APPENDIX X **– Stock Status Report – Alfonsino**

STATUS REPORT

Beryx splendens
Alfonsino

2016

Updated 14 October 2016

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1. Description of the fishery

1.1 Description of fishing vessels and fishing gear

In recent years the Korean trawl fishery was the only fishery targeting the alfonsino in the SEAFO CA. This fishery finished it activity in 2014. During the period 2010-2013 two fishing vessels participated in the fishery.

Although primarily considered as a midwater trawl fishery, 94% of the tows recorded by onboard observers were classified as "Demersal". Whether or not these trawls were bottom trawls remains uncertain, and this is an issue that still requires clarification.

At the SEAFO CA the vessel1 stern trawler operated with the following fishing gears (Table 1 and Figs. 1-4 provide the specifications of the fishing gears):
HAMPIDJAN NET is a bottom otter trawl with two-piece nets of 66 m in length. The head rope is 48 m long; ground rope is 50 m; the height, width and girth of the net are 5.5 m, 30 m and 100 m, respectively. The cod-end mesh size is 120 mm. The ground gear is 50 m in length and 903 kg in weight, and the float is 1,018 kg.
MANUFACTURED NET is a four-piece net with a overall length of 66.9 m. The lengths of the head rope and ground rope are 59.0 m and 77.9 m, respectively. The height, width and girth of the net are 5.5 m, 200 m and 83 m, respectively. The cod-end mesh size is 120 mm. The ground is 77.9 m in length and the weight of the ground is 2,068 kg. The float is 913.200 kg with the floating rate of 44%.
MIDWATER NET is 210 m long. The lengths of head rope and ground ropes are 93.6 m. The height and width of the net are 70.0 m and 240-260 m, respectively. The girth of the net is 816 m and the cod-end mesh size is 120 mm.

Table 1: Fishing gear specifications at vessel 1

Gear Specifications		HAMPIDJAN NET bottom trawl	MANUFACTURED NET bottom trawl	MIDWATER NET
Otter board	type	VRS-TYPE	VRS-TYPE	VRS-TYPE
	material	Steel	Steel	Steel
	size (mm)	2,300 x 4,030	2,750 x 4,900	1,854 x 3,818
	weight (kg)	3,930	4,320	2,000
	under water weight (kg)	2,619	2,473	1,145
Trawl Net	purpose	bottom fishing (figure1)	bottom fishing (figure2)	mid-water fishing (figure3)
	net length overall(m)	66	66.9	210.0
	head rope (m)	48	59.0	93.6
	ground rope (m)	50	77.9	93.6
	net height (m)	5.5	5.5	70
	net width (m)	30	200	240~260
	net girth (m)	100	83	816
	mesh size (mm)	120	120	120

The vessel2 was a stern trawler which operated with two types of fishing gears: a mid-water trawl net; and the bottom trawl net. The gear used for the operation in the SEAFO Convention Area was the mid-water KITE gear (Figure 4).
The height of the net's gate is approximately 50 m, and the total length is around 280 m. When net is settled, it sinks underwater and the sinking depth of the net is controlled by the wire ropes. The upper and

lower parts of the bottom trawl net PE Net have attached plastic buoys and rubber balls respectively. As in the case of KITE gear the wire ropes control the sinking depth of the settled gear.

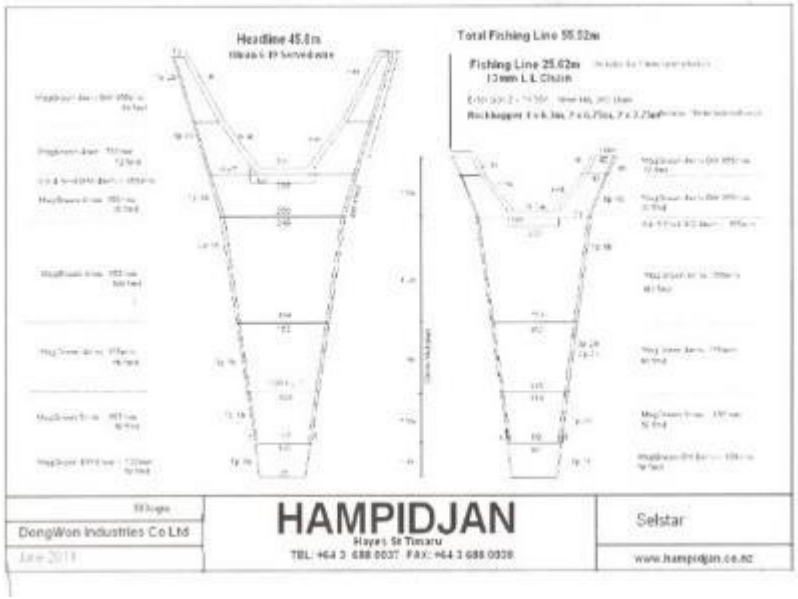

Figure 1: Diagram of HAMPIDJAN NET of the vesse1.

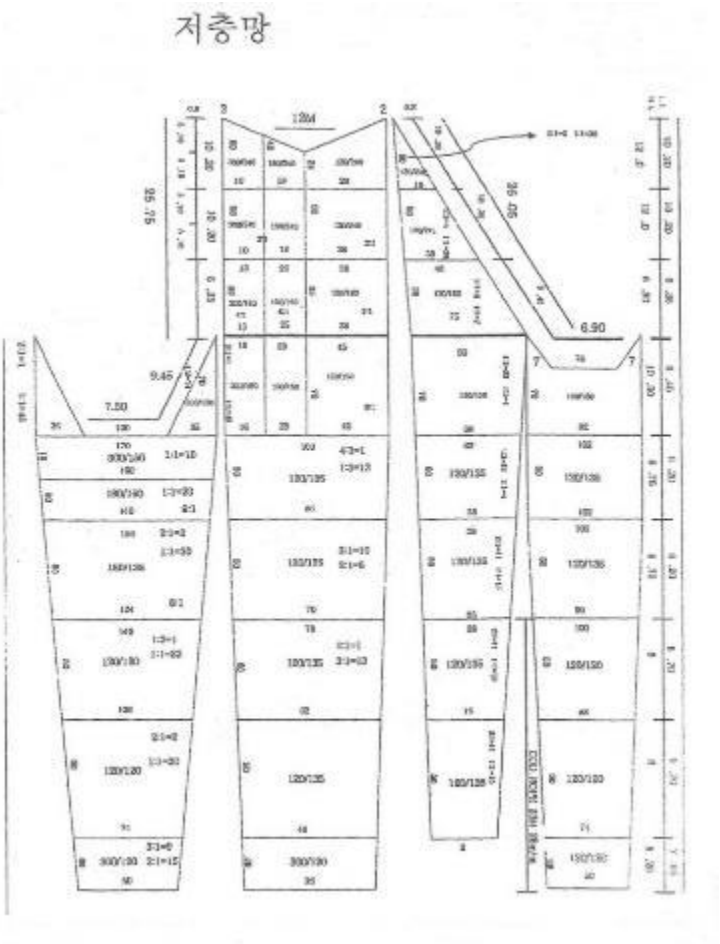

Figure 2: Drawing of the Custom Manufactured Bottom Trawl Net of the vesse1.

