FAO species code: BYS
Scientific name: *Beryx Splendens*

Taxonomy

Phylum	Vertebrata
Class	Actinopterygii
Order	Beryciformes
Family	Berycidae
Genus	*Beryx*
Species	*Beryx splendens* Lowe, 1834
Scientific synonyms	*Beryx decadactylus*
Common names	Alfonsino, splendid alfonsino, slender alfonsino, imperador
Molecular (DNA or biochemical) barcoding	Available in the Barcode of Life Data System (BOLD), at: http://www.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxid=30384

Species Characteristics

Global distribution and depth range

Alfonsino (*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 has been reported from depth extremes of 25 m to at least 1300 m (Busakhin 1982, Menezes et al. 2009). In the South Pacific they appear most abundant between about 300 m and 700 m bottom depth (Anderson et al. 1998) and along the Juan Fernandez ridge off the coast of Chile between about 400 m and 500 m (Contreras *et al*., 2007). Its minimum and maximum depths can also vary significantly between regions, 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. Alfonsino undertake regular vertical diel migrations of 350–400 m for juveniles, and up to 150–200 m for adults.

Distribution within the South Pacific area

Alfonsino is prevalent across the southwest Pacific with common occurrences reported from New Zealand and Australian catch data in the north Tasman Sea, Louisville Ridge, Chatham Rise, and Lord Howe Rise (FAO 2016, Fisheries New Zealand 2021). In the southeast Pacific, catch data from within the Chilean EEZ indicate alfonsino is present mainly on the submarine mounts located in the archipelago of Juan Fernandez, the area of Bajo O'Higgins and the continental shelf area. Other areas of recorded alfonsino abundance in the southeastern Pacific include the Nazca and Sala y Goméz Ridges off southern Peru (FAO 2016).

It has been suggested that alfonsino could comprise widespread populations in large oceanic eddy systems (Alekseev et al. 1986) but very little is known about stock structure.

General habitat and behaviour

In the South Pacific, Alfonsino 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 in most regions where studies have taken place (Galaktionov 1984, Uchida & Tagami 1984, Lehodey & Grandperrin 1996, Parin & Pakhorukov 2003). 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 is no information on vertical migration behaviour. More broadly, some inferences have been made via a physiological approximation realized by Saavedra *et al*., 2016, which demonstrates that alfonsino present an enhanced metabolic capacity typically closely related with an increased migratory capacity and may allow them to spend time in the oxygen minimum zone. Furthermore, Alekseev et al. (1986) conclude that alfonsino are capable of fast movements around seamounts within their distribution range and undergo lengthy migrations, more than 1 000 nm in the northeast Atlantic and 700 nm in the southeast Atlantic.

Biological characteristics

Morphology

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.
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 annuli in otoliths has been validated (Massey & Horn 1990, Lehodey & Grandperrin 1996, Rico et al. 2001). Females tend to have a higher maximum length (von Bertalanffy L_∞) than males, but growth appears relatively similar between some areas (e.g., eastern and western Atlantic, and North and South Pacific) (Lehodey & Grandperrin 1996, Rico et al. 2001, Gili *et al.,* 2002). Growth of juveniles is probably rapid; it is estimated that they reach a fork length of about 15–20 cm in their first year, an average fork length of about 25 cm after 3 years, and about 40 cm after 10 years. Maximum age is thought to be approximately 20 years (Horn & Massey).

Reproduction

Alfonsino are serial spawners. Very little published information on spawning time or location of alfonsino in the South Pacific is available. In New Zealand waters Horn & Massey (1989) examined gonadosomatic indices and suggested that spawning occurred mid-winter around July–August, although there is still large uncertainty around when and where alfonsino spawn in this area. This is inconsistent with evidence from other parts of the South Pacific, i.e., New Caledonia, where spawning was found to take place between November and February.

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).

Length at maturity and growth

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).

Growth parameters of the Bertalanffy growth function from several studies are summarised in Table 1.

