Report on Cymothoids (Crustacea, Isopoda) collected from marine fishes in Turkey

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This work describes Cymothoidae species in Turkey. Some species were collected by the authors, i.e., Anilocra frontalis Milne Edwards, 1840; Nerocila orbignyi (Guérin-Ménéville, 1829-1832); Ceratothoa italicca Schioedte and Meinert, 1883; Ceratothoa oestroides (Risso, 1826); Ceratothoa parallela (Otto, 1828); Emetha audouini Milne Edwards, 1840; Livoneca punctata (Uljanin, 1872); Mothocya epimera Costa, 1851, and Mothocya belonae Bruce, 1986. Four of these are reported amongst the Turkish fauna for the first time, i.e., A. frontalis, C. italicca, L. punctata, and M. belonae. A list of Cymothoidae already reported from marine fishes of Turkey plus our new reports includes thirteen species (two yet undetermined) from six genera Anilocra, Nerocila, Ceratothoa, Emetha, Livoneca, and Mothocya, and 27 host species. The distributions, hosts, and reporting authors are given.

Key words: Cymothoidae, Crustacea, parasitic isopods, Turkey

INTRODUCTION

Cymothoids (Crustacea, Isopoda) are ecto-parasites of marine, freshwater, or brackish water teleost fishes. Numerous families and species of fishes, including many of commercial importance, are infected by cymothoids. They settle on the skin, in the buccal cavity, in the gill chambers, and sometimes in a pouch (TRILLES, 1969; BRUSCA, 1981). Cymothoids are protandrous hermaphrodite isopods with a short phase as free-living, plankton organisms (TRILLES, 1969; COLORNI et al., 1997). Upon finding a suitable host, they initiate their parasitic life, feeding on blood and tissues (TRILLES, 1969; ROMESTAND & TRILLES, 1976, 1977; ROMESTAND, 1978, 1979; HORTON & OKAMURA, 2003). Several cymothoid isopods have been reported parasitizing marine fishes from the coasts of Turkey (MONOD, 1931; DEMIR, 1952; GELDIAY & KOCATAS, 1972; TRILLES, 1977; AKMIRZA, 1997, 1998a,b, 2000a,b, 2001; KIRKIM, 1998; YELER, 1998; TOKSEN, 1999; ÖKTENER & SEZGIN, 2000; HORTON & OKAMURA, 2001 & 2003). This study provides a comprehensive summary of Cymothoidae species found in Turkish fauna.
MATERIALS AND METHODS

Three hundred eighty-eight samples belonging to several fish families and species (Symphodus tinca, Spicara maena, Dicentrarchus labrax, Boops boops, Sardina pilchardus, Belone belone, Alosa fallax, Liza aurata, Mullus surmuletus, Atherina boyeri) from the Black Sea, the Sea of Marmara, and the Aegean coast of Turkey were examined during 2000-2003. Fish samples were captured with a fish net. The specimens were preserved in 70% alcohol. Data on parasites and collection were recorded. The taxonomic positions of the parasites were identified mainly according to BORCEA (1933), TRILLES (1965, 1968, 1972, 1976, 1977, 1979), TRILLES et al. (1989), and BRUCE (1986). The overall prevalence and location of the parasites on their hosts were specified and information about their geographical distribution and host species were added. All collected specimens were deposited in the personal collection of A. ÖKTENER (Cihannüma mah. Hüsnü savman sokak no: 22/5, 80690 Beşiktaş Istanbul, Turkey).

After describing the species that we personally collected, including four species reported for the first time in Turkish fauna, we compiled a list of Cymothoidae already reported for marine fishes of all Turkish coasts. The compilation was prepared as in MOREIRA & SADOWSKY (1978) for the parasitic Isopoda of Chondrichthyes, SIRIKANCHANA (1982) for parasites of fishes in Thailand, and HOLLAND & KENNEDY (1997) for helminth and crustacean species from freshwater fish in Ireland. The following plan was followed: (1) a list of collected Cymothoids and their parasitized fish, the collection site, and author; (2) a list of parasitized fishes with the corresponding species of Cymothoidae.

