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Parastenocaris lorenzae n.sp., and first record of *Parastenocaris glacialis* Noodt (Copepoda, Harpacticoida) from Italy *

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Abstract

Parastenocaris lorenzae n.sp. is described from rhithrostygal of the Sangro river (Abruzzo, Central Italy). *Parastenocaris glacialis* Noodt, 1952 is for the first time recorded from Italy. The presence of borealpine elements in ground waters of Central Apennines is briefly discussed.

Introduction

In the course of investigations on the stygofauna of Italy, by the 'Dipartimento di Scienze Ambientali' of the University of L'Aquila (Italy), a large number of harpacticoid copepods were collected from different groundwater habitats (krenal, hyporheal, rhithrostygal) and moss of the Sangro river basin (Abruzzo, central Italy), and representatives of the family Parastenocarididae Chappuis were recorded for the first time from this region.

Included among these, were a new species of the genus *Parastenocaris* Kessler, herein described as *Parastenocaris lorenzae* n.sp., and the species *Parastenocaris glacialis* Noodt, 1952, new to Italy.

Material and methods

Depending on the habitat being sampled, a fine (100 μm mesh) net through which sediment were strained, and the Karaman-Chappuis method were adopted. Harpacticoid copepods were sorted and preserved in 75% ethyl alcohol. Dissected specimens were mounted in Faure's medium. Drawings and measurements were made using a Leitz Laborlux phase contrast microscope with a drawing-tube attachment.

The following abbreviations are used throughout the text and figures: A1 = antennula; A2 = antenna; P1–P5 = legs 1 to 5; Ti = inner apical, furcal seta; Te = outer apical, furcal seta.

The nomenclature and descriptive terminology are adopted from Lang (1948) and Dussart (1967). Material deposited in the senior author's collections, at the 'Dipartimento di Scienze Ambientali', University of L'Aquila (Italy), and at the 'Museo Civico di Storia Naturale', Verona (Italy).

Family PARASTENOCARIDIDAE Chappuis, 1933

Genus *Parastenocaris* Kessler, 1913

Parastenocaris lorenzae n.sp. (Figs 1–13)
Type material. 1 ♂ (Holotype) and 1 ♀ (Paratype), completely dissected and mounted on slides (nn. PaA/001–002), ST.9, krenal, spring 'Tornareccio' (Val Fondillo, Pescasseroli, L'Aquila, Italy). Coordinates: 13 °51′19"E – 41 °46′16"N; altitude: 1085 m a.s.l. Water temperature: 6.4 °C; pH: 6.7; el. cond.: 285 μMHOS. May 10.1992, coll. L. Fenici and D. P. Galassi. Cooccurring copepod fauna: *Eucyclops serrulatus* (Fischer, 1851); *Epactophanes richardi*

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Mrázek, 1893; *Attheyella (Mrazekiella) paranaphtalica* Pesce & Galassi, 1988; *Bryocamptus (Limocamptus) echinatus* (Mrázek, 1893); *Bryocamptus (Rheocamptus) pygmaeus* (Sars, 1863); *Bryocamptus (Rheocamptus) zschokkei* (Schmeil, 1893).

Holotype deposited at the 'Museo Civico di Storia Naturale', Verona (Italy); paratype in the senior author's collections.

Description. Body elongated and slender, as usual in the genus; total length, excluding A1 and furcal setae, 390 μm (holotype), 400 μm (paratype). Anal operculum rounded, with some hair-like elements on the distal margin.

Furcal rami short [length/width ratio: 2.3:1 (♂ and 2.4:1 (♀)], with a prominent, pointed outer corner; armature consisting of 3 lateral setae, one dorsal, long seta and 3 apical setae; Te longer than Ti [length ratio: 2.8:1 (♂), 1.6:1 (♀)], medial seta the longest.

A1 (male), 7-segmented, esthete on segment 4 reaching about the distal segment; setation as in Fig. 2. A1 (female) missing. A2 not sexually dimorphic, exopod 1- segmented, bearing a slender apical seta; remaining ornamentation as in Fig. 1.

