



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

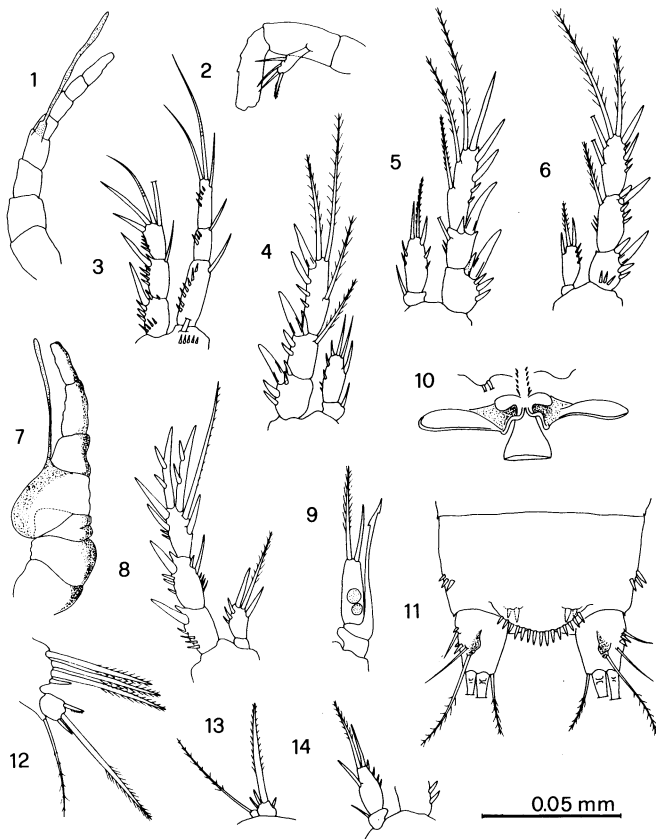
Elaphoidella aprutina n. sp.
(Figs. 1-14)

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 Collihanesco (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).

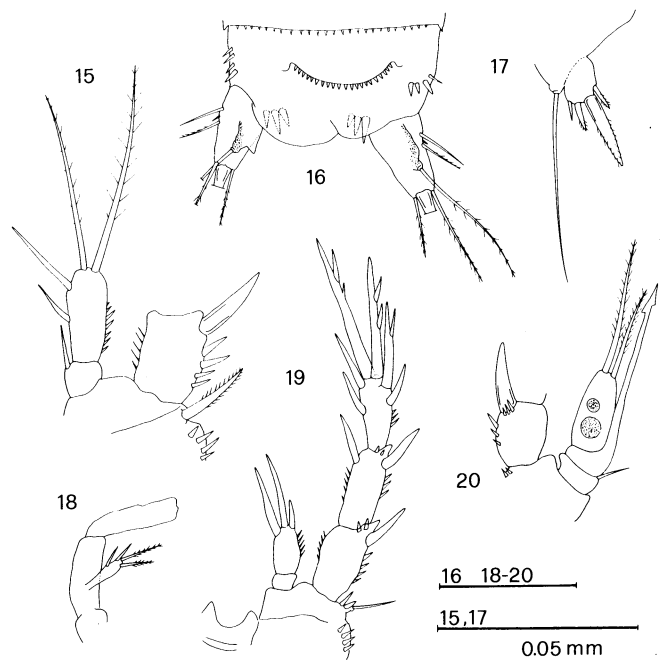
P_5 reduced, with rudimentary basipodite; exopod partially fused with the basipodite, and armed with 4 spines, the medial the longest.

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 Volturmo (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).

