

# The morphological characters of *Mothocya taurica* (Czerniavsky, 1868) and *Emetha audouini* (H. Milne Edwards, 1840) from Turkey

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**Abstract.** Öktener A, Alaş A, Türker D. 2017. The morphological characters of *Mothocya taurica* (Czerniavsky, 1868) and *Emetha audouini* (H. Milne Edwards, 1840) from Turkey. *Bonorowo Wetlands* 1: 55-64. This paper aims to present morphological characters of two species *Mothocya taurica* (Czerniavsky, 1868) and *Emetha audouini* (H. Milne Edwards, 1840) from Turkey. Although *Mothocya taurica* with different synonymies were described by several researchers, Bruce (1986) indicated the necessity of redescription of *Mothocya taurica*. Pleopods 1 to 5 having peduncle medial margin with 4 hooks of *Emetha audouini* are found for the first time in this study as distinct from other studies. Also, the host preferences of these parasites are given.

**Keywords:** Cymothoidae, *Emetha*, Isopoda, morphology, *Mothocya*, Turkey

## INTRODUCTION

Cymothoids are ectoparasitic isopods on the body, fins, or inside the buccal or the branchial cavities of numerous freshwater and marine fishes. They are protandrous hermaphrodite (Bariche and Trilles 2005). Although that Cymothoidae family is famously known, there are some deficiencies from the taxonomic point of view. Studies concerned with molecular and morphological are needed on this family according to some researchers (Poore and Bruce 2012; Martin et al. 2013; Hadfield et al. 2016).

Thirty-one species in *Mothocya* genus and two species in *Emetha* genus were listed by The World Register of Marine Species (Hadfield et al. 2017; Schotte 2007). Three species (*Mothocya epimerica*, *Mothocya taurica*, *Mothocya belonae*) of *Mothocya* and one species (*Emetha audouini*) of *Emetha* are reported from Turkish waters, but these studies include limited information about morphology of mouth-parts (Öktener and Trilles 2004; Kırkim 1998). *Mothocya taurica* was reported from the Black Sea, the Mediterranean Sea (Trilles 1994; Bruce 1986; Kononenko 1988; Ramdane et al. 2006). Bruce (1986) pointed out a needed evaluation of the status of this species.

The morphological characters given in the study obtains a possibility to compare the findings of the other countries in next time. Although it could not able to use the electron microscopy, the dna barcoding and the molecular identification methods being reliable and so expensive in this study, it aims to present the morphological characters which especially including mouthparts of *Mothocya taurica* and *Emetha audouini* from Turkey.

## MATERIALS AND METHODS

Eighty-three *Alosa* sp. (Pisces; Clupeidae) and 38 picarel *Spicara maena* (Linnaeus, 1758) (Pisces; Centrarchidae), 56 *Sardinella aurita* Valenciennes, 1847 (Clupeidae), 170 *Engraulis encrasicolus* (Linnaeus, 1758) (Engraulidae) were collected with the local fishing gears in the Sea of Marmara in 2014. The collected parasites were fixed in 70% ethanol. Mouthparts and pleopods were dissected using a Wild M5 stereo microscope. The dissected parts were mounted on slides in a glycerin-gelatine mounting medium. The pleopods of isopods were stained with methylene blue. The appendages were drawn with the aid of a camera lucida (Olympus BH-DA). The photos were taken with the aid of Canon EOS 1100D camera attached to the microscope. The measurements were taken in millimetre (mm) with a micrometric programme (Pro-way). The scientific names, synonyms of parasite and host were checked with the WoRMS Editorial Board (2017). The information of feeding habits, habitat characteristics of host were prepared according to Froese and Pauly (2017). *Mothocya taurica* (MNHN-IU-2013-18751) and *Emetha audouini* (MNHN-IU-2017-16) was deposited in the collections of the Musée National d'Histoire Naturelle (MNHN), Paris, France.

## RESULTS AND DISCUSSION

### *Mothocya taurica* (Czerniavsky, 1868) (Figure 1-6)

#### Synonyms:

*Cymothoa oestrum* Rathke, 1837: 394

*Cymothoa punctata* Uljanin, 1872: 113-114.—Popov, 1933: 193, 196-198.—Markewitsch, 1934: 224, 225, pl. XLV (fig. 10-11).—Nikolaeva, 1963: 1-46

*Lironeca pontica* Borcea, 1933a: 128.—Borcea, 1933b: 481-502, figs 1-9, pls 2-4.

*Livoneca punctata* Vasiliu and Carausu, 1948: 180-184, pl. II (fig. 1-12), pl. III (fig. 13-38d).—Carausu, 1959: 349-351, pl. I (fig. A-B)

*Lironeca punctata* Trilles, 1976a: 782-783, pl. I. fig. 6.—Dollfus and Trilles, 1976: 828

*Lironeca taurica* Kussakin, 1979: 295, figs. 160, 161.

