

Deep-sea Chondrichthyes caught in an experimental fishing survey off the Canary Islands (NE Atlantic Ocean)

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INTRODUCTION

There is a long tradition in the deep-sea fishery of the bathypelagic black scabbard-fish, *Aphanopus carbo* and *A. intermedius*, in Portugal mainland and in the Madeira archipelago (Delgado et al., 2013). In Madeira, this fishery is performed with drifting longlines, set between 800 and 1200 m of depth, on the insular slopes and nearby seamounts. This is one of the oldest known fisheries in the world targeting a deepwater resource (Leite, 1988). Recently, Portugal and Spain signed an agreement to study the black scabbard-fish in the Canary Islands, using commercial fishery vessels from Madeira in an experimental survey. The main objectives of the experimental survey were to obtain indications about the relative abundance of the black scabbard-fish in the Canary Islands and to study the by-catch of this fishery.

MATERIAL AND METHODS

In March 2009 an experimental fishing survey was carried out off the Canary Islands between 1000 and 1200 deep, with the black scabbard-fish drifting longline - *Madeiran* type, on-board the black scabbard-fish fishery vessels F/V *Pico Dourado* and F/V *Pico Alto*. In each fishing set both vessels used two separate long lines, one with around 500 hooks and the other with around 5000 hooks. Hauls were done along the Islands of Tenerife, La Gomera, La Palma, Fuerteventura and El Hierro, in a total of 20 hauls (Fig. 1). The bait used was the neon flying squid *Ommastrephes bartramii*. Shark specimens caught as by-catch were all sampled. All individuals were measured, weighed and the sex registered. Several voucher specimens from all species caught were deposited as reference collections in the Natural History Museum of Funchal (MMF). This survey was carried out inside the Canary Island ZEE, in the framework of a fisheries agreement between the Macaronesian archipelagos.

RESULTS

A total of 436 mesopelagic chondrichthyan specimens were caught and sampled at laboratory, being identified 9 species belonging to 5 families (Tab. 1). The leafscale gulper shark (*Centrophorus squamosus*) (Centrophoridae), with 170 specimens, was the most captured species. The somniosids velvet dogfish (*Zameus squamulosus*) (n=129) and roughskin dogfish (*Centroscyrmnus owstonii*) (n=121) were also well-represented in the captures; however the fact of being separately captured by one or another fishing vessels may reveal differences in depth distribution or/and characteristics in the fishing gear (notably the type of hook). The capture of the other five chondrichthyan species could be considered as anecdotic or incidental. (Tab. 1).

Family	Species	Common name	Pico Dourado (n)	Pico Alto (n)	Total number (N)
Centrophoridae	<i>Centrophorus granulosus</i>	Gulper shark	7	3	10
	<i>Centrophorus squamosus</i>	Leafscale gulper shark	53	117	170
Chimaeridae	<i>Chimaera monstrosa</i>	Rabbit fish	-	1	1
Etmopteridae	<i>Etmopterus princeps</i>	Great lanternshark	1	2	3
	<i>Etmopterus pusillus</i>	Smooth lanternshark	-	1	1
Pseudotriakidae	<i>Pseudotriakis microdon</i>	False catshark	-	1	1
Somniosidae	<i>Centroscyrmnus owstonii</i>	Roughskin dogfish	121	-	121
	<i>Zameus squamulosus</i>	Velvet dogfish	-	129	129

Table 1 – Species composition in numbers (n) of Chondrichthyes caught by the black scabbard-fish fishery vessels *Pico Dourado* and *Pico Alto*.

