

Update on the occurrence and ecological data of *Rhinobatos rhinobatos* (Rhinobatidae, Rajiformes, Actinopteri) on the Algerian coast

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Résumé

Actualisation de la présence de *Rhinobatos rhinobatos* (Rhinobatidae, Rajiformes, Actinopteri) sur la côte algérienne - Sept (7) spécimen de *Rhinobatos rhinobatos*, ont été pêchés à l'extrême est du golfe de Annaba sur des fonds meubles, dont la taille est comprise entre 47.25 et 60.75 cm (282.2 et 388.5 gr) pour une moyenne de 52.54±4.14 cm (348.66±30.44 gr), ils présentent un sex-ratio de 0.4 en faveur des femelles. Ce sont des juvéniles immatures d'un an. C'est une espèce très rare avec des fréquences de capture inférieure 2% avec un régime alimentaire de type carnivore avec des poissons benthiques comme proies préférentielles à partir de l'analyse des contenus stomacaux analysés.

Mots clés: *Rhinobatos rhinobatos* – Poissons – Mesures biométriques – Régime alimentaire – Est Algérien

Abstract

Seven (7) specimens of *Rhinobatos rhinobatos* were caught in the far east of the Gulf of Annaba on soft bottoms, which the size is between 47.25 and 60.75 cm (282.2 and 388.5 gr) for an average of 52.54±4.14 cm (348.66±30.44 gr), they have a gender ratio of 0.4 in favor of females. They are immature juveniles of one year old. It is a very rare species with capture frequencies of less than 2% with a carnivorous type diet with benthic fish as preferential prey based on the analysis of the stomach contents analyzed.

Keywords: *Rhinobatos rhinobatos* – Fish – Biometric measurements – Diet – Eastern Algeria

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Introduction

In the Mediterranean, two species of *Rhinobatidae* Bonaparte, 1835 are reported: *Rhinobatos cemiculus* Geoffroy Saint-Hilaire, 1817 and *Rhinobatos rhinobatos* (Linnaeus, 1758) with a distribution in the Atlantic and the Mediterranean (Mc Eachran and Capapé, 1984-1986; Bauchot, 1987; Serena, 2005). A third species, of Indo-Pacific origin, is reported in the eastern Mediterranean by Golani et al. (2006): *Rhinobatos halari* (Forsskal, 1775), frequenting the waters of the Red Sea and which entered the Mediterranean through the Suez Canal. According to Bradaï et al. (2004), *R. rhinobatos*, called “Guitare de mer commune” in French and Common guitarfish in English, is an Atlantic-Mediterranean species with a hot affinity. It extends from the Atlantic from the south of the Bay of Biscay to Angola, in the western and eastern Mediterranean, and in the Adriatic Sea but absent from the Black Sea (Mc Eachran and Capapé, 1984-1986; Bauchot, 1987).

In Algeria, the first two species were reported: *R. cemiculus*, which was only reported by Dieuzeide (1950) in Bou-Ismaïl Bay and *R. rhinobatos*, which was recorded by Dieuzeide et al. (1953) without reporting its location, ISTPM (1982) reported it in the Gulf of Béjaïa and in the Bay of Jijel, Derbal and Kara (2001) reported it in the Gulf of Annaba. According to the online database <https://www.sharkipedia.org> (Mull et al., 2022), the species has not been recently located on the Algerian coast.

With the aim of updating information on *Rhinobatos rhinobatos* from the Algerian coast, this work presents a new report of *R. rhinobatos* in the far east of Algeria by recording data on the biometric characteristics of captured individuals and

the diet of individuals captured. A synthesis of ecological and biogeographic data of the species along the Algerian coast is presented in comparison with the available Mediterranean ichthyological literature.

Material and method

Geographic location

The sampling was carried out in the extreme east of the Gulf of Annaba (36°56'28.68"N-8°09'17.28"E) on sandy bottoms 44 meters deep. The catches were made using a trammel net on May 8, 2018 (fig. 1).