*Livoneca taurica* Uljanin, 1871: 113.—Uljanin, 1872: 113

**Host:** *Alosa* sp. (the shad); **Locality:** Bandırma Bay; **Total parasite:** 5; **Dissected parasite:** 3.

All parasites were firmly attached to the gill cavity of the host. The prevalence, mean intensity of parasite were 6%, 1 respectively.

**Description-female:** Body length varies from 15 to 19 mm. Body slightly twisted to one side, about 2 times as long as wide. Pereon widest at pereonite 4, most narrow at pereonite 1. Coxal plates visible in dorsal view, with round posterior margins. Length of coxae greater than width. Pereonite 1 longest, length of pereonites decreasing step by step from 3 to 7; pereonite 7 shortest. The width of the head is about 2 times the head length. Pleotelson wider than length, posterior margin evenly rounded, about 1.6 wider than long. All pleonites visible, the first pleonite distinctly narrow, 2-5. pleonites slightly wider. Pleon 1 largely and pleon 2 partially concealed by pereonite 7. Antennula and antenna composed of eight articles. Mandible palp third article distinctly shorter than others. Maxillula with four terminal spines, one long and three short. Maxilla medial lobe with 2 spines, lateral lobe with 2 spines. Maxilliped article 3 with five hooked spines. Pereopods 5-7 slightly larger than pereopod 1-4, all without spines. Pleopods 1 to 5 having peduncle medial margin with 4 hooks. Pleopods 3 to 5 endopods with large proximomedial lobes. Uropod rami not extending beyond pleotelson; endopod slightly longer than exopod.

**Distribution:** Black Sea, Mediterranean Sea, Aegean Sea (Bruce 1986; Kononenko 1988; Trilles 1994; Ramdane et al. 2006; Schotte 2008a; Ramdane et al. 2009;).

**Hosts:** *Alosa immaculata* (Borcea 1933a; Borcea 1933b; Vasiliu and Carausu 1948; Muradian 1972; Kussakin 1979; Trilles 1976; Bruce 1986; Trilles 1994; Öktener and Trilles 2004; Olguner 2008; Öktener et al. 2010); *Alosa fallax* (Dollfus and Trilles 1976); *Atherina hepsetus* and *Gobius* sp (Markewitsch 1934); *Alosa tanaica*, *Pomatomus saltatrix* (Borcea 1933a); *Engraulis encrasicolus*, *Sprattus sprattus*, *Trachurus mediterraneus* (Nikolaeva 1963); *Helicolenus dactylopterus*, *Trisopterus minutus* (Öktener et al. 2009); *Sardina pilchardus* (Borcea 1933a; Markewitsch 1934; Vasiliu and Carausu 1948); *Scorpaena porcus* (Markewitsch 1934; Josipa et al. 2007).

The hosts parasitism with *Mothocya taurica* was examined according to family characteristics 37% of 13 host belongs to Clupeidae, and 63% to Carangidae, Gadidae, Scorpaenidae, Pomatomidae, Sebastidae, Gobiidae, Engraulidae and Atherinidae. The hosts parasitism with *Mothocya taurica* was examined according to habitat selections; 54% of 13

host fish species are pelagic-neritic; 15% of them pelagic-oceanic; 15% demersal; 8% benthopelagic and 8% bathydemersal. The hosts parasitism with *Mothocya taurica* according to feeding habits; all hosts are carnivorous.

Clupeidae fishes are host of *Mothocya taurica*. This parasite selects carnivorous and pelagic fishes as host for habitat and feeding habits. In this study, we examined *Alosa* sp. is carnivorous and pelagic fish. It is fit as preferring host for *Mothocya taurica*. Although should indicate references to this statement that *Mothocya taurica* is also reported from *Engraulis encrasicolus* and *Sardinella aurita*, it was not found in these fishes.

**Remarks:** The antennula and the antenna with 8 articles found in this study agree with the descriptions of Borcea (1933b); Vasiliu and Carausu (1948); Kussakin (1979); Bruce (1986); Öktener et al. (2010, re-examined). The maxillula with four terminal spines found in this study is compatible with Kussakin (1979), Vasiliu and Carausu (1948) and Öktener et al. (2010). The medial lobe and lateral lobe with 2 spines of maxilla found in this study are compatible with the findings indicated by Kussakin (1979) and Öktener et al. (2010), while the medial lobe with 1 spines and the lateral lobe with 2 spines mentioned by Vasiliu and Carausu (1948).

