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Ceratothoa steindachneri (Isopoda: Cymothoidae) new to British waters with a key to north-east Atlantic and Mediterranean *Ceratothoa*

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This paper presents the first record of *Ceratothoa steindachneri* from Cornwall, making it the first resident species of the fish–parasitic isopod family Cymothoidae in Britain. The host is *Echiichthys vipera* (Trachinidae) the lesser weever fish, the isopod attaching to the host tongue. A complete redescription and reillustration for *C. steindachneri* is given, and a neotype is selected for the species *Ceratothoa parallela*. A key to the north-east Atlantic and Mediterranean species of *Ceratothoa* is included, with a brief illustrated account for each species.

INTRODUCTION

Cymothoid isopods are ectoparasites of marine, fresh, and brackish water teleost fish. The records of cymothoids from elasmobranchs probably represent trawl transfers (Brusca, 1981). Cymothoids parasitize numerous families and species of fish, including many of commercial importance. Cymothoids attach externally, occur as more intimate ectoparasites in the buccal-cavity/gill-chamber, or burrow inside the fish to develop in a pouch. Species of the family Cymothoidae are rarely found in the cool and cold temperate latitudes (Brusca, 1981). Thus the recent discovery of cymothoids attached in the buccal cavity of lesser weever fish (*Echiichthys vipera* (Cuvier), Trachinidae) in Whitsand Bay, Cornwall, is unusual. This discovery reveals the first established population of any cymothoid in Britain and represents a new host and range extension of *Ceratothoa steindachneri* Koelbel, 1878.

Identifying known species of cymothoids is highly problematic and, as a result, the taxonomy of the group is far from clear. Original illustrations of species of cymothoids are frequently inadequate and superficial, often consisting of a single dorsal view of a single adult female. Original descriptions are also often insufficient, describing characters known to be highly variable or polymorphic, whilst the more important taxonomic characters, such as mouthparts and pleopods, are omitted. Thus, although descriptions and illustrations of most of the seven Mediterranean and north-east Atlantic species exist, they are in need of revision. Furthermore, an identification key to the *Ceratothoa* in these regions is lacking.

This paper contains a thorough redescription of the female, male and pullus secundus of *C. steindachneri*, and includes a key to the *Ceratothoa* in the north-east Atlantic and Mediterranean. A full synonymy and information on the geographical range and host specificity for each of the species featured in the key is also provided.

MATERIALS AND METHODS

The majority of specimens of *Ceratothoa steindachneri* were obtained in 1996 by B. Okamura from lesser weever fish (*Echiichthys vipera*) in Whitsand Bay, Cornwall (NHM reg. nos. 2000.1823–1828). Comparisons were made with specimens identified by J.P. Trilles at the MNHN, Paris (reg. nos MNHN-Is28-33), and specimens taken from *E. vipera* in the collections of the Paris Museum (reg. nos MNHN-Is5696 & MNHN-Is5697) and Natural History Museum (reg. nos NHM 1999.1295-1301). Holotypes were examined of all species in the following key.

Segments of the pereon (pereonites), coxae (coxal plates) and pereopods are numbered with Roman numerals. Segments of the pleon (pleonites) and pleopods are numbered with Arabic numerals. The anterior (or ventral) lamella of the pleopods is taken to be the exopod, the posterior (or dorsal) lamella, the endopod. Sex and life stage of the specimen is given. Sizes are indicated both by the scale bars on the illustrations and in the text where necessary. Complete synonymy, and information on geographic range and host preferences are provided.

GEOGRAPHIC RANGE

The geographic range covered by this work extends from as far south as Senegal in north-west Africa, around the coast of the Mediterranean, and as far north as Britain.

Genus *Ceratothoa* Dana, 1852

Ceratothoa Dana, 1852: 303; Schiœdte & Meinert, 1883: 332; Bowman, 1978: 217; Brusca, 1981: 177; Bruce & Bowman, 1989: 2.

Codonophilus Haswell, 1881: 471.

Rhexana Schiœdte & Meinert, 1883: 289.

Cteatessa Schiœdte & Meinert, 1883: 296.

Meinertia Stebbing, 1893: 354.

Rhexanella Stebbing, 1911: 179.

Not *Ceratothoa*; Dana, 1853: 747; Richardson, 1905: 236; Schultz, 1969: 155; Kussakin, 1979: 287. (=*Glossobius* Schiœdte & Meinert, 1883.)

Remarks

Two species were originally assigned to *Ceratothoa* by Dana in 1852; *Cymothoa gaudichaudii* Milne-Edwards, 1840 and *Cymothoa parallela* Otto, 1828. The type species for this genus must therefore be one of these two. The lectotype of *C. gaudichaudii* in the MNHN, Paris, is badly damaged (Trilles, 1972b). A male specimen at the MNHN also has a type label, but from its size it cannot be the specimen described by Milne-Edwards (1840). It is likely that this was found with the now damaged female lectotype. The type material of *C. parallela* was cited by Schiœdte & Meinert (1883) to be deposited at the Museum of Göttingen '(Otto, Mus. Vratisl.—Specim. Typ.; Mus. Goting.)' but is no longer extant. For a provisional diagnosis of the genus see Bruce & Bowman (1989).

Three species of the genus *Ceratothoa* parasitizing the Exocoetidae and Hemiramphidae were dealt with in detail in Bruce & Bowman (1989). Two monotypic genera were synonymized with *Ceratothoa*, namely *Cteatessa retusa*, and *Rhexana verrucosa* (placed in *Rhexanella* by Stebbing (1911) and also synonymized in Bruce & Bowman, (1989)).

Ceratothoa poutassouiensis (Brian, 1939) has been mentioned in two papers, Brian (1939) and Penso (1939). Both authors state that it is found in *Gadus potassou*, however it is described inadequately, and, although it appears in two figures in Penso (1939), these are insufficient to describe the species. There is no mention of the location of type material in either paper. Brian (1939) states that 'this species of *Meinertia* deserves to be described as it seems to be a new species, I hope to be able to publish the description of this species which I call *Meinertia poutassouiensis*'. Due to the lack of holotype, adequate description or illustration, this is deemed to be a *nomen nudum*.

