

**OCCURRENCE OF BASKING SHARK, *CETORHINUS MAXIMUS* (ELASMOBRANCHII: LAMNIFORMES: CETORHINIDAE), OFF THE SYRIAN COAST (EASTERN MEDITERRANEAN) WITH FIRST DESCRIPTION OF EGG CASE**

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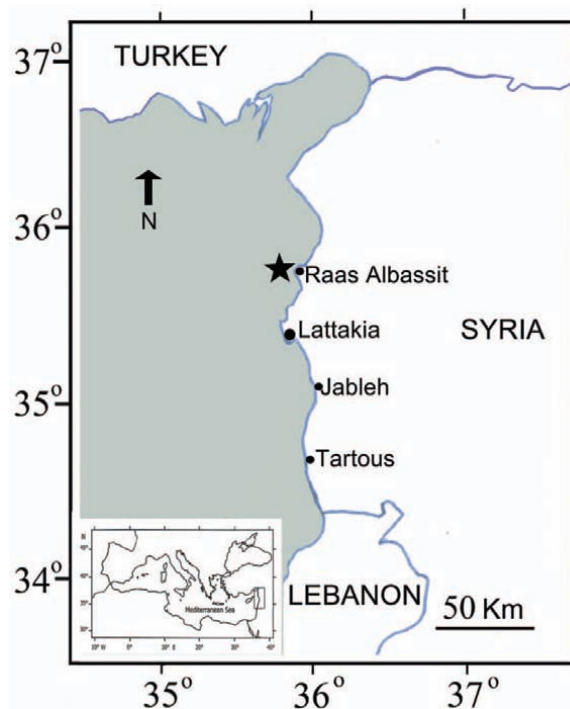
**Abstract.** The authors report in this paper the first record of basking shark, *Cetorhinus maximus* (Gunnerus, 1765), off the coast of Syria (eastern Mediterranean). The specimen was an adult female, 690 cm total length and weighing approximately 2.5 t. It was a pregnant female at the beginning of gestation and contained 34 egg cases. The first description of *C. maximus* egg case is provided with short comments on the reproductive biology of the species.

**Keywords:** Chondrichthyes, Cetorhinidae, *Cetorhinus maximus*, first record, egg case, Syrian coast, Mediterranean

Basking shark, *Cetorhinus maximus* (Gunnerus, 1765), is a large shark, distributed worldwide, generally found in boreal to warm temperate waters, frequently sighted in open seas, and which often enters into enclosed bays where it is usually captured; additionally, some dead specimens are found stranded on the beach (Compagno 1984). The presence of basking shark is known in the Mediterranean, but most of the reported captures were from western and central areas (Mancusi et al. 2005), especially off the Maghreb coast (Capapé et al. 2005) and the Adriatic Sea (Lipej et al. 2000, Soldo et al. 2008).

Conversely, *C. maximus* appears to be less frequently captured in the eastern Mediterranean basin, from the Turkish coast (Kabasakal 2002, Kabasakal and Kabasakal 2004, Golani et al. 2006) to Levant Basin (Golani 2005). It has hitherto not been reported off Lebanon (Mouneimne 1977, 1979) and Syria, where through surveys conducted from January 2000 to date, 42 elasmobranch species have already been identified (Saad et al. 2004, Ali et al. 2010).

During these surveys, a female *C. maximus* was captured on 20–21 April 2012 by gill-net, spread from the beach to 150 m in the sea, at a depth of approximately 10 metres, off Raas Albassit, city located in northern Syria (35°50'50"N, 35°48'16"E; Fig. 1). The specimen was a female measuring 6.90 m in total length and weighing 2.5 t (Fig. 2). Its identification was aided by Bigelow and Schroeder (1948),



**Fig. 1.** Map of the Mediterranean showing Syria and map of the coast of Syria pointing out the capture site of the pregnant female *Cetorhinus maximus* (black star)

