# Information describing alfonsino (*Beryx splendens*) fisheries relating to the South Pacific Regional Fishery Management Organisation


**WORKING DRAFT**
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# 1 Overview

*Beryx splendens*, Lowe, 1834, has a circum-global distribution, from about 65° N to 43° S, excluding the northeast Pacific Ocean. It inhabits the outer continental shelves and slopes, and is often associated with seamounts.

Target fisheries for *B. splendens* have occurred in the South Pacific from the early 1980s to the present day.

The basic biology of *B. splendens* is reasonably well known, although aspects of their reproduction and stock structure are still poorly understood.

The biological productivity of *B. splendens* is likely to be moderate to low.

The main method used to catch this species is a high-opening trawl generally fished hard down on the bottom. Trawling for this species on seamounts impacts habitat, but the precise impact of this on the alfonsino populations or other species on the seamounts is unknown.

There are currently no known management measures in place for *B. splendens*.

This is a living document. It is a draft report and requires additional information to complete.

## 2 Taxonomy

2.1 Phylum

Vertebrata

2.2 Class

Actinopterygii

2.3 Order

Beryciformes

2.4 Family

Berycidae

2.5 Genus and species

*Beryx splendens* Lowe, 1834

2.6 Scientific synonyms

None known

2.7 Common names

Alfonsino, splendid alfonsino, slender alfonsino, imperador

2.8 Molecular (DNA or biochemical) bar coding

**No information**

## 3 Species Characteristics

3.1 Global distribution and depth range

*Beryx splendens* has been reported from all tropical and temperate oceans (excluding the northeast Pacific) between latitudes of about 65° N and 43° S. It occurs from depths of about 25 m to at least 1300 m (Busakhin 1982). Its minimum and maximum depths appear to vary quite markedly between areas, e.g., it is found as shallow as 25 m off Oman in the Indian Ocean, but seldom shallower than 200 m in the New Zealand EEZ.

3.2 Distribution within South Pacific area

Distribution in the south west Pacific is shown in Figure 1. In the South Pacific they appear most abundant between about 300 m and 700 m (Anderson et al. 1998) and in the Juan Fernandez area they are known from about 400-500 m (Contreras *et al.*, 2007).

In Chile the catch data from within the EEZ indicate the presence of this species mainly on the submarine mounts located in the archipelago of Juan Fernandez, the area of Bajo O'Higgins and the continental shelf area from IV to X region.

