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*Research Article*

# New Record of the Velvet Belly Lanternshark *Etmopterus spinax* (Linnaeus, 1758) in the Deep Seas of Northern Cyprus

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## ABSTRACT

Lantern sharks are small shark species that can be seen at depths between 70 and 2000 meters. Due to their luminescent characteristics, they have been called "Lantern shark". In total eleven specimens of the velvet belly lantern shark, *Etmopterus spinax* (Linnaeus, 1758), were caught in the deep seas of Northern Cyprus by using a bottom trawl. Sampling was carried out using 13 trawling operations. The collected samples were placed in 4% formalin and stored at the Museum of the Systematic, Faculty of Fisheries, Mersin University, (catalogue number: MEUFC-18-11-082). As a sampling area, the depths between 274 and 641 m were selected. Other cartilaginous fish caught during sampling except *E. spinax* were *Galeus melastomus* (1 individual), *Squalus acanthias* (4 individuals), *Scyliorhinus canicula (*85 individuals). *E. spinax* made up 10.89% of all cartilaginous fishes which were caught. Species identification for all fishes caught is made with the help of morphological features.

***Keywords:*** *Lantern shark, Etmopterus spinax, Northern Cyprus, Mediterranean Sea*

# Kuzey Kıbrıs'ın Derin Denizlerinde Kadife Karınlı Fener Köpekbalığının *Etmopterus spinax* (Linnaeus, 1758) Yeni Kaydı

## ÖZET

Fener köpekbalıkları 70 - 2000 m arasındaki derinliklerde görülebilen küçük köpekbalığı türleridir. Lüminesan özellikleri nedeniyle "Fener köpekbalığı" olarak anılmaktadırlar. Kuzey Kıbrıs derin denizlerinde 13 adet trol operasyonu yapılarak, dip trolü yöntemi ile toplam 11 adet kadife fener köpekbalığı, *Etmopterus spinax* (Linnaeus, 1758) yakalanmıştır. Yakalanan örnekler %4'lük formalin içerisine konularak; Mersin Üniversitesi, Su Ürünleri Fakültesi, Sistematik Müzesine (Katalog numarası: MEUFC-18-11-082) yerleştirilmiştir. Örnekleme alanı olarak 274 ve 641 m arasındaki derinlikler seçilmiştir. Örneklemeler sırasında *E. spinax* haricinde yakalanan diğer kıkırdaklı balıklar *Galeus melastomus* (1 birey), *Squalus acanthias* (4 birey), *Scyliorhinus canicula* (85 birey) şeklindedir. *E. spinax* yakalanmış olan tüm kıkırdaklı balıkların %10.89'luk bir bölümünü oluşturmaktadır. Yakalanan tüm balıklar için tür teşhisi morfolojik özellikler yardımı ile yapılmıştır.

***Anahtar kelimeler:*** *Fener köpekbalığı, Etmopterus spinax, Kuzey Kıbrıs, Akdeniz*

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# I. INTRODUCTION

The velvet belly lanternshark, *Etmopterus spinax* (Linnaeus, 1758); is a small sized demersal shark (up to 60cm), belonging to the Etmopteridae family. They are usually widely distributed, commonly in Western Mediterranean and Eastern Atlantic [1,2]. *E. spinax* can be seen between 70-2000 m in depth, however they are mostly found around 200-500m [1,3-5]. *E. spinax* is the third most common species of sharks under 1000 meters [6]. *E. spinax* has an important place among the by-catch of bottom longline and trawling techniques [6,7].

Main pray items of *E. spinax* are; euphausiids, cephalopods, decapods and some teleost fish [3,8,9]. *E. spinax* has the ability to produce light using its ventrally positioned photophores. Having those photogenic organs is a common feature of many organisms living in deep seas [10,11]. Different studies indicate that, having these organs can be used in mating/ hunting behaviors and for camouflage [12,13].

