

HISTORICAL AND CONTEMPORARY PRESENCE OF THE PORBEAGLE, *LAMNA NASUS* (BONNATERRE, 1788), IN ITALIAN WATERS (MEDITERRANEAN SEA)

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ABSTRACT

Data concerning the presence of Lamna nasus (Bonnaterre, 1788) in Italian waters, is presented here. A total of 33 specimens are reported. Specimens ranged from 86.7 to about 250 cm. The sex ratio is 1: 2 males to females. We estimated 14 of the 33 specimens as possibly mature, corresponding to 42.42%. Four new-born specimens were recorded from the Adriatic Sea and the Ligurian Sea. L. nasus doesn't seem to reproduce in Italian waters, but a reproductive area may exist in some part of the Mediterranean. L. nasus was most often recorded during summer, but seems to be present in the study area throughout the year. Most porbeagles were taken as bycatch. The fishing gear used are pelagic longlines, floating gillnets, surrounding nets, tuna traps and harpoon.

Key words: porbeagle, *Lamna nasus*, fishery, Italy, Mediterranean Sea

PRESENZA STORICA E CONTEMPORANEA DELLO SMERIGLIO, *LAMNA NASUS* (BONNATERRE, 1788), IN ACQUE ITALIANE (MARE MEDITERRANEO)

SINTESI

Vengono presentati dati sulla presenza di Lamna nasus (Bonnaterre, 1788) in acque italiane. E' riportato un totale di 33 esemplari. Le dimensioni degli esemplari sono comprese tra 86.7 e circa 250 cm. Il rapporto tra i sessi è 1 : 2 = maschi : femmine. Abbiamo stimato 14 dei 33 esemplari come verosimilmente maturi, corrispondenti al 42.42%. Quattro neonati sono stati registrati nei Mari Adriatico e Ligure. L. nasus sembrerebbe non riprodursi nelle acque italiane, ma un'area riproduttiva potrebbe esistere all'interno del bacino Mediterraneo. L. nasus è stato registrato più frequentemente durante l'estate, ma sembra essere presente nell'area di studio durante tutto l'anno. La maggior parte di smerigli sono stati pescati come catture accessorie. Gli attrezzi da pesca usati comprendono palangari pelagici, reti derivanti, reti a circuizione, tonnare e arpioni.

Parole chiave: smeriglio, *Lamna nasus*, pesca, Italia, Mare Mediterraneo

INTRODUCTION

The porbeagle *Lamna nasus* (Bonnaterre, 1788) is a member of the Lamnidae Müller & Henle, 1838 family. It is a large species that can reach 360 cm in total length (Castro, 1983; Compagno, 1984). It can be easily identified by its spindle-shaped body, strongly conical snout, lunate caudal fin, strong primary caudal keels and small secondary keels, moderately large bladelike teeth with a pair of lateral

cusplets, large rounded dark eyes, dark blue-grey to blackish coloration on the dorsal surface and white on the ventral surface, a conspicuous white rear tip of first dorsal fin (Castro, 1983; Compagno, 1984). The porbeagle is a fast swimming mackerel shark. Its speed and power can be explained by a complex blood vessel heat-exchanging arrangement: in fact, we could consider this condition as warm-bloodedness or endothermy, well known also in other mackerel sharks (Carey et al., 1985). It feeds on bony fishes, sharks, squids and crustaceans (Joyce et al., 2002). Its longevity estimate is 46 years (Natanson et al., 2002). The porbeagle may take 5 or more years to reach maturity: in the Northern Hemisphere males mature at about 150-200 cm total length, while females at about 200-229 cm (Francis & Stevens, 2000; Barrull & Mate, 2002). Its mode of reproduction is aplacental viviparity and embryos are nourished by oophagy. The gestation period is 8-9 months (Francis & Stevens, 2000), and in the North Atlantic birth occurs in spring and summer (Castro, 1983; Francis & Stevens, 2000); litter sizes are 2-6, and size at birth is 68-89 cm total length (Francis & Stevens, 2000; Mollet, 2001; Jensen et al., 2002). The porbeagle is an important object of commercial fisheries all around the world for its high-quality meat, mainly caught on pelagic longlines, and also highly considered for sport-fishery. Intensive fishery greatly reduced the population of porbeagles in the North Atlantic Ocean and the Mediterranean Sea (Castro, 1983; Compagno, 1984; Moreno, 1995; Vannuccini, 1999; Watts, 2001). In Italy, where porbeagle meat is widely eaten and usually marketed as "palombo" (smooth-hound, *Mustelus sp.*), it's mainly imported frozen or fresh from North-eastern Atlantic Countries and Japan (De Maddalena & Piscitelli, 2001).