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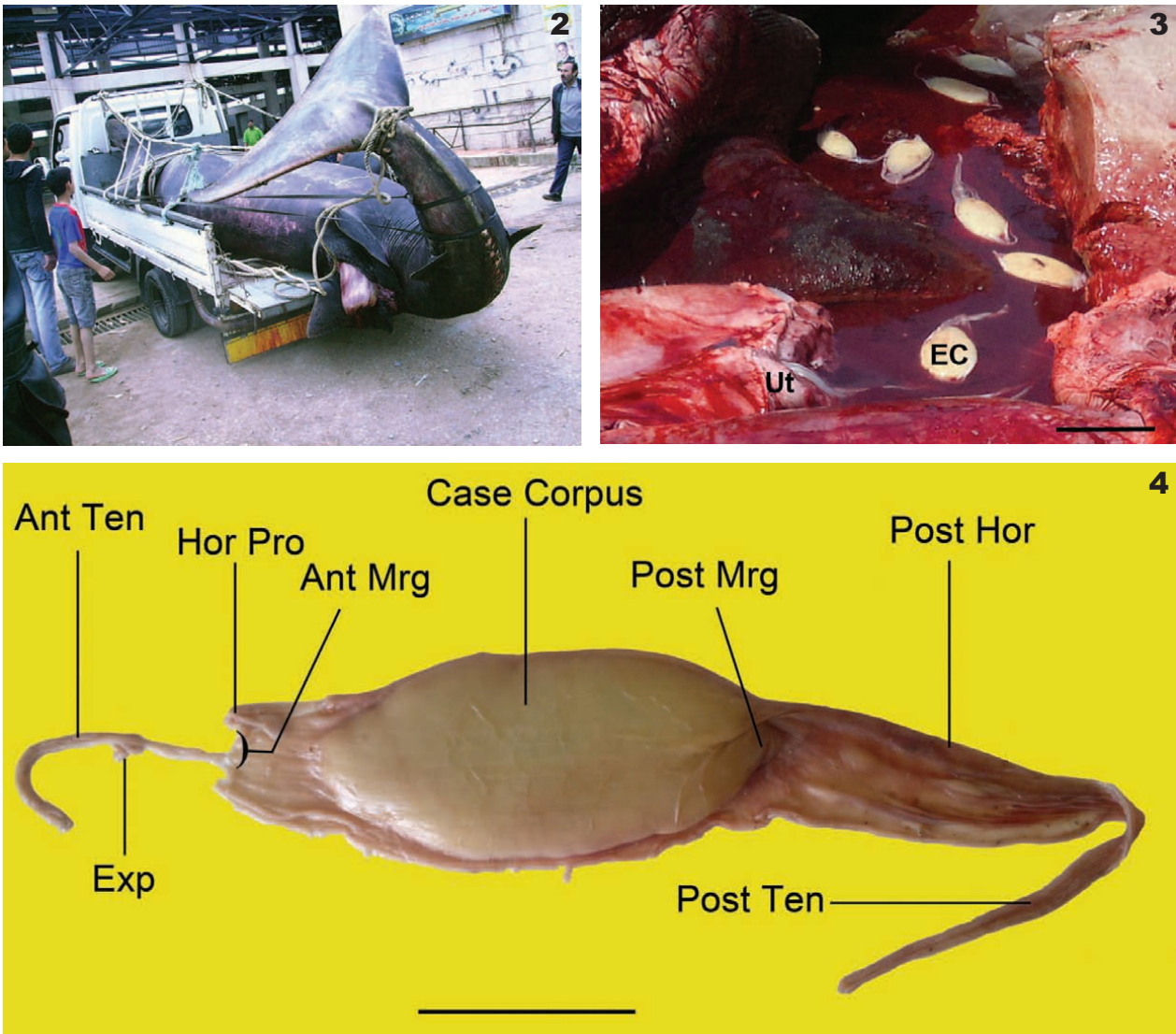
Compagno (1984), and Quéro (1984), based on: 5 extremely huge gill-slits virtually encircling the head, gill arches with bristle-like rakers, pointed snout, large sub-terminal mouth with numerous minute hooked teeth, caudal peduncle with strong lateral keels, lunate caudal fin nearly asymmetrical. Measurements were carried out directly at Lattakia fish market, following methodology of Compagno (1984) for sharks, and recorded to the nearest cm. The absolute values were also related to the percentage of total length (Table 1).

