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DEEP-WATER TARDIGRADA OF THE ISTANBUL STRAIT'S (BOSPORUS) OUTLET AREA OF THE BLACK SEA

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Deep-Water Tardigrada of the Istanbul Strait's (Bosporus) Outlet Area of the Black Sea. Kharkevych Kh. O., Sergeeva N. G. — The results of investigations of tardigrades (2009–2010) in the Bosporus outlet area of the Black Sea are represented. For the first time two species of tardigrades *Dipodarctus subterraneus* (Renaud-Debyser, 1959) and *Tanarctus ramazzottii* (Renaud-Mornant, 1975) are recorded for the Black Sea. Tardigrades are registered on 4 stations at depths range 88–250 m. Average abundance of tardigrades widely varied from 141 to 11 440 ind./m^2. The vertical distribution of tardigrades in the sediments was analyzed: most specimens (up to 98 %) found in the top 0–1 cm sediment layer.

Key words: deep-water tardigrades, *Dipodarctus subterraneus, Tanarctus ramazzottii*, abundance, distribution, Black Sea.

Глубоководные тихоходки (Tardigrada) в районе Босфора (Чёрное море). Харкевич Х. О, Сергеева Н. Г. — Приведены результаты исследований тихоходок (2009–2010 гг.) в Прибосфорском районе (Чёрное море). Впервые для Чёрного моря зарегистрированы два вида тихоходок *Dipodarctus subterraneus* (Renaud-Debyser, 1959) и *Tanarctus ramazzottii* (Renaud-Mornant, 1975). Тихоходки были зарегистрированы на 4 станциях в диапазоне глубин 88–250 м. Средняя численность тихоходок варьировала в широких пределах от 141 до 11 440 экз./м^2. Проанализировано вертикальное распределение тихоходок в донных осадках: большинство экземпляров (до 98 %) обнаружены в верхнем 0–1 см слое донных осадков.

Ключевые слова: глубоководные тихоходки, *Dipodarctus subterraneus, Tanarctus ramazzottii*, численность, распространение, Чёрное море.

Introduction

Among the seas of Mediterranean basin, the Black Sea exhibits a number of features. It is deep marginal meromictic reservoir that has an oxygenated surface layer overlying a sulfide containing anoxic deep layer. The combined effect of great depth, considerable desalination of surface waters caused by river discharges, and the influx of saline deep water from the Marmara Sea, creates a distinct stratification of the water column into an upper, relatively thin (150–250 m deep) oxic zone with plentiful flora and fauna and a huge anoxic zone (from 150 to 250 m depth down to the deepest point) with high hydrogen sulfide concentrations.

The Black Sea exhibits a number of remarkable oceanographic and hydrographic characteristics (Murray et al., 1993; Özsoy, Ünlüata, 1997). The combined effect of great depth (> 2000 m), shallow sill depth (35 m) of the Istanbul Strait (Bosporus) outlet, large amount of river water input, and the inflow of warm and saline Mediterranean water creates a distinct basin-wide water-column stratification with a chemocline/pycnocline at 100 to 150 m, separating an oxic and an anoxic zone. Between the oxic and anoxic waters there is a suboxic zone, which is important for biogeochemical and redox reactions.

Long-term monitoring of the distribution of oxygen and sulfide across this boundary indicates that it is situated at a depth of 80–100 m in the centre and 160–250 m at the periphery (Eremeev, Konovalov, 2006).

Where the oxic/anoxic interface in the water column impinges on the seafloor, it creates a strong benthic gradient in oxygen and hydrogen sulfide concentrations. This O_2/H_2S-transition zone is highly dynamic, characterized by varying concentrations of oxygen and hydrogen sulfide in the bottom water, and oscillates above and below its average depth.

The interactions between these oxic and anoxic water masses are of great interest to researchers in different scientific fields. The taxonomic composition and distribution of meiobenthic fauna inhabiting the depth zone where the oxic/anoxic interface zone meets the sea floor is of special interest.

Researches give considerable attention to the investigation of meiobenthos of the Black Sea (Sergeeva et al., 2013). However, data on meiobenthos of Bosporus region and on the meiofauna of the interaction zone of oxygen and anoxic water masses are scarce (Sergeeva, Gulin, 2007). Specific communities of benthic nematodes, foraminifera, harpacticoides, ostracodes and polychaetes adapted to specific environmental conditions were recorded to the Bosporus outlet area of the Black Sea (Caraion, 1959; Didkowsky, 1969; Yanko, Vorobyova, 1991; Karaçuha et al., 2011; Ürkmez et al., 2011; Zaika, Sergeeva, 2012).

The first detailed data of the taxonomic structure, abundance and distribution of the meiobenthos on the Black Sea shelf and the upper slope area off the Bosporus Strait outlet in the transition zone from oxic to anoxic conditions along transects from 75 to 300 m water depth were presented of Sergeeva et al. (2013). The meiobenthos was present at all investigated depths and includes 21 taxa. For the first time in the Bosporus Strait outlet Tardigrades were found.

