Native and non-native ctenophores in the Gulf of Trieste, Northern Adriatic Sea

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Received March 11, 2008; accepted in principle September 9, 2008; accepted for publication October 6, 2008; published online 2 November, 2008

Corresponding editor: Roger Harris

Observations of ctenophore species were made in the Gulf of Trieste between 2003 and 2006. We examined native ctenophore species with special attention to representatives of the orders Lobata and Beroida, and we recorded among them two non-native ctenophores: Mnemiopsis leidyi A. Agassiz 1865 and Beroe ovata sensu Mayer, 1912. The validity of the Mediterranean species Beroe ovata is discussed. We determined that among the native species, it is not Beroe ovata but rather Beroe cucumis sensu Mayer, 1912 that occurs in the Mediterranean Sea.

INTRODUCTION

Over the last century, due to increased fishing pressure, anthropogenic eutrophication and global warming, many marine zooplankton communities have changed toward increasing dominance of harmful gelatinous species (Hays et al., 2005; Dybas, 2006). Elevated populations of gelatinous species in their native habitats affect local ecosystems, but also raise the potential for spread to other areas either by natural expansions (Malej and Malej, 2004) or with ballast water (Dumont et al., 2004).

A well-documented example of the introduction of the ctenophore Mnemiopsis leidyi A. Agassiz 1865 occurred in the Black Sea during the early 1980s, via ballast water (Vinogradov et al., 1989). This species has shown explosive population growth since 1988, and subsequently expanded into the Sea of Azov (Studenikina et al., 1991), the Sea of Marmara (Shiganova, 1993), and the eastern Mediterranean, including the Aegean Sea (Shiganova et al., 2001). Mnemiopsis leidyi was first reported in the Caspian Sea in 1999, probably introduced in the ballast water of oil tankers (Ivanov et al., 2000). Ctenophores preliminarily identified as M. leidyi were recorded in Berri lagoon and Marseille Bay (western Mediterranean Sea) during recent years (Francois Carlotti, personal communication). Its presence along the French coast was confirmed by the genetic study of a few specimens (Bayha et al., 2004). In 2006, M. leidyi was recorded along the northern European coast, in the Baltic and North seas (Javidpour et al., 2006; Faasse et al., 2006; Viitasalo et al., 2008).

The native habitat of M. leidyi includes estuaries and coastal regions along the eastern coast of North and South America (GESAMP, 1997). Mnemiopsis leidyi is polymorphic, with wide environmental tolerance; therefore, environmental conditions in the southern Eurasian seas seem suitable for the species’ establishment in this area. The spread of M. leidyi is of particular concern since the species strongly affects all levels of most invaded ecosystems, including the fisheries in the Black, Azov and Caspian Seas, although effects were less pronounced in the Aegean Sea (Shiganova et al., 2001; Shiganova et al., 2004a, b, c).

In response to this situation, a group of experts from an international commission (GESAMP, 1997) proposed the introduction of potential predators for M. leidyi. Among the suggested species was another ctenophore Beroe ovata, which is an obligate predator on zooplanktivorous ctenophores, including M. leidyi. Although this suggestion was not intentionally implemented, B. ovata...
nevertheless appeared in the Black Sea in 1997, also likely introduced with ballast water (Konsulov and Kamburska, 1998). *Beroe ovata* established a large reproductive population in the Black Sea and began to control the population of *M. leidyi* by 1999 (Shiganova et al., 2000a). Detailed analysis of the morphology of the new Black Sea ctenophore indicated that it was *Beroe ovata sensu* Mayer, 1912 (Seravin et al., 2002). This identification was confirmed by Harbison (Harbison, 2001, personal communication) and molecular analyses by Bayha et al. (Bayha et al., 2004).

