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A CASE OF HERMAPHRODITISM IN THE COMMON EAGLE RAY
MYLIOBATIS AQUILA (CHONDRICHTHYES: MYLIOBATIDAE), REPORTED
FROM THE TUNISIAN COAST (CENTRAL MEDITERRANEAN)

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ABSTRACT

A common eagle ray Myliobatis aquila (Linnaeus, 1758) exhibiting abnormal male and female traits on the left side of the genital apparatus was captured off the north-eastern Tunisian coast. As the specimen could not be considered a functioning adult male and/or female, it was classified as an abnormal hermaphrodite. This is the latest of the 16 hermaphrodite batoid specimens known to date.

Key words: Chondrichthyes, *Myliobatis aquila*, abnormal hermaphrodite, north-eastern Tunisian coast

CASO DI ERMAFRODITISMO NELL'AQUILA DI MARE *MYLIOBATIS AQUILA*
(CHONDRICHTHYES: MYLIOBATIDAE) DALLA COSTA TUNISINA
(MEDITERRANEO CENTRALE)

Sintesi

Un'aquila di mare Myliobatis aquila (Linnaeus, 1758), con tratti anormali maschili e femminili sul lato sinistro dell'apparato genitale, è stata catturata al largo della costa nord-orientale della Tunisia. Poiché l'esemplare non può essere considerato né femmina né maschio adulto funzionale, è stato classificato come ermafrodito anormale. Questo è l'ultimo dei 16 esemplari ermafroditi batoidi conosciuti fino ad oggi.

Parole chiave: Chondrichthyes, *Myliobatis aquila*, ermafrodito anormale, costa tunisina nord-orientale

INTRODUCTION

The common eagle ray *Myliobatis aquila* (Linnaeus, 1758) is distributed over the eastern Atlantic from northern regions to Southern Africa, the frequency of its capture varying by areas (McEachran & Capapé, 1984). The species is also reported in the Mediterranean Sea; it is considered common off the southern coast of France (Capapé et al., 2006) and in southern areas, especially off the Maghreb shore (Rafrafi-Nouira, 2016).

M. aquila occurs throughout the Tunisian coast (Bradai et al., 2004) and has also been recorded in brackish areas, such as the Lagoon of Bizerte (El Kamel et al., 2009). In the wake of a collaboration with experienced local fishermen, some common eagle rays were collected, among them a specimen with a visible asymmetry in the size of the claspers. This specimen was delivered to our laboratory, where it was thoroughly dissected and examined. This paper presents, describes and comments on our observations.

MATERIAL AND METHODS

On 27 November, the specimen was captured by means of a 1000 m long longline with 0.8 m long snoods spaced at 5 m intervals, each carrying 13 hooks baited with common cuttlefish, *Sepia officinalis* Linnaeus, 1758. The capture occurred off Ras Jebel (Fig. 1), in north-eastern Tunisia, at 37° 14' 08 04" N and 10° 10' 53 71" E, at a depth of 20 m, on sandy-muddy bottom. The specimen had the tail cut off by the fishermen after the capture to avoid sting injury, however, its weight was recorded to the nearest gram and its morphometric measurements to the nearest millimetre, all of which

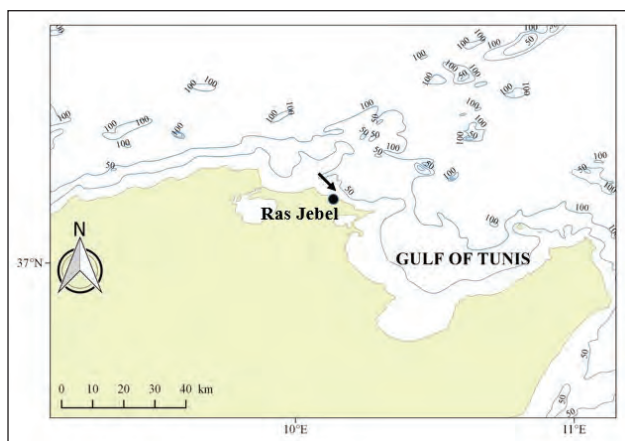


Fig. 1: Map of northern Tunisia indicating the capture site (black arrow) of the abnormal hermaphrodite *Myliobatis aquila* (FSB-Myl-aqui-04).
Sl. 1: Zemljevid severne Tunizije z označeno lokaliteto ulova (črna puščica) abnormalnega hermafrodita morskega goloba (FSB-Myl-aqui-04).

are included in Table 1 with percentages of disc width (% DW). The specimen was preserved in 10% buffered formalin and deposited in the Ichthyological Collection of the Faculté des Sciences of Bizerte (Tunisia) under the catalogue number FSB-Myl-aqui-04.

