



The genus *Elaphoidella* Chappuis (Copepoda: Harpacticoida) in Italy, including the description of five new species*

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ABSTRACT

Elaphoidella aprutina n.sp., *Elaphoidella italica* n.sp., *Elaphoidella paraelaphoides* n.sp., *Elaphoidella rossellae* n.sp. and *Elaphoidella subplutonis* n.sp. are described from phreatic groundwaters of central Italy. New localities are reported for the species *Elaphoidella elaphoides* (Chappuis) and *Elaphoidella phreatica* (Chappuis) from central and southern Italy.

The distribution of the genus *Elaphoidella* in Italy is briefly discussed.

KEY WORDS: Copepods; Harpacticoids; *Elaphoidella*; Ground-water habitat; Italy.

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* Contribution to the knowledge of the underground water fauna in central and southern Italy: XXXIX

INTRODUCTION

Recent stygobiological research on different ground-water habitats (superficial and deep phreatic networks and hyporheic substrates) in Italy, by the «Dipartimento di Scienze Ambientali» of the University of L'Aquila, from 1983 to 1986 (Pesce, 1980, 1983; Pesca & Galassi, 1983; Pesca & Teté, 1985) has yielded large samples of harpacticoid copepods of the genus *Elaphoidella*, *sensu* Apostolov, 1985.

Among the specimens, uncommon species such as *Elaphoidella elaphoides* (Chappuis, 1923) and *Elaphoidella phreatica* (Chappuis, 1925) were identified; five species are described as new, viz. *Elaphoidella aprutina* n.sp., *Elaphoidella italica* n.sp., *Elaphoidella paraelaphoides* n.sp., *Elaphoidella rossellae* n.sp. and *Elaphoidella subplutonis* n.sp.

MATERIALS AND METHODS

Samples were taken with the aid of modified (Cvetkov, 1969) plankton nets, with nylon gauze 120 HD, and fixed in 5% neutralized formalin. They were washed and harpacticoid copepods were sorted and preserved in 75% ethyl alcohol. Dissected specimens were mounted variously in glycerol, lactic acid or Faure's medium. Drawings and measurements were made using a Wild microscope with a drawing-tube attachment.

The following abbreviations are used throughout the text and figures: A_1 = antennulae; A_2 = antennae; P_1 - P_6 = legs 1 to 6; T_i = inner apical, furcal seta; T_e = outer apical, furcal seta.

Holotypes and paratypes are deposited at the «Dipartimento di Scienze Ambientali», University of L'Aquila, Italy (first Author's collections).

Fam. CANTHOCAMPTIDAE G.O. Sars, 1906

Elaphoidella, *sensu* Apostolov, 1985

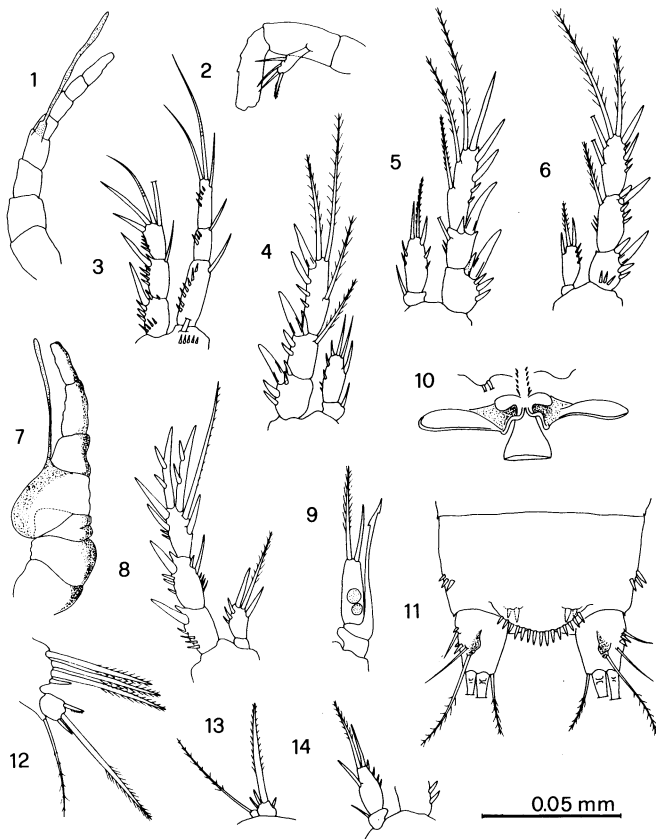
Elaphoidella aprutina n. sp.
(Figs. 1-14)

Holotype (♀) and paratypes (2 ♀♀ and 3 ♂♂), Abruzzo, central Italy, fresh-water well at Corropoli (Teramo) (type-locality); December 9, 1984, coll. G. L. Pesca and G. Silverii. Paratypes (2 ♀♀), Abruzzo, fresh-water well at Colliermanesco (Teramo); October 3, 1983, coll. G.L. Pesca.

Description

Female - Slender body, total length, excluding antennule and furcal setae, 650 to 680 μ m; holotype 672 μ m. Posterior dorsal margin of thoracic and abdominal somites naked, except the last abdominal one, which is armed with 2 ventral spines at the basis of each furcal ramus. First two abdominal somites fused together. «Receptaculum seminis» as in Figure 10. Anal operculum (Fig. 11) convex and armed with 15-16 spines (15 in the holotype).

Furcal rami (Fig. 11) about twice as long as its apical width, without cilia or spinules on the inner margin; outer margin with 2 setae and 2 short spinules; distal margin with 3 setae, the medial the longest;



Figs. 1-14 - *Elaphoidella aprutina* n.sp. 1. A_1 (holotype); 2. A_2 (holotype); 3. P_1 (holotype); 4. P_2 (holotype); 5. P_3 (holotype); 6. P_4 (holotype); 7. A_1 (male paratype); 8. P_4 (male paratype); 9. endopod of P_3 (male paratype); 10. genital field (holotype); 11. furcal rami, dorsal view (holotype); 12. P_5 (holotype); 13. P_5 (male paratype); 14. endopod of P_2 (male paratype).

dorsal seta elongated, about twice longer than the furcal ramus.