The marine tardigrades fauna of the Black Sea is poorly known. From the northwestern Black Sea, near the Bulgarian and Romania coast, five species, *Batillipes mirus* Richters, 1909, *Stygarctus bradipus* Schultz, 1951, *Echiniscoides sigismundi* Schultz, 1865, *Halechiniscus guiteli* Richters, 1908 and *Hypsibius stenostomus* Richters, 1908 were recorded (Richters, 1909, Rudescu, 1969).

After that, there were found tardigrades species *B. mirus, E. sigismundi, H. guiteli* and species Styraconyxinae gen. sp. in the coastal zone of Crimea (Sergeeva et al., 2006). Since then, data about the Crimean fauna of Tardigrada have successively been obtained from different coastal regions and new for the Black sea species of tardigrades *B. gilmartini* McGinty, 1969, *B. spinicauda* Gallo D'addabbo, Sandulli and de Zio Grimaldi, 2005, *Styraconyx qivitoq* Kristensen and Higgins, 1984, *S. nanoqsunguak* Kristensen and Higgins, 1984 and *Megastygarctides* sp. n. were recorded (Khakrevych, 2012). Until now, the marine tardigrades of the Bosporus area are entirely unknown.

We adhere to the classification of (Guidetti, Bertolani, 2005; Degma, Guidetti, 2007; Degma et al., 2013) that the tardigrades form separate phylum Tardigrada, which is divided into 3 classes: Eutardigrada, Mesotardigrada and Heterotardigrada.

Our main aim is to provide preliminary information concerning diversity and abundance of tardigrades at the oxic/anoxic interface of the Bosporus region.

This work is the continuation of the series of studies of the deep-water meiobenthos in the Istanbul Strait's (Bosporus) outlet area of the Black Sea (Sergeeva et al., 2013), conducted within the framework of the EU 7th FP project HYPOX (In situ monitoring of oxygen depletion in hypoxic ecosystems of coastal and open seas, and land-locked water bodies) EC Grant 226213.

Material and methods

In the region of the Bosporus Strait (Black Sea), samples were obtained on two occasions: in November 2009 during a cruise of the R/V "Arar" of the Istanbul Technical University (Turkey) and in April 2010 during cruise 15/1 of the R/V "Maria S. Merian" (Germany) (fig. 1).

The meiobenthos on the Black Sea shelf and the upper slope area off the Bosporus Strait outlet was for the first time studied along depth transects from 75 to 300 m water depth, where less saline surface waters of the Black Sea interact with the saline Mediterranean waters, creating a special ecological system and rapid transitions from oxic, hypoxic and anoxic water conditions.

During the cruise of R/V "Maria S. Merian" samples for biological studies were collected using a multicorer (diameter of tubes 9.5 cm) and in the cruise of the R/V "Arar" was used a gravity corer (diameter 7 cm) device that obtain virtually undisturbed sediment samples. The sediment cores were sliced into 1-cm-thick layers down to a depth of 5–10 cm depth in order to study the vertical distribution of the fauna. All sediment sections were preserved in 75 % alcohol, which is known to preserve morphological structures of fauna without distortion. Each layer was washed through two sieves, the upper one with a mesh size of 1 mm, the lower one with a mesh size of 63 μm, and stained with Rose Bengal solution before being sorted in water under a microscope for "live" (i. e., stained) and extracted organisms only those specimens that stained intensely with rose Bengal and showed no signs of morphological damage. All of the isolated organisms were counted and identified to higher taxa. Tardigrades were picked out using a glass pipette and placed in cavity slides with a mixture of glycerol (50 %) and water (50 %). Tardigrades specimens were observed and identificated for species with using of the microscope Nikon Eclipse E200. Photos of the organisms were taken under different magnification. To compare the data obtained during two cruises, the average abundance of tardigrades was calculated per square meter.

Oxygen concentrations in the sediment and the overlying water and oxygen penetration depth measured at 88 m (st. 4), 103 m (st. 5) and 122 m (st. 6) are presented in table 1 (Sergeeva et al., 2013).

Bottom-water oxygen concentrations in the study area range from 0.17 mmol L^{-1} at 103 m water depth to 0.12 mmol L^{-1} at 88 m water depth. The sediment samples in all stations differed by its composition and structure. In the samples from 88 m (st. 4) the sediment was represented by gray aleuritic mud with fragments of mollusk shells, at a depths of 117 m (st. 283) — black mud with mussel shells, at 122 m deep (st. 6) — by black mud, and at 250 m (st. 9) — flowing black mud with a strong odor of hydrogen sulfide.

Tardigrada specimens were found on the 3 stations from 9 during a cruise of the R/V "Arar" and only on the 1 from 18 meiobenthos stations during cruise of the R/V "Maria S. Marian" (table 2).