In October 1999, *Beroe ovata* was observed in the Sea of Azov (Shiganova et al., 2000b). It now appears regularly in the Sea of Azov in early autumn, as reported for *M. leidyi* (Mirzoyan et al., 2006). In 1999, two individuals of *B. ovata* were found near the Bosphorus Strait, in the Sea of Marmara (Tarkan et al., 2000). The species now occurs in this sea in the same season as in the Black Sea (Isinibilir et al., 2004). In November 2004, a *Beroe ovata* was found in the northern Evvoicos Gulf of the Aegean Sea (Shiganova et al., 2007a, b) with the source likely being the Black Sea.

Large blooms of gelatinous plankton, mainly Scyphomedusae, have been reported from the northern Adriatic Sea in the past (Avian and Rottini Sandrini, 1994; Purcell et al., 1999). On the other hand, Ctenophora were generally neglected due to difficulties with preservation and lack of taxonomic expertise in the region. Semi-quantitative data on a few Ctenophora species were reported in the early 20th century (Cori and Steuer, 1901; Issel, 1925; see Table I), but despite several observations of high ctenophore abundances during the last few decades, there have been no recent published reports on this gelatinous group.

In 2003, studies of gelatinous plankton, with special attention to Ctenophora, were initiated in the northernmost part of the Adriatic Sea within the framework of the Slovenian-Russian collaboration that has continued.

### Table I: List of Ctenophora species reported in the northern Adriatic

<table>
<thead>
<tr>
<th>Phyl. Ctenophora (Class Tentaculata)</th>
<th>Other names</th>
<th>References</th>
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</thead>
<tbody>
<tr>
<td>O. Cydippida</td>
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<tr>
<td>F. Haeckeliida</td>
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<tr>
<td>Haeckelia rubra (Kolliker, 1853)</td>
<td>Euchlora rubra (Kolliker, 1853)</td>
<td>Krumbach, 1911</td>
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<td>F. Lampeida</td>
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<tr>
<td>Lampea pancerina (Chun, 1879)</td>
<td>Lampetia pancerina (Chun, 1880)</td>
<td>Krumbach, 1911</td>
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<td>F. Mertensiidae</td>
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<tr>
<td>Callanira bialata (Della Chiaje, 1841)</td>
<td>Eschscholtzia cordata (Kolliker, 1853)</td>
<td>Steuer, 1903</td>
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<tr>
<td>F. Pleurobrachiida</td>
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<tr>
<td>Hormiphora plumosa (L. Agassiz, 1960)</td>
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<td>Riedl, 1991; Gamulin, 1979</td>
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<tr>
<td>Pleurobrachia pleius (O.F. Müller, 1776)</td>
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<td>Issel, 1922, 1925; Gamulin, 1979</td>
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<tr>
<td>Pleurobrachia rhododactyla (L. Agassiz, 1860)</td>
<td>Pleurobrachia rhodopis (Chun, 1880)</td>
<td>Milis, 2005; Stiasny 1911, 1912; Krumbach, 1911; Gamulin, 1979</td>
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<tr>
<td>O. Lobata</td>
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<td>F. Bolinopsisida</td>
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<tr>
<td>Bolinopsis vitaea (L. Agassiz, 1860)</td>
<td>Bolina hydatina (Chun, 1879)</td>
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<tr>
<td>F. Mnemiida</td>
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<tr>
<td>Mnemiopsis leidyi (A. Agassiz, 1865)</td>
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<td>This work</td>
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<tr>
<td>Deopea kaloktenota (Chun, 1879)</td>
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<td>Krumbach, 1911, Gamulin, 1979</td>
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<td>F. Leucotheidae</td>
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<tr>
<td>Leucothea multicorins (Quoy&amp;Gaimard, 1824)</td>
<td>Eucharis multicorins (Eschscholtz, 1928)</td>
<td>Cori and Steuer, 1901; Steuer, 1903; Stiasny 1909, 1910, 1911, 1912, Krumbach, 1911, Issel, 1922, 1925, this work</td>
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<tr>
<td>O. Cestida</td>
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<td>F. Cestida</td>
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<tr>
<td>Cestum veneris (Lesueur, 1813)</td>
<td>Cestus veneris (Chun, 1879)</td>
<td>Krumbach, 1911, Gamulin 1979</td>
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<td>O. Beroida</td>
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<td>F. Beroidae</td>
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<td>Steuer, 1903; Stiasny 1909, 1910, 1911, 1912, Krumbach, 1911, this work</td>
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<td>Beroe ovata (Brown 1756)</td>
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<td>Steuer, 1903, Gamulin 1979</td>
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<td>Beroe sensu ovata (Mayer, 1912)</td>
<td>Beroe ovata Chamisso and Tyssenhart</td>
<td>This work: see discussion</td>
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<tr>
<td>Beroe sensu cucumis (Mayer, 1912)</td>
<td>Beroe cucumis Fabricius</td>
<td>This work: see discussion</td>
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within the EU-funded project SESAME. In this paper, we report on the Ctenophora fauna in this area and include new descriptions of, among others, two non-native species.