Mandibular palp with 2 setae. Maxilla I and maxilla II as in *P. pasquinii* Cottarelli, 1972. Maxilliped as in Fig. 12.

P1 and P2 identical in both sexes. P1: endopod 2-segmented, basal segment without developed spines or setae, distal segment with 2 long plumose setae; exopod 3- segmented, basal segment with 1 outer spine, middle segment bare, distal segment with 2 subapical spines and 2 longer, apical plumose setae.

P2: endopod 1-segmented, with 4 cuticular spicules and 1 long seta; exopod 3- segmented, basal segment with 1 outer subdistal spine, middle segment without spine, distal segment with 1 subapical outer spine and 2 apical plumose setae, the inner the longest.

P3 (male): both segments of exopod fused; basal segment with 4 cuticular spicules and 1 long subdistal seta, distal segment with the apex modified into a pincer-like structure, and armed with 6 cuticular spicules on the outer side. P3 (female): endopod 1-segmented, slightly shorter than the basal segment of the exopod; exopod 2-segmented, basal segment with 1 outer subapical spine, distal segment with 1 short spine and 1 long plumose seta.

P4 (male): endopod 1-segmented, with 1 strongly feathered spine and 3 cuticular spicules on the apical corner; basipodite armed with 4 cuticular spicules; exopod 3-segmented, basal segment with 1 outer subapical spine, middle segment without spine, distal segment bearing 1 subapical stout spine and 1 apical, long plumose seta.

P4 (female): endopod 1-segmented, with 1 apical stout spine; exopod as in male.

P5 similar in both sexes, subtriangular shaped and armed with 3 apical and 1 outer, longer setae.

Etymology. Name after Miss Lorenza Fenici, who actively participated in the field work and collected the new species.

Affinities. P. lorenzae n.sp., owing to the construction and armature of both the endopod and basipodite of male P4, well fits the *minuta*-group of *Parastenocaris sensu* Lang (1948). Within this group, it most closely resembles *P. pasquinii* Cottarelli, 1972, from Latium (central Italy), in having pointed distal furcal corners and a similar morphology of the male P5.

