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A record of porbeagle, *Lamna nasus* (Bonnaterre, 1788), in the Gulf of Trieste with discussion on its occurrence in the Adriatic Sea

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*A juvenile male of porbeagle (*Lamna nasus*) was caught in waters off Piran (Slovenia, northern Adriatic) on December 22, 2015. The specimen was accurately measured and weighed. Cephalopods and fish remains were found in its stomach contents. This is the first record of a porbeagle in the waters of Slovenia and in the Gulf of Trieste, and one of the few records up to date reported in the northern Adriatic Sea. The presence of this juvenile specimen arises a question whether the Adriatic Sea is a reproductive ground of this species. According to an older record from 1910, a female porbeagle with four embryos was caught on Ugljan Island, confirming the fact that porbeagles reproduced at least in the past in the Adriatic Sea.*

Key words: *Lamna nasus*, lamnoid sharks, occurrence, by-catch, Adriatic Sea

INTRODUCTION

Porbeagle (*Lamna nasus*) is large cold-temperate epipelagic shark species inhabiting coastal and oceanic waters occurring on both sides of the North Atlantic Ocean, in the South Atlantic and South Pacific Oceans (CAMPANA *et al.*, 2002). It can reach up to 370 cm in total length and 230 kg in weight (COMPAGNO, 2002). Among the three species of lamnoid sharks up to date recorded in the Adriatic Sea, the porbeagle is considered the rarest (TORTONESE, 1956; JARDAS, 1985, 1996; SOLDI & JARDAS, 2000; LIPEJ *et al.*, 2004). Little is known about its presence in the Adriatic Sea, since only irregular records of this species were recorded in the area, mostly in its southern part (MARANO *et al.*, 1983; SOLDI

& JARDAS, 2000; STORAI *et al.*, 2003). In the northern Adriatic Sea, there are available only few records, whereas in Slovenian part of the Adriatic Sea this shark is not mentioned in the Key for the determination of vertebrates in Slovenia (LIPEJ, 1999).

The aim of this contribution is to report the case of a juvenile porbeagle caught in waters off Slovenia and to comment the state of art about this species in the Adriatic Sea.

MATERIAL AND METHODS

A small sized specimen of porbeagle (Fig. 1) was caught by fishermen in the waters off Piran on December 22, 2015. The specimen

