Studi Trentini di Scienze Naturali – Acta Biologica
v. 73 (1996), pp. 135-145, Trento 1998

ISSN 0392-0542

Moraria alpina n. sp. and redescription of *Moraria radovnae* Brancelj 1988, new rank, from Italian and Slovenian Alps (Crustacea, Copepoda, Harpacticoida)

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ABSTRACT - STOCH F., 1998 - *Moraria alpina* n. sp. and redescription of *Moraria radovnae* Brancelj 1988, new rank from Italian and Slovenian Alps (Crustacea, Copepoda, Harpacticoida). [*Moraria alpina* n. sp. e ridescrizione di *Moraria radovnae* Brancelj 1988, stat. nov. delle Alpi italiane e slovene (Crustacea, Copepoda, Harpacticoida)]. *Studi Trent. Sci. Nat., Acta Biol., vol. 73, pp. 135-145.*

Two species of the genus *Moraria* (Copepoda, Harpacticoida) are described from sources, mosses, bogs and interstitial habitats of brooks in Italian and Slovenian Alps. *Moraria alpina* n. sp. resembles *M. brevipes* (SARS, 1863), differing in the structure and setation of the swimming legs in both sexes. *Moraria radovnae* Brancelj, 1988 new rank is redescribed on topotypic material from the Slovenian Alps and the male is described herein for the first time.

PAROLE CHIAVE: *copepodi, arpatticoidi,* Moraria, *ambienti alpini*
KEY WORDS: *copepods, harpacticoids,* Moraria, *alpine environments.*

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1. INTRODUCTION

During recent investigations on alpine copepods in Italy and Slovenia, a new species of the genus *Moraria* T. & A. Scott, 1893 was discovered; several other samples kindly put at my disposal by the Museo Tridentino di Scienze Naturali (Trento) and S.A.R. (Verona), collected in alpine sources, included additional specimens of the new species, which is described herein as *Moraria alpina* n. sp. Moreover, an interstitial sample collected in a small alpine brook in Slovenia yielded several specimens of *Moraria radovnae* Brancelj, 1988 new rank, including one male, previously unknown. This rare and little known species is redescribed herein in detail.

2. MATERIALS AND METHODS

The specimens were collected from two main habitats:

- alpine springs: the water was filtered using a plankton net (100 μm) stirring the substratum at the spring mouth (eucrenal) and squeezing the mosses; the samples were poured into vials and fixed with formaldehyde (5%);
- interstitial habitat: the groundwaters of alpine brooks and brooklets (hypocrenal and rhithral) were sampled using the Karaman-Chappuis method; the samples were fixed as above.

Several specimens were received from S.A.R. (Verona); they were collected in alpine sources mainly using the Bou-Rouch method; additional

samples come from the collections of the Museo Tridentino di Scienze Naturali (Trento).

Copepods were extracted from detritus under a stereomicroscope (50 X) and stored in 70% ethanol with 10% glycerine added. Selected specimens were dissected in glycerine, and permanently mounted on slides in Faure's medium. A Zeiss Axioskop microscope fitted with a drawing tube was used to study the details at 1000X using an oil immersion lens.

The material is deposited in the collections of Museo Tridentino di Scienze Naturali (MTSN) and in the author's collection (FS).

The terminology related to the external morphology follows HUYS & BOXSHALL (1991).

3. TAXONOMIC ACCOUNT

Family Canthocamptidae Sars, 1906
Subfamily Morariinae Borutzky, 1952
Genus *Moraria* T. & A. Scott, 1893

Moraria alpina n. sp. (Figs. 1-3)

Synonymy:
Moraria brevipes: KIEFER, 1963: 45
Moraria sp. nov. aff. *brevipes*: CREMA *et al.*, 1996: 45.

Material examined - Source of Valparola (m 2030 a.s.l.), NNE of the war cemetery, province of Belluno, Italy, 29/07/1994 *leg.* Stoch F. (crenal, epibenthic sample), 1 ♂ (FS). Source in Finstertal (m 1600 a.s.l.), Zillertaler Alpen, Vandoies, province of Bolzano, Italy, 11/07/1993 *leg.* SAR (crenal, interstitial sample, Bou-Rouch method), 1 ♀ copepodid V, 1 ♀ (FS). Source on the right bank of Rü de Côf dai Furns (m 1647 a.s.l.), Punt de Sciarè, Badia, province of Bolzano, Italy, 31/07/1994 *leg.* Stoch F. (epirhithral, interstitial sample, Karaman-Chappuis method), 1 ♂ (FS). Puddles near the bog of Bellamonte (m 1370 a.s.l.), Predazzo, province of Trento, Italy, 01/08/1992 *leg.* Stoch F., 1 ♂ (FS). Source NE of Malga Trenca (m 1720 a.s.l.), Massif of Lagorai, Roncegno, province of Trento, Italy, 10/07/1993 *leg.* SAR (epirhithral, interstitial sample, Bou-Rouch method) 1 ♂, 1 ♀ (MTSN); ibidem (crenal, epibenthic sample), 1 ♂ (FS); 01/07/1994 *leg.* SAR (crenal, epibenthic sample 2 ♂♂ (FS). Source SW of Rifugio Gardeccia (m 2000 a.s.l.), Massif of Catinaccio, Pozza di Fassa, province of Trento, Italy, 10/07/1993 *leg.* SAR (crenal, epibenthic sample), 1 ♂ (FS). Source W of Malga Nambino (m 1650 a.s.l.), Massif of Presanella, Pinzolo, province of Trento, Italy, 12/07/1993 *leg.* SAR (crenal, epibenthic sample) 1 ♀ (FS). Source Fontanabona (m 1091 a.s.l.), Natural Park Adamello-Brenta, province of Trento, Italy, 04/06/1996 *leg.* Cantonati M. (crenal, epibenthic sample), 1 ♀ (MTSN). Source Valagola (m 1317 a.s.l.), Natural Park Adamello-Brenta, province of Trento, Italy, 01/06/1996 *leg.* Cantonati M. (crenal, epibenthic sample), 1 ♀ (MTSN).