Ceratothoa steindachneri Koelbel, 1878
Figures 1–4

Ceratothoa steindachneri Koelbel, 1878: 403; Schiœdte & Meinert, 1883: 364; Carus, 1885: 443; Rokicki, 1984: 1–220; 1985: 95; Trilles et al., 1989: 294; 1999: 6; Trilles, 1979: 257; 1994: 127; Bruce & Bowman, 1989: 2.

Meinertia steindachneri Montalenti, 1948: 36; Trilles, 1968: 131; 1972a: 1215; 1972b: 1237; Trilles & Raibaut, 1971: 76; Dollfus & Trilles, 1976: 822; Capapé & Pantoustier, 1976: 202.

Ceratothoa gobii Schiœdte & Meinert, 1883: 356; Carus, 1885: 443; Trilles, 1994: 119.

Meinertia gobii Montalenti, 1948: 36.

Material

Atlantic Ocean. (NHM reg. nos 2000.1823–1828) United Kingdom, Whitsand Bay, Cornwall (50°20′N 04°14′W). Otter trawl over sandy bottom at depths of 4–14 m. Found in buccal cavity of *Echiichthys vipera* (Trachinidae). MNHN Collection: Is 29, 30, 31—Agay, Var, France (43°26′N 06°51′E), from *Serranus hepatus*. Holotype material, see below.

Type material

Holotype female (length 23 mm, width 9 mm) is in the Naturhistorisches Museum, Vienna (reg. no. NHMW 6230), from Lissabon.

Description of female—(Figures 1A–K & 2A–G)

Length 15–23 mm, width 7.8–9.0 mm, body index (length/width) 1.88–2.24 (mean 2.03) (holotype 2.42). Width greatest at pereonite IV/V. Body oval to rounded, very stocky. Colour in alcohol tan/ivory, with occasional chromatophores around coxal plates (Figure 1A,B).

Cephalon: cephalon width 1.88–2.66 times length (mean 2.24). Rounded anteriorly following line of anterolateral margins of pereonite I to form blunt pointed rostrum which

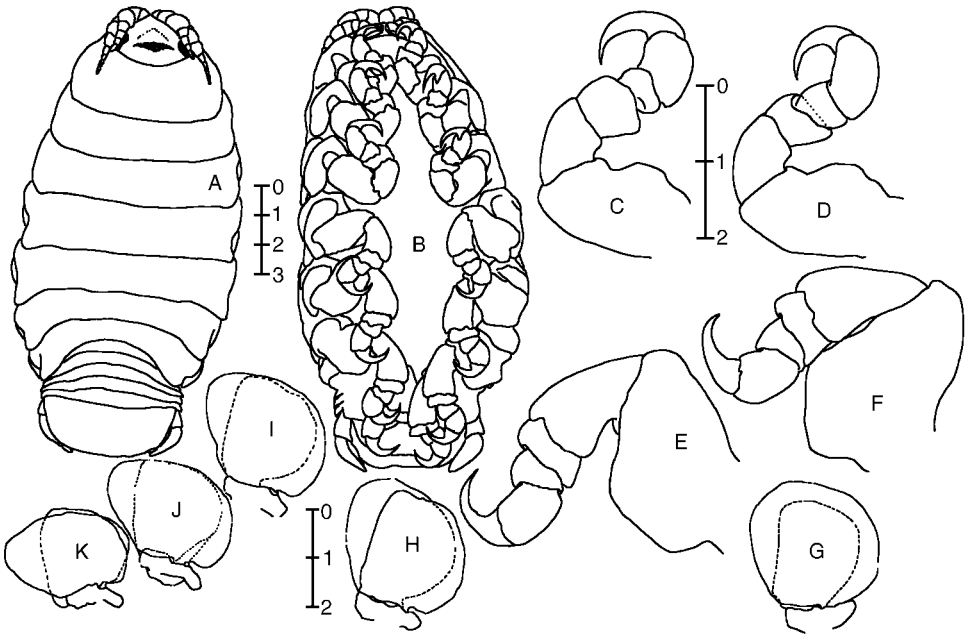

Figure 1. *Ceratothoa steindachneri* (ovigerous female): (A) dorsal view; (B) ventral view; (C–F) pereopods I, II, VI & VII; (G–K) pleopods 1–5. Scale bars in mm.

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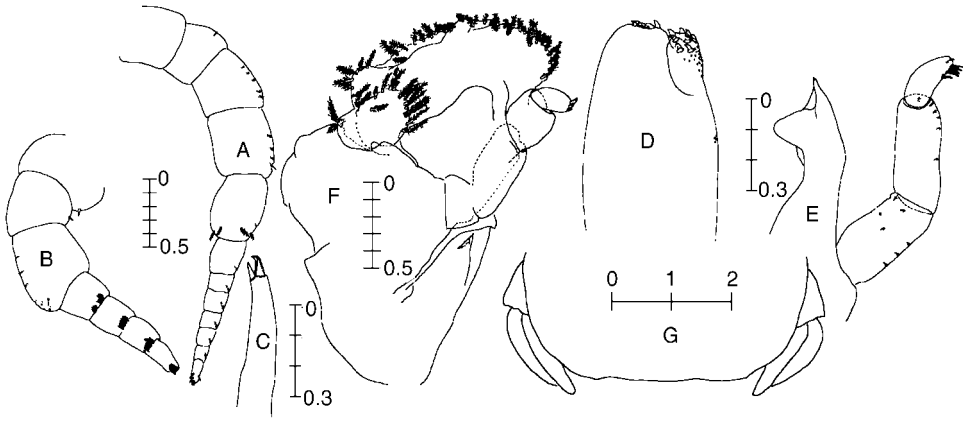

Figure 2. *Ceratothoa steindachneri* (ovigerous female): (A) antenna; (B) antennule; (C) maxillule; (D) maxilla; (E) mandible; (F) maxilliped; (G) pleotelson and uropods. Scale bars in mm.

does not protrude between antennae. Distinct dorsal curve towards rostrum at the level of the eyes. Eyes small, hidden by antennae, but distinct outlines (Figure 1A,B).