The female was cut up in a hurry by fishermen and rapidly sold, the abdominal cavity was opened and 34 egg cases were found in the body liquids (Fig. 3). Unfortunately, a single egg case could be collected; it was deposited in the Ichthyological Collection of the Marine Sciences Laboratory, Agriculture Faculty, Tishreen University of Syria, under the catalogue number 251 M.S.L. (Fig. 4).

The egg case was studied and presented herein, following the methodology proposed by Oddone et al.

(2006) and Oddone and Vooren (2008) for skate species. The egg case, 96 mm length and 46 mm width, was globally ovoid, symmetrically convex with a highest point centrally located; it was keeled longitudinally, and its anterior margin was curved, with on each corner a horn-like short projection, followed by anterior tendril of 87 mm length, rounded in cross section of 3 mm diameter, exhibiting two short curved expansions. The case corpus was followed by a posterior horn, sharp and triangular, measuring 68 mm in length, 26 mm in maximum width, and 12 mm in minimum width, ended by a filament measuring 90 mm in length, 8 mm in maximum width and 4 mm in minimum width. The complete egg case weighed 40.39 g. Two empty cases weighed 9.49 and 9.37 g, respectively with an average of  $9.43 \pm 0.08$  g, so the egg weighed 30.96 g approximately.

This large female *C. maximus* contained egg cases in the uterus, was at the beginning of the gestation, and it could be



**Figs. 2–4.** Pregnant female of *Cetorhinus maximus* captured off the coast of Syria; **Fig. 2.** Entire specimen loaded on a truck; **Fig. 3.** Egg cases (EC) outside the uterus (Ut); Scale bar = 100 mm; **Fig. 4.** Single egg case; Ant Ten = anterior filament; Ant Mrg = anterior margin; Exp = expansions; Hor Pro = horny process; Post Ten = posterior filament; Post Hor = posterior horn; Post Mrg = posterior margin; Scale bar = 50 mm

Table 1

Morphometric measurements (absolute and relative values) recorded in the pregnant female of *Cetorhinus maximus* captured off the coast of Syria

Morphometric character	Value	
	Absolute [cm]	Relative [% TL]
Total length	690	100.0
Pre-second dorsal fin length	475	68.8
Pre-first dorsal-fin length	244	35.4
Head length	128	18.6
Pre-branchial length	90	13.0
Pre-spiracular length	62	9.0
Pre-orbital length	32	4.6
Pre-pelvic-fin length	375	54.3
Pre-anal-fin length	485	70.3
Pelvic-fin anal-fin space	74	10.7
Pre-narial length	18	2.6
Pre-oral length	27	3.9
Eye length	7	0.9
Eye ball length	5	0.7
Cornea	2	0.2
Pectoral fin anterior margin	120	17.4
Pectoral-fin base	40	5.8
Pectoral-fin inner margin	24	3.5
Pectoral-fin posterior margin	105	15.2
Dorsal caudal-fin margin	143	20.7
Preventral caudal-fin margin	95	13.8
Upper postventral caudal-fin margin	90	13.0
Lower postventral caudal-fin margin	68	9.9
Caudal-fin fork width	52	7.5
Terminal caudal-fin margin	21	3.0
Terminal caudal-fin lobe	25	3.6
First dorsal-fin anterior margin	52	7.5
First dorsal-fin base	55	8.0
First dorsal-fin height	44	6.4
First dorsal-fin inner margin	15	2.2
First dorsal-fin posterior margin	58	8.4
Second dorsal-fin anterior margin	25	3.6
Second dorsal-fin base	18	2.6
Second dorsal-fin inner margin	27	3.9
Second dorsal-fin posterior margin	22	3.2
Pelvic-fin anterior margin	50	7.2
Pelvic-fin base	58	8.4
Pelvic-fin height	28	4.1
Pelvic-fin inner margin [length]	15	2.2
Pelvic-fin posterior margin [length]	58	8.4
Anal-fin length	23	3.3
Anal-fin anterior margin	24	3.5
Anal-fin base	28	4.1
Anal-fin inner margin	16	2.3

cont. **Table 1**

Morphometric character	Value	
	Absolute [cm]	Relative [% TL]
Anal-fin posterior margin	21	3.0
Abdomen height	110	15.9
Second dorsal-fin insertion anal-fin insertion	7	1.0
Mouth length	42	6.1
Mouth width	94	13.6
Nostril width	6	0.9
Internarial space	13	1.9
Tail width	65	9.4
Caudal-fin peduncle width	29	4.2