Type series - Holotype ♀, allotype ♂, from Source NE of Malga Trenca (m 1720 a.s.l.), Massif of Lagorai, Roncegno, province of Trento, Italy, completely dissected and mounted on slide in Faure's medium; paratypes 3 ♂♂, preserved in 75% ethanol. Holotype and allotype deposited in the collections of the Museo Tridentino di Scienze Naturali; paratypes in the author's collection.

Etymology - The name refers to the geographical location of the sampling sites on the Alps.

Female - Body length of the holotype, excluding caudal setae, 510 µm. Hyaline fringes of dorsal posterior margins of somites smooth (Fig. 1a), dorsal and ventral surfaces of urosomites without microspinules. Genital segment and genital field as in Fig. 1a,c with hyaline fringe of caudal margin smooth, accompanied by 1 ventral row of spinules. Two urosomites posterior to genital segment with 1 ventral row of spinules close to caudal margin. Anal somite with 1 ventral row of spinules (Fig. 1a) along caudal margin; anal operculum pointed, triangular, smooth (Fig. 1a). Anal operculum of copepodids crenulated (Fig. 1d).

Caudal ramus approximately 3 times longer than wide (Fig. 1a), longer than anal segment. Ventral side with a row of short distal spinules, basal to terminal setae. Dorsal side of ramus with a longitudinal chitinous keel. Anterolateral seta shorter than posterolateral seta; posterolateral seta shorter than caudal ramus. Outer terminal seta longer than caudal ramus, terminal accessory seta short, as long as caudal ramus width. Inner terminal seta normally developed. Dorsal seta shorter than half length of ramus, inserted in the distal part of the chitinous keel.

Nuchal organ as in Fig. 1b. Antennule (Fig. 1e) 7-segmented; segment 4 bearing 1 aesthetasc longer than 4 distal segments. Antenna as in Fig. 1f, with exopod 1-segmented, armed with 4 setae. Labrum as in Fig. 1g. Mandible as in Fig. 1h; gnathobase with 5 teeth and 1 seta; mandibular palp 2-segmented, segment 1 bearing a distal row of 3 spinules, segment 2 bearing 3-4 terminal setae. Maxillule (Fig. 1i) with praecoxa unarmed; arthrite with 7 distal spines and 1 seta accompanied by 1-2

facial setae on anterior surface and a row of 3 tiny spinules on posterior surface; coxa with 1 claw and 1 seta; basis with 1 distal claw accompanied by 2 distal setae and 4-5 lateral setae. Maxillary syncoxa (Fig. 1j) with 2 endites each bearing 3 distal setae; allobasis bearing 1 endite transformed in a claw and 2 setae; endopod bearing 2 setae. Maxilliped (Fig. 1k) prehensile; syncoxa armed with 2 small rows of spinules and 1 forked seta (erroneously reported as double in Fig. 1k); basis with a row of long spinules along inner margin, and few tiny spinules along outer margin; endopodal claw with small spinules.

Swimming legs: exopods 3-segmented; setal formula of exopods: P1 0.0.022; P2 0.0.022; P3 0.0.022; P4 0.0.022. Couplers of P1-P4 without transverse rows of setules. P1 (Fig. 2a): basipod with 1 inner and 1 outer stout spines; endopod 2-segmented, with segment 1 bearing 1 inner short seta accompanied by 2 spinules, and segment 2 bearing 3 distal setae, the inner one very short, accompanied by slender spinules. P2 (Fig. 2b): basipod with 1 outer stout spine; endopod 2-segmented; endopod segment 1 with 1 inner seta and 2 outer spinules; segment 2 bearing 2 terminal setae. P3 (Fig. 2c): basipod bearing 1 outer seta; endopod 2-segmented; segment 1 with 1 inner seta, segment 2 bearing 4 distal setae. P4 (Fig. 2d): basipod bearing 1 outer seta; endopod 2-segmented; segment 1 bearing 1 inner seta; segment 2 bearing 4 distal setae. P5 (Fig. 2e): baseoendopod with 6 setae accompanied by 2 spinules; exopod armed with 5 setae.

Male - Body length, excluding caudal setae, 470 - 500 µm; habitus as in Fig. 3c. Hyaline fringes of posterior margins of somites smooth (Fig. 3b); each urosomite with 1 transverse row of spinules on ventral margin (Fig. 3a). Anal somite with 2 dorsal rows of microspinules lateral to anal operculum (Fig. 3b). Anal operculum triangular, as in female.

Caudal ramus slightly shorter than in female (Fig. 3a, b); caudal setae as in female, except for the slightly longer outer terminal seta.

Antennule (Fig. 3g) geniculate, 8-segmented; segment 4 bearing 1 aesthetasc shorter than 4 distal segments. Antenna and mouthparts as in female.

Swimming legs: exopods P1-P4 and setal formula as in female. P1 endopod as in female. P2 endopod (Fig. 3d) 2-segmented; segment 1 bearing 1 inner seta accompanied by 2 short spinules, 1 slender long outer spinule and the chitinous tooth typical of the genus *Moraria*; segment 2 bearing 2 terminal setae of different length. P3 endopod (Fig. 3f) 2-segmented; segment 1 with 1 inner seta and 2 outer spinules; segment 2 with 3 terminal setae. P4 endopod (Fig. 3e) 2 segmented; segment 1 bearing 1 inner seta and 2 outer spinules; segment 2 with 3 inner setae, 2 outer spinules and 1 terminal, recurved spine. P5 (Fig. 3i): baseoendopod with 2 stout spines, slightly longer than exopod; exopod armed with 5 setae of different length. P6 (Fig. 3h) bearing 3-4 setae.

Remarks – The new species is closely related to *Moraria brevipes* (Sars, 1863), as redescribed by GURNEY (1932); *Moraria alpina* n. sp. can be easily distinguished by its possession of the following characters:

- longer caudal rami
- A2 exopod bearing 4 setae
- different number and length of setae on female P2-P4 endopods
- segment 2 of male P4 endopod long and slender.

The very long setae of female P2-P4 endopods and the shape of male P4 endopod are similar in *Moraria pectinata* Thiébaud & Pelosse, 1928, which can be easily distinguished by the dorsally crenulated hyaline fringes of somites.

