

STATUS REPORT

Beryx splendens



2012

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1. Description of the fishery

1.1 Description of fishing vessels and fishing gear

The Korean trawl fishery in the SEAFO CA started in 2010 using trawl nets by two fishing vessels, F/V Adventure and F/V Dongsan Ho. Table 1 and Fig. 1-3 show the gear specifications for F/V Adventure. HAMPIDJAN NET, bottom fishing, is a two-piece net, 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 the 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 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. The cod-end mesh size is 120 mm.

Table 1: Gear specifications for F/V Adventure

Gear Specifications		bottom fishing HAMPIDJAN	bottom fishing (custom manufactured)	mid-water
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

F/V Dongsan Ho is a stern trawler which has two types of fishing gears; mid-water trawl net and bottom trawl net – this vessel will not be operating in the future. The gear used for the operation in the SEAFO Convention Area is the mid-water KITE gear (Fig. 4), which consists of ropes, whose upper part has kites and lower part has chains. The height of the net's gate is approximately 50 m, and the total length is around 280 m. When set the mid-water net, the gear sinks underwater, whose sinking depth is controlled by wire ropes. Bottom trawl net is that PE Net is used in the SEAFO Area, to whose upper and lower parts plastic buoys and rubber balls are attached respectively. When set the bottom net, the gear sinks underwater, and the depth is controlled by wire ropes.

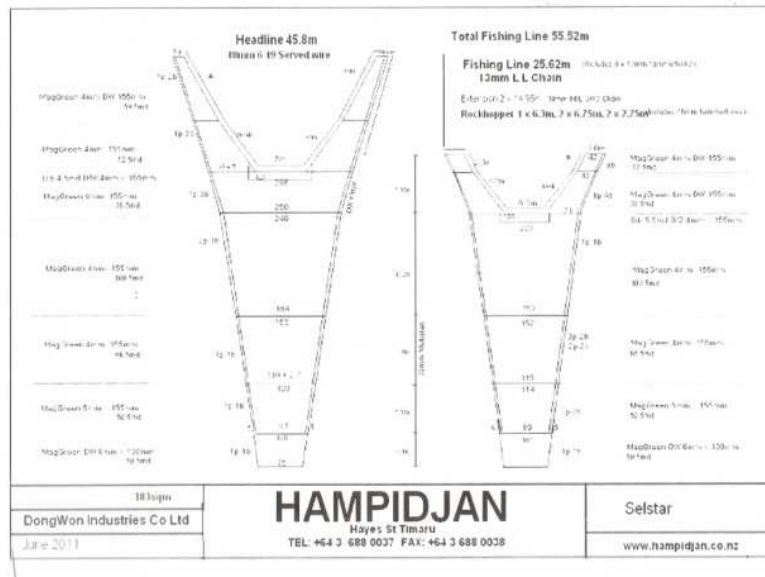


Figure 1: Diagram of HAMPIDJAN NET of F/V Adventure.

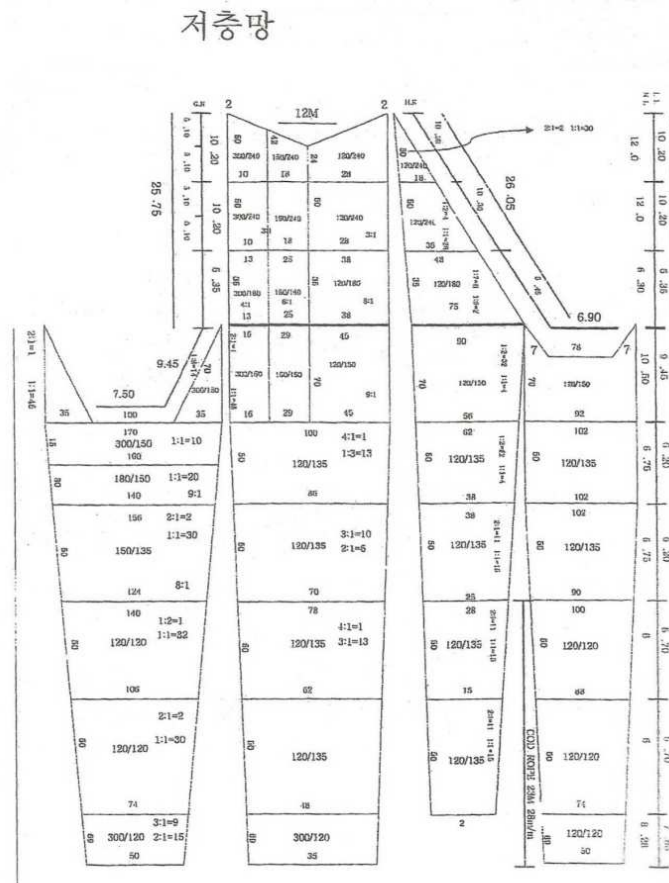


Figure 2: Drawing of the Custom Manufactured Bottom Trawl Net of F/V Adventure.

