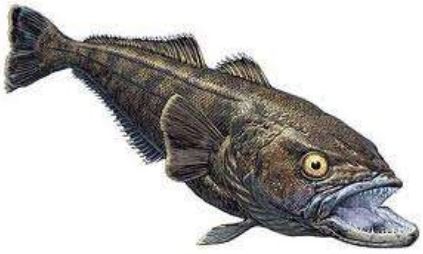
STATUS REPORT

Dissostichus eleginoides

Common Name: Patagonian toothfish

FAO-ASFIS Code: TOP



2017

Updated 21 November, 2017

TABLE OF CONTENTS

1. Description of the fishery

1.1 Description of fishing vessels and fishing gear

Fishing for Patagonian toothfish in the SEAFO CA started around 2002. The main fishing countries working in the area include vessels from Japan, the Republic of Korea, Spain and South Africa. Historically a maximum of three vessels per year fished in the SEAFO CA. The Spanish longline system and the Trotline (Fig. 1) are the fishing gears commonly used.

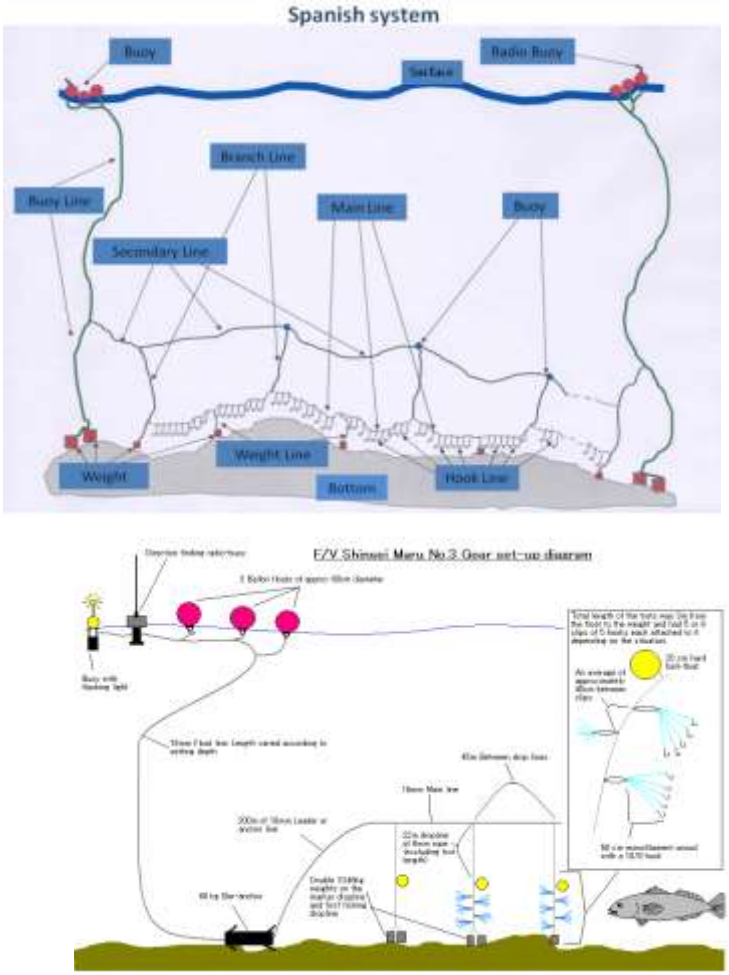
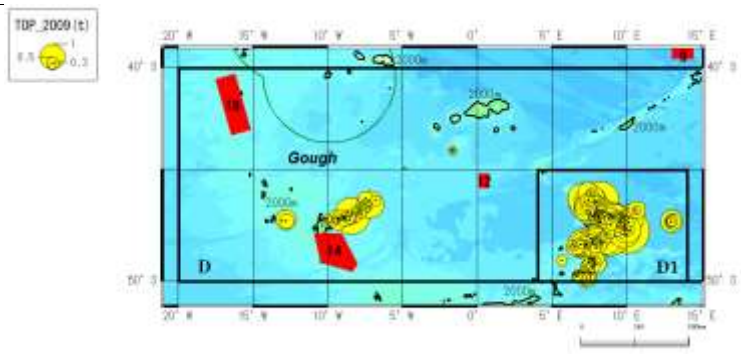


Figure 1: Fishing gears used to fish *D. eleginoides*: Spanish longline system (top) and the Trotline (bottom).

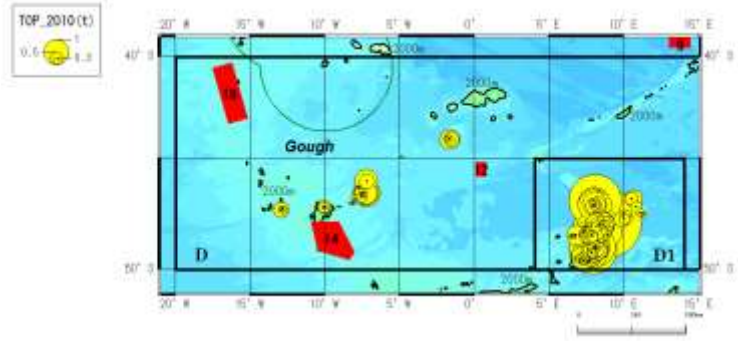
1.2 Spatial and temporal distribution of fishing

In SEAFO CA, the fishery from 2011 to 2014 took place in Sub-Area D, being concentrated over seamounts in Division D1, at Discovery seamount and also at seamounts located in the western part of Sub-Area D (Fig. 2).

