

**Observations on *Etmopterus spinax* (Pisces: Squalidae), from the north-eastern Aegean Sea**

Hakan KABASAKAL and Nuran ÜNSAL

*University of Istanbul, Faculty of Fisheries, Department of Marine Biology  
Ordu caddesi, No: 200, Laleli 34470 Istanbul, Turkey*

*On October 16, 1996, five specimens (three females and two males) of *Etmopterus spinax* (LINNAEUS, 1758) (Pisces: Squalidae) were caught in the Gulf of Saros (NE Aegean Sea), at a depth of 280 m. A description of *E. spinax* based on morphometric measurements and morphological characteristics from five specimens is provided. Morphometric measurements and biological data of this species are given for the first time from the seas of Turkey. All these specimens were juveniles. The stomach contents of three specimens consisted of remains of decapod crustaceans, cephalopods and teleosts.*

**Key words:** Squalidae, *Etmopterus spinax*, morphometry, north-eastern Aegean Sea

**INTRODUCTION**

*Etmopterus spinax* (LINNAEUS, 1758) is the only species of the genus occurring in the Mediterranean Sea (ŠOLJAN, 1948; TORTONESE, 1956; McEACHRAN and BRANSTETTER, 1984; BAUCHOT, 1987; PAPACONSTANTINO, 1988; GALIL and GOREN, 1994). Its distribution range extends from Iceland to southern Africa and Mediterranean (COMPAGNO, 1984; McEACHRAN and BRANSTETTER, 1984). It occurs at depths from 70 to 2000 m, but mostly between 200 and 500 m (McEACHRAN and BRANSTETTER, 1984; BAUCHOT, 1987). Because of its deep-sea dwelling habit, *E. spinax* has been considered a rare bathypelagic elasmobranch in the Aegean Sea and the eastern Mediterranean basin (PAPACONSTANTINO and TSIMENIDIS, 1979; GALIL and GOREN, 1994). Its presence in the seas of Turkey has been recorded by AKŞIRAY (1987) without an accurate information about depth and locality

where this species was caught, nor where the study material was available for inspection. KAYA (1993) reported only one specimen of *E. spinax* from the Gulf of Gökova (SE Aegean Sea), at a depth of 730 m. This is the only accurate recording of this species from the seas of Turkey.

Because of its scarcity in the deep-sea haulings, our knowledge on the biology of this little shark is still rudimentary. On October 16, 1996, five *E. spinax* were caught by a trawling haul on a muddy-sandy bottom in the Gulf of Saros (NE Aegean Sea), at a depth of 280 m. The objective of this paper is to provide morphometric data of *E. spinax* based on these five specimens.

## MATERIAL AND METHODS

Specimens used for this study were collected by means of an otter trawl with a cod end mesh opening of 22 mm, during the north-eastern Aegean Sea Expedition of the R/V YUNUS I of the Faculty of Fisheries. The sharks were fixed and preserved in 5 percent formaline at the Faculty of Fisheries, Marine Biology Laboratory at the University of Istanbul. All the sharks were measured to the nearest 0.05 mm, total length (TL). Fifty morphometric measurements were taken according to COMPAGNO (1984) and plotted in figure 1.

