

## A new genus and two new species of Canthocamptidae (Copepoda, Harpacticoida) from caves in northern Italy

Fabio Stoch

Museum of Natural History, Trieste, Italy

Current address: v.le XXV Aprile, 24, I-34015 Muggia (Trieste), Italy (e-mail: fabiocop@mbox.vol.it)

Received 12 March 1997; accepted in revised form 25 March 1997

**Key words:** copepods, harpacticoids, *Lessinocamptus* n.g., groundwaters

### Abstract

*Lessinocamptus* n. gen. is established to accommodate three species from northern Italian caves. It can be ascribed to the family Canthocamptidae Sars 1906 and is distinguished from the other genera by the combined characters of: antenna exopod 1-segmented and bearing 3 setae (or 1 seta and 1 spine); mandibular palp 2-segmented with distal article bearing 5 setae; swimming legs exopods 3-segmented; setal formula of exopods: P1 0.0.022; P2 0.1.112; P3 0.1.212; P4 0.1.212; P1 endopod 2-segmented; P2 endopod 1- or 2-segmented; female P3 endopod 1- or 2-segmented, male P3 endopod 3-segmented and modified as usual in Canthocamptinae; male P5 baseendopod with 2 spines and exopod with 3 spiniform setae. Three species are described in detail: *L. caoduroi* n.sp. from the vadose zone of Lessinian caves, *L. insoletus* (Chappuis 1928) and *L. pivai* n.sp. from cave 'Buso della Rana' near Vicenza.

### Introduction

In 1928 Chappuis described a new harpacticoid copepod, named *Canthocamptus insoletus*, from the cave 'Buso della Rana' (Lessinian Mountains, Vicenza, northern Italy). He stated that the morphological characters of the new species did not fit exactly the definition of any known genera of Canthocamptidae; however the single male in hand (probably bearing a teratological P2 endopod) did not allow Chappuis to establish a new genus. In a subsequent paper, Chappuis (1954) examined further material from the same cave and reported the discovery of a second male of '*Canthocamptus insoletus*', together with a female of a new species, which should have been ascribed to another new genus. Again, the scarcity of material prevented Chappuis from creating new genera, and, unfortunately, no descriptions or drawings of the specimens were given. '*Canthocamptus insoletus*' was later arbitrarily ascribed to the genus *Moraria* (Dussart, 1969; Pesce, 1985) or *Morariopsis* (Cottarelli, 1996).

I visited the large cave system 'Buso della Rana' (consisting of over 20 km of explored galleries) in the

years 1993–94 in order to solve this taxonomic puzzle. Unfortunately, the cave is accessible only during the drier months, being very dangerous after rains; this fact prevented me from adequately sampling the percolating waters. Despite the high number of copepods collected from the cave brook and in some rivulets, only one female of '*Canthocamptus insoletus*' was discovered, together with some males which are ascribed to a new, closely related, species. Further researches in other caves in the Lessinian Mountains yielded both male and female of a further similar species, new to science. Following what Chappuis (1928, 1954) correctly suggested for '*Canthocamptus insoletus*', a new genus is described herein to accommodate the three species.

### Materials and methods

The specimens were collected from two main cave habitats:

– vadose zone: small puddles of percolating water ('gours') were sampled using a little rubber hand pump

and a hand plankton net; the samples were poured into vials and fixed with formaldehyde (5%)

– amphibian zone: the water of an hypogean brook was filtered using a plankton net stirring the substratum upstream; the samples were fixed as above.

Copepods were extracted from detritus under a stereomicroscope (50×) 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 1000× using an oil immersion lens.

### Taxonomic account

Family Canthocamptidae Sars, 1906

Subfamily Canthocamptinae Sars, 1906 emend. Chappuis, 1929

*Lessinocamptus* n. gen.

#### Type species

*Lessinocamptus caoduroi* n.sp.

#### Gender

Masculine

#### Etymology

The name is derived from the locality where the new genus was discovered, the Lessinian Mountains.

#### Diagnosis

Small Canthocamptidae (350–500 μm); hyaline fringes of posterior margins of urosomites crenulated or smooth. Urosomites with or without rows of setules, bearing 1 row of spinules along ventral margin; ventromedial spinules of anal somite usually stout. Anal operculum slightly convex, smooth, with fine hairs. Anterolateral and posterolateral caudal setae short and accompanied by tiny spinules; outer terminal seta long or short and spiniform.