A_1 , 8-segmented, aesthete on the 4th segment well overreaching the tip of the distal segment. A_2 , endopod 3-segmented; exopod 1-segmented, armed with 2 apical and 2 subapical spines.

Mouthparts without particular characteristics as compared to those of other species of the genus.

Exopod of P_1 - P_4 and endopod of P_1 , 3-segmented; endopod of P_2 - P_4 , 2-segmented. Setal formula of P_1 - P_4 as follows:

	exopod			endopod		
P_1	0	1	022	1	1	111
P_2	0	1	122	—	1	111
P_3	0	1	222	—	1	221
P_4	0	1	222	—	0	111

P_5 : basipodite not much protruding, armed with 4 plumose setae, the outer very short; exopod well developed, slightly larger than wide, armed with 3 apical setae, the medial the longest.

Male-Total body length, 640 to 642 μ m. Furcal rami

slightly shorter than in the female. A_1 haplocerate (Fig. 7) Endopod of P_3 , 3-segmented; first segment without inner seta, second segment with a long spine, overreaching the tip of the distal segment; distal segment armed with 2 setae of different lengths (Fig. 9). Endopod of P_4 short, 2-segmented; first segment without inner seta, second segment distally enlarged and armed with 2 stout spines and one long seta; distal segment of exopod with 6 spines and setae, 2 apical spines transformed (Fig. 8). P_5 , basipodite not well developed and without spines or setae; exopod reduced and armed with 4 spines, the inner very short, the apical the longest, the outer ones reduced. Other characteristics not differing from female.

Derivatio nominis: after the ancient Italic people «Aprutini» from the Abruzzo region.

Affinities

Recently, Apostolov (1985) provided a review of the debated genus *Elaphoidella* Chappuis, 1929, separating three new genera from the nominate genus, viz. *Elaphoidellopsis*, *Stygoelaphoidella* and *Neoelaphoidella*. In that occasion the Author divided the species of the new restricted genus *Elaphoidella* into two groups: «*gracilis*-group» and «*simplex*-group», characterized respectively by the presence of 6 or 4-5 spines and setae on the distal segment of the exopod of leg 4.

According to the above review, the new species undoubtedly belongs to the genus *Elaphoidella* and it fits into the «*gracilis*-group» of species, owing to the presence of 6 spines and setae on the distal segment of the P_4 exopod. Within this group *E. aprutina* n.sp. is close to *E. plutonis* Chappuis, 1938 and *E. incerta* Chappuis, 1937, respectively from cave habitats in Italy and Yugoslavia; it resembles the former in the armature of the endopod of the male leg 2, but resembles the latter in the construction and armature of the male leg 5.

The new species differs from both the above species by the morphology of the furcal rami, the armature of the anal operculum, the number of setae and spines on the distal segment of the female leg 2 and finally by the long inner, apical furcal seta.

Distribution and ecology

Elaphoidella aprutina is at present endemic to the Abruzzo region, central Italy. It lives in phreatic freshwaters (water level from the soil surface: 25.0-15.5 m; water depth: 3.5-3.6 m; water temperature: 15.5°C; pH: 7.0; bottom sediment composed of thin organogenic sandstone and clay) in association with the harpacticoid copepod *Parapseudoleptomesobra italica* Pesce & Petkovski, and with other stygobiontes such as cyclopid copepods [*Diacyclops clandestinus* (Kiefer), *Diacyclops antrincola* Kiefer], asellid isopods (*Proasellus amiterninus* Argano & Pesce), amphipods (*Bogidiella aprutina* Pesce, *Niphargus longicaudatus* Costa), oligochaetes (*Pelosclex pescei* Dumnicka), gastropods [*Oxychilus hydatinus* (Rossmässler)], ostracods and water mites.

Elaphoidella italica n.sp.
(Figs. 15-20)

Holotype (♂) and paratype (♂), Tuscany, central Italy, fresh-water well at Spianate, Altopascio (Lucca); September 13, 1984, coll. P. Bianchi.

Description

Male - Slender body; total length, excluding antennule and furcal setae, 680 μm (holotype) and 685 μm (paratype). Posterior dorsal margin of thoracic somites without ornamentation.

Anal somite armed with a row of denticles along the proximal margin and with 4 stout spines on each lateral side; 3 stout spines are implanted at the basis of each furcal ramus, ventrally. Anal operculum slightly convex and armed with 21 spinules, both in the holotype and paratype (Fig. 16).

Furcal rami about 1.5 times longer than wide; outer margin with 2 subequal slender setae; distal margin with 3 setae, the medial the longest; dorsal seta long, about twice longer than furcal ramus (Fig. 16). A_1 , 7-segmented, subhaplocerate. A_2 , mouthparts and P_1 , without particular characteristics.

Endopod of P_2 , 2-segmented and armed with 1 slender inner seta on the first segment and 2 inner and 2 apical setae on the distal segment. Endopod of P_3 , 3-segmented, transformed: first segment with 1 inner seta, second segment with a long spiniform process, well overreaching the tip of the distal segment; distal segment armed with 2 apical, plumose setae (Fig. 20).

P_4 : endopod 2-segmented; first segment naked, distal segment armed with 3 spiniform setae, the outer short; distal segment of exopod with 3 transformed spines (Fig. 19).