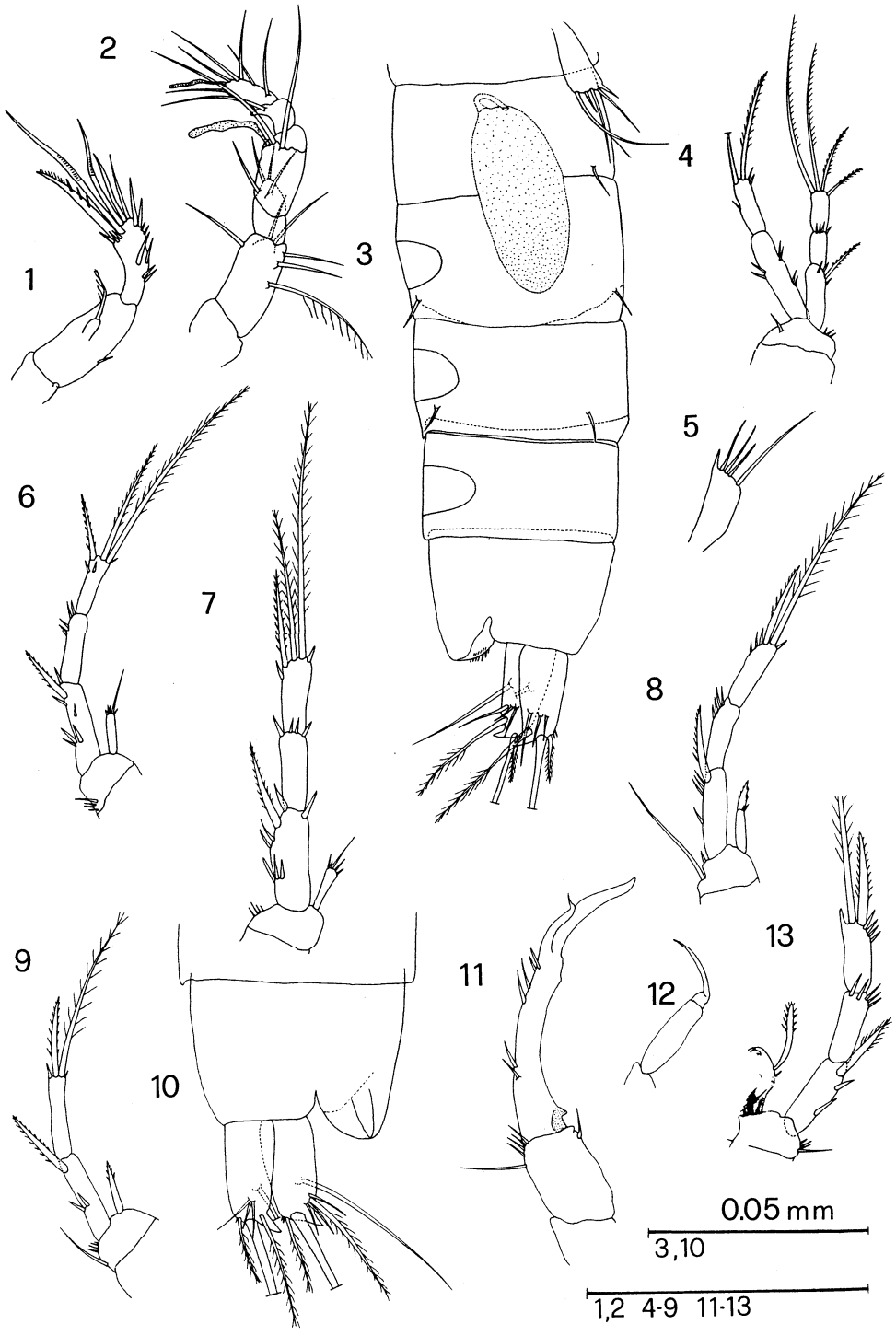
P. lorenzae n.sp., however, is easily distinguished from the above species as well as from its congeners in the same group, by the armature of male P3, the morphology and armature of the endopod of P4 and female P5.

Parastenocaris glacialis Noodt, 1952
(Figs 14–27)