RESULTS AND DISCUSSION

The specimen was identified as a *Myliobatis aquila* based on a suite of characteristics described by Capapé & Quignard (1974), McEachran & Capapé (1984) and El Kamel et al. (2009).

The present *Myliobatis aquila* reached 430 mm in DW. Its size allowed us to consider it as a mature specimen, as size at maturity for this species in Tunisian waters ranges between 360 and 410 mm in DW (see

Tab. 1: Morphometric measurements in mm with percentages of disc width (% DW) and weight in grams, recorded in the abnormal hermaphrodite *Myliobatis aquila* (FSB-Myl-aqui-04).

Tab. 1: Morfometrične meritve v mm in delež širine diska (% DW) ter masa v gramih pri abnormalnem hermafroditskem primerku vrste *Myliobatis aquila* (FSB-Myl-aqui-04).

Reference	FSB-Myl-aqui-04	
Morphometric measurements	in mm	% DW
Total length	-	-
Disc length	200	46.5
Disc width	430	100.0
Maximum snout width	80	18.6
Snout length	56	13.0
Mouth width	44	10.2
First gill slit	9	2.0
Fifth gill slit	9	2.0
Distance between first gill slits	65	15.1
Distance between fifth gill slits	34	7.9
Pectoral fin anterior margin	204	47.4
Pectoral fin posterior margin	180	41.8
Pectoral fin inner margin	22	5.1
Pelvic fin anterior margin	54	12.5
Pelvic fin posterior margin	42	9.7
Pelvic fin inner margin	16	3.7
Span of pelvic fins	52	12.0
Right clasper	68	15.8
Left clasper	82	19.0
Total weight (in grams)	1029.8	

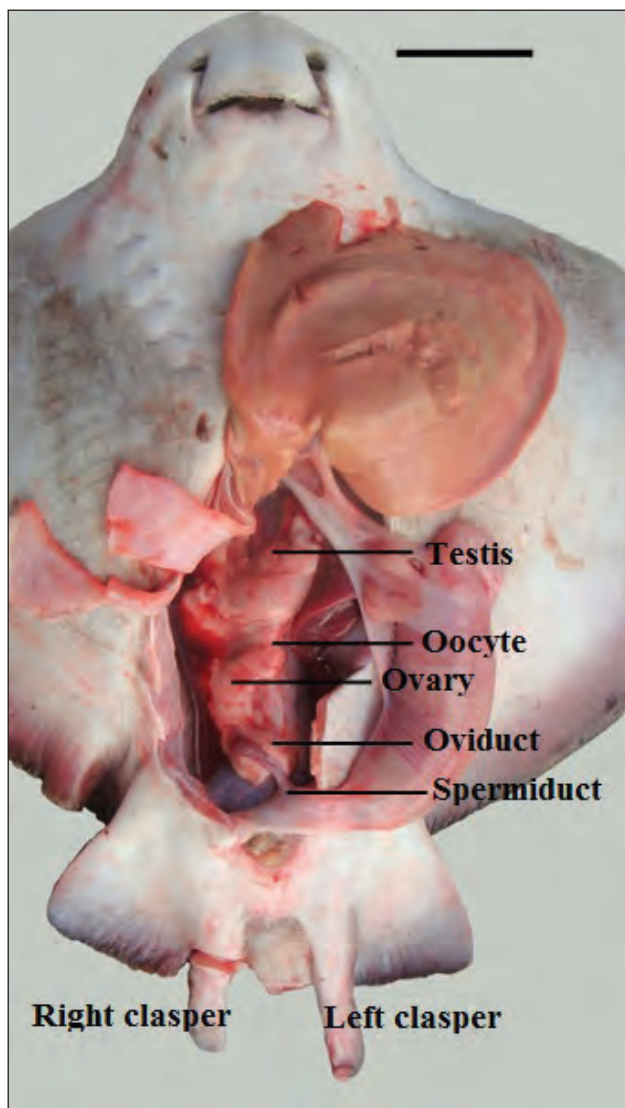


Fig. 2: Dissection of the abdominal cavity of the abnormal hermaphrodite *Myliobatis aquila* (FSB-Myl-aqui-04) showing the male and female reproductive organs on the left side of the genital apparatus.