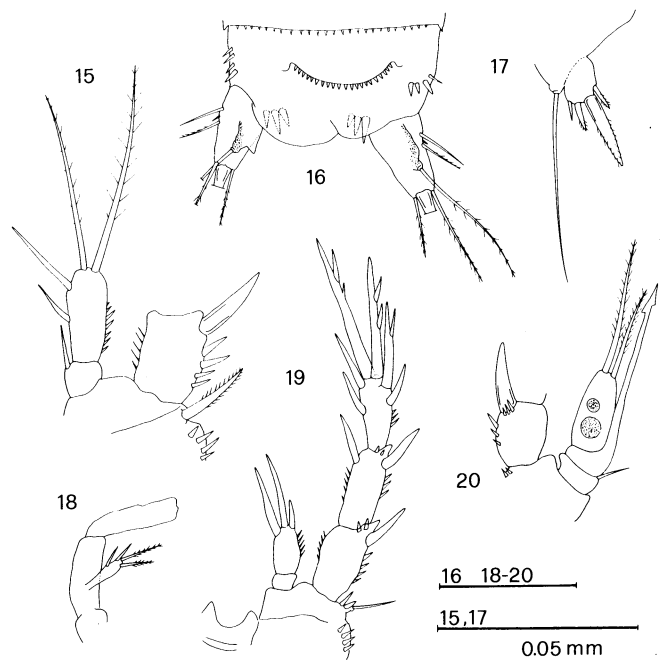
P_5 reduced, with rudimentary basipodite; exopod partially fused with the basipodite, and armed with 4 spines, the medial the longest.

Femal unknown.

Affinities

Within the «*gracilis*-group» of species, *E. italica* n.sp. is close to *E. croatica* Petkovski, 1959 and *E. cavatica* Chappuis, 1957, respectively found in groundwaters of Yugoslavia and France. Particularly, the new species is closest to the former in the construction and armature of legs 3 to 5; with the latter, it shares the general morphology as well as the armature of leg 4.

From the above species, *E. italica* differs as follows: from *E. croatica* by the shorter furcal rami (length/width ratio: 1.45-1.51 in *italica*, 2.0-2.2 in *croatica*), the presence of 3 spines at the basis of furcal rami (versus 1 spine only), the stouter apical spine on the exopod of P_5 , and the length ratio between the inner and the outer apical, furcal setae (0.56-0.57 in *italica*, 0.33-0.35 in *croatica*); from *E. cavatica*, the new species is distinguished especially by the armature of the thoracic legs and of the furcal rami.



Figs. 15-20 - *Elaphoidella italica* n.sp. (holotype). 15. P_5 ; 16. Furcal rami, dorsal view; 17. P_5 ; 18. A_2 ; 19. P_4 ; 20. endopod of P_3 .

Distribution and ecology

At present, *E. italica* is found only in the groundwaters of Tuscany, central Italy. It lives in a fresh-water well (depth: 2.5 m; water level on 0.8 m; water temperature: 14.8°C; pH: 6.9; bottom sediment composed of thin sandstone and clay) in association with the harpacticoid copepod *Nitocrella achainae* Pesce and with other stygobiontes and stygophiles, such as cyclopoid copepods [*Eucyclops serrulatus* (Fischer), *Diacyclops languidus* (Sars), *Acanthocyclops robustus* (Sars)], amphipods (*Salentinella angelieri* Ruffo & Delamare Deboutteville), ostracods and water mites.

Elaphoidella paraelaphoides n.sp.
(Figs. 21-28; 29-32)

Holotype (♀) and allotype (♂), Abruzzo, central Italy, hyporheic habitat of the river Foro at Miglianico (Chieti) (type-locality); June 3, 1985, coll. G. L. Pesce. Paratypes (2 ♀♀, 1 ♂), Molise, central Italy, fresh-water well at Pozzilli (Isernia); August 21, 1986; coll. E. Vitelli and F. Palmucci. Paratypes (2 ♀♀), Molise, fresh-water well at Colli a Volturno (Isernia); January 18, 1986, coll. E. Vitelli and F. Palmucci.

Description

Female - A middle sized *Elaphoidella*; body length, excluding antennulae and furcal setae, 630 μm to 651 μm ; holotype, 640 μm . Thoracic somites without armature. Posterior distal margin of abdominal somites with rows of thin spinules; «receptaculum seminis» as

in Figure 24. Anal somite with 4 spines on each lateral side and 3 spines at the basis of furcal ramus. Anal operculum convex and armed with 12-14 stout spines (13 in the holotype).

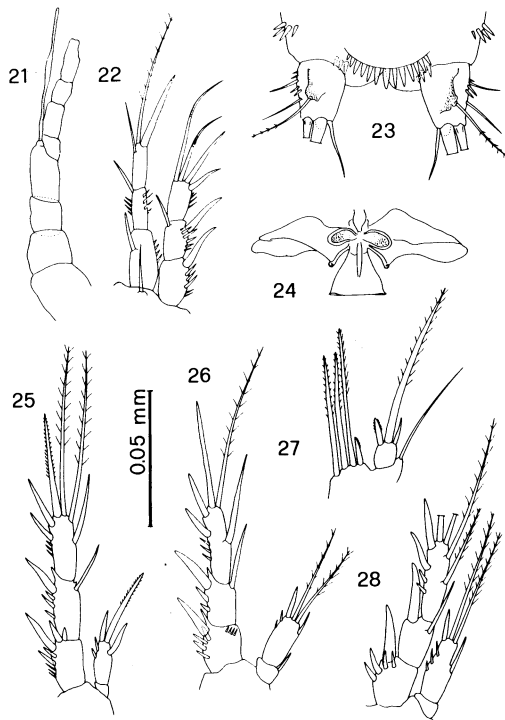
Furcal rami slightly longer than broad (length/width ratio: 1.25-1.30; holotype: 1.28), without cilia or spinules on the inner margin; outer margin with 2 slender setae and 3-4 spines (3 in the holotype); dorsal seta not much elongated, slightly longer than furcal ramus; distal margin with 3 setae, the medial the longest, the inner about as long as the furcal ramus (Fig. 23).

A₁, 8-segmented; aesthete on the 4th segment overreaching the tip of distal segment. A₂, 3-segmented; exopod 1-segmented and armed with 2 inner and 2 apical setae.

Exopod of P₁-P₄ and endopod of P₁, 3-segmented; endopod of P₂-P₄, 2-segmented. Setal formula of P₁-P₄ as follows:

	exopod			endopod		
	0	1	022	1	1	111
P ₁	0	1	022	1	1	111
P ₂	0	1	122	-	1	121
P ₃	0	1	222	-	0	121
P ₄	0	1	222	-	0	111

P₅: basipodite with 4 setae, the outer much shorter than the others; exopod about as long as broad, and armed with 3 setae, the medial the longest (Fig. 27).

