Dissostichus eleginoides
Species Profile

SEAFO
South East Atlantic Fisheries Organization

UPDATE

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1. Taxomony

Phylum	Chordata
Subphylum	Vertebrata
Superclass	Osteichthyes
Class	Actinopterygii
Subclass	Neopterygii
Infraclass	Teleostei
Superorder	Acanthopterygii
Order	Perciformes
Suborder	Notothenioidei
Family	Nototyheniidae
Genus	*Dissostichus* Smitt, 1898
Species	*Dissostichus eleginoides* Smith, 1898
Synonyms	*Macrias amissus*
Common name	Patagonian toothfish (En) Légine australe (Fr) Austromerluza negra (Sp) Róbalo de profundidad (Sp)
Species code	TOP *Dissostichus eleginoides* TOT *Dissostichus* spp.

2. Species characteristics

2.1 *Distribution*

The Nototyheniidae *Dissostichus eleginoides* Smitt, 1898, commonly known as Patagonian toothfish, is a southern circumpolar, euribatic species (70-1600m), associated with shelves of the sub-Antarctic islands preferably north of 55º S. Young stages are pelagic (North, 2002). Their presence is remarkable in the Kerguelen-Heard Ridge, islands of the Scotia Arc and the northern part of the Antarctic Peninsula (Hureau, 1985; DeWitt *et al.*, 1990). It 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 South Atlantic and El Cano Ridge in the South Indian (López-Abellán *et al.*, 1999; López-Abellán, 2005). Distribution overlaps with *D. mawsoni* at only a few locations: in the Antarctic Peninsula (Arana y Vega, 1999) and around the South Sandwich Islands in the South Atlantic, Elan and Banzare Bank in the Southern Indian Ocean and in the northern Ross Sea seamounts (Roberts *et al*. 2011). .

