus blacodes</i>	MW/BT
Lookdown dory	<i>Cyttus traversi</i>	MW/BT
Orange roughy	<i>Hoplostethus atlanticus</i>	BT
Pale ghost shark	<i>Hydrolagus bemisi</i>	BT
Ray's bream	<i>Brama brama</i>	MW/BT
Red bait	<i>Emmelichthys nitidus</i>	MW/BT
Red cod	<i>Pseudophycis bachus</i>	BT
Ribaldo	<i>Mora moro</i>	MW/BT
Ruby fish	<i>Plagiogeneion rubiginosus</i>	MW/BT
School shark	<i>Galeorhinus galeus</i>	BT
Scampi	<i>Metanephrops challengerii</i>	BT
Sea perch	<i>Helicolenus</i> spp.	MW/BT
Silver warehou	<i>Seriola punctata</i>	MW/BT
Slender mackerel	<i>Trachurus murphyi</i>	BT
Smooth oreo	<i>Pseudocyttus maculatus</i>	BT
Smooth skate	<i>Dipturus innominatus</i>	BT
Squid	<i>Nototodarus gouldi</i> , <i>N. sloanii</i>	MW/BT
Spiny dogfish	<i>Squalis acanthias</i>	BT
Stargazer	<i>Kathetostoma giganteum</i>	BT
White warehou	<i>Seriola caerulea</i>	MW/BT

Detailed rationale:*Management strategy and implementation: Moderately effective*

Legislative approaches to fishery management are relatively strong in terms of fishery sustainability. Catch limits have been implemented in two of three alfonso management areas; overcatch regularly occurs in the third. However, there is a lack of evidence demonstrating that management is maintaining alfonso stocks over time. The sustainability of harvest in one management area is unknown and in another it is considered likely to be sustainable based on catch levels over time (rather than a quantitative stock assessment). For other retained species, there is a range of variable evidence that management is meeting its goals (e.g., for hoki) or that harvesting impacts are unknown (e.g., ghost shark) (Ministry of Fisheries 2011a). Thus, there is a certain level of effective management in place, but there is also a need for increased precaution.

*Recovery of stocks of concern: N/A**Scientific research and monitoring: Moderately effective*

The alfonso species complex is not currently a focus of scientific activity (which tends to be concentrated on stocks of higher commercial value). Consequently, stock assessment information is not available in all QMAs. Routine data collection on these species is limited to catch documentation, although some aging analysis was undertaken in 1998–2005 (Ministry of Fisheries 2011a). For other retained species that comprise major commercial harvests (e.g., hoki, orange roughy), extensive bodies of data describing stock status and detailed stock assessments are available and regularly updated (Ministry of Fisheries 2011a).

Scientific advice: Moderately effective

Management action is closely linked to scientific advice in this fishery (Ministry of Fisheries 2011a). However, the lack of scientific information available with which to develop management approaches constrains management efficacy in some areas (e.g., knowledge of the stock and population structure). In some regions, TAC has been exceeded, although it is not set above recommended levels.

Enforcement: Moderately effective

Observer coverage of alfonso fishing is highly variable as a consequence of the diversity of vessels catching this species. Inshore trawl fisheries involving smaller vessels (<28 m in length) are monitored by observers at very low rates (e.g., 0–5% of fishing effort), which limits understanding of fishery activities and impacts as well as impeding enforcement. Observer coverage of offshore fisheries using larger vessels can reach 25–30% (Rowe 2008; Ramm 2010, 2011; Abraham and Thompson 2011). Where observers are present, they collect information on catch composition and many other aspects of the fishing operation. While not enforcers

themselves, observers provide information with which enforcement action is taken. Ongoing overcatch of alfoncino is an issue in one QMA (Ministry of Fisheries 2011a). Fishers are required to report some catch information (New Zealand Government 2001). While not investigated for tows targeting alfoncino, comparisons between fisher-reported catch data and observer data made in other trawl fisheries highlight ongoing issues with under-reporting by fishers (Bremner et al. 2009; Anderson 2009). Given the range in levels of observer coverage among vessel groups and issues of overcatch, enforcement is assessed as ‘Moderately effective’.

