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RESEARCH ARTICLE ARAŞTIRMA MAKALESİ

Bacteridium izmirensis (Gastropoda: Pyramidellidae), a new species from the Aegean Sea

Bacteridium izmirensis (Gastropoda: Pyramidellidae), Ege Denizi'nden yeni bir tür

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Abstract: The genus *Bacteridium* Thiele, 1929 comprises five species known to inhabit the world ocean. However, examination of several specimens collected from İzmir Bay (Aegean Sea) revealed the presence of a further species, which is here described as *Bacteridium izmirensis* sp. nov. In this study, the new species is examined in detail and compared to the other similar species, with comments on the distinctive features of the new species.

Keywords: *Bacteridium izmirensis* sp. nov., Mollusca, Türkiye

Öz: *Bacteridium* Thiele, 1929 genusu dünya okyanusunda yaşadığı bilinen 5 tür içermektedir. Ancak İzmir Körfezi'nden toplanan bazı bireylerin incelenmesi sonucu, *Bacteridium izmirensis* sp. nov. olarak tanımlanan başka bir türünde olduğu tespit edilmiştir. Bu çalışmada, yeni tür ayrıntılı olarak incelenmiş ve benzer türler ile karşılaştırma yapılarak, ayırt edici özellikleri hakkında açıklama ve yorumlarda bulunulmuştur.

Anahtar kelimeler: *Bacteridium izmirensis* sp. nov., Mollusca, Türkiye

INTRODUCTION

The genus *Bacteridium* was described by Thiele (1929) as a subgenus of *Eulimella* Forbes and M'Andrew, 1846, with type species by monotypy *Eulimella praeclara* Thiele, 1925 (in Thiele, 1992). The genus was later raised to genus level (Peñas et al., 1996).

The *Bacteridium* species are characterized by a minute shell of about 1.1-3.7 mm (Pimenta and Absalão, 2001), an elevated heterostrophic protoconch of type B, and sometimes with fine spirals on the teleoconch whorls, covering the entire surface between the sutures. The classification of *Bacteridium* species is mainly based on shell morphology, as is the case for most micromollusc taxa, and includes the following valid species worldwide: *Bacteridium bermudense* (Dall and Bartsch, 1911), *Bacteridium macilentum* (Monterosato, 1878), *Bacteridium praeclarum* (Thiele, 1925), *Bacteridium resticulum* (Dall, 1889) and *Bacteridium vittatum* (Adams, 1861) (Pimenta and Absalão, 2001; Molluscabase, 2025). Of the above-mentioned species, *B. macilentum* is the only one having a distribution in the Mediterranean Sea. The species was initially described as *Odostomia macilenta* by Monterosato (1878) (*nomen novum* pro *debilis* Monterosato, 1875 not Pease, 1868) based on specimens collected from the coast of Palermo (Italy) at depths between 90 and 110 metres.

Of the remaining four species, *Bacteridium resticulum* and *B. bermudense* originated from the northern Atlantic Ocean. *Bacteridium resticulum* was described from the coast of Florida (Key West) and has a native range of distribution from the Caribbean to the northern Brazil (Miloslavich et al., 2010). However, *B. bermudense* originated from the coast of Bermuda, for which the known distribution is the Caribbean Sea, the coast of Cuba, the Gulf of Mexico and the coasts of Venezuela and Brazil (Pimenta and Absalão, 2001; Molluscabase, 2025). The other representative, *Bacteridium vittatum*, with type locality Hulu-Shan Bay (Yellow Sea, western Pacific), is known from the type locality, Boso Peninsula on the Pacific coast and coasts of Japan and China (Adams, 1861; Okutani, 2000; Molluscabase, 2025). *Bacteridium praeclarum* is the type species of the genus *Bacteridium* Thiele, 1929, recorded from the coast of western Sumatra (northern Indian Ocean) (MolluscaBase, 2025).

In the studies carried out in İzmir Bay (on the Turkish coast of the Aegean Sea), a few specimens assignable to the genus *Bacteridium* were found. When their shell features were compared to those of the other known species, they appeared distinctive and are thus described herein as new.

MATERIALS AND METHODS

The specimens studied in this study were sampled within the framework of a project supported by TUBITAK (SINHA 107 G 066) from the outer part of İzmir Bay (on the Turkish coast of the Aegean Sea) on 11 and 13 November 2009. The material was collected in triplicate at each station from a sandy muddy and muddy bottoms at depths of 19 (38°25.76' N - 27°07.11'E) and 26 m (38°23.32' N - 26°46.62' E) using a Van Veen grab (sampling an area of 0.1 m^{-2}) by the *RV* '*K. Piri Reis*'. Benthic

samples were sieved through a 0.5 mm mesh on board the *RV* '*K. Piri Reis*', and the retained fauna was transferred to jars containing 10% seawater-formalin solution. In the laboratory, the samples were sorted into major taxonomic groups under a stereomicroscope and then preserved in 70% ethanol. Among the examined gastropod specimens, a few individuals belonging to the genus *Bacteridium* were found. The specimens were then identified according to the relevant literature and their shells were measured.