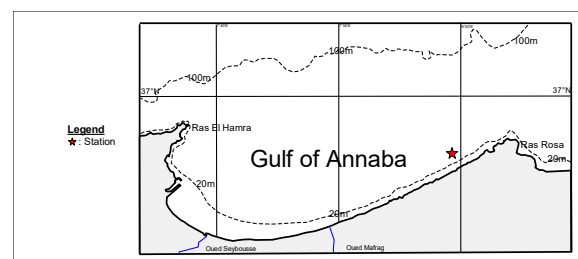


Figure 1. Location of the sampling station in the far east of the Gulf of Annaba.



Figure 2. Captured individuals.

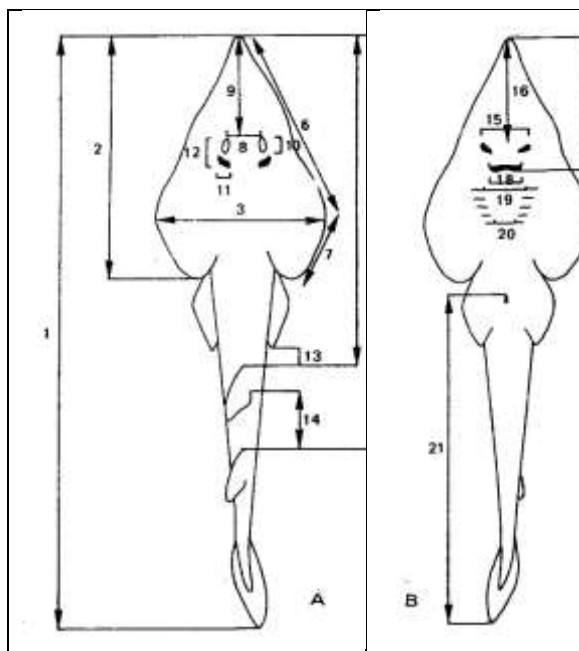


Figure 3. Biometric characters of *R. rhinobatos* according to the protocol proposed by Capapé et al. (1981). A. Dorsal side; B. ventral side; 1. total length; 2. disc length; 3. disc width; 4. distance between the end of the snout and the birth of the first dorsal fin; 5. distance between the end of the snout and the birth of the 2nd dorsal fin; 6. anterior edge; 7. posterior edge; 8. inter-orbital space; 9. preorbital space; 10. longitudinal diameter of the eye; 11. length of event; 12. orbital space; 13. distance between the posterior pelvic end and birth of the first dorsal; 14. distance between first dorsal axilla and birth of the 2nd dorsal; 15. internasal space; 16. pre-nasal space; 17. pre-oral space; 18. width of the mouth; 19. space between the first gill slits; 20. space between the fifth gill slits; 21. tail length.

Biometric measurements

The biometric measurements were carried out according to the measurement protocol proposed by Capapé et al. (1981) relating to 21 biometric characters (fig. 2 and 3) using an ichthyometer (ruler graduated to the nearest 0.1 cm) and a caliper (near 0.01 cm). We also noted the individual weight indicated in grams (gr), the gender was specified thanks to sexual dimorphism present or not (pterygopods) at the level of the pelvic girdle and the stages of maturity

according to Capapé et al (1990) for females and Enajjar et al. (2008) for males.

Diet

The stomachs of the different captured individuals were collected, and were preserved in 10% formalin. The stomach contents of each individual are sorted, determined and counted under a binocular magnifying glass. The prey that are partially digested or fragmented, are identified and counted based on leg segments, thoracic or abdominal fragments, head parts or tails.

A qualitative analysis is carried out, which consists of drawing up a list of prey ingested in the stomachs examined (Sorbe, 1979). A quantitative analysis of stomach contents was done by calculating the relative abundance (Ar) which is the ratio of the number of prey of a category *i* (*P_i*) by the total number of prey consumed by all the individuals studied (*P*) multiplied by 100 (Quiniou, 1996): $Ar = (P_i/P) \times 100$.