Track record: Moderately effective

Retained species caught with alfoncino include those for which significant bodies of information occur (e.g., hoki and orange roughy), and those for which the sustainability of current harvests are unknown (e.g., alfoncino in some QMAs). For well-known stocks (e.g., hoki), management processes have included responses to stock depletion such as reductions in allowable catch. However, given the uncertainty of management measures for some species with respect to the maintenance of stock abundance in the long-term, the track record for this fishery is assessed as ‘moderately effective’ in accordance with Seafood Watch criteria.

Stakeholder inclusion: Highly effective

All stakeholders can access working groups, scientific information, and policy documents with which management advice is developed for retained species caught in these fisheries. Stakeholders are able to attend and participate fully in all working group meetings. Documents are circulated online and available in hard copy. Proceedings of meetings are documented and circulated to all stakeholders. Management decisions made by the Minister for Primary Industries (who is responsible for fisheries) are documented and made available online.

Factor 3.2. Management of fishing impacts on bycatch species: Moderate concern

Key relevant information:

As for retained species, management of bycatch does not differ for midwater and bottom trawl fisheries. Consequently, scores for both fisheries are identical in this section. Most of the bycatch species caught in the course of alfoncino fishing comprise small amounts of total catch (see Criterion 2). Stock or population assessments are unavailable for most bycatch species. Seabirds are an exception: population levels are broadly known and the risk of commercial fisheries to populations has been explicitly examined (Richard et al. 2011). Data collection by observers is robust where it occurs, although levels vary significantly in different areas and for different sectors of the fishery harvesting alfoncino (e.g., smaller vessels fishing inshore versus larger vessels fishing offshore with <5%–25% observer coverage, Rowe 2008; Ramm 2010, 2011; Abraham and Thompson 2011). With the variation in coverage levels across sectors of the fleet harvesting alfoncino, as well as the lack of alternative data collection regimes for most bycatch species in areas fished for alfoncino, the development of science-based advice for

management is difficult. Enforcement capabilities are similarly constrained in the absence of observer coverage (e.g., on smaller inshore trawlers catching alfonsino).

Detailed rationale:

Management strategy and implementation: Moderately effective

Legislative approaches to fishery management are relatively strong in that sustainability is an explicit consideration and includes the broader marine ecosystem (i.e., all bycatch species as well as target and retained species). There are no limits on volumes of bycatch taken of any species. However, quantities of bycatch taken are monitored through observer coverage (where this occurs) and fisher reporting (see below). Seabird bycatch is managed more closely than fish bycatch with the development of a risk assessment (Richard et al. 2011) and management responses implemented across trawl fisheries based on vessel size (e.g., mandatory deployment of devices intended to reduce seabird bycatch; New Zealand Government 2010). For fish bycatch, no measures are in place in the alfonsino fisheries specifically. However, for species of higher commercial value alongside which alfonsino are caught, risk assessments have been used in management (e.g., for marine mammals, fish, and benthic impacts in the hoki fishery; Boyd 2011a, b). While the outcomes of management approaches are uncertain for many species, the legislative approach and variation in levels of management for different bycatch species lead to a classification of ‘moderately effective’.

Scientific research and monitoring: Moderately effective

Bycatch is monitored by fisheries observers where coverage occurs. This can be highly variable and tends to be minimal on trawl vessels less than 28 m in length (see Enforcement, below). Fishers also report some bycatch information (e.g., the top eight species caught, by weight). Lack of representativeness in observer coverage of alfonsino fishing renders the generation of bycatch estimates difficult. However, estimates are available for protected species caught in fisheries of higher commercial value alongside which alfonsino is caught (e.g., hoki and orange roughy, Abraham and Thompson 2011). Thus, some data collection occurs, though it is non-representative across the fishery. Some analysis is performed, but the available data do not allow robust quantitative investigation of the outcome status for all bycatch species.

Scientific advice: Moderately effective

For some bycatch species (e.g., seabirds), management action is closely linked to scientific advice (Ministry of Fisheries 2011a). For other species (e.g., corals, benthic invertebrates), lack of available scientific information with which to develop management approaches constrains management efficacy in some areas. Thus, scientific advice is deemed ‘moderately effective’.

Enforcement: Moderately effective

Fishers are legally required to report non-fish bycatch (Ministry of Fisheries 2011b) and fish bycatch when bycatch species are among the eight species caught in the highest amounts (per tow) (New Zealand Government 2001). Based on this and the information reflected in Factor 3.1 above, enforcement is assessed as 'moderately effective'.

Criterion 4: Impacts on the habitat and ecosystem

Guiding principles

- The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.
- Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity.