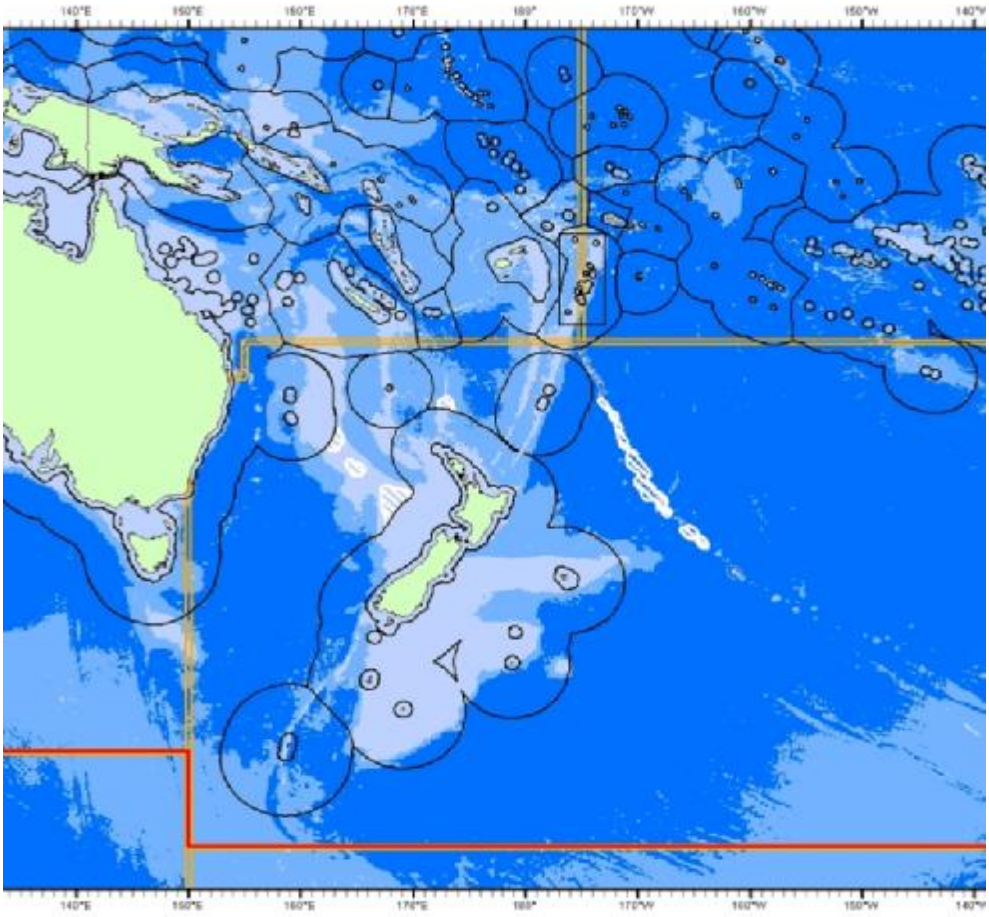

**Figure 1: Known distribution of alfonsino on the high seas in the south west Pacific ocean.**

3.2.1 Inter-annual and/or seasonal variations in distribution

**No information**

3.2.2 Other potential areas where the species may be found

**No information**

## 3.3 General habitat

In the South Pacific, this fish inhabits outer continental shelves and slopes, and is often found over seamounts and underwater ridges. It is benthopelagic, often occurring near the bottom during the day, but ascending to feed in midwater during the night (Galaktionov 1984, Uchida & Tagami 1984). However, Horn & Massey (1989) observed the reverse pattern on some days, and concluded that no single consistent vertical migration behaviour could be attributed to alfonsino in New Zealand waters. In Chile there are no estimates of migration behaviour. Some information is assumed via a physiologic approximation realized by Saavedra *et al*., 2006, which demonstrates that alfonsino present an enhanced metabolic capacity typically closely related with an increased migratory capacity.

Alfonsino are often found in association with bluenose (*Hyperoglyphe antarctica*), gemfish (*Rexea solandri*), hoki (*Macruronus novaezelandiae*), and javelinfish (*Lepidorhynchus denticulatus*).

## 3.4 Biological characteristics

Catch samples are seldom strongly biased to either sex (Horn & Massey 1989). *B. splendens* can reach about 50 cm fork length; females appear to reach a slightly larger size than males. Age and growth have been investigated in a number of areas (see Table 1 for a summary), and the ageing method of counting annual zones in otoliths has been validated (Massey & Horn 1990, Lehodey & Grandperrin 1996, Rico et al. 2001). Females tend to have a higher von Bertalanffy $L_\infty$ value than males, but growth appears relatively similar between areas (i.e., east and west Atlantic, and North and South Pacific) (Lehodey & Grandperrin 1996, Rico et al. 2001, Gili *et al.*, 2002). Alfonsino have an average fork length of about 25 cm after 3 years and about 40 cm after 10 years. Maximum age is about 20 years. Growth of juveniles is probably rapid; it is estimated that they reach a fork length of about 15–20 cm in their first year.

Alfonsino are serial spawners and reproduce in the areas that they normally inhabit. Average size at sexual maturity appears to be about 30–34 cm (4–6 years old), and can vary between localities (González et al. 2003). Time of spawning also varies markedly between areas (Masuzawa et al. 1975, González et al. 2003). No published information on spawning of alfonsino in the South Pacific is available, although Horn & Massey (1989) examined gonadosomatic indices and suggested that spawning occurred about July–August in New Zealand waters. Eggs are buoyant and hatch after 1–8 days. The pelagic larvae can be widely distributed by surface currents until they adopt a demersal existence, probably when they are about 1 year old (Chikuni 1971). In Chile have not been observed eggs or larvas (Wiff *et al*., 2006).