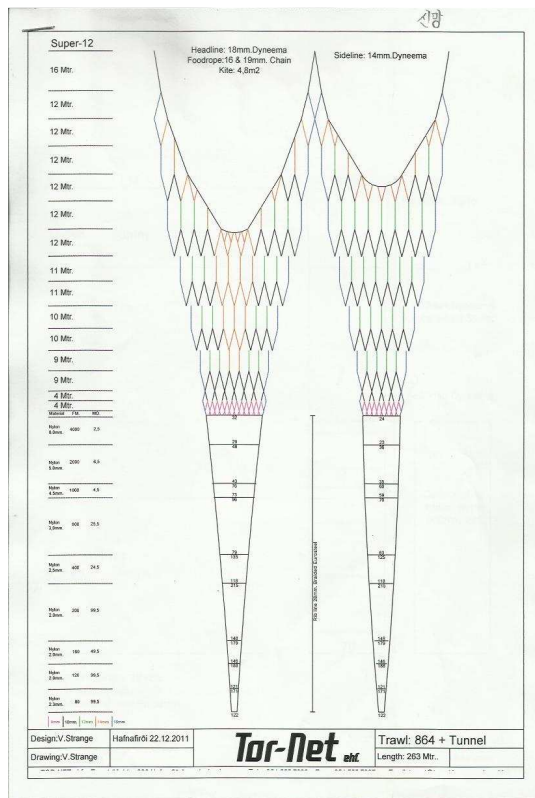


Figure 3: Drawing of mid-water trawl net of F/V Adventure.

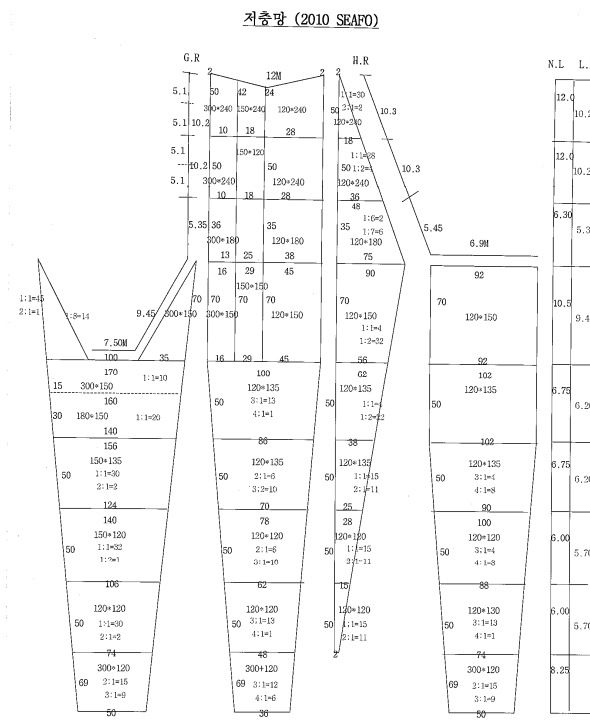


Figure 4: Drawing of mid-water trawl net of F/V Dongsan Ho.

1.2 Spatial and temporal distribution of fishing

During the period from 2010 to 2011 Korean trawl vessels (Dongsan Ho and/or Adventure) caught Alfonsino mainly in the northern part, but southern part in Sub-division B1 in 2012 (Fig. 5-7).

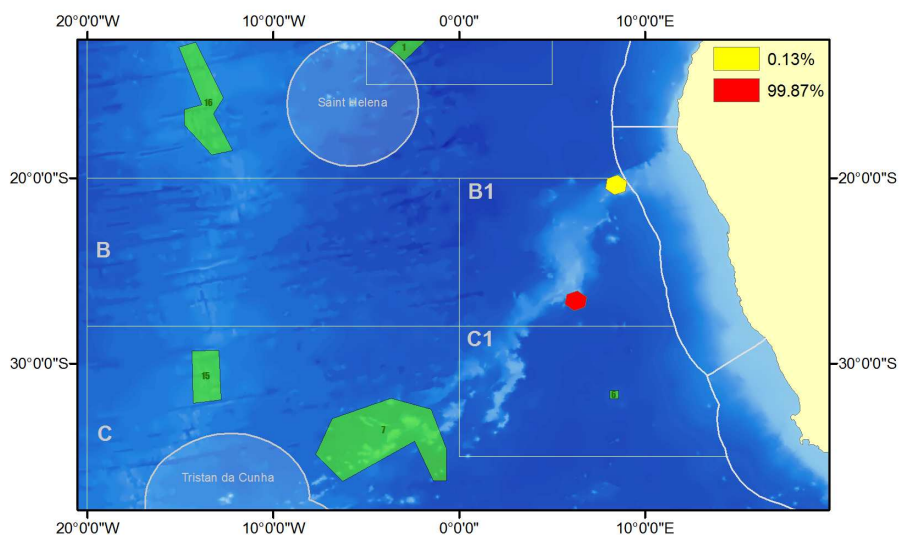


Figure 5: Annual estimated catch from the observer of Alfonsino (*B. splendens*) aggregated to 100km diameter hexagonal cells (Jan-Sep 2012).