The specimens from Switzerland reported by KIEFER (1963) as *Moraria brevipes* clearly belong to this species, the only difference being segment 2 of female P2 endopod bearing an additional, tiny seta, which was not observed in the Italian specimens.

Distribution and habitat - The species was found in sources, as a member of the interstitial and epibenthic assemblages (CREMA *et al.*, 1996), as well as in wet mosses around the mouth of the springs, in the interstitial habitat of small alpine brooks and in small puddles in a bog. All the samplig sites are alpine environments located in the central and eastern Alps. KIEFER (1963) reported this species from Switzerland. Probably other records of *Moraria brevipes* from the alpine region are to be referred to *Moraria alpina* n. sp.; a more extensive sampling effort on the Alps is required to test this hypothesis.

Moraria radovnae Brancelj, 1988, new rank (Figs. 4-6)

Synonymy:
Moraria pectinata radovnae: Brancelj, 1988: 5. The taxon is not reported in JANETZKY *et al.* (1996).

Material examined - Radovna Torrent (type locality), Karaman - Chappuis method applied near the mouth of a small inlet (m 610 a.s.l.), between Zg. Gorje and Fuzine, Bled, Slovenia, 22/06/1993 *leg.* F. Stoch, several ♀♀, 1 ♂ (FS).

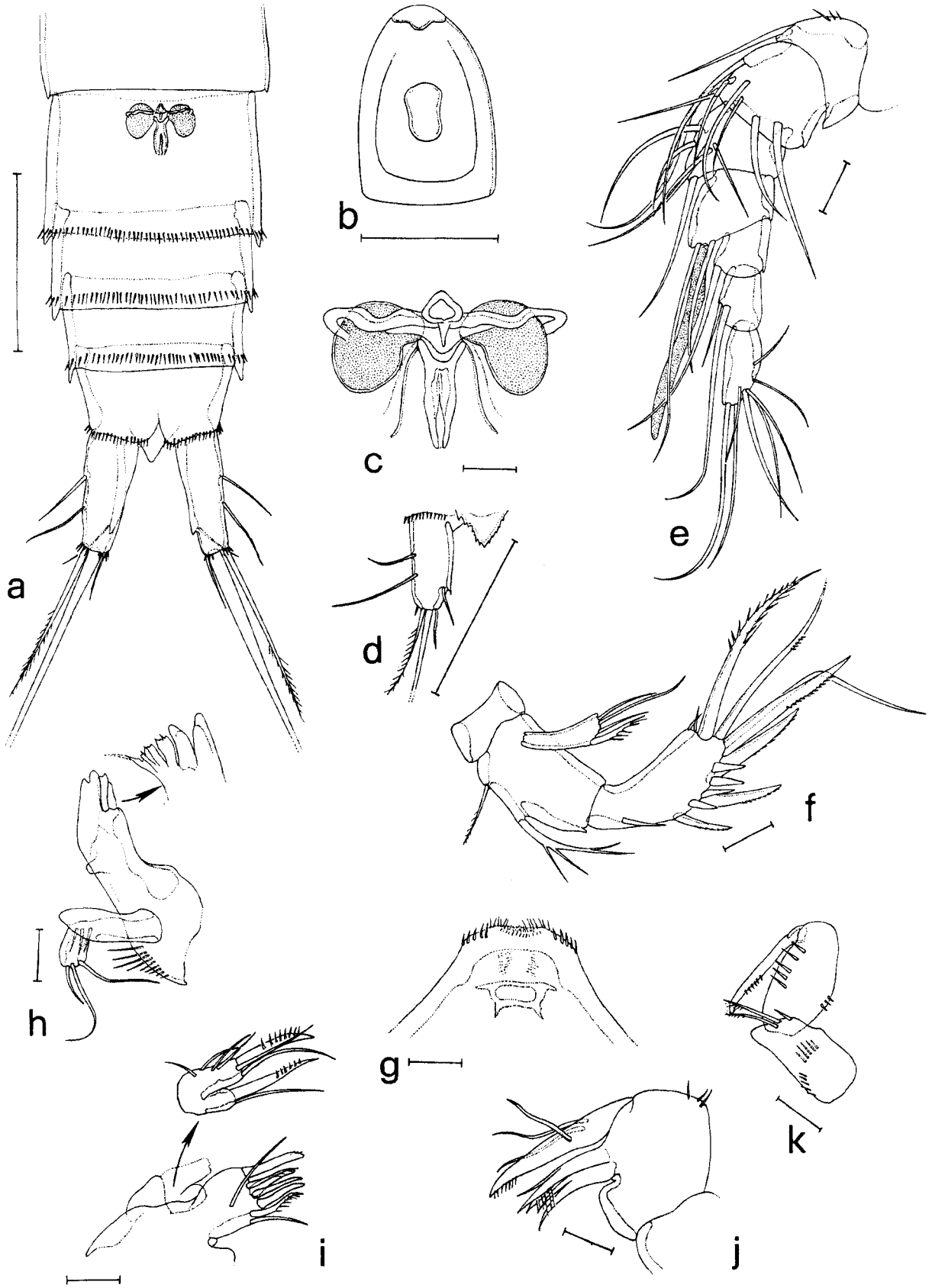

Fig. 1 – *Moraria alpina* n. sp. holotype ♀ (a-c and e-k) and copepodid V ♀ (d): a) abdomen and caudal rami, ventral view; b) head, dorsal view showing nuchal organ; c) genital field; d) anal operculum and caudal ramus of copepodid V ♀; e) antennule; f) antenna; g) labrum; h) mandible; i) maxillule; j) maxilla; k) maxilliped. Scale bars = 100 µm (a, b, d) and 10 µm (c, e-k).