Antennule extending to middle of eye, composed of seven articles; first three articles in some specimens expanded and dorsoventrally flattened; group of sensory setae on ventral side on the anterior margin of the last four articles (Figure 2B). Antennae extending to posterior margin of cephalon sometimes to the middle of pereonite I; comprising 10–12 articles (Figure 2A).

Maxillule simple with three terminal, recurved spines, two long and one short (Figure 2C); medial lobe of maxilla with five recurved spines, partly fused to lateral lobe, with eight spines; both lobes covered with setae (Figure 2D). Last article of mandible palp with setae on anterolateral margin (Figure 2E). Maxilliped of ovigerous female composed of three articles, and weakly segmented basal article (Figure 2F); article one with lamellar oostegital lobe; a second, smaller oostegital lobe arising from the basal article; oostegital lobes bordered by numerous plumose setae. Palp article three with five spines (three recurved, larger spines, and two slender smaller ones which are not shown in Figure 2F). Labrum simple, crescent shaped.

Pereon: pereonite I with anterolateral angles extended to anterior margins of eyes; Pereonite I longest, pereonites II–V shorter and equal in length but increasing in width to a maximum at pereonite V. Pereonites VI and VII decreasing in width and length, becoming progressively more rounded and concave to incorporate the pleon (Figure 1A). Coxae rounded, compact, never produced, not reaching the posterior margins of their respective segments, (Figure 1A).

Pereopods I–III increasing gradually in size; bases without carinae. Pereopod IV–VII, with square carinae on bases, progressively more expanded posteriorly (Figure 1C–F).

Pleon: pleonites 2–4 equal in length and width. Pleonite 5 longer than preceding pleonites, with slight trisinuate border with pleotelson. Pleotelson wider than long (average 2.3 times as wide as long) (Figure 2G), widest at base. Pleopods simple without accessory folds or lamellae, decreasing in size posteriorly (Figure 1G–K).

Uropods extending to, or slightly beyond posterior margin of the pleotelson if stretched out. Exopod ramus shorter and wider than endopod ramus; both rami with convex lateral margins, that of exopod more exaggerated (Figure 2G).

Description of male (Figure 3A–M)

Body=4.75–5.3 mm (mean=5.02 mm); 10–12 mm (mean=11.0 mm) long. Body index=2.1–2.4 (mean=2.13). Similar to female except for the following: body less rotund and stocky, more rectangular. Anterolateral margins of pereonite I less produced. Antennae less robust, sometimes reaching the posterior margin of pereonite I, comprised of up to 13 articles (Figure 3C). Pleopod 2 with an appendix masculinum (Figure 3F); penes present between pereopods VII.

Description of pullus secundus (Figure 4A–S)

Body length=1.5 mm, width=0.75 mm. Mouthparts similar to those of the male, except mandibular palp is composed of three elongate articles with two long terminal setae on article three (Figure 4D–G). Pereopods I–VI simple and elongated, without carinae, spines increasing from I–VI (Figure 4H–M). Antennule comprised of seven articles and adorned with a number of long setae on articles one, two, five, six and seven (Figure 4C); antenna is comprised of 15–18 articles (Figure 4B). Pleopods 1–3 have long setae on both exopod and endopod with four short bristles on the basis (Figure 4N–P); pleopods 4–5 similar but without setae on the endopods (Figure 4Q–R). Both rami of the uropods have long setae along margins, and short spines on margin of the pleotelson (Figure 4S).

Remarks

According to Bruce & Bowman (1989), species of *Ceratothoa* can be grouped according to their pereopod morphology. A typical feature of the genus is a prominent expansion of the basis of the posterior pereopods. Bruce & Bowman (1989) state that 'Most *Ceratothoa* species . . . have this character, but . . . it is only weakly developed in *C. steindachneri* Koelbel 1878 (see Trilles, 1972)'. The latter is not supported by the present study. This comment that the expansion in *C. steindachneri* was only weakly developed was probably taken from the illustrations given by Trilles (1972), which fail to adequately emphasize this character.

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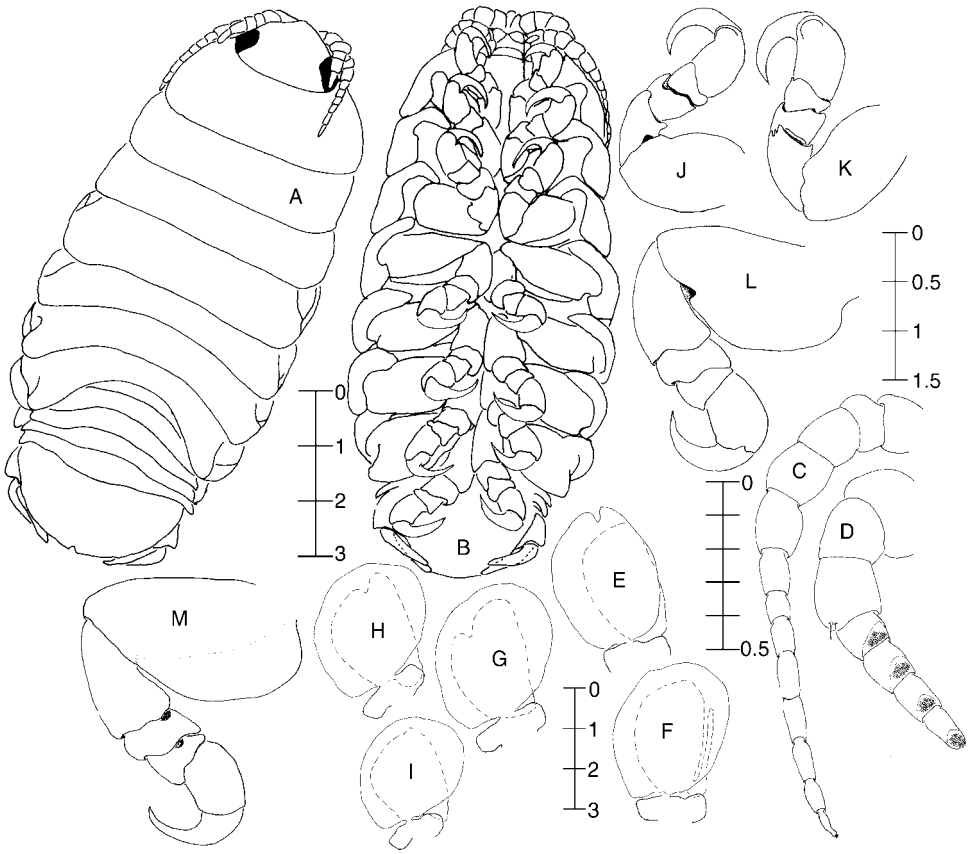

Figure 3. *Ceratothoa steindachneri* (male): (A) dorsal view; (B) ventral view; (C) antenna; (D) antennule; (E–I) pereopods I, II, VI & VII; (J–M) pleopods 1–5. Scale bars in mm.

