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# *Melanonus zugmayeri* Norman, 1930, captured off Portugal. A review of the current knowledge on this species.*

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SUMMARY: The capture of two specimens of *Melanonus zugmayeri* Norman, 1930 (Melanonidae) off Portugal was reported. Morphometric and meristic characteristics of the specimens examined were presented. One of the specimens represented a new size record for the species. The available data on the specimens caught in other geographical areas was comparatively analysed and the current knowledge on the species was discussed. Due to the lack of data to support the existence of more than one species of *Melanonus*, further taxonomic revisions would need more specimens, especially from the southern oceans.

*Key words*: *Melanonus zugmayeri*, Melanonidae, rare fish, taxonomic status, Portugal.

## INTRODUCTION

The capture of rare deep-sea fishes is of special interest whenever the main biological and morphological characteristics of the species are not yet well defined. At such a low level of knowledge, any new information may lead to new phylogenetic and biogeographic insight (Haedrich, 1996). This is the case of the meso-bathypelagic fishes of the family Melanonidae (Gadiformes, Actinopterygii). This family comprises only the genus *Melanonus* Günther, 1878, and *Melanonus gracilis* Günther, 1878 and *Melanonus zugmayeri* Norman, 1930 are the commonly accepted species (Cohen *et al*., 1990; Nelson, 1994). *M. gracilis* has a circumpolar distribution in subantarctic and temperate seas and has been occasionally caught in tropical areas of the southern hemisphere (Cohen, 1990). *M. zugmayeri* is a circumtropical or subtropical species (Cohen, 1986a) that is rare in the north-east Atlantic (Cohen, 1973) but reaches 40ºN or even further north (Cohen, 1986b, 1990). Gordon *et al*. (1996) captured two specimens at Porcupine Seabight (50ºN) and one further north (56ºN 9ºW, Gordon *pers. com*.). Torres *et al*. (1979) and Melendez and Sielfeld (1991) found some specimens in the Pacific Ocean, 33ºN and 21ºS respectively, and Kotthaus (1970) in the Indian Ocean (5ºS 40ºE).

The morphological data of the few known specimens of *M. zugmayeri* were not consistent. Also, the characteristics used in the diagnosis of the species of the genus *Melanonus* were not well defined. The

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present paper recorded the main characters of two specimens caught off Portugal and discussed the current knowledge on the species.

## MATERIAL AND METHODS

Two individuals of *M. zugmayeri* were caught off the south-west coast of Portugal in April 1994 and August 1995 respectively. The first specimen was captured by bottom trawl at 350 m depth (37º30'N, 9º25'W), whereas the second one was caught by long-line at 1500 m depth (38º00'N, 9º20'W). Both specimens were kept in the Oceanographic Museum of the Arrábida Natural Park (Setúbal, Portugal) with catalogue numbers 543MOPNA and 536MOPNA.

In order to compare the data published in previous studies with those of the present work, similar meristic and morphometric measurements were taken, namely number of fin rays, total length, standard length, body height, head length, eye diameter, pectoral fin length and ventral fin length.

## RESULTS AND DISCUSSION

The capture of the two individuals of *M. zugmayeri* confirmed the presence of this species off the mainland coast of Portugal. Apart from the records from Madeira (Maul, 1952) and Azores (Roule and Angel, 1933; Santos *et al*., 1997), the only other reference to this species near the Portuguese coast is based on unpublished data (Cohen *pers. com.*).

The specimen scales were cycloid and coloured uniformly black, and several striae were found in the opercular apparatus. Both specimens had nematode parasites (Anisakidae) in the body cavity. Only one of the specimens had stomach contents, which included remains of unidentified shrimps (Decapoda, Natantia). The only data on the food habits of this species were reported by Koefoed (1953), who found remains of *Euphausia krohnii*, *Nematoscelis* sp. and *Phronima* sp. in the stomach of one individual.

The second specimen reported in the present paper (Table 1), represented in Figure 1, is the longest individual of this species ever recorded (294 mm total length). Both specimens had the characteristics considered to be distinctive of the species *M. zugmayeri* according to Blache *et al*. (1970) and Cohen (1986b), namely the lower jaw teeth of uneven size (see Fig. 1) and the number of pectoral fin rays (see Table 1). Two dorsal fins were observed in both individuals, with a clear separation between the last ray of dorsal I and the first ray of dorsal II, both linked to the back body's skin by independent membranes; the rays of the first dorsal were longer than the rays of the second.