Fig. 1 - Moraria alpina *n. sp. olotipo ♀ (a-c e e-k) e copepodite V ♀ (d): a) addome e rami caudali, visione ventrale; b) capo, visione dorsale mostrante l'organo nucale; c) campo genitale; d) opercolo anale e ramo caudale del copepodite V ♀; e) antennula; f) antenna; g) labrum; h) mandibola; i) maxillula; j) maxilla; k) massillipede. Scala = 100 µm (a, b, d) e 10 µm (c, e-k).*

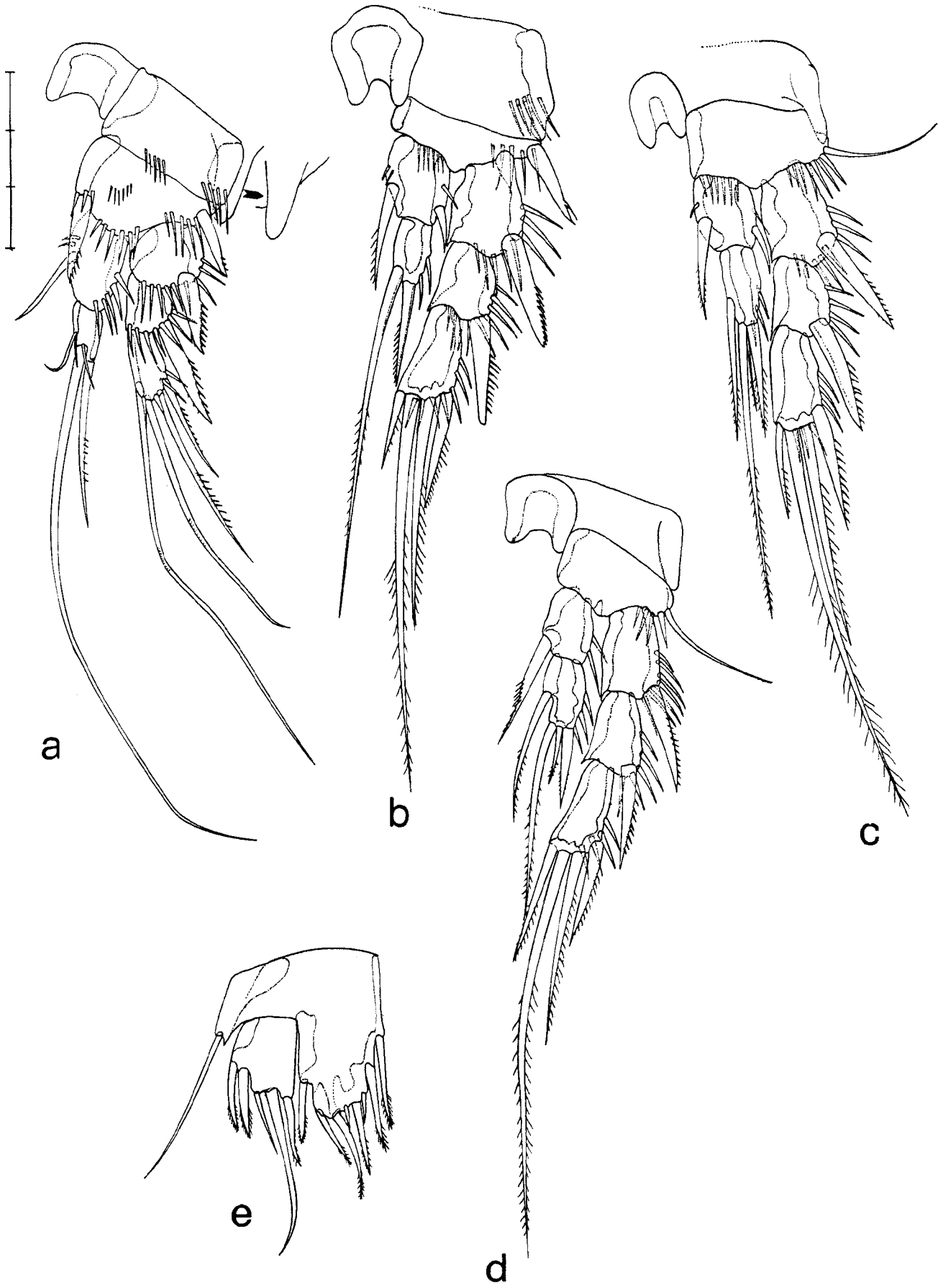

Fig. 2 – *Moraria alpina* n. sp. holotype ♀: a) P1; b) P2; c) P3; d) P4; e) P5. Scale bars = 10 µm.
Fig. 2 - Moraria alpina *n. sp. olotipo ♀: a) P1; b) P2; c) P3; d) P4; e) P5. Scala = 10 µm.*