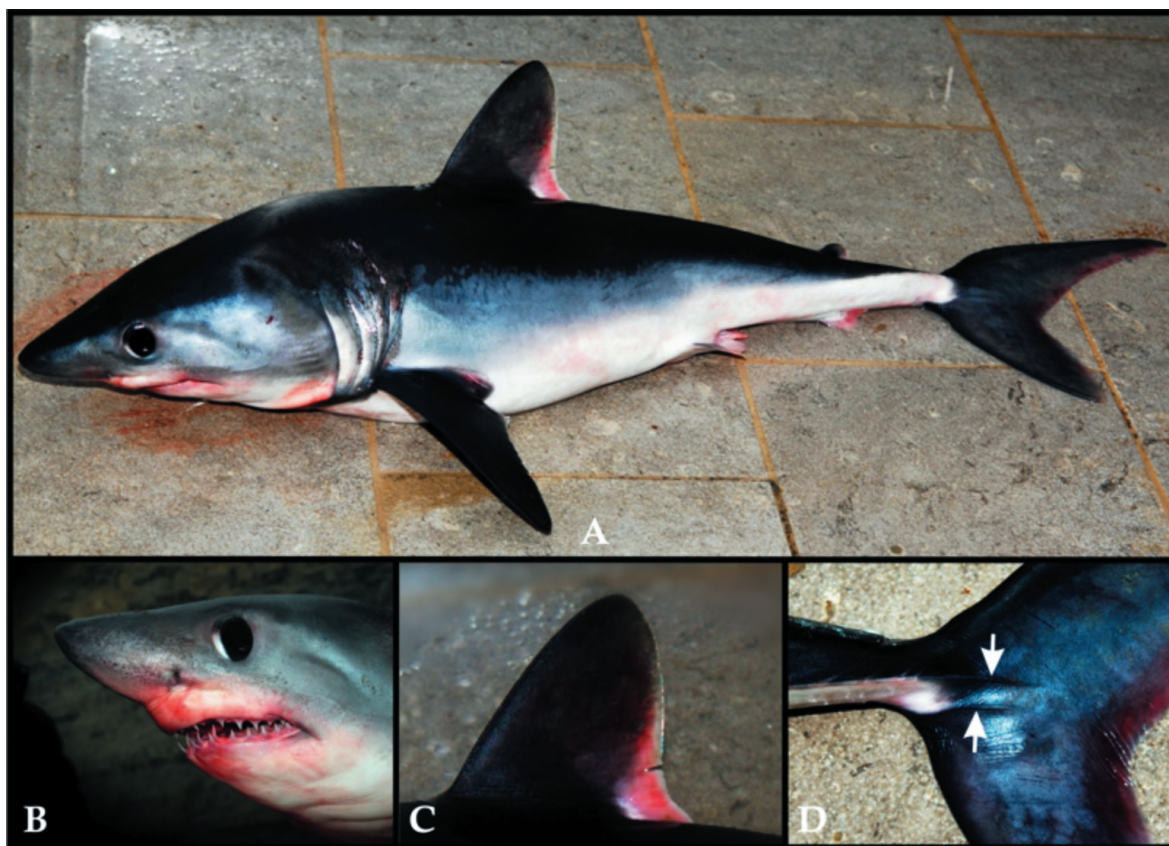


Fig. 1. A 104 cm long juvenile male of *Lamna nasus* captured in December 2015 in waters off Piran (Slovenia, northern Adriatic): A) whole specimen. B) close up of the head, C) white patch on the first dorsal fin and D) keels on the caudal fin (Photo: B. Mavrič)

was brought to the Marine Biology Station of the National Institute of Biology in Piran where it was measured to the nearest millimeter and weighed following the procedure recommended by COMPAGNO (1984). After that, the specimen was photographed and dissected in order to analyze its stomach contents. The remains of prey items found in the stomach were isolated and rinsed with seawater and preserved in 80% alcohol. The cephalopod beaks found were determined according to MANGOLD & FIORONI (1966), while fish otoliths were identified using the otolith atlas of TUSET *et al.* (2008).

The specimen was salted, frozen and transported to the Slovenian Natural Museum where it is housed with the catalog number 1304.

RESULTS AND DISCUSSION

The biometric measurements are given in Table 1. It was an immature male that measured

104 cm in total length and weighed 8.54 kg. The body is stout and spindle-shaped. Apex of the first dorsal fin is broadly rounded. A clear white patch is evident on its free tip. The second dorsal fin is very short (about 1 quarter of the first dorsal fin) and is located directly over the anal fin. Two lateral caudal keels are present on each side of the caudal peduncle, with the upper (primary keel) larger than the lower (secondary keel). The caudal fin is more or less lunate. Upper and lower precaudal pits are present. The snout is conical and the mouth rounded. The bladelike teeth are alike in lower and upper jaws. Lateral cusplets are not present in all teeth. Claspers were soft and uncalcified. The back and flanks of the body together with dorsal and pectoral fins were dark blue, while the ventral side was white. No umbilical scars were visible.

In the stomach content cephalopods were found and they constituted the bulk of the diet.

Table 1. Measurements (in mm) of a specimen, caught on December 22, 2015, in Piran (Northern Adriatic)