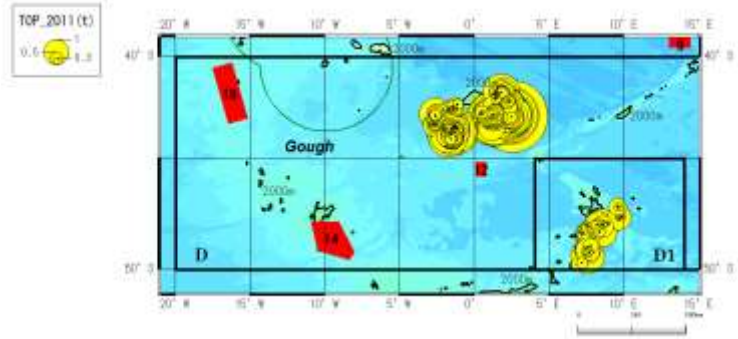
2009



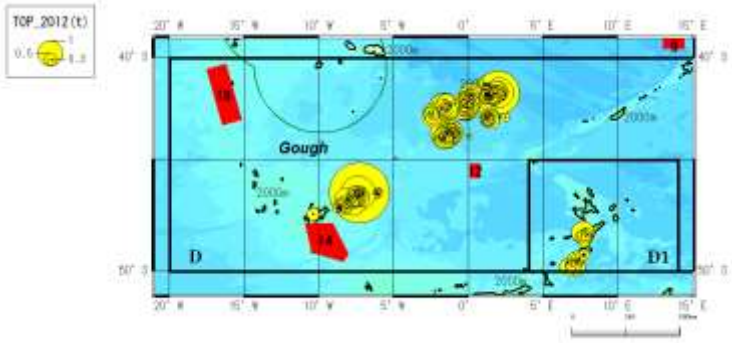
2010



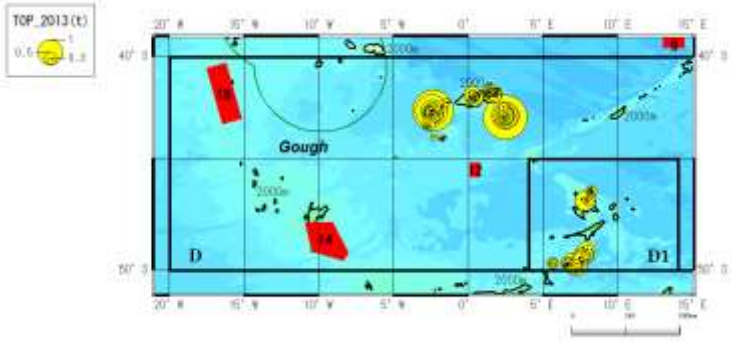
2011



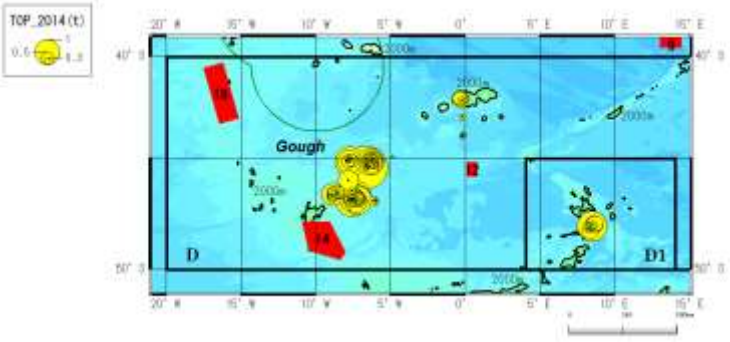
2012



2013



2014



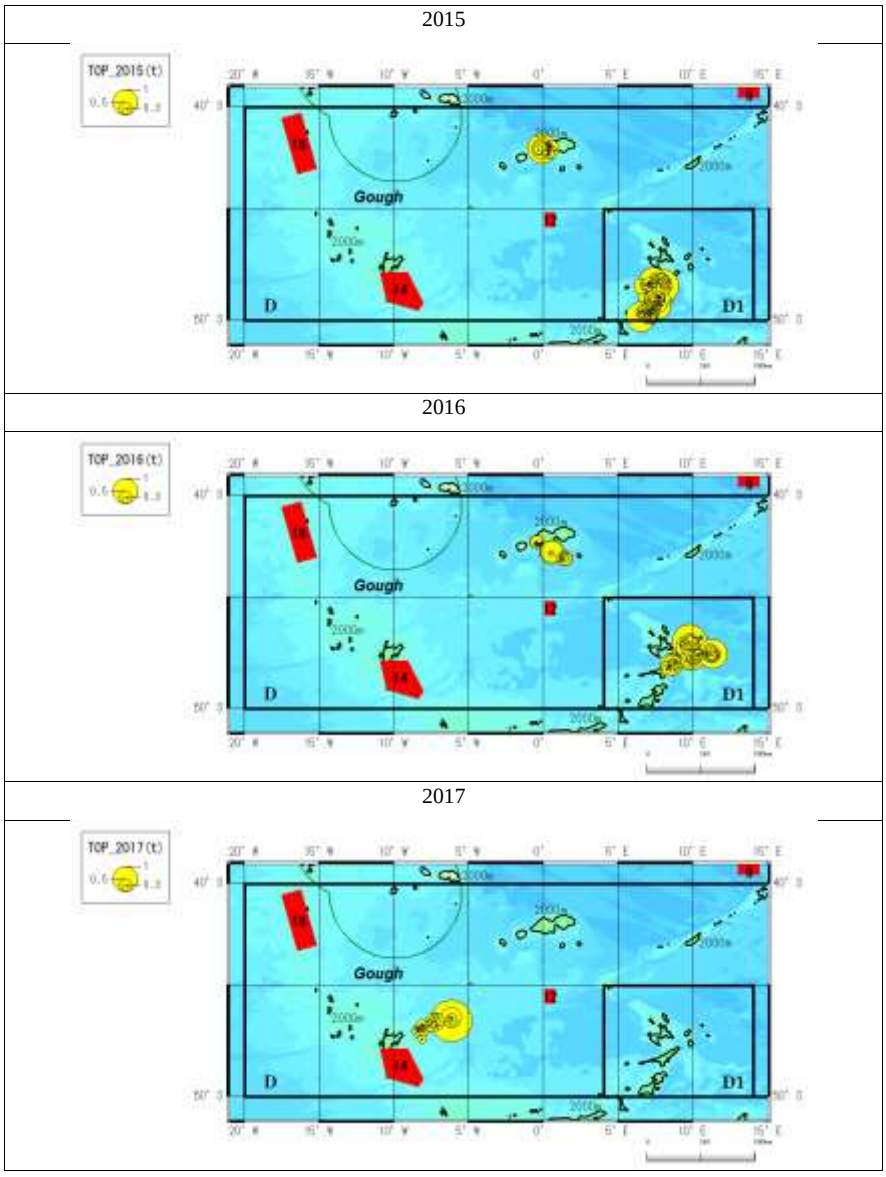


Figure 2: Reported catch of Patagonian toothfish (*Dissostichus* eleginoides) (2011-2017).

Table 1 shows that the main fishing ground is located on Discovery seamount and also in D1 but less hauls were deployed in the western seamounts of Sub-Area D.

Table 1: Number of sets by year and location

Year	Western	Discovery	D1- Meteor
2010	27	5	118
2011	1	207	54
2012	68	207	25
2013	0	108	57
2014	100	64*	13
2015	0	24	127
2016	0	22	67
2017	34	0	0

1.3 Reported retained catches and discards

Table 2A presents data on Patagonian toothfish catches and discards listed by country, as well as fishing gear used and the management area from which catches were taken. Annual catches varied between 18t (2002) and 413t (2007).

Discards were mainly due to parasite infection of fish. In the last three years with complete data (2013, 2014 and 2015) retained catches were 61, 79 and 59t respectively and the annual weight of discarded specimens was 3, 7 and 2 t in the three year period.

Table 2A: Catches (tons) of Patagonian toothfish (*Dissostichuseleginoides*) by South Africa, Spain, Japan and Korea (2002-2017)

Nation	Spain		Japan				Korea				South Africa			