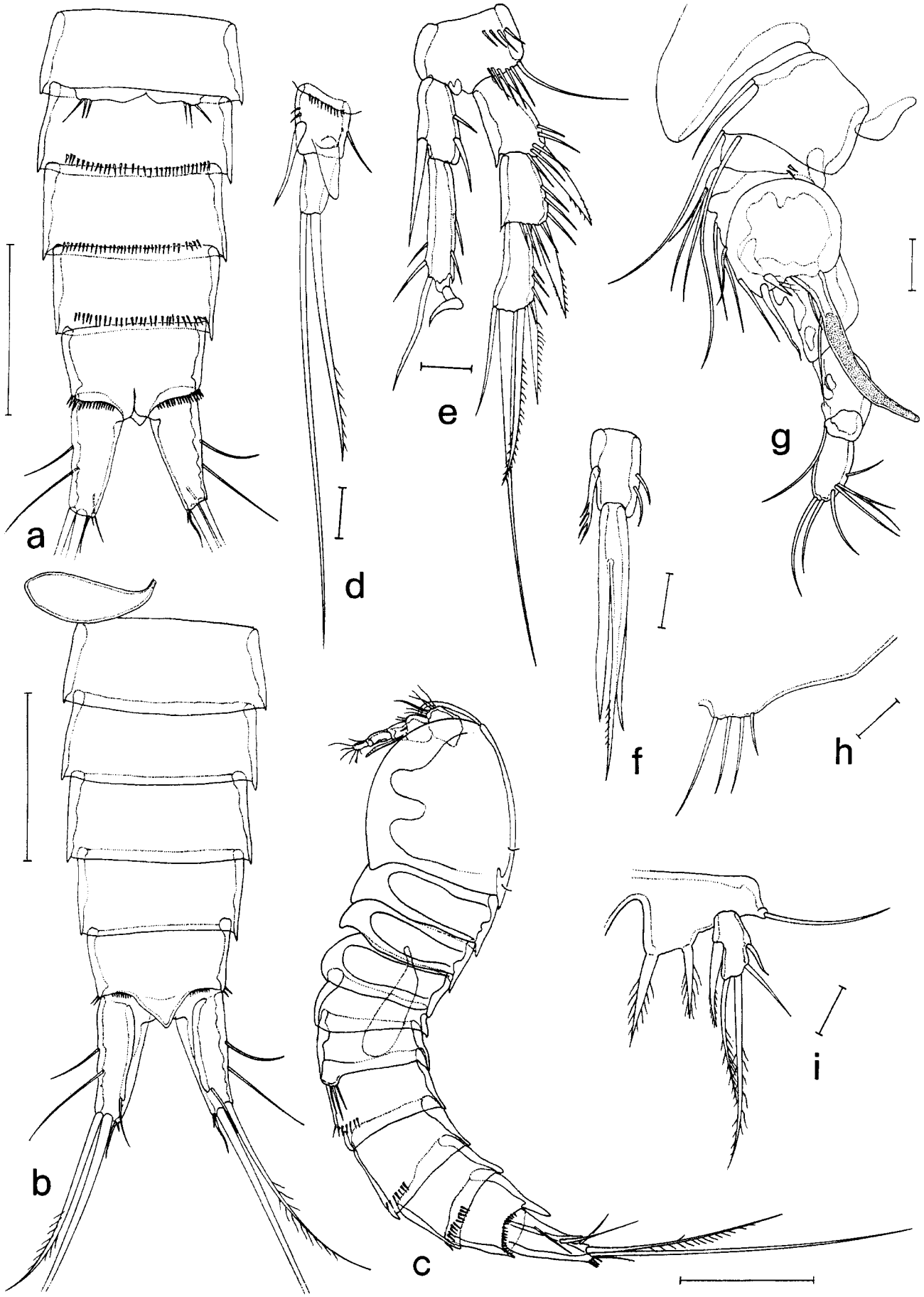

Fig. 3 – *Moraria alpina* n. sp. allotype ♂: a) abdomen and caudal rami, ventral view; b) abdomen and caudal rami, dorsal view; c) habitus; d) P2 endopod; e) P4; f) P3 endopod; g) antennule; h) P6; i) P5. Scale bars = 100 μm (a-c) and 10 μm (d-i).

Fig. 3 - Moraria alpina *n. sp. allotipo ♂: a) addome e rami caudali, visione ventrale; b) addome e rami caudali, visione dorsale; c) habitus; d) endopodite di P2; e) P4; f) endopodite di P3; g) antennule; h) P6; i) P5. Scala = 100 μm (a-c) e 10 μm (d-i).*

Female - Mean body length, excluding caudal setae, 700 µm. Hyaline fringes of dorsal posterior margins of somites coarsely crenulated (Fig. 5e), dorsal and ventral surfaces of urosomites smooth. Genital segment and genital field as in Fig. 5e, with hyaline fringe of caudal margin dorsally crenulated and ventrally smooth, accompanied by 1 short ventral row of spinules. Two urosomites posterior to genital segment with 1 ventral row of spinules close to caudal margin. Anal somite with 1 ventral row of spinules (Fig. 5d, e) along caudal margin, 2 smaller dorsal rows of shorter spinules lateral to anal operculum, and 2 long medial spinules (Fig. 5e). Anal operculum pointed, triangular, haired (Fig. 5e).

Caudal ramus approximately 2.5 times longer than wide (Fig. 5d), as long as anal segment. Inner margin with a pronounced recess. Ventral side with a row of short distal spinules, basal to terminal setae, and a second row of stouter and longer spinules along distal and inner margins. Dorsal side of ramus with a longitudinal chitinous keel. Anterolateral seta half length of posterolateral seta, accompanied by a spinule; posterolateral seta as long as caudal ramus. Outer terminal seta longer than caudal ramus, terminal accessory seta short, as long as caudal ramus width. Inner terminal seta normally developed (see Fig. 4 in BRANCELJ, 1988). Dorsal seta shorter than ramus, inserted in the distal part of the chitinous keel.

Rostrum pointed (Fig. 4a). Antennule (Fig. 4a) 7-segmented; segment 4 bearing 1 aesthetasc longer than 4 distal segments. Antenna as in Fig. 4b, with exopod 1-segmented, armed with 4 setae.

Mandible as in Fig. 4e; gnathobase with 5 teeth and 1 seta; mandibular palp 2-segmented, segment 1 bearing 3 distal spinules, segment 2 with 4 terminal setae. Maxillule (Fig. 4f) with praecoxa unarmed; arthrite with 8 distal spines; coxa with 1 claw and 1 seta; basis with 1 distal claw and 6 setae. Maxillary syncoxa (Fig. 4h) with 2 endites each bearing 3 stout distal setae (some setae are hidden in Fig. 4h); allobasis bearing 1 endite transformed in a claw and 2 setae; endopod bearing 2 setae. Maxilliped (Fig. 4g) prehensile; syncoxa armed with 1 row of spinules and usually 1 seta (absent in Fig. 4g); basis with 1 row of spinules along inner margin, and 2 small rows of tiny spinules along outer margin; endopodal claw with tiny spinules. Paragnath (Fig. 4h) with a very long spine, and short rows of tiny spinules.

Swimming legs: exopods 3-segmented; setal formula of exopods: P1 0.0.022; P2 0.0.022; P3 0.0.022; P4 0.0.022. The inner terminal seta of P2-P4 exopod 3 is very short. Couplers of P1-P4 smooth. P1 (Fig. 4c): basipod with 1 inner and 1 outer stout spines; endopod 2-segmented, with segment 1 bearing 1 inner short seta accompanied by 1 spinule, and segment 2 bearing 1 stout distal spiniform seta and 2 additional setae, the inner one very short. P2 (Fig. 4d): basipod with 1 outer stout spine; endopod 2-segmented, slightly longer than exopod segment 1; endopod segment 1 with 1 inner seta; segment 2 bearing 3 terminal setae, the medial one short. P3 (Fig. 5a): basipod bearing 1 outer seta; endopod 2-segmented; segment 1 with 1 inner spiniform seta, segment 2 bearing 1 distal spiniform seta accompanied by 3 inner setae. P4 (Fig. 5b): basipod bearing 1 outer seta; endopod 2-segmented; segment 1 bearing 1 inner stout spiniform seta; segment 2 bearing 1 distal spiniform seta shorter than segment and 3 inner setae. P5 (Fig. 5c): baseoendopod with 7 short and stout spiniform setae; exopod subrounded, armed with 4 setae.