The porbeagle is a pelagic, epipelagic, or littoral shark that is usually more common on continental shelves, but is also found far from land in ocean basins (Scott and Scott, 1988; Compagno 2001). It ranges in depth from the surface to at least 700 m (Compagno, 2001). It prefers waters colder than 18°C (Aasen, 1963). Widely distributed in the cold temperate waters of the North Atlantic, South Atlantic, South Indian and South Pacific Oceans. In the Mediterranean, it is indicated as rare or very rare in all waters (Tortonese, 1938; Capapé, 1989; Barrull et al., 1999; Buencuerpo et al., 1998; Lipej et al., 2004). Therefore we consider it particularly interesting to provide a survey on the occurrence of porbeagles off Italian coasts based on both historical and recent data.

MATERIALS AND METHODS

The search for data on porbeagles from the Italian waters was effected by examination of the fish caught, location and study of materials preserved in natural history museums, collaborations with commercial fishermen, sport fishermen, scuba divers and bibliographical research. This program is an initiative lead by the Italian Ichthyological Society (Società Ittiologica Italiana).

For every case, whenever possible, the following data were collected: date and location of the record, total length (TOT) or fork length (FOR) in cm (following Compagno, 1984), mass (M) in kg, and sex (S) of the specimen, type of record (capture or sighting), distance from the coast, information about specimens preserved in museums and catalogue number (cat. no.) in the collections, as well as any additional details. Detailed morphometric measurements were made by A.D. of a 163 cm male porbeagle caught off Cesenatico (Italy), Adriatic Sea, on 4 July 2001, following the methods of Compagno (1984).

RESULTS

At this writing, 33 records of *Lamna nasus* in Italian waters have been collected. Of these, a total of 7 cases are referred to the Ligurian Sea, 10 to the Southern Tyrrhenian Sea and the Messina Strait, 2 to the Sicilian Channel, 1 to the Ionian Sea and 13 to the Western Adriatic Sea.

In addition to the records described above, in the interests of completeness, it is of some interest to report that in other Museums there are three additional specimens of which the capture location is unknown, but for which is easy to hypothesize that they may be from Italian waters. In the Museum of Natural History and the Territory of Calci there is a young taxidermied preserved specimen, possibly referable to the 19th Century, in the Museum of Natural History "Fontego dei Turchi" of Venice there is a 112 cm taxidermied female (cat. no. 7841) (Mizzan, 1994), and in the Museum of Natural History of Trieste there is a set of jaws belonging to a specimen caught in the Adriatic Sea.

The data collected are presented in Table 1. For each specimen the following data are reported: capture date, capture location, sex (M or F), total length (TOT or, where indicated, FOR) in cm, weight in kg, notes and data source. Morphometric measurements of a 163 cm male porbeagle caught off Cesenatico on 4 July 2001 are presented in Table 2.

Table 1. Records of the porbeagle *Lamna nasus* (Bonnaterre, 1788) from Italian waters.