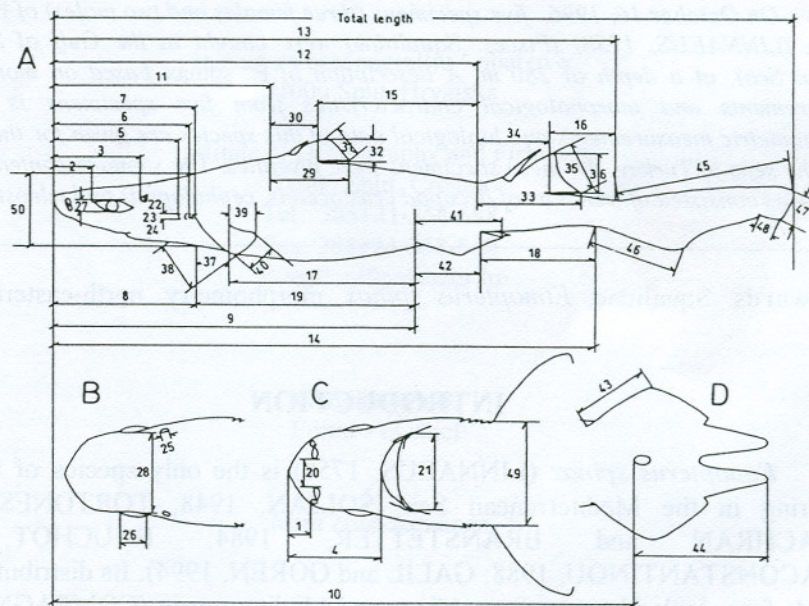
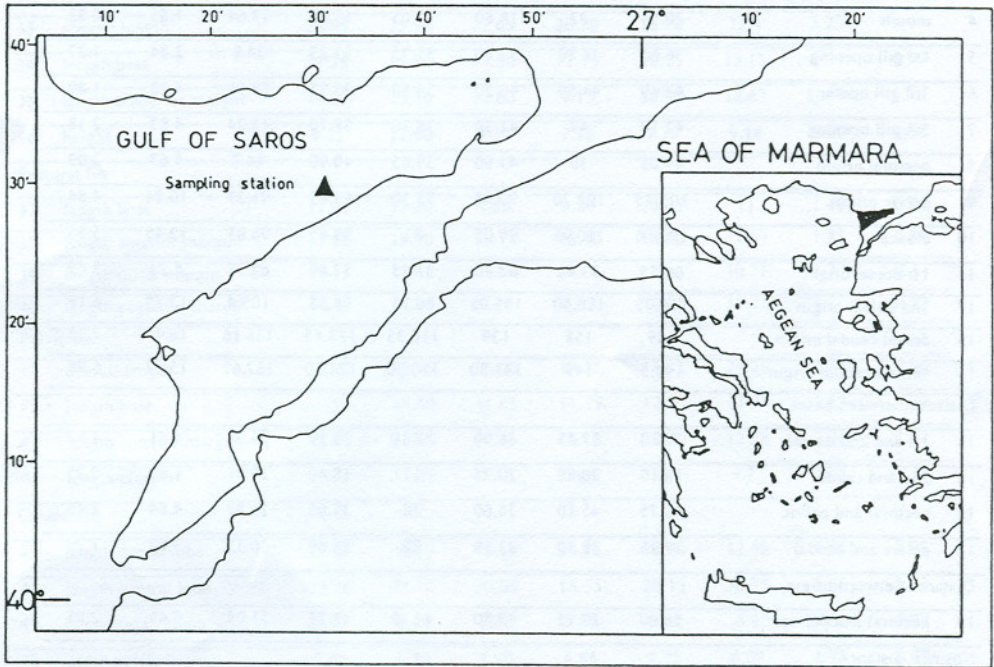


Fig. 1. Morphometric measurements of *Etmopterus spinax*: A) Lateral view; B) Dorsal view of head; C) Ventral view of head; D) Ventral view of pelvic fins. The numbers are the same as in table 1

Identification and taxonomic nomenclature of the species follow COMPAGNO (1984), McEACHRAN and BRANSTETTER (1984) and BAUCHOT (1987).

### Material examined

Three females (TL 153 mm, 169 mm and 197 mm) and two males (TL 186 mm and 204 mm) were caught in the Gulf of Saros ( $40^{\circ}29'33''$  N;  $26^{\circ}31'54''$  E), at a depth of 280 m (Fig. 2).



*Fig. 2. Sampling station in the Gulf of Saros ( $40^{\circ}29'33''$  N;  $26^{\circ}31'54''$  E, NE Aegean Sea). Shaded area in the small map indicates the area investigated*

Morphometric measurements of the specimens are given in table 1.