Fishing method	Longlines		Longlines				Longlines				Longlines			
Management Area	D0		D0		D1		D0		D1		D0		D1	
Year	Retain	Discard	Retain	Discard	Retain	Discard	Retain	Discard	Retain	Discard	Retain	Discard	Retain	Discard
2002	18													
2003	101		47				245							
2004	6		124											
2005	-	-	158				10							
2006	11		155											
2007	-		166											
2008	-	-	122	0	-	-	76							
2009	-	-	86	0	74	0	16	0	46	0	-	-	-	-
2010	26	0	-	-	54	2	-	-	-	-	-	-	-	-
2011	-	-	159	6	-	-	-	-	-	-	15	0	28	0
2012	-	-	86	3	-	-	-	-	-	-	24	0	12	0
2013	-	-	41	2	19	1	-	-	-	-	-	-	-	-
2014	-	-	47	<1	6	<1	-	-	-	-	-	-	-	-
2015	-	-	52	<1	7	<1	-	-	-	-	-	-	-	-
2016	-	-	7	<1	53	<1	-	-	-	-	-	-	-	-
2017*	-	-	12	<1	-	-	-	-	-	-	-	-	-	-

- = No Fishing Blank fields = No data available * Provisional (September 2017).

Table 2B: Atlantic toothfish (*Dissostichus mawsoni*). (TOA) catches and discards

Nation	**Japan**			
Fishing method	**Longlines**			
Management Area	**D0**		**D1**	
Year	Ret..	Disc.	Ret..	Disc.
2014	< 1	0	0	0
2015	0	0	0	0
2016	0	0	0	0
2017	0	0	N/F	N/F

Ret. = Retained Disc. = Discarded *Provisional (September 2017).

Retained and discarded bycatch from the Patagonian toothfish fishery are presented in Table 3. The two most important species (in terms of weight) are grenadiers (GRV) and Blue antimora (ANT).

1.4 IUU

IUU fishing activity in the SEAFO CA has been reported to the Secretariat latest in 2012, but the extent of IUU fishing is at present unknown.