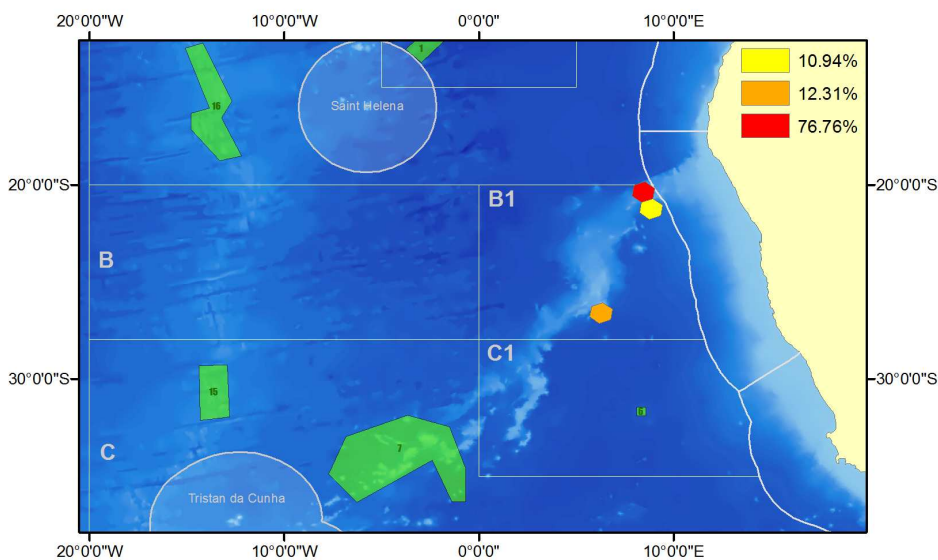


Figure 6: Annual estimated catch from the observer of Alfonsino (*B. splendens*) aggregated to 100km diameter hexagonal cells (2011).

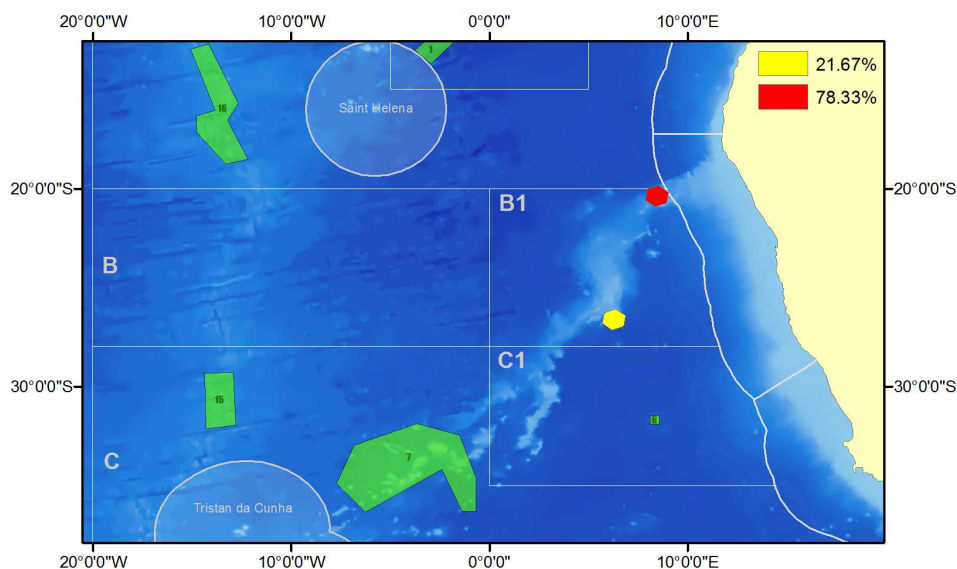


Figure 7: Annual estimated catch from the observer of Alfonsino (*B. splendens*) aggregated to 100km diameter hexagonal cells (2010).

1.3 Reported landings 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) in the early 2010. 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			<i>252</i>			
1977			<i>2,972</i>			
1978			<i>125</i>			
1993					172	
1994						
1995	<i>1</i>	N/F				
1996	<i>368</i>	N/F			747	
1997	<i>208</i>	836	<i>2,800</i>		392	
1998	N/F	1,066	69			
1999	<i>1</i>	N/F		3		
2000	<i><1</i>	242		1		
2001	<i>1</i>	N/F		7		
2002	<i>0</i>	N/F		1		
2003	<i>0</i>	N/F		5		
2004	<i>6</i>	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	107

* Provisional (September 2012)

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

Main species Management Area Nations Fishing method	Alfonsino (continued)					
	Spain	Poland	Unknown Cook Island	Unknown Mauritius Bottom trawl	Unknown Cyprus Bottom trawl	B1? RSA
	MWT /BLL		Bottom trawl	trawl	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

1.4 IUU catch

Apparent IUU fishing activity in the SEAFO CA has been report by vessel to the Secretariat, but the extent of this is at present unknown.