Results and discussion

7 individuals were captured on loose, silted sand substrates at a depth of 44 m (fig. 2). They represent exceptional catches because the capture frequencies of this species classify it as a very rare species. ISTPM (1982) captured 2 individuals out of 182 trawl hauls carried out, i.e. a capture frequency of 1.1% on loose sand and sandy mud substrates between 17 and 19 m depth. Massuti et al. (2003 and 2004) did not capture any specimens out of 168 trawl hauls made. On the other hand, in the Gulf of Gabès (Tunisia), an average of 0.91 individuals/seine haul was recorded on 45 seine hauls, the species representing 11.3% of the catches made (Echvikhhi et al., 2012). Serena (2005) indicates that *R. rhinobatos* colonizes coastal soft bottoms up to a 100 m

depth. The captures made by ISTPM (1982) indicate the fauna associated with *R. rhinobatos* is composed of *Balistes carolinensis*, *Dasyatis pastinaca*, *Dentex gibbosus*, *Gymnura altavela*, *Lithognathus mormyrus*, *Mullus barbatus*, *Mustelus mustelus*, *Myliobatis aquila*, *Pagellus acarne*, *Pagellus erythrinus*, *Pomadasys incisus*, *Raja asterias*, *Raja miraletus*, *Raja montagui*, *Seriola dumerilii*, *Torpedo torpedo*, *Trachinus araneus*, *Trachurus mediterraneus*, *Trigla lucerna* and *Sepia officinalis* with a numerical dominance of *Pagellus erythrinus* (44.99%) and a weight dominance of *Pagellus erythrinus* (12%) and *Dasyatis pastinaca* (12%).

We identified 5 females and 2 males for a sex ratio (M/F) of 0.4 in favor of females. In the Eastern Mediterranean, in Alexandria (Egypt), Abdel-Aziz et al. (1993) identify 236 females and 202 males, i.e. a sex ratio of 0.86 in favor of females; in Iskenderun Bay (Türkiye), Ismen et al. (2007) captured 96 females and 129 males for a sex ratio of 1.34 in favor of males. Echvikh et al. (2012) records a sex ratio of 0.52 in favor of females. It is an ovoviviparous species with a litter of 4 to 10 embryos, which reaches the size of first sexual maturity at 75 cm for males and 85 cm for females (Mc Eachran and Capapé (1984-1986). Adel-Aziz and (1993) estimate the sizes of first sexual maturity of 87 and 70 cm respectively for females and males with a reproduction rate of 8 to 14 embryos per litter with a gestation of 9 months and parturition at the end of August. Ismen et al. (2007) determine a size at first sexual maturity of 68 cm for males and 69 cm for females; parturition between May and September. Enajjar et al. (2008) estimate the size at first sexual maturity at 79 cm for females and 70 cm for males, for a gestation of 10 to 12

months and parturition in late summer and early autumn.

The total sizes of the 7 specimens captured are between 47.25 and 60.75 cm (tab. 1) for an average of 52.54 ± 4.14 cm and weights between 280.2 and 388.5 gr (348.66 ± 30.44 gr). Mc Eachran and Capapé (1984-1986) report that the maximum size is 100 cm for a common size of 80 cm. Abdel-Aziz et al. (1993) indicate maximum sizes for females of 181 cm (20 kg) and 172 cm (16 kg) for males. Basusta et al. (2007) indicate sizes between 39 and 147 cm or weights between 0.121 and 13,042 kg, the sizes of females are between 42 and 147 cm and those of males between 39 and 124 cm in Iskenderun Bay (Turkey). Ismen et al. (2007) record sizes between 22.2 and 120 cm for a maximum of 120 cm (4.6 kg) for males and 81 cm (1.3 kg) for females. In the Gulf of Gabès, maximum sizes are reached for females and males at 120 and 100 cm respectively (Enajjar et al., 2008). Echvikh et al. (2012) recorded sizes between 53 and 118 cm for a respective average of 81.74 and 84.64 cm for females and males.

The age of the individuals observed in the Gulf of Annaba is one year based on the age-length key of Ismen et al. (2007), they belong to the one year cohort (46-64cm). The small number of samples does not make it possible to estimate the total weight – total length relationship, where Ismen et al. (2007) establish an overall size-weight relationship ($W=0.0036L^{2.9329}$), for females ($W=0.0043L^{2.89}$) and for males ($W=0.003L^{2.98}$). The analysis of the proportions between the different biometric variables indicates that the total length is 2.53 times the length of the disc, the length of the disc is 1.11 times the width of the disc, the total length compared to the distances between the muzzle and the birth of the first

and second backbones are 1.4 and 1.7 times respectively.