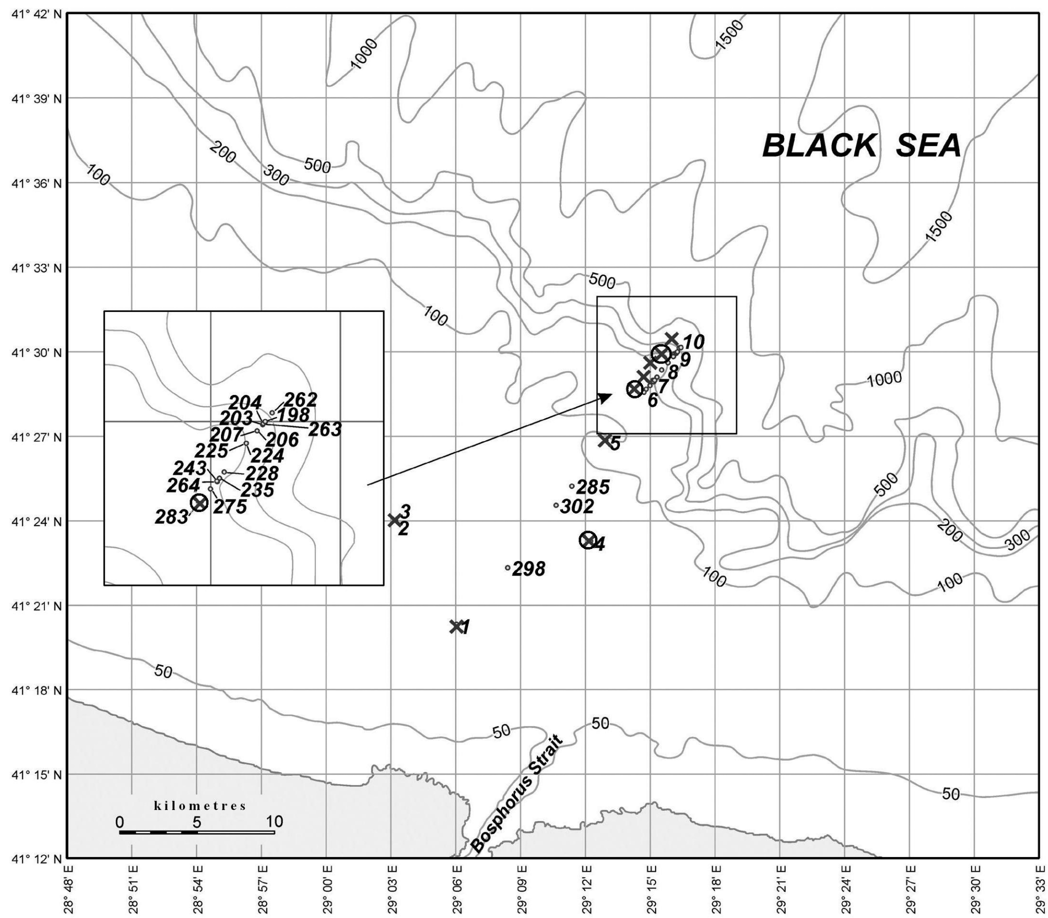

Fig. 1. Meiobenthos stations in the region of Bosporus: × — stations 1 — 10 (R/V "Arar", November, 2009); o — stations 198 — 302 (R/V "Maria S. Marian", April, 2010); ⊗ — stations, where tardigrades were found.

Рис. 1. Мейобентосные станции в районе Босфора: × — станции 1 — 10 (НИС «Arar», ноябрь, 2009); o — станции 198 — 302 (НИС «Maria S. Marian», апрель, 2010); ⊗ — станции, где обнаружены тихоходки.

Table 1. Dissolved oxygen concentrations measured in bottom waters above sediments and maximal oxygen penetration depth in the sediments measured in cores retrieved from the near Bosporus area

Таблица 1. Концентрация растворенного кислорода в придонных водах и максимальная глубина проникновения кислорода в колонку донного осадка в прибосфорском районе

Station	Water depth (m)	Oxygen concentration in the overlying water (mmol L^{-1})	Maximal oxygen penetration depth (mm) in bottom sediment
4	88	0.12	1
5	103	0.17	2
6	122	0.16	3

Note. Measurings of A. Lichtschlag (Sergeeva et al., 2013).