The analysis of the available data on morphometric and meristic characteristics for the specimens of the genus *Melanonus* caught in several geographical areas revealed a considerable discrepancy (Table 1) in the morphological characters reported for *M. zugmayeri*. This was also reflected in the published illustrations of this species. In their figures, Blache *et al*. (1970) and Cohen (1986b) representing Norman's holotype specimen (Norman, 1930), show two dorsal fins well separated by a gap. Maul (1952) and Cohen (1986a) represent their specimens with only one dorsal fin with the first rays slightly higher than the remaining posterior rays. Melendez and Sielfeld (1991) describe it as being a single one with its first 6 rays higher. Cohen (1986b) and Cohen *et al*. (1990) admit that in some specimens but not in

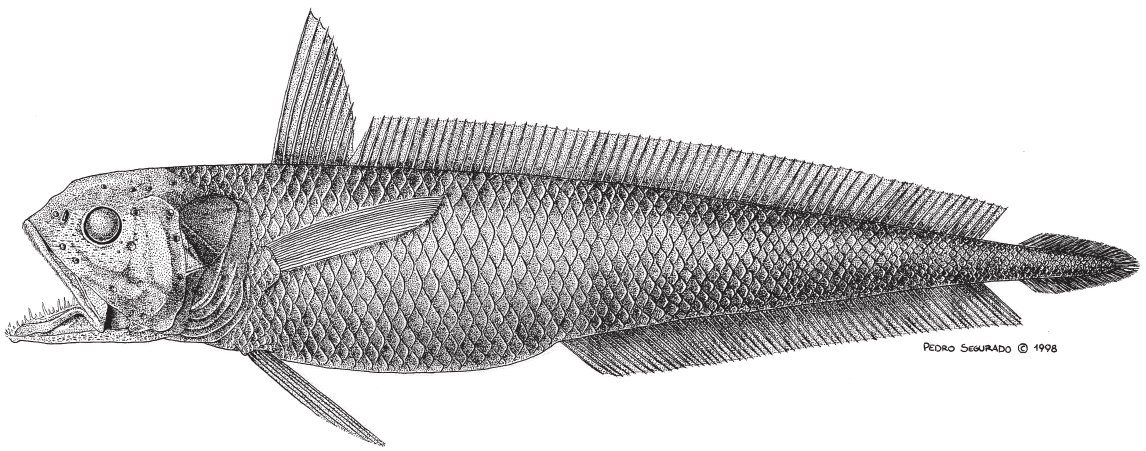


FIG. 1 – *Melanonus zugmayeri* Norman, 1930

TABLE 1. – Meristic and morphometric data available for *Melanonus* spp. specimens caught worldwide (1: Günther, 1887; 2, 4: Brauer, 1906; 3: Norman, 1930; 5: Norman, 1930; 6: Zugmayer, 1911; 7: Beebe, 1932; 8: Maul, 1952; 9: Koefoed, 1953; 10: Kotthaus, 1970; 11: Melendez and Sielfeld, 1991; 12: Present work, specimen 1; 13: Present work, specimen 2).

| Author | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Originally described as | *M. gracilis* | *M. gracilis* | *M. gracilis* | *M. gracilis* | *M. zugmayeri* | *M. gracilis* |
| Synonym Cohen (1990a) | *M. gracilis* | *M. gracilis* | *M. gracilis* | *M. zugmayeri* | *M. zugmayeri* | *M. zugmayeri* |
| Geographical area | Antarctic | S Atlantic | S Atlantic | Cent. Atlantic | Cent. Atlantic | NE Atlantic |
| Latitude/Longitude | 62ºS 95ºE | 31º21'S 9º46'E | 46º-5ºS 46ºW-16ºE | 1º51'N 0º31'E | 13ºS-13ºN 18ºW-16ºE | 37ºN 11ºW |
| Depth (m) | 3600 | 3000 | 150-2500 | 2000 | 900 | 5100 |
| Nº specimens reported | 1 | 1 | 13(5) | 1 | 8(3) | 1 |
| Number of dorsal fin rays | 6+67 | 5+64 | 5-8 + 59-67 | - | 6+64 | 8+70 |
| Number of anal fin rays | 54 | 54 | 52-54 | - | 50 | 50 |
| Number of caudal fin rays | 50 | 50 | 50 | - | 50 | 50 |
| Number of pectoral fin rays | 10 | 14 | 12-14 | - | 13 | 14 |
| Number of ventral fin rays | 5 | 7 | 7 | - | 7 | 7 |
| Total length (TL) (mm) | 152 | 65 | 67-142 | 17 | 58-110 | 77 |
| Standard length (SL) (mm) | 150 | - | - | - | - | - |
| Body height (% SL) | 18.2 | 15.4 | 15.4-16.0 | 20 | 18.8-21.5 | 16.6 |
| Head length (HL) (% SL) | 17.9 | 22.2 | 18.2-18.8 | 25 | 25.0 | 20.0 |
| Eye diameter (% HL) | 23.5 | 24.4 | 22.2-25.0 | - | 20.0-21.1 | 20.0 |
| Pectoral fin length (% SL) | 13.1 | 12 | - | - | 16.7 | 14 |
| Ventral fin length (% SL) | - | 9 | - | - | - | 10 |
| Separation between D1 and D2 | D2 immediately behind D1 | Joined | - | D2 immediately behind D1 | Separated (1/2 D1 length) | Minute interspace |
| Maxillae | Not reaching posterior edge of eye | Reaching centre of eye | Reaching posterior edge of eye | - | Reaching posterior edge of eye | Reaching posterior edge of eye |
| Mandibular teeth | Narrow bands viiliform teeth | Narrow bands viiliform teeth | Narrow bands viiliform teeth | - | Some enlarged on lower jaw | - |
| Vomerine teeth | Narrow stripes of minute teeth | Narrow stripes of minute teeth | Narrow bands viiliform teeth | - | Single series on each side of head | - |
| Palatine teeth | Narrow stripes of minute teeth | Narrow stripes of minute teeth | Narrow bands viiliform teeth | - | Single series on each side of head | - |