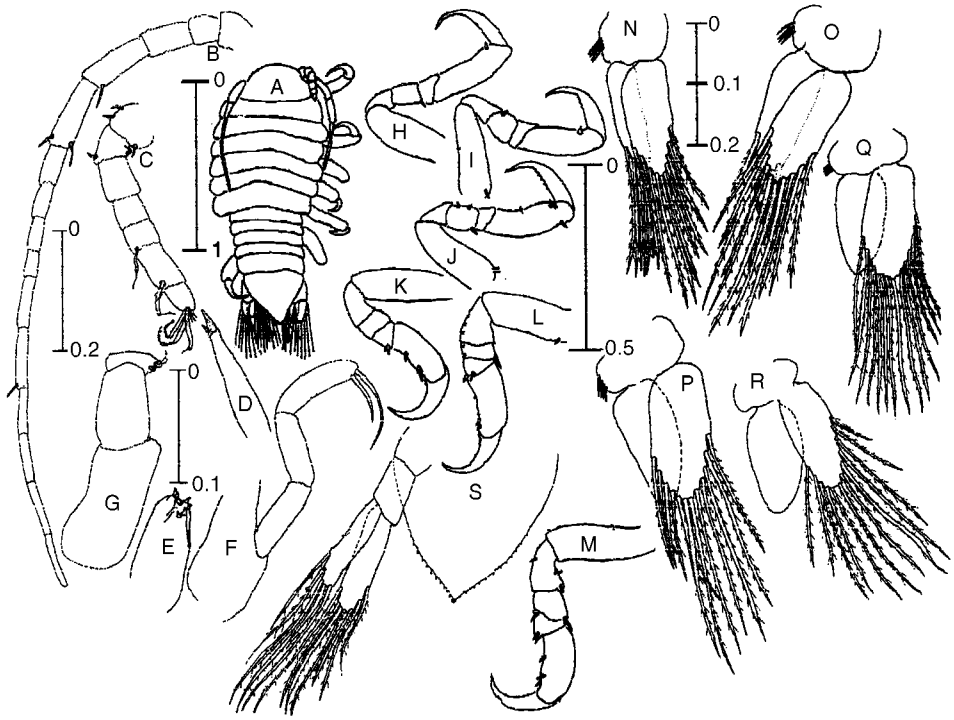

Figure 4. *Ceratothoa steindachneri* (pullus secundus): (A) dorsal view; (B) antenna; (C) antennule; (D) maxillule; (E) maxilla; (F) mandible; (G) maxilliped; (H–M) pereopods I–VI; (N–R) pleopods 1–5; (S) pleotelson and uropods. Scale bars in mm.

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There are some slight variations between the specimens collected in Britain, and those found on a different host (*Serranus hepatus*) from the coast of France. For instance, the anterolateral margins of pereonite I are produced anteriorly by varying amounts and can possess dorsal ridges on the shoulders. Variation is also observed in the number of articles of the antenna and in the degree of expansion and dorsoventral flattening of the first three articles. One specimen was examined with eight and nine articles of the antennae. It is not uncommon for the number of articles to be unequal, but these are unusually low numbers. For figures of the pullus primus stage see Trilles (1972a).

Ceratothoa gobii, Schiœdte & Meinert, 1883, in the Museum of Comparative Zoology, Harvard (MCZ), has only been recorded once, from Messina, Italy, on *Gobius niger*, and *Pomatoschistus minutus* (Gobiidae). One of the specimens re-examined was taken from the intestine of the fish and has been identified as a male *C. parallela* (MCZ 3708). The other specimen, is the holotype (MCZ 3707). The only description of *C. gobii* is that of Schiœdte & Meinert (1883). It seems likely from examination of the holotype and the description that the species could be synonymized with *C. steindachneri*. However, until further material is collected from the family Gobiidae, this species is retained.

Distribution

The species was first collected by Steindachner (described by Koelbel in 1878) in the Atlantic ('Mare Atlanticum, Ulysipponem'). Schiœdte & Meinert (1883), later described it from the Mediterranean and Atlantic, ('ad Ulisipponem . . . ad Nizzam . . . ad Villafrancam'). The geographical range has not been fully elucidated, but records exist from Tunisia (Trilles & Raibaut, 1971), Tabarka, on the northern coast of Tunisia (Capapé & Pantoustier, 1976), Bay of Kotor, Yugoslavia (Radjukovic et al., 1985), Montenegro, Adriatic (Trilles et al., 1989), Casablanca, Morocco (Trilles, 1979; Dollfus & Trilles, 1976), La Rochelle, Agay (Var) (Trilles, 1972b), and the Mediterranean (Trilles, 1968). The species is reported here for the first time in British waters.

Hosts

Koelbel (1878) first noted *C. steindachneri* on *Pagri vulgaris* (Sparidae). It has also been reported from *Serranus cabrilla*, *S. hepatus*, *S. scriba*, (Serranidae), *Diplodus annularis*, *D. vulgaris* (Sparidae), *Raja asterias*, *R. polystigma*, *R. albas* (Rajidae) although the records from Rajidae may be a result of trawl transfers and have yet to be verified.

The new host *Echiichthys vipera* (Trachinidae) has never before been reported as being parasitized by *C. steindachneri*, and the geographical range of *C. steindachneri* was not previously reported as extending into British waters. Increases in sea temperatures off the south-west coast of Britain may explain the recent discovery.