Area description

The northern Adriatic basin is the northernmost protrusion of the Mediterranean Sea, and is strongly influenced by rivers discharging from the western coast (Fig. 1). The area is among the most productive regions in the Mediterranean Sea (Fonda Umani et al., 1992; Harding et al., 1999). Increases in nutrient inputs during the latter half of the 20th century resulted in cultural eutrophication, although the effects have been alleviated over the past 15 years due to mitigation measures (Degobbis et al., 2000). Approximately rectangular in shape, the Gulf of Trieste (Fig. 1) is the northernmost gulf of the enclosed Adriatic Sea, with an average depth of <20 m, a surface area of 600 km² and a volume of 9.5 km³. Freshwater inputs are larger along the northern than the southern coast, approx. annual rate of flow of 90–130 m³/s, and peaks of over 1000 m³/s, when compared with 5–10 m³/s and peaks up to 100 m³/s (Mozetič et al., 1998), respectively. The structure of the water column and water movements vary greatly with dominant seasonal influences. In winter, the waters of the Gulf are characterized by considerable homogeneity. In spring, heating of the surface layer and freshwater inflows begin to establish a pycnocline, which intensifies during the summer. Seasonal dynamics of thermal stratification are governed by the seasonal cycle of solar irradiance (Malacić, 1991). Autumnal cooling and wind mixing re-establish vertical water column homogeneity, although strong winds may cause destratification during summer. Mean surface temperatures in the summer months are well above 20°C, with maximum values above 26°C in July and August, while minima in February–March are below 10°C. The southeastern part of the Gulf shows variability in surface salinities ranging from slightly above 32 in late spring and late autumn to values close to 38 in winter and late summer. The Gulf is classified as a moderate eutrophic area (Flander-Putrle and Malej, 2003) with primary production ranging from 0.2 to 15.9 μmol C dm⁻³ day⁻¹ (Malej et al., 1995; Cantoni et al., 2003) and mean mesozooplankton dry weight and ash-free biomass 18.5 and 13.6 mg m⁻³, respectively (Benović et al., 1984; Fonda Umani et al., 1992).

METHOD

Observations of Ctenophora species were carried out during 2003–2007 in the southeastern part of the Gulf of Trieste using a video-camera operated from a research boat, during diving and/or while snorkeling. Observations in situ were made using a Sony DCR-VX200E video camera with an Ikellie underwater housing equipped with two 100 W lights and a depth gauge; the dimension of the imaged area was 2.3 m² (Malej et al., 2007). Still pictures were taken with the Nikon D2X digital camera enclosed in a SEALUX CD2 underwater housing and operated by a diver. In addition, some specimens were hand-collected using plastic jars. Individuals of **M. leidyi** were hand-collected in the Bay of Piran in October 2005; similarly, **B. ovata** were hand-collected in autumn 2005. Individuals were maintained in a laboratory aquarium and photographed alive, while preservation in 2% neutralized formalin was not successful. Dimensions were assessed from photographs taken in the laboratory aquarium containing an object of known size. The Black Sea and the Mediterranean live individuals were put in Petri dishes with a small amount of seawater not completely covering the animal and then measured with a ruler. The same individuals were photographed and measured to make sure that measurements of individuals which...
were available only from photos are comparable with others.