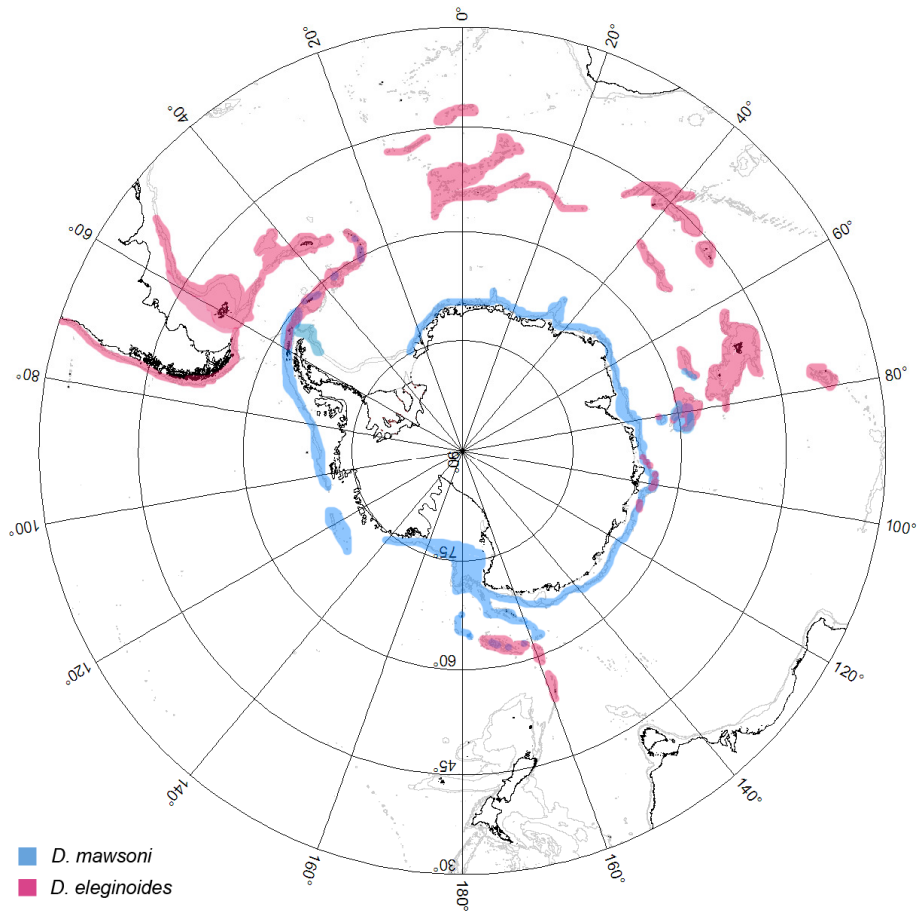

Figure 1. Estimate distribution of two species of genus *Dissostichus*. *D. eleginoides* (pink colour) (From Lopez-Abellán and Balguerías-Guerra, 2009)

The geographical distribution in the Southeast Atlantic Ocean is roughly represented in figure 2. The area would be located South 40ºS.

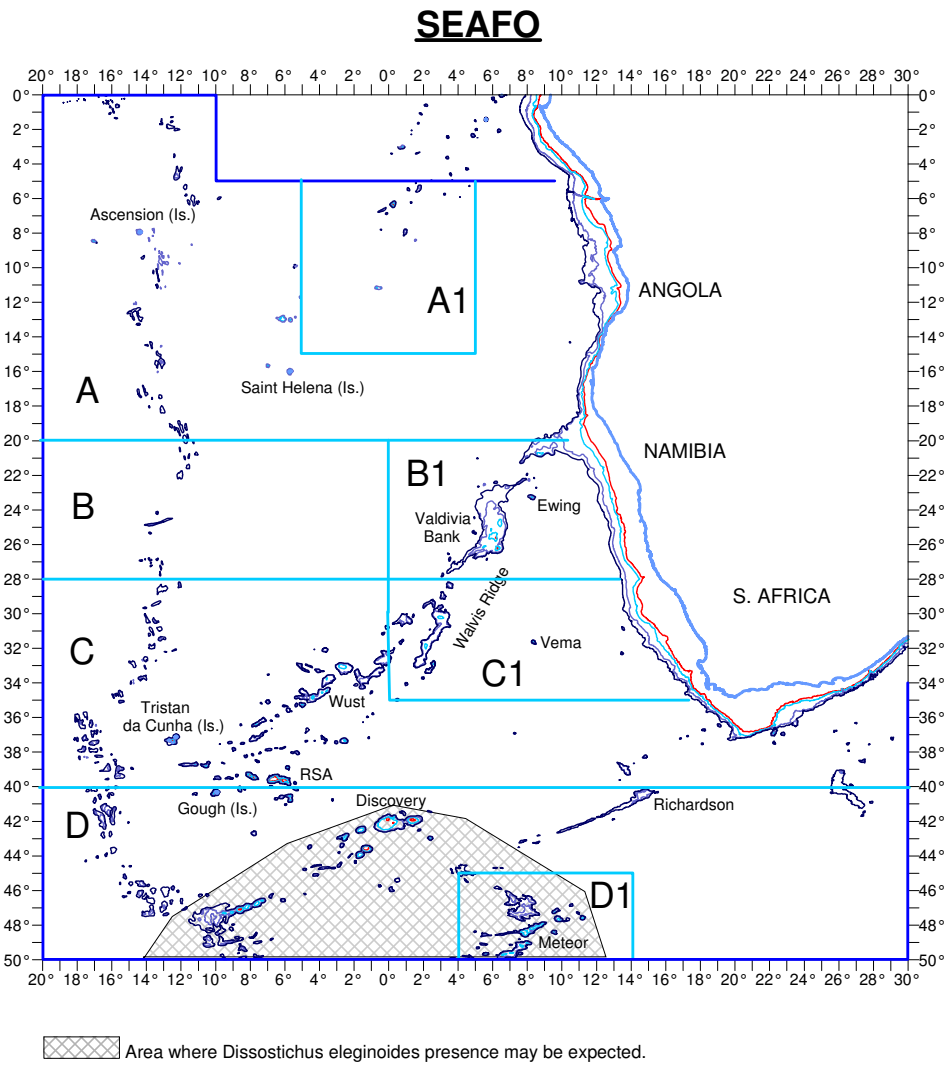

Figure 2.- Geographical distribution of *D eleginoides* in the SEAFO region and adjacent waters.