Sl. 2: Trebušna votlina abnormalnega hermafrodita morskega goloba (FSB-Myl-aqui-04) z moškimi in ženskimi razmnoževalnimi organi na levi strani genitalnega aparata.

Capapé & Quignard, 1974). Conversely, both orbitary surfaces were smooth and missing the horns, the morphological trait only recorded in adult males (Capapé & Quignard, 1974).

A thorough examination of the abdominal cavity revealed a normally developed testis on the right side of the genital apparatus with externally visible spermatozoa (Fig. 2); however, the seminal vesicle contained no sperm and the spermiduct was slightly convoluted. Con-

Tab. 2: Consistency of different morphological traits observed on both sides of the genital apparatus in the abnormal hermaphrodite *Myliobatis aquila* (FSB-Myl-aqui-04) with the three stages of development in normal specimens: the juvenile, sub-adult and adult, following Capapé *et al.* (2007).

Tab. 2: Značilni morfološki znaki na obeh straneh razmnoževalnega aparata pri abnormalnem hermafroditskem primerku morskega goloba *Myliobatis aquila* (FSB-Myl-aqui-04) in opredelitev treh razvojnih stadijev pri normalnih primerkih: mladič, mladostni primerek, odrasli primerek (po Capapé *et al.*, 2007).

Morphological characters of the present specimen	Morphological stages following Capapé <i>et al.</i> (2007)
Size (DW,mm)	Adult
Orbit	Juvenile
Right testis	Adult
Right spermiduct	Sub-adult
Left testis	Adult
Left spermiduct	Juvenile
Left ovary	Adult
Left oviduct	Juvenile

versely, on the left side, both a testis and an ovary were present. Although the left testis appeared normal, the respective spermiduct was inconspicuously developed and thread-like. The ovary exhibited yolked oocytes, undersized in comparison with mature oocytes ready to be ovulated (Capapé *et al.*, 2007), no oviducal gland was visible and the oviduct was thread-like.

As per Atz (1964) and Iglésias (2005), there exist two types of hermaphrodites in chondrichthyans: normal or true hermaphrodites, and abnormal or pseudo hermaphrodites (see Irvine *et al.*, 2002). It appears that normal or true hermaphrodites can – reaching sexual maturity – assume the functions of both the male and the female, while all other cases of hermaphroditism should be defined as abnormal or pseudo-hermaphroditism. In Table 2, we compared the morphology of different traits observed on both sides of the present specimen in order to assess their consistency with the three stages of development in normal specimens: the juvenile, sub-adult and adult (Capapé *et al.*, 2007). Based on the two types of morphology present in the specimen, the *M. aquila* under study could not be considered as a functioning adult male and/or female, but as an abnormal or pseudohermaphrodite specimen. It increases the number of cases of hermaphroditism recorded to date for the batoid species to 16, with 15 previously reported by Capapé *et al.* (2012).

Although Iglesias *et al.* (2005) noted that hermaphroditism is a normal condition in the reproduction of the longhead catshark *Apristurus longicephalus* Nakaya, 1975, the batoid species, to our knowledge, does not display a similar pattern. The causes of hermaphroditism in chondrichthyans remain obscure; however, Atz (1964)

suggested they may involve endogenous, hormonal or genetic factors as in other vertebrate species. The impact of unfavourable environmental conditions and pollutants, which induce stress in the wild, cannot be ruled out completely either (Sfakianakis *et al.*, 2004), but that has not been clearly assessed yet (Capapé *et al.*, 2012).