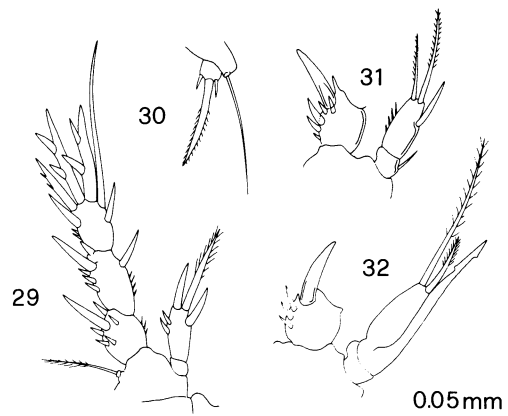


Figs. 21-28 - *Elaphoidella paraelaphoides* n.sp. (holotype). 21. A₁; 22. P₁; 23. furcal rami, dorsal view; 24. genital field; 25. P₄; 26. P₂; P₃; 27. P₅; 28. P₄.

Male - Body proportions, anal operculum and armature of P₁ and exopod of P₂ and P₃ similar to those of the female; sexual dimorphism on the endopod of P₂-P₃, P₅ and exopod of P₄.

Endopod of P₂, 2-segmented and armed with 1 inner spine on the first segment and 1 inner and 2 apical setae on the distal segment. Endopod of P₃, 3-segmented; first segment naked, second segment with the typical spiniform process, overreaching the distal segment; distal segment armed with 2 plumose setae, the outer about 2.5 times longer than inner one. Distal segment of the exopod of P₄ armed with 6 spines and setae, 3 transformed. P₅: basipodite not developed; exopod rudimentary, armed with 3 setae, the medial the longest (Fig. 30).

Derivatio nominis: the specific epithet «*paraelaphoides*» refers to the similarity of this species with *E. elaphoides*.



Figs. 29-32 - *Elaphoidella paraelaphoides* n.sp. (male paratype). 29. P₄; 30. P₅; 31. endopod of P₂; 32. endopod of P₃.

Affinities

Elaphoidella paraelaphoides n.sp., owing to the morphology and armature of the furcal rami, the armature of the endopod of P₄, both in males and females, the morphology of the «receptaculum seminis» and the construction of the anal operculum, is most similar to *E. elaphoides*.

The most important diagnostic features of the new species, as compared to *E. elaphoides* as well as to the other species in the same genus, are the shape and armature of P₅ in both males and females, and the armature of the endopod of P₂ and P₃ (males and females).

Distribution and ecology

E. paraelaphoides was found in the groundwater-habitat (phreatic and hyporheic networks) of central Italy (Abruzzo and Molise).

In the type-locality (depth of the interstitial water: 0.60 m; water temperature: 15.6°C; pH: 6.9) this species lives together with other stygobiontes or eustygobiontes, such as cyclopoid copepods (*Diacyclops*

clandestinus, *Diacyclops antrincola*), asellid isopods [*Proasellus coxalis* (Dollfus)], amphipods (*Salentinella angelieri*), ostracods and water mites. In the other localities, viz. phreatic substrates of Molise (water level from the soil surface: 13.0-13.5 m; water depth: 2.5-2.7 m; water temperature: 16.0°C; pH: 6.9; bottom sediment composed of sandstone detritus) it was collected in association with other harpacticoids [*Parapseudoleptomesobra italica* Pesce & Petkovski, *Attheyella crassa* (Sars)] and stygobiontes such as cyclopid copepods (*Speocyclops italicus* Kiefer, *Diacyclops clandestinus*, *Diacyclops antrincola*), amphipods (*Niphargus aquilex* Schiöde), oligochaetes (*Pristina idrensis* Sperber), gastropods, ostracods and water mites.

Elaphoidella rossellae n.sp.
(Figs. 33-45)

Holotype (♀) and paratypes (2 ♂♂, 1 ♀), Abruzzo, fresh-water well at the railway station of Sassa, L'Aquila (type-locality); November 12, 1983, coll. G. L. Pesce. Other paratypes (3 ♀♀, 2 ♂♂), from a fresh-water well along the main road Sassa-Tornimparte, cross-road to Sassa, L'Aquila; November 20, 1983, coll. G. L. Pesce and R. Fabrizi.

Description

Female - Slender body, width not greatly reduced posteriorly; total length, excluding antennule and furcal setae, 670 to 685 µm; holotype, 675 µm. Thoracic somites without ornamentation; abdominal somites with a row of hyaline denticles along the posterior dorsal margin, and a row of long spines on the posterior ventral side. «Genital field» as in Figure 41. Anal somite with 3 spines at the basis of each furcal ramus (Fig. 43); anal operculum convex and armed with 13-14 spines (14 in the holotype).

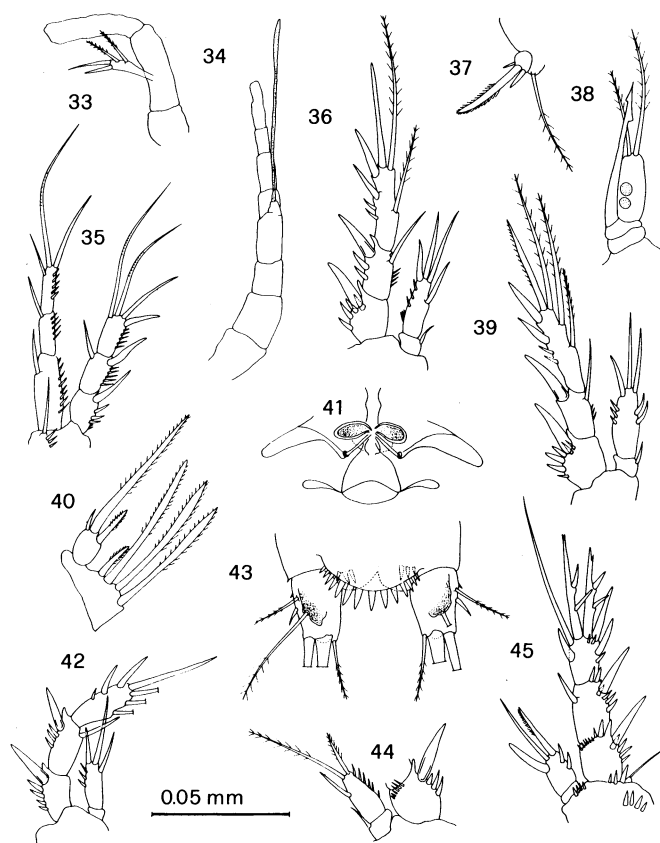
Furcal rami longer than broad (length/width ratio: 1.67-1.75), without cilia or spinules on the inner margin; distal edge with 3 setae, the medial the longest, the innermost slightly shorter than furcal ramus; outer margin with 1 slender seta and 2 short spines; dorsal seta well developed, longer than furcal ramus (Fig. 43).