		Abb.	mm	%TL
1	Total length	TOT	1038.0	100.00
2	Fork length	FOR	924.0	89.02
3	Precaudal length	PRC	760.0	73.22
4	Pre-second dorsal length	PD2	686.0	66.09
5	Pre-first dorsal length	PD1	346.0	33.33
6	Head length	HDL	280.0	26.97
7	Prebranchial length	PGL	212.0	20.42
8	Preorbital length	POB	74.0	7.13
9	Interdorsal space	IDS	252.0	24.28
10	Dorsal-caudal space	DCS	94.0	9.06
11	Prepectoral length	PP1	236.0	22.74
12	Prepelvic length	PP2	518.0	49.90
13	Pectoral-pelvic space	PPS	212.0	20.42
14	Pelvic-anal space	PAS	108.0	10.40
15	Pelvic-caudal space	PCA	204.0	19.65
16	Preanal length	PAL	672.0	64.74
17	Prenarial length	PRN	64.1	6.18
18	Preoral length	POR	83.2	8.02
19	Eye length	EYL	24.0	2.31
20	Eye height	EYH	26.8	2.58
21	Intergill length	ING	58.0	5.59
22	Pectorial anterior margin	P1A	188.0	18.11
23	Pectorial posterior margin	P1P	164.0	15.80
24	Pectorial base	P1B	76.0	7.32
25	Pectorial inner margin	P1I	44.8	4.32
26	Pectorial length	P1L	120.2	11.58
27	Pectorial height	P1H	180.0	17.34
28	First dorsal anterior margin	D1A	139.5	13.44
29	First dorsal posterior margin	D1P	126.5	12.19
30	First dorsal base	D1B	94.8	9.13
31	First dorsal length	D1L	133.3	12.84
32	First dorsal height	D1H	113.6	10.94
33	Second dorsal anterior margin	D2A	36.5	3.52
34	Second dorsal posterior margin	D2P	24.0	2.31
35	Second dorsal base	D2B	21.5	2.07
36	Second dorsal length	D2L	52.0	5.01
37	Second dorsal height	D2H	19.3	1.86
38	Pelvic anterior margin	P2A	54.5	5.25
39	Pelvic posterior margin	P2P	36.3	3.50
40	Pelvic base	P2B	46.4	4.47
41	Pelvic inner margin length	P2I	49.0	4.72
42	Pelvic length	P2L	84.7	8.16
43	Pelvic height	P2H	53.1	5.12
44	Anal anterior margin	ANA	35.9	3.46
45	Anal posterior margin	ANP	27.3	2.63
46	Anal base	ANB	22.0	2.12
47	Anal length	ANL	54.2	5.22

48	Anal height	ANH	19.7	1.90
49	Dorsal caudal margin	CDM	256.0	24.66
50	Preventral caudal margin	CPV	182.0	17.53
51	Lower postventral caudal margin	CPL	116.0	11.18
52	Caudal fork length	CFL	102.4	9.87
53	Upper postventral caudal margin	CPU	157.4	15.16
54	Caudal fork width	CFW	94.4	9.09
55	Terminal caudal margin	CTR	50.7	4.88
56	Terminal caudal lobe	CTL	52.5	5.06
57	Internarial space	INW	37.0	3.56
58	Mouth width	MOW	91.2	8.79
59	Head height	HDH	150.0	14.45
60	Trunk height	TRH	153.0	14.74
61	Abdomen height	ABH	134.0	12.91
62	Tail height	TAH	83.0	8.00
63	Caudal peduncle height	CPH	26.0	2.50
64	Interorbital space	INO	59.2	5.70
65	Head width	HDW	150.0	14.45
66	Nasal length	NAL	11.5	1.11
67	Snout to vent length	SVL	91.2	8.79
68	Vent to caudal length	VCL	470.0	45.28
69	Clasper length	CL	39.1	3.77

In fact, certain studies revealed that cephalopods are important prey items in the diet of smaller individuals of *L. nasus* (JOYCE *et al.*, 2002), while adults are opportunistic predators on bony fish. Remains of two common cuttlefish *Sepia officinalis*, one musky octopus *Eledone moschata* and one European squid *Loligo vulgaris* were found together with the otoliths and bones of whiting *Merlangius merlangus*.

This is the first record of porbeagle in the Slovenian waters and in the Gulf of Trieste. The closest record of this species was in waters off Venice. Up to date, at least 33 records of the porbeagle are known for the Adriatic Sea. The oldest record dates from 1893, reported by the Croatian ichthyologist Juraj KOLOMBATOVIĆ (1893). However, probably the porbeagle was captured even prior this date since FABER (1883) mentioned this species as rare in the Adriatic Sea. BRUSINA (1888) pointed out that there is a possibility that this species might be found in the Adriatic Sea, however, he doubted about previous records of this species reported by other Adriatic ichthyologists.

More than a half of all porbeagle's reports (56.6%) occurred in the period between 2000

and 2015. There could be various explanations about higher numbers of records in recent times. One reason might be related to the increasing interest in sharks due to the increasing public awareness and the other due to the increased interest of scientists. Due to the availability of many documentaries on various TV channels, lamnoid sharks are nowadays recognized easier than they used to be recognized in the past. The majority of records were reported for Middle and Southern Adriatic Sea and only a few cases are known for the northernmost area. The records are more or less equally distributed in eastern and western part of the Adriatic Sea. According to STORAI *et al.*, (2005) some other records without precise data probably originated from the Adriatic Sea, as is the case of a 112 cm long taxidermied specimen in the Museum of Natural History of Venice housed in "Fontego dei Turchi" (MIZZAN, 1994) and a set of jaws belonging to a porbeagle caught in the Adriatic Sea, housed in the Museum of Natural History of Trieste.