%TL = percentage of total length.

considered as a pregnant specimen, the second recorded to date. The first record was made by a Norwegian fisherman who caught a female ready to give birth to large near-term embryos (Sund 1943). Catches of basking sharks exclusively concern non-pregnant females (Watkins 1958, Mancusi et al. 2005). Matthews (1950) recorded a non-pregnant female *C. maximus* having large number of small eggs in their ovaries. Compagno (1984) and Kunzlik (1988) suggest that the species is ovoviviparous and has uterine cannibalism like other lamnoids, with embryos feeding on the small eggs. Such hypothesis is not suitable due to the fact that the species exhibits minute teeth and is planktonophagous. Additionally, the eggs found in this female—rather large and heavy—showed that *C. maximus* is unable to assume this reproductive strategy. On the other hand, *C. maximus* is not a true ovoviviparous elasmobranch species such as whale shark, *Rhincodon typus* Smith, 1828, in which embryo development is protected by a rigid capsule in female uterus (Joung et al. 1996).

At maturity, female basking sharks reach the size of 8.1–9.8 m (Compagno 1984). The specimen described in the present paper showed that females could mature at smaller-size, which would be consistent with Bigelow and Schroeder (1948) who noted that they matured between the length of 457 and 610 cm. Gilmore (1993) noted that parturition size occurred when the embryos reached 150 cm total length and the smallest free-swimming specimen was 165 cm total length. Compagno (1984) noted that gestation period of basking shark lasted between 12 and 36 months. The small size and low weight of eggs collected and—on the contrary—the large size of neonates (observed elsewhere) suggest a substantial transfer of nutrients from the mother to the embryos. Such transfers probably require a long period of time. The length of this period, however, still remains obscure and requires further records to be clearly assessed. The presently reported fecundity per litter (34 eggs) does not appear very low for an elasmobranch species, for instance, Capapé (1985) recorded a minimum fecundity of one specimen per litter in gulper shark, *Centrophorus granulosus* (Bloch and

Schneider 1801). This first record of *C. maximus* off the Syrian coast confirms the rarity of the species throughout the Mediterranean Sea. The capture of a pregnant female in shallow coastal waters is probably occasional, but remains also questionable with special regard to an isolate and declining population still existing in the region.

#### REFERENCES

- Ali M., Saad A., Ben Amor M.M., Capapé C. 2010. First records of the Honeycomb Stingray, *Himantura uarnak* (Forskål, 1775), off the Syrian coast (eastern Mediterranean) (Chondrichthyes: Dasyatidae) Zoology in the Middle East **49**: 104–106.
- Bigelow H.B., Schroeder W.C. 1948. Sharks. Pp. 59–546. In: Tee-Van J., Breder C.M., Hildebrand S.F., Parr A.E., Schroeder W.C. (eds.) Fishes of the western North Atlantic. Memoirs of the Sears Foundation for Marine Research No. 1. Part 1. Yale University, New Haven, CT, USA.
- Capapé C. 1985. Propos sur la fécondité des poissons sélagiens. Archives de l'Institut Pasteur de Tunis **62** (3): 305–328.
- Capapé C., Hemida F., Bensaci J., Saïdi B., Bradai M.N. 2005. Records of basking sharks, *Cetorhinus maximus* (Gunnerus, 1765) (Chondrichthyes: Cetorhinidae) off the Maghrebin shore (southern Mediterranean): a survey. Annales, series Historia Naturalis **13** (1): 13–18.
- Compagno L.V.J. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of sharks species known to date. Part 2. Carcharhiniformes. FAO Fisheries Synopsis No. 125, Volume 4, Part 1. FAO, Rome, Italy.
- Gilmore R.G. 1993. Reproductive biology of lamnoid sharks. Environmental Biology of Fishes **38** (1–3): 95–114. DOI: 10.1007/BF00842907
- Golani D. 2005. Check-list of the Mediterranean fishes of Israel. Zootaxa **2005** (947): 1–90.
- Golani D., Oztürk B., Basusta N. 2006. Fishes of the eastern Mediterranean. Turkish Marine Research Foundation, Istanbul, Turkey.
- Joung S.-J., Chen C.-T., Clark E., Uchida S., Huang W.Y.P. 1996. The whale shark, *Rhincodon typus*, is a livebearer: 300 embryos found in one 'magamma' supreme.