**Table 1: Comparison of von Bertalanffy growth parameters for alfonsino from different areas** (where: M= males, F= female, $L\infty$ = asymptotic length, K= rate at which $L\infty$ is approached, $t_0$ = age at length = 0 according to von Bertalanffy growth function)**. Table based on that from Lehoday & Grandperrin, 1996.**

| Area | $L\infty$ | | K | | $T_0$ | | Source |
|---|---|---|---|---|---|---|---|
| | **M** | **F** | **M** | **F** | **M** | **F** | |
| **New Caledonia** | | | | | | | |
| Norfolk-Loyalty Ridges | 45.2 | 50.8 | 0.146 | 0.134 | -2.34 | -2 | Lehoy & Grandperrin 1996 |
| **New Zealand** | | | | | | | |
| Palliser Bay | 51.1 | 57.5 | 0.11 | 0.088 | -3.56 | -4.1 | Massey & Horn 1990 |
| Tuaheni | 54.9 | 76.3 | 0.093 | 0.042 | -4.3 | -8.25 | Massey & Horn 1990 |
| Paoanui | 49.1 | - | 0.144 | - | -1.81 | - | Massey & Horn 1990 |
| **Japan** | | | | | | | |
| Sagami Bay | 37.8 | | 0.439 | | 0.40 | | Ikenouye 1969 |
| Sagami Bight | 45.8 | | 0.323 | | -.22 | | Masusawa et al. 1979 |
| Zunan Sea | 54.4 | | 0.181 | | -0.08 | | Masusawa et al. 1979 |
| **Atlantic** | | | | | | | |
| Angular Rise | 48.5 | | 0.170 | | -2.63 | | de Leon & Malkov 1979 |
| New Year Rise | 44.8 | | 0.209 | | -0.89 | | de Leon & Malkov 1979 |

### *Morphological characteristics*

*B. splendens* have four dorsal spines, 13–16 soft dorsal rays, four anal spines, and 26–30 soft anal rays. The first infraorbital bone has a spine projecting laterally on its anterior end. Lateral line extends to caudal fin. In young fishes, the second dorsal ray is elongated.

## 3.5 Population structure

Recent analyses of stock structure in the central Atlantic have indicated limited gene flow between populations on relatively close archipelagos (Schönhuth et al. 2005). Limited movement was also indicated by a tagging study of alfonsino in Japanese waters (Masuzawa et al. 1975). In contrast, Alekseev et al. (1986) suggested that populations of alfonsino were associated with large oceanic eddy systems; currents carried eggs and larvae from a reproductive to a 'vegetative' zone, and then maturing fish migrated back with the current to the reproductive zone. There is no information available as to whether alfonsino is a single stock in New Zealand waters or in the South Pacific. In Chile there has been no genetic research, but there is parasitic information showing two zones around Juan Fernandez (Niklichek 2006), but this is weak evidence for stock definition within Chilean waters.

### 3.6 Biological productivity

González et al. (2003) noted that alfonsino have a specialist life-history style, are only moderately fecund and moderately productive, and appear relatively sedentary. Hence, they concluded that alfonsino are relatively susceptible to growth overfishing and population depletion.

### 3.7 Role of the species in the ecosystem

The alfonsino feeds by hunting macrofauna, mainly small squids and fish, but also crustaceans (i.e., copepods, amphipods, shrimps, prawns, and euphausiids). It normally occurs within 20 m of the bottom, but is believed to make feeding forays off the bottom, generally at night. Alfonsino are prey at various stages of their life to other bony fishes and sharks.

Alfonsino are often found in association with bluenose (*Hyperoglyphe antarctica*), gemfish (*Rexea solandri*), hoki (*Macruronus novaezelandiae*), and javelinfish (*Lepidorhynchus denticulatus*) In Chile it is associated to Orange roughy.

## 4 Fisheries Characterisation

### 4.1 Distribution of fishing activity

In the majority of years between 1969 and 2004, half or more of the total annual *Beryx* spp. catch was taken from inside the South Pacific region. Recent catches have been dominated by Chile in FAO area 87, followed by New Zealand vessels in FAO area 81 (most of these catches are from within EEZs, although especially in the south west Pacific substantial catches have been taken on the high seas). *B. splendens* has been target fished by trawl off New Zealand on the high seas since 1982 and Chile since 1999. Sporadic trawl catches have also occurred off Australia since the mid 1990s. An exploratory line fishery southeast of New Caledonia occurred from 1988 to 1991.

### 4.2 Fishing technology

Alfonsino taken on the high seas in the South Pacific by New Zealand and Cook Island vessels is predominantly caught by bottom trawling (85.5%) with the remainder being taken by mid-water trawling.

### 4.3 Catch history

Between 1991 and 2005, the reported total New Zealand catch of alfonsino taken outside the New Zealand EEZ within the South Pacific region was over 1000 t.

4.4 Status of stocks

The stock status is not known or uncertain, but it is assumed that it is at least moderately exploited. Some specific areas maybe more exploited than others.

4.5 Threats

No threat status known.