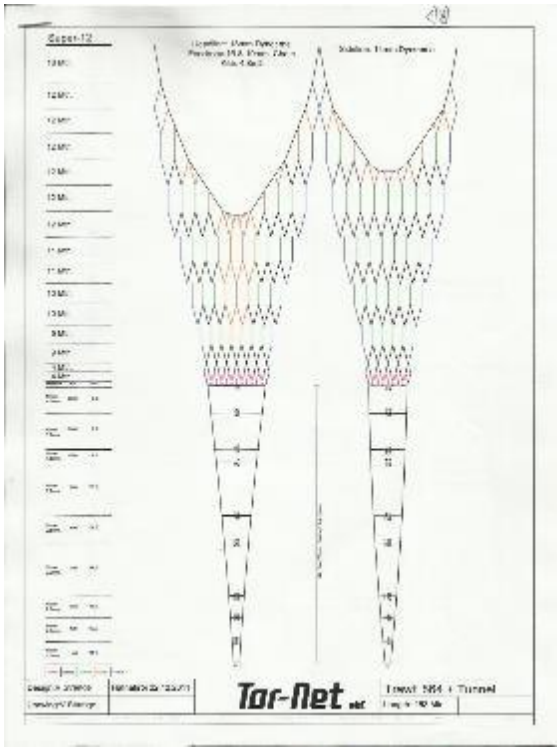

Figure 3: Drawing of mid-water trawl net of the vesse1.

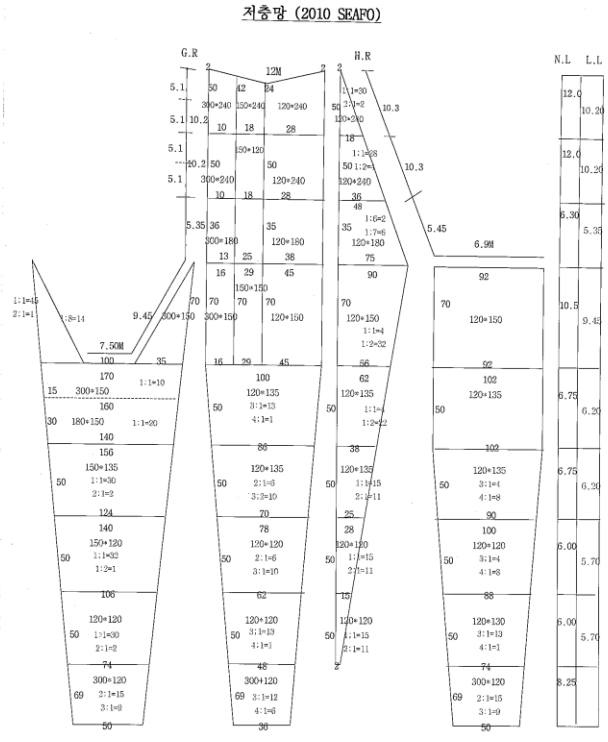

Figure 4: Drawing of mid-water trawl net of the vessel 2.

1.2 Spatial and temporal distribution of fishing

During the period from 2010 to 2011the Korean trawl vessels caught Alfonsino mainly in the northern part of Division B1and in the southern part in 2012 and 2013 (Fig. 5-8).). The three main fishing grounds in Division B1 are shown in these figures.

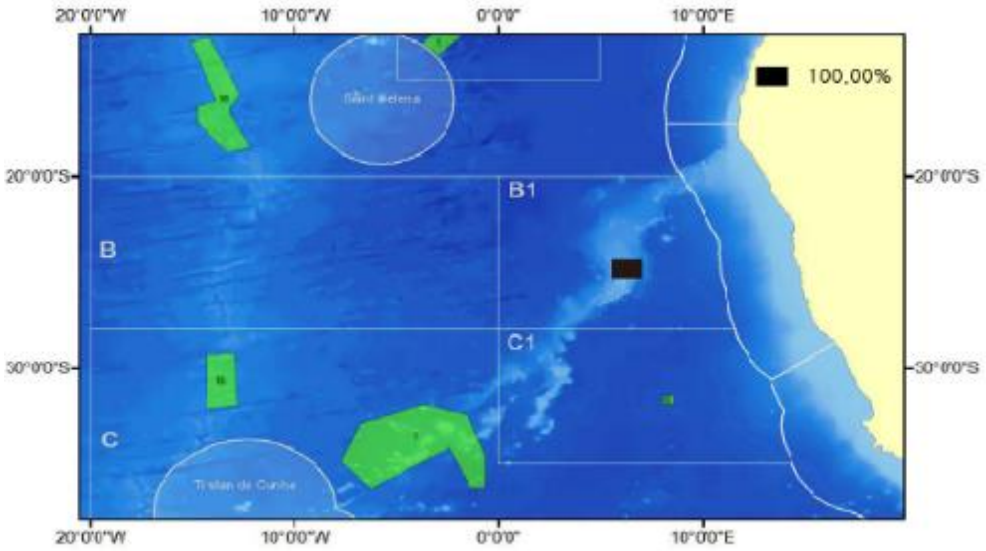

Figure 5: Proportion of catch of Alfonsino (*B. splendens*) by zone (2013).

