

First confirmed record of the Halave's Guitarfish, *Rhinobatos halavi* (Forsskål, 1775) (Chondrichthyes: Rhinobatidae) in the Mediterranean Sea with a description of a case of albinism in elasmobranchs

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Abstract: A specimen of the Halave's guitarfish, *Rhinobatos halavi* (Forsskål, 1775) (Chondrichthyes: Rhinobatidae), is recorded off Zarzis, in the Gulf of Gabès, southern Tunisia, confirming the occurrence of this species in the Mediterranean Sea. This species is common in the Red Sea and its presence in the Mediterranean is probably due to migration through the Suez Canal, i.e. Lessepsian migration *sensu* Golani et al. (2002). *R. halavi* is the second Lessepsian immigrant elasmobranch species known in the Mediterranean Sea. Moreover, this specimen is the first albino rhinobatid described to date.

Résumé: Première observation confirmée d'une raie guitare, *Rhinobatos halavi* (Forsskål, 1775) (Chondrichthyes : Rhinobatidae) en Méditerranée avec la description d'un nouveau cas d'albinisme chez les Elasmobranches. Un spécimen de raie guitare, *Rhinobatos halavi* (Forsskål, 1775), est signalé pour la première fois au large de Zarzis, dans le golfe de Gabès, Tunisie méridionale, ce qui confirme la présence de l'espèce en Méditerranée. Elle probablement due à une migration de l'espèce de la mer Rouge à travers le canal de Suez, (migration lessepsienne *sensu* Golani et al. (2002). *R. halavi* est le second élasmobranche immigrant lessepsien connu en mer Méditerranée. En outre ce spécimen est le premier rhinobatidé albinos décrit à cette date.

Keywords: Rhinobatidae • *Rhinobatos halavi* • Mediterranean Sea • Tunisia • Lessepsian migration • Albinism.