If we try to assess the tentative age according to the relationship between the fork length

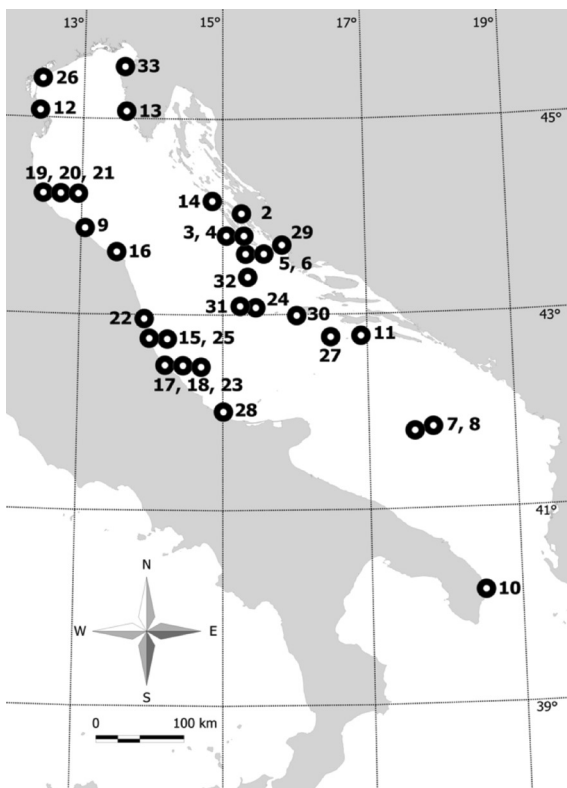


Fig. 2. Up to date records of the porbeagle in the Adriatic Sea. The record (circles) number is corresponding to the number in Table 2

and estimated age for male porbeagles fitted with the Von Bertalanffy growth curves, then the young male from Piran is between one and two years old (FRANCIS & STEVENS, 2000). Only one record dealt with a specimen smaller than in our case when the capture of 91 cm long porbeagle was reported by MARCONI & DE MADDALENA (2001) in waters off San Benedetto del Tronto.

The presence of this juvenile specimen arises a question whether the Adriatic Sea is a reproduction area of this species. SOLDI (2006) considered the open waters of the Middle and Southern Adriatic Sea as a potential reproduction area for the porbeagle, since among reported sharks many juvenile and immature porbeagles (< 150 cm TL) were captured. Similarly, SCACCO *et al.* (2012) pointed out the fact that some areas in the Central Adriatic Sea, such as the Jabuka-Pomopit, could function as a favorable environment for early life stages of the porbeagle shark, such as mating, pupping and nursery areas. This statement could be confirmed by the record dating

on the March 4, 1910, which dealt with a 260 cm long female, captured at Kukljica on Ugljan Island (see locality 2 on Fig. 2). Female carried four embryos and many eggs (KATURIC, 1910) which prove that porbeagles may reproduce (or might have reproduced in the past) in the Adriatic Sea. Female and embryos from the Kukljica record are housed in the collection of the Nature History department of the National Museum in Zadar. One of the authors (S. V.-K.) checked the teeth of the adult specimen although the head was not well preserved. It seems that the housed specimen is indeed a porbeagle. (Fig 3.)

The catch of a juvenile porbeagle represents further evidence of the presence of this lamnoid shark in the Adriatic Sea. Despite some new records were reported in recent years, the porbeagle should still be considered as a very rare shark in the Adriatic Sea. This large sized and slow growing species with low reproductive capacity is nowadays highly vulnerable to population depletion due to commercial and incidental fisheries and its Mediterranean population is evaluated as a critically endangered (STEVENS *et al.*, 2006).