2. Stock distribution and identity

Patagonian toothfish is a southern circumpolar, eurybathic species (70-1600m), associated with shelves of the sub-Antarctic islands usually north of 55ºS. Young stages are pelagic (North, 2002). The species occurs in the Kerguelen-Heard Ridge, islands of the Scotia Arc and the northern part of the Antarctic Peninsula (Hureau, 1985; DeWitt et al., 1990). This species is also known from the southern coast of Chile northward to Peru and the coast of Argentina, especially in the Patagonian area (DeWitt, 1990), and also present in Discovery and Meteor seamounts in the SE Atlantic (Figure 3) and El Cano Ridge in the South Indian Ocean (López-Abellán and Gonzalez, 1999, López-Abellán, 2005).

In SEAFO CA the stock structure of the species is unknown. The CCAMLR Scientific Committee in 2009 noted that in most years (since 2003) the main species caught in CCAMLR sub-area 48.6 (adjacent to and directly south of SEAFO Division D) is *D. eleginoides*. The distribution of the species appears to be driven by the sub-Antarctic front which extends into the SEAFO CA.

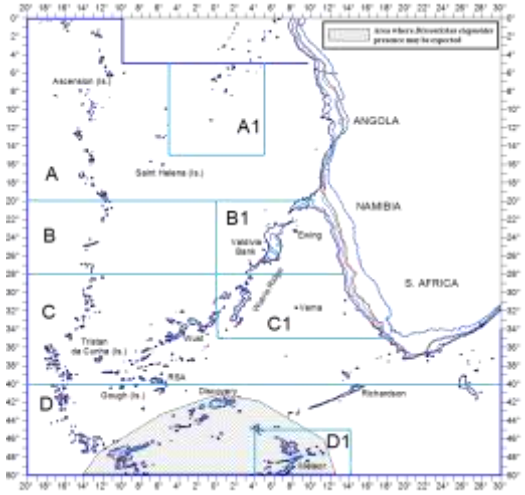


Figure 3: Species geographical distribution in the SEAFO CA (source: Species profile on the SEAFO website).

Table 3: Retained and discarded bycatch from the Patagonian toothfishfisheries (kg).

	2009				2010				2011		2012				2013				2014			
	Retained		Discarded		Retained		Discarded		Retained	Discarded	Retained		Discarded		Retained		Discarded		Retained		Discarded	
Species	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D0**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**
GRV			89	5 833	4 047	1 936	93	2 601		22 414			23 705	186			7 273	869				267
ANT			126	4 786			453	1 348		4 794			4 442	65			796	610			329	106
BYR	1 221		573																			
MCC			336	896																		
BYR																						
BEA	360																					
MZZ								168														
SRX										30			124				20					
MRL			108					1		2			37				1					
COX			2							21			75									
SKH			90																			
LEV			36				4															
KCX				1			3	35									83	10				
HYD													31				17					
BUK							17															
NOX										7												
MWS										6												
ETF																	3					
SEC													2									
SSK							2															
CKH							1	1														
KCF			1																			
TOA																			99			
RTX																					1122	

BSH: Blue shark (*Prionace glauca*); ETF: Blackbelly lanternshark (*Etmopterus Lucifer*); HIB: Deep-water arrowtooth eel (*Histiobranchus bathybius*); LEV: Lepidion codlings nei (*Lepidion spp*);ANT:Blue antimora (*Antimora rostrata*); BEA:Eaton's skate (*Bathyraja eatonii*); BYR:Kerguelen sandpaper skate (*Bathyraja irrasa*); COX:Conger eels, etc. nei (*Congridae*); CKH:Abyssal grenadier (*Coryphaenoides armatus*); BUK:Butterfly kingfish (*Gasterochisma melampus*); HYD:Ratfishes nei (*Hydrolagus spp*); LEV:Lepidion codlings nei (*Lepidion spp*); KCX:King crabs, stone crabs nei (*Lithodidae*); MCC:Ridge scaled rattail (*Macrourus carinatus*); GRV:Grenadiers nei (*Macrourus spp*); MWS:Smallhead moray cod (*Muraenolepis microcephalus*); MRL:Moray cods nei (*Mur aenolepis spp*); NOX:Antarctic rockcods, noties nei (*Nototheniidae*); MZZ:Marine fishes nei (*Osteichthyes*); KCF:Globose king crab (*Paralomis formosa*); ETF:Blackbelly lantern shark (*Etmopterus lucifer*); SEC:Harbour seal (*Phoca vitulina*); SRX:Rays, stingrays, mantas nei (*Rajiformes*); SKH:Various sharks nei (*Selachimorpha(Pleurotremata*)); (Rajiformes); SSK:Kaup's arrowtooth eel (*Synaphobranchus kaupii*).