Key to the north-east Atlantic species of Ceratothoa

1. Pereopods without expansions of the merus 2
— Prominent expansions of the merus of some or all of the pereopods (Figures 5B & 6B) 3

2. Expansions of the basis of pereopods VI and VII on both upper and lower edges (Figure 6G); body distinctly parallel sided not round or oval (Figure 6D) .....*C. parallela*
— Expansions on the pereopods VI and VII on the lower edge only. Body distinctly elliptical, not parallel sided, widest at pereonite V.....*C. capri*

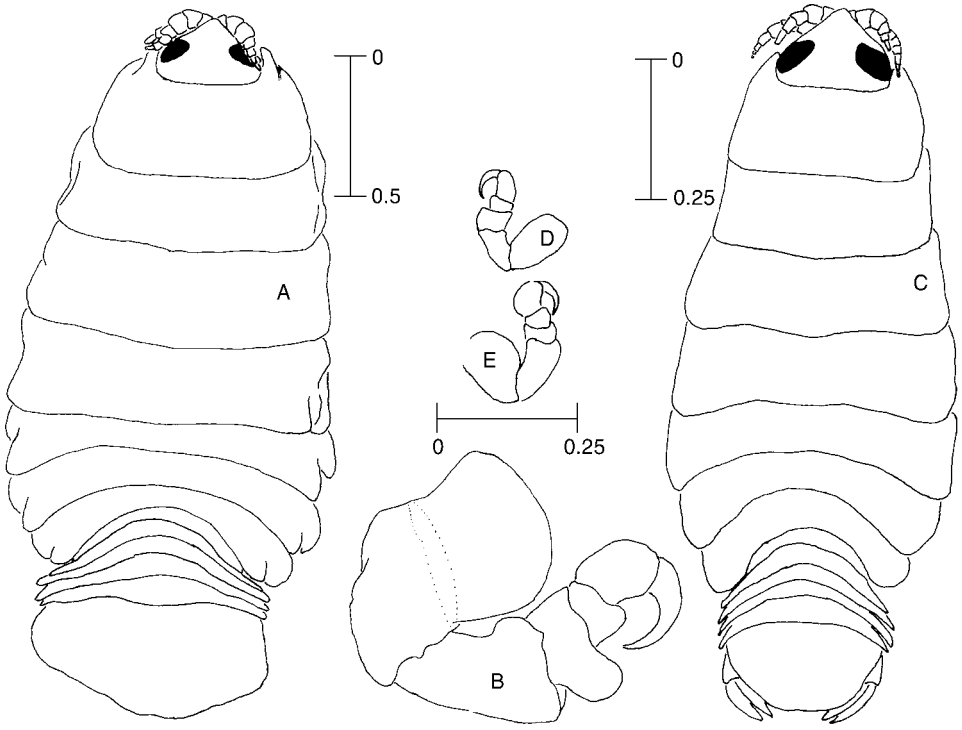

Figure 5. (A) *Ceratothoa oxyrrhynchaena*, (Holotype, reg. nos NHMW 6216); (B) pereopod VII; (C) *Ceratothoa capri* (reg. nos NHM 1961:8:25:4); (D) pereopod I; (E) pereopod VII. Scale bars in mm.

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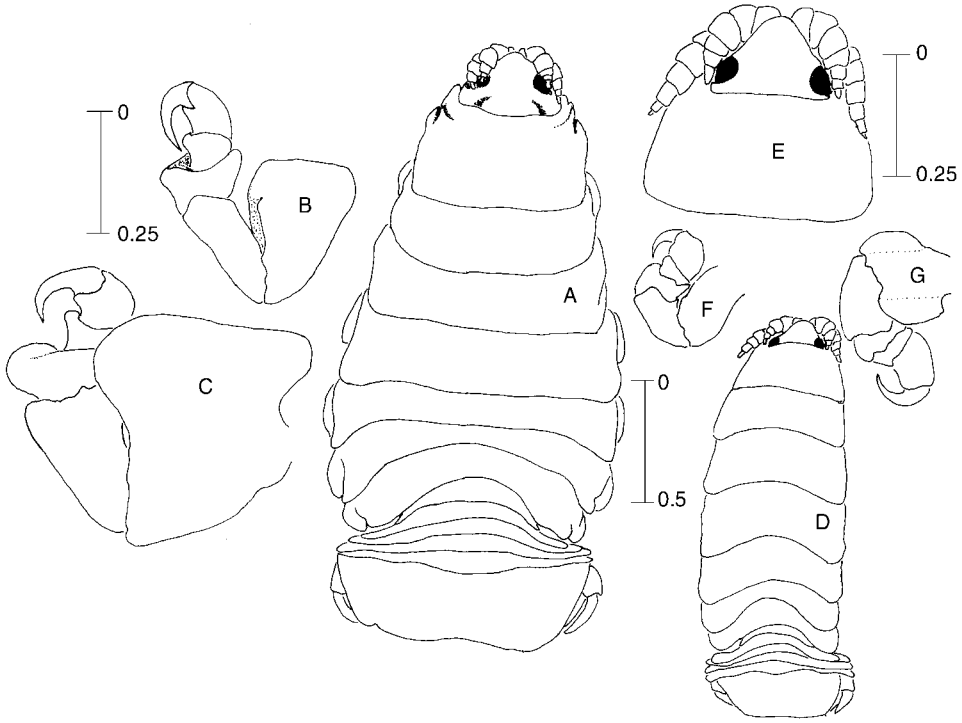

Figure 6. (A) *Ceratothoa collaris*, (reg. nos NHM 1963:3:10:2–5); (B) pereopod I; (C) pereopod VII; (D) *Ceratothoa parallela* (reg. nos NHM 1911:11:87790); (E) cephalon; (F) pereopod I; (G) pereopod VII. Scale bars in mm.