A_1 , 8-segmented, aesthete on segment 4 well over-reaching the distal segment. A_2 , 3-segmented; exopod, 1-segmented, armed with 2 apical and 2 inner setae.

Mouthparts without particularities.

Exopod of P_1 - P_4 and endopod of P_1 , 3-segmented; endopod of P_2 - P_4 , 2-segmented. Setation of P_1 - P_4 as listed below:

	exopod			endopod		
P_1	0	1	022	1	1	120
P_2	0	1	122	-	1	121
P_3	0	1	122	-	1	221
P_4	0	1	222	-	0	111



Figs. 33-45 - *Elaphoidella rossellae* n.sp. 33. A_2 (holotype); 34. A_1 (holotype); 35. P_1 (holotype); 36. P_2 (holotype); 37. P_5 (male paratype); 38. endopod of P_3 (male paratype); 39. P_3 (holotype); 40. P_5 (holotype); 41. genital field (holotype); 42. P_4 (holotype); 43. furcal rami, dorsal view (holotype); 44. endopod of P_2 (male paratype); 45. P_4 (male paratype).

Morphology and armature of P_5 remarkable: basipodite well developed, reaching about the middle exopod, and armed with 4 plumose lanceolate setae; exopod longer than wide (length/width ratio: 1.39-1.45) and armed with 3 setae, the medial the longest, the outer reduced (Fig. 40).

Male - Based on mature, spermatophore bearing specimens, length 620 to 625 µm. Only the A_1 (haplocerate), endopod of P_2 - P_3 , exopod of P_4 and P_5 differ from the female. Body ornamentation like female.

Endopod of P_2 , 2-segmented; first segment with inner seta; distal segment with 1 inner and 2 apical setae. Endopod of P_3 , 3-segmented; first segment naked; second segment with a long spiniform process, over-reaching the distal segment; distal segment armed with 2 plumose setae of different length (Fig. 38).

Distal segment of exopod of P_4 with 6 setae and spines, 2 transformed (Fig. 45).

P_5 with reduced basipodite, without armature; exopod about as long as broad, with 1 terminal long spine and 2 lateral shorter spines.

Derivatio nominis: specific epithet after Miss. Rossella Fabrizi who collected the new species.

Affinities

Among the species of the «*gracilis*-group», the closest relative to *E. rossellae* n.sp. is *E. plutonis*. With this species, *E. rossellae* shares the same armature of legs 2 and 3, the construction and armature of the endopod of leg 4 and the armature of male leg 5.

The new species is distinguishable from *E. plutonis*, especially in the morphology of the spines on the basipodite of the female P₅, the armature of the anal operculum which bears 13-14 spines (versus 7-9 spines) and, lastly, in the morphology of the genital field of the female.

Distribution and ecology

Up to now, *E. rossellae* is known from groundwater networks of Abruzzo, central Italy. In the type-locality, as well as in a neighbouring well (depth of phreatic water: 9.5-10.0 m; water level on 0.4-0.5 m; water temperature: 10.5°C; pH: 7.0; bottom sediment composed of thin sandstone and some gravel) *E. rossellae* has been collected together with other harpacticoid copepods [viz. *Parapseudoleptomesobra italica* and *Attheyella crassa*], and with stygobiontes such as cyclopid copepods [*Diacyclops antrincola*, *Diacyclops clandestinus*], amphipods [*Niphargus longicaudatus*], asellid isopods [*Proasellus amiterninus*], ostracods, gastropods and water mites.

Elaphoidella subplutonis n.sp.
(Figs. 46-57)

Holotype (♀) and allotype (♂), Umbria, central Italy, fresh-water well at San Venanzo (Perugia); October 3, 1984, coll. B. Di Francescantonio and P. Teté (type-locality).

Description

Female - Body slender, gradually tapering posteriorly; total length, excluding antennulae and furcal setae, 595 µm. Posterior dorsal margin of thoracic somites without ornamentation; posterior dorsal margin of abdominal somites with a chitinous denticulate lamella; anal somite with one spinula on the outer edge and 2 ventral spines at the basis of each furcal ramus. Genital field as in Figure 48. Anal operculum convex, armed with 14 long spines (Fig. 55).

Furcal rami longer in length than in width (length/width ratio about 1.45); outer edge with 2 setae; distal margin with 3 setae, the medial the longest, Te about twice as long as Ti; dorsal seta long, about as long as the apical distal seta (Te) (Fig. 55).

A₁, 8-segmented, aesthete on segment 4 overreaching the distal segment. A₂, 3-segmented, most similar to that of *E. plutonis*.

P₁-P₄, all with 3-segmented exopod; endopod of P₁, 3-segmented; endopod of P₂-P₄, 2-segmented. Setation as listed below:

	exopod			endopod		
P ₁	*	1	022	1	1	111
P ₂	0	1	122	-	1	020
P ₃	0	1	222	-	1	221
P ₄	0	1	222	-	0	120

P₅: basipodite and exopod not fused; basipodite not very protruding, armed with 4 plumose setae, the outer the shortest; exopod slightly longer in length than in width and armed with 2 outer spiniform setae, 1 long apical seta and 1 spiniform seta.