Antennule 8-segmented in both sexes, segment 4 bearing 1 aesthetasc, segment 8 lacking aesthetasc. Antenna with exopod 1-segmented, bearing 3 setae or 1 seta and 1 stout spine.

Mandible coxa with 1 stout subdistal lateral tooth; mandibular palp 2-segmented: segment 1 bearing 1 seta; segment 2 bearing 5 setae (1 lateral and 4 terminal setae). Maxillary arthrite with 1 seta; coxa with 2 claws; basis with 1 distal claw and a varying number of

setae. Maxillary syncoxa with 2 endites each bearing 2 stout setae; allobasis bearing 1 endite transformed as claw or blunt spine; endopod fused with basis and bearing 3 setae. Maxilliped prehensile; basis with a row of spines along inner margin; endopodal claw smooth.

Swimming legs exopods 3-segmented; setal formula of exopods: P1 0.0.022; P2 0.1.112; P3 0.1.212; P4 0.1.212. Couplers without ornamentation. P1 endopod 2-segmented, with segment 1 bearing 1 inner spine; segment 2 with 2 distal setae. P2 endopod 1- or 2-segmented. P3 endopod 1- or 2-segmented in female. Male P3 endopod 3-segmented, modified as usual in Canthocamptinae; segment 1 armed with 1 inner spine, segment 2 bearing a long spiniform process, segment 3 bearing 1 or 2 setae. P4 endopod 1-segmented, bearing 2 spiniform setae. P5 baseoendopod with 3 or 4 spines in female, 2 spines in male; left and right baseoendopods fused together in male; exopod distinct or partially fused with baseoendopod, armed with 3–4 strong spiniform setae in female, 3 in male. Male P6 bearing 2 short stout setae.

#### Remarks and affinities

The new genus shares some characters with the *Elaphoidella* Chappuis 1929 – group of genera (sensu Apostolov, 1985, but see criticism in Petkovski & Brancelj, 1988), e.g. 2-segmented mandibular palp, 1-segmented antenna exopod and shape of female P5 baseoendopod. However, it is distinguished from *Elaphoidella* s.l. in having 2 spines on the male P5 basipod; this is a plesiomorphic character, shared by *Bryocamptus* Chappuis 1929, *Attheyella* Brady 1880, *Paracamptus* Chappuis 1929, *Hypocamptus* Chappuis 1929, *Maraenobiotus* Mrázek 1893 and others. *Elaphoidella* s.l. males have no spines on this segment, except for *Neoelaphoidella calypsonis* Chappuis & Rouch 1959, an aberrant species with 1 spine on the male P5 baseoendopod. The structure of P2 endopod, together with the reduced number of setae on antenna exopod and the presence of 5 setae on mandibular palp segment 2 are further discriminant characters from *Elaphoidella* s.l. Moreover, the structure of female P5 clearly differentiates *Lessinocamptus* n.g. from *Antrocamptus* Chappuis 1956, *Spelaocamptus* Chappuis 1933 and *Paramorariopsis* Brancelj 1991, three genera probably closely related to *Elaphoidella* s.l. Considering that male P3 endopod is triarticulate, there is no close relationship of the new genus with *Moraria* T. & A. Scott 1893 and *Morariopsis* Borutzky 1931, as postulated respectively by Chap-

puis (1954) and Borutzky (1952) for '*Canthocamptus insoletus*'. These opinions, followed by Dussart (1969), Pesce (1985) and Cottarelli (1996) were based on the probably inaccurate observation of male P3 reported by Chappuis (1928).

*Lessinocamptus caoduroi* n.sp. (Figures 1–3)

#### Synonymy

Canthocamptidae n.gen., n.sp.: Caoduro, Gasparo & Stoch, 1995: 94.

#### Material examined

Cave named 'Grotta dell' Arena' (cadastre number 476 V/VR), Malga Bagorno, Bosco Chiesanuova, Lessinian Mountains, province of Verona, 1512 m a.s.l.; small pools of percolating water; water temperature = 4.7 °C, pH = 7.6, conductivity = 220  $\mu\text{S cm}^{-1}$ ; 20 July 1993, leg. G. Caoduro, F. Gasparo, F. Stoch, 2 ♂♂, 1 ♀.