Table 2. Coordinates of the stations, where tardigrades found

Таблица 2. Координаты станций, на которых обнаружены тихоходки

Data	Coordinates/Cruise	Station, N	Depth, m
2009.11.15	41°23,29′ N, 29°12,24′ E / R/V "Arar"	4	88
2009.11.15	41°28,68′ N, 29°14,81′ E / R/V "Arar"	6	122
2009.11.15	41°29,93′ N, 29°16,12′ E / R/V "Arar"	9	250
2010.04.16	41°28,54′ N, 29°14,63′ E / R/V "Maria S. Marian"	283	117

Table 3. List of tardigrades species with indication of the stations, where they were found
Таблица 3. Список видов тихоходок с указанием станций, где они были обнаружены

Species account	Sampling station	Total
HALECHINISCIDAE		
Tanarctinae Renaud-Mornant, 1980		
Tanarctus Renaud-Debyser, 1959		
Tanarctus ramazzottii Renaud-Mornant, 1975	4, 6, 9, 283	40
Dipodarctinae Pollock, 1995 *Dipodarctus* Pollock, 1995		
Dipodarctus subterraneus Renaud-Debyser, 1959	4, 6	13

Results

Meiobenthic samples from Bosporus region contain rich fauna of meiobenthic organisms. The meiobenthos was represented by 21 different taxa. Tardigrades were associated with the great number of these groups of meiobenthic organisms.

In total, 53 specimens of tardigrades were found. Two species belonging to one family of heterotardigrades were recorded from 4 stations from Bosporus region. All species recorded from Bosporus region belong to the family Halechiniscidae (table 3).

Short diagnosis of found tardigrades species and some aspects of their ecological and distributional features are given below.

CLASS HETEROTARDIGRADA Marcus, 1927

ORDER ARTHROTARDIGRADA Marcus, 1927

FAMILY HALECHINISCIDAE Thulin, 1928

Genus *Dipodarctus* Pollock, 1995

Dipodarctus subterraneus (Renaud-Debyser, 1959) (fig. 2)

Material examined. 13 adult specimens from Bosporus area of the Black Sea, at 88 and 122 m deep, from st. 4 and 6, respectively; cruise of R/V "Arar", November 2009.

Diagnosis. All general taxonomic characters according to the original description (Renaud-Debyser, 1959). Length about 100 μm, cuticle smooth, with a slight fold in correspondence with each pair of legs. A complete set of well-developed cephalic sense organs is present. Median cirrus (10 μm), unpaired, vertically erected; internal buccal cirrus (10 μm), paired and in dorsal position; external buccal cirrus (9 μm), paired and in ventral position; lateral cirrus (13 μm), paired; clava (30 μm), paired. The median cirrus and the buccal cirri have a well developed basal sheath; the lateral cirrus and the clavae arise from a common base. Secondary clavae present as cephalic ridges between internal and external cephalic cirri. Buccal aperture ventral; two stylets are present.

Long legs, each with 4 digits ending with a claw without spurs. Between third and fourth legs two long and robust dorsolateral cirri E. Each leg bears short sense organs. Feet on legs I—III with at least 3 of the 4 toes short and of equal length; these feet unlike that of the IV leg; foot on leg IV of *Tanarctus*-type, with 2 short outer toes (toes 1 and 4) with simple crescent claws and 2 long, thin, flexible medial toes (toes 2 and 3) with small crescent claws. Leg IV papilla is like an ovoid base with terminal spine.

As there are no table measurements in original description of the species (Renaud-Debyser, 1959), so we can only compare the characters that were in the text (table 4).

There is difference in body length between the two localities. According to our data, Black sea specimens are smaller than that described from Bimini Island. In spite of this, specimens of this species that were found in other localities (Gallo D'Addabbo et al., 2001) also have length about 100 μm. Differences in body size and some other