3. Posterior margin of pleonite 5 strongly trisinuate (Figure 7C) 4
— Posterior margin of pleonite 5 not trisinuate, either smooth or weakly bisinuate 5

4. Pleotelson much wider than long and as wide or wider than pereonite VII. Prominent merus expansions on pereopods I–III, less prominent on pereopods V–VII. Body rectangular and stocky..... *C. italica*
— Pleotelson wider than long but not as wide as pereonite VII. Very prominent expansions of the merus on pereopods I–III, not significant on pereopods IV–VII. Body oval, widest as pereonite V ..... *C. oestroides*

5. Cephalon deeply curved towards rostrum at the level of the eyes (Figure 1A). Pereopods without prominent expansions on the merus. Expansion of pereopod VII basis not reaching level of propodus ..... *C. steindachneri*
— Cephalon not curved towards rostrum. Prominent merus expansion on all pereopods, most noted on pereopod VII. Very prominent expansions of the basis on pereopod VII reaching the level of the propodus 6

6. Pleotelson not wider than pereonite VII, body rectangular in shape. Cephalon deeply immersed, shoulders of pereonite I level with anterior margin of eyes..... *C. oxyrrhynchaena*
— Pleotelson wider than pereonite VII, body almost triangular in shape. Cephalon not completely immersed, (shoulders of pereonite I reaching level of posterior margin of eyes)..... *C. collaris*

General remarks. Figures of *Ceratothoa capri*, *C. italica*, *C. oestroides*, *C. oxyrrhynchaena*, *C. steindachneri* and *C. parallela* can be found in Trilles' paper covering the species of the coasts of France (1972a). Figures of *C. italica*, *C. oestroides* and *C. oxyrrhynchaena* can also be found in Montalenti (1948).

Ceratothoa capri (Trilles, 1964)
(Figure 5C–E)

Meinertia capri Trilles, 1964: 188, figures 1–41; 1968: 129, plates 32–34; 1972a: 1218, figures 219–263, plates II & III; Trilles & Raibaut, 1973: 277; Brusca, 1981: 178.

Ceratothoa capri; Trilles, 1994: 116.

Distribution

Mediterranean (Nouvelle, France), Tunisia (La Galite, Tabarka).

Hosts

Capros aper (Zeiformes) in buccal cavity.

Holotype

Muséum National d'Histoire Naturelle, Paris (MNHN-Is 81). Female (length=19.5 mm, width=8.5 mm) La Nouvelle, France (43°01′N 03°03′E).

Remarks

A description and figures of this species can be found in the original paper by Trilles (1964).

Ceratothoa collaris Schiœdte & Meinert, 1883
(Figure 6A–C)

Ceratothoa collaris Schiœdte & Meinert, 1883: 366, table XVI (Cym. XXIII) figures 8–9; Carus, 1885: 433; Rokicki, 1984: 1–220, figures 1–68; 1985: 95; Trilles, 1994: 117.

Meinertia collaris; Monod, 1924a: 31; 1924b: 430; 1925: 103; Trilles 1972b: 1240, plate I; 1977: 10; 1979: 521; Capapé & Pantoustier, 1976: 203; Avdeev, 1979: 54.

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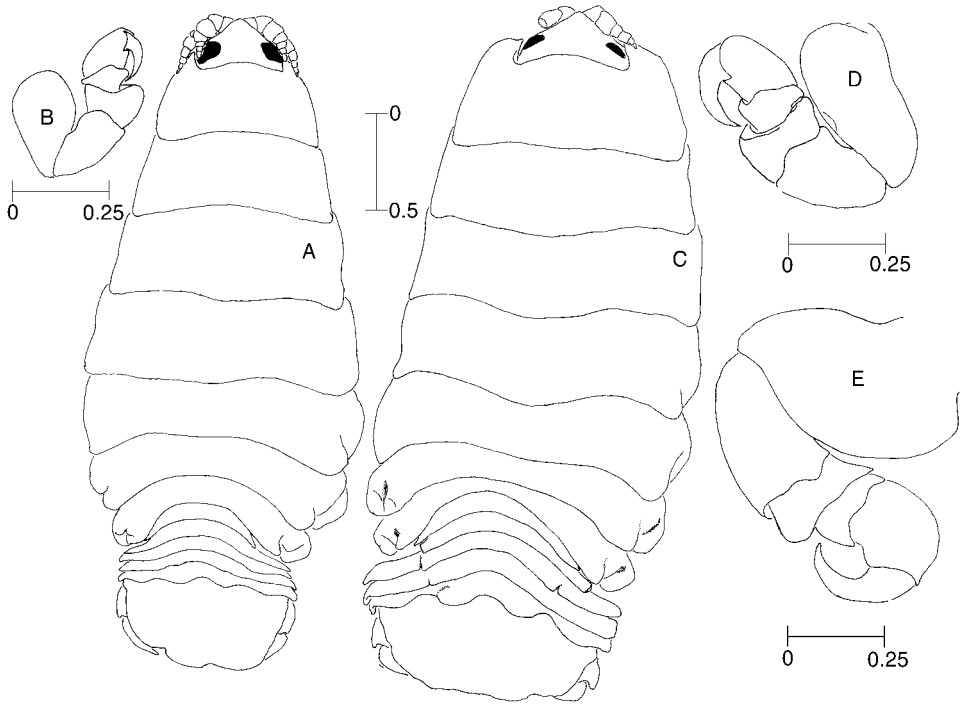

Figure 7. (A) *Ceratothoa oestroides*, (Holotype, reg. nos MNHN 1895:5:28:12); (B) pereopod I; (C) *Ceratothoa italica* (Holotype, reg. nos ZMUC-CRU-6914); (D) pereopod I; (E) pereopod VII. Scale bars in mm.

Distribution

Algeria (Gulf of Oran, Alger) Morocco (Safi) and coast of Mauritanian Sahara, Tunisia (Tabarka), coasts of north-west Africa (Port Etienne, Senegal).

Hosts

Dentex filosus, *Pagellus erythrinus*, *P. acarne*, *Pagellus* sp. (Sparidae) *Corvina cameronensis.*

Holotype

Muséum National d'Histoire Naturelle, Paris (MNHN-Is 40), Female (length=38 mm) Algeria.

Remarks

Originally divided into three 'forms' by Monod (1924a,b) forma typica, forma globuligera, and forma africana, according to the morphological variations of the head and antennae. Similar variations are also seen in *C. steindachneri*.