Male - Body length, excluding caudal setae, 600 µm. Hyaline fringes of posterior margins of somites crenulated (Fig. 6h); each urosomite with 1 transverse row of spinules on ventral margin (Fig. 6i). Anal somite with 2 rows of microspinules lateral to anal operculum (Fig. 6h).

Caudal ramus slightly shorter than in female (Fig. 6g), about 2 times as long as wide; outer margin with 2 microspinules in proximal third. Posterolateral seta only slightly longer than anterolateral seta; other setae as in female.

Antennule (Fig. 6a) geniculate, 8-segmented; segment 4 bearing 1 aesthetasc shorter than 4 distal segments. Antenna and mouthparts as in female.

Swimming legs: exopods P1-P3 and setal formula as in female. P1 endopod as in female. P2 endopod (Fig. 6f) 2-segmented; segment 1 bearing 1 inner seta and the chitinous tooth typical of the genus *Moraria*; segment 2 bearing 2 terminal setae of different length. P3 endopod (Fig. 6e) 2-segmented; segment 1 with 1 inner spiniform seta; segment 2 with 3 terminal setae, the outer one shorter and stouter. P4 endopod (Fig. 6d) 2 segmented; segment 1 bearing 1 inner spiniform seta; segment 2 with 3 inner setae and 1 distal, recurved spine. P5 (Fig. 6b): baseoendopod with 2 stout spines, slightly longer than exopod; exopod armed with 6 setae of different length. P6 (Fig. 6c) bearing 3 setae.

Remarks - The description given above complements the paper by BRANCELJ (1988) for the female; the male, previously unknown, is described for the first time. The morphological characters of both sexes indicate that *Moraria radovnae* new rank is a good species, well distinguished from

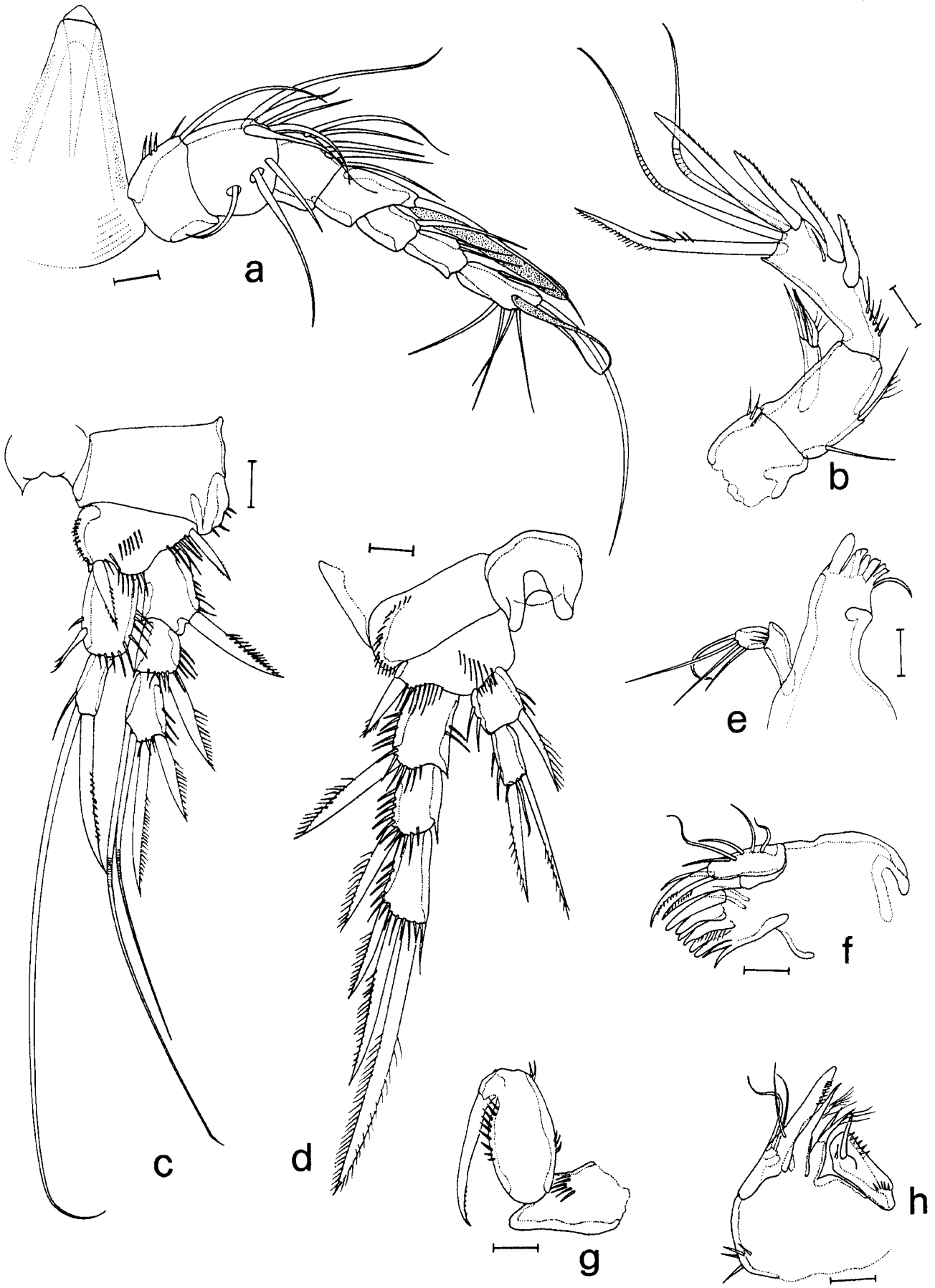

Fig. 4 – *Moraria radovnae* Brancelj, 1988 topotype ♀: a) antennule; b) antenna; c) P1; d) P2; e) mandible; f) maxillule; g) maxilliped; h) maxilla. Scale bars = 10 μm.

