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ELAPHOIDELLA COTTARELLII N. SP., FROM HYPORHEIC  
INTERSTITIAL OF THE VOMANO RIVER,  
CENTRAL APENNINES, ITALY, AND COMMENTS  
ON THE GENUS *ELAPHOIDELLA* CHAPPUIS  
(Crustacea Copepoda: Harpacticoida) (\*) (\*\*)

**ABSTRACT.** *Elaphoidella cottarellii* n. sp. is described from the hyporheic interstitial of the Vomano river, central Apennines, Italy. The new species belongs to the *gracilis* group of *Elaphoidella* as defined by Apostolov (1985), and it is close to *E. damianae* Kiefer, 1967 and *E. federicae* Pesce & Galassi 1988, from Romania and Corsica respectively and to some Italian species, such as *E. tiberina* Pesce & Galassi, 1983, from phreatic waters of central Apennines, and *E. plutonis* Chappuis, 1938, from cave and phreatic waters of central Apennines and Campania. *E. cottarellii* n. sp. is readily distinguished by the nominate taxa and by other congeners by combined characters such as the very reduced major setation of the swimming 1-4 and leg 5, the finely denticulated anal operculum and the structure and armature of the caudal rami.

**Key words:** Copepoda Harpacticoida, *Elaphoidella*, interstitial, Italy.

**RIASSUNTO.** *Elaphoidella cottarellii* n. sp., un nuovo copepode arpacticoida dell'ambiente iporreico del fiume Vomano (Appennino centrale) (Crustacea Copepoda: Harpacticoida). La nuova specie rientra nel gruppo *gracilis* sensu Apostolov (1985), risultando affine a *E. damianae* Kiefer, 1967 e *E. federicae* Pesce & Galassi 1988, note di acque sotterranee della Romania e della Corsica. *E. tiberina* Pesce & Galassi, 1983 ed *E. aprutina* Pesce & Galassi, 1983, note di sistemi freatici superficiali dell'Appennino centrale e *E. plutonis* Chappuis, 1938, nota di ambienti cavernicoli e freatici dell'Appennino centrale e della Campania. *E. cottarellii* n. sp. si distingue dalle suddette specie e dalle altre congeneriche per la combinazione di caratteristiche morfologiche quali la ridotta armatura degli endopoditi di tutte le appendici toraciche e del basipodite ed esopodite del quinto paio, la spinulazione dell'opercolo anale, la forma della setola interna dei rami furcali ed il rapporto tra le setole, interna ed esterna, degli stessi rami.

**Parole chiave:** Copepoda Harpacticoida, *Elaphoidella*, ambiente interstiziale, Italia.

Continuing researches on the hyporheic biocoenoses of central Apennines, carried out by the "Dipartimento di Scienze Ambientali" of

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the University of L'Aquila, Italy, has yielded a previously undescribed species of the harpacticoid genus *Elaphoidella* Chappuis.

The new species, which belongs to the *gracilis*-group of species *sensu* Apostolov (1985), is described below as *Elaphoidella cottarellii* n. sp.

The present finding brings to ten the number of *Elaphoidella* species recorded from central Apennines, the others being *E. aprutina* Pesce & Galassi, 1983, *E. elaphoides* (Chappuis, 1924), *E. italica* Pesce, Galassi & Apostolov, 1987, *E. mabelae* Galassi & Pesce, 1991, *E. paraelaphoides* Pesce, Galassi & Apostolov, 1987, *E. phreatica* (Chappuis, 1925), *E. plutonis* Chappuis, 1938, *E. rossellae* Pesce, Galassi & Apostolov, 1987, *E. subplutonis* Pesce, Galassi & Apostolov, 1987 and *E. tiberina* Pesce & Galassi, 1983.

Canthocamptidae Sars, 1906; Lang, 1948  
*Elaphoidella* Chappuis, 1928; *sensu* Apostolov 1985

*Elaphoidella cottarellii* n. sp. (figg. 1-18)

#### MATERIAL AND METHODS

Specimens were collected from the interstitial bed by scooping the upper 20-30 cm of sediment with a fine mesh hand net. Samples were preserved in field in 4% buffered formalin; after sorting, the animals were transferred to a solution of 70% ethanol - 1% glycerol.