RESULTS AND DISCUSSION

Earlier works on zooplankton of the northern Adriatic reported occurrences of the following Ctenophora species: Haeckelia rubra, Lampea pancerina, Callianira bialata, Hormiphora planosa, Pleurobrachia rhodopis, P. pileus, P. rhododactyla, Bolinopsis vitrea, Deoepta kaloktenata, Leucothea multicorns, Cestum veneris, Beroe forskali and Beroe ovata (Table I). Special taxonomic studies of the ctenophores collected were not performed; therefore, identification of some species is probably not reliable. In our observations during 2003–2007, we paid special attention to representatives of the Lobata and Beroidae, while other taxonomic groups were not studied.

Order Lobata L. Agassiz, 1860

Chun (Chun, 1880) described three species of Lobata in the Mediterranean (the Gulf of Naples): Deoepta kaloktenata, Leucothea (Eucharis) multicorns and Bolinopsis (Bolina) hydatina. The two first species are valid for the Mediterranean Sea, but species identification of the representatives of the genus Bolinopsis was uncertain for a long time. The presence of the genus Bolinopsis has been confirmed by several later authors, but species identification has not altered for a long time. Krumbach (Krumbach, 1925) noted one species, Bolinopsis infundibulum, in the Mediterranean. In contrast, other authors indicated B. vitrea (Bolina hydatina) as the sole species (Treguboff and Rose, 1957; Rossi, 1971; Cambell, 1982) and we also collected B. vitrea in the Aegean Sea (Shiganova et al., 2003). Mayer (Mayer, 1912) considered B. infundibulum as an Arctic and cold temperate water species, and B. vitrea as a warm water species, typical in the tropics, i.e. the West Indies, Florida and the Mediterranean. In the western Mediterranean close to the Strait of Gibraltar (Alboran Sea), Mills et al. (Mills et al., 1996) found both species: B. infundibulum was observed in deeper waters (274–831 m) and B. vitrea found mostly in surface waters (upper 15 m). Most probably, only the warm water species (B. vitrea, L. Agassiz, 1860) occurs in other Mediterranean areas.

In the Gulf of Trieste two native species of Lobata, Bolinopsis vitrea, (L. Agassiz, 1860) and Leucothea multicorns (Quoy and Gaimard, 1824) were often found from October to March. In 2007, Bolinopsis vitrea was observed during summer (July). During 2004–2007, Leucothea multicorns individuals were frequently observed in swarms near the coast in December and April (Fig. 1B and C).

The representatives of the genus Leucothea are distinguished from all other Lobata by the two remarkable blind-ending sacs which form a pair of long narrow pits open to the exterior below and extending inward and upward above the tentacle-bulbs near to the level of the funnel (Fig. 2C). Leucothea multicorns is the largest member of the Lobata in the Mediterranean up to 25 cm long, covered with distinctive papillae. Its oral lobes are large and contain complex winding chymiferous tubes (Mayer, 1912; Wrobel and Mills, 1998).

In addition, in October 2005, we recorded a swarm of non-native M. leidyi A. Agassiz, 1865 (Fig. 2A) surrounded by the native Beroe species. A representative of M. leidyi can be easily distinguished morphologically from native Bolinopsis vitrea (Fig. 2A and B). Both species have an oval body with considerable lateral compression, two oral lobes on each side of the mouth and four smaller lobes, auriculars, under the principal two oral lobes. However, the main difference is the position of the oral lobes. In M. leidyi, the oral lobes originate near the level of the infundibulum, whereas in B. vitrea they originate approximately half-way between the mouth and the level of the infundibulum (Fig. 2B) (Mayer, 1912). In addition, M. leidyi may have warts (papillae) on the body that have never been observed in B. vitrea (Fig. 2A and B).