The third article without setae on the lateral margin of the mandible palp found in this study are compatible with the descriptions of Kussakin (1979) and Öktener et al. (2010) excepting for Vasiliu and Carausu (1948) findings. Five spines on article 3 of the maxilliped of ovigerous female were observed in this study, while 4 spines on article of ovigerous female maxilliped were described by Kussakin (1979); 4 spines on article of female maxilliped by Vasiliu and Carausu (1948), and 5 spines on article of ovigerous female maxilliped by Öktener et al. (2010).

There are limited studies about the morphology of *Mothocya taurica* (Borcea 1933b; Vasiliu and Carausu 1948; Kussakin 1979; Bruce 1986; Öktener et al. 2010). The findings of the structures of mouthparts, pereopod and pleopod in this study agree with the previous literature. In appearance *Mothocya taurica* is very similar to *M. belonae*, from which it can be distinguished by having slightly wider coxae, a rounder pleotelson, and pleopods 3 to 5 endopods with much larger proximomedial lobes as well as a distolateral extension according to Bruce (1986).

#### ***Emetha audouini* (H. Milne Edwards, 1840) (Figure 9-14)**

##### **Synonyms:**

*Cymothoa audouini* Milne-Edwards, 1840: 274-275.—Heller, 1866: 738-739.—Stalio, 1877: 237.—Stossich, 1880: 45.—Gerstaecker, 1901: 255-257

*Cymothoa nigropunctata* Hope, 1851: 33

*Cymothoa audouinii*: Hope, 1851: 33

*Emetha audouinii* Schioedte and Meinert, 1883: 317-321, tab. XI, fig. 14-18.—Dudich, 1931: 18.—Montalenti, 1941: 337-394.—Montalenti, 1948: 27-36, tav. I (fig. 1-8).—Amar, 1951: 530.—Euzet and Trilles, 1961: 190-191.—Trilles, 1962: 103-106.—Trilles, 1964: 107-108.—Trilles, 1968: 20-36, pl. IV, phot. 2-5.—Thampy and John, 1974: 580, 582.—Quignard and Zaouali, 1980: 357.—Brusca, 1981: 127.—Sartor, 1986: 1-12.—Sartor, 1987: 49.—Wagele, 1987: 1-398.



Figure 1. *Mothocya taurica* ♀

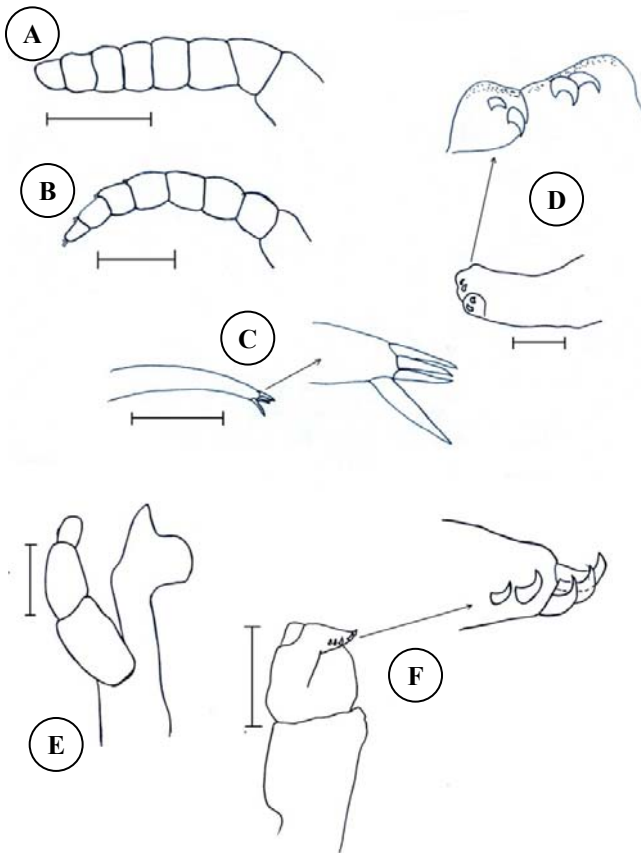


Figure 3. *Mothocya taurica* ♀, A. antennula (0.25 mm), B. antenna (0.27 mm), C. maxillula (0.40 mm), D. maxilla (0.26 mm), E. mandible (0.35 mm), F. maxilliped (0.47 mm)

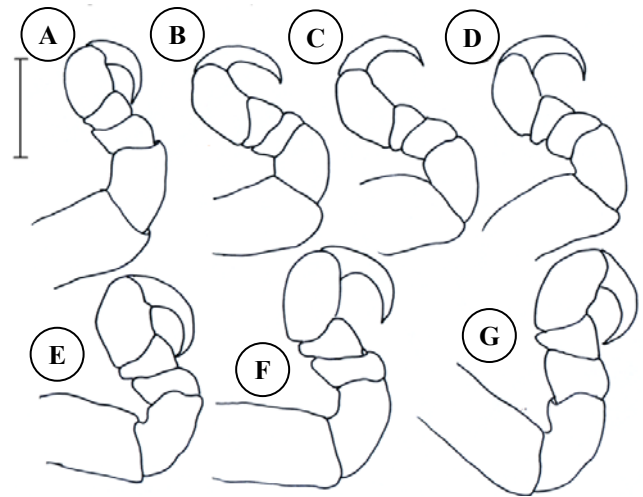


Figure 4. *Mothocya taurica* ♀, A-G. pereopods I-VII (1.2 mm)