2.2 *Habitat*

The wide distribution range of this species both geographic and bathymetric is associated to continental shelves, continental and island slopes, banks and seamounts in the area of influence of the Antarctic Circumpolar Current (ACC) and their associated fronts. So the northward distribution is closely related to the extension of the Sub-Antarctic Front, and especially the intermediate layer of Sub-Antarctic water masses (3.72ºC-4.7ºC), which defines the area of *D. eleginoides* toothfish distribution (López-Abellán, 2005). The temperature range of this species is between 2ºC and 11º C, lacking antifreeze glycopeptides (Eastman, 1990)

2.3 *Biological characteristics*

One of the two largest species occurring in the Antarctic. Body fusiform, rather elongate, its depth 16 to 20% of standard length. Head depressed, its dorsal profile flat; length of head about 3 times in standard length; cephalic sensory canals with prolonged superficial canaliculi; eye 5 or 6 times in head length; 11 or 12 small gillrakers on lower part of anterior arch; mouth large, maxilla extending posteriorly to below middle or posterior part of eye; lower jaw strongly

projecting; teeth biserial in upper jaw, those of the outer row enlarged, canine-like; a group of stronger canine teeth on each premaxilla; teeth on lower jaw uniserial, canine-like. Two dorsal fins, the first with 8 to 11 flexible spines, the second with 26 to 30 soft rays; 26 to 30 anal fin rays; pectoral fins large, fan-like, with 24 rays, much longer than the pelvics; caudal fin truncate or a little emarginate. Two lateral lines, the lower beginning below or anterior to the middle of the second dorsal fin; about 95 tubular scales in upper lateral line and 64 in the lower; the body entirely covered with large and more or less smooth scales; upper surface of head (except snout and preorbital area), cheeks and opercles with small scales; 2 elongate scaleless areas symmetrically arranged on upper surface of head. The five hypural bones of the caudal skeleton are separated from each other. Pectoral foramen entirely located in the scapula bone (Hureau, 1985).

D. eleginoides larvae are large, post-larvae range size between 49-62 mm SL. *D. eleginoides* appear to be moderately fast growing, at least to about age 10, and reasonably long-lived, reaching at least 50 years (Horn, 2002). Females grow at a faster rate and reach a larger size than males. Size at 10 years reaches 100 cm TL and the maximum size is 215 cm TL (DeWitt *et al*, 1990). Long-lived species.

Estimate of growth parameters varies between regions:

Ocean	Area	Sex	L_∞	k	t_0	Reference
Pacific	Chilean South-central	Both	177,8	0,109	0,000	Pavéz *et al.* (1983)
		Both	218,0	0,048	-0,664	Rubilar *et al.* (1999)
		Both	152,2	0,085	-0,590	Oyarzún *et al.* (2003a)
		Both	176,2	0,058	-1,647	Oyarzún *et al.* (2003)
	Chilean South	Both	210,8	0,064	-0,432	Aguayo & Cid (1990)
		Both	212,6	0,066	-0,477	Young *et al.* (1992)
	88.1	Male	134.3	0.118	0.08	Horn 2002
		Female	158.7	0.085	-0.35	Horn 2002
Atlantic	South Georgia	Both	170,8	0,088	0,000	CCAMLR (1995)
		Both	170,9	0,087	0,160	Aguayo (1992)
		Both	204,0	0,056	-0,545	Zacharov & Frolkina (1976)
		Both	175,0	0,071	0,005	Shust *et al.* (1990)
		Both	207,0	0,075	-0,290	Cassia (1998)