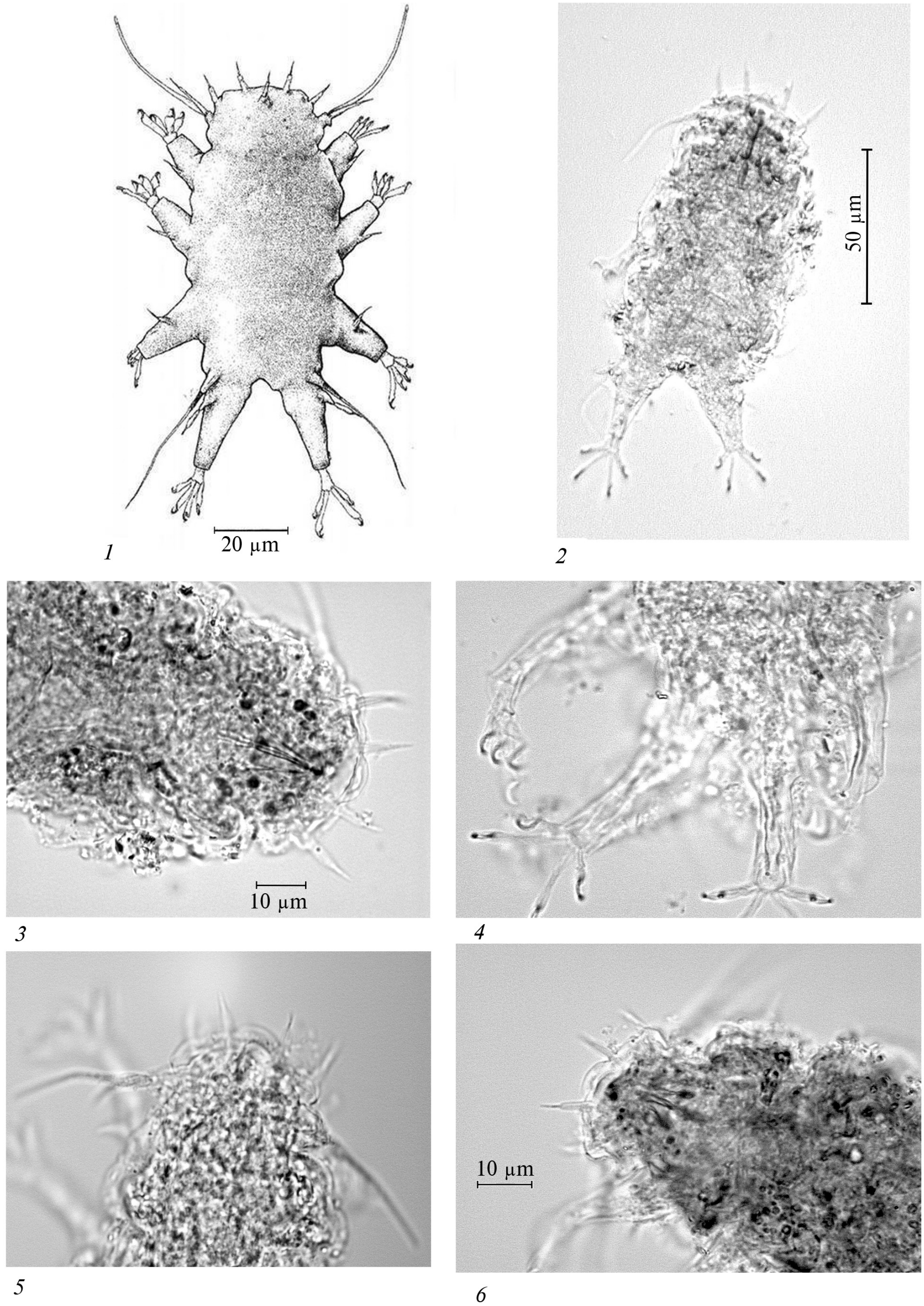

Fig. 2. *D. subterraneus*: *1* — general view (by Gallo D'Addabbo et al., 2001); *2* — photo of ventral view; *3* — head cephalic appendages with cells glands; *4* — 3rd and 4th legs with different type of digits ending with claws; *5* — internal, external and lateral cirri and clavaes; *6* — general view of the head.

Рис. 2. *D. subterraneus*: *1* — общий вид (по: Gallo D'Addabbo et al., 2001); *2* — фото с вентральной стороны; *3* — головные усики и одноклеточные гланды; *4* — 3-ая и 4-ая нога с пальцами разных типов и коготками; *5* — внешние, внутренние, боковые усики и клава; *6* — общий вид головы.

Table 4. Morphometrics of the type-materials of the *Dipodarctus subterraneus* (by Renaud-Debyser, 1959) and values of characters of specimens (N = 13) found in the Black Sea

Таблица 4. Морфометрические характеристики типового материала вида *Dipodarctus subterraneus* (по: Renaud-Debyser, 1959) и значения параметров экземпляров (N = 13), обнаруженных в Чёрном море

Character, μm	Holotype from Bimini island (Bahamas)	Specimens from the Bosporus region (Black Sea)
Total body length	133	100–105
Median cirrus	15	8–10
Internal cirri	14–15	10–12
External cirri	7–8	8–9
Lateral cirri "A"	10–13	13–14
Clavae	30–32	30–32
Cirri E	–	40

Note. N — number of specimens.

features as internal and external cirri could be due to the variation between the two localities and different environmental conditions.

Species of this genus have specific and unique foot features that simplify the process of identification of the species — unequal toe patterns on legs I–III and leg IV. Feet of this species are a combination of short broad toes of the basic *Halechiniscus-type* on the I–III legs, along with the long toes of the *Tanarctus-type* on the IV legs. According to these features and other general taxonomic features we can exactly identified the specimens.

Ecological pattern and geographical distribution. For the first time it was found from Bimini Island (Bahamas) (Renaud-Debyser, 1959) and later (De Zio Grimaldi et al., 1999) at various sites in the Mediterranean Sea. Also it was found in Malta, Faroe Islands, Bahamas and in the Indian ocean near Seychelles in intertidal and subtidal zones and Maldivian Island at a depth of 58 m (De Zio Grimaldi et al., 2003; Gallo et al., 2007). The species was a part of the interstitial benthos of the intertidal zone; it was found at a depth of 50-60 cm, in sand composed of detritus of organisms (foraminifera, polyps, spines of echinoderms, mollusks) and of calcareous algae. Species was recorded from submarine caves in S. Domino Island (Tremiti Island) in the Mediterranean Sea in intertidal, interstitial coralline sands and subtidal within 20 m depth (Gallo D'Addabbo, 2001).