Individuals of M. leidyi, which we observed with a video camera, were approximately 30–50 mm in length. The oral lobes and auricles were shorter than those observed in the Black Sea adult individuals of M. leidyi but longer than those found in the Azov and Caspian Seas (Shiganova et al., 2007a, b). These could be juvenile individuals, or, more likely, they did not grow due to suboptimal conditions in the Gulf of Trieste. Usually, only adult individuals have warts on the body, although they were present on the observed individuals.

Most probably, individuals of M. leidyi were released with ballast water originating from the Black Sea, as there is a direct connection between the Port of Koper and various Black Sea ports (David and Perkovic, 2004; Alexandrov, 2004; Matishov et al., 2005; David et al., 2007).

Order Beroidae Eschscholtz, 1829

During our observations, we identified three species which belong to the family Beroidae.

Two species of Beroidae inhabit the Mediterranean Sea, according to identification by Chun (Chun, 1880): Beroe ovata Brown 1756 and Beroe forskali Chun. Perrier (Perrier, 1936); Treguboff and Rose (Treguboff and
Rose, 1957) have followed Chun (Chun, 1880) for species identification. Mills has mentioned also B. mitrada as an infrequent visitor in the Mediterranean (Mills, 2005). Beroe ovata and Beroe forskalii occur in the Gulf of Trieste, but we discuss below validation of the Mediterranean Beroe ovata.

Species of the family Beroidae are specialized predators on zooplanktivorous ctenophores and, occasionally, on salps (L. Agassiz, 1860). The body is mitten-shaped, egg-shaped or conical; extended laterally in the voluminous stomodeum. There are neither tentacles nor tentacular canals (Mayer, 1912) but eight meridional and two paragastric canals. The meridional canals lie under eight rows of ciliary combs. Meridional canals may communicate with each other by means of an anostomosing network of side branches (diverticulae), thus establishing a circum oral canal system. All species have a wide-flaring mouth and stomodeum with powerful cilia on the walls near the mouth, which help the ctenophore to bite and capture prey (Tamm and Tamm, 1993). The polar plate surrounding the sense-organ at the aboral pole is fringed and may have a row of branched papillae. These ctenophores generally have a pink color, while the largest adults are colored more intensely with a brown tinge (Mayer, 1912).

Beroe forskalii Milne Edwards (Fig. 3A and B) was the most abundant species in the Gulf of Trieste. Its body is conical in the aboral part while its aboral end is pointed (Fig. 4A) when viewed in the stomodeal plane. The oral end is broad with a very large mouth. The mouth opening is wide, and has a large, half-circle shape. The body is strongly compressed. Diverticulae (lateral branches) of the meridional canals are very dense and anostomose with each other. There is axial funnel-tube. The aboral pole is fringed with a row of long branched papillae (Fig. 5A). Color varies from transparent to slightly pinkish in juveniles, becoming pink in adults.

Native “Beroe ovata sensu Chun” (Fig. 3C and D) was another species found during our surveys.
This species is native to the Mediterranean Sea, described by Chun. But it is remarkably different from *B. ovata*, which occurs along the northeastern and southeastern American coast (Mayer, 1912; Harbison *et al.*, 1978; Mianzan, 1999; Oliveira and Migotto, 2006) and was recently introduced into the Black Sea (Seravin *et al.*., 2002). It has an oval egg-shaped body and is much less flattened in the paragastric plane (the large diameter of the ellipse is only twice or less than the small diameter) (Fig. 4B). In our video survey observations in the Gulf of Trieste, and measurements from these pictures, this native ctenophore has ratio of length to width ($l/w$) 2.1$\pm$0.2 (Table II).