*Table modified from Cubillos and Araya, 2007

Estimate of length-weight relationship from SEAFO CA in 2010:

Length-weight	a	b
SEAFO 2010 (both sexes)	0.000021	2.88

Natural mortality input parameter for the assessment of *Dissostichus eleginoides* in CCAMLR estimates is M=0.13 y^{-1} or 0.155 y^{-1} in Division 58.5.2 (Candy et al., 2011). Cubillos (2007) estimates M from a range of ages between 8 and 20 years (0.11 y^{-1}).

In the Atlantic Ocean sector and Kerguelen Islands sexual maturity is reached at about 90-100 cm TL (9-10 years), but in the Crozet Islands maturity is reached slightly earlier (DeWitt, 1990). Males reach sexual maturity slightly earlier than females (Barerra oro *et al*., 2005).

Maturity data from South Georgia waters suggests that in addition to a major spawning event in late July/August, there may be a small spawning event in April/May. Detailed examination of maturity-at-depth data suggests that mature males move down slope and females move up slope to meet at breeding areas defined by slope position (between 800 and 1200 m depth) and not by geographical position (Agnew *et al*., 1999).

In the Kerguelen Islands, larvae and juveniles feed on krill and as they grow, they feed increasingly on fishes (primarily *Champsocephalus gunnari*, *Lepidonotothen squamifrons* and myctophids) In the South Georgia area, juvenile feed on fishes (principally Nototheniids) and, to a lesser degree, on the decapods *Crangon antarcticus*. Fish dominated the prey mass at the

South Sandwichs Islands, mainly *Macrourus* cf. *whitsoni* (Roberts *et al*., 2011).In the central and southern coast of Chile *D. eleginoides* predates mainly on demersal fish like Gadiformes and Ophidiiformes, in addition to mesopelagic teutid cephalopods, reaching the last special group importance in the South zone of Chile (Murillo *et al*., 2008).

2.4 *Population structure*

The patagonian toothfish populations are known to be stratified by size according to depth, with juveniles found in shallower strata than the adults.

In figures 3 and 4, length frequency distribution and mean length by zone are shown, respectively, as an example of the status of the population size structure from specimens caught in 2009 (SEAFO SC, 2011).

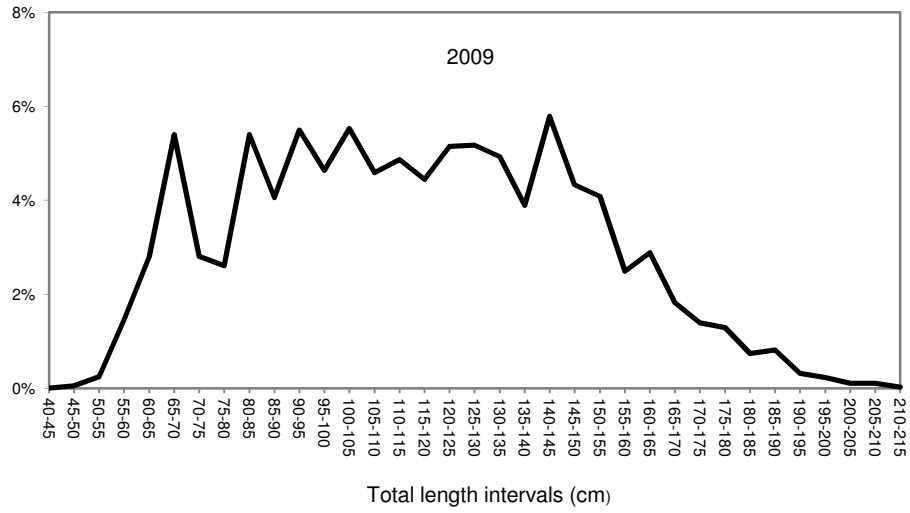

Figure 3.- ***D. Eleginoides***. Annual length frequency distribution extrapolated to total catch in the SEAFO CA for 2009.