It is the first records of this species in the Black Sea, where it was found in deep water detritus sediment at a depth of 88 and 122 m.

FAMILY HALECHINISCIDAE Thulin, 1928

Genus *Tanarctus* Renaud-Debyser, 1959

Tanarctus ramazzottii (Renaud-Mornant, 1975) (fig. 3)

Material examined. 40 adult specimens from Bosporus area, at 88, 122 and 250 m deep, from st. 4, 6 and 9, respectively of cruise R/V "Arar", and 1 specimen from st. 283, at 117 m deep, cruise R/V "Maria S. Marian".

Diagnosis. Diagnostic characteristics and general features in accordance with the original description of the species (Renaud-Mornant, 1975). Comparative analysis of the main taxonomic characters of the type-species and Black Sea specimens are given in the table 5.

Specimens of *T. ramazzottii* species found in the Black Sea have the similar morphometric characteristics as type-materials of the species. Length about 80 μm, head width — 35 μm. The Black Sea specimens are of the same sizes (as shown in the table). The unpaired dorsal median cirrus (11 μm) is present, inserted on an enlarged base. Paired internal cephalic cirri (20 μm) are inserted on basal peduncle, connected by a

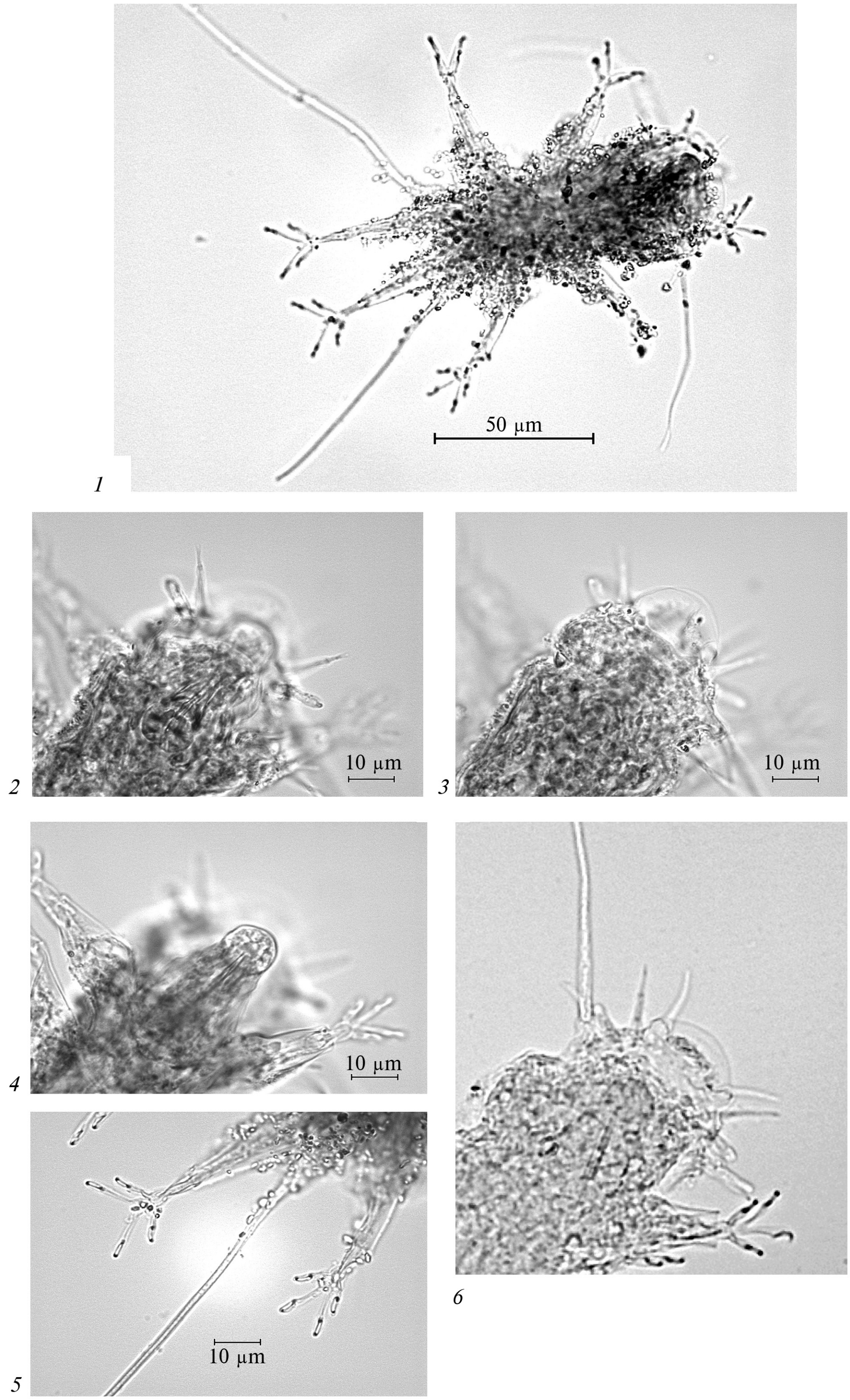

Fig. 3. *T. ramazzottii*: *1* — general view; *2* — external cirri and secondary clavae; *3* — cuticular membrane; *4* — mouth with subspherical bulb; *5* — clavae between 3rd and 4th legs, digits and claws; *6* — head with full set of cephalic appendages.

Рис. 3. *T. ramazzottii*: *1* — общий вид; *2* — внешние головные усики и вторичная клава; *3* — кутикулярная мембрана; *4* — субсферическая ротовая луковица; *5* — усик между 3-й и 4-й ногой, пальцы и коготки; 6 — полный набор головных придатков.

Table 5. Morphometrics of the type-materials of the *Tanarctus ramazzottii* (by Renaud-Mornant, 1975) and values of characters of specimens (N = 40) found in the Black Sea

Таблица 5. Морфометрические характеристики типового материала вида *Tanarctus ramazzottii* (по Renaud-Mornant, 1975) и значения параметров экземпляров (N = 40), обнаруженных в Чёрном море

Character, μm	Holotype from Bay of Biscay	Paratype from Brittany	Specimens from the Bosporus region (Black Sea)
Total body length	80	82	80–83
Head width	35	32	33–35
Median cirrus	11	10	10–11
Internal cirri	21	22	20–22
External cirri	14	13	12–14
Lateral cirri “A”	11	11	10–11
Clavae	60	65	60–65
Secondary clavae	10	10	10–11
Cirri E	35	33	33–35
IV leg appendage	150	148	148–150
Median digit	13	12	11–12
Lateral digit	9	9	8–9

Note. N — number of specimens.