Fig. 4 – Moraria radovnae *Brancelj, 1988 topotipo ♀: a) antennula; b) antenna; c) P1; d) P2; e) mandibola; f) maxillula; g) massillipede; h) maxilla. Scala = 10 μm.

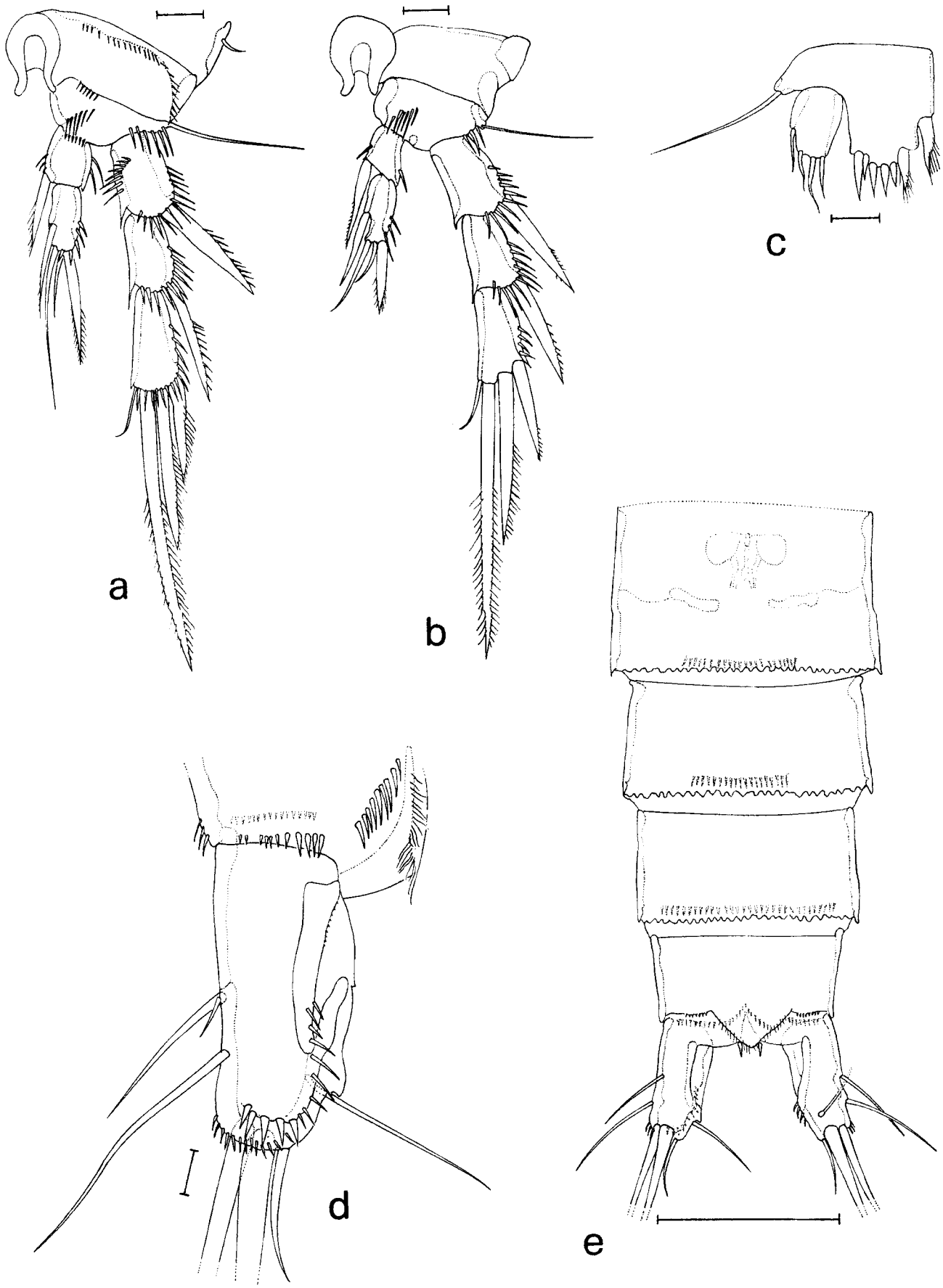

Fig. 5 – *Moraria radovnae* Brancelj, 1988 topotype ♀: a) P3; b) P4; c) P5; d) caudal ramus; e) abdomen and caudal rami, dorsal view. Scale bars = 100 μm (e) and 10 μm (a-d).

Fig. 5 – Moraria radovnae *Brancelj, 1988 topotipo ♀: a) P3; b) P4; c) P5; d) ramo caudale; e) addome e rami caudali, visione dorsale. Scala = 100 μm (e) e 10 μm (a-d).*