DATE	LOCATION	SEX	TOT (cms)	WEIGHT (kgs)	NOTES	SOURCE
1871	Palermo	-	-	-	Capture.	Doderlein (1881)
November 1880	Alassio	-	-	-	Capture.	Tortonese & Trotti (1949)
6 May 1913	Genova Boccadasse	F	200	-	Preserved taxidermied in the Museum of Natural History "G. Doria" of Genes (cat. no. MSNG 1662)	Ariola (1913), Tortonese (1956), G. Doria (pers. comm.)
1958	Camogli	-	236	120	Caught in a tuna-trap.	Boero & Carli, 1979
7 July 1959	Pizzo Calabro	-	138	25	Capture.	Genovese (1960)
Summer 1987	Torre Faro	-	ca. 180	-	Caught with a harpoon	A. Arena (pers. comm.)
August 1992	Otranto	-	ca. 250	-	Capture. Possibly the same specimen was encountered by scuba diver Andrea Del Coco one week before between Otranto and Porto Badisco	A. Del Coco (pers. comm.)
1994	Albarella	-	-	240	Caught by sport-fishermen	R. Basanisi (pers. comm.)
Summer 1995	Ganzirri	-	ca. 200	-	Caught with a harpoon, 300 m offshore	M. Mancuso (pers. comm.)
31 July 1995	Pieve Ligure	-	-	-	Caught 6 miles offshore. Preserved in liquid in the Museum of Natural History "G. Doria" of Genes (cat. no. MSNG 48692)	G. Doria (pers. comm.)
Summer 1998	Lampedusa	-	ca. 200	-	Caught with a surrounding net	P. Billeci (pers. comm.)
18 August 1998	Sanremo	F	87.1	-	Preserved in liquid in the Museum of Natural History "G. Doria" of Genes (cat. no. MSNG 50789)	Orsi Relini & Garibaldi (2002), G. Doria (pers. comm.)
18 May 1999	Salina, Eolie Islands	F	175 (FOR)	-	Caught with a longline for tuna	Examined by A.C.
10 September 1999	Sanremo	F	86.7	-	Preserved in liquid in the Museum of Natural History "G. Doria" of Genes (cat. no. MSNG 50785)	Orsi Relini & Garibaldi (2002), G. Doria (pers. comm.)
February 2000	Eastern Ionian Sea	-	ca. 200	-	Caught with a longline for tuna	V. Testa (pers. comm.)
9 February 2000	Giulianova	-	163	-	Caught with a longline for tuna	A. Celona (pers. comm.)
Summer 2000	Ancona	M	152	-	Caught with a longline	G. Mattioli (pers. comm.)
Summer 2000	Pescara	-	<200	-	Caught by sport-fishermen.	Cugini & De Maddalena (2003)
21 July 2000	Capo San Raineri	F	185 (FOR)	-	Caught with a harpoon	Examined by A.C.
31 July 2000	Sanremo	F	89.3	-	Preserved in liquid in the Museum of Natural History "G. Doria" of Genes (cat. no. MSNG 50784)	Orsi Relini & Garibaldi (2002), G. Doria (pers. comm.)
May 2001	Southern Tyrrhenian Sea	-	ca. 180	-	Caught with a floating gillnet for tuna	A. Sanfilippo (pers. comm.)
8 May 2001	Pescara	M	ca. 150	35	Capture.	Cugini & De Maddalena (2003)