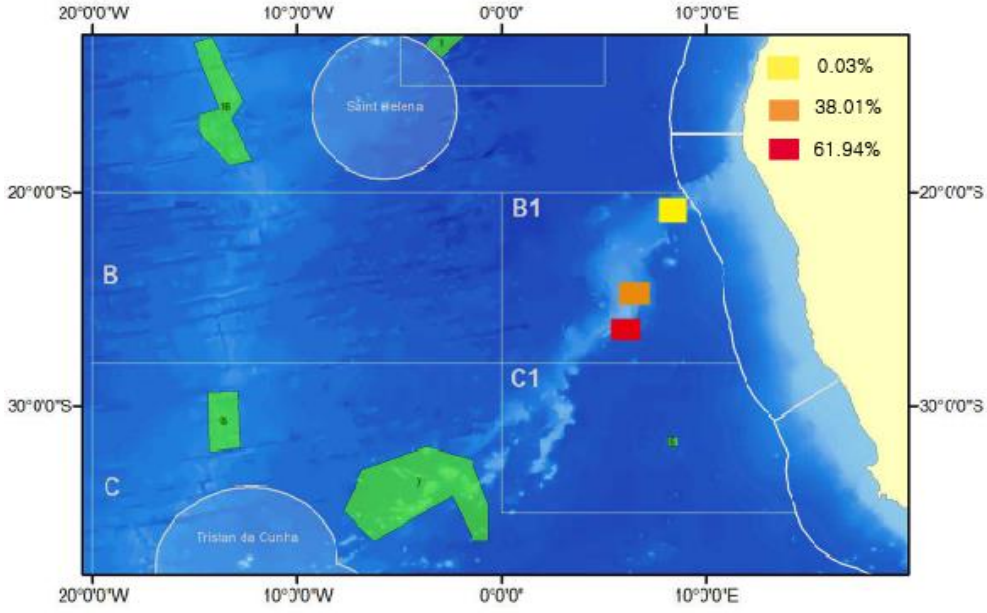

Figure 6: Proportion of catch of Alfonsino (*B. splendens*) by zone c (Jan-Nov 2012).

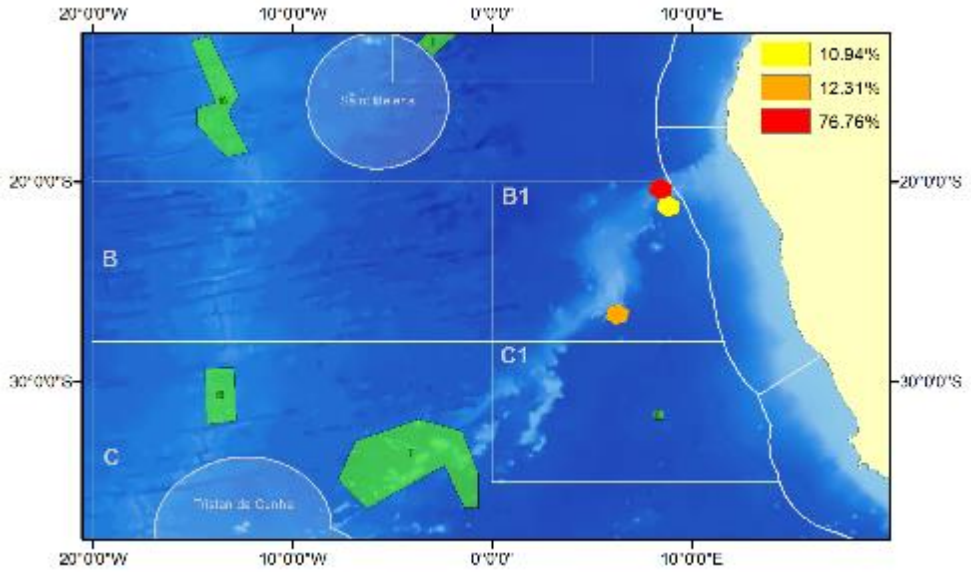

Figure 7: Proportion of catch of Alfonsino (*B. splendens*) aggregated to 100km diameter hexagonal cells (2011).

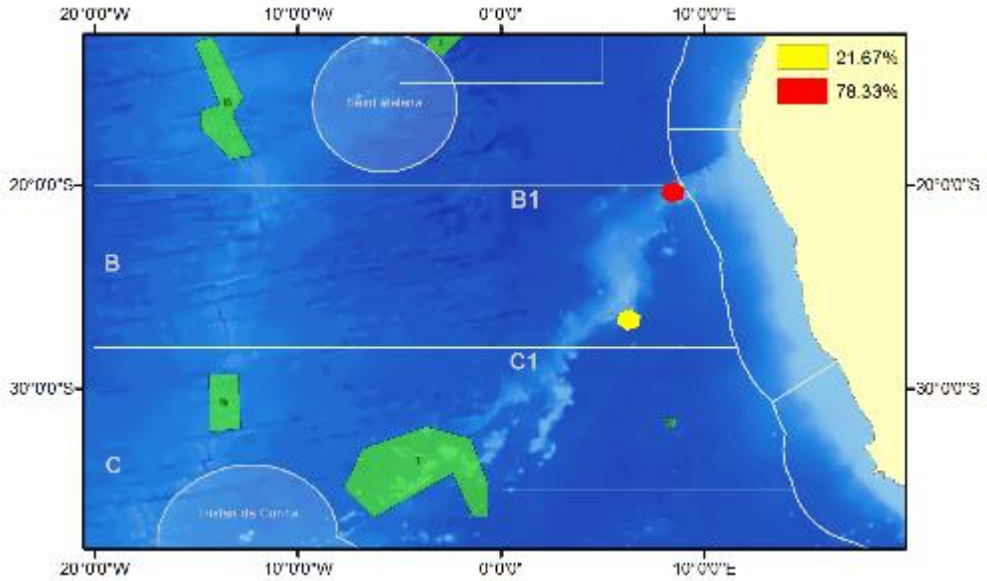

Figure 8: Proportion of catch of Alfonsino (*B. splendens*) aggregated to 100km diameter hexagonal cells (2010).

1.3 Reported retained catches and discards

Table 2 presents Alfonsino catches by country, as well as fishing gear and the sub-divisions in which the catch was taken. The main fishing countries worked in the area included Russia (bottom trawl) in the late 1970s, Ukraine in the mid-1990s, Russia (bottom trawl), Norway (bottom trawl), Spain (MWT /BLL), Poland and Namibia (bottom trawl) in the late 1990s, and South Korea (mid-water trawl) for 4 years from 2010 to 2013, respectively, 198 tonnes, 196 tonnes, 172 tonnes and 1.6tonnes. Historically the highest catches of the fish were recorded by Russia with 2,972 and 2,800 tons in 1977 and 1997 respectively, Poland 1,964 tonnes in 1995, and Norway 1,066 tons in 1998 in the SEAFO CA.

Table 2: Catches (tonnes) of Alfonsino (*B. splendens*) made by various countries. Values in *italics* are taken from Japp (1999). Values in **bold** are from the FAO.