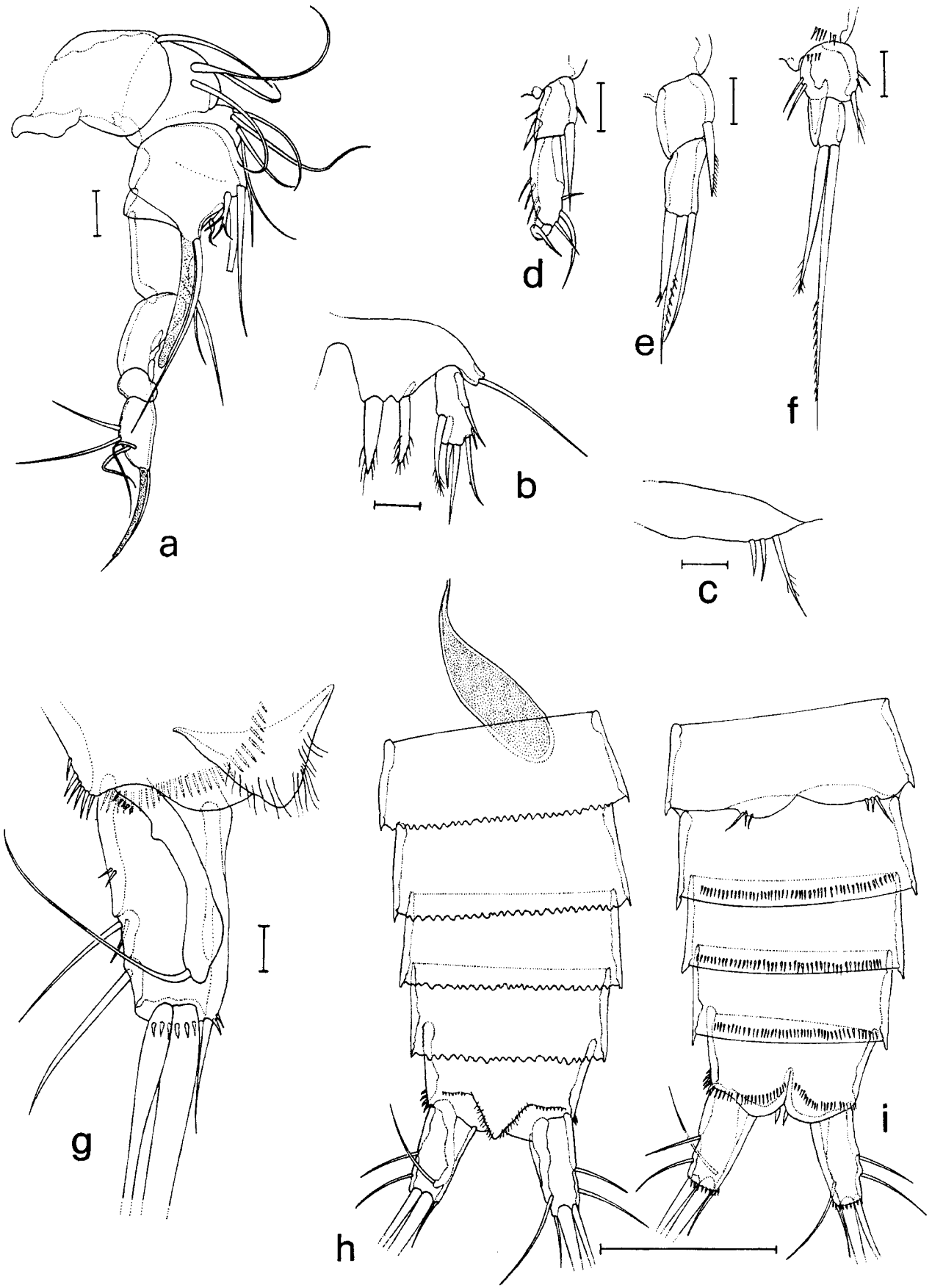

Fig. 6 – *Moraria radovnae* Brancelj, 1988 topotype ♂: a) antennule; b) P5; c) P6; d) P4 endopod; e) P3 endopod; f) P2 endopod; g) caudal ramus, dorsal view; h) abdomen and caudal rami, dorsal view; i) abdomen and caudal rami, ventral view. Svale bars = 100 μm (h, i) and 10 μm (a-g).

Fig. 6 – Moraria radovnae *Brancelj, 1988 topotipo ♂: a) antennula; b) P5; c) P6; d) endopodite di P4; e) endopodite di P3; f) endopodite di P2; g) ramo caudale, visione dorsale; h) addome e rami caudali, visione dorsale; i) addome e rami caudali, visione ventrale. Scala = 100 μm (h, i) e 10 μm (a-g).*

Moraria pectinata Thiébaud & Pelosse, 1928, by the following characters:

- shorter caudal rami
- shorter distal setae of segment 2 of male P2 endopod
- shorter segment 2 of male P4 endopod, bearing a curved distal spine
- shape and armature of female P5.

Unfortunately the comparison of other morphological details is difficult due to the incomplete description of *M. pectinata* reported by THIÉBAUD & PELOSSE (1928).

Distribution and habitat - The known geographical distribution is restricted to the type locality, a small alpine brook in Slovenian Julian Alps. The specimens used in the present study were collected in the interstitial environment using the Karaman-Chappuis method.

ACKNOWLEDGEMENTS

The author is indebted to the working group of S.A.R. (Sistema Ambiente Risorse, Verona) and to dr. M. Cantonati (Museo Tridentino di Scienze Naturali, Trento) for the loan of part of the material used in this study, and to dr. G. Moura (University of Oldenburg) for her helpful comments on the manuscript.

SUMMARY - Two species of the genus *Moraria* (Copepoda, Harpacticoida) are described from sources, mosses, bogs and interstitial habitats of brooks in Italian and Slovenian Alps. *Moraria alpina* n. sp. resembles *M. brevipes* (Sars, 1863), differing in the structure and setation of the swimming legs in both sexes. Some specimens referred to *M. brevipes* in the literature from the alpine region (Switzerland) should be attributed to the new species. *Moraria radovnae* Brancelj, 1988 new rank is redescribed on topotypic material from the Slovenian Alps and the male is described herein for the first time. *M. radovnae* new rank, originally described as a subspecies of *M. pectinata* Thiébaud & Pelosse, 1928, is elevated to specific rank on the basis of P1-P4 setation and the shape of caudal rami.

RIASSUNTO - Vengono descritte due specie del genere *Moraria* (Copepoda, Harpacticoida) provenienti da sorgenti, muschi, torbiere e ambiente interstiziale di ruscelli nelle Alpi italiane e slovene. *Moraria alpina* n. sp. è simile a *M. brevipes* (Sars, 1863), ma se ne distingue per la struttura e l'ornamentazione delle appendici in entrambi i sessi; probabilmente anche altri reperti di *M. brevipes* della regione alpina (Svizzera) riportati in letteratura sono da riferire a questa nuova specie. *Moraria radovnae* Brancelj, 1988, stat. nov. viene ridescritta su materiale topotipico delle Alpi slovene ed il maschio viene descritto nel presente lavoro per la prima volta. *M. radovnae* stat. nov., descritta originariamente come sottospecie di *M. pectinata* Thiébaud & Pelosse, 1928, è elevata a rango specifico sulla base delle differenze dell'ornamentazione di P1-P4 e la struttura dei rami furcali.

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Issued April 1998.