PRIMER HERMAFRODITIZMA PRI NAVADNEM MORSKEM GOLOBU *MYLIOBATIS AQUILA* (CHONDRICHTHYES: MYLIOBATIDAE) OB TUNIZIJSKI OBALI (OSREDNJE SREDOZEMSKO MORJE)

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POVZETEK

*Ob severovzhodni tunizijski obali je bil ujet primerek navadnega morskega goloba *Myliobatis aquila* (Linnaeus, 1758), pri katerem so bili vidni deli ženskega in moškega spolnega aparata. Primerek je bil opredeljen kot abnormalni hermafrodit, saj ni funkcioniral ne kot odrasel moški ali ženski primerek. Gre za zadnji primer izmed 16 znanih za morske skate.*

Ključne besede: Chondrichthyes, *Myliobatis aquila*, abnormalni hermafrodit, severovzhodna tunizijska obala

REFERENCES

- Atz, J.W. (1964):** Intersexuality in fishes. In: Armstrong, C.N. & A.J. Marshall (eds): Interspecificity in vertebrates including man. Academic Press, London, pp. 145-232.
- Bradaï, M. N., J.-P. Quignard, A. Bouaïn, O. Jarboui, A. Ouannes-Ghorbel, L. Ben Abdallah, J. Zaouali & S. Ben Salem (2004):** Ichtyofaune autochtone et exotique des côtes tunisiennes: recensement et biogéographie. *Cybium*, 28(4), 315-328.
- Capapé, C. & J.-P. Quignard (1974):** Dimorphisme sexuel et observations sur *Myliobatis aquila* (L., 1758). Contribution à l'étude du genre *Myliobatis*, Cuvier, 1817. *Ann. Mus. Civ. Sto. Nat., Genova*, 50, 1-27.
- Capapé, C., O. Guélorget, Y. Vergne, A. Marquès & J.-P. Quignard (2006):** Skates and rays (Chondrichthyes) from waters off the Languedocian coast (southern France, northern Mediterranean). *Annales, ser. Hist. Nat.* 16(2), 166-178.
- Capapé, C., O. Guélorget, Y. Vergne & J.-P. Quignard (2007):** Reproductive biology of the common eagle ray, *Myliobatis aquila* (Chondrichthyes: Myliobatidae) from the coast of Languedoc (Southern France, northern Mediterranean). *Vie Milieu*, 53(3), 25-30.
- Capapé, C., O. El Kamel-Moutalibi, N. Mnasri, M. Boumaïza & C. Reynaud (2012):** A case of hermaphroditism in Tortonese's stingray, *Dasyatis tortonesei* (Elasmobranchii: Rajiformes: Dasyatidae) from the Lagoon of Bizerte, Tunisia. *Acta Ichthyol. Piscat.*, 42(2), 141-149.
- El Kamel, O., N. Mnasri, J. Ben Souissi, M. Boumaïza, M.M. Ben Amor & C. Capapé (2009):** Inventory of elasmobranch species caught in the Lagoon of Bizerte (Northeastern Tunisia: central Mediterranean). *Pan-Am. J. Aquat. Sci.*, 4(4), 382-412.
- Iglésias, S.P., D.Y. Sellos & K. Nakaya (2005):** Discovery of a normal hermaphroditic chondrichthyan species: *Apristurus longicephalus*. *J. Fish. Biol.*, 66(2), 417-428.
- Irvine, S.B, L.J.B. Laurenson & J.D. Stevens (2002):** Hermaphroditism in the southern lantern shark, *Etmopterus granulosus*. 21-26 July 2002. University of British Columbia, Vancouver, Canada.
<http://www-heb.pac.dfompo.gc.ca/congress/2002/DeepSea/Irvine2.pdf>
- McEachran, J.D & C. Capapé (1984):** Myliobatidae. In: Whitehead, P.J.P., M.L. Bauchot, J.-C. Hureau, J. Nielsen & E. Tortonese (eds): *Fishes of the North-eastern Atlantic and the Mediterranean*, Vol. 1. Unesco, Paris, pp. 205-209.
- Rafrafi-Nouira, S. (2016):** Catalogue raisonné des espèces de poissons capturées devant Ras Jebel et autres régions marines de Tunisie septentrionale: aspects morphologiques, biométriques et bio-écologiques. Thesis, University of Bizerte (Tunisia), 509 pp.
- Sfakaniakis, D.G., G. Koumoundouros G., P. Divanach & M. Kentouri (2004):** Osteological development of the vertebral column and of the fins in *Pagellus erythrinus* (L. 1758). Temperature effects on the development plasticity and morpho-anatomical abnormalities. *Aquaculture*, 232(1-4), 407-424.