	2015				2016				2017			
	Retained		Discarded		Retained		Discarded		Retained		Discarded	
Species	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1	D0	D1
GRV			1221	1579	1197.7			2496.7			1338.3	
ANT			452	598			27.4	117.6				
BYR												
MCC												
BYR												
BEA												
MZZ												
SRX			16								19	
MRL			2				0.7				0.2	
COX												
SKH												
LEV												
KCX					9.1			1.4			2.1	
HYD			233									
BUK												
NOX												
MWS												
ETF			1									
SEC												
SSK												
CKH												
KCF												
TOA												
RTX			146									
BSH			89									
ETF												
HIB			18				0.9					
LEV			5									
CSS							0.68	3.88			6.91	
GGW							0.01	9.54			1.41	
AXT								0.12			303	
PFR								0.84			0.52	
OWP								0.6				
AGZ											0.06	
AJZ											0.06	
AQZ											0.1	
AZN											0.59	
GSK											12	
GWD											0.08	
NTW											0.02	
OEQ											1.14	
ZOT											1.12	

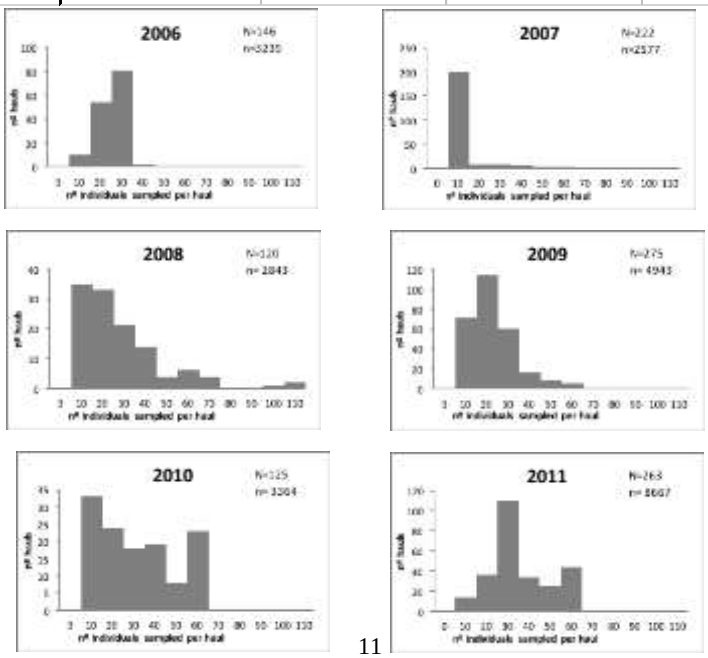
3. Data available for assessments, life history parameters and other population information

3.1 Fisheries and survey data

The number of fishing sets sampled from 2006 onwards indicates a good sampling level in line with the SEAFO preliminary guidelines for data collection (Table 4). On average 20 specimens were measured per sampled fishing set, which is considered acceptable given the length range of the exploited population. It will be necessary to apply in future this sampling effort of 20 individuals in all sampled fishing sets (Figure 4).

Table 4. Annual analysis of sampling effort conducted on board fishing vessel

Year	No. of Sets Observed	Mean Individuals	Min. Individuals	Max. Individuals
2006	146	22.16	1	31
2007	222	11.61	1	57
2008	120	23.69	2	110
2009	275	17.97	1	58
2010	125	26.91	1	60
2011	263	32.95	1	60
2012	298	20.58	1	57
2013	164	19.87	1	70
2014	176	25.50	3	50
2015	149	17.23	1	23
2016	88	17.63	2	20
2017	32	15.03	1	25



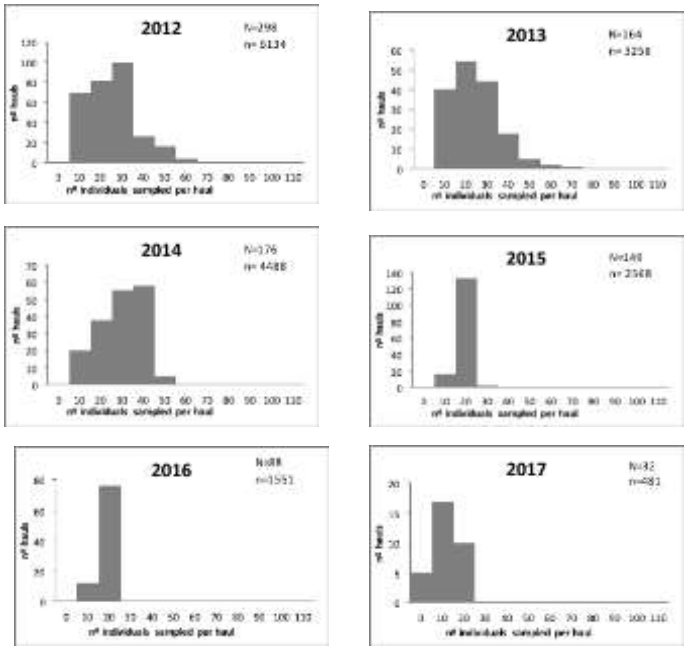


Figure 4: Frequency distribution of sample size per set. Data from Observer Reports submitted to SEAFO. N = number of sets sampled per year; n = total number of individuals sampled.

3.2 Length data and frequency distribution

Figure 5 shows the annual total length frequency distributions of Patagonian toothfish catches based on the observer data from all fleets submitted to SEAFO. Length frequency distributions for the period 2006-2013 suggest a shift towards smaller lengths in the catches in more recent years. The proportion of large fish appears to be declining.