Table 1. Biometric measurements in centimeters (cm) and weight in grams (gr) of the seven specimens.

	1	2	3	4	5	6	7
Total length (cm)	60.75	60	52	50.5	49.5	47.25	47.75
Disc length (cm)	24	23.7	20.5	19.8	19.5	18.6	18.8
Disc width (cm)	21.6	21.3	18.4	17.8	17.5	16.7	16.9
Distance between the snout and the birth of the first dorsal (cm)	30	29	29.5	29.5	28	27.5	27
Distance between the snout and the birth of the second dorsal (cm)	37.5	38	38.5	37.5	36.5	35	34.5
Anterior edge of the disc (cm)	14	13.6	14	13.6	13.3	13	13
Posterior edge of the disc (cm)	7	6.8	7	6.8	7	6.5	6.5
Interorbital space (cm)	2.32	2.26	1.98	1.91	1.88	1.79	1.81
Pre-orbital space (cm)	8.48	8.36	7.22	6.98	6.87	6.55	6.63
Longitudinal diameter of the eye (cm)	1.92	1.89	1.63	1.58	1.55	1.48	1.5
length of event (cm)	1.76	1.73	1.5	1.45	1.42	1.36	1.38
orbital space (cm)	2.88	2.84	2.45	2.37	2.33	2.23	2.25
Distance between the posterior pelvic end and the birth of the first dorsal (cm)	2.5	2.4	2.3	2.1	2	1.8	1.9
Distance between the axilla of the first dorsal and the birth of the second dorsal (cm)	4.5	4.2	4.1	3.3	3.2	3.1	3.2
Internasal space (cm)	4.2	3.9	3.8	3	2.9	2.8	2.9
Pre-nasal space (cm)	8.5	6.4	6.3	6.1	4	4.8	4.9
Pre-oral space (cm)	7.2	6.8	7.1	6.8	6.6	6.5	6.5
Mouth width (cm)	4	3.8	3.6	2.8	2.7	2.8	2.8
Space between gill slits (cm)	4.3	4.1	3.9	3.1	3	3.1	3.1
Space between 5th gill slits (cm)	3.9	3.7	3.6	2.8	2.7	2.8	2.8
Length of tail from anal orifice to tip of caudal (cm)	17.5	17.25	17.5	17.75	17.5	16.25	16.5
Total weight (gr)	377.8	348	388.5	375.3	304.2	366.6	280.2
Sex	F	F	M	F	F	M	F

Diet

In the present work the emptiness rate is zero due to the shallow depth of the catches taken, where this phenomenon is rather linked to the catches taken by trawl at greater depths. The stomach contents make it possible to highlight the diet of the captured individuals (tab. 2), which is composed of teleost fish and the determination of the *Mullidae* *Mullus barbatus* and the *Bothidae* *Bothus podas*, i.e. 8 fish (relative abundance = 46.66%), 3 crabs of the *Homolidae* *Homola barbata* (relative abundance = 20%), 1 shrimp of the *Alpheidae* *Alpheus glaber* and 3 *Penaeidae* *Penaeus kerathurus* (relative abundance = 26.67%) and *Stomatopods* of the *Squillidae* *Squilla mantis* (relative abundance = 6.67%). The diet indicates a carnivorous type diet with fish as preferential prey, where several factors are involved during food intake. Quiniou (1986) indicates that the anatomical possibilities, the behavior of the predator which varies during ontogenesis influence adaptive feeding strategies through the

distribution and size of the predator, stenophagous or euryphagous habits and the availability and spatial distribution prey. Basusta et al. (2007) highlight a diet composed of shrimp (35.89% of prey), fish (34.51% of prey), crabs (16.91% of prey) and other prey (2.90%), with precise identification *Squilla mantis* (5.11% of prey) and *Crangon crangon* (4.69% of prey). Ismen et al. (2007) determined a diet based 56.1% on *Squillidea* (*Oratosquilla massavensis*; *Squilla mantis*), *Penaeidea* (*Penaeus kerathurus*) and *Crangonidea* (*Crangon spp.*) (23.3%), *Teleostei* (7.8%) represented by *Clupeidae*, *Mullidae* (*Mullus surmuletus*), *Argentinidae* (*Argentina sphyraena*), *Gobiidae* and *Pleuronectiformes*, *Brachyura* (5.8%) and *Annelida* (5.4%). Newell (2017) specifies on the basis of a bibliographic synthesis that the preferential prey of *R. rhinobatos* are macrozoobenthic organisms including crustaceans, fish and molluscs.