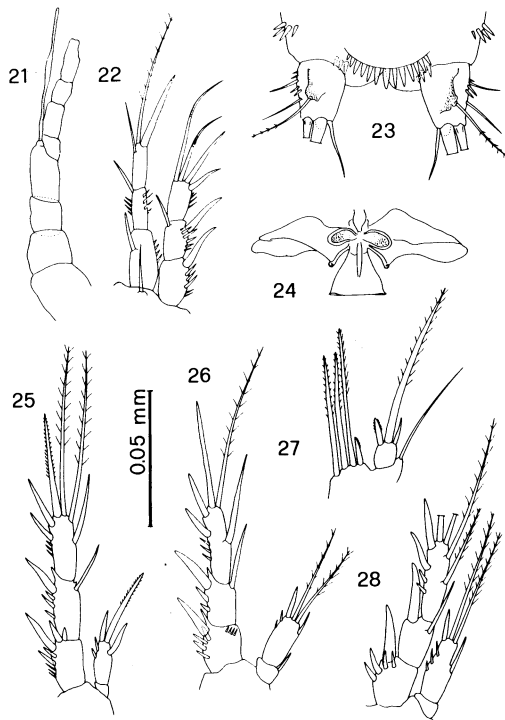
Furcal rami slightly longer than broad (length/width ratio: 1.25-1.30; holotype: 1.28), without cilia or spinules on the inner margin; outer margin with 2 slender setae and 3-4 spines (3 in the holotype); dorsal seta not much elongated, slightly longer than furcal ramus; distal margin with 3 setae, the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

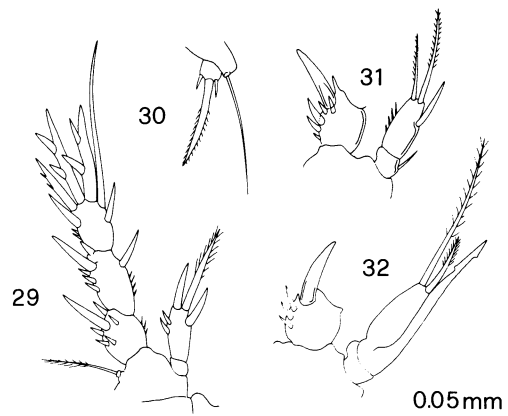


Figs. 21-28 - *Elaphoidella paraelaphoides* n.sp. (holotype). 21. A₁; 22. P₁; 23. furcal rami, dorsal view; 24. genital field; 25. P₄; 26. P₂; P₅; 28. P₃.

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 eustygophiles, 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).

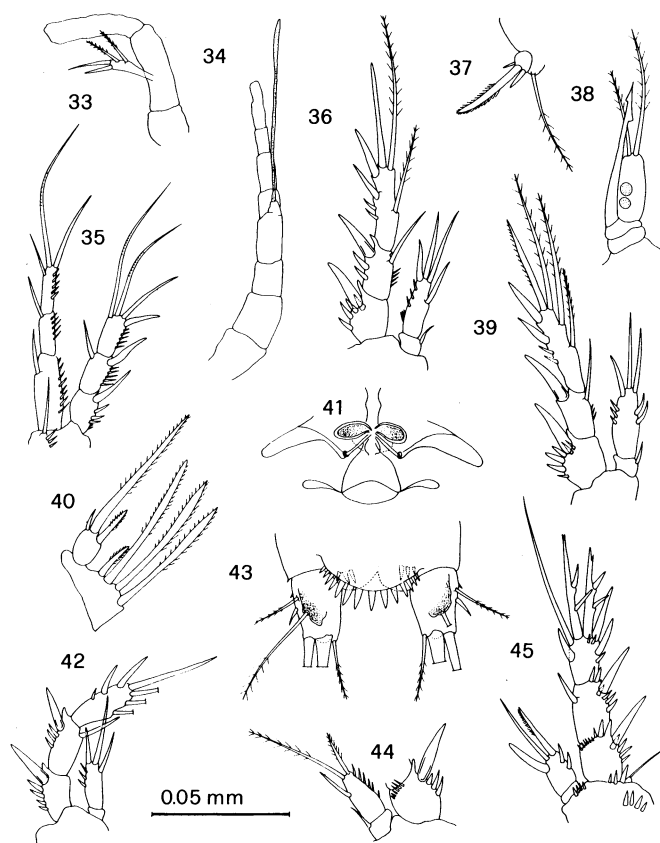
Furcal rami longer than broad (length/width ratio: 1.67-1.75), without cilia or spinules on the inner margin; distal edge with 3 setae, the medial the longest, the innermost slightly shorter than furcal ramus; outer margin with 1 slender seta and 2 short spines; dorsal seta well developed, longer than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