Management Area	B1	A1	Unknown	Unknown	Unknown	A, B & C
Nations	Namibia	Norway	Russia	Portugal	Ukraine	South Korea
Fishing method	Bottom trawl	Bottom trawl	Bottom trawl			Mid-water trawl
1976			*252*			
1977			*2,972*			
1978			*125*			
1993					**172**	
1994						
1995	*1*	N/F				
1996	*368*	N/F			**747**	
1997	*208*	836	*2,800*		**392**	
1998	N/F	1,066	**69**			
1999	1	N/F		**3**		
2000	<1	242		**1**		
2001	1	N/F		**7**		
2002	0	N/F		**1**		
2003	0	N/F		**5**		
2004	6	N/F	210			
2005	1	N/F	54			
2006	N/F	N/F	N/F	<1		
2007	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	198
2011	N/F	N/F	N/F	N/F	N/F	196
2012	N/F	N/F	N/F	N/F	N/F	172
2013	N/F	N/F	N/F	N/F	N/F	1.6
2014	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016)

N/F means no fishing. Blank fields mean no data available.

Main species	Alfonsino (continued)					
Management Area Nations	Spain	Poland	Unknown Cook Island	Unknown Mauritius	Unknown Cyprus	B1? RSA
Fishing method	MWT /BLL		Bottom trawl	Bottom trawl	Bottom trawl	Bottom trawl
Catches						
1976						
1977						
1978						
1993						
1994						
1995		**1,964**				*60*
1996						*109*
1997	**186**					*124*
1998	**402**					
1999						
2000						
2001	2					

2002						
2003	2					
2004	4		142	115	437	
2005	72					
2006	N/F	N/F	N/F	N/F	N/F	N/F
2007	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F

1.4 IUU catch

Some IUU fishing activity in the SEAFO CA has been reported for a vessel to the Secretariat, but the extent of this is at present unknown.

2 Stock distribution and identity

Alfonsino has a global distribution and has been reported from all tropical and temperate oceans (excluding from the northeast Pacific and Mediterranean Sea) between latitudes of about 65° N and 43° S. It occurs from depths of about 25 m to at least 1300 m (Busakhin 1982). In the Atlantic Ocean the species occurs at both at western (Gulf of Maine to the Gulf of Mexico) and eastern Atlantic (off south western Europe and the Canary Islands to South Africa) (Fig. 9). This species is benthopelagic: adults inhabit the outer shelf (180 m) and slope to at least 1,300 m depth, probably moving further from the bottom at night but ascending to feed in midwater during the night; often found over seamounts and underwater ridges. There are no estimates of migration behaviour. The species is oviparous; spawning in batches. Eggs, larvae and juveniles are pelagic.

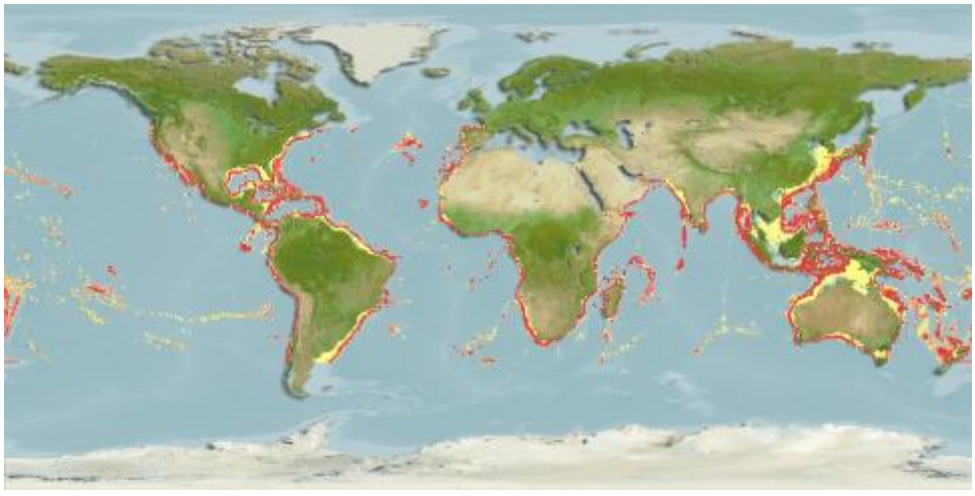

Figure 9: The distribution of Alfonsino (*B. splendens*) (source: FishBase).

Data available for assessments, life history parameters and other population information

3.1 Fisheries and surveys data

Non- availability of the historical data and fishing trends for fishing activities in the SEAFO CA prevent application of standard assessment methods. However, only catch and effort (per haul) data for a period of three years (2010-2012) are available for quantitative stock assessment.

3.2 Length data and frequency distribution

Using the data collected by Korean trawl fisheries between 2010 and 2013, the length frequency distributions were analysed (Table 3 and Fig. 10). The catch landing data in 2013 were not enough to represent the situation of the southern area of Division B1. The length of Alfonsino in the southern area of Division B1 was the largest with average 26.5 cm and 28.0 cm at the 3rd quartile, with two modes at 22 cm and 27 cm in 2011. In the southern area of Division B1 the length of the fish was also the largest in 2011 and reached about 50 cm fork length. No trend appeared in 2012 (May-June) due to paucity of samples (23 samples). Overall length trends between the areas during 2012-2013 were asymmetric. The length of the species in the northern part was larger than that of southern part in 2012 and 2013.

Table 3: Results of length composition of Alfonsino collected by Korean vessels in the SEAFO CA (B1) (2010-2013)

	2010		2011		2012 (5~6)		2012(11)		2013	
	South	North	South	North	South	North	South	North	South	North
No. of samples	200	841	174	593	514	23	77	-	97	5
Minimum length	19.0	17.0	20.0	15.0	17.0	26.0	24.0	-	17.0	25.0
Maximum length	42.0	47.0	50.0	48.0	34.0	35.0	39.0	-	31.0	34.0
Average length	25.8	24.8	26.5	27.8	24.8	31.0	31.5	-	23.7	27.4
Median length	25.0	24.0	25.0	28.0	25.0	32.0	32.0	-	22.0	26.0
1st quartile length	23.0	22.0	23.0	25.0	23.0	30.0	29.0	-	21.0	25.0
3rd quartile length	27.0	26.0	28.0	31.0	26.0	32.5	34.0	-	27.0	27.0