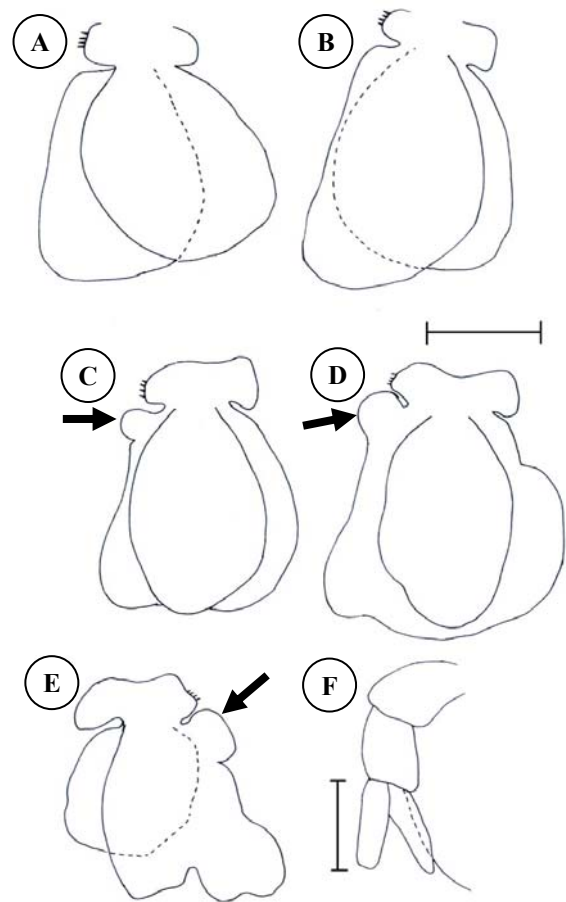
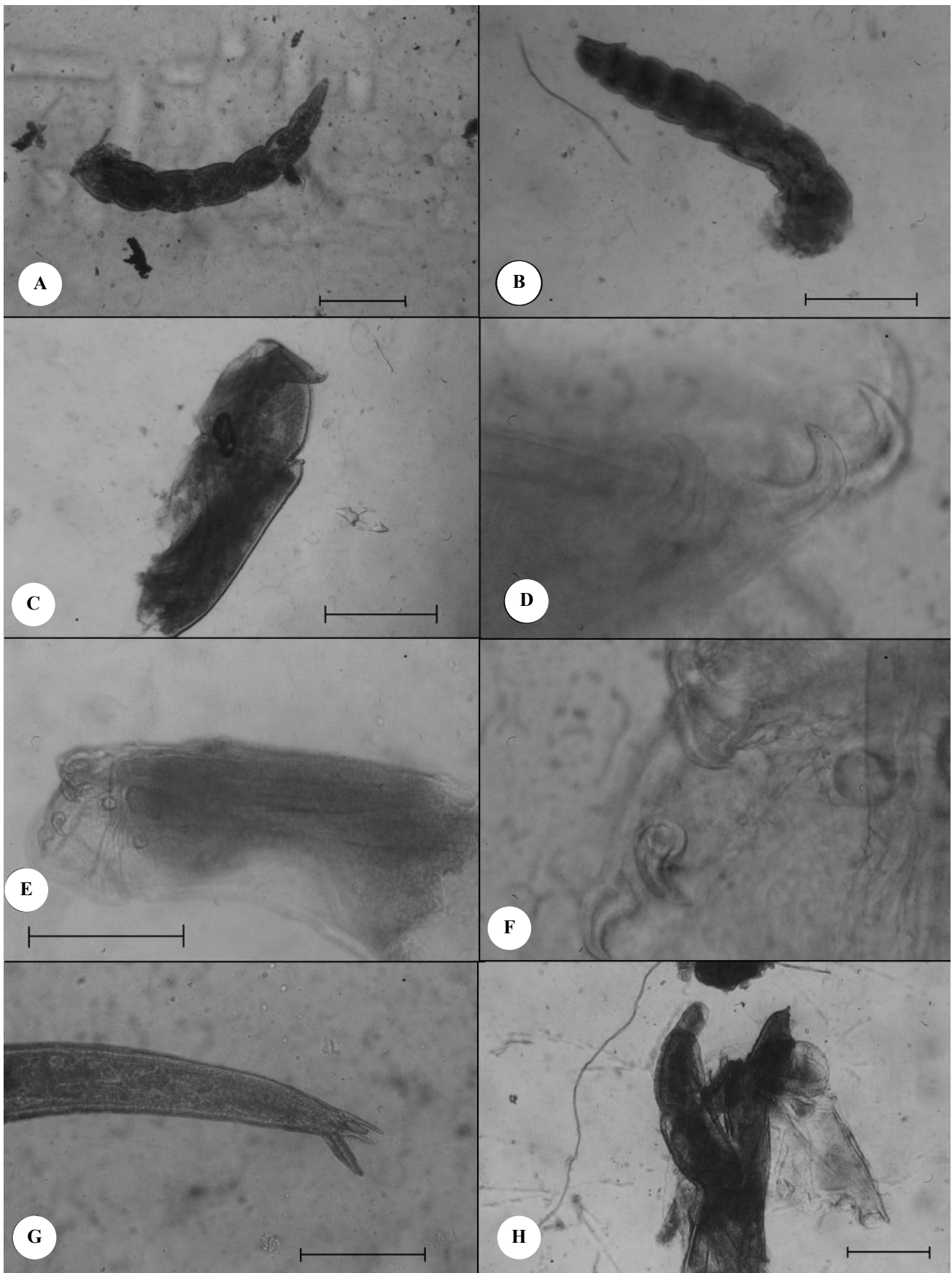