RESULTS

Cymothoidae collected by the authors

**Anilocra Leach, 1818; Anilocra frontalis**
Milne Edwards, 1840

Material:

*Anilocra frontalis* was collected from the nasal region of two *Symphodus tinca* among twenty specimens examined (prevalence = 10%) at Sinop (on the Black Sea coast of Turkey). The species is recorded for the first time in the Turkish fauna.

Distribution:

North Sea, Channel, Atlantic Ocean, Mediterranean Sea, Adriatic Sea (TRILLES, 1994).

Hosts:

Especially Labridae (*Labrus maculatus*, *L. vetula*, *L. bergylta*, *L. merula*, *Crenilabrus melops*, *C. cinereus*, *C. ocellatus*); sometimes collected on other fishes (*Gadus* sp., *Merlangius pollachius*, *Blennius pholis*, *Cottus bubalis*, *Gobius flavescens*, *G. paganellus*, *G. minutus*, *Onos mustela*, *Spinachia vulgaris*, *Boops boops*, *B. salpa* and *Spondyliosoma cantharus* (TRILLES, 1994).

**Nerocila Leach, 1818; Nerocila orbignyi**
(Guérin-Meneville, 1829-1832)

Material:

*Nerocila orbignyi* was collected from the operculum on two of four *Liza aurata* (prevalence = 50%) at Sinop.

Distribution:

Australian coasts from central New South Wales, southeastern Tasmania, Victoria, south Australia, and western Australia to Fremantle. Apparently absent from the tropical Indo-Pacific (except for one specimen from Eilat), north Pacific, east Pacific and western north Atlantic (BRUCE, 1987). Widely distributed in the Mediterranean, northwest Africa, Red Sea, ?Egypt, ?New Zealand (TRILLES, 1994).

Hosts:

TRILLES (1975, 1994) summarized the known hosts of this species which chiefly parasitize Mugilidae (*Mugil auratus*, *M. cephalus*, *M. capito*, *M. chelo*, *M. labrosus*); are less common on Flesus passer; Dicentrarchus labrax, Alosa fallax nilotica, Siphonostomids and Serranidae, Tilapia galilea and Salmo trutta. In Australia, BRUCE (1987) recorded the parasite
on Callorhynchus mihi, Acanthopagrus australis, Chrysophrys auratus, Pseudocaranx dentex, Mola mola, Sillago bassensis, Pomatomus saltatrix and unidentified Mugilidae, Kyphosidae, and Platycephalidae, Girella trifuspidata, Chelidonichthye kumu, and Dactylopena orientalis. N. orbignyi is apparently widely ubiquitous but, maybe, several data concern other species.

*Ceratothoa Dana, 1852; Ceratothoa italica*  
Schioedte et Meinert, 1883

**Material:**
*Ceratothoa italica* was collected from the mouth on seven of thirty-four specimens of *Dicentrarchus labrax* (prevalence = 20.6%) in a sea bass farm on the Mugla coast of the Aegean Sea, Turkey, and from the mouth on four of thirty-five *Spicara maena* (prevalence = 11.4%) in the Bosphorus (Sea of Marmara). *C. italica* was recorded for the first time in Turkish fauna.

**Distribution:**  
Mediterranean Sea, Adriatic Sea, northwest Africa (TRILLES, 1994; HORTON, 2000).

**Hosts:**  
*Pagellus mormyrus, P. erythrinus, Oblada melanura, Canthusius lineatus, Sargus sp.* (TRILLES, 1994; HORTON, 2000). *D. labrax* and *S. maena* are new hosts, identified for the first time for *C. italica*.

*Ceratothoa oestroides* (Risso, 1826)

**Material:**  
*Ceratothoa oestroides* was collected from the mouth of twelve of forty-five *Spicara maena* (prevalence = 26.7%) in the Erdek coast and the Bosphorus (Sea of Marmara). It was also collected on one of twenty-two *Sardina pilchardus* (prevalence = 4.5%) along the Erdek coast.

**Distribution:**  
Widely distributed in the Mediterranean and Adriatic Seas. Also recorded from the northeast Atlantic including the northwest coasts of Africa (TRILLES, 1994; HORTON, 2000).