cuticular membrane; paired external cephalic cirri (12 μm), also with peduncle bases, are ventrally inserted; both the pair of cirri consists of a larger basal part and a slender terminal part. The lateral cirri are inserted on an enlarged base, are (11 μm) long. The primary clavae, 60–65 μm long, shorter that body length, flattened and end with a rounded apex. Secondary clavae (10 μm) exist as short oval shape, not inserted on a common base with lateral cirri A, but in a position more ventral and median, very near to the bases of the external cephalic cirri.

The mouth is ventral with subspherical bulb, stylets are present. Specimens are with long, slender and telescopic legs. The first three pairs possess long appendages. The III leg appendages are slightly longer. The cirrus E (35 μm) is situated dorsally, above the insertion of the 4th legs. The leg IV appendages are 150 μm long, simple without any projections and branching. The legs bear four digits of different length, having the internals longer (12 μm) than the externals (9 μm). They insert on a base joined to the telescopic part of the leg by a strip of cuticle. Cuticular bar supports the lateral digits. The claws are simple and attached to the digits by a basal spur. The cuticle is punctuated with visible pores on the dorsal side, uniformly distributed.

In the description of the type specimen of this species is said that there is an important ventral cephalic papillae and long simple IV leg appendages without secondary branches or projections. The Black Sea specimens of the species have all these important taxonomic features.

Ecological pattern and geographical distribution. This is the first record of the species in the Black Sea at a depth of 88–250 m. For the first time the species was found and identified by (Renaud-Mornant, 1975) from the abyssal mud in the Bay of Biscay at a depth of 3039 meters, as well as in infralittoral fine sand on the coast of northwestern Britain at a depth of 20 m. Also species were found in different localities in the Mediterranean and other seas (De Zio Grimaldi et al., 2003).

Average abundance of tardigrades in meiobenthic communities widely varied. In samples collected during the cruises, average abundance of tardigrades varies at different stations from 141 ind./m^2 (117 m deep) and 260 ind./m^2 (250 m deep) at the 283 and 9 stations of cruise R/V “Maria S. Merian” and R/V “Arar”, respectively, to 1820 ind./m^2 (88 m deep) and 11440 ind./m^2 (122 m deep) at the 4 and 6 station of cruise R/V “Arar” (fig. 4).