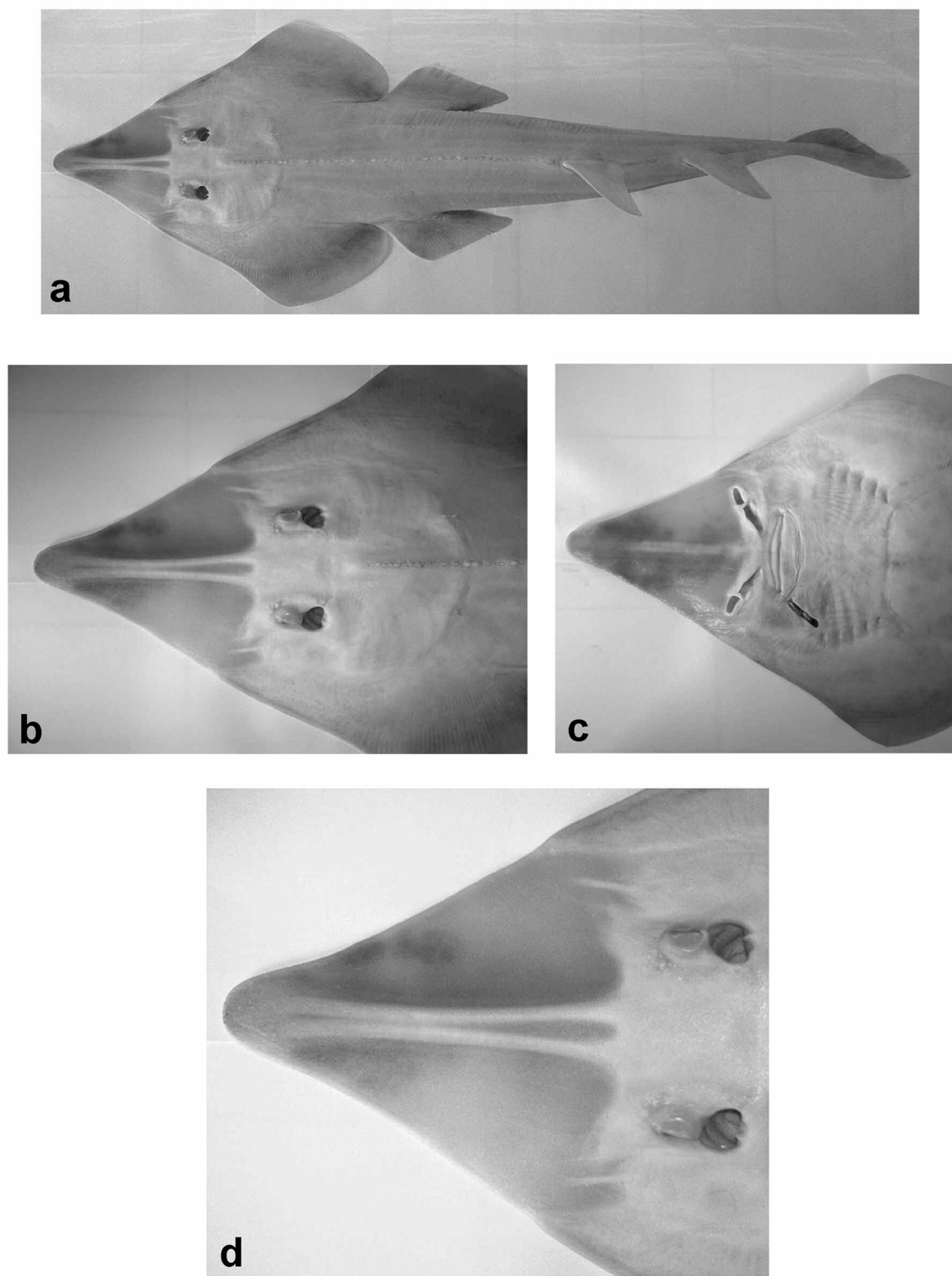


Figure 1. *Rhinobatos halavi*, 1023 mm TL, (RHI-Rhh-01), from the Gulf of Gabès, southern Tunisia, central Mediterranean. **A.** Dorsal view. **B.** Head in dorsal view. **C.** Mouth-nasal region in ventral view. **D.** Snout with rostrum in dorsal view.

Figure 1. *Rhinobatos halavi* en face dorsale. Longueur totale 1023 mm (RHI-Rhh-01), capturé au Golfe de Gabès, sud de la Tunisie, Méditerranée centrale. **A.** Vue dorsale. **B.** Tête en vue dorsale. **C.** Bouche : région-nasale. **D.** Museau avec rostre en vue dorsale.

Introduction

The family Rhinobatidae is represented by two species of the genus *Rhinobatos* in the Mediterranean Sea (McEachran & Capapé, 1984; Quignard & Tomasini, 2000): the Blackchin guitarfish *Rhinobatos cemiculus* E. Geoffroy Saint-Hilaire, 1817 and the Common guitarfish *R. rhinobatos* (Linnaeus, 1758). They are commonly captured in the southern and eastern Mediterranean (Capapé et al., 1981; Capapé & Zaouali, 1994; Golani, 1996). A third species, the Halave's guitarfish, *Rhinobatos halavi* (Forsskål, 1775), from the Red Sea (Bonfil & Abdallah, 2004), was reported by Tortonese (1951) off Mediterranean Egypt; however, Golani et al. (2002) excluded it from the exotic species recorded in the Mediterranean, since no specimen was available for confirmation.

Results and discussion

On the night of 4 September 2004, a 1023 mm total length (TL) female Halave's guitarfish weighing 3005 g (Fig. 1), was captured 16 miles east to Zarzis (33°29'N, 11°25'E), in the Gulf of Gabès, southern Tunisia (Fig. 2). The specimen was caught on a longline at a depth between 28 and 30 m, on sandy substrate. According to information provided by the fishermen, other elasmobranch species were included in the same catch, such as *R. cemiculus* E. Geoffroy Saint-Hilaire, 1817, *R. rhinobatos* (Linnaeus, 1758), *Pteromylaeus bovinus* (E. Geoffroy Saint-Hilaire, 1817), *Dasyatis pastinaca* (Linnaeus, 1758) and *D. tortonesei* Capapé, 1975. However, for all of these species, no substantial information about the numbers caught was given by the fishermen.

The present specimen of *R. halavi* is the first albino rhinobatid known to date; it is preserved in 5% buffered formalin solution and deposited in the Ichthyological Collection of the Institut National Agronomique de Tunisie, catalogue number RHI-Rhh-01.

Measurements in mm and as percent of TL and counts *pro parte* were made according to Capapé et al. (1981) and Randall & Compagno (1995), and are compared with those of specimens of *R. cemiculus* and *R. rhinobatos* from Tunisian waters, in order to point out differences between the three rhinobatid species (Table 1).