*E. spinax* can be distinguished by looking at its morphological characteristics. They have a long head with a long nose tapering towards the front of the eye. Nostrils are located between the nose tip and eyes. Each of the upper teeth consist of 3 parts and the middle part is the biggest. For the lower teeth; there is a tip notch covering about 1/7 of the tooth. Gill slits are very short and located at the back-top of the eyes. They are almost horizontal in position. Gill length becomes shorter from the first gill to fifth gill. While pectoral fins were found just above the fifth gill, pelvic fin base is located at the same vertical alignment as the second dorsal fin. They don't have an anal fin. In the upper part of the caudal fin, there is an indeterminate notch. The central part of the spine and dermal denticles are prominent. The dorsal part of the body is brownish and the photophores are located in the ventral. Pelvic, pectoral and dorsal fin bases are darker. Dorsal and ventral parts of the caudal fin are black in color [5,14] . *E. spinax* has a gender-specific dimorphism. Females have been observed to grow more than males. It is also known that males mature earlier than females [4,15].

*E. spinax* has several records in the Mediterranean Sea. Some of these are; Straits of Gibraltar to Aegean Sea [16], North Cyprus [17,18], Tunisia [19], Balearic Sea, Western/Eastern Ionian Sea [20], Sardinian Cost [21], Aegean Sea, Levantine Sea [22] and Egyptian Coast [14].

This study aimed to confirm the velvet belly lantern shark's occurrence from the deep seas of Northern Cyprus (Northeastern Mediterranean). Furthermore, historical records of the velvet belly lantern shark in the Mediterranean Sea were discussed in this study.

# II. MATERIALS AND METHODS

Deep-sea sampling by means of trawl was carried out in the deep seas of Northern Cyprus between May 14 and 17 2018 by a commercial trawl. The depth of the sampling area was between 274 and 641 m. Coordinates of the sampled area: 36.24853N-34.36491E, 36.18839N-43.38847E, 36.17065N-34.40686E, 36.07227N-34.53326E (Figure1). A total of 13 trawling operations were carried out. Each trawling operation lasted about 4 hours. During the sampling, 11 specimen of the *Etmopterus spinax* were caught. Morphological features were used to identify the species [5]. Some specimen were preserved in 4% formalin and were deposited in the Museum of the Systematic, Faculty of Fisheries, Mersin University, (catalog no: MEUFC-18-11-082) (Figure 2). All morphometric measurements were done to the nearest 0.01 cm using dial calipers (Table 1).

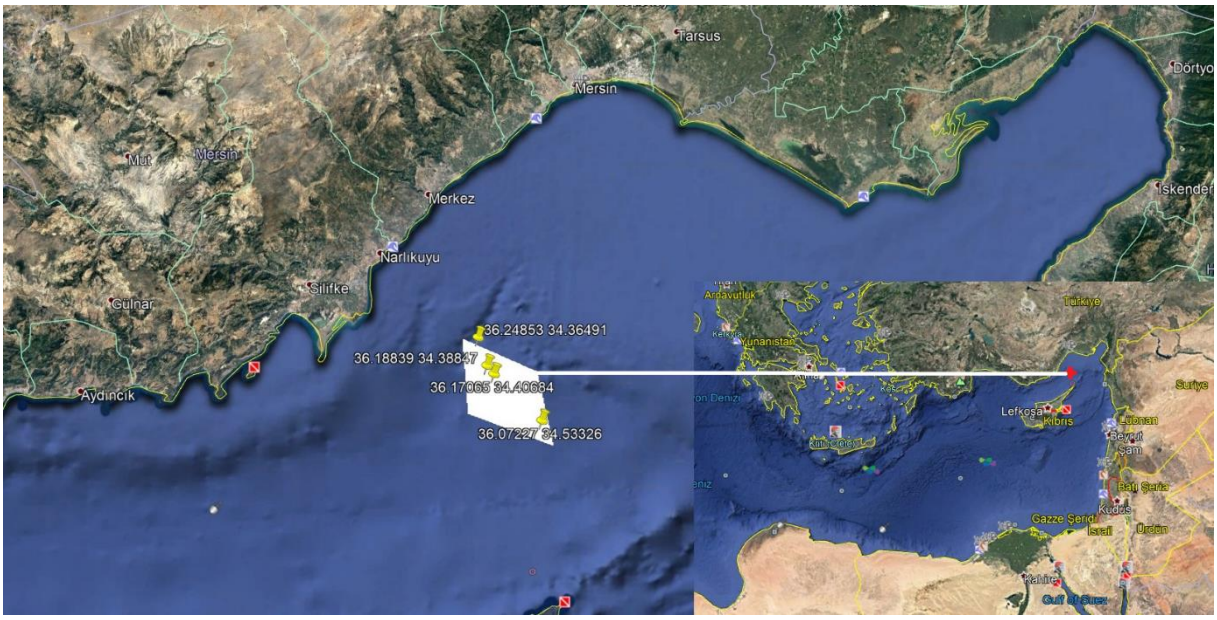


***Figure 1.*** *The shaded area indicates the locations where the specimens were caught. ("Google Earth" program was used to create the map.)*