Male - The only differences from the female are described below. A₁, 7-segmented, haplocerate. Endopod of P₂, 2-segmented; first segment with inner seta; distal segment with one inner and 2 apical plumose setae. Endopod of P₃, 3-segmented, modified; first segment naked; second segment with the characteristic spiniform process that overreaches the distal segment; distal segment armed with 2 apical plumose setae. Exopod of P₄, distal segment with 6 spines and setae, 3 transformed. P₅: basipodite not well developed, naked; exopod broader than long and armed with 3 spiniform setae (Fig. 53).

Derivatio nominis: The specific name «*subplutonis*» refers to the similarity of the new species to *E. plutonis*.

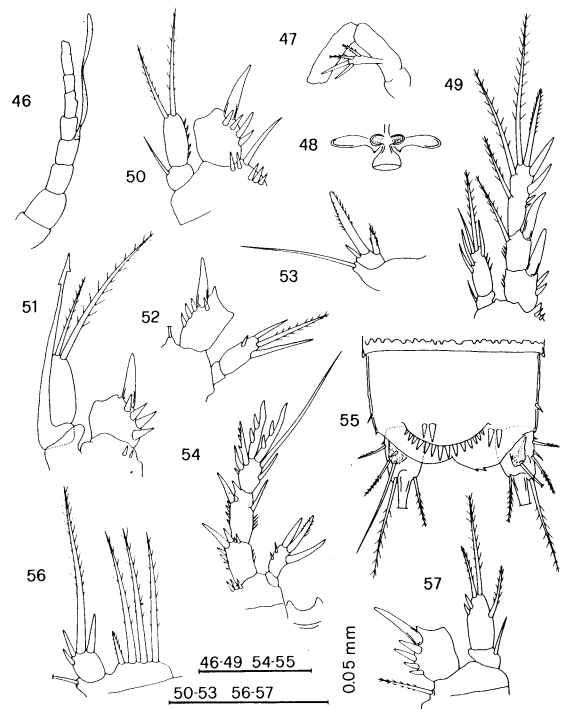


Fig. 46-57 - *Elaphoidella subplutonis* n.sp. 46. A₁ (holotype); 47. A₂ (holotype); 48. genital field (holotype); 49. P₃ (holotype); 50. endopod of P₂ (holotype); 51. endopod of P₃ (allotype); 52. endopod of P₄ (holotype); 53. P₅ (allotype); 54. P₄ (allotype); 55. furcal rami, dorsal view (holotype); 56. P₅ (holotype); 57. endopod of P₂ (allotype).

Affinities

Elaphoidella subplutonis n.sp. is most closely related to *E. plutonis*, because of the armature of both the endopod and exopod of P₁, P₃ and P₄, and the morphology and armature of furcal rami.

Important diagnostic features of the new species in contrast to *E. plutonis* are the armature of the distal segment of the endopod of the female P₂ which bears 2 setae (versus 4 setae) and the presence of 4 setae on the exopod of female P₅ (versus 3 setae) and 2 spines at the basis of furcal rami (versus 3 spines).

Distribution and ecology

Up to now *E. subplutonis* is found only in its type-locality, in Umbria, central Italy.

It lives in phreatic waters (water level from the soil surface: 10.5 m; water depth: 7.2 m; water temperature: 14.5°C; pH: 7.2; bottom sediment composed of thin organogenic sandstone) in association with the harpacticoid copepod *Nitocrella morettii* Pesce and other remarkable stygobiontes such as cyclopid copepods [*Diacyclops clandestinus*, *Graeteriella unisetigera* (Graeter)], asellid isopods [*Proasellus diana* Pesce & Argano], amphipods [*Niphargus longicaudatus*], ostracods, oligochaetes and halacarid water mites.

Elaphoidella elaphoides (Chappuis, 1923)
(Figs. 58-67; 68)

2 ♀♀, 1 ♂, Latium, central Italy, fresh-water well at Ladispoli (Rome); May 16, 1986, coll. A. Canossi and M. C. Curia. 3 ♀♀, 2 ♂♂, Molise, central Italy, fresh-water well at Capracotta (Isernia); December 12, 1985, col. E. Vitelli and F. Palmucci. 2 ♀♀, 3 ♂♂, Basilicata, south Italy, fresh-water well at Rivello (Potenza); May 5, 1983, coll. L. D'Addario; 2 ♀♀, Sicily, fresh-water well at San Cipirello (Palermo); May 16, 1986, coll. L. D'Agruma and G. Di Giambattista; 1 ♀, 1 ♂, Sicily, fresh-water well at some distance along the road n. 115d, between Castelvetrano and Marinella (Trapani); May 17, 1986, coll. L. D'Agruma and G. Di Giambattista.

Elaphoidella elaphoides is a stygophile species, widely distributed both in the surface and underground water networks of Europe (Germany, Yugoslavia, Bulgaria, Roumania, Czecho-Slovakia and Italy) and U.S.S.R. (Ukraine).

A survey of the literature (Petkovski, 1959; Pesce, 1981, 1983; Apostolov, 1985) and our material has revealed high variability in such characters as the length and armature of furcal rami, the setation of the endopod of female swimming legs 2 and 3 and the armature of the anal operculum.

Based on this assessment it appears that *E. elaphoides* represents a variable species, and it is our view that the species *E. minos* Chappuis, 1956, *E. varians* Chappuis, 1955 and *E. juxtaputealis* Damian & Botosan-

eanu, 1954, all from groundwaters of the Balkan Peninsula, should also be included in this species.