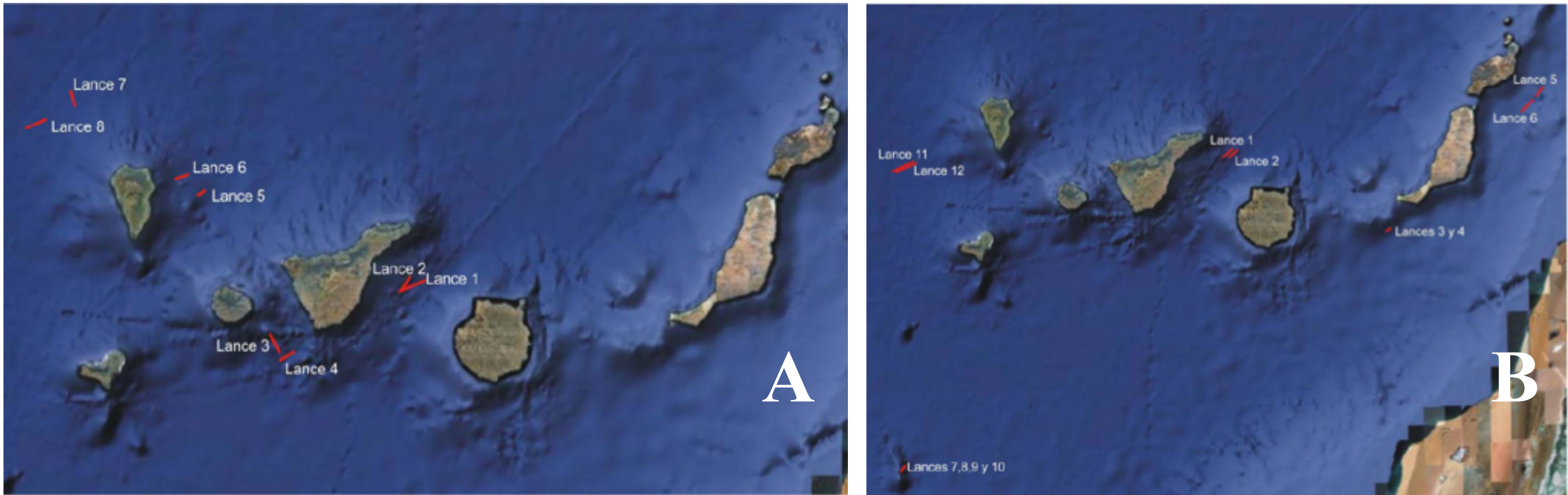
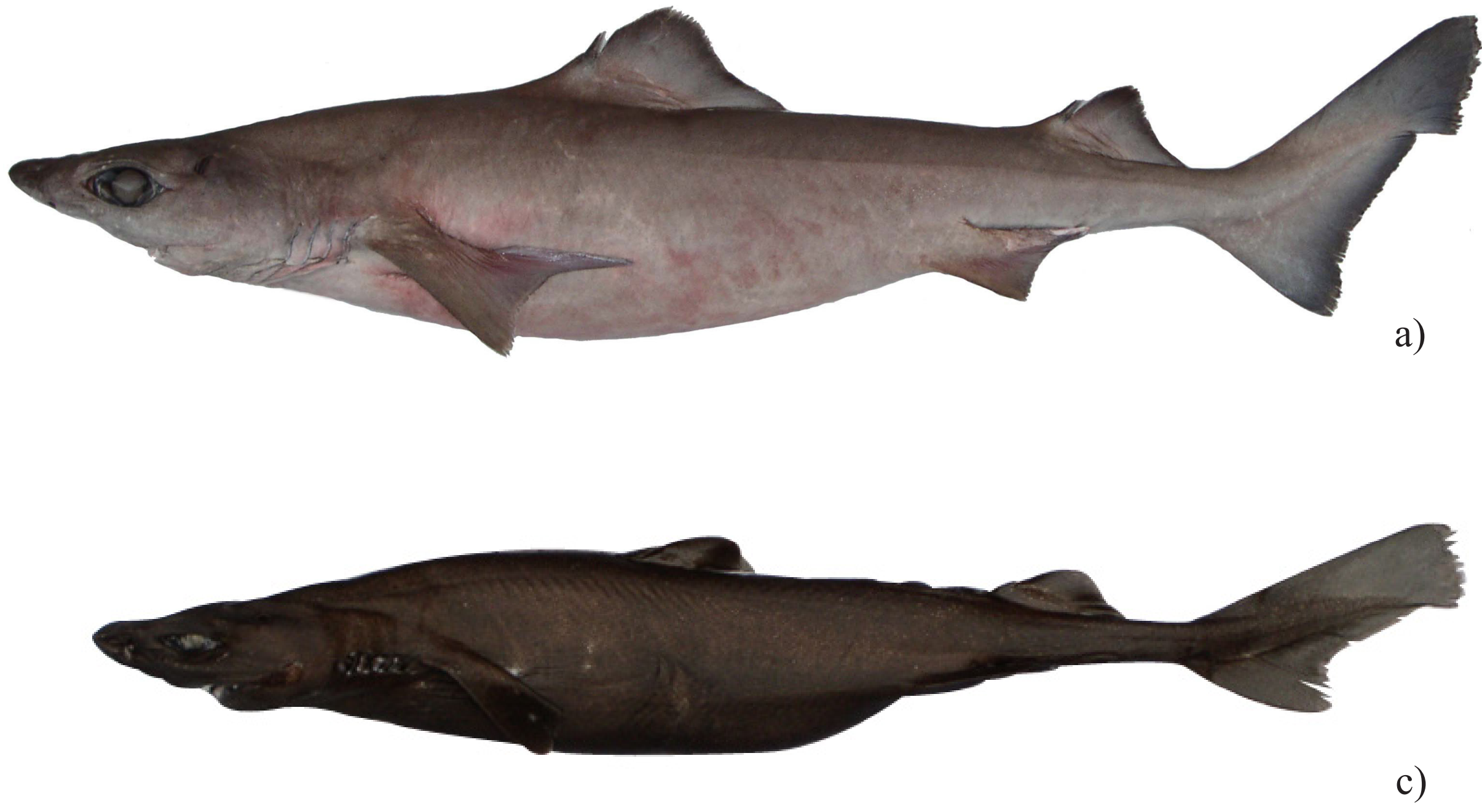