Table 1. Morphometric measurements of the specimens of *Etmopterus spinax* caught in the north-eastern Aegean Sea. M) Male; F) Female; SD) Standard deviation; SE) Standard error

MEASUREMENTS	1-F	2-M	3-M	4-F	5-F	MEAN	SD	SE
Total length	197	204	186	153	169	181.8	20.82	9.31
Snout tip to								
1 outer nostrils	3	3.25	2.25	2.75	2.70	2.79	0.37	0.16
2 eye	12.55	12.95	10.45	10.40	9.40	11.15	1.52	0.30
3 spiracle	26.75	28.75	24.70	22.85	23.40	25.29	2.44	0.48
4 mouth	20.55	22	18.80	17.05	19.80	19.64	1.85	0.83
5 1st gill opening	36.60	38.80	33.60	31.75	33.25	34.8	2.84	1.27
6 3rd gill opening	42.40	44.50	40.20	34.50	35.95	39.51	4.22	1.89
7 5th gill opening	47.10	49	43.30	38.10	38.70	43.24	4.87	2.18
8 pectoral origin	49.05	50	43.90	39.65	40.90	44.7	4.67	2.09
9 pelvic origin	101.45	102.70	90.65	78.30	83.05	91.23	10.84	4.84
10 cloaca	110.60	110.95	99.05	83	89.65	98.65	12.45	5.56
11 1st dorsal origin	66.55	73.40	62.40	51.75	57.80	62.38	8.25	3.69
12 2nd dorsal origin	116.75	120.40	105.05	86.25	98.55	105.4	13.85	6.19
13 dorsal caudal origin	149	158	139	116.35	128.45	138.16	16.44	7.35
14 ventral caudal origin	145.5	149	133.30	110.80	124.50	132.62	15.62	6.98
Distance between bases								
15 1st and 2nd dorsal	37.10	37.45	36.90	27.10	33.10	34.33	4.41	1.97
16 2nd and caudal	18.10	20.80	20.75	17	18.40	19.01	1.69	0.75
17 pectoral and pelvic	48.75	45.10	38.60	38	38.65	41.82	4.84	2.16
18 pelvic and caudal	29.25	35.40	33.50	26	28.60	30.55	3.82	1.70
Distance between origin								
19 pectoral and pelvic	56.60	59.15	47.80	44.10	47.75	51.08	6.44	2.88
Nostrils: distance								
20 between inner corners	6.85	7.15	6.40	5.25	5.40	6.21	0.85	0.38
Mouth								
21 width	20.35	18.90	16.95	14.90	14.75	17.17	2.45	1.09
Gill opening lengths								
22 1st	3.50	3.55	2.45	2.90	3.15	3.11	0.45	0.20
23 3rd	3.05	3.25	2.10	2.65	2.60	2.73	0.44	0.19
24 5th	3	3.05	2.05	2.55	2.05	2.54	0.48	0.21
25 Spiracle: max. width	3.85	4.10	3.55	3.35	3.55	3.68	0.29	0.13

Table 1. cont'd

Eye									
26	horizontal diameter	11.25	10.85	9.75	8.70	9.70	10.05	1.01	0.45
27	vertical diameter	4.70	5.05	4.15	3.75	4.25	4.38	0.50	0.22
28	Interorbital width	19.05	18.05	17.25	14.80	16.30	17.09	1.63	0.72
1st dorsal fin									
29	overall length	19.15	20.30	17.45	15.30	14.60	17.36	2.43	1.08
30	length base	10.45	11.90	9.65	8.20	7.75	9.59	1.68	0.75
31	length posterior margin	10.65	11.60	7.45	5.25	5.40	8.07	2.94	1.31
32	height	7.45	7.20	6.45	5	5.20	6.26	1.12	0.50
2nd dorsal fin									
33	overall length	25.05	25.90	22.65	20.20	18.20	22.4	3.23	1.44
34	length base	14.25	15.80	13.80	11.75	10.15	13.15	2.21	0.99
35	length posterior margin	14.20	15.30	12.60	9.15	10.90	12.43	2.47	1.10
36	height	9.35	12.60	9.30	7.10	7.35	9.14	2.20	0.98
Pectoral fin									
37	length base	11.65	13.30	9.80	9.80	10.45	11	1.49	0.66
38	length anterior margin	17.80	19.90	15.75	16.40	15.50	17.07	1.81	0.81
39	length distal margin	11.15	12.65	11	9.75	8	10.51	1.73	0.77
40	length posterior margin	10.90	12.20	9.75	8.65	10.05	10.31	1.32	0.59
Pelvic fin									
41	overall length	22.15	22.35	20.60	17.35	18.85	20.26	2.15	0.96
42	length base	15	14.40	11.65	11.35	12.70	13.02	1.62	0.72
43	length anterior margin	14.05	15.35	11.15	10.15	10.70	12.28	2.28	1.02
44	length clasper	-	11.25	8.30	-	-	9.77	2.08	1.47
Caudal fin									
45	length dorsal lobe	47.60	46.30	43.80	36.75	38.95	42.68	4.68	2.09
46	length ventral lobe	23.20	21.10	20.65	18.65	20.15	20.75	1.65	0.73
47	dorsal tip to notch	9.90	6.65	5.30	5.10	5.05	6.4	2.06	0.92
48	depth notch	7.65	8.30	4.90	4.85	4.75	6.09	1.73	0.77
Trunk at pectoral origin									
49	width	25.80	26.05	22.10	19.60	21.70	23.05	2.79	1.24
50	height	21.65	21.75	19.20	16.90	17.25	19.35	2.31	1.03
Number of spiral valves		8	8	8	8	9			