2. Stock distribution and identity

Alfonsino has a global distribution, being excluded from the northeast Pacific and Mediterranean Sea. 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. 8).

Adults inhabit the outer shelf (180 m) and slope to at least 1,300 m depth, probably moving further from the bottom at night; often found over seamounts and underwater ridges. The species is oviparous; spawning in batches. Eggs, larvae and juveniles are pelagic.

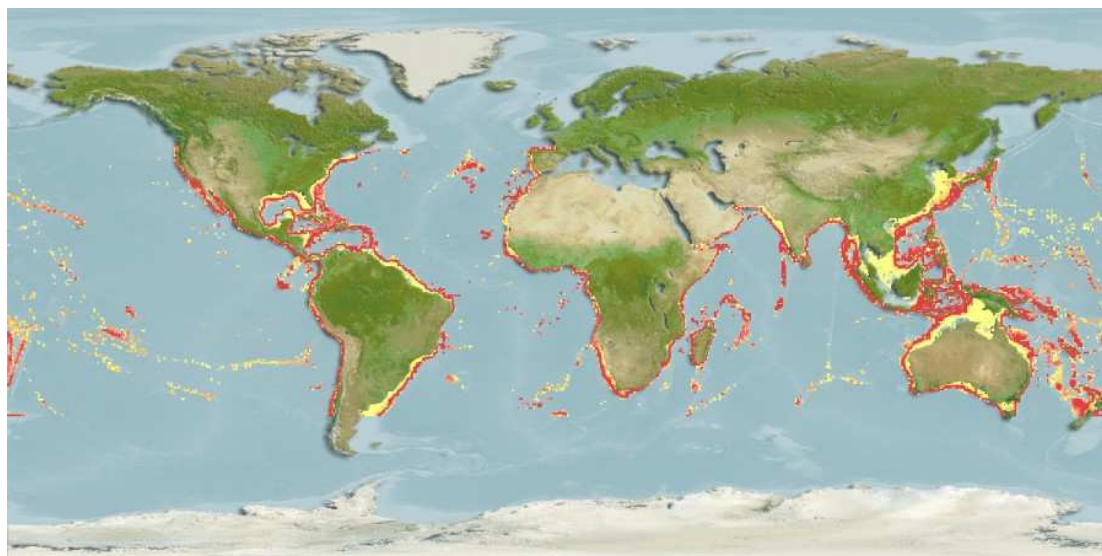


Figure 8: The distribution of Alfonsino (*B. splendens*) (source: FishBase).

3. Life history parameters and information

3.1 Length frequencies

Using the data collected by Korean trawl fisheries between 2010 and 2012 September, the length frequency distributions were analysed (Table 3 and Fig. 9). The length of Alfonsino in the southern area of Sub-division B1 was biggest with average 26.5 cm and 28.0 cm at the 3rd quartile, with two models at 22 cm and 27 cm in 2011. In the northern area of Sub-division B1 the length of the fish was also biggest in 2011, and there was no trend in 2012. No trend appeared in 2012 might be happened because of lack of samples (23 samples).

Table 3: Results of length composition of Alfonsino collected by Korean vessels in the SEAFO CA (2010-2012)

	2010		2011		2012	
	South B1	North B1	South B1	North B1	South B1	North B1
No. of samples	200	841	174	593	514	23
Minimum length (FL, cm)	19.0	17.0	20.0	15.0	17.0	26.0
Maximum length (FL, cm)	42.0	47.0	50.0	48.0	34.0	35.0
Average length (FL, cm)	25.8	24.8	26.5	27.8	24.8	31.0
Median length (FL, cm)	25.0	24.0	25.0	28.0	25.0	32.0
1 st quartile length (FL, cm)	23.0	22.0	23.0	25.0	23.0	30.0
3 rd quartile length (FL, cm)	27.0	26.0	28.0	31.0	26.0	32.5