Figure 5. *Mothocya taurica* ♀, A-E. pleopods I-V (1.43 mm), F. uropod (1.33 mm).



**Figure 2.** *Mothocya taurica* ♀, A. antenna (0.27 mm), B. antennula (0.25 mm), C. maxilliped (0.47 mm), D. spines on maxilliped (2 mm), E. maxilla (0.26 mm), F. spines on maxilla, G. maxillula (0.10 mm), H. mandible (0.14 mm)

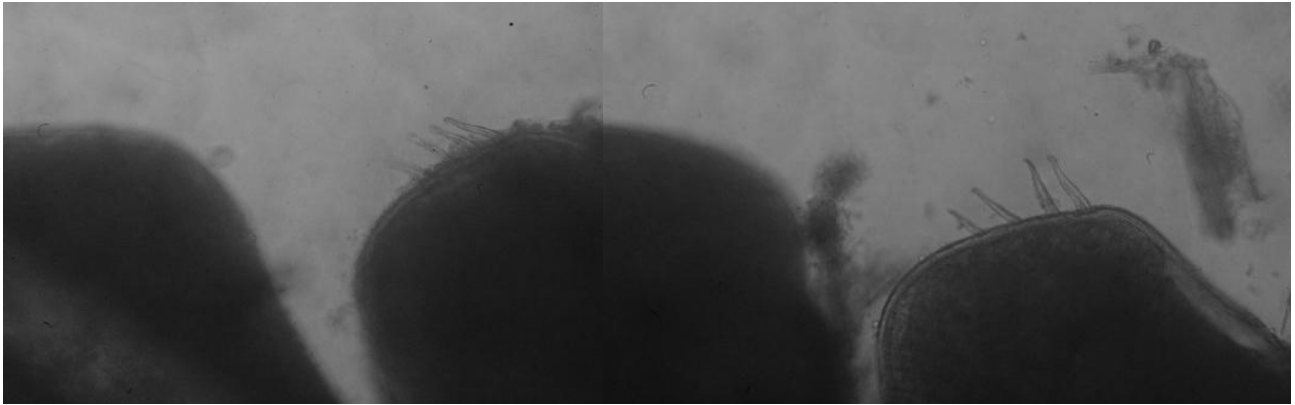


Figure 6. Four hooks on peduncle medial margin of pleopods (*Mothocya taurica*♀)



Figure 7. *Mothocya taurica* on the right and left gill chamber of fish



Figure 8. Atrophy on the gill filaments of fish parasitized by *Mothocya taurica*

*Emetha audouini* Carus, 1885: 442.—Quintard-Dorques, 1966: 10.—Berner, 1969: 93-95.—Trilles, 1972a: 1192-1196, fig.1-45,pl (1-3).—Trilles, 1972b: 1232-1233.—Trilles, 1972c: 1269-1277, fig.1-13.—Trilles,

1977: 8.—Romestand and Trilles, 1977: 92-95, fig.1-2.—Radujkovic, 1982: 155-161.—Radujkovic et al, 1984: 161-181.—Trilles et al. 1989: 279-306, fig.7

*Emetha adriatica* Bovallius, 1885: 17-20, pl.IV (fig. 34-40)

*Ceratothoa salparum* Gourret, 1891: 18-19, tav.I (fig.19), tav. XI (figs.7-13)

**Host:** *Spicara maena* (Linnaeus, 1758) (Blotched picarel); **Locality:** Bandırma Bay; **Total parasite:** 8; **Dissected parasite:** 6.