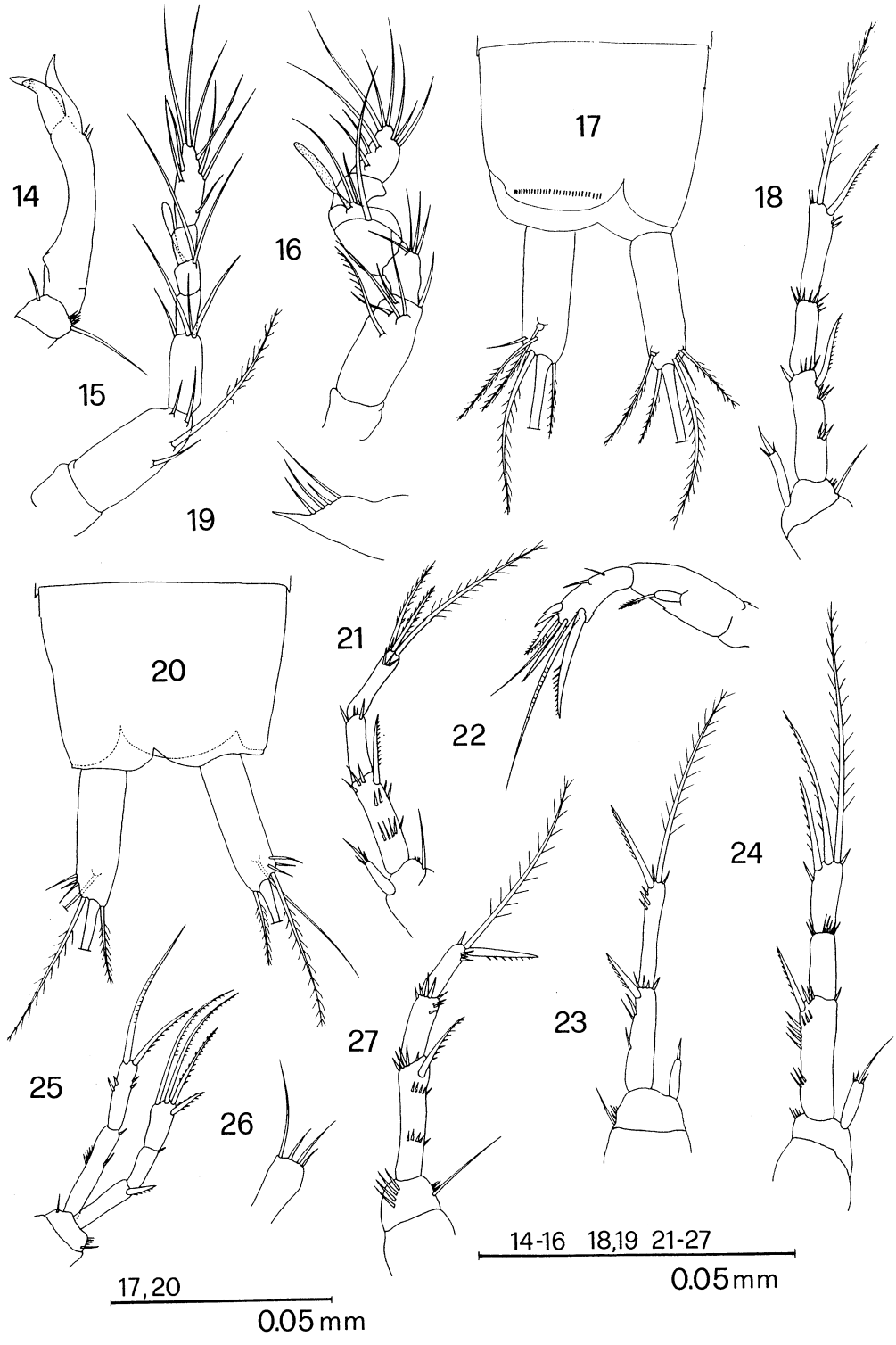
Material 1 ♂ and 7 ♀♀, St.11, rhithrostygal, Rio Fondillo (Val Fondillo, Pescasseroli, L'Aquila), altitude: 1080 m a.s.l. Water temperature: 9.5 °C; pH: 6.9; el. cond.: 280 μMHOS. April 9. 1992, coll. Diana P. Galassi, Lorenza Fenici and Giuseppe L. Pesce. Cooccurring copepod fauna: *Eucyclops serrulatus* (Fischer, 1851); *Diacyclops paralanguidoides* Pesce & Galassi, 1987; *Diacyclops clandestinus* (Kiefer, 1926); *Moraria poppei* (Mrázek, 1893); *Hypocamptus brehmi* Van Douwe, 1922; *Bryocamptus (Limocamptus) echinatus* (Mrázek, 1893); *Bryocamptus (Bryocamptus) minutus* (Claus, 1863); *Bryocamptus (Rheocamptus) pygmaeus* (Sars, 1863).

Supplementary description. Body elongated and slender; total length, excluding A1 and furcal setae, 340 μm (♂ and 365–430 μm (♀♀). Anal operculum, slightly rounded, naked. Furcal rami sexually dimorphic, elongated [length/width ratio about 3:1 (♂, 2.6–2.75:1 (♀♀)]; armature consisting of 3 lateral setae, one dorsal seta (longer in the female), and 3 apical setae; Te about twice longer than Ti, medial seta the longest.

A1 (female) 7-segmented, esthete on segment 4 short, not reaching beyond tip of the distal segment; remaining setation as in Fig. 15. A1 (male) 7-segmented, esthete on segment 4 reaching the tip of distal segment. A2 not sexually dimorphic, exopod



Figs 1-13. *Parastenocaris lorenzae* n.sp. 1. A2 (♂); 2. A1 (♂); 3. abdomen and furcal rami (♂); 4. P1 (♂); 5. P5 (♂); 6. P2 (♂); 7. P2 (♀); 8. P4 (♀); 9. P3 (♀); 10. furcal rami (♀); 11. P3 (♂); 12. maxilliped (♂); 13. P4 (♂).