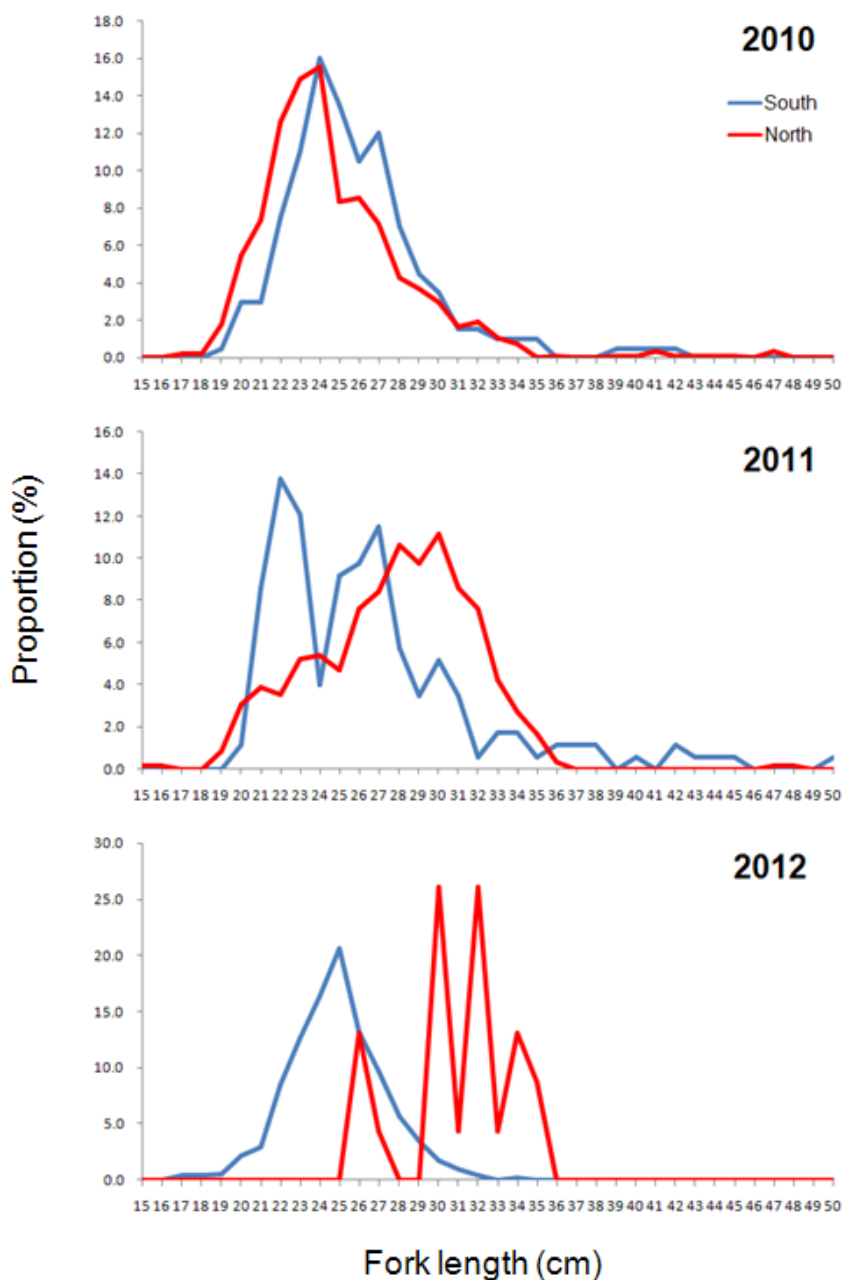


Figure 9: Annual length-frequency distribution of Alfonsino in the SEAFO CA (2010-2012).

Figure 10 shows the length distribution of Alfonsino by depth in 2010-2012. The range of average depth was from 210.9 m to 323.8 m, and the average length was 24.8 cm to 31.0 cm (Table 4). The deepest depth and the largest length showed in 2012 in the northern area, however in the southern area the depth became deeper, but the length was the biggest in 2011.