All parasites were firmly attached to the mouth cavity of the host. The prevalence, mean intensity of parasite were 21%, 1 respectively.

**Description-female:** Body length varies from 18 to 22 mm. Body expands from anterior to posterior, later narrow. The body about 2.5-3 times as long as wide. The width of pereonites increasing from 1 to 5; later decreasing. Pereonite 5 widest, pereonite 7 narrowest. 3-7 coxal plates visible in dorsal view. 3-5 pereonites are approximate of equal length, pereonite 7 shortest. The eyes are small, concealed by antennula and antenna. Pleotelson wider than large, posterior margin rounded. All pleonites visible, first pleonite narrowest. 2-5 pleonites wider than the first one.

All pleonites are of equal length. Antennula extending to behind the eye, composed of seven articles. Antenna extending to the middle of 1 pereon. Pereon, with eight articles. Mandible palp third article distinctly shorter than others, without setae. Maxillula with four terminal spines, one long and three short. Maxilla medial lobe with 2 spines, lateral lobe with 3-4 spines. Maxilliped article 6 with five hooked spines in ovigerous and non-ovigerous female. Pereopods 1-3 slightly smaller than 4-7, all without spines. The expansion on upper and lower parts of 5-7 pereopod distinct than 1-4 pereopods. Pleopods gradually decreasing in length. Pleopods 1 to 5 having peduncle medial margin with 4 hooks. Uropod rami extending to posterior margin of pleotelson. Exopod slightly longer than endopod.

**Distribution:** The Mediterranean Sea, Adriatic (Trilles 1994; Schotte 2008b).

**Hosts:** *Boops boops* (Montalenti 1948; Kırkim 1998); *Spicara smaris* (Montalenti 1948; Berner 1969; Papoutsoglou 1976; Trilles 1977; Trilles et al. 1989; Ramdane et al. 2009; Radujkovic et al. 1984; Kırkim 1998); *Spicara maena* (Montalenti 1948; Berner 1969; Romestand et al. 1976; Öktenen and Trilles 2004); *Sarpa salpa* (Montalenti 1948); *Centracanthus cirrus* (Schioedte and Meinert 1883); *Pagellus acarne*, *Raja clavata* (Trilles et al. 1989); *Scomber scombrus* (Balcells 1954); *Dicentrarchus labrax* (Papapanagiotou et al. 1999); *Clupea* sp (Trilles 1977).



Figure 9. 1 *Emetha audouini* ♀

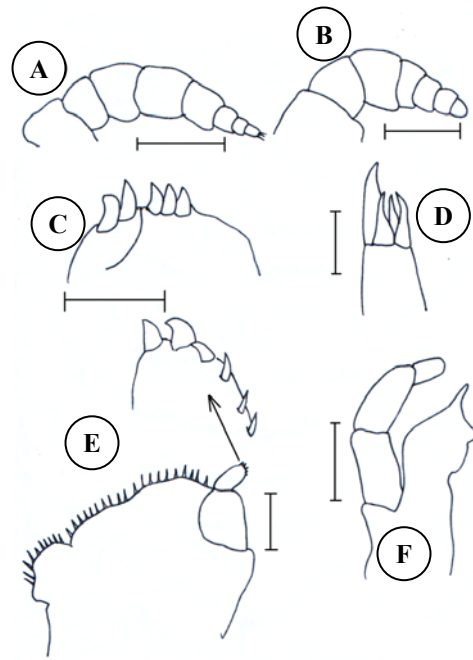


Figure 11. *Emetha audouini* ♀, A. antenna (0.68 mm), B. antennula (0.74 mm), C. maxilla (0.21 mm), D. maxillula (0.11 mm), E. maxilliped (0.24 mm), F. mandible (0.34 mm)

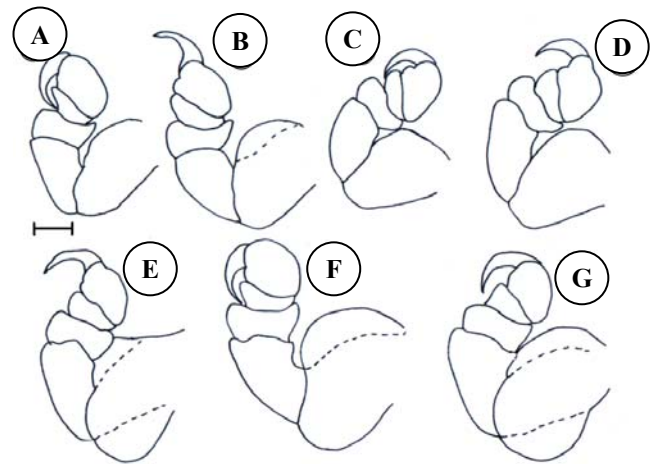


Figure 12. *Emetha audouini* ♀, A-G. pereopods I-VII (0.56 mm)