The studied material was deposited in the Scientific Collection (ESFM) of the Faculty of Fisheries, Ege University, İzmir (Türkiye).

RESULTS

SYSTEMATICS

Class: Gastropoda Cuvier, 1795

Family: Pyramidellidae Gray, 1840

Genus: *Bacteridium* Thiele, 1929

***Bacteridium izmirensis* sp. nov.**

(Figure 1, A-L)

Anisocycla striatula (Jeffreys, 1856)- Öztürk and Bitlis-Bakır (2013: 426, Figure 5A)

Materials examined

Type material: TÜRKİYE, 3 spm, İzmir Bay, 38°23.32' N - 26°46.62' E, 26 m, 11 November 2009, mud; 1 spm, İzmir Bay, 38°25.76' N - 27°07.11'E, 19 m, 13 November 2009, mud. The type material is deposited in the Scientific Collection (ESFM) of the Faculty of Fisheries, Ege University, İzmir (Türkiye).

Description. Holotype: ESFM-GAS /2009-67 (Figure 1, A-D), 38°25.76' N - 27°07.11'E, 19 m, 13 November 2009, mud; **Paratype 1:** ESFM-GAS /2009-68) (Figure 1, E-H); **Paratype 2:** ESFM-GAS /2009-66 (Figure 1, I-L).

Shell very small, fragile and subcylindrical (slightly conical), with approximately four convex teleoconch whorls and an inclined subsutural ramp. Protoconch of type B, planispiral and inclined, according to that indicated in Schander (1994), with a diameter of 140 and 160 µm (160 µm). Suture deep and inclined. Very fine striae of nearly equal distance on teleoconch whorls covering the entire surface between the sutures and appear slightly wavy under magnification. The spirals are between 16-25 (24) in number on the body whorl and 9-15 (14) on the penultimate whorl. In the Paratype 2, the distance between the spirals is wider and they are fewer in number compared to the other two type specimens. Growth lines not pronounced under stereomicroscope magnification (x 50). Aperture pear-shaped, columellar side inclined, tooth or fold absent. Outer lip thin and smooth. No umbilicus. Shell hyaline in colour and semi-transparent. Total height of the shell **(H)**=1.58-1.78 (1.77) mm; width of the shell **(D)**=500-570 (570) µm, height of aperture **(hA)**= 450-470 (470) µm, body whorl height **(BWH)**= 725-850 (850) µm (in brackets holotype).

Distribution

Known only from the type locality.

Type locality

İzmir Bay (Aegean Sea), Türkiye

Etymology

The species was named after the bay where it was collected.

Remarks

Bacteridium izmirensis sp. nov. differs from *Odostomia macilenta*, which was renamed as *Bacteridium macilentum* by Nappo et al. (2024), in having more convex teleoconch whorls (especially the middle part of the whorls) and an inclined subsutural ramp, as opposed to the staggered one (as step-like) in *B. macilentum* illustrated by Nappo et al. (2024) (Figure 1, M-O). In addition, the second teleoconch whorl of *B. macilentum* is proportionally much larger than the first teleoconch whorl (Figure 1, O) compared to *B. izmirensis* sp. nov. The latter species also differs from *Ebala striatula* (Jeffreys, 1856) sensu Renda and Vannozzi (2025) (Figure 2, E-H) in having a subcylindrical shell shape, more convex teleoconch whorls, and more prominent spirals and subsutural ramp on the teleoconch whorls. The aperture shape is also different.

The specimen in Figure 2, A-D (ESFM-GAS/2009-69), which was sampled alongside two paratypes of the new species at a depth of 26 m and having dimensions **H**=1.60 mm, **D**= 590 µm, **hA**= 400 µm, **BWH** =740 µm, and diameter of protoconch=140 µm, was tentatively assigned to *Bacteridium izmirensis* sp. nov. In terms of shell features, the specimen resembles the type material of the new species but differs in having a shell with more convex teleoconch whorls and a higher shell diameter, as well as a slightly shorter total shell height compared to the type material of *B. izmirensis* sp. nov., except for Paratype 2. In addition, the distance between the spirals on the teleoconch whorls of this specimen is almost as wide as that of Paratype 2 of the new species (Figure 1, I-L). Considering that morphological variation is prominent in some heterostrophic taxa and that the specimen was found alongside two paratypes of the new species, it was tentatively identified as *Bacteridium* cf. *izmirensis*, on the assumption that it could be a morphological variation of the new species. However, a definitive decision requires further material to be examined.