12 June 2001	Panarea, Eolie Islands	-	ca. 200	-	Caught with a surrounding net, 25 miles off Panarea	G. Galano (pers. comm.)
4 July 2001	Cesenatico	M	163	-	Brought to the fish market in Milano.	Examined by A.D.
4 July 2001	Cesenatico	F	ca. 160	-	Brought to the fish market in Milano.	L. Piscitelli (pers. comm.)
4 July 2001	Cesenatico	F	ca. 160	-	Brought to the fish market in Milano.	L. Piscitelli (pers. comm.)
15 July 2001	S. Benedetto del Tronto	F	91	6.5	Caught by sport-fisherman. Stomach contained sardines, <i>Sardina pilchardus</i> . Preserved in the Museo Ittico Augusto Capriotti in San Benedetto del Tronto (cat. no. 1850).	Marconi & De Maddalena (2001)
December 2001	Pescara	F	ca. 250	-	Filmed.	Cugini & De Maddalena (2003)
February-March 2002	Giulianova	-	180	-	Caught by professional fisherman	Cugini & De Maddalena (2003)
10 June 2002	Filicudi, Eolie Islands	M	187 (FOR)	-	Caught with floating gillnet	Examined by A.C.
15 April 2003	Stromboli, Eolie Islands	M	206 (FOR)	-	Caught with a longline for tuna	Examined by A.C.
February 2004	Venezia	-	ca. 150	-	Capture.	G. Cugini (pers. comm.)
26 September 2004	Lampione	-	ca. 200	-	Sighting	Examined by A.C.

Table 2. Measurements of a 163 cm male porbeagle *Lamna nasus* (Bonnaterre, 1788) caught off Cesenatico (Italy), Adriatic Sea, on 4 July 2001 (following terminology and parameters of Compagno, 1984). All measurements are given in centimetres.

Abbreviation	Measurement	cm	%TOT
TOT	total length (caudal fin in depressed position)	163	100.00%
FOR	fork length	139	85.27%
PRC	precaudal length	124.5	76.38%
PD2	pre-second dorsal length	110	67.48%
PD1	pre-first dorsal length	53	32.51%
PG1	prebranchial length	33.5	20.55%
POB	preorbital length	11.4	6.99%
PP1	prepectoral length	41.5	25.46%
PP2	prepelvic length	85	52.15%
PAL	preanal length	111.5	68.40%
PRN	prenarial length	8	4.91%
POR	preoral length	10	6.13%
EYL	eye length	3.1	1.84%
EYH	eye height	2.6	1.59%
GS1	first gill slit height	12	7.36%
P1A	pectoral anterior margin	28.8	17.67%
P1B	pectoral base	12	7.36%
P1P	pectoral posterior margin	25	15.34%
CDM	dorsal caudal margin	38	23.31%
CPV	preventral caudal margin	25	15.34%
CPL	lower post ventral caudal margin	18.5	11.35%
D1A	first dorsal anterior margin	21	12.88%
D1B	first dorsal base	14	8.59%
D1H	first dorsal height	18.5	11.35%
D1I	first dorsal inner margin	6.5	3.99%
D2A	second dorsal anterior margin	5	3.07%
D2B	second dorsal base	2.5	1.53%
D2H	second dorsal height	3	1.84%
D2I	second dorsal inner margin	5	3.07%
D2P	second dorsal posterior margin	5	3.07%
ANA	anal anterior margin	5	3.07%
ANB	anal base	3	1.84%
ANH	anal height	3.5	2.15%
ANI	anal inner margin	5	3.07%

ANP	anal posterior margin	4.5	2.76%
MOL	mouth length	7.5	4.60%
MOW	mouth width	11.5	7.05%
NOW	nostril width	1.5	0.92%

DISCUSSION

The paucity of data collected from Italian waters confirm the rarity of *L. nasus* in the Mediterranean area.

The lengths of the specimens fell within the ranges previously described for this species. Specimens for whom the length was recorded ranged from 86.7 to about 250 cm. In December 2000 a large female was landed in Pescara's harbour where it had been transported following capture in adjacent waters. The total length of the specimen was not accurately measured, but it was subsequently estimated at about 250 cm from the filmed evidence (Cugini & De Maddalena, 2003). In late August 1992 an approx. 250 cm porbeagle was caught off Otranto; possibly the same specimen was encountered one week before by scuba diver Andrea Del Coco at 28 m depth, between Otranto and Porto Badisco (A. Del Coco, pers. comm.).