In measurements of individuals from pictures taken in other areas of the Mediterranean Sea, $l/w$ values ranged from 2.16$\pm$0.045 (Table II). The lateral canals have numerous diverticulae, which may branch out in adult ctenophores, but they do not anastomose with each other, and do not connect with the paragastric canals (Fig. 5A). The eight rows of cilia extend about three-quarters of the distance from the apical sense organ to the mouth. There is no axial funnel-tube, but instead there are two lateral tubes which extend upward from the funnel to the two halves of the pole plate. Each of these tubes opens by an excretory pore on alternate opposite sides of the figure “8” shaped pole-plate. The sense organ at the aboral pole is not fringed with a row of long-branched papillae (Fig. 5C). The aboral end is rounded, while the oral end is almost straight and can be wider than the body width.

Individuals which we observed in the northern Adriatic had a ratio 1.3$\pm$0.03 (Table II), similar to the non-native species *B. ovata* from the Black Sea that have a length to width ($l/w$) ratio of 1.2$\pm$0.1 (Table III). From the measurements of individuals from the Black Sea (Fig. 3G and J) (Seravin *et al.*, 2002) the length of the *B. ovata* body does not exceed 1.5 times its width; therefore, our individuals from the northern Adriatic

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**Fig. 4.** (A) Lateral canals of the native Mediterranean “*B. ovata*” sensu Chun; (B) lateral canals of the non-native *B. ovata* sensu Mayer from the Gulf of Trieste.

**Fig. 5.** Aboral part of the body. (A) *Beroe forskali*; (B) *B. ovata* sensu Chun (photo of Tihomir Makovec); (C) *B. ovata* sensu Mayer (photo of T. Shiganova).
Beroe ovata ceratocephala was the identifier of these species for researchers, even those not familiar with ctenophore morphology.

There is some controversy over the describing authority for this species. Mayer (Mayer, 1912) suggested it was Chamisso and Eysenhardt, 1821. Seravin et al. (Seravin et al., 2002) wrote that the descriptions of Chamisso and Eysenhardt (Chamisso and Eysenhardt, 1821) were so uncertain it was not clear what species they had, therefore, he suggested putting Mayer, 1912 as the identifier of B. ovata. Scientists from South America still use the name B. ovata Chamisso and Eysenhardt, 1821 thus following Mayer (1912) (Mianzan, 1999; Oliveira and Migotto, 2006). Harbison et al. (Harbison et al., 1978) first mentioned this species as Beroe ovata Bosc, but afterwards the first author (2001) indicated that it was Beroe ovata sensu Mayer, 1912 which was introduced into the Black Sea.

Based on the molecular phylogenetic analysis of the individuals from the Bosphorus region of Turkey, the western Mediterranean and the western Atlantic Bayha et al. (Bayha et al., 2004) concluded that Beroe ovata sensu Mayer, 1912, which seemed to be restricted to the eastern seaboard of North and South America, much like M. leidyi, was then introduced into the Black Sea. So, these authors use Beroe ovata sensu Mayer, 1912 as the species name.

The Mediterranean species described by Chun as Beroe ovata is in reality Beroe cucumis, according to the features described by Mayer (Mayer, 1912). Rossi (Rossi, 1971) also considered that Beroe cucumis Fabricium (≡B. ovata Esch. Bosc) occurred in the Mediterranean Sea. Cambell (Cambell, 1982) showed that Beroe cucumis Fabricium inhabited the Mediterranean Sea as well. On the basis of comparison of the morphological features B. ovata from the Black Sea with individuals named B. ovata from the Mediterranean Sea Seravin et al. (Seravin et al., 2002) concluded that Beroe cucumis Fabricius (1780) occurs in the Mediterranean Sea.