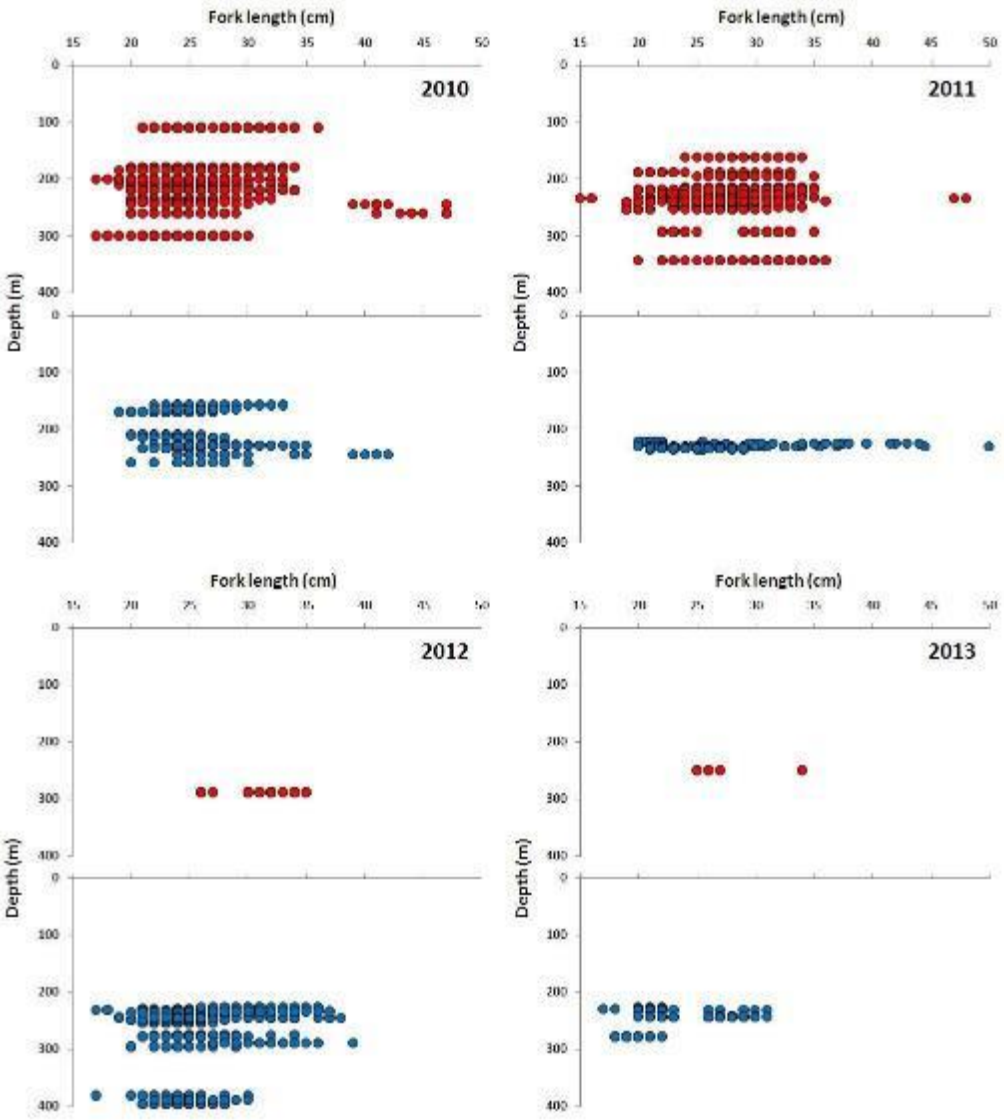

Figure 11: Fork length distribution of Alfonsino (*Beryx splendens*) by depth for 2010-2013.

Table 4: Summary of fork length distribution of Alfonsino (*Beryx splendens*) by depth for 2010-2013.

	2010		2011		2012(5~6)		2012(11)		2013	
	South	North	South	North	South	North	South	North	South	North
No. of Samples	841	200	174	593	514	23	77	-	5	97
Average Depth (m)	210.9	211.1	229.6	238.4	323.8	288.5	248.2	-	250.0	265.1
Average FL (cm)	25.8	24.8	26.5	27.8	24.8	31.0	31.5	-	27.4	23.7