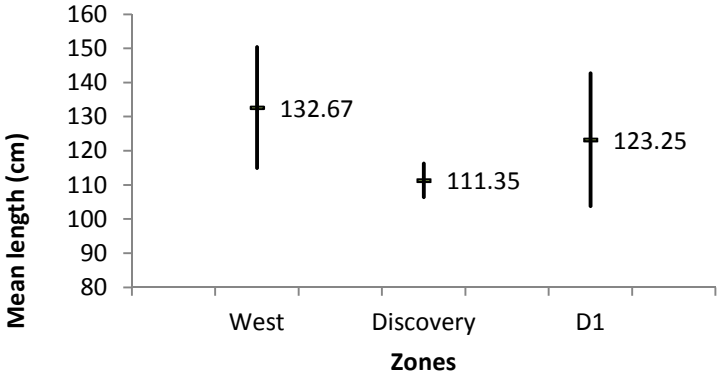

Figure 4.- Mean length of *Dissostichus eleginoides* at different seamount complexes within Division D in the SEAFO CA for 2009.

Data from a longline commercial cruise conducted within the SEAFO Division D (2010) provide a 1.28:1 female to male ratio (n=432; 42-203 cm TL). Comparing with nearby areas, Roberts *et al*. (2011) estimated a ratio of 2.5:1 (n=775; 55-178 cm TL) around South Sandwich Islands.

2.5 *Behavior and associated species*

D. eleginoides is a top predator in the ecosystem of the southern ocean up to the Antarctic polar front (Laptikhovsky et al., 2006), trophic level 3.96 (s.e. 0.68) (Froese and Pauly, 2012 – FishBase). Opportunistic species feeding on available species within their distribution area. Is commonly eaten by sperm whales (Yukhov 1972). Specimens caught by longlines are eaten by killer whales and giant squids.

Is reported to be pelagic during some periods of its life. Upon attaining 12-15 cm TL, semi-pelagic juveniles become demersal at 150-400 m depth, and after several years growing to 60-70 cm TL. Adult fish then migrate to deepwater meso and bathypelagic habitats at depths greater than 1,000 m (Eastman, 1993). This species tends to have a spatial distribution in patches, which can include individuals with a great range of sizes.

D. eleginoides is presently managed as spatially discrete populations (this assumes no movement between fishing areas), but tagging experiments at Heard Island (Division 58.5.2) (Williams et al., 2002; WG-FSA-07/48 Rev. 1) show long-distance movements of sub-adult/adult fish between zones (Heard to Kerguelen and also Crozet) although the proportion of exchange between stocks is unknown. Recent studies based on the otolith chemistry (Ashford et al, 2008) suggest that tootfish populations are structured by their physical environment; population abundance and persistence may rely on a restricted number of breeding members with access to spawning grounds (Patagonian selves/south America, South Georgia, Kerguelen and Macquarie), whereas fisheries may rely substantially on no breeding vagrants transported from fishing areas upstream. To compensate losses of vagrants this species has high fecundity rates, an attribute associated with high mortality, yet are long-lived and grow slowly, features more often associated with low natural mortality.

Associated species in the SEAFO CA:

Antimora rostrata
Macrourus spp.
Macrourus carinatus
Macrourus holotrachys
Coryphaenoides armatus
Gasterochisma melampus
Lepidion spp.
Muraenolepis microps
Lithodidae
Bathyraja sp.
Bathyraja irrasa
Selachimorpha sharks

2.6 *Resilience / productivity*

Low

(Fecundity = 230,000; t_{max}=21)

(Froese and Pauly, 2012 – FishBase)

2.7 *Intrinsic vulnerability*

High to very high vulnerability (68 of 100)

(Froese and Pauly, 2012 – FishBase, based in Cheung *et al*, 2005; Cheung *et al*, 2007)

3. Other remarks

Not available.

4. References

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