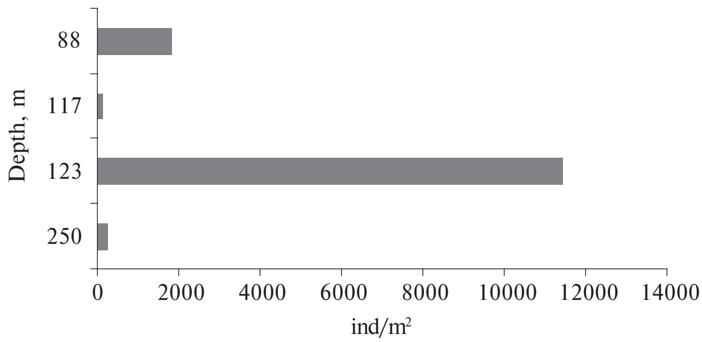

Fig. 4. Average abundance of tardigrades along the depth on the Bosporus region (R/V "Arar", November, 2009, R/V "Maria S. Marian", April 2010).

Рис. 4. Распределение численности тихоходок по глубине в районе Босфора (НИС «Arar», ноябрь, 2009; НИС «Maria S. Marian», апрель 2010).

New data about vertical distribution of tardigrades within the sediment column have been obtained in Bosporus study area. Vertical stratification of tardigrades in 0—5 cm upper layer of benthic sediment was investigated. Most tardigrades specimens were found in the top layer (0—1cm) or in the overlying surface detritus, and only at st. 6 one specimen of Tardigrada species *T. ramazzottii* were recorded from 1—2 cm layer. Our data suggest that near to 98 % of the studied tardigrades are confined to the top layer (0—1 cm) of the sediments, supposedly to get access to available limited oxygen and food in the bottom water. Studies supplement data about vertical distribution of species individuals within the sediments.

Discussion

Heterotardigrada have a large geographical and ecological distribution. Taking into account the new information and all the previous data from the literature, it can be seen that two tardigrades species *T. ramazzottii* and *D. subterraneus* are highly distributed in different marine waters throughout the world.

Concerning *Tanarctus,* currently only 12 species have been described worldwide (Jorgansen, Kristensen, 2001). Moreover, most found species of the genus *Tanarctus* are from the Atlantic and very scare data from the Pacific. Also very little is known about the worldwide zonation patterns of tanarctid tardigrades (Jorgansen, Kristensen, 2001).

For the first time *T. ramazzottii* was found in the sediments of Biscay Bay at a depth of 3039 m. The species was found in the 2-cm-deep sediment. The sand was heavily compacted and the oxidation of the sediment attains low values from the depth of 6 to 7 cm (Renaud-Mornant, 1975). In the Mediterranean Sea, where the samples were collected at different depths and in different sediments, tardigrades species *T. ramazzottii* was found in substratum of coralligenous detritus at a depth between 21—40 m and 61—80 m (Grimaldi de Zio, Gallo D'Addabbo, 2001).

We can suppose that the Black Sea specimens were found in the similar environmental conditions of the oxygen regime of Biscay Bay, where it was found at first time. We recorded *T. ramazzottii* at 0—1 and 1—2 cm layer of the sediment. Oxygen concentration in the overlying water was 0.12—0.16 mmol L-1 at the stations where specimens were found. The maximal oxygen penetration depth in bottom sediment was 1 and 3 mm at the 88 and 122 m depth, respectively.

Only 3 species of the genus *Dipodarctus* is known (Degma et al., 2013; Pollock, 1995; Renaud-Debyser, 1959). *D. subterraneus* were found in sand, sand with *Posidonia* meadow, in shell gravel and coralligenous detritus at all depth between 0 and over 80 m (Grimaldi de Zio, Gallo D'Addabbo, 2001). Also it was found in the Indian Ocean and in other water basins (Gallo et al., 2007). In the Black Sea *D. subterraneus* was found in deep water detritus sediment at a depth of 88 and 122 m.

Black Sea specimens of *D. subterraneus* species are smaller than the type-material of the species. We suppose that it can probably be explained by the fact that it could be juveniles of the species, because they are proportionately similar to adults in most features with the exception of disproportionately longer lateral cirri “A”. Also the differences in sizes of the specimens from one species *D. subterraneus* but from different localities can be explained by different environmental conditions, such factors as specific hypoxic conditions.

Some authors considered that the kind of the substratum is the most important ecological factor, whereas the depth has less influence (Grimaldi de Zio, Gallo D’Addabbo, 2001), at that time the others confirm that physical-chemical characteristics may be more influential in the distribution of meiofauna than the depth or water temperature (Kristensen, 1992). It is interesting, that in Bosporus region tardigrades were found in the mud, while in different localities of the Mediterranean Sea no tardigrades of these species were found in mud samples. Comparing the distribution of tardigrades in different sediments at different depths in the Black Sea, the highest number of specimens reach a depth of 122 m, where the substratum is black mud.

Scarcity of data about tardigrades biology and distribution is due to the difficulties of finding them by the minimal size of the specimens.

Agreeing with the statement that the majority of marine Tardigrada show a geographical distribution highly correlated with that of Tardigrada-workers, it can be assumed that in future we will not only review the available data concerning the distribution of marine tardigrades in the other seas, but also we will find different species in the Black sea.

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