## RESULTS

### Description

The trunk is slender. Body height at pectoral origin is 9.05-9.3 times in TL (Fig. 3).

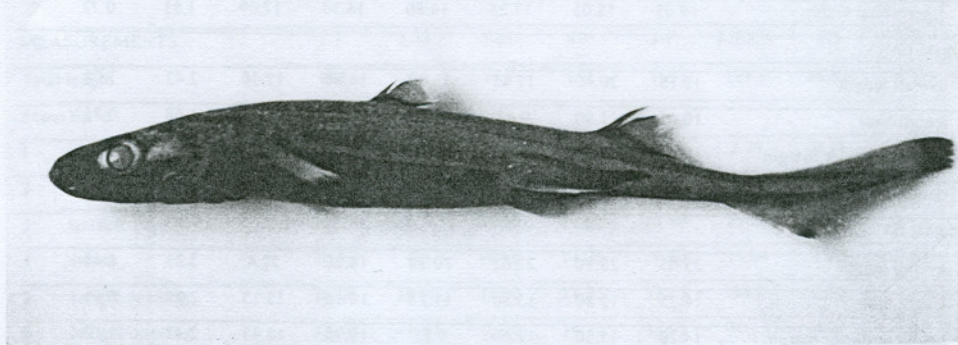


Fig. 3. Side view of *Etmopterus spinax* (TL 204 mm)

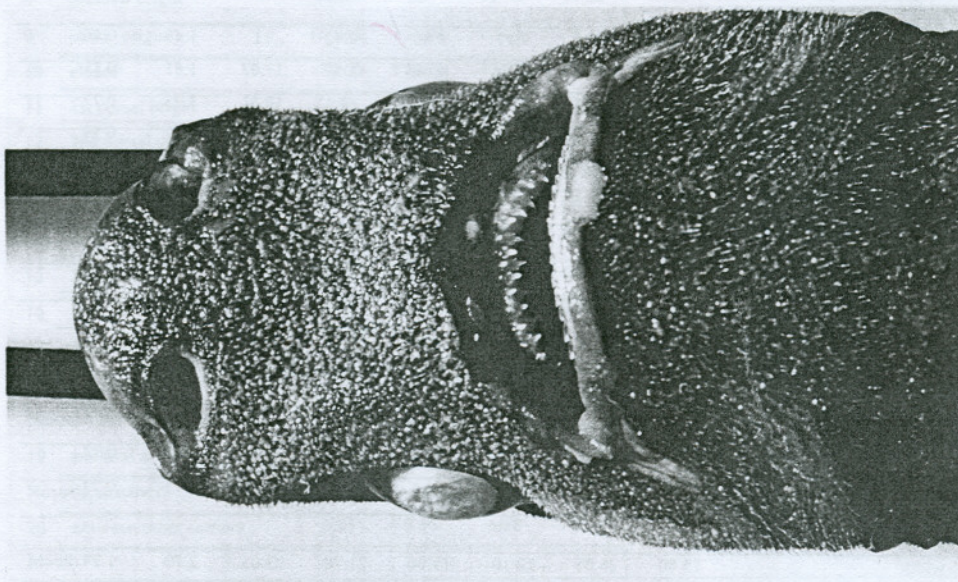


Fig. 4. Ventral view of the head

The head is long, 4-5.25 times in TL. The snout is long, its tip rounded, 4.2-6.63 % of TL. The nostrils are large, inter-nasal distance is 8.03-14.58 % of TL. Anterior margin of nostrils with a small triangular flap (Fig. 4).