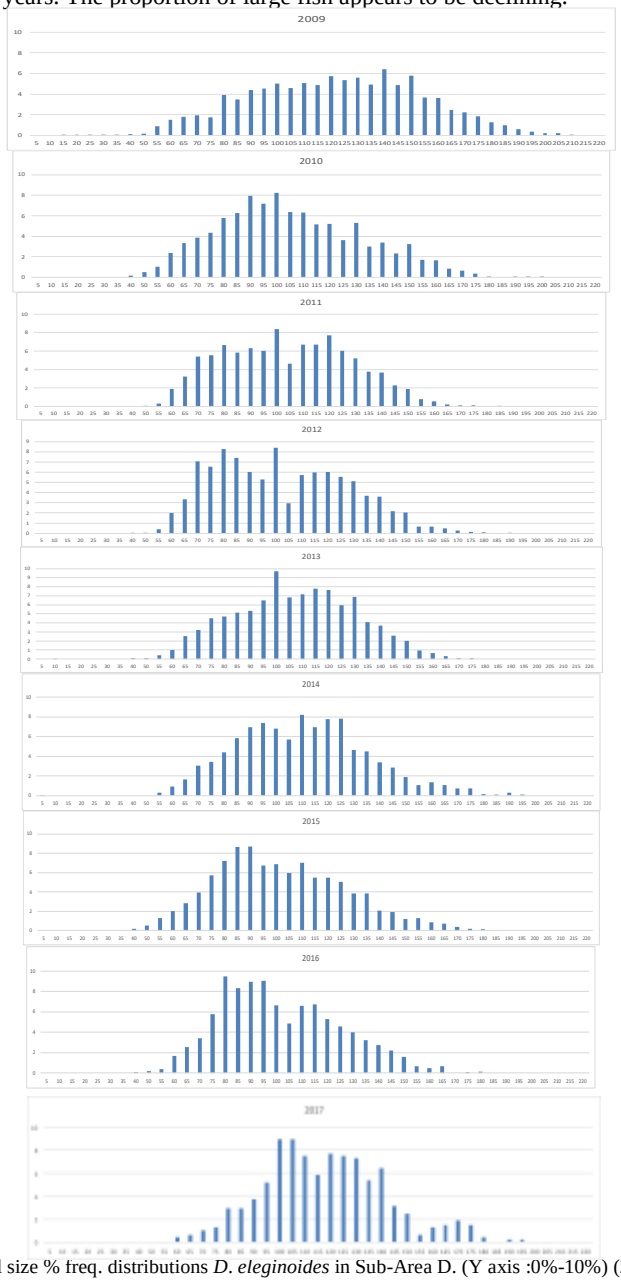


Figure 5: Annual size % freq. distributions *D. eleginoides* in Sub-Area D. (Y axis :0%-10%) (2009-2017)

3.3 Length-weight relationships

Table 5 shows the length-weight relationships by sex based on observer data from Japanese fleet in 2013.

Table 5: Length-weight relationships by sex (based on 2013 Japanese observer data)

Samples	a	b	r^2	n
Males	1E-06	3.4484	0.9768	405
Females	2E-06	3.4296	0.9579	860

3.4 Age data and growth parameters

There is no available information for this species in SEAFO CA.

3.5 Reproductive parameters

There is no available information for this species in SEAFO CA.

3.6 Natural mortality

There is no available information for this species in SEAFO CA.

3.7 Feeding and trophic relationships (including species interaction)

There is no available information for this species in SEAFO CA.

3.8 Tagging and migration

Eleven specimens were tagged in Subarea D in 2006 and fourteen in 2010 (Spanish flagged Viking Bay vessel). However, there is no available information on recoveries of tagged specimens or on tagged specimens tagged at adjacent areas of CCAMLR.

4. Stock assessment status

There are no agreed stock assessments.

5. Incidental mortality and bycatch of fish and invertebrates

5.1 Fish bycatch

Table 6 shows the bycatch species in the Patagonian toothfish (*Dissostichus eleginoides)* Fishery and its weights based on the observer reports. SC noted that the major bycatch is grenadiers (Macrouridae - GRV) and the bycatch is discarded. The impact of this bycatch on grenadiers spp. is unknown.

5.2 Incidental mortality (seabirds, mammals and turtles)

In the SEAFO database there are records of three seabirds having been caught during Japanese longline daytime fishing in 2014. The seabirds caught were recorded by the ID codes "PUG" – *Puffinus gravis* (Great shearwater) & "DIM" – *Thalassarche melanophris* (Southern black-browed albatross).

5.3 Invertebrate bycatch (VME taxa)

Table 6 shows the bycatch of VME species and its amount based on the observer data for the period 2010-2017. Figure 7 shows their geographic location.

Table 6: VME Bycatch from Patagonia toothfish fishery (kg)

	Species	Gorgonians (Gorgoniidae)	Hard corals, madrepores nei (Scleractinia)	Black corals and thorny corals (Antipatharia)	Basket and brittle stars (Ophiuroidea)	Sea pens (Pennatulacea)	Soft corals (Alcyonacea)	Feather stars and sea lilies (Crinoidea)	Hydrocorals (Stylasteridae)	Sponges
	FAO code	GGW	CSS	AQZ	OWP	NTW	AJZ	CWP	AXT(AZN)	PFR
2010	D0	33.9	2.1	3.9	1.3	1	0.2	0.9		
	D1	13.6	0.1	0.5	2	0.3	1	0.1		
2011	D0	3.8	15.4							
2012	D0	30.3	17.6	0.2		0	1.2			
2013	D0	2.3	0.3							
2014	D0	2.6	2.8							
	D1	1.2								
2015	D0									0.4
	D1	0.35			4.9				1	
2016	D0	0.01	0.68						1.2	0.84
	D1	9.54	3.88					0.6		
2017	D0	1	7	0.1		0.02	0.06		0.59	0.37
	D1									