Description of *Rhinobatos halavi*: Disc sub-triangular, its width 3.04 in TL; snout moderately elongated, broad and bluntly round tipped, anterior margins slightly convex at level of eyes. Rostral ridges broad, close together most of their length, diverging anteriorly and posteriorly. Preorbital length 7.1 in TL; interspiracular distance 2.8 in snout length. Orbit length 7.5 in pre-orbital length. Orbit width 1.1 in orbit length. Snout angle in front of eyes 60°. Snout

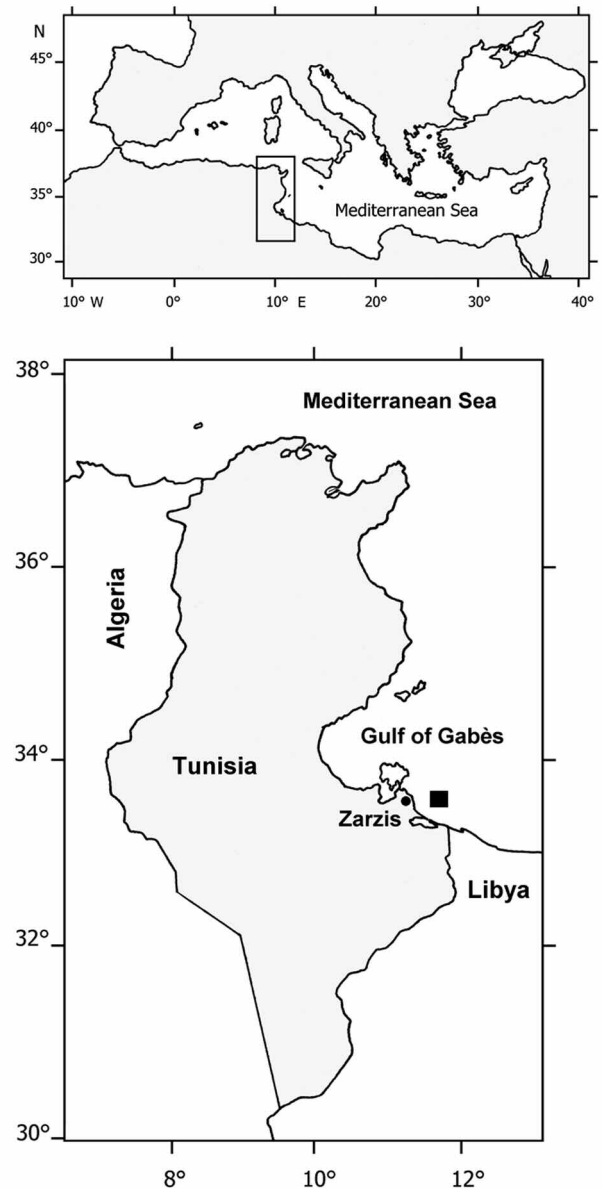


Figure 2. Map of Tunisia, showing the collection site of *Rhinobatos halavi*.

Figure 2. Carte de la Tunisie, montrant le site de capture de *Rhinobatos halavi*.

tip to eye practically equal to snout tip to mouth. Mouth slightly arched, its width 2.5 in pre-oral snout length. Nostrils length nearly 1.5 in mouth width. Anterior nasal lobe not extending onto the internasal space; posterior nasal flap narrow. Spiracles with two cutaneous folds on posterior margin, the inner one the smaller. Spiracle length 2.6 in interspiracular width, slightly larger than third and fourth gill slit. Fifth gill slit about 2/3 of second and third gill slit. Width between first gill slit span of pelvic fin 2.51 in tail length. Tail small, its width the same to about origin

Table 1. *Rhinobatos halavi*. Morphometric measurements (in mm) and as percentage of total length (% TL) of the specimen caught in Tunisian waters (RHI-Rhh-01). Comparison with *Rhinobatos cemiculus* and *R. rhinobatos* from the same area.

Tableau 1. *Rhinobatos halavi*. Caractéristiques morphométriques (en mm) et en pourcentage de la Longueur totale (% TL) du spécimen capturé dans les eaux Tunisiennes (RHI-Rhh-01). Comparaison avec *Rhinobatos cemiculus* et *R. rhinobatos* pêchés dans la même zone.