**Hosts:**  
This species is found on many host species. Centracanthidae and Sparidae are the most frequently parasitized groups (*Spicara* sp., *S. chrysalis, S. maena, Smaris melanurus, Boops boops, Diplodus annularis, D. sargus, D. vulgaris). Also, but rarely, collected on *Sardina pilchardus sardina, Trachurus trachurus, Phycis mediterranea, Mullus barbatus, Abudesdus saxatilis* (TRILLES, 1994). Recently recorded from *Dicentrarchus labrax* and *Sparus auratus* on farms of the Adriatic and Greece (PAPOUTSOGLOU et al., 1996; ŠARUŠIĆ, 1999; HORTON & OKAMURA, 2001; MLADINEO, 2002).

*Ceratothoa parallela* (Otto, 1828)

**Material:**  
*Ceratothoa parallela* was collected from the mouth of thirteen of twenty-eight *Boops boops* (prevalence = 46.4%) along the Erdek coast (Sea of Marmara).

**Distribution:**  
Widely distributed in the Mediterranean and Adriatic Seas. Also recorded in the northeast Atlantic including the northwest coasts of Africa, the Canary and Madeira Islands (TRILLES, 1994).

**Hosts:**  
*Ceratothoa parallela* has been found parasitizing particularly *Boops boops*. It was rarely collected on *Sparus, Dentex vulgaris, Boops salpa, Esocis belonis, Spicara chrysalis, S. maeri, S. alcedo, Trigla corax, Mullus, Gadus capelanus, Merluccius merluccius, Raja asterias, and R. clavata* (TRILLES, 1994). However, it seems likely that several reports misidentified the species. Recently, *C. parallela* was reported on cultured *Sparus aurata* in Greece (PAPAPANAGIOTOU & TRILLES, 2001).

*Emetha* Schioedte and Meinert, 1883; *Emetha audouini* (Milne Edwards, 1840)

**Material:**  
*Emetha audouini* was collected from the mouth of four of twenty-two *Spicara maena*
(prevalence = 18.2%) on the Erdek coast (Sea of Marmara).

Distribution:
Widely distributed in the Mediterranean and Adriatic Seas (TRILLES, 1994).

Hosts:
Emetha audouini is mainly a parasite of Sparidae and Centracanthidae, particularly Boops salpa, B. boops, Spicara vulgaris, S. maena, S. aprilis, S. smaris, S. alcedo, and S. maurii, (TRILLES, 1994). Recently reported in cultured Dicentrarchus labrax in Greece (PAPAPANAGIOTOU et al., 1999).

Livoneca Leach, 1818; Livoneca punctata (Uljanin, 1872)

Material:
Livoneca punctata was collected from the branchial cavity of ten Alosa fallax of fifty shads (prevalence = 20%) from the coast of Sinop (Black Sea coast of Turkey) and the Bosphorus (Sea of Marmara). L. punctata had previously been recorded in the Black Sea, but this is the first time it is reported amongst Turkish fauna.

Distribution:
TRILLES (1994) lists the known locations for this species: in the Black Sea, particularly the Crimea, the regions of Kerch in Crimea and Gelendzhik, county of Krasnodar in Russia, and region of Agigea, near Constanta, Romania; also reported from Castiglione in the Mediterranean Sea.

Hosts:
Several fishes, particularly Clupeidae and shads: Clupea pilchardus, Alosa finta, Caspialosa pontica, C. nordsmanni, Sardinella pilchardus, Sardina pilchardus, Engraulis encrasicholus ponticus, Sprattus sprattus phalericus, Trachurus mediterraneus ponticus; also Temnodon saltator, Scorpaena porcus, Atherina hepsetus, Gobius sp. (TRILLES, 1994).

Mothocyta Costa, in Hope, 1851;
Mothocyta epimerica Costa, 1851

Material:
Mothocyta epimerica was collected in the branchial cavity of fifteen Atherina boyeri of fifty-six specimens (prevalence = 26.8%) from the coast of Sinop (Black Sea of Turkey).

Distribution:
Mothocyta epimerica has been reported in the Mediterranean, Black, and Adriatic Seas (BRUCE, 1986; TRILLES, 1994). Also, recorded from Arcachon, Atlantic Ocean (TRILLES, 1968, 1977).

Hosts:

Mothocyta belonae Bruce, 1986

Material:
Mothocyta belonae was collected in the branchial cavity of two Belone belone of forty-two specimens (prevalence = 4.8%) from the coast of Sinop (Black Sea coast of Turkey). This species is recorded for the first time in Turkish fauna.