- Environmental Biology of Fishes **46** (3): 219–233.  
DOI: 10.1007/BF00004997
- Kabasakal H.** 2002. Capture of a female basking shark, *Cetorhinus maximus* (Gunnerus, 1765), from southern Turkey. *Annales, series Historia Naturalis* **12** (1): 31–34.
- Kabasakal H., Kabasakal E.** 2004. Sharks captured by commercial fishing vessels off the coast of Turkey in the northern Aegean Sea. *Annales, series Historia Naturalis* **14** (2): 171–180.
- Kunzlik P.A.** 1988. The basking shark. Scottish Fisheries Information. Pamphlet No. 14. Department of Agriculture and Fisheries for Scotland, Aberdeen.
- Lipej L., Makovec T., Orlando M., Ziza V.** 2000. Occurrence of the basking shark, *Cetorhinus maximus* (Gunnerus, 1765), in the waters off Piran (Gulf of Trieste, Northern Adriatic). *Annales, series Historia Naturalis* **10** (2): 211–216.
- Oddone M.C., Mesa A., De Amorim A.F.** 2006. The egg capsule of *Rioraja agassizi* (Müller & Henle) (Elasmobranchii, Rajidae), endemic to the SW Atlantic. *Pan-American Journal of Aquatic Sciences* **1** (2): 41–43.
- Oddone M.C., Vooren C.M.** 2008. Comparative morphology and identification of egg capsules of skate species of the genera *Atlantoraja* Menni, 1972, *Rioraja* Whitley, 1939 and *Sympterygia* Müller & Henle, 1837. *Arquivos de Ciências do Mar* **41** (2): 5–13.
- Mancusi C., Clò S., Affronte M., Bradai M.M., Hemida F., Serena F., Soldo A., Vacchi M.** 2005. On the presence of basking shark (*Cetorhinus maximus*) in the Mediterranean Sea. *Cybiurn* **29** (4): 399–405.
- Matthews L.H.** 1950. Reproduction in the basking shark, *Cetorhinus maximus* (Gunner). *Philosophical Transactions of the Royal Society of London: B Biological Sciences* **243** (612): 247–316.  
DOI: 10.1098/rstb.1950.0003
- Mouneimne N.** 1977. Liste des poissons de la côte du Liban (Méditerranée orientale). *Cybiurn* 3 ème série **1**: 37–66.
- Mouneimne N.** 1979. Poissons nouveaux pour les côtes libanaises (Méditerranée orientale). *Cybiurn* 3 ème série, **6** : 105–110.
- Quéro J.C.** 1984. Cetorhinidae. Pp. 87–88. *In*: Whitehead P.J.P., Bauchot, M.L., Hureau J.C., Nielsen J., Tortonese, E. (eds.) *Fishes of the north-western Atlantic and the Mediterranean*. Vol. I. UNESCO, Paris, France.
- Saad A., Séret B., Ali M.** 2004. Liste commentée des Chondrichthyens de Syrie. Rapport de la Commission internationale pour l'exploration scientifique de la mer Méditerranée **37**: 430.
- Soldo A., Lucic D., Jardas I.** 2008. Basking shark (*Cetorhinus maximus*) occurrence in relation to zooplankton abundance in the eastern Adriatic Sea. *Cybiurn* **32** (2): 103–109.
- Sund O.** 1943. Et Brugdebrasel. *Naturen* **67**: 285–286.
- Watkins A.** 1958. The sea my hunting ground. Heinemann, London, UK.

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