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Nota Científica

**Bycatch of the piked dogfish *Squalus acanthias* Linné, 1758
(Chondrichthyes, Squalidae) in semi-pelagic longline fisheries
at the Patagonian Shelf**

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ABSTRACT. The piked dogfish *Squalus acanthias* is part of the bycatch of several South American longline fisheries, although in Argentina, it was only reported in the bycatch of benthic and demersal fisheries operating bottom nets. This communication represents the first record of *S. acanthias* bycatch in a commercial semi-pelagic longline fishery within Argentinean waters. In October-November 2005, 185 piked dogfish were captured (122 females and 63 males). The estimated mean catch rate was 0.37 sharks/1000 hooks (544,320 hooks deployed). Nearly half of the captured females and over 50% of captured males were morphometrically mature. The piked dogfish bycatch could have been influenced by the use of the Argentine shortfin squid *Illex argentinus* as bait; this squid is part of the shark's natural diet. Although *S. acanthias* is abundant in the region, we believe that the bycatch species could be more vulnerable than the targeted ones since the signs indicating a declining population of non-target species in commercial catches and collapses in bycatch populations go unnoticed.

Key words: piked dogfish, *Squalus acanthias*, bycatch, semi-pelagic longline, Patagonian Shelf.

**Captura incidental del tiburón espinoso *Squalus acanthias* Linné, 1758
(Chondrichthyes, Squalidae) en pesquerías que utilizan palangre semi-pelágico
sobre la plataforma Patagónica**

RESUMEN. El tiburón espinoso *Squalus acanthias* es capturado incidentalmente en diversas pesquerías sudamericanas de palangre, aunque en Argentina la captura incidental ha sido informada en pesquerías de arrastre de fondo. Esta comunicación representa el primer registro de la captura incidental de *S. acanthias* en una pesquería comercial de palangre semi-pelágico en aguas nacionales. Entre octubre y noviembre de 2005, se capturaron 185 tiburones espinosos (122 hembras y 63 machos). La tasa de captura media fue de 0,37 tiburones/1000 anzuelos (544.320 anzuelos calados). Aproximadamente la mitad de las hembras y más del 50% de los machos estaban morfométricamente maduros. La captura incidental del tiburón espinoso habría sido influenciada por el uso de calamar *Illex argentinus* como carnada que constituye parte de la dieta natural del tiburón. Aunque *S. acanthias* es abundante en la región, se cree que las especies que conforman la captura incidental podrían ser más vulnerables que las especies objetivo, ya que los signos en el decrecimiento poblacional en las capturas comerciales y los colapsos poblacionales de aquellas especies no-objetivo pasan inadvertidos.

Palabras clave: tiburón espinoso, *Squalus acanthias*, captura incidental, palangre semi-pelágico, plataforma Patagónica.

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Bycatch, considered here as unwanted species or individuals caught during fishing operations (Hall, 1996), of non-commercial species in longline fisheries, particularly sharks, is a recent global phenomenon. In South America, these fisheries incidentally catch several shark species (Compagno, 1984; Cervigón *et al.*, 1992; Marín *et al.*, 1998; Nion, 1999; Kotas *et al.*, 2000; Massa & Hozbor, 2003; Lamilla-Gómez, 2005). Because of their biological features such as high adult survival rates, deferred maturity, and low fecundity (Van der Molen *et al.*, 1998; García de la Rosa *et al.*, 2000), sharks tend to be susceptible to heavy fishing pressure (Walker & Hislop, 1998; Kiyota *et al.*, 2002).

The piked dogfish *Squalus acanthias* Linné, 1758 inhabits the coasts of the south-west Atlantic Ocean from 55°S up to southern Uruguay, occurring from 20 to 200 m deep (Cousseau & Perrotta, 2004). This shark and the tope *Galeorhinus galeus* Linné, 1758 were intensively exploited six decades ago by coastal trawl fisheries in northern Patagonia (Van der Molen *et al.*, 1998). Currently, sharks and skates in the south-west Atlantic region are targeted by artisanal hook and trawl fisheries in Uruguay, a longline fishery in Argentina (a single vessel targeting skates), and a Rajidae fishery in the Malvinas/Falkland region (Walker & Hislop, 1998; Nion, 1999; Massa & Hozbor, 2003).