DISCUSSION

Among the known *Bacteridium* species, *Bacteridium macilentum* is the only one distributed in the Mediterranean Sea. The species was initially described as *Odostomia macilenta* by monotipy [=nomen novum pro *debilis* Monterosato, 1875] and later recorded by Molluscabase as a synonym of *Ebala striatula* (Jeffreys, 1856) (Appolloni et al., 2018).

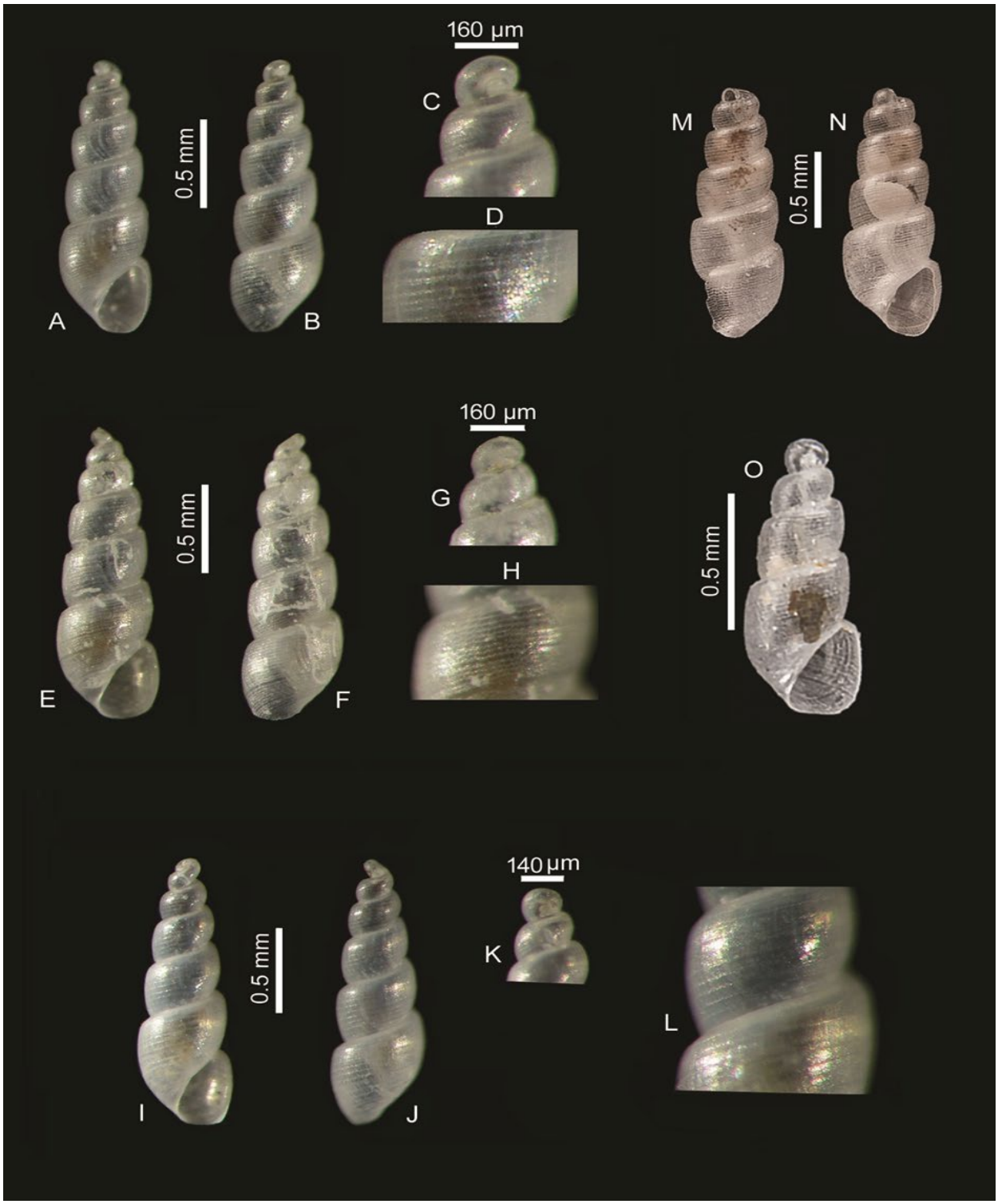

Figure 1. A-O. A-L. *Bacteridium izmirensis* sp. nov., **A-D. Holotype** [ventral (**A)** and dorsal (**B)** views of the specimen, and its protoconch (**C)**, **D.** view of microsculpture on the teleoconch whorls under magnification]; **E-H. Paratype 1** [ventral (**E**) and dorsal (**F**) views of the specimen, and its protoconch (**G**), **H**. view of microsculpture on the teleoconch whorls under magnification]; **I-L. Paratype 2** [ventral (**I**) and dorsal (**J**) views of the specimen, and its protoconch (**K**), **L**. view of microsculpture on the teleoconch whorls under magnification]; **M-O.** *Bacteridium macilentum* sensu Nappo et al. (2024) [lateral (**M)** and dorsal **(N)** views of a specimen recorded from the Maltese Islands, **O.** a specimen from the Levantine coast of Türkiye, near Mersin].