Distribution:
Italy, Livorno. According to BRUCE (1986), “The range of this species within the Mediterranean is not even approximately known”.

Hosts:
Recorded only on Belone belone (BRUCE, 1986).
### List of Cymothoidae parasites and their distribution along Turkish coasts

<table>
<thead>
<tr>
<th>Cymothoid</th>
<th>Parasitized fish</th>
<th>Location</th>
<th>Author</th>
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<td><em>Spicara smaris</em></td>
<td>Aegean</td>
<td>GELDIAY &amp; KOCATAS, 1972</td>
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<td></td>
<td>Not identified</td>
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<td></td>
<td><em>Scomber japonicus</em></td>
<td>Aegean</td>
<td>AKMIRZA, 1997</td>
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<td></td>
<td><em>Sparus auratus</em></td>
<td>Aegean</td>
<td>KIRKIM, 1998</td>
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<td></td>
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<td>Aegean</td>
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<td><em>Anilocra frontalis</em> Milne</td>
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<td>Meneville, 1828-1832)</td>
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*Ceratotha parallela* (Otto, 1828)

*Ceratotha italica* Schioedte & Meinert, 1883

*Dicentrarchus labrax*                     | Aegean          | Present study   |
| *Spicara maena*                          | Bosphorus       | Present study   |

*Ceratotha capri* (Trilles, 1964)

*Diplodus annularis*                     | Aegean          | KIRKIM, 1998    |
| *Boops boops*                           | Aegean          | KIRKIM, 1998    |
| *Sparus auratus*                        | Aegean          | KIRKIM, 1998    |
| *Puntazzo puntazzo*                     | Aegean          | KIRKIM, 1998    |

*Ceratotha sp.*

*Diplodus annularis*                     | Aegean          | AKMIRZA, 2000   |
| *Oblada melanura*                       | Aegean          | AKMIRZA, 2000   |
| *Boops boops*                           | Aegean          | AKMIRZA, 2000   |
| *Sarpa salpa*                           | Aegean          | AKMIRZA, 2000   |
| *Mullus surmuletus*                     | Aegean          | AKMIRZA, 2000   |
| *Scomber japonicus*                     | Aegean          | AKMIRZA, 2001   |
| *Spicara smaris*                        | Aegean          | AKMIRZA, 2001   |

*Emetha audouini* (Milne Edwards, 1840)

*Boops boops*                            | Aegean          | KIRKIM, 1998    |
List of Cymothoidae cont’d

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<th>Cymothoid</th>
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List of parasitized fish with corresponding species of Cymothoidae

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<td>Anilocra physodes</td>
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ACKNOWLEDGEMENTS

We thank the reviewers for their time to carefully review our manuscript. We believe that their positive comments substantially improved this article.

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Popis cimotoidnih rakova (Crustacea, Isopoda) na morskim ribama Turske

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SAŽETAK

U radu se daje opis cimotoidnih vrsta rakova u Turskoj. Neke vrste su sazvratili autori kao što su Anilocra frontalis (Milne Edwards, 1840); Nercilia orbignyi (Guérin-Ménéville, 1829-1832); Ceratothoa italic (Schioedte i Meinert, 1883); Ceratothoa oestroides (Risso, 1826); Ceratothoa parallela (Otto, 1828); Emetha audouini (Milne Edwards, 1840); Livoneca punctata (Uljainin, 1872); Mothocyra epimera (Costa, 1851), i Mothocyra belonae (Bruce, 1986). Četiri od spomenutih vrsta po prvi put zabilježene u fauni Turske i to: A. frontalis, C. italic, L. punctata, i M. belonae. Lista cimotoidnih rakova, nađenih na ribama Turske, zajedno s novim nalazima, obuhvaća 13 vrsta (2 još nedeterminirane) iz 6 rodova (Anilocra, Nercilia, Ceratothoa, Emetha, Livoneca, i Mothocyra), i 27 ribljih domaćina. Iznimni su podaci o distribuciji i ribljim domaćinima, te odgovarajući autori.

Ključne riječi: Cymothoidae, Crustacea, parazitski izopodi, Turska