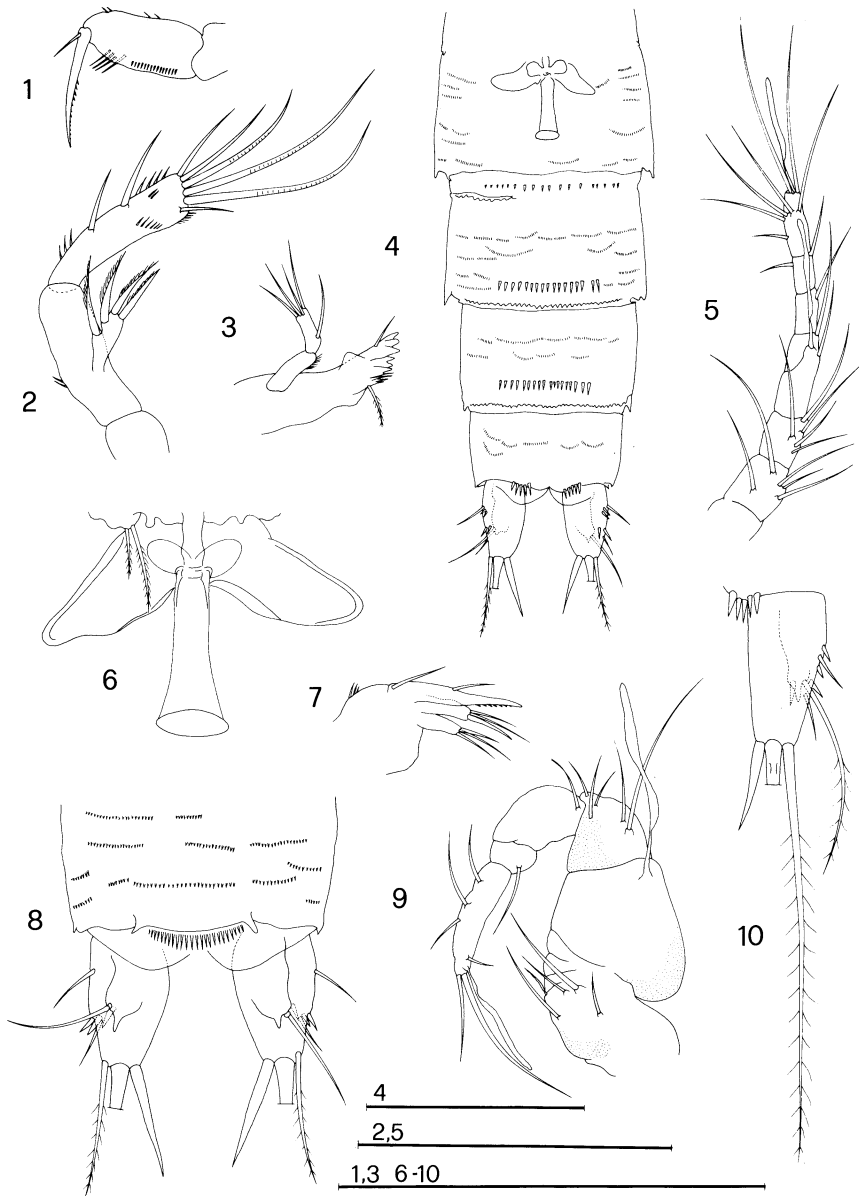
For description specimens were completely dissected and mounted in commercial polyvinyl lactophenol medium. The figures were prepared using a camera lucida on a Leitz Laborlux D phase-contrast microscope.

The nomenclature and descriptive terminology used are adopted from Lang (1948).

Holotype deposited in the collections of the "Museo Civico di Storia Naturale", Verona (Italy); paratypes deposited in the senior author's collections at the "Dipartimento di Scienze Ambientali", University of L'Aquila (Italy).

#### MATERIAL EXAMINED

1 ♀ (holotype), 1 ♀, 1 ♂ (paratypes), hyporheic habitat of the Vomano river, at the confluence of S. Giovanni stream, L'Aquila (Abruzzo); 31.