***Figure 2****. A specimen of E. spinax from the deep seas of Northern Cyprus*

# III. RESULTS

In this study, eleven individuals of *Etmopterus spinax*, which have an average of 226.8 g total weight and 172.5 mm total length, were caught from Northern Cyprus between 274 and 641 m depth in May of 2018. The morphometric measurements of all specimens were done and the ratio of each morphometric character to total length were calculated (Table 1). In the present study, the other cartilaginous fishes caught apart from *E. spinax* were *Galeus melastomus* (1 individual), *Squalus acanthias* (4 individuals), *Scyliorhinus canicula (*85 individuals) and *E. spinax* made up 10.89% of all cartilaginous fishes, which were caught. Species identification for all fishes caught is made with the help of metric measurements [5].

***Table 1.*** *Comparison of morphometric characteristics of E. spinax from the deep seas of the Mediterranean*

| **References** | This study | | [23] | | [24] | | [25] | |
|---|---|---|---|---|---|---|---|---|
| **n** | 11 | | 1 | | 1 | | 5 | |
| **Total weight** *(g)* | 25.29 (14.9-35.2) | | 208.3 | | 106.6 | | | |
| **Morphometric measurements** | **mm (min-max)** | **TL%** | **mm** | **TL%** | **mm** | **TL%** | **mm** | **TL%** |
| **Total length** | 172.5 (140-190) | 100 | 354 | 100 | 317.1 | 100 | 103-191 | 100 |
| **Standard length** | 130.0 (110-145) | 75.36 | 280 | 79.1 | 251.2 | 79.2 | | |
| **Head length** | 32.83 (28-86) | 19.03 | 80 | 22.6 | 71.5 | 22.5 | 22-39 | 21.4-20.42 |
| **Prespiracular length** | 24.00 (19-28) | 13.91 | 44 | 12.4 | 38.9 | 12.3 | | |
| **Spiracle length** | 3.33 (2-4) | 1.93 | 5 | 1.4 | 5.2 | 1.6 | | |
| **Preorbital length** | 11.50 (9-13) | 6.67 | 29 | 8.2 | 25.9 | 8.2 | 5-8 | 4.9-4.2 |
| **Eye length** | 9.33 (9-10) | 5.41 | 22 | 6.2 | 19.2 | 6.1 | 4-7 | 3.9-3.7 |
| **Prenarial length** | - | - | 7 | 2 | 6.4 | 2 | | |
| **Preoral length** | 17.67 (13-19) | 10.24 | 35 | 9.9 | 31.7 | 10 | | |
| **Nostril width** | 4.33 (3-5) | 2.51 | 11 | 3.1 | 9.4 | 3 | | |
| **Mouth width** | 15.67 (13-19) | 9.08 | 32 | 9 | 28.9 | 9.1 | | |
| **Pre-first dorsal-fin length** | 61.33 (53-67) | 35.56 | 114 | 32.2 | 104.3 | 32.9 | 31-51 | 30.01-26.7 |
| **First dorsal-fin length** | - | - | 31 | 8.8 | 27.7 | 8.7 | | |
| **First dorsal-fin base** | 8.17 (7-10) | 4.73 | 12 | 3.4 | 11.2 | 3.5 | | |
| **First dorsal-fin height** | 9.00 (8-10) | 5.22 | 14 | 4 | 12.6 | 4 | | |
| **First dorsal fin spine length** | 5.17 (4-6) | 3.00 | 18 | 5.1 | 16.1 | 5.1 | | |
| **Pre-second dorsal-fin length** | 106.33 (92-115) | 61.64 | 217 | 61.3 | 193.6 | 61.1 | | |
| **Second dorsal-fin length** | 20.17 (18-22) | 11.69 | 41 | 11.6 | 36.4 | 11.5 | | |
| **Second dorsal-fin base** | 11.33 (10-13) | 6.57 | 25 | 7.1 | 22.4 | 7.1 | | |
| **Second dorsal-fin height** | 10.00 (8-11) | 5.80 | 23 | 6.5 | 20.2 | 6.4 | | |
| **Second dorsal fin spine length** | 12.42 (11.5-15) | 7.20 | 22 | 6.2 | 19.4 | 6.1 | | |
| **Prepectoral-fin length** | 15.83 (35-47) | 9.18 | 86 | 24.3 | 77.1 | 24.3 | | |
| **Pectoral-fin base** | 10.67 (9-11) | 6.18 | 22 | 6.2 | 19.2 | 6.1 | | |
| **Pectoral-fin length** | 15.83 (9-20) | 9.18 | 31 | 8.8 | 27.6 | 8.7 | | |
| **Prepelvic-fin length** | 93.33 (79-101) | 54.11 | 185 | 52.3 | 166.2 | 52.4 | | |
| **Pelvic-fin length** | 18.25 (16-20) | 10.58 | 41 | 11.6 | 37.1 | 11.7 | | |