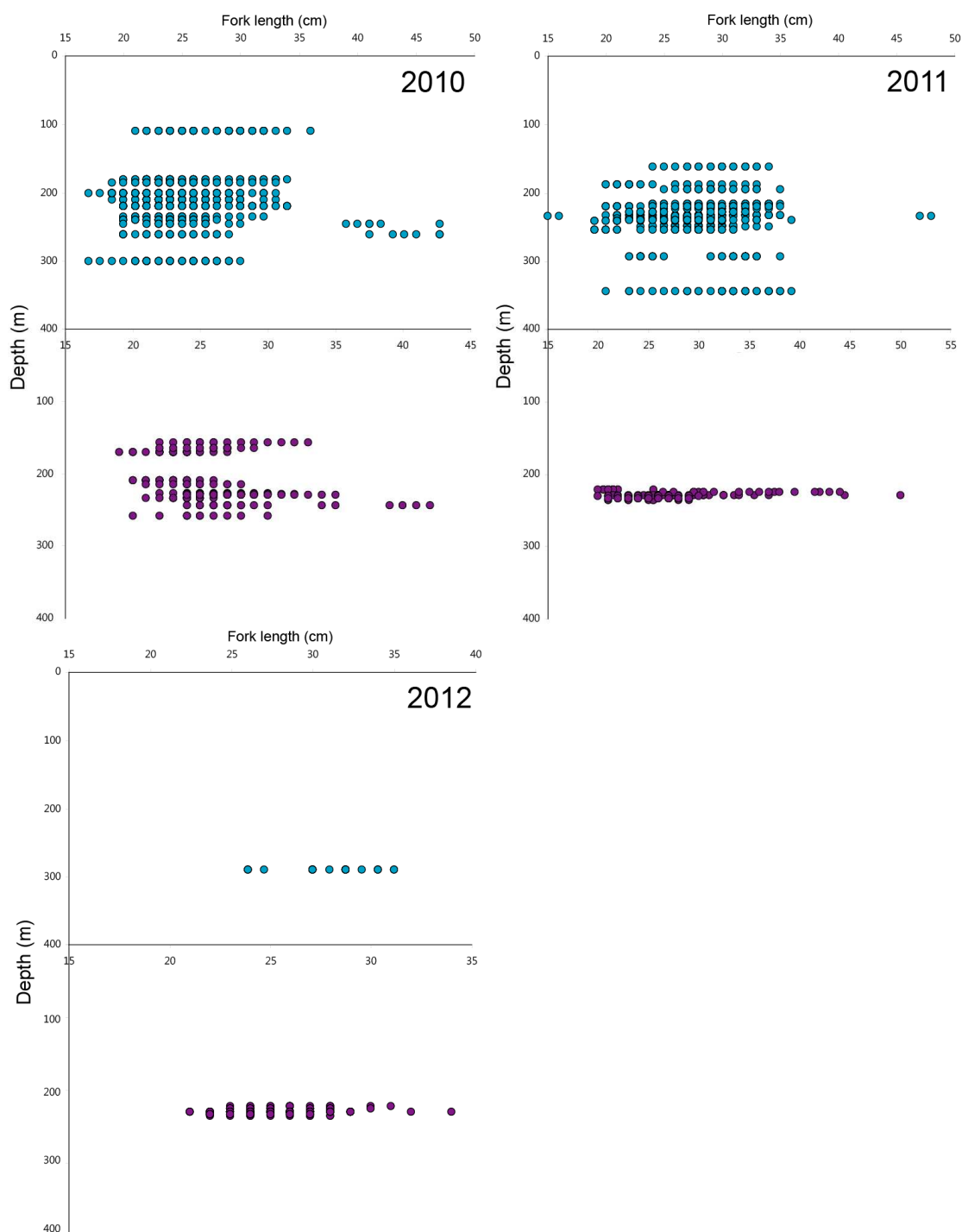


Figure 10: Fork length distribution of Alfonsino (*Beryx splendens*) by depth for 2010-2012.

Table 4: Summary of fork length distribution of Alfonsino (*Beryx splendens*) by depth for 2010-2012.

	2010		2011		2012	
	North	South	North	South	North	South
No. of samples	200	841	593	174	23	514
Average depth (m)	211.1	210.9	238.4	229.6	288.5	323.8
Average fork length (cm)	24.8	25.8	27.8	26.5	31.0	24.8

3.2 Length-weight relationships

Figure 11 shows the length and weight relationship of Alfonsino for 2010-2012. Two parameters of the length-weight relationship were 0.018 for α and 3.065 for β of combined sex of Alfonsino.

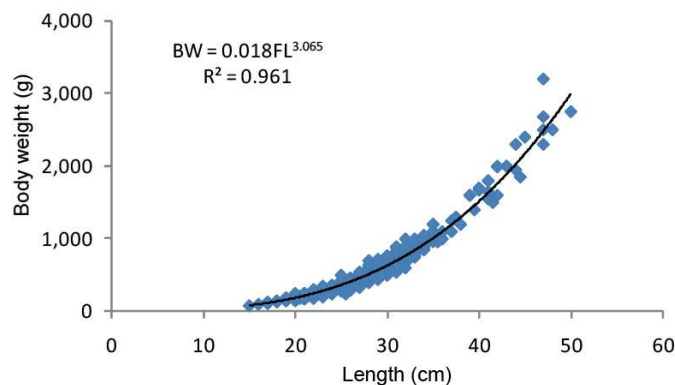


Figure 11: Relationship between length and weight of Alfonsino (*B. splendens*) in the SEAFO CA for 2010 - 2012.

3.3 Age data and growth parameters

The maximum observed age of the fish in the Guinean Gulf was 20 years. The species is known to aggregate and thus is vulnerable to overfishing.

The growth parameters of Alfonsino were estimated as $K=0.097 \text{ year}^{-1}$, $L_{inf}=48 \text{ cm}$, and $t_0=-3.08 \text{ year}^{-1}$ using the specimens from Guinean Gulf (López-Abellán *et al.* 2008).