The spiracles are small, maximum width of the spiracle is 2.59-2.92 times in the horizontal diameter of eye, origin of the spiracles behind and above the level of eyes (Fig. 5). The mouth is wide, its width is 2.55-2.59 times in the head length. A marked labial fold on each jaw (Fig. 4). Gill slits are almost vertical, 1st gill slit is the longest and 5th is the shortest (Fig. 5).

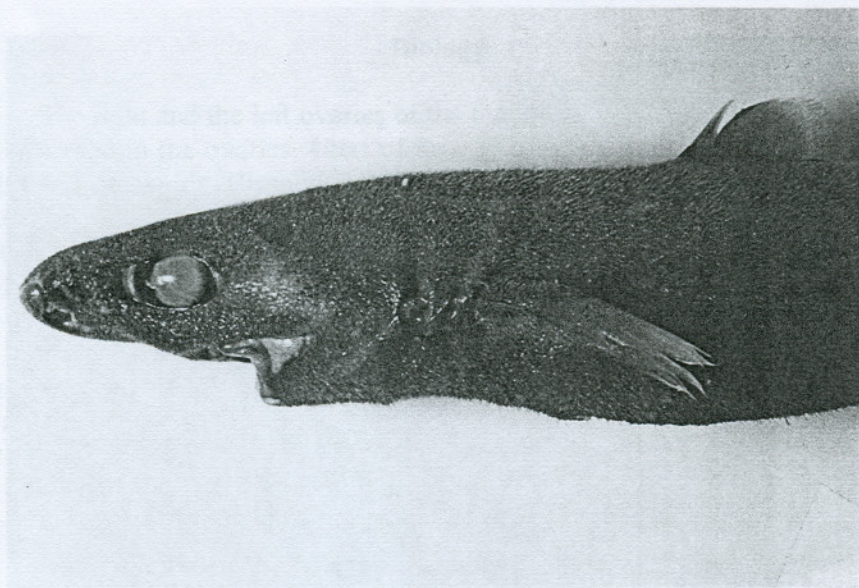


Fig. 5. Lateral view of the head and the front part of the trunk

Origin of the pectoral is almost above the 5th gill slit (Figs. 3 and 5). Origin of the 1st dorsal is above the free rear tip of pectorals. The distance from snout tip to origin of the 1st dorsal is 2.77-2.95 times in TL. Origin of the 2nd dorsal is above the insertion of pelvics, the distance from snout tip to origin of the 2nd dorsal is 1.6-1.77 times in TL. The 2nd dorsal is larger than the 1st dorsal, the overall length of the 1st dorsal is 1.24-1.27 times in the overall length of the 2nd dorsal. No anal fin. The distance from snout tip to upper caudal origin is 1.29-1.31 times in TL. Subterminal notch is present on the dorsal lobe of the caudal fin, the depth of notch is 5.57-7.57 times in the length of the dorsal lobe. The distance between the bases of pectoral and pelvic fins is 4.02-4.52 times in TL. Interdorsal distance is 5.44-5.64 times in TL. A prominent spine is present in front of each dorsal fin (Fig. 5).

LEDOUX (1970) gives a good description of the dentition of *E. spinax*. Upper teeth are tri-cuspid, medial cusp is much larger; lower teeth with strongly oblique (almost lateral) cusp, cutting surface is horizontal and almost entire (Fig. 4). There are 27-28 teeth on the functional row of the upper jaw and 31-32 teeth on the lower jaw. Margins of the teeth are not serrated. Detailed information about the squamation of *E. spinax* has been given by REIF (1985). Dermal denticles arranged in irregular longitudinal rows and each dermal denticle bears a prominent median spine (Fig. 6). There are 8-9 turns in spiral valve.

The colour of the specimens is dark brown above, black below; lateral line is distinct; a pale spot is present between the eyes; bases of dorsal fins, and pectoral and pelvic fins are dark coloured; anterior margins of dorsal fins are dark coloured; tips of dorsal and ventral lobes of the caudal fin are black; photophores are present on the ventral surface (Figs. 3 and 7).

## Biology

The right and the left ovaries of the females were not vascularized. No ova were observed in the ovaries. Uteri of the caught females were very thin, ranging 0.5-2.0 mm in width. Claspers of the caught males were uncalcified, soft and shorter than the pelvic fins. Sperm were not present in the seminal vesicles or the sperm sacs.