Figs. 1-10 - *Elapheidella cottarellii* n. sp. 1-8 (holotype), 9-10 (male paratype). 1. Maxilliped; 2. Antenna; 3. mandible; 4. abdomen and caudal rami, ventral view; 5. Antennule; 6. Seminal receptacle; 7. Maxilla; 8. Anal somite and caudal rami, dorsal view; 9. Antennule; 10. caudal ramus, ventral view. Scale=100  $\mu$ m.

5. 1994, coll. G. L. Pesce and P. De Laurentiis. Water depth: 45 cm; interstitial water temperature: 17.5 °C; pH: 7.1; O<sub>2</sub>: 10.8 mg/l; el. cond.: 410 µMHOS; Ca<sup>++</sup>: 78 mg/l; clorinity less than 25 mg/l; sediment composed of fine clay, and sandstone. Co-occurring copepod fauna: cyclopids [*Paracyclops fimbriatus* (Fischer, 1853), *Diacyclops hypricola* (Gurney, 1927), *Diacyclops languidus* (G. O. Sars, 1863), *Diacyclops clandestinus* (Kiefer, 1926), *Microcyclops rubellus* (Lilljeborg, 1901), *Acanthocyclops robustus* (G. O. Sars, 1863)]; harpacticoids [*Elaphoidella gracilis* (G. O. Sars, 1862), *Paracamptus schmeili* (Mrazek, 1893), *Canthocamptus staphylinus* (Jurine, 1820), *Bryocamptus pygmaeus* (G. O. Sars, 1862), *Bryocamptus zschokkei* (Schmeil, 1893), *Bryocamptus minutus* (Claus, 1863)].

## DESCRIPTION

Femal. Body subcylindrical; length, excluding antennule and caudal setae, 560 µm (holotype), 545 µm (paratype).

Posterior frills of thoracic somites smooth. Genital segment broader than long, with a posteroventral row of small spinules, a toothed hyaline membrane on the posterior dorsal margin and discontinuous dorsal and ventral rows of minute spinules. Seminal receptacle normal for genus, quite extending beyond to midlength of segment. Urosomal somites 2-3 each with row of large spinules ventrally, a hyaline membrane along posterior dorsal margin and numerous dorsal and ventral rows of minute spinules. Anal somite with row of 5-6 spinules above each caudal ramus. Anal operculum slightly convex, with marginal spines row.

Caudal rami 2 times longer than broad, with dorsal keel ending in posteriorly directed pointed, bearing one short seta; inner margin smooth, outer margin with two outer short setae and 4-5 spinules. Middle apical seta about 1.2 times longer than urosome; outer apical seta slightly longer than corresponding inner apical spiniform seta. Remaining ornament as in figs. 4, 8.

Antennule 8-segmented, segments 4 and 8 each with one long esthetasc; remaining ornamentation as in fig. 5. Antenna with allobasis, single article of exopod bearing four plumose setae; remaining ornament as usual for the genus (fig. 2).

Mandible with biarticulate palp, bearing four terminal and one lateral setae. Maxilliped prehensile; basis without seta, endopodite with

row of spinules on anterior and posterior surface, and few spinules on dorsal surface. Other mouthparts without particular characteristics.

Leg 1 with endopodite and exopodite 3-segmented; legs 2-4 each with 3-segmented exopodite and 2-segmented endopodite. Couplers of legs 1-2 with few hairs on anterior surface; those of legs 3-4, smooth. Major lateral spines of leg 3 exopodite stout and slightly curved posteriorly. Basipodite of legs 1-4 with some hairs and spinules. Setae on the distal segment of the endopodite of legs 2-4 spiniform.

Setation formula for major armament as follows:

	coxa	basis	exopodite	endopodite
leg 1	0-0	1-1	1-0; 1-1; 220	0-1; 0-1, 021
leg 2	0-0	1-0	1-0; 1-1; 122	0-1; 111
leg 3	0-0	1-0	1-0; 1-1; 222	0-0; 111
leg 4	0-0	1-0	1-0; 1-1; 222	0-0; 111

Leg 5 with basipodite little produced, bearing three long, spinulose setae; subovoid exopodite with three setae, the middle much longer than others.

Male. More slender and smaller than females. Body length, excluding antennule and caudal setae, 515  $\mu\text{m}$ . Antennule geniculate, with es-thetasc on articles 4 and 8. Mouthparts, leg 1 and 4 the same as females. Legs 2-3 and caudal rami sexually dimorphic.