Species Specimen	<i>Rhinobatos halavi</i> RHI-Rhh-01		<i>Rhinobatos cemiculus</i> RHI-Rhc-02		<i>Rhinobatos rhinobatos</i> RHI-Rhr-01	
Proportions	mm	%TL	mm	%TL	mm	%TL
Total length	1023.0	100	823.0	100	788.0	100
Disc length	407.0	39.8	335.0	40.7	293.0	37.2
Disc width (DW)	336.0	32.8	271.0	32.9	237.0	30.1
Disc depth	55.0	5.4	48.0	5.8	34.0	4.3
Orbit length	19.0	1.9	17.3	2.1	26.7	3.4
Orbit width	17.5	1.7	17.3	2.1	26.7	3.4
Cornea	10.8	1.1	10.0	1.2	18.0	2.3
Snout length	143.5	14.0	127.7	15.5	95.9	12.2
Inter-orbital width	44.0	4.3	34.9	4.2	29.0	3.7
Spiracle length	19.4	1.9	15.9	1.9	18.5	2.3
Spiracle width	15.0	1.5	12.0	1.5	10.8	1.4
Inter-nasal width	76.0	7.4	67.0	8.1	50.2	6.4
Nasal curtain	29.4	2.9	27.3	3.3	21.5	2.7
Nostril width	6.9	0.7	6.5	0.8	6.2	0.8
Nostril length	43.9	4.3	37.1	4.5	27.8	3.5
Inter-spiracular width	50.6	4.9	41.9	5.1	37.4	4.7
Pre-oral length	167.2	16.3	141.1	17.1	113.5	14.4
Mouth width	65.9	6.4	60.0	7.3	55.7	7.1
First gill slit	15.6	1.5	12.4	1.5	10.0	1.3
Second gill slit	17.6	1.7	13.6	1.7	10.5	1.3
Third gill slit	17.7	1.7	12.4	1.5	10.2	1.3
Fourth gill slit	15.8	1.5	12.2	1.5	9.8	1.2
Fifth gill slit	11.2	1.1	10.0	1.2	5.5	0.7
Width between first gill slit	129.3	12.6	111.0	13.5	90.9	11.5
Width between fifth gill slit	94.3	9.2	78.9	9.6	70.2	8.9
Snout tip to eye	167.6	16.4	138.0	16.8	104.0	13.2
Snout tip to mouth	168.3	16.5	153.0	18.6	120.6	15.3
Snout tip to first gill slit	230.0	22.5	196.4	23.9	162.2	20.6
Snout tip to fifth gill slit	272.0	26.6	228.7	27.8	189.5	24.0
Snout tip to pelvic fin	395.0	38.6	315.0	38.3	280.0	35.5
Snout tip to vent	419.0	41.0	345.0	41.9	300.0	38.1
Pectoral fin anterior margin	320.0	31.3	271.0	32.9	235.0	29.8
Pectoral fin posterior margin	144.0	14.1	117.8	14.3	106.9	13.6
Pectoral fin inner margin	29.9	2.9	19.6	2.4	21.4	2.7
Pelvic fin anterior margin	78.0	7.8	68.3	8.3	60.5	7.7
Pelvic fin posterior margin	104.7	10.2	65.6	8.0	68.7	8.7
Pelvic fin inner margin	67.7	6.6	45.6	5.5	54.2	6.9
Span of pelvic fins	225.0	22.0	185.8	22.6	167.3	21.2
Tail base width	115.9	11.3	85.8	10.4	79.0	10.0
Tail base depth	41.1	4.0	40.0	4.9	33.8	4.3
Tail length	564.0	55.1	452.0	54.9	464.0	58.9
Snout tip to first dorsal	607.0	59.3	482.0	58.6	435.0	55.2
Snout tip to second dorsal	741.0	72.4	593.0	72.1	572.0	72.6
Snout tip to caudal dorsal origin	844.0	82.5	680.0	82.6	665.0	84.4
Snout tip to caudal ventral origin	868.0	84.8	700.0	85.1	688.0	87.3
Pelvic fin axil to first dorsal	134.0	13.1	84.7	10.3	92.5	11.7
Caudal superior	176.5	17.3	142.9	17.4	123.4	15.7
Caudal inferior	77.3	7.6	52.5	6.4	54.3	6.9
Caudal posterior	92.3	9.0	84.5	10.3	61.4	7.8
First dorsal anterior edge	104.7	10.2	84.7	10.3	78.7	10.0

First dorsal posterior edge	61.5	6.0	55.8	6.8	54.3	6.9
First dorsal inner edge	30.6	3.0	24.2	2.9	17.8	2.3
First dorsal base	46.2	4.5	38.4	4.7	42.8	5.4
First dorsal fin height	89.3	8.7	71.9	8.7	66.3	8.4
Second dorsal anterior edge	104.1	10.2	85.0	10.3	77.2	9.8
Second dorsal posterior edge	61.7	6.0	58.7	7.1	52.6	6.7
Second dorsal inner edge	23.1	2.3	20.0	2.4	16.4	2.1
Second dorsal base	50.8	5.0	41.2	5.0	45.2	5.7
Second dorsal fin height	85.8	8.4	69.5	8.4	62.1	7.9
Inter-dorsal distance	98.0	9.6	75.1	9.1	97.5	12.4
Second dorsal to caudal origin	51.3	5.0	46.1	5.6	50.0	6.3
Caudal fold length	315.0	30.8	294.0	35.7	305.0	38.7