Ceratothoa italica Schiœdte & Meinert, 1883
(Figure 7C–E)

Ceratothoa italica Schiœdte & Meinert, 1883: 347, table XV (Cym. XXII) figures 1–4; Carus, 1885: 442; Trilles, 1979: 521; 1994: 121; Brusca, 1981: 178; Rokicki, 1984: 1–220, figures 1–68; 1985: 95; Trilles et al., 1989: 279, figure 8.

Meinertia italica; Monod, 1924a: 34; Montalenti, 1948: 42, figures 11–13; Trilles, 1964: 106; 1968: 122, plates 25–27; 1972a: 1212, figures 156–187, plate II; 1972b: 1238.

Distribution

Mediterranean (Fiume, Cap Blanc, Yugoslavia (Montenegro), Gulf of Naples, Tunisia, Morocco (Port Etienne), north-west Africa, (Mauritania).

Hosts

Pagellus mormyrus, *P. erythrinus*, *Oblada melanura*, *Canthurus lineatus*, *Sargus* sp. (Sparidae).

Holotype

Zoologiske Museum, University of Copenhagen (ZMUC-CRU-6914). Female (length=33.5 mm, width=15.5 mm), Fiume, Adriatic (45°56′N 12°44′E).

Ceratothoa oestroides (Risso, 1826)
(Figure 7A,B)

Canolira oestroides Risso, 1826: 123.

Cymothoa oestroides; Milne-Edwards, 1840: 272; White, 1847: 110; Lucas, 1849: 78, plate 8, figure 4; Hope, 1851: 33; Heller, 1866: 737; Barcelo y Combis, 1875: 68; Bullar, 1876: 118; 1878: 505, plates 45–47; Stalio, 1877: 236; Mayer, 1879: 176; Stossich, 1880: 45; Bonnier, 1887: 133; Odon de Buen, 1887: 418; 1916: 363; Monticelli, 1890: 420; Gilbert i Olivé, 1919–1920: 88; Sanada, 1941: 209.

Cymothoa (Meinertia) oestroides; Taschenberg, 1879: 245; Dollfus, 1922: 287.

Ceratothoa oestroides; Schiœdte & Meinert, 1883: 350, table XV (Cym. XXII) (figures 5–11); Carus 1885: 442; Barrois, 1887: 12; 1888: 63; Gourret, 1891: 14, plate IV (figures 10 & 11); Bolivar, 1892: 133; Koelbel, 1892: 107; Gerstaecker, 1901: 255; Zimmer, 1926–1927: 746; Dudich, 1931: 18; Trilles, 1979: 515; 1994: 122; Renaud et al., 1980: 467; Radujkovic et al., 1984: 161; Rokicki, 1984: 1–220, figures 1–68; 1985: 95; Trilles et al., 1989: 279, figure 9.

Ceratothoa sargorum Gourret, 1891: 16, plate I, figure 17 and plate IV, figures 1–4.

Meinertia oestroides; Nierstrasz, 1915: 89; Monod, 1923a: 82; 1923b: 18; 1924a: 432; 1924b: 34; Montalenti, 1948: 47;

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Amar, 1951: 530; Houdemer, 1951: 39; Balcells, 1953: 548; Euzet & Trilles, 1961: 190; Trilles, 1962: 118; 1964: 107; 1968: 53, plates XIII–XVIII, photographs 9–12; 1972: 1201, figures 90–136, plates I, III; 1972: 1233; 1977: 8; Vu–Tân–Tûe, 1963: 225; Quintard–Dorques, 1966: 10; Berner, 1969: 93; Roman, 1979: 501; Trilles & Raibaut, 1971: 73; Thampy & John, 1974: 575; Romestand, 1974: 571; 1979: 423, plates I–IV; Romestand & Trilles, 1976: 87, figure l; 1977: 47, figures 1–11; 1977: 91, figures 1 & 2; 1979: 195; Romestand et al., 1976: 981; Chaigneau, 1977: 403; Romestand et al., 1977: 171, plate III (10–14); Thuet & Romestand, 1980: 240; 1981: 15; Quignard & Zaouali, 1980: 357; Brusca, 1981: 125; Radujkovic, 1982: 155; Brusca & Gilligan, 1983: 813, figures 1 & 2; Segal, 1987: 351; Wägele, 1987.

Ceratothoa (Meinertia) oestroides; Brusca, 1981: 123.

Distribution

Mediterranean (Algeria, French coast, Spanish coast, Balearic Islands, Turkey, Iberian Peninsula, Yugoslavia and Tunisia) and north-east Atlantic coasts (Azores, Canary Islands, north-west Africa, Spanish and French coasts).

Hosts

This species is found on many different host species, the Centracanthidae and Sparidae are the most frequently parasitized groups but members of the Clupeidae, Mullidae and Carangidae have also been recorded. Trilles (1994) lists the known hosts and locations for this species.

Syntypes

Muséum National d'Histoire Naturelle, Paris (MNHN-Is431 (6)). Two Females (lengths=20 mm, 22 mm), Nice, France (43°42′N 07°16′E).

Ceratothoa oxyrrhynchaena Koelbel, 1878
(Figure 5A,B)

Ceratothoa oxyrrhynchaena Koelbel, 1878: 401, plate I; Gerstaecker, 1901: 261; Trilles, 1979: 521; 1994: 124; Bruce, 1980: 320, figures 3–4; Avdeev, 1982: 65; 1982: 69; Rokicki, 1984: 1–220, figures 1–68: 1985: 95; Trilles et al., 1989: 279, figure 10; 1999: 6.

Ceratothoa oxyrrhynchoena; Schiœdte & Meinert, 1883, 368, table XVI (Cym. XXIII) figures 10–14.

Meinertia oxyrrhynchaena; Nierstrasz, 1915: 89; Gurjanova, 1936: 84; Montalenti, 1948: 51; Euzet & Trilles, 1961: 190; Quintard-Dorques, 1966: 10; Trilles, 1968: 125, plates 28–31; 1972a: 1208, figures 137–155, plates I–III; 1972b: 1250; 1977: 10; 1979: 421; Trilles & Raibaut, 1971: 74, plate 4; Capapé & Pantoustier, 1976: 201; Avdeev, 1978: 30; Bruce, 1980: 320.