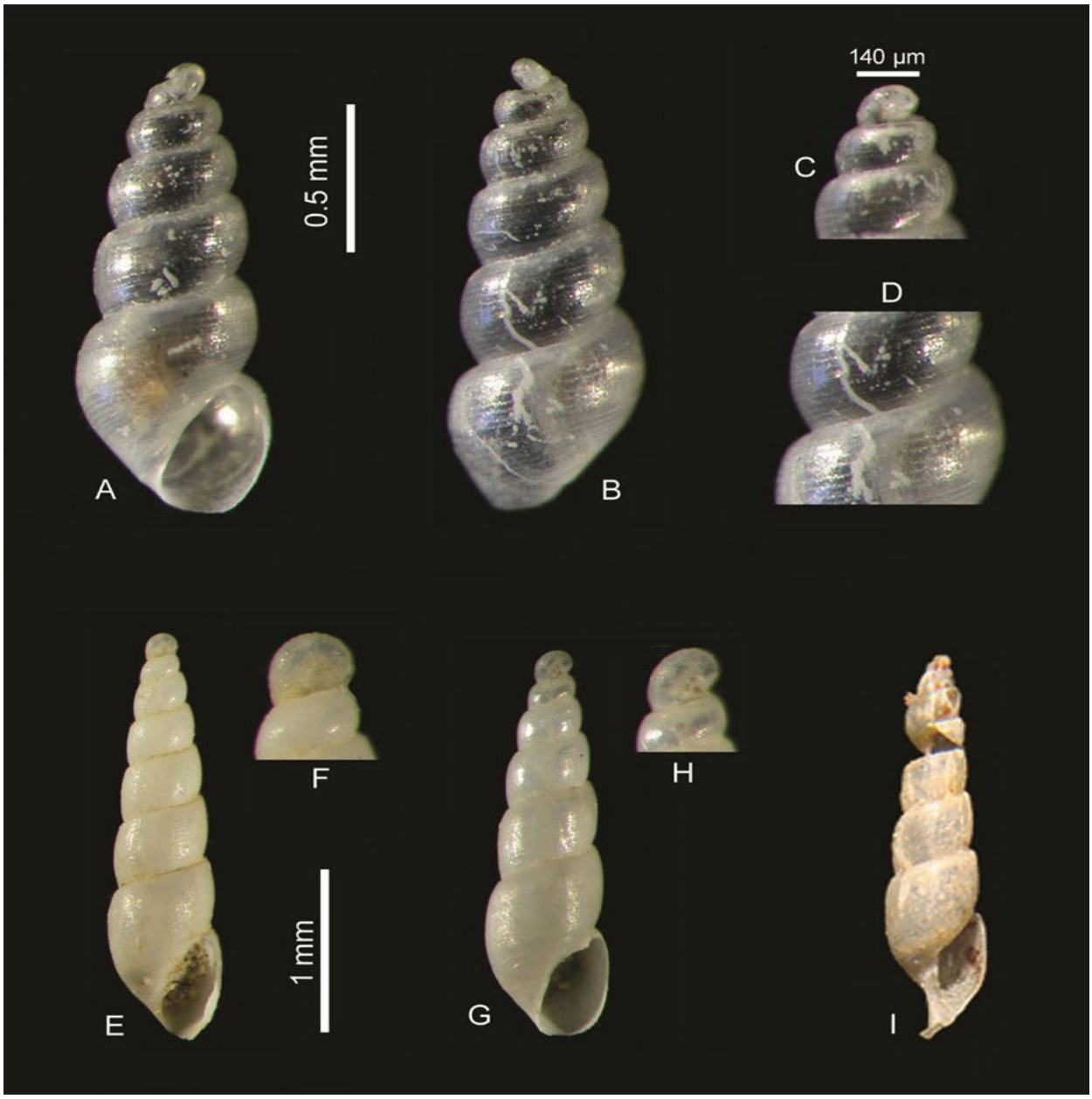

Figure 2. A-I. A-D. *Bacteridium* cf. *izmirensis* [ventral (**A)** and dorsal **(B)** views of the specimen and its protoconch (**C**), **D.** view of microsculpture on the teleoconch whorls under magnification]; **E-H.** *Ebala striatula* (Jeffreys, 1856) [ventral (**E, G)** views of two specimens and their protoconchs (**F**, **H**)]; **I.** Holotype of *Odostomia macilenta* Monterosato, 1878 (according to Renda and Vannozzi, 2025) [specimen broken into two sections, not measurable (Appolloni et al., 2018)]

The specimen illustrated by the latter authors (p.117, fig. 27, G) from Palermo, which was recorded at depths of 90-110 m, is the holotype of *Odostomia macilenta* Monterosato, 1878 (Renda and Vannozzi, 2025), for which taxon Nappo et al. (2024) proposed the new combination *Bacteridium macilentum* (Monterosato, 1878).

As Appolloni et al. (2018) made no mention of a lectotype for *O. macilenta*, the statement by Nappo et al. (2024) that the authors designated the lectotype of *O. macilenta* seems to contradict reality. On the other hand, Nappo et al. (2024), interestingly, found *Ebala striatula* to fit comfortably within the range of intraspecific variability of *Eulimella acicula* (Philippi, 1836) and suggested that *E. striatula* should be considered as a junior synonym of *E. acicula*. However, Renda and Vannozzi (2025) reviewed the taxonomic history of the species and provided arguments that the suggestion of Nappo et al. (2024) must be rejected.

Bacteridium izmirensis sp. nov., which was found in İzmir Bay, exhibits some similarities with the figures depicted by Nappo et al. (2024: p. 69, figs 13 A-R) for *Bacteridium*

macilentum from the Maltese Archipelago and the Turkish Levantine coast near Mersin. However, considering that the figure provided by Appolloni et al. (2018) is the holotype of *Odostomia macilenta=B. macilentum* (Figure 2, I), as it was stated by Renda and Vannozzi (2025), the figures illustrated by Nappo et al. (2024) appear to be questionable as *B. macilentum*. Because the holotype of the species is slender conical, with higher number of teleoconch whorls, higher total shell height, without a subsutural area as evident as in the specimens assigned to *B. macilentum* and, despite being damaged, with an aperture which is clear that is in a different shape. In addition, the lack of a protoconch in the illustrated specimen (Figure 1, M, N) makes the specific identification questionable, despite it having been assigned to *B. macilentum*. Consequently, the specimen depicted by Nappo et al. (2024) may belong to an undescribed species of the genus *Bacteridium* or another taxon.