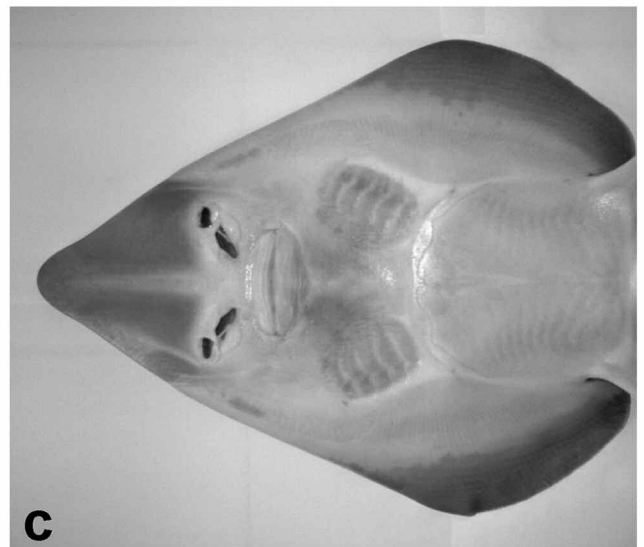
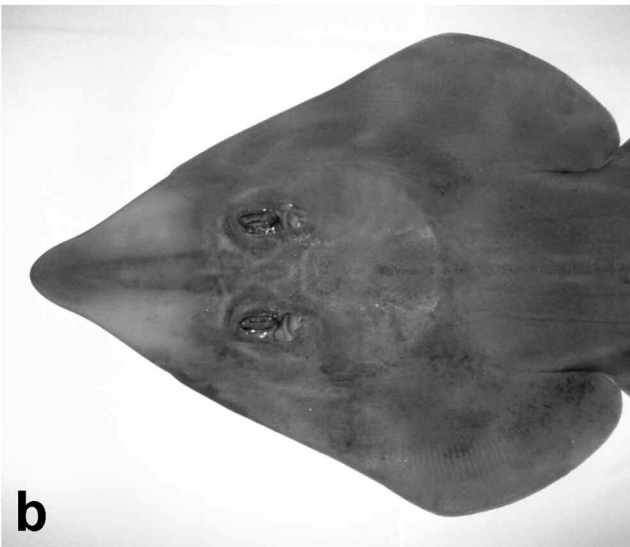
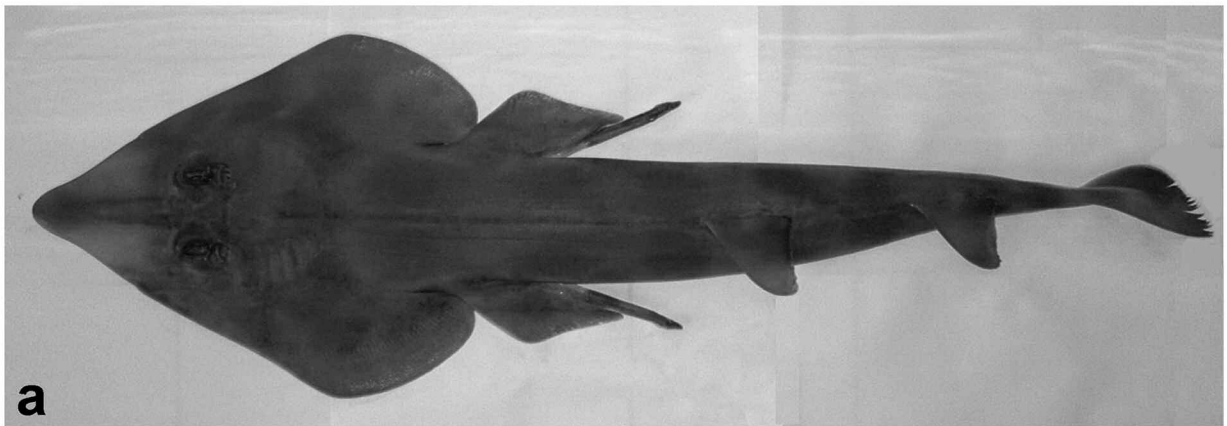


Figure 3. *Rhinobatos rhinobatos*, 788 mm TL, (RHI-Rhr-01), from the Gulf of Gabès, southern Tunisia, central Mediterranean. **A.** Dorsal view. **B.** Head in dorsal view. **C.** Mouth-nasal region; ventral view.