Summary

Fishery	Impact of gear on the substrate Rank (score)	Mitigation of gear impacts Rank (score)	EBFM Rank (score)	Criterion 4 Rank (score)
Alfonsino bottom trawl	Very high concern (0)	Minimal mitigation (0.25)	Moderate concern (3)	Red (0.87)
Alfonsino midwater trawl	None (5)	N/A	Moderate concern (3)	Green (3.87)

Bottom and midwater trawl fishing for alfonsino occurs over habitats including oceanic banks, ridges, and seamounts. The amount of fishing is managed through catch limits although there are no effort restrictions in place (e.g., on numbers or durations of tows). Some benthic protection occurs at a nationwide scale through the exclusion of bottom trawling from designated areas. These areas include parts of alfonsino quota management areas (QMAs) but are not representative of habitat types within those QMAs. Ecosystem effect considerations are a specific component of the management approach, but work has not been focused on alfonsino *per se*. Over time, ecosystem management approaches are planned for the fisheries alongside which alfonsino is caught (i.e., where alfonsino is a bycatch species in a higher value commercial fishery). Some ecosystem components are managed across New Zealand fisheries (e.g., seabirds) for which bycatch reduction measures are required on all trawlers ≥ 28 m, which operate in deeper waters rather than inshore areas.

Justification of ranking

Bottom trawl

Factor 4.1. Impact of the fishing gear on the substrate: Very high concern

Key relevant information:

The bottom trawl fishery occurs on a variety of habitats that include rocky substrates, biogenic habitats, and seamounts (Ministry of Fisheries 2011a).

Factor 4.2. Modifying factor – Mitigation of fishing gear impacts: Minimal mitigationKey relevant information:

Fishing intensity is limited indirectly through catch limits on the species complex. There is some benthic protection from bottom trawling at a national level, comprising around 30% of the New Zealand Exclusive Economic Zone (Helson et al. 2010). However, these areas do not provide representative benthic protection at the scale of the Exclusive Economic Zone (Leathwick et al. 2008) and few are located in the QMAs in which most alfoncino fishing effort occurs (BYX1, 2, and 3, Ministry of Fisheries 2011a). Thus, there is ‘minimal mitigation’ in accordance with the Seafood Watch criteria.

Factor 4.3. Ecosystem and food web considerations: Moderate concernKey relevant information:

Alfoncino are not considered to be ‘exceptional species’ as defined by Seafood Watch, i.e., they do not play an ecosystem role disproportionate to their biomass. The approach to fishery management includes explicit consideration of impacts on the aquatic environment, including non-target species, benthic habitats, and biodiversity (Ministry of Fisheries 2010). However, currently there are no specific plans or management measures addressing ecosystem or food web considerations for bottom trawl alfoncino fishing. These may be developed in time for the species of greater commercial value alongside which alfoncino are caught as bycatch, e.g., the oreo species complex (including *Pseudocyttus maculatus*, *Allocyttus niger*, *A. verrucosus*, and *Neocyttus rhomboidalis*) caught by bottom trawling (Ministry of Fisheries 2010). However, the impacts of the fishery on certain ecosystem components (e.g., seabirds) are managed across fishery groups. For example, seabird bycatch reduction devices must be deployed on trawlers \geq 28 m in length (New Zealand Government 2010). As above, some benthic protection (e.g., closure of seamounts to bottom trawling) occurs at a national level through Benthic Protected Areas (Helson et al. 2010). The fishery is assessed as ‘moderate’ in accordance with Seafood Watch criteria.

Midwater trawl**Factor 4.1. Impact of the fishing gear on the substrate: None**

Key relevant information:

Midwater trawling is assigned a score of 5, in accordance with the Seafood Watch criteria, because there is no indication that the gear touches the bottom. Consequently, Factor 4.2 is not assessed.

Factor 4.3. Ecosystem and food web considerations: Moderate concern

Key relevant information:

As above, alfonsino are not 'exceptional species'. The approach to fishery management includes explicit consideration of impacts on the aquatic environment, including non-target species, benthic habitats, and biodiversity (Ministry of Fisheries 2010). Currently, there are no specific plans or management measures addressing ecosystem or food web considerations for midwater trawl alfonsino fishing. However, impacts of the fishery on some ecosystem components are managed across fishery groups (e.g., the required deployment of seabird bycatch reduction devices on trawlers ≥ 28 m in length (New Zealand Government 2010)). The fishery is assessed as 'moderate' in accordance with Seafood Watch criteria.