Other large porbeagles recorded are a 236 cm specimen caught off Camogli in 1958 (Boero & Carli, 1979) and a 206 cm FOR male caught off Stromboli on 15 April 2003. From the fork length - total length relationship presented by Kohler et al. (1996), $FL = (0.8971) TL + 1.7939$, we calculated the total length of the Stromboli specimen to be 227.63 cm.

Of the 33 specimens, 10 were females, 5 males and 18 were of unknown sex. The sex ratio is 1: 2 males to females. This numerical dominance of females may indicate some form of sex segregation; however a large sample of adults is required before drawing any such conclusions. Gonads were not examined, and we estimated the reproductive state on the basis of the specimens' size. In total we estimated 14 of the 33 specimens as possibly mature, corresponding to 42.42%. Four new-born specimens, ranging from 86.7 to 91 cm, were recorded, of which one from the Adriatic Sea and three from the Ligurian Sea (Marconi & De Maddalena, 2001; Orsi Relini & Garibaldi, 2002; G. Doria, pers. comm.). No pregnant female was recorded. Therefore we presume that *L. nasus* doesn't reproduce in Italian waters, but given the presence of new-born specimens we can't exclude that a reproductive area may exist in some part of the Mediterranean Sea.

Porbeagles appear to be inoffensive animals. These sharks very rarely approach divers closely. We are unaware of any aggressive, provoked or unprovoked incidents involving humans in these waters.

L. nasus was recorded most often during Summer, but seems to be present in the study area throughout the year.

Apparently porbeagles are rarely caught by professional fishermen operating in the study area. The fishing gear used are pelagic longlines, floating gillnets, surrounding nets, tuna-traps and harpoon. Most porbeagles were taken as bycatch, caught accidentally while fishing for other commercial species, primarily with the same pelagic longlines used to fish tuna and swordfish. These sharks were retained and sold for human consumption. The large size of these sharks make them an abundant source of meat, also, in Italy porbeagle meat is considered among the most valuable shark meats, so the species is of interest to fishermen. Porbeagle meat is marketed fresh or frozen for human consumption, destined for domestic consumption. It can often be found in the markets (but mainly exported from the Atlantic) and is consumed in all parts of the Country. In Italy the meat of many sharks is marketed under incorrect names and *L. nasus* is usually sold as "palombo" (smooth-hound).

There are no regulations or control over the porbeagle fishery in Italy. The absence of any other details on the porbeagle fishery in the area does not allow an assessment of the status of their stocks in these waters, however, according to local fishermen and traders, these sharks have greatly declined. Effective

management of fisheries is needed in order to avoid a rapid decline in the near future. These management decisions are based on research on the biology, ecology, distribution, abundance and exploitation of the species. It is also necessary to improve management of fisheries in which sharks constitute a significant bycatch (Vannuccini, 1999; Watts, 2001).

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FIGURE CAPTIONS

Fig. 1 – Area of the Mediterranean Sea showing the locations of porbeagle captures and sightings presented in this work (Drawing: Alessandro De Maddalena).

Fig. 2 - A 163 cm male porbeagle Lamna nasus (Bonnaterre, 1788) caught off Cesenatico (Italy), Adriatic Sea, on 4 July 2001 (Photo: Alessandro De Maddalena).

Fig. 3 - A 152 cm male porbeagle Lamna nasus (Bonnaterre, 1788) caught off Ancona (Italy), Adriatic Sea, in Summer 2000 (Photo: Marco Zuffa).

Fig. 4 - An about 250 cm female porbeagle Lamna nasus (Bonnaterre, 1788) caught off Pescara (Italy), Adriatic Sea, in December 2001 (Photo reproduced by kind permission of M. Di Giovanni).

Fig. 5 - Head of a porbeagle Lamna nasus (Bonnaterre, 1788) caught off Pieve Ligure (Italy), Ligurian Sea, on 31 July 1995, and preserved in the Museum of Natural History "G. Doria" of Genes with cat. no. MSNG 48692 (Photo: Alessandro De Maddalena, reproduced by kind permission of the Museum of Natural History "G. Doria" of Genes).