Fig. 3. Left: Four embryos of porbeagle housed by Katuric in 1910 in the Nature History department of the National Museum in Zadar. Right: Head of a 260 cm long female porbeagle captured at Kukljica on Ugljan Island (Middle Adriatic) in March 1910. (photo credit: S. Vujčić-Karlo)

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Table 2. Historical and recent records of the porbeagle *Lamna nasus* in the Adriatic Sea

No.	Year	Date	Location	TL(cm)	W(kg)	Reference
1	1893	04 Aug	Dalmatia	230		Kolombatović, 1893
2	1910	04 Mar	Kukljica Ugljan	260		Katuriĉ, 1910
3	1933	June	Kornati	375		Soldo & Jardas, 2000
4	1938	24 Jul	Kornati		100	Pallaoro & Jardas, 1996
5	1957	15 Jan	Blitvenica		65	Soldo & Jardas, 2000
6	1957	17 Jan	Blitvenica		100	Soldo & Jardas, 2000
7	1981	July	South Adriatic			Marano <i>et al.</i> , 1983
8	1981	Sept	South Adriatic			Soldo & Jardas, 2000
9	1985		Fano			Anonymous, 2011
10	1992	Aug	Otranto	250		Storai <i>et al.</i> , 2005
11	1993	03 Sep	Lastovo	200	110	Dulĉiĉ & Lipej, 2002
12	1994		Albarella		240	Storai <i>et al.</i> , 2005
13	1999	10 Apr	Rovinj	150	60	Petrov (2003)
14	1999	26 Jul	Veli rat, Dugi otok	110	50	Petrov (2003)
15	2000	9 Feb	Giulianova	163		Storai <i>et al.</i> , 2005
16	2000	Summer	Ancona			Storai <i>et al.</i> , 2005
17	2000	Summer	Pescara	<200		Cugini & De Maddalena, 2003
18	2001	8 May	Pescara	ca. 150	35	Cugini & De Maddalena, 2003
19	2001	4 Jul	Cesenatico	160		Storai <i>et al.</i> , 2005
20	2001	5 Jul	Cesenatico	163		Storai <i>et al.</i> , 2005
21	2001	5 Jul	Cesenatico	160		Storai <i>et al.</i> , 2005
22	2001	15 Jul	S. Benedetto del Tronto	91	65	Marconi & De Maddalena, 2001
23	2001	Dec	Pescara	ca. 250		Cugini & De Maddalena, 2003
24	2002	Feb	Jabuka Pit	240		Soldo (unpublished data)
25	2002	Feb-Mar	Giulianova	180		Cugini & De Maddalena, 2003
26	2004	Feb	Venezia	ca. 150		Storai <i>et al.</i> , 2005
27	2008	24 Feb	Sušac		50	Anonymous, 2009a
28	2009	22 Sep	Ortoina, Termoli	200	100	Anonymous, 2009b
29	2009	2 Sep	Šibenik	175	60	Pavić, 2009
30	2009	11 Oct	Biševo (Vis)	150	60	Eterović, 2009
31	2010	7 Jul	42 52 803N; 15 04 986	150	60	Scacco <i>et al.</i> , 2012
32	2011	19 Aug	43 10 794N; 15 07 832	200	120	Scacco <i>et al.</i> , 2012
33	2015	22 Dec	Strunjan, Gulf of Trieste	104	8.45	this work

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Nalaz kučine, *Lamna nasus* (Bonnaterre, 1788), u tršćanskom zaljevu i rasprava o njegovu pojavljivanju u Jadranskom moru

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SAŽETAK

Nedorasla jedinka mužjaka kučine (*Lamna nasus*) uhvaćena je u vodama Piranskog zaljeva (Slovenija, sjeverni Jadran) 22. prosinca 2015. Primjerak je izmjeren i izvagan. U sadržaju želuca pronađeni su glavonošci i ostaci riba. Ovo je prvi zapis o kučini u tršćanskom zaljevu, i jedan od rijetkih zapisa prijavljenih u sjevernom Jadranskom moru. Prisutnost ovog nedoraslog mužjaka povlači pitanje da li je područje mriješta ove vrste Jadransko more. Prema starijem zapisu iz 1910. kod otoka Ugljana je uhvaćena ženka psine kučine s četiri embrija. Time se potvrdila činjenica da se ova vrsta barem u prošlosti razmnožavala u Jadranskom moru.

Ključne riječi: *Lamna nasus*, lamnoidni morski psi, pojavljivanje, prilov, Jadransko more