Table 2. List of species ingested by *R. rhinobatos*.

Specimens	Fish	Crabs	Shrimp	Stomatopods
1	1 <i>Mullus barbatus</i>	0	0	0
2	1 <i>Bothus podas</i> – 1 <i>Mullus barbatus</i>	0	2 <i>Penaeus kerathurus</i>	0
3	1 <i>Teleostei</i>	0	0	1 <i>Squilla mantis</i>
4	1 <i>Teleostei</i>	1 <i>Homola barbata</i>	0	0
5	1 <i>Teleostei</i>	1 <i>Brachyura</i>	0	0
6	1 <i>Bothus podas</i>	0	1 <i>Alpheus glaber</i> 1 <i>Penaeus kerathurus</i>	0
7	1 <i>Bothus podas</i>	1 <i>Homola barbata</i>	0	0

Conclusion

The information collected on *Rhinobatos rhinobatos* from the Algerian coast makes it possible to update the biological and ecological data on a very rare species in terms of capture frequencies, the last update was done by Dieuzeide et al. (1953). Due to the global changes that the Mediterranean is currently undergoing in terms of biodiversity and population dynamics, it is necessary to update data on the fish populations of the Algerian coast, particularly on rare to very rare species.

Bibliographic references

- Abdel-Aziz S.H., Khalil A.N., Abdel-Maguid S.A., 1993.** Reproductive cycle of the common guitarfish, *Rhinobatos rhinobatos* (Linnaeus, 1758), in Alexandria waters, Mediterranean Sea. *Aust. J. Mar. Fresh. Res.*, 44(3): 507-517. <https://doi.org/10.1071/MF9930507>
- Basusta, N., Demirhan, S.A., Karalar, M. & Cekic, M., 2007.** Diet of common guitarfish (*Rhinobatos rhinobatos* L., 1758) in the Iskenderun Bay (northeast Mediterranean). *Rapp. Comm. int. Mer Médit.* 426.
- Bauchot M.L., 1987.** Raies et autres Batoides. In Fischer W., Schneider M., Bauchot M.L. Fiches FAO d'identification des espèces pour les besoins de la pêche. (Révision 1). Méditerranée et Mer Noire. Zone de pêche 37. Volume 2 : Vertébrés. FAO (Rome) : 845-885.
- Bradaï M. N., Quignard J.P., Bouain A., Jarbaoui O., Ouanes-Ghorbel A., Ben Abdallah L., Zaouali J., Ben Salem S., 2004.** Ichtyofaune autochtone et exotique des côtes tunisiennes : Recensement et biogéographie. *Cybium*, 28(4) : 315-328.
- Capapé C., Quignard J.P., Zaouali J., 1981.** Nouvelles descriptions de *Rhinobatos rhinobatos* (Linné, 1758) et de *Rhinobatos cemiculus* Geoffroy Saint Hilaire, 1817 (Pisces, Rhinobatidae). *Bull. Off. Natn. Pêche, Tunisie*, 5(1) : 1-27.
- Capapé C., Quignard J.P., Mellinger J., 1990. Reproduction and development of two anguillid sharks, *Squatina squatina* and *S. oculata* (Pisces : Squatinidae), off Tunisian coasts : semi delayed vitellogenesis, lack of egg-capsule and lecithotrophy. *J. Fish Biol.*, 37 : 347-356.
- Derbal F., Kara M.H., 2001.** Inventaire des poissons des côtes de l'est algérien. *Rapp. Comm. Int. Mer Méditer.*, 36 : 258.
- Dieuzeide R., 1950.** La faune du fond chalutable de la baie de Castiglione. *Bull. Stat. Aquic. Pêche Castiglione*, n.s., 2 : 9-86.
- Dieuzeide R., Novella M., Roland J., 1953.** Catalogue des poissons des côtes algériennes. I. Squales, Raies et Chimères. *Bull. Stat. Aquic. Pêche Castiglione*, n.s., 4 : 1-135.