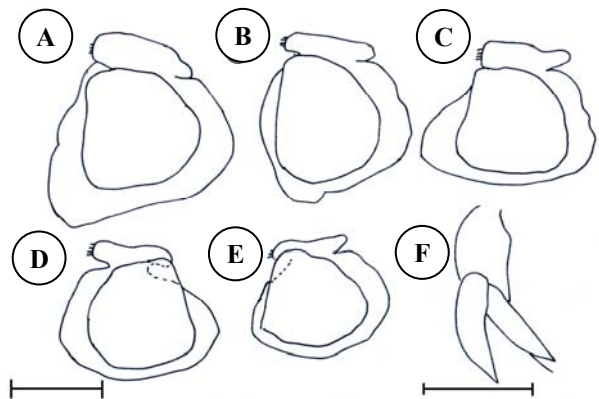
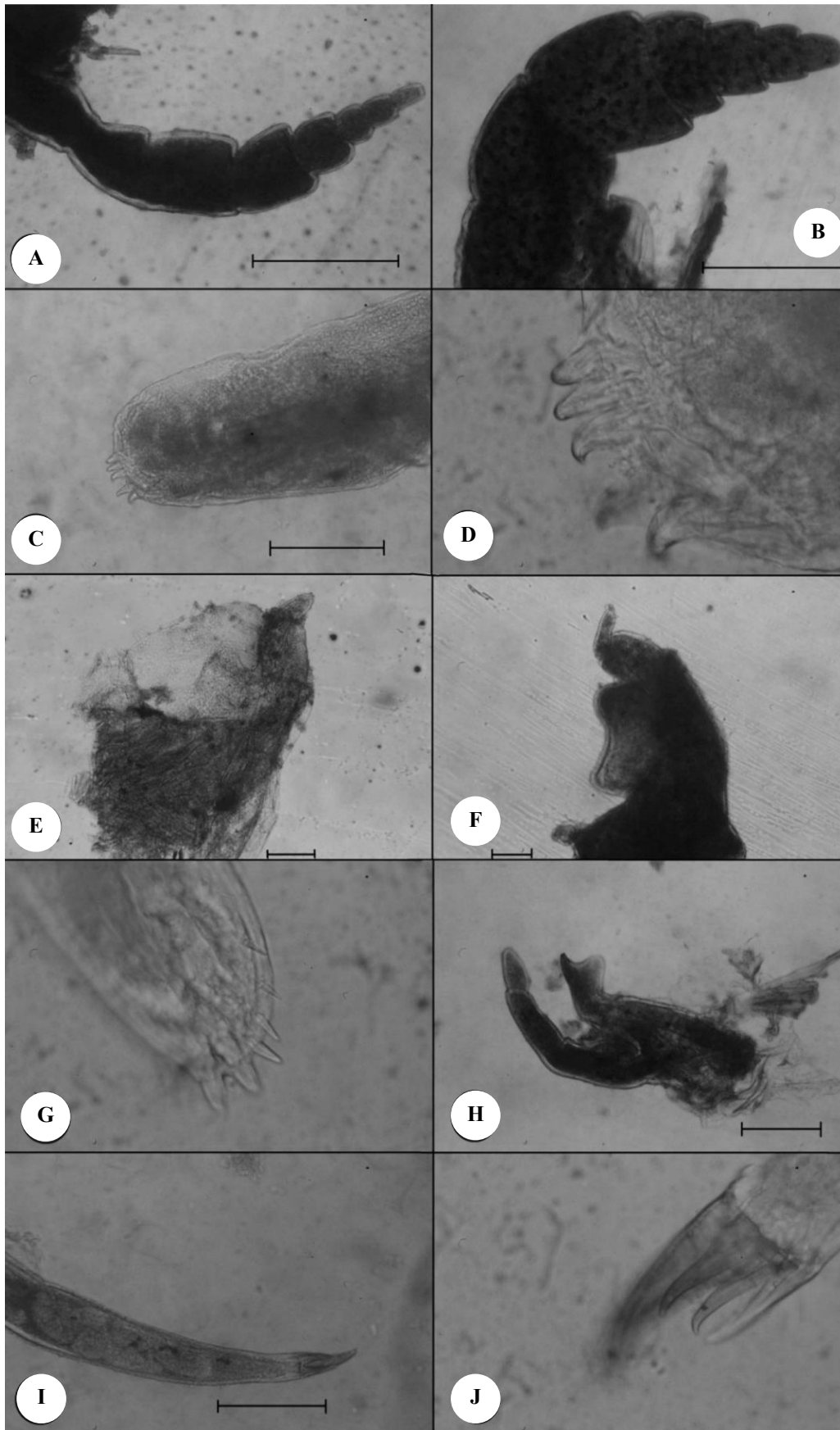
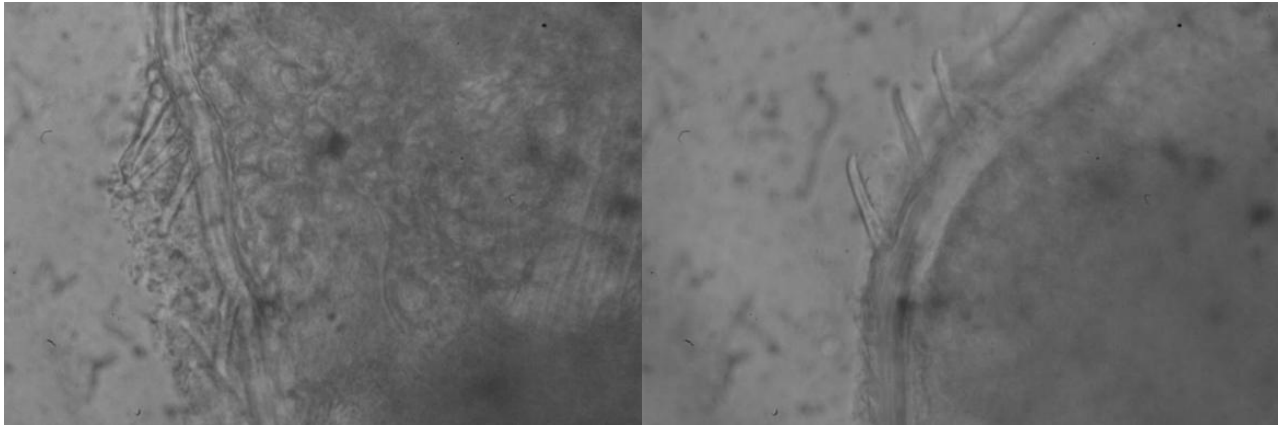