| Author | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|
| Originally described as | *M. unipennis* | *M. macrostoma* | *M. unipennis* | *M. zugmayeri* | *M. zugmayeri* | *M. zugmayeri* | *M. zugmayeri* |
| Synonym Cohen (1990a) | *M. zugmayeri* | *M. zugmayeri* | *M. zugmayeri* | *M. zugmayeri* | | | |
| Geographical area | NW Atlantic | NE Atlantic | NE Atlantic | SW Indian | SE Pacific | NE Atlantic | NE Atlantic |
| Latitude/Longitude | Bermuda | Madeira | 31º-37ºN 29º-47ºW | Mombassa | 21ºS 71ºW | 37º30'N 9º25'W | 38ºN 9ºW |
| Depth (m) | 1280 | - | 900-3890 | 450 | 580 | 350 | 1500 |
| Nº specimens reported | 1 | 2 | 11(1) | 1 | 1 | 1 | 1 |
| Number of dorsal fin rays | 72 | 8-9 + 67-68 | 78 | 11+59 | 70 | 9+76 | 10+67 |
| Number of anal fin rays | 56 | 57 | 58 | 57 | 55 | 68 | 57 |
| Number of caudal fin rays | 57 | 50 | 54 | - | - | - | - |
| Number of pectoral fin rays | 16 | 17 | 15 | 13 | 15 | 15 | 16 |
| Number of ventral fin rays | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| Total length (TL) (mm) | 70 | - | 29-83 | 65 | - | 195 | 294 |
| Standard length (SL) (mm) | 62.5 | 236, 259 | 79 | 63 | 251 | 181 | 286 |
| Body height (% SL) | 16.0 | 18.2 | 14.2 | 13.5 | 19.1 | 15.5 | 17.8 |
| Head length (HL) (% SL) | 21.7 | 20.0 | 21.3 | 21.1 | 23.0 | 19.9 | 20.3 |
| Eye diameter (% HL) | 20.8 | 20.0 | 19.0 | 20/4.9 | - | 25.0 | 15.5 |
| Pectoral fin length (% SL) | 12.8 | - | 15.2 | 8.2 | - | 14.4 | 14.0 |
| Ventral fin length (% SL) | 10.2 | - | 12.3 | 5.7 | - | 13.3 | 13.6 |
| Separation between D1 and D2 | Joined | D2 immediately behind D1 | Joined | - | Joined | Separated | Separated |
| Maxillae | Reaching posterior edge of eye | Passes the posterior edge of eye | Reaching posterior edge of eye | Reaching posterior edge of eye | Reaching posterior edge of eye | Not reaching posterior edge of eye | Not reaching posterior edge of eye |
| Mandibular teeth | Partially enlarged | Some enlarged on lower jaw | Partially enlarged | - | Some enlarged in the front of jaw | Partially enlarged | Partially enlarged |
| Vomerine teeth | - | Two rows | A group | - | One row of enlarged teeth | Three rows | Three rows |
| Palatine teeth | - | Three rows, the innermost enlarged | Single row on each side | - | One row of enlarged teeth | Three rows | Three rows |

others the first dorsal rays may appear separated. Finally, Nelson (1994) assumes a single long-based dorsal fin for the Melanonidae family. Besides the dorsal fin, other aspects of external morphology and relative measurements of the body are also very variable in the published work (e.g. Fowler, 1936; Maul, 1952). Thus, new biometrical data needed for a better description of the external morphology of this rare species, and its geographical variation.

The diagnosis characters traditionally used, such as the number of pectoral fin rays and the existence (or not) of two separated dorsal fins (Cohen, 1986b), do not seem to be reliable for species discrimination purposes. In fact, the range of values presented for several meristic and morphometric characters overlap in most cases. Regarding the dorsal fin characteristics, even in the original description of *M. gracilis* (Günther, 1887) a slight separation between dorsal fins is reported (in both text and figure). This separation has been considered as one of the discriminating characteristics between *M. gracilis* and *M. zugmayeri* (Cohen, 1986b). The shape of the teeth of the lower jaw seems to be the only morphological characteristic that is coherently used for species discrimination. However, the differences reported may be due to individual variation rather than interspecific variation. Given the small number of specimens studied so far, there is a lack of data to support the hypothesis of the existence of more than one species of the genus *Melanonus*.

Further work is needed to better characterise this genus. Though *Melanonus zugmayeri* has recently been captured for a variety of studies in deep-sea fish physiology (e.g. Phleger and Laub, 1989; Douglas and Thorp, 1992; Patridge *et al*., 1992; Marshall, 1996), these specimens were not used to improve the knowledge on the systematics of this species. Any capture of individuals of this genus should be carefully analysed from the taxonomic point of view.

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