Although piked dogfish are incidentally caught in several South American longline fisheries off Uruguay (Compagno, 1984; Marín *et al.*, 1998; Nion, 1999) and Brazil (Kotas *et al.*, 2000), this bycatch was only reported in benthic and demersal fisheries operating bottom nets off Argentina (Caille *et al.*, 1997; Massa & Hozbor, 2003). Even though artisanal hook fisheries in coastal Patagonia captured piked dogfish ten years ago (Caille, 1996), no record exists of *S. acanthias* bycatch with commercial longlines. This study reports the first record of piked dogfish incidentally caught by a commercial semi-pelagic longline fishery from Argentinean waters.

From 7 October to 14 November 2005, whilst conducting seabird observation tasks onboard the longliner F/V "Argenova XII", the bycatch of piked dogfish was noticed. The vessel's fishing master was targeting kingclip *Genypterus blacodes* Schneider, 1801 using the Argentine shortfin squid *Illex argentinus* Castellanos, 1960 as bait in waters off the Patagonian Shelf (Argentina) (Fig. 1). Forty-one longline sets, or a total of 544,320 hooks, were deployed. The longlines consisted of several sections

or "magazines", each of which had 720 Mustad J-shaped hooks attached to a 10 mm nylon-polyester line or "mother line". The gear configuration used was semi-pelagic, comprising weights and floats every 70 hooks (*ca.* 84 m) along the mother line. During line hauling, sex and total length of piked dogfish were assessed. Sex was determined by direct examination of claspers (males) with the naked eye. The total length of the sharks was measured to the nearest centimeter. Morphometrical maturity was determined after Compagno (1984) and Menni (1985) and weight was assessed using the length-weight relationship formula given by Gosztonyi & Kuba (1998). All sharks were released alive with uncertain survival prospects.

A total of 185 (122 females and 63 males) piked dogfish were captured. Females made up 66% of the specimens, which was significantly different from a 1:1 sex ratio (χ^2 test, $p < 0.05$). Nearly half of the females 46% ($n = 57$) and 54% ($n = 34$) of the males were morphometrically mature. Total length of females ranged from 46 to 88 cm, with a mean length of 67.04 ± 10.91 cm. Males ranged from 45 and 68 cm, with a mean length of 59.82 ± 6.03 cm. The estimated mean weight for females was 905 ± 435.18 g ($n = 122$) and 1157 ± 324.43 g ($n = 63$) for males. Piked dogfish were caught on nineteen of the forty-one sets observed. The mean catch rate observed was 0.37 sharks/1000 hooks, ranging from 0.11 up to 3.93 sharks per 1000 hooks (Fig. 1).

Bycatch of piked dogfish with semi-pelagic longline fishing gear could have been influenced by the use of squid *Illex argentinus* as bait, as it is part of this shark's natural diet between 30 and 85 cm total length (Sánchez & Prenske, 1996; García de la Rosa & Prenske, 1997). Although squids are important trophic items during summer and autumn months, the generalistic-opportunistic behaviour of the piked dogfish enables it to catch prey that is either benthic or free-living in the water column (Sánchez & Prenske, 1996). Furthermore, the same authors grouped the kingclip and the piked dogfish in the same trophic assemblage based on intra and interspecific dietary overlaps (Sánchez & Prenske, 1996). The sex bias observed in the samples may be explained by the segregation of feeding grounds for males and females (Compagno, 1984; Menni, 1985; García de la Rosa & Prenske, 1997), although this segregation was observed mainly for the southern part of the Buenos Aires Province, between 34° and 37°S (García de la Rosa & Prenske, 1997).