Figure 13. *Emetha audouini* ♀, A-E. pleopods I-V (1.40 mm), F. Uropod (0.96 mm)



**Figure 10.** *Emetha audouini* ♀, A. antenna (0.68 mm), B. antennula (0.37 mm), C. maxilla (0.24 mm), D. distal of maxilla, E. maxilliped of non-ovigerous female (0.17 mm), F. maxilliped of ovigerous female (0.21 mm), G. distal of maxilliped, H. mandible (0.35 mm), I. maxillula (0.30 mm), J. distal of maxillula.



**Figure 14.** Four hooks on peduncle medial margin of pleopods (*Emetha audouini* ♀)

The hosts parasitism with *Emetha audouini* was examined according to the family characteristics, 30% of 10 host species belongs to Sparidae; 30% to Centranchthidae; 40% to Rajidae, Scombridae, Moronidae and Clupeidae. The hosts parasitism with *Emetha audouini* was examined according to habitat selections; 30% of 10 host fish species are benthopelagic; 30% demersal; 30% pelagic-neritic; 10% pelagic-oceanic. The hosts parasitism with *Mothocya taurica* examined according to feeding habits; 60% of the 10 host fish species are omnivorous; 40% carnivorous.

Fish of Centranchthidae family are preferred host for *Emetha audouini* which mostly select omnivorous and benthopelagic fishes.

**Remarks:** The antennula with 7 articles and antenna with 8 articles are were observed in this study, while antennula and antenna with 7 articles is indicated by Montalenti (1948); antennula with 7 articles and antenna with 9 articles by Trilles (1972) and Kırkım (1988); antennula and antenna with 8 articles by Schioedte ve Meinert (1883). The maxillula with four terminal spines found in this study is compatible with Trilles (1968, 1972) and Montalenti (1948)'s findings. The medial lobe with 4-7 spines and lateral lobe with 6-12 spines of maxilla are found in this study, while the medial lobe without spines and the lateral lobe with 4 spines was found by Montalenti (1948); medial lobe with 1 spine and lateral lobe with 3 spines by Trilles (1968, 1972). The third article with setae on the lateral margin of the mandible palp found in this study is compatible with Trilles (1968, 1972) and Montalenti (1948)'s finding. Six spines on article 3 of maxilliped of ovigerous and non-ovigerous females are found in this study, while 6 spines on article of only ovigerous female maxilliped were described by Trilles (1968). The observed expansions on the basis of pereopod 7 distinct than pereopods 1-4 are compatible with Trilles (1968, 1972), Montalenti (1948)'s findings. The pleopods 1 to 5 having peduncle medial margin with 4 hooks are found for the first time as distinct from the previous studies.

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