Mills et al. (Mills et al., 1996) pointed out the incorrect identification of the Mediterranean Beroe ovata, but they just put Beroe ovata in inverted commas and wrote that that species, which was illustrated and called B. ovata Eschscholtz 1829 by Chun (1880), was also illustrated and called Beroe cucumis Fabricius 1780 by Mayer (1912). However, they added that the ctenophore that Mayer illustrated and called Beroe cucumis is not the same species as that first described from Greenland by Fabricius (1780), which appears to be restricted to Polar Regions and mesopelagic depths (Mills et al., 1996; Seravin, 1998). Later Harbison (Harbison, 2001, personal communication) suggested the name Beroe cucumis sensu Mayer, 1912 for this species. Bayha et al. (Bayha et al., 2004) also concluded that it was prudent to use the name B. cucumis sensu Mayer (B. ovata sensu Chun) for B. ovata (sensu Chun) from the Mediterranean as well as B. cucumis from the eastern Pacific and the western Atlantic indicating one widespread species instead of the several isolated ones.

Thus, using the main morphological features, we can subdivide three species of the genus Beroe, which we found in the Gulf of Trieste:

Phylum Ctenophora Eschscholtz 1829; Order Berooida Eschscholtz 1829; Genus Beroe Browne 1756. We provide descriptions that may useful for the identification of these species for researchers, even those not familiar with ctenophore morphology.

The body is conical, strongly compressed with a pointed aboral end and a broad oral end. Oval,
The body is mitten-shaped, wider at the oral end and rounded at the aboral end. Lateral compression is very strong (the large diameter is three to four times greater than the smaller). Almost straight or slightly oval shape of the mouth can be wider than body width. Ratio of length to width (l/w) is from 1.1 to 1.4 (less than 1.5). Meridional canals are interconnected with each other by a loose network of numerous diverticulae, with anastomoses forming a wide meshwork. Comb rows extend only about half of the body length. There is no axial funnel-tube. The aboral pole is fringed with a row of long-branched papillae. Size is up to 150 mm. The Mediterranean, western Atlantic and Pacific oceans: Beroe forskali Milne Edwards, 1841.

Two non-native comb-jelly species, M. leidyi and Beroe ovata, were recorded in the Gulf of Trieste in 2005 in addition to species known to occur from past records. It is presently difficult to say with certainty whether these two species have established viable populations in the northern Adriatic, since no population studies of Ctenophora have been carried out in this area. Thermohaline conditions and high prey abundance may favor establishment of M. leidyi in the northern Adriatic Sea; however, the concomitant presence of two species of Beroidae, which prey on M. leidyi, may prevent its explosive growth as has been observed in other new localities. Beroe ovata may not establish because salinity in the area may be too high and because it may compete with two native Beroe species for prey.

Beroe species eat their prey by engulfing it if size allows or, if it is too large, by biting pieces out with the use of macrocilia, compound ciliary-feeding organelles found inside the mouth opening. The macrocilia are different from one species of Beroe to another, seemingly adapted to a preferred prey (Tamm and Tamm, 1993). Beroe ovata occurs with M. leidyi as a prey in its native habitat along the eastern American coast (Mianzan, 1999; Purcell et al., 2001; Oliveira and Migotto, 2006). Beroe cucumis occurs with the prey species Bolinopsis; therefore, we do not know if native Beroe species will consume M. leidyi or not in the Adriatic Sea. We observed that native Beroe species tried to swallow individuals of M. leidyi but then spat them out, indicating that the native Beroe probably does not prey on M. leidyi.

ACKNOWLEDGEMENTS

The authors are grateful to Tihomir Makovec, Janez Forte, Marjan Richter for underwater video and digital photographs, as well as other MBS divers that regularly reported on Ctenophora. We also appreciate constructive comments of anonymous reviewers.
**FUNDING**

The work was performed within the framework of Russian and Slovenian cooperation, RFBI 07-04-01640a and the EU-funded project SESAME.

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Koper study .