Figure 3. *Rhinobatos rhinobatos*, Longueur totale 788 mm (RHI-Rhh-01), capturé au Golfe de Gabès, sud de la Tunisie, Méditerranée centrale. **A.** Vue dorsale. **B.** Tête en vue dorsale. **C.** Bouche

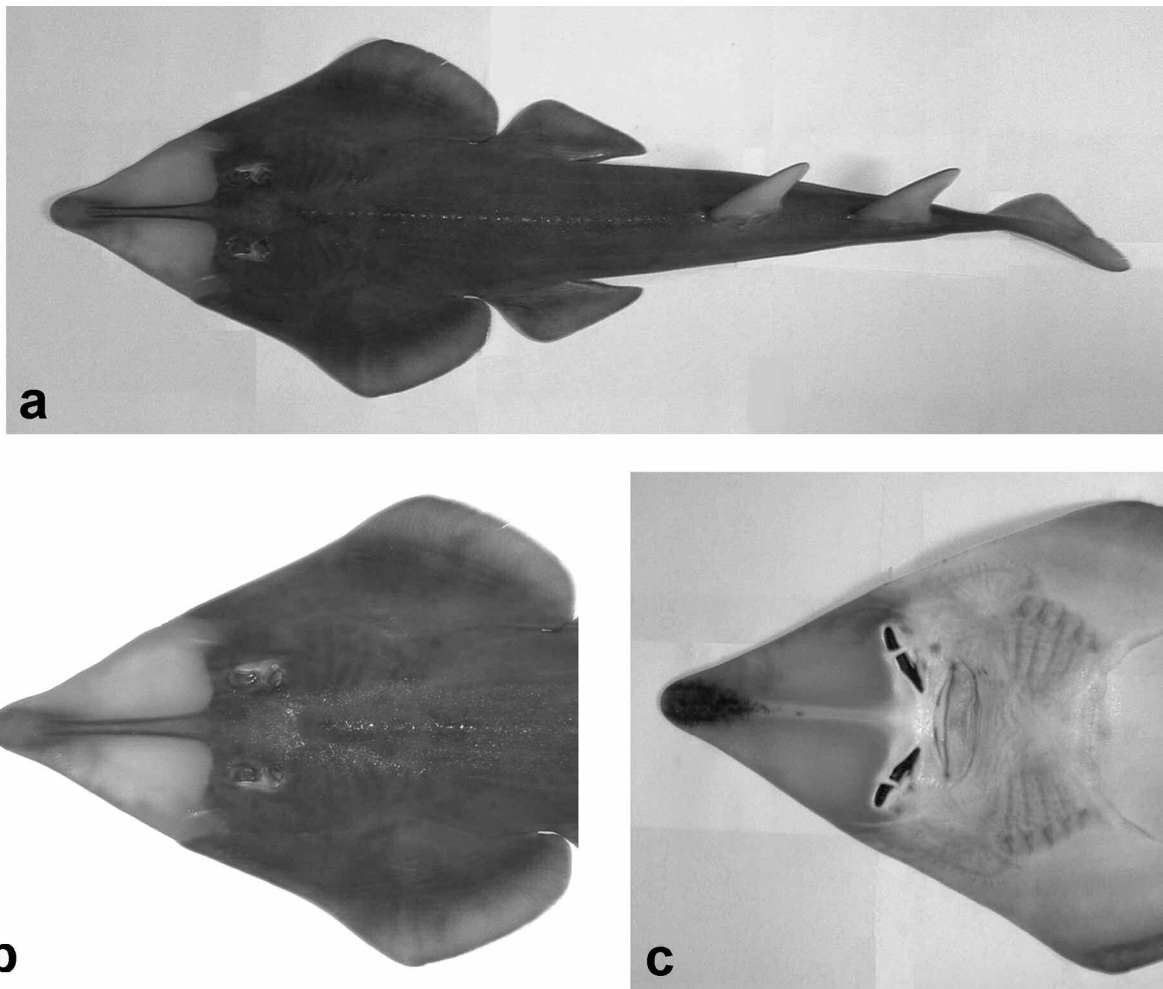


Figure 4. *Rhinobatos cemiculus*, 823 mm TL, (RHI-Rhc-02), from the Gulf of Gabès, southern Tunisia, central Mediterranean. **A.** Dorsal view. **B.** Head in dorsal view. **C.** Mouth-nasal region; ventral view.

Figure 4. *Rhinobatos cemiculus*, Longueur totale 823 mm (RHI-Rhh-01), capturé au Golfe de Gabès, sud de la Tunisie, Méditerranée centrale. **A.** Vue dorsale. **B.** Tête en vue dorsale. **C.** Bouche : région-nasale.

of first dorsal, its length 1.8 in TL. Disc length 1.37 and disc width about 1.7 in tail length. Inter-dorsal distance about 1.4 in distance pelvic base to first dorsal origin. Dorsal fins subequal, height of first two times its base. Ventrolateral folds on tail, their length nearly 1.8 in tail length.

Dermal denticles minute, covering entire dorsal surface, rather smooth at level of distal end of snout. A row of small tubercles on each rostral ridge. Small tubercles around inner margin of spiracles and orbit. A row of tubercles median to spiracle and eye. Three tubercles arranged in a line on each side of shoulder region. A middorsal row of 38 thorns commencing at spiracles and ending at origin of first dorsal fin, a row of seven thorns in interdorsal space. Thorns moderately enlarged, bluntly pointed and projecting posteriorly. Ventral surface entirely smooth, slightly rough

at level of distal end of snout. Total tooth rows 68/79 in upper/lower jaws.