Codonophilus oxyrrhynchaenus; Nierstrasz, 1931: 132.

Distribution

Japan and China, Mediterranean (France, Italy, Tunisia, Algeria, Montenegro, Yugoslavia) north-east Atlantic coasts (Mauritania).

Hosts

Boops boops, *Spicara maena*, (Centracanthidae). Has also been noted on, *Zeus faber* (Zeiformes), *Scyliorhinus stellaris*, *Torpedo marmorata* (Rajidae), and on *Scolopsis* sp. (Nemipteridae).

Holotype

Naturhistorisches Museum, Vienna (NMHW 6216). Female (length=26 mm, width=11.5mm), Japan, Drasdie, 1877.

Ceratothoa parallela (Otto, 1828)
(Figure 6D–G)

Cymothoa parallela Otto, 1828: 351, table XXII (figure III); Milne-Edwards, 1840: 273; Lucas, 1849: 78, plate 8 (figure 24); Hope, 1851: 33; Dana, 1852: 303; Heller, 1866: 738; Stalio, 1877: 236; Bullar, 1878: 505; Stossich, 1880: 45; Gerstaecker, 1901: 255; Gilbert i Olivé, 1919: 88; Belloc, 1929: 250; Bowman, 1978: 217–218.

Ceratothoa parallela; Schiœdte & Meinert, 1883: 329, table XIII (Cym. XX) (figures 3–10); Carus, 1885: 442; Gourret, 1891: 15, plate IV (figures 12–15); Koelbel, 1892: 107; Bolivar, 1892: 133; Szidat, 1955: 16; 1956: 254; Bowman, 1978: 217; Trilles, 1981: 585; 1994: 125; Brusca, 1981 ; 127; Radujkovic et al., 1984: 161; Rokicki, 1984: 1–220, figures 1–68; 1985: 95; Trilles et al., 1989: 279, figure 11.

Meinertia parallela; Montalenti, 1948: 36; Amar, 1951: 530; Euzet & Trilles, 1961: 190; Trilles, 1964: 106; 1968: 38, plates VII–XII, photographs 6–8; 1972: 1271, figure 2; 1972: 1196, figures 46–89, plate I (4 & 5), III (19); 1972: 1236; 1977: 9; Berner, 1969: 93; Geldiay & Kocatas, 1972: 24; Thampy & John, 1974 ; 580; Capapé & Pantoustier, 1976: 202; Bowman, 1978: 217; Romestand & Trilles, 1979: 195; Brusca, 1981: 119.

Ceratothoa triglae Gourret, 1891: 19, plate XI, figures 14–19.

Ceratothoa deplanata Bovallius, 1885: 20, plate IV, figures 41–46; Menzies & Frankenberg, 1966: 9; Schultz, 1969: 157, figure 235; Trilles, 1981: 585, plates 1 & 2; Brusca, 1981: 178.

Meinertia deplanata; Richardson, 1905: 240, figure 246.

Codonophilus deplanatus; Nierstrasz, 1931: 132.

Distribution

Mediterranean and Atlantic. This species has been collected in many places in these areas (Trilles, 1994).

Hosts

Ceratothoa parallela has been found parasitizing diverse fish species, particularly the Centracanthidae, and especially the common bogue, *Boops boops*.

Neotype

Muséum National d'Histoire Naturelle, Paris (MNHN-Is415 (24)). Female (length=24 mm).

Remarks

The Crustacea collection of the Museum of Göttingen, where Otto's type material is cited as being found (Schiœdte & Meinert, 1883), was transferred to the Senckenberg Research Institute, Frankfurt, in 1985 and the collection has since undergone a major revision. The holotype of *C. parallela* is no longer extant (Dr M. Tuerkay, personal communication). However, in Schiœdte & Meinert (1883) there is a reference to a 'specim. typ.' from 'Oran (Bravais, Mus. Paris)'. This specimen has been examined and is designated as the neotype.

Ceratothoa directa (Otto, 1821) was originally described with a short paragraph in Latin, without figures and without reference to the location of a type specimen. In 1828, Otto described *C. parallela* using a similar Latin description, with only a few omissions, in addition to a German description and a figure. There is little doubt that they are the same species, but since *C. directa* has not been used since 1821 and *C. parallela* has been widely used, the latter name is valid in accordance with Article 23.9.1 of the International Code of Zoological Nomenclature. *Ceratothoa parallela* becomes a *nomen protectum*, whilst the invalid *Ceratothoa directa*, becomes a *nomen oblitum*.

Ceratothoa deplanata Bovallius, 1885, was described only once and has since been mentioned in the literature five times by different authors using the same figures. In the original description the author states that "the animal comes nearest to *Ceratothoa parallela* Otto, but is to be distinguished by the broadly rounded front, the rhomboidal eyes, the form of the hinder corners of the pereonal segments, the free, narrow, first pleonal segment and the form of the urus". Since the holotype is unknown and these features are insufficient to distinguish the two species, *C. deplanata* is placed in synonymy with *C. parallela*.

SUMMARY

This manuscript has provided a complete redescription and re-illustration of *Ceratothoa steindachneri* with a key to the north-east Atlantic and Mediterranean species of *Ceratothoa*. A specimen of *C. parallela* held at the Paris Museum is designated as the neotype of the species.

Seven of the 27 species of *Ceratothoa* noted by Trilles (1994) are found in Mediterranean and north-east Atlantic waters. In addition, *C. deplanata*, *C. directa*, and *C. poutassouiensis* are here synonymized, designated as *nomen nudum*, or *nomen oblitum* for reasons outlined above. In order to clarify the status of *C. gobii* it is necessary to obtain more specimens from the family Gobiidae. This leaves a remaining 16 species. Of these, almost half are of questionable validity. Two species, *Ceratothoa venusta*, and *Ceratothoa hemiramphi* were synonymized by Bruce & Bowman (1989) with *C. retusa* and *C. guttata* respectively. Others are described on the basis of juveniles, have only been collected once, or have no holotype. Although the problems with the species of *Ceratothoa* from the north-east Atlantic and Mediterranean region have been dealt with, there is clearly more work to be done with the remaining members of the genus.

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