## Diet

The stomachs of the two specimens (TL 169 mm and 197 mm) were empty. The stomach contents of the remaining three individuals (TL 153 mm, 186 mm and 204 mm) consisted of the remains of decapod crustaceans, cephalopods and teleosts (Myctophid fish?).

## DISCUSSION

COMPAGNO (1984) stated that the maximum total length of *E. spinax* is up to 60 cm, but specimens longer than 45 cm are rare. According to McEACHRAN and BRANSTETTER (1984) maximum total length of this species is up to 45 cm. The maximum total length of *E. spinax* in the seas of Turkey is up to 50 cm (AKŞIRAY, 1987). PAPACONSTANTINO and TSIMENIDIS (1979), PAPACONSTANTINO and TORTONESE (1980), and KAYA (1993) collected specimens of *E. spinax* of TL 112-317 mm from the Aegean Sea.

According to COMPAGNO (1984) *E. spinax* reaches maturity at a total length between 33-36 cm. The presence of uncalcified, soft claspers of males and unvascularized ovaries and thin uteri of females showed that, all our specimens were hence juveniles. Total lengths of our specimens were also smaller than the reported maturing size of *E. spinax*. COMPAGNO (1984) stated that size at birth is 12 to 14 cm TL.

According to CLARKE and MERRETT (1972), MACPHERSON (1980) and BAUCHOT (1987) *E. spinax* feeds mainly on small teleosts, cephalopods, euphausiaceans and decapod crustaceans. Stomach contents of the specimens, TL 153 mm, 186 mm and 204 mm, included similar prey items. The long medial cusps of the teeth of upper jaw and the almost oblique, single cusps of the teeth of lower jaw, which forms a continuous cutting edge facilitate the capturing of large-sized preys, such as squids (STEEL, 1985).

Because of the lacking of a morphometric study on *E. spinax* from the seas of Turkey, we were unable to compare our morphometric data. COMPAGNO (1984) stated that *E. spinax* is a long-tailed species, and the distance from pelvic insertions to ventral caudal origin about as long as from tip of snout to first gill openings, slightly less than 1.5 times in distance between pectoral and pelvic bases. In the study material, the mean of the distance from pelvic insertions to ventral caudal origin (30.55 mm, Table 1) is 1.36 times in the mean of the distance between pectoral and pelvic bases (41.82 mm, Table 1). According to COMPAGNO (1984) the distance between 2nd dorsal base and dorsal caudal



origin about 2 times in interdorsal space. In the study material, the mean of the distance between 2nd dorsal base and dorsal caudal origin (19.01 mm, Table 1) is 1.8 times in the mean of the interdorsal space (34.33 mm, Table 1). The same author also noted that the gill slits of *E. spinax* are very short and they are about 0.33 times in the horizontal diameter of eye. In the study material, the mean heights of 1st, 3rd and 5th gill slits were 3.11 mm, 2.73 mm and 2.54 mm (Table 1), respectively, and they are 0.3, 0.27 and 0.25 times in the horizontal diameter of eye. It can be clearly seen that, morphometric averages of the study material agree with COMPAGNO (1984). Slight differences between the mean values of the study material and those of COMPAGNO (1984) are geographic variation.