Overall Recommendation

Final Score = geometric mean of the four scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

The overall recommendation is as follows:

- **Best Choice** = Final Score between 3.2 and 5, **and** no Red Criteria, **and** no Critical scores
- **Good Alternative** = Final score between 2.2 and 3.199, **and** Management is not Red, **and** no more than one Red Criterion other than Management, **and** no Critical scores
- **Avoid** = Final Score between 0 and 2.199, **or** Management is Red, **or** two or more Red Criteria, **or** one or more Critical scores.

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Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Appendix A: Minor Species Caught in the Fishery Under Assessment

Minor species: The highest proportion of catch comprised by each species, as reported by fisheries observers, is shown for the years 2006/07 - 2011/12. Figures in parantheses are the total observed landed catch (greenweight tonnes) in the corresponding year. For many species, zero catch was recorded in most years.

Common name	Scientific name	% of bottom trawl catch	% of midwater trawl catch
Banded bellowsfish	<i>Centriscopus humerosus</i>	0.51 (51202)	0.34 (60967)
Barracouta	<i>Thyrsites atun</i>	0.002 (384522)	0.0007 (453283)
Basketwork eel	<i>Synaphobranchidae</i>	0.03 (34024)	0
Bass groper	<i>Polyprion americanus</i>	0.08 (19870)	0.01 (31701)
Baxter's lantern dogfish	<i>Etmopterus baxteri</i>	0.10 (34024)	0
Beaked salmon, sandfish	<i>Gonorynchus forsteri</i> & <i>G. greyi</i>	0.0003 (384522)	0
Bellowsfish	<i>Centriscopus spp.</i>	0.45 (51202)	0.08 (60967)
Bigeye cardinalfish	<i>Epigonus lenimen</i>	0.008 (153184)	0
Bigeye tuna	<i>Thunnus obesus</i>	0	0.02 (453283)
Big-scale pomfret	<i>Taractichthys longipinnis</i>	0	0.004 (27206)
Black cardinal fish	<i>Epigonus telescopus</i>	Assessed as a main species	0.07 (93675)
Black oreo Broadnose	<i>Allocyttus niger</i>	0.007 (19870)	0
sevengill shark	<i>Notorynchus cepedianus</i>	0.02 (51202)	0

Brown chimaera	<i>Chimaera spp.</i>	0.002 (384522)	0
Capro dory	<i>Capromimus abbreviatus</i>	0.1 (19870)	0
Carpet shark	<i>Cephaloscyllium isabellum</i>	0.003 (153184)	0
Catshark	<i>Apristurus spp.</i>	0.003 (153184)	0
Chimaera	<i>Chimaera spp.</i>	0.02 (51202)	0
Common roughy	<i>Paratrachichthys trailli</i>	0.43 (19870)	0.003 (31701)
Common warehou	<i>Seriolella brama</i>	0.003 (117933)	0.02 (27206)
Conger eel	<i>Conger spp.</i>	0.002 (34024)	0.0004 (453283)
Cucumber fish	<i>Caraulopus nigripinnis</i>	0	0
Dealfish	<i>Trachipterus trachipterus</i>	0.0007 (153184)	0.02 (453283)
Deepsea flathead	<i>Hoplichthys haswelli</i>	0.03 (34024)	0
Deepwater rock lobster	<i>Projasus parkeri</i>	0.03 (34024)	0
Deepwater spiny skate	<i>Amblyraja hyperborea</i>	0.003 (153184)	0.001 (453283)
Electric ray	<i>Torpedo fairchildi</i>	0.002 (153184)	0.01 (93675)
Flatfish		0.0005 (384522)	0
Fox fish	<i>Bodianus flavipinnis</i>	0	0.001 (93675)
Frostfish	<i>Lepidopus caudatus</i>	0.08 (19870)	Assessed as a main species
Gemfish	<i>Rexea spp.</i>	Assessed as a main species	0.27 (453283)
Ghost shark	<i>Hydrolagus novaezealandia</i>	0.27 (51202)	0.05 (93675)
Giant stargazer	<i>Kathetostoma spp.</i>	0.22 (19870)	0
Greenback jack mackerel	<i>Trachurus declivis</i>	0	0.01 (27206)