4.6 Fishery value

**Section yet to be developed**

## 5 Current Fishery Status and Trends

5.1 Stock size

There are no known estimates of stock size in the South Pacific.

5.2 Estimates of relevant biological reference points

5.2.1 Fishing mortality

**No information**

5.2.2 Biomass

**No information**

5.2.3 Other relevant biological reference points

**No information**

## 6 Impacts of fishing

6.1 Incidental catch of associated and dependent species

No estimates available.

6.2 Unobserved mortality of associated and dependent species

No estimates available.

### 6.3 Bycatch of commercial species

The New Zealand alfonsino trawl fishery has an associated by-catch of several commercially important species. The dominant species that have been caught in quantities over 90 t on the high seas in the South Pacific region since 1991 include: cardinalfish and southern boarfish. Species that have been caught in quantities over 30 t include: bluenose. Species that have been caught in quantities over 5 t include: orange roughy, rubyfish, ribaldo, rubyfish, and spiky oreos.

### 6.4 Habitat damage

The main method used to catch this species is a high-opening trawl generally fished hard down on the bottom. Trawling for this species on seamounts impacts habitat (Clark and O'Driscoll 2003, Koslow et al. 2001), but the precise impact of this on the alfonsino populations or other species on the seamounts is unknown.

Studies have shown that repeated trawl disturbances alter the benthic community by damaging or removing macro-fauna and encouraging anaerobic bacterial growth (see review by Cryer et al. (in prep). Severe damage of coral cover from bottom trawl fishing for orange roughy inside the Australian EEZ has been documented (Koslow et al. 2001). Video images reveal bare rock and pulverized coral rubble where bottom trawling has occurred.

Bottom trawling also tends to homogenise the sediment, which damages the habitat for certain fauna. Benthic processes, such as the transfer of nutrients, remineralisation, oxygenation and productivity, which occur in undisturbed, healthy sediments, are also impaired (Cryer et al. in prep).

As fishing gear disturbs soft sediment they produce sediment plumes and re-mobilise previously buried organic and inorganic matter. This increase in the rates of nutrients into the water column has important consequences for the rates of biogeochemical cycling (Kaiser et al. 2002).

## 7 Management

### 7.1 Existing management measures inside EEZs

Landings of alfonsino from the New Zealand, Australian, and Chilean EEZs are regulated by quotas.

### 7.2 Existing management measures in areas beyond national jurisdiction

There are no regulations for *B. splendens* on the high seas.

7.3 Fishery management implications

The lack of information, especially a direct stock assessment, exacerbates risk.

7.3 Ecosystem considerations

The main method used to catch this species is a high-opening trawl generally fished close to, or on, the bottom. Trawling for this species on seamounts—which has taken place—will bring about habitat change, but the precise impact of this on the alfonsino populations and other species on the seamount is unknown. Lining has also been used to fish this species, and is relatively benign.

## 8 Research

8.1 Current and ongoing research

***Within EEZs***

In specific quota management areas inside New Zealand's EEZ length and age information have been collected. Investigations have also been attempted to assess the abundance of alfonsino using trawl-acoustic and video tagging surveys (Horn & Massey, 1989). These were ruled inadequate and unsuccessful for the estimation of stock abundance. Since non-standardised CPUE indices have been used to track the abundance of alfonsino (Horn & Massey, 1989).

***High seas***

None known

8.2 Research needs

Sampling of length frequency data to determine the size composition of commercial catches is necessary for alfonsino caught outside EEZs in the South Pacific. Observers should be placed on board. The collection of otoliths to determine the growth of alfonsino populations is also necessary. The resulting age composition of the catch would reveal the age at recruitment to the fishery, the number of age classes supporting the commercial catch, the maximum age of fish in the catch and the variability of recruitment strength in the South Pacific. These data would provide a useful baseline for future monitoring of trends in the length and age composition of the South Pacific catch.

Genetic work is required to determine stock structure for management purposes.

## 9 Additional Remarks

Little is known about the closely related longfinned beryx or red bream (*Beryx decadactylus*). It is similar in appearance to the alfonsino, though its body is slightly deeper. The two Beryx species appear to have similar life histories and quite similar distributions within New Zealand and Australian EEZs (although they are more common in northern, rather than southern, New Zealand waters). Both species are occasionally caught in the same tows on the high seas. In New Zealand waters, landings of Beryx species comprise less than 1% B. *decadactylus*.

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