Compared to the other extant *Bacteridium* taxa, *B. izmirensis* sp. nov. differs from *B. bermudensis* in having a subcylindrical shell and spiral microsculpture on the teleoconch whorls. The new species can be distinguished from *B. resticulum* by its more convex whorls, smaller size and fewer teleoconch whorls. As for its difference from the *B. vittatum*, the latter species is characterized with two narrow reddish brown spiral bands on each teleoconch whorl (Okutani, 2000).

There is also a contradiction regarding the family to which the genus *Bacteridium* belongs. According to Warén (1995), currently it was placed in the Pyramidellidae (Molluscabase, 2025), although some authors (Giannuzzi-Savelli et al, 2014) consider it within the family Murchisonellidae. The main difference between the two families is the presence or absence of the so-called "*jaw apparatus*", which does not exist in the pyramidellids (Warén, 1995).

The specimens considered herein were collected from İzmir Bay in 2009. Since then, a lot of materials have been studied from this area, but no further specimens have been found.

Consequently, *Bacteridium* species are rarely found. This may be because they require specific environmental conditions to develop, or because they are so small and fragile that they are lost when the sampled materials are washed.

NOMENCLATURAL ACTS

This work and the nomenclatural acts it contains have been registered in ZooBank. The ZooBank Life Science Identifier (LSID) for this publication is: https://zoobank.org/NomenclaturalActs/99348bbc-86d9-42bf-9baf-7fcad8b3ed33

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ETHICS APPROVAL

No specific ethical approval was necessary for the study.

CONFLICT OF INTEREST STATEMENT

The author declares that there are no conflicts of interest or competing interests

DECLARATION OF AI USE

We have not used AI-assisted technologies in creating this article.

DATA AVAILABILITY

For any questions, the corresponding author should be contacted.

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