Measurements and description are in agreement with Norman (1926), Gohar & Mazhar (1964), Compagno & Randall (1987) and Randall & Compagno (1995). However, Gohar & Mazhar (1964) found 84 to 94 tooth rows in both upper-lower jaws, they probably observed specimens different in size. Generally, in rhinobatids, the number of tooth rows in both jaws increases with growth (Capapé et al., 1981).

Color: Dorsal surface yellowish to beige. Ventral surface entirely white. Eyes red, no ventral dark blotch on snout. The specimen was completely unpigmented.

R. rhinobatos (Fig. 3) differs from *R. halavi* by its snout more rounded at distal tip, with widely separated rostral ridges, slightly converging at the tip, and the anterior nasal

Table 2. Cases of albinism reported to date in elasmobranch species.**Tableau 2.** Cas d'albinisme inventoriés jusqu'à ce jour chez les espèces d'élasmobranches.

Record	Family	Species	Albinism	Capture site	Authors
1	Hexanchidae	<i>Notorynchus maculatus</i>	partial	California	Herald (1953)
2	Cetorhinidae	<i>Cetorhinus maximus</i>	?	Norway	Frøiland (1975)
3	Ginglymostomatidae	<i>Nebrius concolor</i>	full	Japan	Taniuchi & Yanagisawa (1987)
4	Stegostomatidae	<i>Stegostoma fasciatum</i>	full	Indian Ocean	Nakaya (1973)
5	Lamnidae	<i>Carcharodon carcharias</i>	partial	?	Smale & Heemstra (1997)
6	Triakidae	<i>Mustelus californicus</i>	?	Monterey Bay	Herald et al. (1960)
7		<i>Mustelus californicus</i>	full	California	Talent (1973)
8		<i>Mustelus californicus</i>	full	California	Cohen (1973)
9		<i>Mustelus schmittii</i>	full	Brazil	Ferreira Teixeira & Goes de Araújo (2002)
10		<i>Hemirhamphys japonica</i>	partial	Japan	Furuta (1985)
11		<i>Triakis semifasciata</i>	full	California	Follett (1976)
12		<i>Galeorhinus galeus</i>	full	Channel	see Deynat (2003)
13	Carcharhinidae	<i>Carcharhinus amboinensis</i>	partial	Australia	McKay & Beinssen (1987-1988)
14	Sphyrnidae	<i>Sphyrna lewini</i>	full	Georgia	McKenzie (1970)
15	Squalidae	<i>Squalus acanthias</i>	partial	Georgia	Frøiland (1975)
16		<i>Squalus megalops</i>	full	?	Sanda & De Maddalena (2003)
17	Somniosidae	<i>Centroscymnus coelolepis</i>	partial	NE Atlantic	Deynat (2003)
18	Dalatidae	<i>Dalatias licha</i>	partial	Italy	Bottaro et al. (2005)
19	Rhinobatidae	<i>Rhinobatos halavi</i>	full	Tunisia	This study
20	Rajidae	<i>Raja clavata</i>	partial	Scotland	Traquair (1893)
21		<i>Leucoraja naevus</i>	partial	Scotland	Wilson (1951)
22		<i>Dipturus batis</i>	partial	Scotland	Wilson (1951)
23		<i>Dasyatis americana</i>	partial	California	Schwartz & Safrit (1977)
24		<i>Dasyatis pastinaca</i>	partial	Tunisia	Capapé & Pantoustier (1975)
25	Rhinopterae	<i>Rhinoptera bonasus</i>	partial	Maryland	Schwartz (1959)
26		<i>Rhinoptera bonasus</i>	partial	Chesapeake Bay	Joseph (1961)
27	Myliobatidae	<i>Myliobatis californica</i>	full	California	Jesus-Roldan (1990)
28	Torpedinidae	<i>Torpedo torpedo</i>	full	Tunisia	Ben Brahim et al. (1998)

lobe extending onto the internasal flap, the posterior flap being wide, interdorsal distance less than distance from axil of pelvic fin to first dorsal fin, orbit length 3.4% of TL, snout tip to eye 1.1 in snout tip to mouth, nostril length 1.6 in mouth width, mouth width 2.03 in pre-oral length. *R. cemiculus* (Fig. 4) differs from *R. halavi* by its snout rather acute at distal tip, with rostral ridges narrow close together and nearly parallel anteriorly, diverging posteriorly, snout tip to eye 1.2 in snout tip to mouth, nostril length 1.6 in mouth width, mouth width 2.35 in pre-oral length, pre-orbital length less than 6.5 times in TL, interspiracular width more than 3.0 times in pre-orbital length, interdorsal distance about equal from axil of pelvic fin to first dorsal fin, presence of black notch on ventral surface of snout.