3.4 Reproductive parameters

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 annual numbers and proportion of the fish by maturity stage of gonad during the period of 2010 – 2012 are presented in Table 5 and Figure 12. The proportion of immature fishes was 99.4%, 91.4%, and 100.0% in 2010, 2011, and 2012, respectively. The fish, which is on pre-spawning and spawning stages of gonad, appeared from October explaining the spawning season may start from sometime after October. To get more accurate reproductive results on Alfonsino in the SEAFO Area, it is needed to collect data for a few more years.

Table 5: Annual number of fish by maturity stages of Alfonsino (*B. splendens*) in the SEAFO CA for 2010 to 2012.

Year	Maturity stage 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	

2012	May	16	7	0	0	0
	Jun	452	32	0	0	0

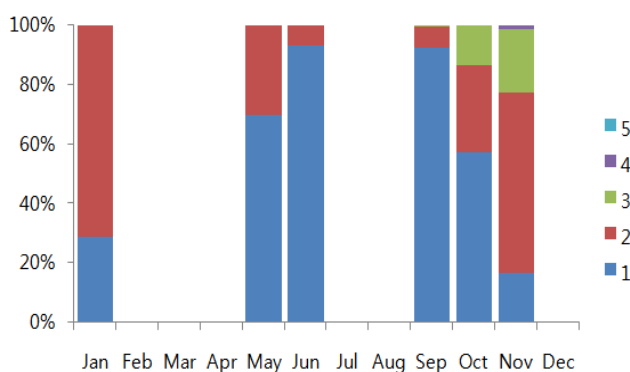


Figure 12: The proportion of maturity stage of Alfonsino in the SEAFO CA for 2010-2012. (1: immature, 2: developing, 3: pre-spawning, 4: spawning, and 5: spent).

3.5 Natural mortality

The estimated natural mortality (M) of Alfonsino was 0.195.

3.6 Feeding and trophic relationships (including species interaction)

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

3.7 Tagging and migration

Tagging and migration study on the Alfonsino has not done in the SEAFO Area.

4. Stock assessment

4.1 Available abundance indices and estimates of biomass

4.2 Data used

The data used are derived from fishing hauls in which total catch of *Beryx splendens* represented more than 60% of the total catch of *P. richardsoni* and *Beryx splendens* caught by Korean trawls around Valdivia area. This criterion is used since the catches of these two species are highly negatively correlated, i.e., when one of these two species occurs in the haul the other does not occur.

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

Local depletion model (DeLury, 1947; Leslie and Davis, 1939) was applied to 2010 and 2011 Catch and CPUE data. Depletion estimators are widely used in fish and wildlife studies to estimate population abundance (Seber, 2002; Hilborn and Walters, 1992).

Under Local depletion model it is assumed that no recruitment and no entries/exits to the fishing area during a particular season of fishing. Under these assumptions, catch rates will decline with continued fishing until all fishes have been removed. A linear regression model is adjusted to CPUE and the corresponding temporal cumulative catches. Through this model the total biomass available at the beginning of the season will thus corresponds to the total catch that equates to local extinction, i.e., point that cuts the x-axis.

The uncertainties of the estimates were determined by bootstrapping method. A total of 2000 bootstrap samples were derived from the input data and based on bootstrap estimates of the parameter and through this confidence interval for each parameter was derived accordingly.

4.4 Results

Figure 13 presents the CPUE against cumulative catch and the adjusted regression lines for 2010 and 2011.