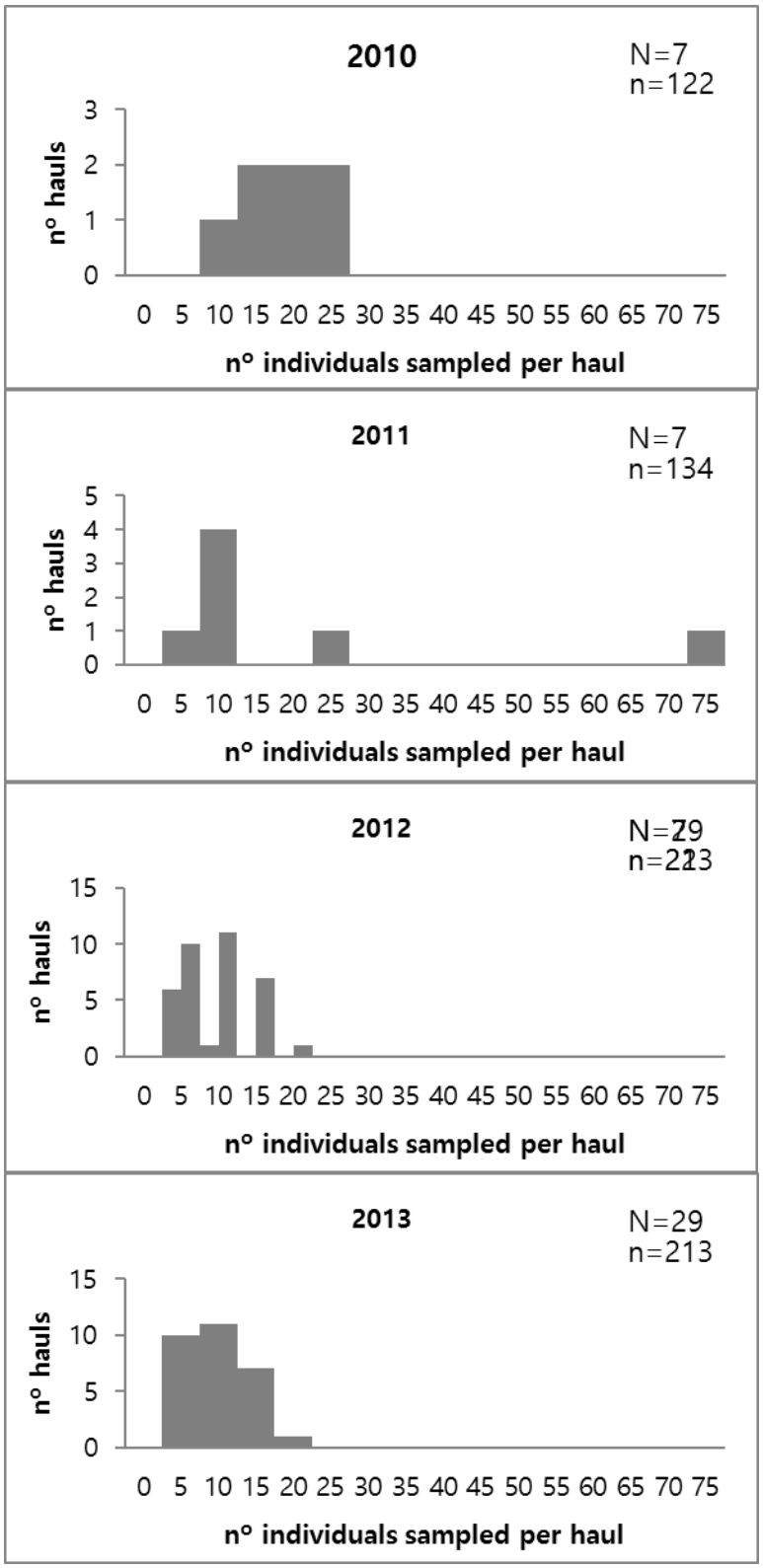

Figure 12: The number of individuals of Alfonsino per haul over a period of four year from 2010 to 2013 in the SEAFO CA.

Table 5: Number of sets by year, minimum and maximum number of individuals per set and the number of individuals sampled between 2010 to 2013 in the SEAFO CA.

Year	No. of Sets Observed	Mean Individuals	Min. Individuals	Max. Individuals	Mean sample size/tonnes
2010	7	17.429	10	25	0.92
2011	7	19.143	5	75	1.36
2012	29	7.345	1	16	0.06
2013	7	3.143	1	7	1.94

3.3 Length-weight relationships

Figure 13 shows the length and weight relationship of Alfonsino for 2010-2013. Two parameters of the length-weight relationship were 0.022 for α and 3.010 for β of combined sex of Alfonsino.

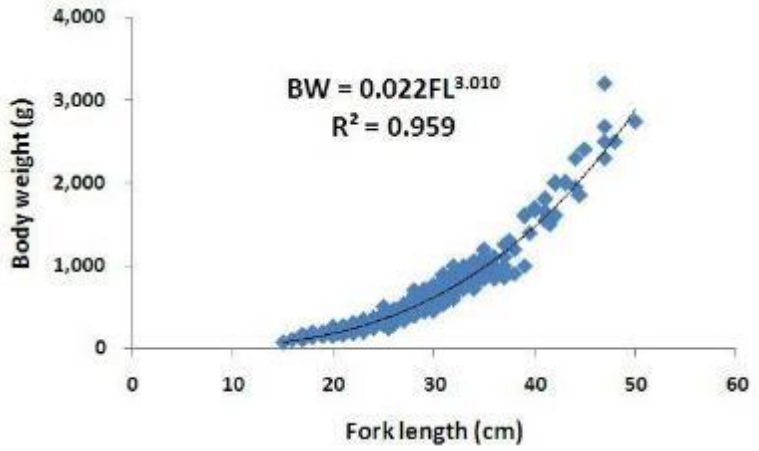

Figure 13: Relationship between length and weight of Alfonsino (*B. splendens*) in the SEAFO CA for 2010 - 2013.

3.4 Age data and growth parameters

The maximum observed age of Alfonsino in the Guinean Gulf was 20 years. The growth parameters of Alfonsino were estimated as K=0.097 year^-1, Linf=48 cm, and t0=-3.08 year^-1 using the specimens from Guinean Gulf (López-Abellán *et al*. 2008).

3.5 Reproductive parameter

The reproductive parameters of Alfonsino were analysed as follows. Spawning season was evaluated as the period from November to February (Nova Caledonia). Length at 1st maturity was estimated as fork length 39.67 cm for females (95% c.i.=39.34, 40.02 cm) and 36.88 cm for males (95% c.i.=36.45, 37.36 cm) (Flores et al. 2012). Fecundity was calculated as 270,000 – 650,000 eggs (source: FishBase).

The biological productivity of *B. splendens* is likely to be moderate to low in general (Anonymous, 2007). Alfonsinos are serial spawners and reproduce in the areas that they normally inhabit. Average size at sexual maturity appears to be about 30–34cm (4–6 years old), and can vary between localities (González et al. 2003). The annual numbers and proportion of the fish by gonad maturity stage by Korean trawl fisheries during the period of 2010 - 2013 are presented in Table 6 and Figure 14. Time of spawning also varies

markedly between seasons. The proportion of immature fishes was 99.4%, 91.4%, 98.6% and 97.1% in 2010, 2011, 2012 and 2013, respectively. The fish, which is in pre-spawning and spawning gonad stages, appeared from October indicating that the spawning season may start from sometime after October. To get more accurate reproduction results of Alfonsino in the SEAFO Area, there is a need to collect data for a few more years.

Table 6: Annual number of fish by maturity stages of Alfonsino (*B. splendens*) in the SEAFO CA for 2010 to 2013.

Year	Month	Maturity stage				
		Immature	Developing	Pre-spawning	Spawning	Spent
2010	Sep	882	66	6	0	0
	Oct	33	6	0	0	0
	Nov	0	20	0	0	0
2011	Jan	95	239	0	0	0
	Sep	37	1	0	0	0
	Oct	18	20	12	0	0
	Nov	26	77	34	2	0
2012	May	16	7	0	0	0
	Jun	452	32	0	0	0
	Nov	29	40	3	5	0
2013	Oct	42	4	0	0	0
	Nov	28	25	3	0	0

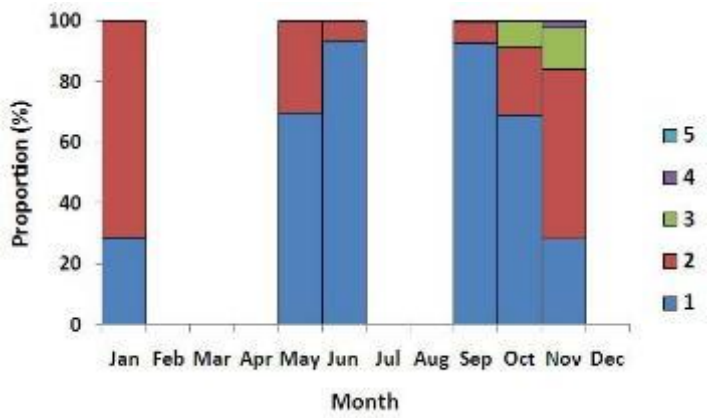

Figure 14: The proportion of maturity stage of Alfonsino in the SEAFO CA for 2010-2013. (1: immature, 2: developing, 3: pre-spawning, 4: spawning, and 5: spent).