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

Area	L∞		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	-2.0	Lehodey & 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	-4.30	-8.25	Massey & Horn 1990
Paoanui	49.1	-	0.144	-	-1.81	-	Massey & Horn 1990
East Coast North Island	51.1	57.5	0.110	0.080	-3.56	4.10	Stocker & Blackwell 1991
Japan							
Sagami Bay	37.8		0.439		0.40		Ikenouye 1969
Sagami Bight	45.8		0.323		-0.22		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
Chile							
Juan Fernandez Islands	58.5	63.6	0.095				Gili et al. 2002
	49.3		0.012		-2.00		Niklitschek & Toledo 2011

Biological productivity

Absolute fecundity off New Caledonia seamounts was reported to be 270,000–675,000 eggs per individual (Lehodey et al. 1997).
González et al. (2003) noted that alfonsino life-history parameters of the alfonsino suggest that this species has a specialistic life-history strategy and that fisheries based on this species might be more susceptible to growth overfishing and population depletion.

Role of the species in the ecosystem

Alfonsino feed by hunting macrofauna, mainly small squids and fish, but also crustaceans (i.e., copepods, amphipods, shrimps, prawns, and euphausiids).

Horn et al. (2010) examined stomach contents from individuals caught on three consecutive summer trawl surveys in New Zealand between 2005-2007. They determined that the species in this region was a moderately selective feeder that fed predominantly in the mesopelagic layers. The most common prey items were crustaceans and mesopelagic fishes. By mass, the most important prey items were prawns from the genus *Sergestes*, followed by the myctophid fish *Lampanyctodes hectoris*. Horn et al. (2010) also found an ontogenetic difference in prey selection, with euphasiids and amphipods being most important in the diet of alfonsino 17-26 cm in length (FL), and larger prawns and mesopelagic fishes being important for individuals >27 cm. In contrast, Porteiro and Sutton (2007) described alfonsino as targeting midwater micronekton, and that they actively tracked the deep scattering layer in contrast to other seamount-associated fish species. While alfonsino span a wide range of prey species, there is some indication they may still be relatively selective based on the observation that prey items such as squid and salps would be relatively abundant where alfonsino feed on the Chatham Rise in New Zealand but are rarely taken (Horn et al. 2010).

Alfonsino are prey at various stages of their life to other bony fishes and sharks.

In the southwest Pacific alfonsino are often caught in association with bluenose (*Hyperoglyphe antarctica*), gemfish (*Rexea solandri*), hoki (*Macruronus novaezelandiae*), and javelinfish (*Lepidorhynchus denticulatus*) (FAO 2016). In Chile, alfonsino are caught in association with the fish *Helicolenus lengerich*, Emmerlichthys sp., *Epigonus robustus* and the crustacean *Projasus bahamondie*. In the South Pacific alfonsino is rarely associated with orange roughy due to its shallower depth distribution (FAO 2016, Saavedra et al. 2016).

Impacts of fishing

Habitat damage

The main method used to catch this species is trawling generally fishing close to, or on, the seafloor, with some being taken as bycatch from bottom longline methods (FAO 2016, Fisheries New Zealand 2021).

Trawling for alfonsino, like trawling for other species, is likely to have long-term effects on the benthic community structure and function where fishing occurs (e.g., Rice 2006, Clark et al. 2019) and there may be consequences for benthic productivity (e.g., Jennings et al 2001, Hermsen et al 2003, Hiddink et al 2006, Reiss et al 2009).

Underwater topographic features such as seamounts, knolls and pinnacles are widely regarded as fragile habitats and are susceptible to damage from such practices (Althaus et al. 2009, Clarke et al. 2010), along with the habitat-forming species that reside upon them and contribute to local-scale habitat complexity and relief (Clark and O'Driscoll 2003, O'Driscoll and Clark 2005, Koslow et al. 2001). The effects of trawling on alfonsino populations at smaller spatial scales are currently unknown due to a paucity of studies on species-habitat interactions, (i.e., if there are specific habitat-forming species alfonsino associate with).

The Cumulative Bottom Fishery Impact Assessment for Australian and New Zealand bottom fisheries in the SPRFMO Convention Area, 2020 (SC8-DW07_rev1) reviewed and assessed habitat impacts of demersal fisheries. It also assessed the extensive and complex management in place to mitigate benthic impacts within SPFRMO, which is mainly based on spatial restrictions of fishable areas.

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