## REFERENCES

- AKŞIRAY, F. 1987. Türkiye Deniz Balıkları Ve Tayin Anahtarı. İ. Ü. Rektörlüğü Yayınları no. 3490. İstanbul, 811 pp.
- BAUCHOT, M. -L. 1987. Requins. In: W. Fischer, M. -L. Bauchot and M. Schneider (Editors). Fiches FAO d'identification des espèces pour les besoins de la pêche. (Révision 1). Méditerranée et mer Noire. Zone de pêche 37. Vol. II. Vertébrés. FAO, Rome, pp. 767-843.
- CLARKE, M. R. and N. MERRETT. 1972. The significance of squid, whale and other remains from stomachs of bottom-living deep-sea fish. J. mar. biol. Ass. U. K., 52: 599-603.
- COMPAGNO, L. J. V. 1984. FAO species catalogue. Sharks of the World. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. FAO Fish. Synop., 4: 1-249.
- GALIL, B. S. and M. GOREN. 1994. The deep sea Levantine fauna - new records and rare occurrences. Senckenbergiana maritima, 25: 41-52.
- KAYA, M. 1993. An investigation on the deep sea fishes of the Aegean Sea. Tr. J. of Zoology, 17: 411-426.
- LEDOUX, J. -C. 1970. Les dents des Squalidés de la Méditerranée occidentale et de l'Atlantique nord-ouest Africain. Vie et Milieu, 21: 309-361.
- MACPHERSON, E. 1980. Régime alimentaire de *Galeus melastomus* Rafinesque, 1810, *Etmopterus spinax* (L., 1758) et *Scymnorhinus licha* (Bonnaterre, 1788) en Méditerranée occidentale. Vie et Milieu, 30: 139-148.
- McEACHRAN, J. D. and S. BRANSTETTER. 1984. Squalidae. In: P. J. P. Whitehead, M. -L. Bauchot, J. -C. Hureau, J. Nielsen and E. Tortonese (Editors). Fishes of the North-eastern Atlantic and the Mediterranean, Vol. I. UNESCO, Paris, pp. 128-147.
- PAPACONSTANTINO, C. 1988. Check-list of Marine Fishes of Greece. Fauna Graeciae, Vol. IV. National Centre for Marine Research and Hellenic Zoological Society, Athens, 257 pp.
- PAPACONSTANTINO, C. and E. TORTONESE. 1980. On a collection of fishes from Thermaikos Gulf (NE Greece). Thalassographica, 3: 15-42.

- PAPACONSTANTINO, C. and N. TSIMENIDIS. 1979. Some uncommon fishes from the Aegean Sea. *Cybius* 3e série, 7: 3-14.
- REIF, W. -E. 1985. Squamation and Ecology of Sharks. *Cour. Forsch. -Inst. Senckenberg*, 78: 1-255.
- ŠOLJAN, T. 1948. Fishes of the Adriatic (Ribe Jadrana). *Fauna et Flora Adriatica*, 1. Nakladni Zavod Hrvatske. Zagreb, 428 pp.
- STEEL, R. 1985. *Sharks of the World. Facts on File*. New York, 192 pp.
- TORTONESE, E. 1956. *Leptocardia, Ciclostomata, Selachii. Fauna d'Italia*. Calderoni. Bologna, 334 pp.

Accepted: 5 May 1999

## Zapažanja o vrsti *Etmopterus spinax* (Porodica: Squalidae), sjeveroistočnog Egejskog mora

Hakan KABASAKAL i Nuran ÜNSAL

*Sveučilište u Istanbulu, Fakultet ribarstva, Odjel biologije mora, Ordu. Caddesi, No: 200, Laleli 34470 Istanbul, Turska*

### SAŽETAK

U kočarskoj lovini ostvarenoj 16. listopada 1996. u Saroskom zaljevu (SI Egejsko more) na 280 m dubine ulovljeno je pet primjeraka (tri ženke i dva mužjaka) vrste *Etmopterus spinax* (LINNAEUS, 1758) (Porodica: Squalidae). Na temelju morfometrijskih mjerenja i morfoloških karakteristika opisano je pet primjeraka vrste *E. spinax*. Morfometrijske mjere i biološki podaci ove vrste dati su po prvi put za turske vode. Svi ovi primjerci su juvenilni. Sadržaj utrobe se kod tri primjerka sastoji od ostataka desetonožnih rakova, glavonožaca i koštunjača.

BILJEŠKE – NOTES, izdaje Institut za oceanografiju i ribarstvo, 21000 Split, Hrvatska;  
Izlazi povremeno.  
Upute autorima vidi u Acta Adriatica.

Published by the Institute of Oceanography and Fisheries, 21000 Split, Croatia;  
Issued periodically.  
For Instructions to authors see Acta Adriatica.

Institut za oceanografiju i ribarstvo  
21000 Split, Hrvatska

Institute of Oceanography and Fisheries  
21000 Split, Croatia  
Tel.: 385+21-358-688  
Fax: 385+21-358-650  
E-mail: office@izor.hr

Glavni urednik:  
Editor - in chief:

Mira Zore-Armanda

Tehnički urednik:  
Technical Editor:

Fanja Vučković