3.6 Natural mortality
There is no available information and data in the SEAFO CA.

3.7 Feeding and trophic relationships (including species interaction)
There is no available information and data in the SEAFO CA.

3.8 Tagging and migration
No tagging and migration studies on Alfonsino have been done in the SEAFO Area.

4 Stock assessment

4.1 Available abundance indices and estimates of biomass
There is no available information and data in the SEAFO CA

4.2 Data used
The data used are derived from fishing hauls in which total catch of *Beryx splendens* represented more than 80% of the total catch of *P. richardsoni* and *Beryx splendens* caught by Korean trawls around the Valdivia Bank. This criterion is used since the catches of these two species are negatively correlated, i.e., when one of these two species occurs in the haul the other does not.

In each haul the estimate of CPUE of *Beryx splendens* is represented as the ratio of total catch of the species by the haul duration time.

4.3 Methods used
Nominal CPUE was used to derive a perception of the development of the fishery in the period 2010-2012.

4.4 Results
The progression in CPUE over time showed marked variability and no clear trend.

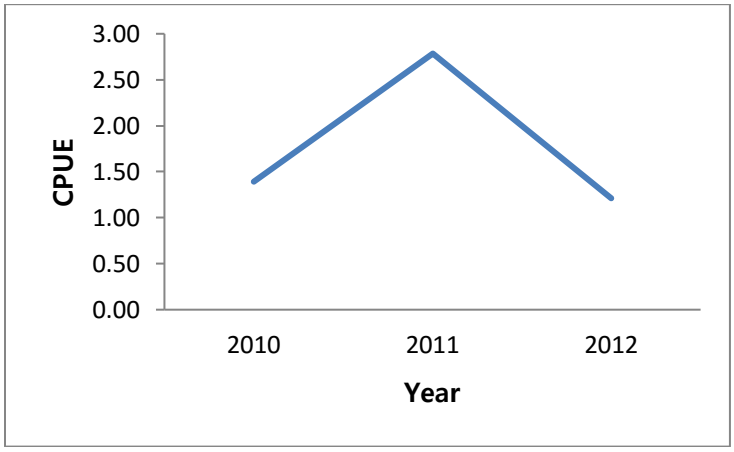

Figure 14: Plot of nominal CPUE (Catch per hour) for 2010-2012.

4.5 Discussion
It should be recognized that the data available for assessment is extremely sparse and represents a short time series. The perception of the stock as described is based on only 3 years of catch and effort data. Length frequency distributions could not be derived based on the insufficient length samples submitted to the Secretariat.

4.6 Conclusion

Catch and effort data per haul on Alfonsino were collected by Korean vessels for only 3 years from 2010 to 2012. These data, although short in series, can be used to get a perception of the trend in nominal CPUE.

4.7 Biological reference points and harvest control rules

No biological reference points could be determined and the SC suggests using an empirical Harvest Control Rule (HCR) to regulate the fishery until the data situation is improved. A candidate HCR consists of the average catch of the last three years to which a 20% uncertainty cap is applied.

ICES Harvest Control Rules, category 5: Data poor stocks (only landings data).Calculation of average catch for three years (2010- 2012) as C_{Y-1}

$$C_{Y-1} = \frac{\sum_{y-3}^{y-1} C_i}{3}$$

= (159+ 165+172)/3

=165

And calculation of the catch advise as

$$C_{Y+1} = 0.8 \times C_{Y-1}$$

= 0.8*165

= 132t

Incidental mortality and by-catch of fish and invertebrates

5.1 Incidental mortality (seabirds, mammals and turtles)

No by-catch of seabirds, mammals and turtles were reported.

5.2 Fish by-catch

In the case of Southeastern Atlantic fisheries, Alfonsino is often found in association with other fish species as, for example, in 2011 the following species (per ton) were caught; Boarfish (*Capros aper*) 14 tonnes, Blackbelly rosefish (*Helicolenus actylopterus*) 3 tonnes, Imperial blackfish (*Schedophilus ovalis*) 6 tonnes, Oilfish (*Ruvettus pretiosus*) 8 tonnes, and Silver scabbardfish (*Lepidopus caudatus*) 4 tonnes.

5.3 Invertebrate by-catch including VME taxa

The main method used to catch Alfonsino is with bottom trawling. Trawling for this species on seamounts impacts habitat (Clark and O'Driscoll, 2003, Koslow et al., 2001), but the precise impact of this on invertebrate populations on the seamounts is unknown.

5.4 Incidental mortality and by-catch mitigation methods

By-catch mitigation measures to reduce incidental mortality for seabirds, mammals and turtles are in place (see current conservation measures in section 6).

5.5 Lost and abandoned gear

There was no reported lost and abandoned gear from the trawl fisheries for Alfonsino in the SEAFO CA.

5.6 Ecosystem implications and effects

The main method to catch Alfonsino is bottom trawling and repeated trawl disturbances will alter the benthic community on a seamount. However, the precise impact of such trawling on the ecosystem as a whole is unknown. (see Conservation Measure 18-10).

Current conservation measures and management advice
There have been no landings of alfonsino in the last 3 years (including 2016). The SC was therefore unable to apply the HCR previously proposed by the SC and accepted by the Commission.

Alfonsino is a seamount-associated species that form aggregations, and the experience worldwide is that serial depletion of aggregations at different seamounts can happen. In the recent fisheries for the species in SEAFO the fishery was concentrated on a single seamount summit, the Valdivia Bank, where it was mainly a bycatch in the target fishery for pelagic armourhead. The only information available from 2015 is the limited observations from the RV Dr Fridtjof Nansen survey noting that only scattered specimens of the species occurred in the main fishing area.

It is also recognized that the last three year's interruption in the exploitation has provided potential for recovery of the resource in the main fishing area on Valdivia Bank. There is however not enough information from any source to determine with certainty whether recovery has happened or not happened.

The SC however recognised that without future fishery data nor survey information the basis for providing scientific advice will deteriorate. The SC therefore discussed what advisory option would be most appropriate while maintaining the potential for data provision from a fishery. It must also be taken into account that the alfonsino is mainly a bycatch and that the catches will depend on the activity level in the target fishery for armourhead.

The SC considered the TAC level advised in 2013 as precautionary at that time. Considering no fishing pressures last 3 years and development of the resource, The SC recommends a TAC of 200 t (status quo) for the SEAFO CA, of which a maximum of 132 tonnes may be taken in Division B1.