Hake	<i>Merluccius australis</i>	0.20 (51202)	0.11 (31701)
Hatchet fishes	<i>Sternoptychidae</i>	0.05 (19870)	0.09 (31701)
Jacknife prawn	<i>Haliporoides sibogae</i>	0.003 (34024)	0
Japanese gurnard	<i>Pterygotrigla picta</i>	0.02 (51202)	0
Javelin fish	<i>Lepidorhynchus denticulatus</i>	0.84 (51202)	0.007 (453283)
John dory	<i>Zenopsis nebulosa</i>	0.13 (34024)	0
Johnson's cod	<i>Halargyreus johnsonii</i>	0.04 (153184)	0
Leafscale gulper shark	<i>Centrophorus squamosus</i>	0.03 (34024)	0
Lighthouse fish	<i>Phosichthys argenteus</i>	0.0002 (384522)	0
Longnose velvet dogfish	<i>Centroscymnus crepidater</i>	0.20 (34024)	0
Long-nosed chimaera	<i>Harriotta raleighana</i>	0.01 (153184)	0
Lookdown dory	<i>Cyttus traversi</i>	0.74 (19870)	0.034 (453283)
Lucifer dogfish	<i>Etmopterus lucifer</i>	0.01 (34024)	0.001 (93675)
Luciosudus sp.	<i>Luciosudus sp.</i>	0	0.002 (453283)
Mahia rattail	<i>Coelorinchus matamua</i>	0.007 (19870)	0
Mandarin shark	<i>Cirrhigaleus barbifer</i>	0.09 (34024)	0
Mirror dory	<i>Zenopsis nebulosa</i>	0.08 (34024)	0.04 (31701)
Morids		0.07 (19870)	0.006 (31701)
Neon flying squid	<i>Ommastrephes bartrami</i>	0.01 (19870)	0.004 (453283)
Northern spiny dogfish	<i>Squalus griffini</i>	0.06 (51202)	0.003 (31701)
Oblong sunfish	<i>Ranzania laevis</i>	0	0.44 (31701)
Omega prawn	<i>Lipkius holthuisi</i>	0.07 (19870)	0
Orange perch	<i>Lepidoperca aurantia</i>	0.003 (153184)	0.002 (93675)
Orange roughy	<i>Hoplostethus atlanticus</i>	0.43 (34024)	0

Pale ghost shark	<i>Hydrolagus bemisi</i>	0.30 (51202)	0
Parrotfish	<i>Labridae</i>	0.002 (51202)	0
Pelagic butterflyfish	<i>Schedophilus maculatus</i>	0	0.004 (27206)
Pelagic stingray	<i>Pteroplatytrygon violacea</i>	0	0.005 (36611)
Pigfish	<i>Congiopodus leucopaecilus</i>	0.0003 (384522)	0
Plunket's shark	<i>Proscymnodon plunketi</i>	0.08 (34024)	0
Portuguese dogfish	<i>Centroscymnus coelolepis</i>	0.07 (153184)	0
Prickly dogfish	<i>Oxynotus bruniensis</i>	0.04 (153184)	0
Pufferfish	<i>Sphaeroides pachygaster</i>	0.02 (34024)	0
Rattails	<i>Macrouridae</i>	0.99 (153184)	0.09 (453283)
Ray's bream	<i>Brama brama</i>	0.04 (153184)	0.25 (31701)
Red cod	<i>Pseudophycis bachus</i>	0.007 (34024)	0
Remoras	<i>Echeneididae</i>	0	0.03 (31701)
Ribaldo	<i>Mora moro</i>	Assessed as a main species	0.004 (453283)
Ruby fish	<i>Plagiogeneion rubiginosum</i>	0.15 (384522)	main species
Rudderfish	<i>Centrolophus niger</i>	0.08 (19870)	0.006 (31701)
Scaly stargazer	<i>Pleuroscopus pseudodorsalis</i>	0.66 (19870)	0.003 (93675)
Scampi	<i>Metanephrops challengerii</i>	0.005 (153184)	0
Scarlet prawn	<i>Aristaeopsis edwardsiana</i>	0.004 (34024)	0
School shark	<i>Galeorhinus galeus</i>	0.12 (19870)	0
Sea perch	<i>Helicolenus percoides</i>	Assessed as a main species	0.02 (93675)
Seal shark	<i>Dalatias licha</i>	0.19 (34024)	0.03 (93675)
Silver dory	<i>Cyttus novaezealandiae</i>	0.01 (384522)	0.004 (27206)
Silver roughy	<i>Hoplostethus mediterraneus</i>	0.43 (34024)	0.006 (31701)
Silvertip shark	<i>Carcharhinus albimarginatus</i>	0.007 (19870)	0