Figs 14-27. *Parastenocaris glacialis* Noodt, 1952 14. P3 (♂); 15. A1 (♀); 16. A1 (♂); 17. anal somite and furcal rami (♂), dorsal view; 18. P4 (♀); 19. P5 (♀); 20. anal somite and furcal rami (♀), ventral view; 21. P2 (♀); 22. A2 (♂); 23. P3 (♀); 24. P2 (♀); 25. P1 (♂); 26. P5 (♂); 27. P4 (♂).

1-segmented, bearing a distal, plumose seta; remaining setation as in Fig. 22.

P1 identical in both sexes: endopod 2-segmented, basal segment without inner spine, distal segment with 2 apical spiniform setae; exopod 3-segmented, basal segment with outer, subapical spine, middle segment bare, distal segment armed with 2 subapical outer spines and 2 distal setae.

P2 not sexually dimorphic: endopod 1-segmented, with 1 apical seta and 3 cuticular spicules; exopod 3-segmented, basal segment with 1 outer subapical spine, middle segment without spine, distal segment with 1 subapical and 2 apical long plumose setae.

P3 (male) elongated and slender, apex modified into a pincer-like structure, with distal outward corners; basal segment armed with a row of 5 cuticular spicules. P3 (female): endopod 1-segmented, bearing a distal short seta; exopod 2-segmented, basal segment with outer subapical spine, distal segment with 1 outer subapical spine and 1 apical plumose seta.

P4 (male) without endopod; exopod 3-segmented, basipodite with a row of 4 cuticular spicules (*nana*-group, *sensu* Lang, 1948) [5 in the original description (Noodt, 1952) and in Kiefer, 1960; 4 in Kulhavy & Noodt (1968)], basal segment with outer spine, middle segment without spine, distal segment with 1 outer subapical spine and 1 apical plumose seta. P4 (female): endopod 1-segmented, with 2 short spicules and 1 apical seta; exopod as in male.

P5 (male) subrectangular, with 4 apical setae, the outer the longest. P5 (female) subtriangular shaped, with inner thorn and 4 outer subdistal setae [3 in the original description (Noodt, 1952) and in Kulhavy and Noodt, 1968, 4 in Kiefer, 1960].

Remarks. The present material, on account of the identical construction and armature of female and male legs 1–5, and the morphology and setation of the furcal rami, quite fits the original diagnosis of *P. glacialis* by Noodt (1952).

So far, *P. glacialis* has been recorded from numerous localities of Central Europe, viz. Iceland, Spitzberg, Fenno-Scandian, Lapland, Denmark and Germany; the present record is the first one for the italian fauna and the most southern finding of the species.

From a biogeographical point of view, *P. glacialis* could be considered a 'borealpine harpacticoid in a wider sense' (Husmann, 1975). According to Kulhavy & Noodt (1968), its presence in Iceland could be explained with dispersion events during a phase of its biological life cycle. However, the wide distribution of this stygobitic species is still doubtfull and not easily interpretable.

From an ecological point of view, *P. glacialis* can be found only in groundwater habitats (rhithrostygal), in highlands, and in the border zones of northern and southern glaciers. Particularly, it could be considered a cold-stenotherm relict, which colonized the stygal biotopes during the postglacial period; in these habitats, species with similar attitudes can survive trought migration ways, following cold water refuges in highlands, ground waters or springs (Husmann, 1975; Hynes, 1976).

In central Apennines, including the Abruzzo region, numerous other harpacticoid species or subspecies, such as *Maraenobiotus vejdovskyi* Mrázek, 1893, *Epactophanes richardi* Mrázek, 1893, *Hypocamptus brehmi* (Van Dowe, 1922), *Bryocamptus (Limocamptus) echinatus* (Mrázek, 1893), *Bryocamptus (Rheocamptus) typhlops* (Mrázek, 1893) and *Bryocamptus (Articocamptus) raethicus* (Schmeil, 1893) show similar patterns of distribution and ecology and, as *P. glacialis*, they are to be considered cold-stenotherm species which could be integrated in the same biogeographical group.

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