The Tunisian specimen of *R. halavi* is evidently from the Red Sea where the species is commonly captured (Gohar & Mazhar, 1964; Bonfil & Abdallah, 2004). Compagno & Randall (1987) and Randall & Compagno (1995) described a single specimen caught in the Gulf of Oman and noted that an eastern extension of *R. halavi* needs further confirmation since *R. halavi* occurs in a rather restricted area.

Rhinobatos halavi is a marine benthopelagic species which lives in shallow waters (Compagno & Last, 1999) and feeds on small mollusks and bony fishes (Michael, 1993). In the Red Sea, the smallest adult male was 950 mm TL and the largest specimen reached 1710 mm TL (Gohar & Mazhar, 1964). The genital duct of the Tunisian specimen was not observed, in order to preserve the specimen intact. Prior to this record, only six allochthonous species of elasmobranchs were known in the Mediterranean Sea (see Golani et al., 2002; 2004): the Great hammerhead, *Sphyrna mokarran* (Rüppell, 1837), the Bignose shark, *Carcharhinus altimus* (Springer, 1950), the Milk shark, *Rhizoprionodon acutus* (Rüppell, 1837), the Silky shark, *Carcharhinus falciformis* (Müller & Henle, 1839), the Tiger shark, *Galeocerdo cuvier* (Péron & Lesueur, 1822), and the Forsskal's stingray *Himantura uarnak* (Forsskal, 1775).

Among the elasmobranchs recorded to date in the Mediterranean Sea, *Rhinobatos halavi* is the second Lessepsian immigrant elasmobranch species, the first being the Forsskal's stingray, *Himantura uarnak* (see Golani et al., 2002; 2004).

In Tunisian waters, a previous case of partial albinism was described in the Common stingray *Dasyatis pastinaca* (Linnaeus, 1758) by Capapé & Pantoustier (1975) and a case of full albinism in the Common torpedo, *Torpedo torpedo* (Linnaeus, 1758) by Ben Brahim et al. (1998). Moreover, a total of 28 cases of partial and full albinism have been reported in 24 elasmobranch species worldwide (Table 2). The scarcity of albinism in elasmobranchs is probably because this aberrant coloration makes them easy prey to larger predators (see Talent, 1973). However, some specimens reached a large size such as a 2904 mm TL Tawny nurse shark, *Nebrius ferrugineus* recorded by Taniuchi & Yanagisawa (1987) off Japan, and a 1850 mm TL Zebra shark, *Stegostoma fasciatum* caught in the Indian Ocean. Moreover, all the albino skates and rays recorded were adult or close to sexual maturity (see Ben Brahim et al., 1998). Dingerkus et al. (1991) reported a relative abundance of albino specimens in Channel catfish *Ictalurus punctatus*, placed in tanks containing water polluted by heavy metals. The waters of the Gulf of Gabès are polluted: during the three last decades, the water quality and sediments has been obviously affected by industrial discharges by both heavy metals and compounds of phosphogyps (Darmoul, 1988). However, no data allow stating that industrial pollution could play a role in non-pigmentation of elasmobranch species caught in the area (Hamza Chaffai et al., 1996, 1997). To date despite thorough investigations conducted in the area, no pseudo-albino specimen has been recorded among teleost or elasmobranch species from the Gulf of Gabès (Bradaï, 2000; Bradaï et al., 2002; 2004). By contrast the slight coloration of the dorsal surface is probably due to skin impregnation with colored matters dissolved in the Gulf of Gabès waters, this hypothesis remains the most suitable to explain this pattern (see Zairi & Rouis, 1999).

With the record of *R. halavi*, a revised key to the three *Rhinobatos* species known in the Mediterranean Sea is given, following Norman (1926), and McEachran & Capapé (1984).

- 1a. Widely separated rostral ridges, slightly converging at the tip; anterior nasal lobe extending onto the internasal space; posterior nasal flap wide . . . *Rhinobatos rhinobatos*
- 1b. Narrowly separated rostral ridges; anterior nasal lobe not extending onto the internasal space; posterior nasal flap narrow. 2
- 2a. Interdorsal distance about equal to distance from axil of pelvic fin to first dorsal fin. Interspiracular distance more than 3.0 times in pre-orbital length *Rhinobatos cemiculus*
- 2b. Interdorsal distance 1.3 at least in the distance from axil of pelvic fin to first dorsal fin. Interspiracular distance less than 3 times in pre-orbital length *Rhinobatos halavi*

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