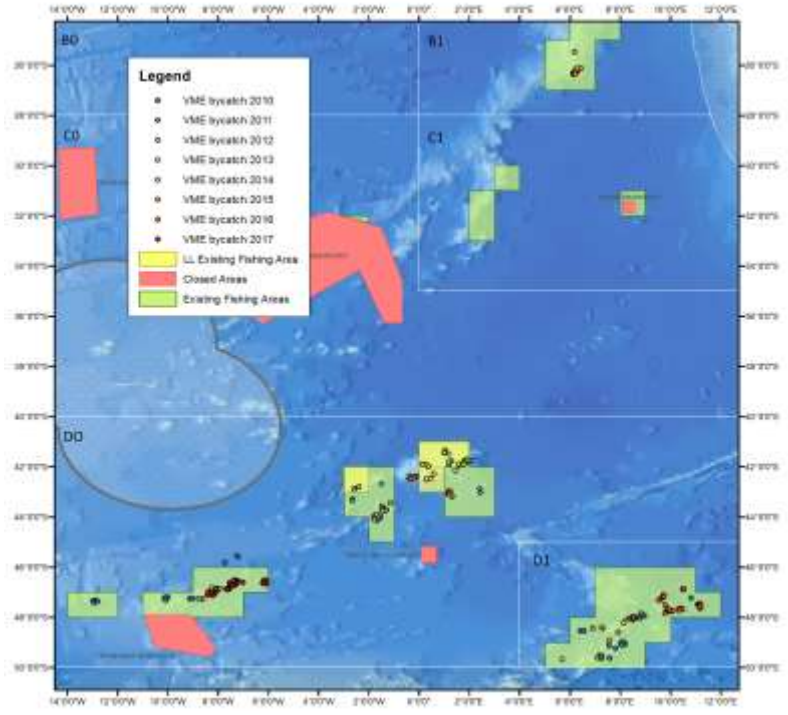


Figure 7: Locations for incidental bycatch of VME species (2010-2017).

5.4 Incidental mortality and bycatch mitigation methods

Offal dumping during hauling and bird scaring devices (Tori lines) are mandated to mitigate seabird bycatch.

5.5 Lost and abandoned gear

Figure 8 shows locations and amount of the lost gears based on the observer data from 2010 to 2013 (no lost gear in 2014-2015).

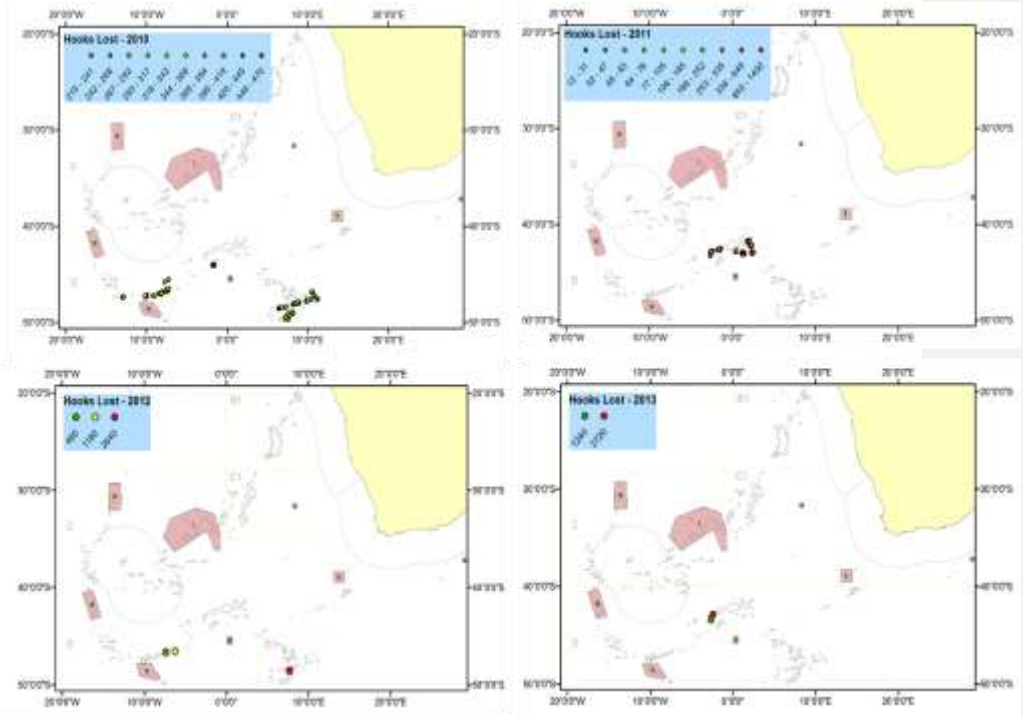


Figure 8: Locations and amount of the lost gears (hooks with attached short line) based on observer data (2010-2013) (no lost gear in 2014-2017).

6. Current conservation measures and management advice

In 2015 the Commission adopted a TAC of 264 t in Sub-Area D applying the harvest control rule, and zero tonnes for the remainder of the SEAFO CA for 2016.