Figure 1. Map of the Canary Islands showing set locations along the Islands of Tenerife, La Gomera, La Palma, Fuerteventura and El Hierro (A – Fishing set by *Pico Dourado*; B – Fishing set by *Pico Alto*).

Species	N total	Mean TL/SD (cm)	TL Range (cm)	Mean weight/SD (g)	Weight Range (g)	Sex-ratio
<i>Centrophorus granulosus</i>	8	97/14,1	85,0-152,0	5100/2687	3200-26000	1:01
<i>Centrophorus squamosus</i>	132	197,0/9,8	82,0-137,0	7120/2487	3200-23000	-
<i>Etmopterus princeps</i>	3	44,8/4,8	40,0-49,5	333/115	200-400	1:02
<i>Etmopterus pusillus</i>	1	47	-	400	-	-
<i>Centroscyrmnus owstonii</i>	118	68,1/8,5	50,5-83,5	1174/478	200-2400	1:6.4
<i>Zameus squamulosus</i>	129	63,27/10,0	46,0-80,0	1132/638	400-2700	1:1.6

Table 2 – Descriptive statistics of length, weight, sex proportion variables on sampled specimens.



a) *Centrophorus squamosus* (Bonnaterre 1788) b) *Centrophorus granulosus* (Bloch & Schneider 1801) c) *Zameus squamulosus* (Günther 1877) d) *Centroscyrmnus owstonii* Garman 1906

REMARKS

Present results were compared to those obtained from the by-catch of the black-scabbard fishery off Madeira (Bordalo-Machado et al., 2009). No significant differences in species composition were observed, except for the absence of *Centroscyrmnus coelolepis* and *Deania calcea* off the Canary Island. Landings of the leaf-scale gulper shark *C. squamosus*, the most captured species within the by-catch, over the past decade peaked in 2003 (3042 tonnes) and have declined to 243 tonnes in 2009. In Portugal, based on FAO catch data, is landed on an average 893 tonnes per year from 2000 to 2009. In contrast, short time series of CPUE available for the western coast of Portugal seems to remain stable (Gibson et al., 2008). Given that this species is highly vulnerable to depletion, evidence for steep declines in several areas of its range and continued fishing pressure remain in this region, it has been assessed as endangered in the Northeast Atlantic. It was recently listed on the OSPAR (2008) List of threatened and/or declining species and habitats (Gibson et al., 2008). Accordingly to these results and concerns, further studies should be conducted in order to evaluate the real impact of this fishery on the north-eastern Atlantic population(s) of the leaf-scale gulper shark, but also addressing technological developments related to the fishing gear tending to minimize their captures.

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