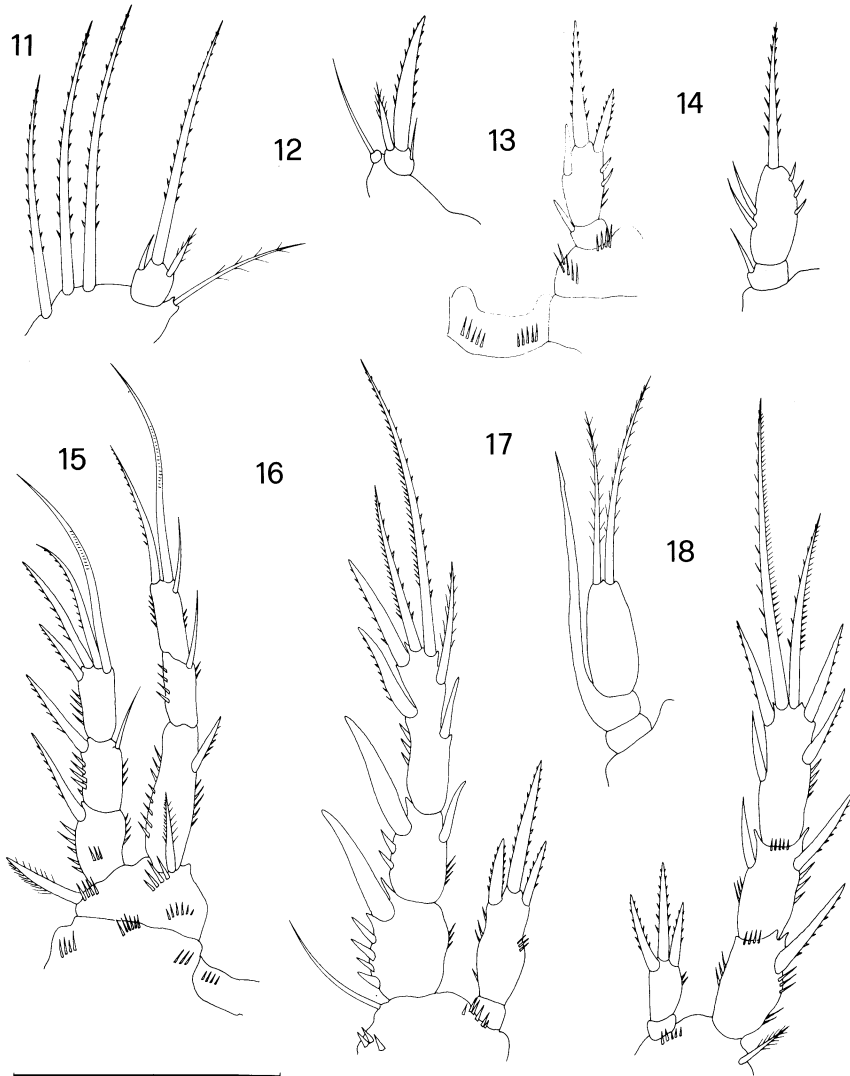
Endopodite of leg 2 with one apical spiniform seta and two inner setae. Endopodite of leg 3, 3-segmented; modified spiniform process of article 2 slender, reaching about midlength of exopodite article 3; article 3 with two apical plumose setae.

Caudal rami slightly longer ( $L/1=2.3$ ) than those of females; outer distal seta very long, about 5 times longer than innermost.

Leg. 5. Basoendopodite reduced, armament lacking; exopodite about as long as broad, and bearing two spines and one shorter seta, middle spine stout and the longest.

## ETYMOLOGY

Name after the colleague. Prof. V. Cottarelli, in recognition of his valuable contributions to the knowledge of the Italian harpacticoid copepods.



Figs. 11-18 - *Elaphoidella cottarellii* n. sp. 11, 13, 15, 16, 18 (holotype), 12, 14, 17 (male paratype), 11. Leg 5; 12. Leg 5; 13. Leg. 2, endopodite and couplers; 14. Leg 2, endopodite; 15. Leg 1; 16. Leg 3; 17. Leg 3, endopodite; 18. Leg 4. Scale=50  $\mu$ m.