The SC notes that in both 2015 and 2016 about 22% of the TAC was taken (incl. the experimental fishery), hence the fishery is not constrained by the TAC.

The application of the HCR requires as input a 5-year time-series of recent CPUE data. The CPUE series applied in 2015 was derived by pooling all available data in the SEAFO CA. No analysis was made to determine if pooling was a valid approach. Also, the series first

discussed in 2016 was not standardised as in 2015, and questions were asked about the consistency of the analysis between years.

The SC explored standardization using generalised linear models (GLM), but the explorations indicated that the variance explained was too low to extract meaningful results, hence further efforts would be required. There were, however, clear indications of significant area-effects, hence pooling of data from different fishing areas was probably not valid.

The SC then resorted to deriving CPUE series for separate fishing areas for which the more extensive continuous time-series of catch and effort data are available in the SEAFO database, i.e. the Meteor and Discovery seamounts. Data from the Western part were excluded from the assessment as the time series was not complete. Only Japanese data within the 2011 agreed footprint, i.e. from the party taking the bulk of the catch in all years, were used in order to retain consistency through the time series.

It is uncertain whether the two CPUE series shown in Fig. 9 reflects abundance, but in the absence of other alternatives, the series from Meteor and Discovery were considered valid for the derivation of TACs using the recommended and accepted HCR.

The CPUE series as derived both have best estimates of slope close to zero. For Discovery the best estimate is slightly negative, for Meteor the estimated slope was zero (Fig. 9).

Applying the HCR based on a weighted average of the CPUE slopes on Meteor and Discovery a TAC estimate of 266 t was derived. **The SC recommends a TAC for Subarea D of 266 t and a zero TAC for the remainder of the SEAFO CA for the years 2017 and 2018.**

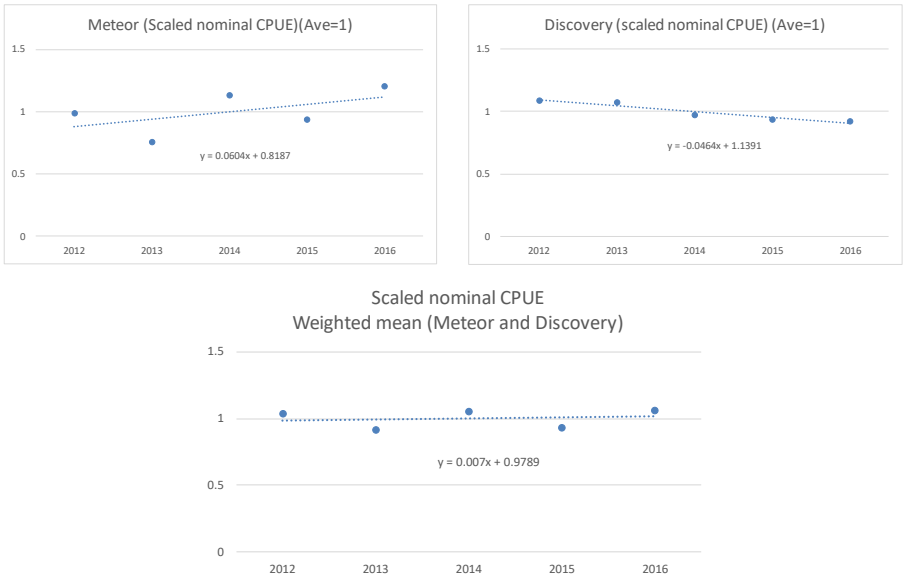


Figure 9: Upper: Average slope in Meteor (left) and Discovery(right) for 5 years CPUE (2012-2016) Lower: Average slope based on the weighted average of two slopes.

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

7. References

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Annex A: Biological data collected

Sex information collected (2009-2017)

species code	Year								
	2009	2010	2011	2012	2013	2014	2015	2016	2017
	Sex	Sex	Sex	Sex	Sex	Sex	Sex	Sex	Sex
	1	22				399			76
ANT	39	464				607	48	86	140
BOA								1	
BSH							1	1	
BYE									1
BYR	18								
CGE								11	
ETF								1	
GRV		655						197	
GSK									1
HIB								2	
KCU								1	
KCX		29						35	
MCC	84						165	234	
MCH							463	641	318
MRL								1	1
QMC							198		
RTX						958	60		
SRX							2		
TOA						11			
TOP	4931	3364	8652	6095	3247	1754	2564	1551	481

Number of otolith collected for TOP:

		Year								
		2009	2010	2011	2012	2013	2014	2015	2016	2017
		Count	Count	Count	Count	Count	Count	Count	Count	Count
Scale/Otolith/ Both	O	0	0	0	0	0	**533**	**732**	**749**	**141**

Gonad information collected:

Year	species code															
	ANT		BSH	BYE	GRV	MCC		MCH	MRL		QMC	SRX	TOA		TOP	
	Gonad Weight (g)	Maturity Stage	Maturity Stage	Maturity Stage	Maturity Stage	Gonad Weight (g)	Maturity Stage	Maturity Stage	Gonad Weight (g)	Maturity Stage	Maturity Stage	Maturity Stage	Gonad Weight (g)	Maturity Stage	Gonad Weight (g)	Maturity Stage
2010					134											432
2014													11	11	1746	1746
2015			1				165	463			198	2			2563	2564
2016	15	15				183	183		1	1					1529	1530
2017				1											472	472