Skates	<i>Rajidae</i>	0.09 (34024)	0
Slender jack mackerel	<i>Trachurus murphyi</i>	0.03 (153184)	0
Slender smooth hound	<i>Gollum attenuatus</i>	0	0.002 (93675)
Slickhead	<i>Alepocephalidae</i>	0.06 (19870)	0
Smooth oreo	<i>Pseudocyttus maculatus</i>	0.39 (51202)	0
Smooth skate	<i>Dipturus innominatus</i>	0.08 (153184)	0
Smoothskin dogfish	<i>Centroscymnus owstoni</i>	0.008 (153184)	0
Spiny dogfish	<i>Squalus acanthias</i>	0.12 (19870)	0
Spotted stargazer	<i>Genyagnus monopterygius</i>	0.28 (34024)	0
Sprats	<i>Sprattus antipodum, S. muelleri</i>		0 0.003 (31701)
Squid	<i>Nototodarus sloanii, N. gouldi</i>	0.02 (51202)	0.02 (31701)
Tarakihi	<i>Nemadactylus macropterus</i>	0.006 (34024)	0
Toadfish	<i>Neophrynichthys sp.</i>	0.006 (51202)	0
Tripod fish	<i>Bathypterois spp.</i>	0.006 (34024)	0
Trumpeter	<i>Latris lineata</i>	0.87 (19870)	0
Tunicate	<i>Pyrosoma atlanticum</i>	0.007 (19870)	0
Velvet dogfish	<i>Zameus squamulosus</i>	0.02 (51202)	0
Violet squid	<i>Histioteuthis spp.</i>	0.006 (34024)	0.01 (27206)
Warty squid	<i>Onykia robsoni</i>	0	0.0009 (453283)
Yellow boarfish	<i>Pentaceros decacanthus</i>	0	0.006 (93675)
	<i>Polyipnus kiwiensis</i>	0	0.003 (31701)
	<i>Scopelosaurus sp.</i>	0.003 (34024)	0

Appendix B: Review Schedule

Any new information relevant to the alfonsino fishery, including catch limits for alfonsino, is evaluated annually. Fishing years run from July 1 – June 30. Therefore, annual review between July and December is recommended.

About Seafood Watch®

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch® defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from www.seafoodwatch.org. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices", "Good Alternatives" or "Avoid". The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch®'s sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

Disclaimer

Seafood Watch® strives to have all Seafood Reports reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science and aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch® program or its recommendations on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

Seafood Watch® and Seafood Reports are made possible through a grant from the David and Lucile Packard Foundation.

Guiding Principles

Seafood Watch™ defines sustainable seafood as originating from sources, whether fished⁵ or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

The following **guiding principles** illustrate the qualities that capture fisheries must possess to be considered sustainable by the Seafood Watch program:

- *Stocks are healthy and abundant.*
- *Fishing mortality does not threaten populations or impede the ecological role of any marine life.*
- *The fishery minimizes bycatch.*
- *The fishery is managed to sustain long-term productivity of all impacted species.*
- *The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.*
- *Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts, or reduction of genetic diversity.*

Based on these guiding principles, Seafood Watch has developed a set of four sustainability **criteria** to evaluate capture fisheries for the purpose of developing a seafood recommendation for consumers and businesses. These criteria are:

1. Impacts on the species/stock for which you want a recommendation
2. Impacts on other species
3. Effectiveness of management
4. Habitat and ecosystem impacts

Each criterion includes:

- Factors to evaluate and rank
- Evaluation guidelines to synthesize these factors and to produce a numerical score
- A resulting numerical score and **rank** for that criterion

Once a score and rank has been assigned to each criterion, an overall seafood recommendation is developed on additional evaluation guidelines. Criteria ranks and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide:

Best Choices/Green: Are well managed and caught or farmed in environmentally friendly ways.

⁵ “Fish” is used throughout this document to refer to finfish, shellfish and other invertebrates.

Good Alternatives/Yellow: Buy, but be aware there are concerns with how they're caught or farmed.

Avoid/Red: Take a pass on these. These items are overfished or caught or farmed in ways that harm other marine life or the environment.