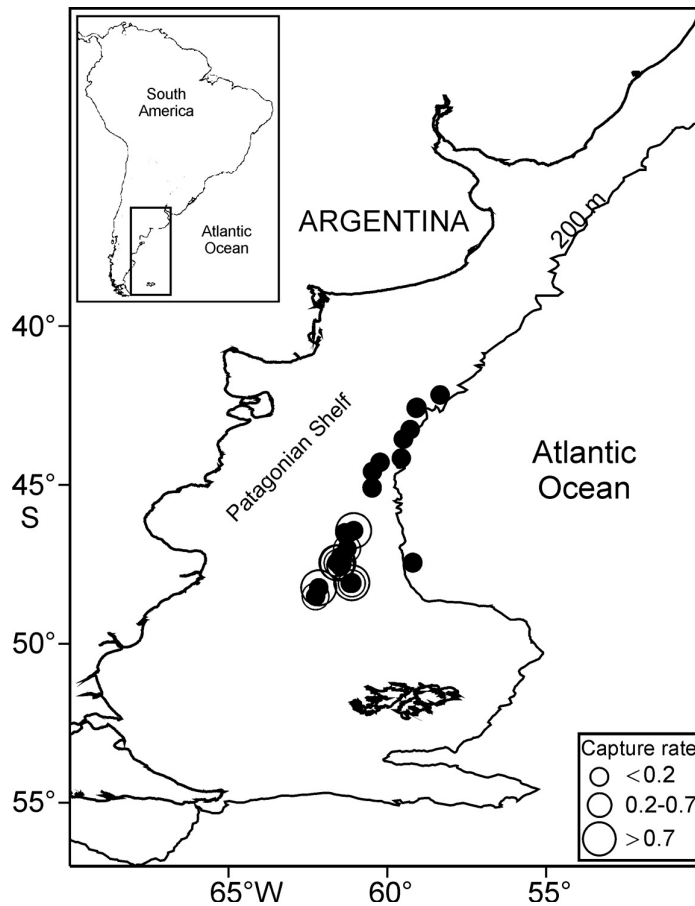


Figure 1. Distribution of fishing effort (closed circles) and capture rates of *Squalus acanthias* (open circles) along the Patagonian Shelf during October-November 2005. Capture rates are informed as the number of piked dogfish every 1,000 hooks deployed.

Figura 1. Distribución del esfuerzo pesquero (círculos cerrados) y tasa de captura de *Squalus acanthias* (círculos abiertos) a lo largo de la plataforma Patagónica durante octubre-noviembre de 2005. La tasa de captura se informa como el número de tiburones espinosos capturados cada 1.000 anzuelos calados.

Sharks are captured by the Argentine commercial fleet chiefly as bycatch (Massa & Hozbor, 2003 and references therein). Fishing statistics derived from the declarations of the fishing masters only identify the tope, the Patagonian smoothhound *Mustelus schmitti* Springer, 1939, and the elephant fish *Callorhynchus callorhynchus* Linné, 1758; the remaining captured cartilaginous fish are grouped as “shark” items (Massa & Hozbor, 2003). Currently, the piked dogfish is considered Vulnerable by the IUCN Red List of Threatened Species (IUCN, 2006) and, although it is extremely abundant in temperate and temperate-cold waters in both hemispheres (Compagno, 1984; Cousseau & Perrotta, 2004), we believe that the nature of this record emphasizes the fact that bycatch species such as the piked dogfish should be identified onboard commercial longline vessels. Furthermore, we believe that the longline fisheries are certain to have a significant impact on

elasmobranches since bycatch species could be more vulnerable than targeted ones because the signs of declining non-target species in commercial catches and population collapses go unnoticed (Camhi *et al.*, 1998) and because fishing-related shark mortalities, if excessive, could have far-reaching ecosystem-level implications (Gruber & Manire, 1991).

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