***Table 1.*** *(continuation) Comparison of morphometric characteristics of E. spinax from the deep seas of the Mediterranean*

| | | | | | | |
|---|---|---|---|---|---|---|
| **Pelvic-fin base** | 8.00 (7-11) | 4.64 | 28 | 8 | 25.5 | 8 |
| **Snout to first dorsal fin** | 57.17 (47-66) | 33.14 | - | - | - | - |
| **Snout to pelvic fin** | 85.33 (73-89) | 49.47 | - | - | - | - |
| **Snout to mouth** | 12.75 (10-15) | 7.39 | - | - | - | - |
| **First to second dorsal fin** | 45.83 (39-50) | 26.57 | - | - | - | - |
| **Between dorsal bases** | 37.83 (32-43) | 21.93 | - | - | - | - |

# IV. DISCUSSION

In this study, morphometric characters were measured from eleven individuals of *Etmopterus spinax* and compared with previous studies (Table 1). The ratio of all metric measurements to TL was our comparison material. All individuals caught in the present study were smaller than previous research materials, except for Başusta (2016). In the study of Başusta (2016), the ratio of some morphometric measurements to TL of 5 individuals sampled from the Northeast Mediterranean, is lower than the results of other studies compared. In the literature, the maximum total length of this species is 60 cm, and the length at which they reach maturity is given as 33-36 cm [1]. With the help of this information in the literature, it is seen that individuals caught from the deep waters of Northern Cyprus in our study are immature. Capturing more than one immature individual supports the possibility that the species form a population in the northeastern Mediterranean.

Some records of *E. spinax* from Mediterranean Sea are Straits of Gibraltar to Aegean Sea [16], North Cyprus [17], Tunisia [19], Balearic Sea, Western/Eastern Ionian Sea [20], Sardinian Cost [21], Aegean Sea, Levantine Sea [22] and Egyptian Coast [14]. Species were previously recorded in the Northeast Mediterranean, but mostly scattered in the Western Mediterranean. The transition from the Atlantic to the northeastern Mediterranean was made along the Strait of Gibraltar. This migration to the East may be due to natural processes as well as habitat changes caused by changing climate conditions as a result of global warming.

# V. CONCLUSION

*Etmopterus spinax* inhabits in the Eastern Atlantic and Western Mediterranean Sea. Like other Atlantic-origin fish, this species spreads from the Western Mediterranean to the northeastern Mediterranean. This may be because of breeding or populating behavior. The results are very important for the Northeastern Mediterranean biodiversity. In addition, according to the International Union for Conservation of Nature's Red List of Threatened Species (IUCN), the population trend of *E. spinax* in the Mediterranean is constant [26].

The deep waters of the Northeast Mediterranean (Levant Basin) are poorer in nutrient content than other basins of the Mediterranean and also have more salty and warm waters [27]. It is very important to know the reasons for the migration of deep water species to the east. On the other hand, the difficulty of deep water sampling limits the studies. Therefore, monitoring the current status of the Levant Basin deep water fauna is useful for identifying the reflections of lessepsian migration and global warming. This information is also useful for answering potential questions.

**Conflict of interests**
The authors declare no conflict of interests.

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