#### AFFINITIES

*Elaphoidella* Chappuis s.l. is a world wide genus, closely related to *Attheyella* Brady, at present including about 200 species and subspecies, for the most part endemic and ground waters dwellings.

Apostolov (1985, 1988), according to the oligomerization of the swimming legs and the setation of the antennal exopodite, splitted the genus into five genera, viz. *Elaphoidella* s. str., *Elaphoidellopsis*, *Stygoelaphoidella*, *Neoelaphoidella* and *Praelaphoidella*, suggesting as well the subdivision of *Elaphoidella* s. str. into two morphological groups, viz. *gracilis*-group and *simplex*-group, embracing species characterized by 6 or 4/5 setae on the distal article of the eopodite of leg 4, respectively.

Successively, the separation of the nominate genera has been critically discussed by Reid (1990), who pointed out mutual inconsistencies in the diagnosis of the new proposed genera, as well as several omissions and blunders in Apostolov's World key of the genus.

Then, Hamond (1987) observed that old species descriptions and drawings of Canthocamptidae do not always agree with modern description standards and, in many cases, such defective descriptions could greatly confuse the status of some genera and subgenera in this family; in the same occasion, returned many genera within the family Canthocamptidae, including *Elaphoidella* s. sl., to subgeneric status of the genus *Canthocamptus* Westwood.

Hamond's statement has been recently supported by Hishida (1994) who described a new *Elaphoidella* from Nepal showing transitional characteristics between *Elaphoidella* and *Attheyella*, confirming as well the need of a World revision of the genera within the family Canthocamptidae.

However, in the present paper, pending a comprehensive revision of the nominate family and partially sharing Reid's objections, we employed the genus name *Elaphoidella* s.l., but considering the validity of the *gracilis* and *simplex* groups by Apostolov (1985), which, in our opinion, may be still of some practical usefulness in species discrimination.

Therefore, *E. cottarellii* n. sp., due to the presence of six setae on the distal article of the exopodite of leg 4, both in females and male, belongs to the *gracilis* group of *Elaphoidella*, being highly distinctive in the reduced major setation of the swimming legs and of both exopodite and basipodite of leg 5.

Other italian *Elaphoidella* species belonging to the same group, such as *E. tiberina* and *E. aprutina*, from central Apennines have somewhat reduced setation of legs 1-5.

From these species, *E. cottarellii* n. sp. differs as follows: from *E. tiberina* in having three setae on the distal article of the endopodite of leg 4 (versus two setae), a shorter apical, outer caudal seta and more spines at the basis of furcal rami; from *E. aprutina* in the different

structure and setation of caudal rami, the different morphology of the seminal receptacle, the unmodified spines of the male exopodite of leg 4 and in the armature of the basipodite of leg 5.

From all the nominate species the new species differs also by the anal operculum with spines comb (versus with shorter and stouter spines).

In table I is a list of the main characters by which *E. cottarellii* n. sp. differs from other Italian *Elaphoidella* species with reduced setation of the swimming legs and leg 5.

Good correlation also exists between *E. cottarellii* n. sp. and *E. damiana*e Kiefer, 1967 and *E. federica*e Pesce & Galassi 1988, known inhabiting ground waters of Romania and Corsica, in having the same setation of legs 1-2 (females) and the identical structure and armature of leg 5.

Tab. 1

Species	anal operculum	setae enp. 3 leg 4	setae exp. leg 5 (♀)	setae exp. leg 5 (♂)	setae basp. leg 5 (♀)	seminal receptacle	spines basis caudal ramus
<i>cottarellii</i>	with comb	3	3	3	3	elongated	5
<i>tiberina</i>	with spines	2	3	unknown	3	elongated	4
<i>aprutina</i>	with spines	3	3	4	4	not elongated	2

Particularly from *E. damiana*e the new species differs by several characters, such as the different armature of the endopodite of leg 4, the armature of the anal operculum, the longer caudal rami, the number of spines at the basis of the same rami, and the morphology and length of the inner apical caudal seta.

From the other species in the *gracilis*-group, *E. cottarellii* n. sp. is readily distinguished by combined morphological characteristics, such as the very reduced major setation of the swimming legs and of leg 5, the finely spinulose anal operculum, the shape of the inner apical spine of caudal rami and the sexually dimorphic length ratio between inner and outer apical setae of the same rami.

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