- Echwikhi K., Saidi B., Bradaï M.N., Bouain A., 2012.** Preliminary data on elasmobranch gillnet fishery in the gulf of Gabès, Tunisia. *Journal of Applied Ichthyology* : 1-6.
- Enajjar S., Bradaï M.N., Bouain A., 2008.** New data on the reproductive biology of the common guitarfish of the gulf of Gabès (southern Tunisia, central Mediterranean). *J. Mar. Biol. Assoc. U.K.*, 88 : 1063-1068.
- Golani D., Öztürk B., Basusta N., Darom D., 2006.** Fishes of eastern mediterranean. Turkish marine research foundation (Istanbul), 259p.
- Ismen A., Yigin C., Ismen P., 2007.** Age, growth, reproductive biology and feed of common guitarfish (*Rhinobatos rhinobatos* Linnaeus, 1758) in Iskenderun bay, the eastern Mediterranean Sea. *Fisheries research*, 84 : 263-269.
- ISTPM, 1982.** Evaluation des ressources halieutiques de la marge continentale algérienne. Stocks pélagiques-Stocks démersaux exploitables au chalut. ISTPM (Nantes), 101p, annexes.
- Massuti E., Guijarro B., Pomar B., Fliti K., Reghis M., Zaghdoudi S., Bouaïcha M., Ait Ferroukh B., Zereb N., 2003.** Informe de la campaña Argelia 0203-DP para la evaluación de recursos demersales profundos en las costas de Argelia (Mediterraneo Sud Occidental). IEO, MPRH, SGPM, 103p.
- Massuti E., Ordinas F., Guijarro B., Pomar B., Fliti K., Refes W., Zaghdoudi S., Bouaïcha M., Reghis M., Miraoui M., Naili R., Ait Ferroukh B., 2004 a.** Informe de la campaña Argelia 0204 para la evaluación de recursos demersales en las costas de Argelia (Mediterraneo Sud Occidental). IEO, MPRH, SGPM, 123p.

Mc Eachran J.D., Capapé C., 1984-1986. Rhinobathidae.

In : Whitehead P.J.P., Bauchot M.L., Hureau J.C., Nielsen J., Tortonèse E., 1984-1986. Fishes of the northeastern Atlantic and the Mediterranean. Poissons de l'Atlantique du Nord-Est et de la Méditerranée. UNESCO (Paris) : 156-158.
Mull C.G., Pacoureaux N., Pardo S.A., Ruiz L.S., García-Rodríguez E., Finucci B., Haack M., Harry A., Judah A.B., VanderWright W., Yin J.S., Kindsvater H.K., Dulvy N.K. 2022. Database of shark and ray life history traits and abundance time-series. scientific data, 9:559. <https://doi.org/10.1038/s41597-022-01655-1>

Newell B.M., 2017. Statuts review report off two species of guitarfish : *Rhinobatos rhinobatos* and *Rhinobatos cemiculus*. Report National Marine Fisheries Service, Office of protected Resources. NOAA (Silver Spring), 62p

Quiniou L., 1986. Les peuplements de poissons démersaux de la pointe de Bretagne. Environnement – Ecologie – Structure démographique – Relation trophique. Thèse de doctorat. Université de Bretagne occidentale (Brest), 292p.
Serena F., 2005. Field identification guide to the sharks and rays of Mediterranean and Black Sea. FAO Species Identifications. Guide for Fisheries Purposes. FAO (Rome), 97p + 11 planches.

Sorbe J.C., 1979. Ecologie et éthologie alimentaire de l'ichthyofaune chalutable du plateau continental sud Gascogne. Thèse de doctorat 3^{ème} cycle en océanographie. Université Aix-Marseille (Marseille), 125p.