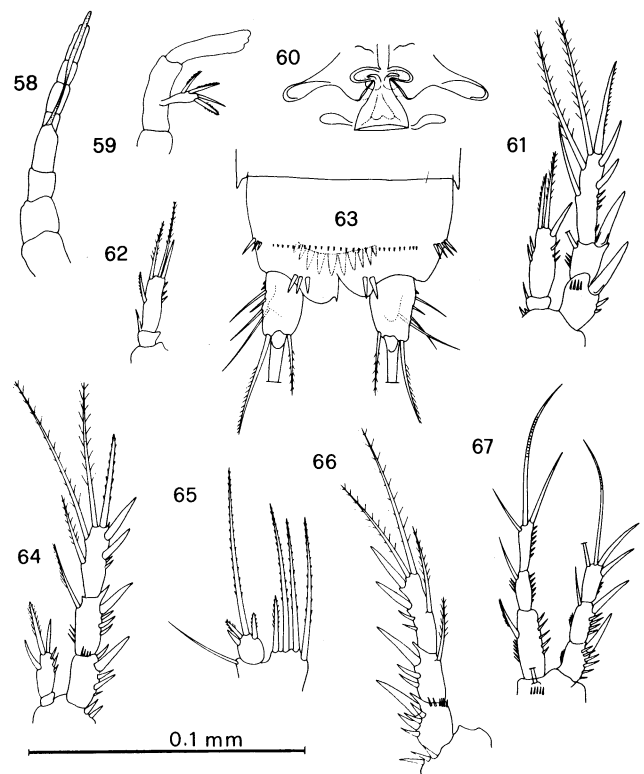
E. elaphoides has been previously reported from other localities of Italy, viz. phreatic habitat of Abruzzo (Pesce, 1983), Marche (Pesce, 1980) and Umbria (Pesce & Galassi, 1983); it appears to be the most widespread species of the genus in Italy (Fig. 68).

Elaphoidella phreatica (Chappuis 1925)
(Figs. 69-77; 78-82)

1 ♀, 1 ♂, Tuscany, central Italy; fresh-water well along the main road SS. 326, at Ascianello (Siena); September 25, 1984, coll. P. Bianchi. 2 ♀♀, 2 ♂♂, Umbria, central Italy; fresh-water well at Montefalco (Perugia); June 6, 1983, coll. D. P. Galassi and B. Di Francescantonio. 2 ♀♀, Umbria; fresh-water well at Petrognano (Perugia); June 11, 1983, coll. P. Teté and B. Di Francescantonio.

Elaphoidella phreatica is a stygobiont species frequently occurring in groundwaters (cave and phreatic habitat) of Europe (Roumania, Yugoslavia, Bulgaria, Hungary, Czecho-Slovakia and Italy).

Petkovski (1972) and later Pesce & Galassi (1983) recognized a wide range of variation in characters such as the total body length, the setation of the female swimming legs, the length and armature of the caudal rami and the armature of the anal operculum, remov-



Figs. 58-67 - *Elaphoidella elaphoides* (Chappuis, 1923) (female): 58. A₁; 59. A₂; 60. genital field; 61. P₃; 62. endopod of P₂; 63. furcal rami, ventral view; 64. P₄; 65. P₅; 66. exopod of P₂; 67. P₁.

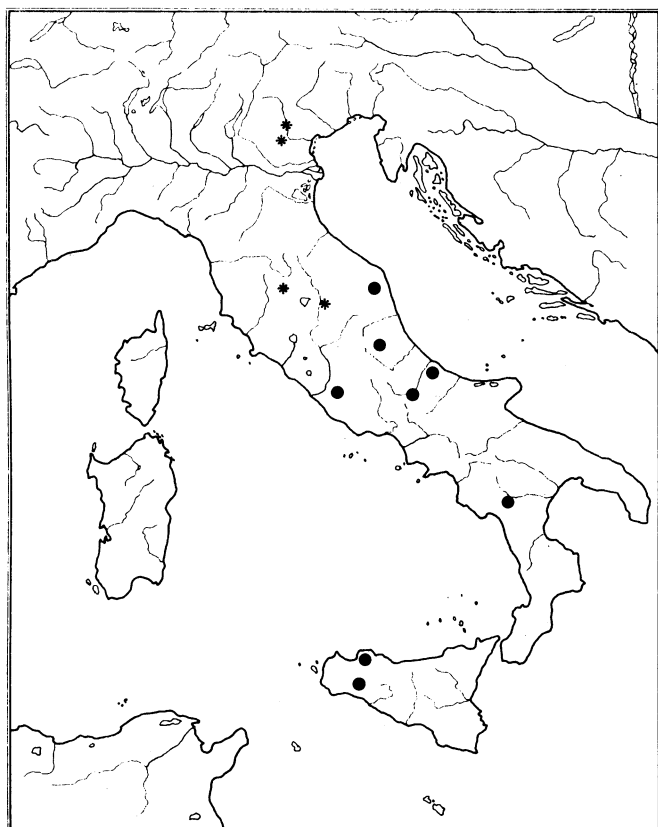


Fig. 68 - Distribution of *Elaphoidella elaphoides* (Chappuis, 1923) (black circles) and *Elaphoidella phreatica* (Chappuis, 1925) (asterisks) in Italy.

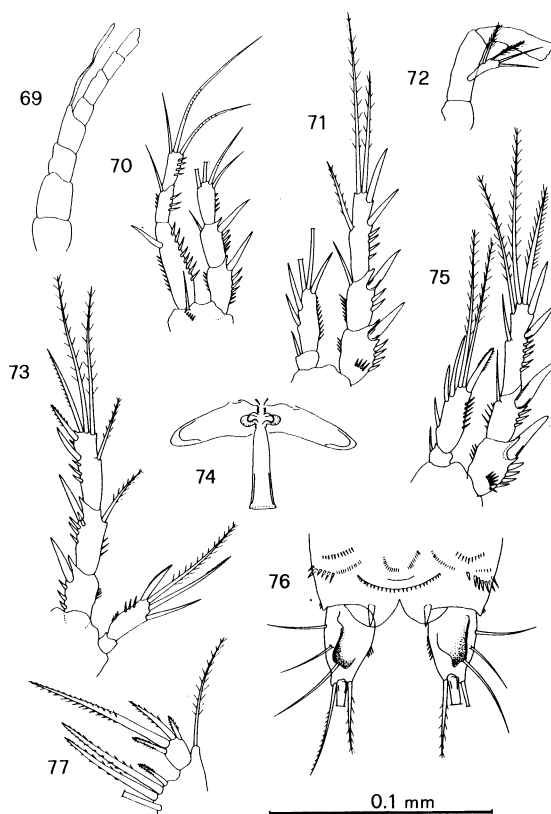
ing as well to *E. phreatica* the following species and subspecies: *E. pseudophreatica* (Chappuis, 1928) from north Italy; *E. phreatica* var. *pseudophreatica* Sterba, 1956, from Czecho-Slovakia; *E. pseudojeanneli* Ponyi, 1956 and *E. pseudojeanneli aggetelekiensis*, both from Hungary.