Other Conservation Measures that are applicable to this fishery can be seen in Table 7.

Table 7: Other Conservation Measures that are applicable to this fishery.

Conservation Measure 04/06	On the Conservation of Sharks Caught in Association with Fisheries Managed by SEAFO
Conservation Measure 14/09	To Reduce Sea Turtle Mortality in SEAFO Fishing Operations.
Conservation Measure 25/12	On Reducing Incidental Bycatch of Seabirds in the SEAFO Convention Area
Conservation Measure 30/15	On the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area
Conservation Measure 31/15	On Total Allowable Catches and related conditions for Patagonian Toothfish, orange roughy, Alfonsino and Deep-Sea Red Crab in the SEAFO Convention Area in 2014

6 References

Anonymous. (2007). Information describing alfonsino (Beryx splendens) fisheries relating to the South Pacific Regional Fishery Management Organisation (Working Draft, 20 June 2007). SPRFMO-IV-SWG-09.

Busakhin, S.V. (1982). Systematics and distribution of the family Berycidae (Osteichthyes) in the World Ocean. *Journal of Ichthyology 22 (6)*: 1–21.

Chile. 2009. Information describing alfonsino (*Beryx splendens*) fisheries relating to the South Pacific Regional Fishery Management Organisation. SP-07-SWG-INF-07

Clark, M.; O'Driscoll, R. 2003: Deepwater fisheries and aspects of their impact on seamount habitat in New Zealand. Journal of Northwest Atlantic Fishery Science 31: 441-458

DeLury, D.B. 1947. On the estimation of biological populations. Biometrics, 3: 145–167.

Fisheries Agency of Japan. 2008. Information describing splendid alfonsin (*Beryx splendens*) fisheries relating to the North Western Pacific Regional Fishery Management Organization. Working draft.

Fisheries Agency of Japan. 2008. Report on Identification of Vulnerable Marine Ecosystems in the Emperor Seamount and Northern Hawaiian Ridge in the Northwest Pacific Ocean and Assessment of Impacts Caused by Bottom Fishing Activities on such Vulnerable Marine Ecosystems or Marine Species as well as Conservation and Management Measures to Prevent Significant Adverse Impacts (Bottom Gillnet).

Flores A, Wiff R, Gálvez P, and Díaz E. 2012. Reproductive biology of alfonsino Beryx splendens. J Fish Biol.
Gili, R., L. Cid, H. Pool, Z. Young, D. Tracey, P. Horne and P. Marriott. 2002. Estudio de edad, crecimiento y mortalidad natural de los recursos orange roughy y alfonsino. FIP 2002-12. Informe Final. IFOP-SUBPESCA. 129 p. Age, growth and natural mortality of orange roughy and alfonsino. (Final report FIP N° 2000-12. 129 p. (In Spanish).
González, J.A.; Rico, V.; Lorenzo, J.M.; Reis, S.; Pajuelo, J.G.; Afonso Dias, M.; Mendonça, A.; Krug, H.M.; Pinho, M.R. (2003). Sex and reproduction of the alfonsino *Beryx splendens* (Pisces, Berycidae) from the Macronesian archipelagos. *Journal of Applied Ichthyology 19*: 104–108.
Heemstra, P.C., 1986. Berycidae. p. 409-410. In M.M. Smith and P.C. Heemstra (eds.) Smiths' sea fishes. Springer-Verlag, Berlin.
Hilborn, R. and C.J. Walters. 1992. Quantitative Fisheries Stock assessment: Choice, Dynamics and Uncertainty. Chapman and Hall: 570 pp.

Koslow, J.A.; Gowlett-Holmes, K.; Lowry, J.K.; O'Hara, T.; Poore, G.C.B.; and Williams, A. (2001). Seamount benthic macrofauna off southern Tasmania: community structure and impacts of trawling. Marine Ecology Progress Series 213: 111-125.

Lehodey, P.; Grandperrin, R. (1996). Age and growth of the alfonsino *Beryx splendens* over seamounts off New Caledonia. *Marine Biology 125*: 249–258.

Leslie, P.H. and D.H.S. Davis. 1939. An attempt to determine the absolute number of rats on a given area. J. Anim. Ecol., 8: 94–113.

López Abellán, L.J., M. T. G. Santamaría and E. Román (2007). Estudio comparado del crecimiento del alfonsiño Beryx splendens Lowe, 1834 de las montañas submarinas del golfo de Guinea y del océano Índico suroccidental. Bol. Inst. Esp. Oceanogr. 23 (1-4): 33-44.
Maul, G.E., 1986. Berycidae. p. 740-742. In P.J.P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen and E. Tortonese (eds.) Fishes of the north-eastern Atlantic and the Mediterranean. UNESCO, Paris. Vol. 2.
Maul, G.E., 1990. Berycidae. p. 626. In J.C. Quero, J.C. Hureau, C. Karrer, A. Post and L. Saldanha (eds.) Check-list of the fishes of the eastern tropical Atlantic (CLOFETA). JNICT, Lisbon; SEI, Paris; and UNESCO, Paris. Vol. 2.

Nakamura, I., T. Inada, M. Takeda and H. Hatanaka, 1986. Important fishes trawled off Patagonia. Japan Marine Fishery Resource Research Center, Tokyo. 369 p.

Paulin, C., A. Stewart, C. Roberts and P. McMillan, 1989. New Zealand fish: a complete guide. National Museum of New Zealand Miscellaneous Series No. 19. 279 p.

Paxton, J.R., 1999. Berycidae. Alfonsinos. p. 2218-2220. In K.E. Carpenter and V.H. Niem (eds.) FAO species identification guide for fishery purposes. The living marine resources of the WCP. Vol. 4. Bony fishes part 2 (Mugilidae to Carangidae). FAO, Rome. Rico, V.; Lorenzo, J.M.; González, J.A.; Krug, H.M.; Mendonça, A.; Gouveia, E.; Afonso Dias, M. (2001). Age and growth of the alfonsino *Beryx splendens* Lowe, 1834 from the Macronesian archipelagos. *Fisheries Research 49*: 233–240.

Rico, V.; Lorenzo, J.M.; González, J.A.; Krug, H.M.; Mendonça, A.; Gouveia, E.; Afonso Dias, M. (2001). Age and growth of the alfonsino *Beryx splendens* Lowe, 1834 from the Macronesian archipelagos. *Fisheries Research 49*: 233–240.

Seber, G.A.F. 2002. The Estimation of Animal Abundance and Related Parameters. Second Edition. Blackburn Press, New Jersey.