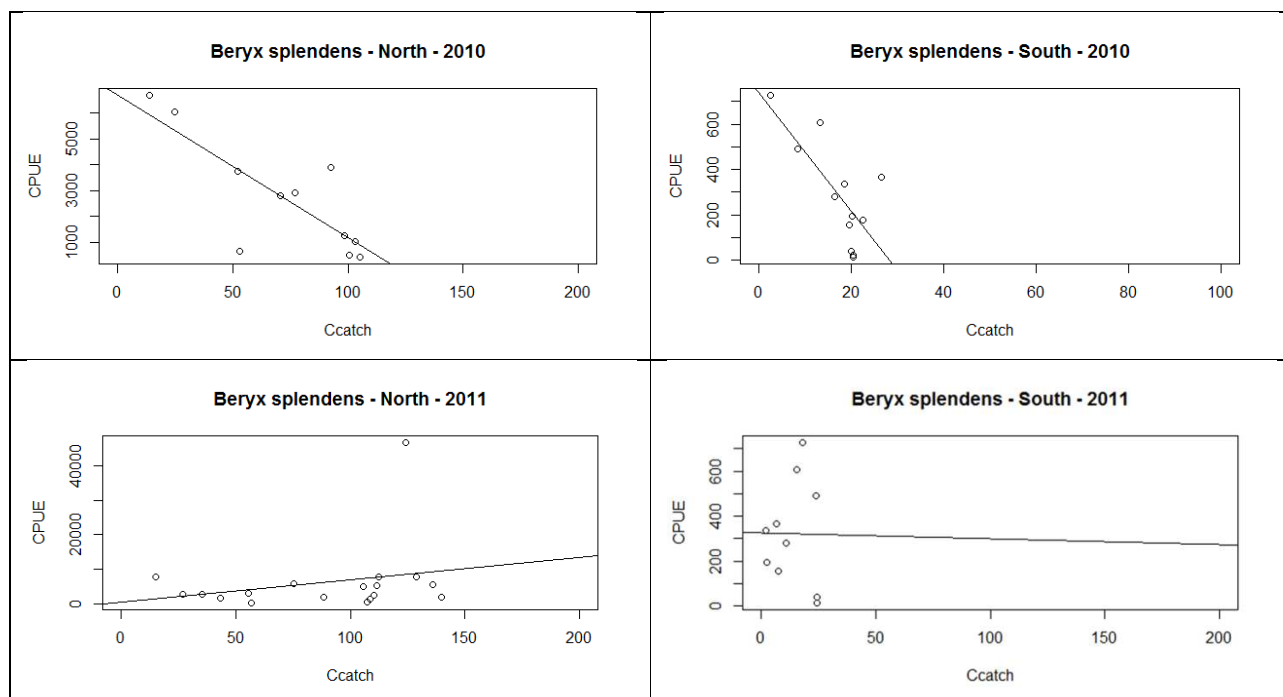


Figure 13: The CPUE against cumulative catch and Cumulative Catch, Ccatch, (tons) of Korean trawl vessels and the adjusted regression lines for 2010 and 2011.

4.5 Discussion

The adjustments of the model to the 2010 and 2011 data were weak both which determines that the estimates of the biomass available at the beginning of the fishing season should not be used as indicative of the exploitable biomass. The results obtained indicate that the assumptions of the model are not fulfilled and this is likely to reflect with the spatial and temporal dynamics of the species.

4.5 Conclusion

New approaches to evaluate the stock status need be tried in the future and inter-sessional work need to be done to fully analyse the data and get some perception of the stock.

5. Ecosystem implications/effects

5.1 Incidental and bycatch statistics (fish, invertebrates, seabirds, cetaceans, turtles)

By-catch species and catches from Alfonsino fishery were boarfish (14 tons), Blackbelly rosefish (3 tons), imperial blackfish (6 tons), Oilfish (8 tons) and Silver scabbardfish (4 tons) in 2011 (Table 6).

Table 6: Bycatch (kg) from the Alfonsino trawl fishery.

	2009	2010	2011	2012
Species	-	-	B1	-
BOC			14,492	
BRF			3,240	
HDV			5,796	
OIL			7,800	
SFS			3,978	

BRF: Blackbelly rosefish (*Helicolenus actylopterus*); BOC: Boarfish (*Capros aper*); HDV: Imperial blackfish (*Schedophilus ovalis*); OIL: Oilfish (*Ruvettus pretiosus*); SFS: Silver scabbardfish (*Lepidopus caudatus*)

5.2 VME incidental catch

5.3 Incidental and bycatch mitigation methods

5.4 Lost and abandoned gear

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

6. Biological reference points and harvest control rules

7. Current conservation measures

- ⇒ Conservation Measure 04/06: On the Conservation of Sharks Caught in Association with Fisheries Managed by SEAFO
- ⇒ Conservation Measure 07/06: Relating to Interim Measures to Amend the Interim Arrangement of the SEAFO Convention
- ⇒ Conservation Measure 08/06: Establishing a List Of Vessels Presumed To Have Carried Out Illegal, Unreported And Unregulated Fishing Activities in the South-East Atlantic Fisheries Organization (SEAFO) Convention Area
- ⇒ Conservation Measure 13-09: Interim Prohibition of Transshipments - at - Sea in the SEAFO Convention Area and to Regulate Transshipments in Port
- ⇒ Conservation Measure 14-09: To Reduce Sea Turtle Mortality in SEAFO Fishing Operations.
- ⇒ Conservation Measure 15-09: On Reducing Incidental By-catch of Seabirds in the SEAFO Convention Area.
- ⇒ Conservation Measures 18/10 on the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area
- ⇒ Conservation Measures 19/10 on Retrieval of Lost Fixed Gear
- ⇒ Conservation Measure 20/10: on Total Allowable Catches and related conditions for Patagonian Toothfish, Orange Roughy, Alfonsino and Deep-Sea Red Crab in the SEAFO Convention Area in 2011 and 2012
- ⇒ Conservation Measure 22/11: on Bottom Fishing Activities in the SEAFO Convention Area

8. State of stock and management advice

New approaches to evaluate the stock status need to be tried in the future and inter-sessional work need to be done to fully analyse the data and get some perception of the stock. Therefore, the present management should be applied continuously in 2013.

9. References

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