E. phreatica has been previously recorded, in Italy, from cave waters of Venetia, as *E. pseudophreatica* (Chappuis, 1953), from hyporheic habitat of the river Brenta, also from Venetia (Braioni *et al.*, 1980) and from phreatic habitat of Umbria (Pesce & Galassi, 1983).

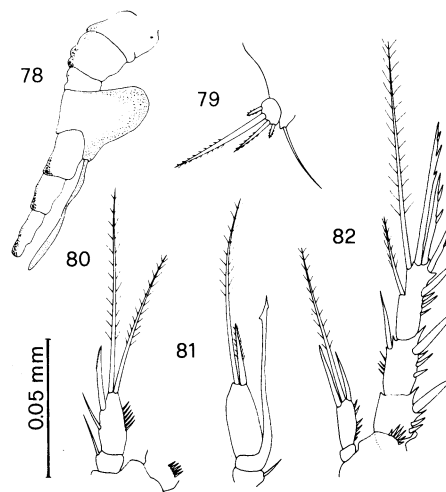
DISCUSSION

Following Apostolov's (1985) recent review of the genus *Elaphoidella* Chappuis, all the species reported in the present paper belong to the genus *Elaphoidella* and they fit into the «*gracilis*-group» of species.

These new findings bring the total number of *Elaphoidella* species in Italy to 13, the others being: *E. tiberina* Pesca & Galassi, 1983, from phreatic waters of Umbria (central Italy); *E. gracilis* (Sars, 1863), widely distributed both in epigeal and groundwaters of Italy, Sardinia included; *E. oglasae* Cottarelli & Torrisi, 1974, from phreatic waters of the island of Montecristo (Tus-



Figs. 69-77 - *Elaphoidella phreatica* (Chappuis, 1925) (female): 69. A₁; 70. P₁; 71. P₂; 72. A₂; 73. P₄; 74. genital field; 75. P₃; 76. furcal rami, dorsal view; 77. P₅.



Figs. 78-82. *Elaphoidella phreatica* (Chappuis, 1925) (male): 78. A₁; 79. P₅; 80. endopod of P₂; 81. endopod of P₃; 82. P₄.

cany, central Italy); *E. plutonis* Chappuis, 1938, from cave and phreatic waters of Umbria and Campania (south Italy); *E. ruffoi* (Chappuis, 1953), from interstitial habitat of Venetia (north Italy); *E. bidens* (Schmeil, 1894), widely distributed both in surface and underground waters of Italy; *E. cvetkai* Petkovski, 1983,

from cave waters of Friuli-Venezia Giulia (north Italy); *E. nuragica* Pesce & Galassi, 1986, from phreatic networks of Sardinia.

The species *E. pseudophreatica* (Chappuis, 1928), reported from Venetia, is the synonym of *E. phreatica* (Petkovski, 1972; Pesce & Galassi, 1983).

The species *Elaphoidella dubia* Kiefer, 1931, also from Venetia, owing to the 2-segmented endopod of the leg 1, should be removed to the genus *Elaphoidellopsis* Apostolov, 1985.

REFERENCES

- Apostolov A., 1985 - Etude sur quelques Copépodes harpacticoides du genre *Elaphoidella* Chappuis 1929 de Bulgarie avec une révision du genre. Acta Mus. Mac. Sci. nat., 17 (146): 135-163.
- Braioni M. G., Duzzin B., Centurioni M. C., Penna G., Negroni L., Campaioli S., 1980 - L'ambiente interstiziale iporreico del fiume Brenta e la sua fauna. Boll. Mus. civ. Stor. nat., Verona, 7: 235-274.
- Chappuis P. A., 1953 - Nouveaux crustacés troglobies de l'Italie du nord. Mem. Mus. civ. Stor. nat., Verona, 4: 1-12.
- Cvetkov L., 1968 - Un filet phréatobiologique. Bull. Inst. Zool. Mus., Sofia, 27: 215-219.
- Pesce G. L., 1980 - Ricerche faunistiche in acque freatiche delle Marche e stato attuale delle conoscenze sulla fauna interstiziale italiana. Contributo alla conoscenza della fauna delle acque sotterranee dell'Italia centro-meridionale: XIII. Riv. Idrobiol., 19: 547-590.
- Pesce G. L., 1981 - Some harpacticoids from subterranean waters of Greece (Crustacea: Copepoda). Boll. Zool., 48: 263-276.
- Pesce G. L., 1983 - Contributo alla conoscenza degli arpacticoidi (Crustacea, Copepoda) delle acque sotterranee della regione Abruzzese. Boll. Mus. civ. Stor. nat., Verona, 10: 459-484.
- Pesce G. L., Galassi D. P., 1983 - Ciclopidi ad arpacticoidi di acque sotterranee freatiche dell'Umbria e descrizione di *Elaphoidella tiberina* n.sp. (Crustacea: Copepoda). Contributo alla conoscenza della fauna delle acque sotterranee dell'Italia centro-meridionale: XXX. Riv. Idrobiol., 22: 101-154.
- Pesce G. L., Teté P., 1985 - Stato attuale delle conoscenze sulla stigofauna dell'Umbria. Contributo alla conoscenza della fauna delle acque sotterranee dell'Italia centro-meridionale: XXXIII. In: Atti Incontro Naz. Biospeleol. Città di Castello, 1985, pp. 121-134.
- Petkovski T. K., 1959 - Neue und Bemerkenswerte Harpacticoiden Ruderfußkrebse (Crust. Cop.) aus den Grundgewässern Jugoslawiens. Acta Mus. Mac. Sci. nat., 6: 101-119.
- Petkovski T. K., 1972 - Zur Copepodenfauna der Höhlen von Banat. Mus. Sci. nat., Skopje, 13 (112): 21-40.