#### Type series

Holotype ♀, allotype ♂ (in copula when collected), completely dissected and mounted on slide in Faure's medium; paratype ♂ (in 70% ethanol), all from 'Grotta dell' Arena' (476 V/VR), Lessinian Mountains, Verona, Italy. Holotype and allotype deposited in the Museum of Natural History, Verona; paratype in coll. F. Stoch.

#### Etymology

The new species is dedicated to Dr G. Caoduro (Verona), accomplished biospeleologist, for his contribution to the knowledge of the cave fauna of the Province of Verona.

#### Female

Length, excluding caudal setae, 440–500  $\mu\text{m}$ . Hyaline fringes of posterior margins of urosomites crenulated (Figure 2e); urosomites with dense rows of microsetules on both dorsal and ventral sides. Genital segment and genital field as in Figure 2f, with 2 ventrolateral rows of spinules along caudal margin. Two urosomites posterior to genital segment (Figure 2f) each with one row of spinules on ventral margin. Anal somite with 2 rows of short spinules (Figure 2d) near posteroventral margin above each caudal ramus, and 2 smaller additional lateral rows of spinules. Anal operculum slightly convex, smooth, with fine hairs. Caudal rami about 3.3 times longer than wide (Figure 2d), conical, longer than anal somite. Posterolateral caudal seta shorter than anterolateral seta, both setae shorter than

width of caudal ramus and accompanied by tiny spinules; outer terminal seta as long as caudal ramus (Figure 2d); terminal accessory seta short; dorsal seta half length of caudal ramus, inserted on a protruberance.

Antennule (Figure 1a) 8-segmented; segment 1 unarmed; segment 4 bearing 1 very long aesthetasc, longer than 4 distal segments. Antenna as in Figure 1b, with exopod 1-segmented, bearing 3 setae. Mandible as in Figure 1d, e; coxa with proximal spinules, 1 stout subdistal lateral tooth and gnathobase with 6 teeth; mandibular palp 2-segmented: segment 1 bearing 1 seta; segment 2 bearing 1 lateral and 4 terminal setae. Maxillule (Figure 1g) with praecoxa unarmed; arthrite with 6 distal spines and 1 seta; coxa with 2 claws, distal part plumed; basis with 1 distal claw and 3 setae. Maxillary syncoxa (Figure 1h) with 2 endites each bearing 2 stout setae; allobasis bearing 1 endite transformed in a claw; endopod fused with basis and bearing 3 setae. Maxilliped (Figure 1f) prehensile; basis with 1 row of spines along inner margin, and 3 tiny spinules along outer margin; endopodal claw smooth.

Swimming legs, exopods 3-segmented; setal formula of exopods: P1 0.0.022; P2 0.1.112; P3 0.1.212; P4 0.1.212. Couplers without ornamentation. P1 (Figure 3a): basipod with 1 inner and 1 outer stout spine; endopod 2-segmented, with segment 1 bearing 1 inner spine and a setula, segment 2 with 2 distal setae; segment 2 may bear 1 inner spine (Figure 3b). P2 (Figure 3f): basipod with outer spine; endopod 1-segmented, as long as exopod segment 1, with 1 strong terminal spine, longer than endopod, and 1 or 2 shorter inner spines. P3 (Figure 2a): endopod 2-segmented; segment 1 armed with 1 inner spiniform seta, segment 2 bearing 3 spiniform setae. P4 (Figure 2b): endopod 1-segmented, shorter than exopod segment 1, bearing 2 spiniform setae. P5 (Figure 2c): baseoendopod with 3 spines; exopod armed with 3 strong spiniform setae (4 setae are present on left P5 of holotype).

#### Male

Length, excluding caudal setae, about 450  $\mu\text{m}$ . Hyaline fringes of posterior margins of urosomites crenulated; urosomites with rows of setules (Figure 3d), and each with 1 row of spinules on ventral margin. Anal somite with 2 rows of spinules (Figure 3d) near posteroventral margin close to each caudal ramus. Anal operculum and shape of caudal rami (Figure 3d) as in female. Outer terminal seta slightly longer than caudal ramus; terminal accessory seta short; dorsal seta shorter than caudal ramus.

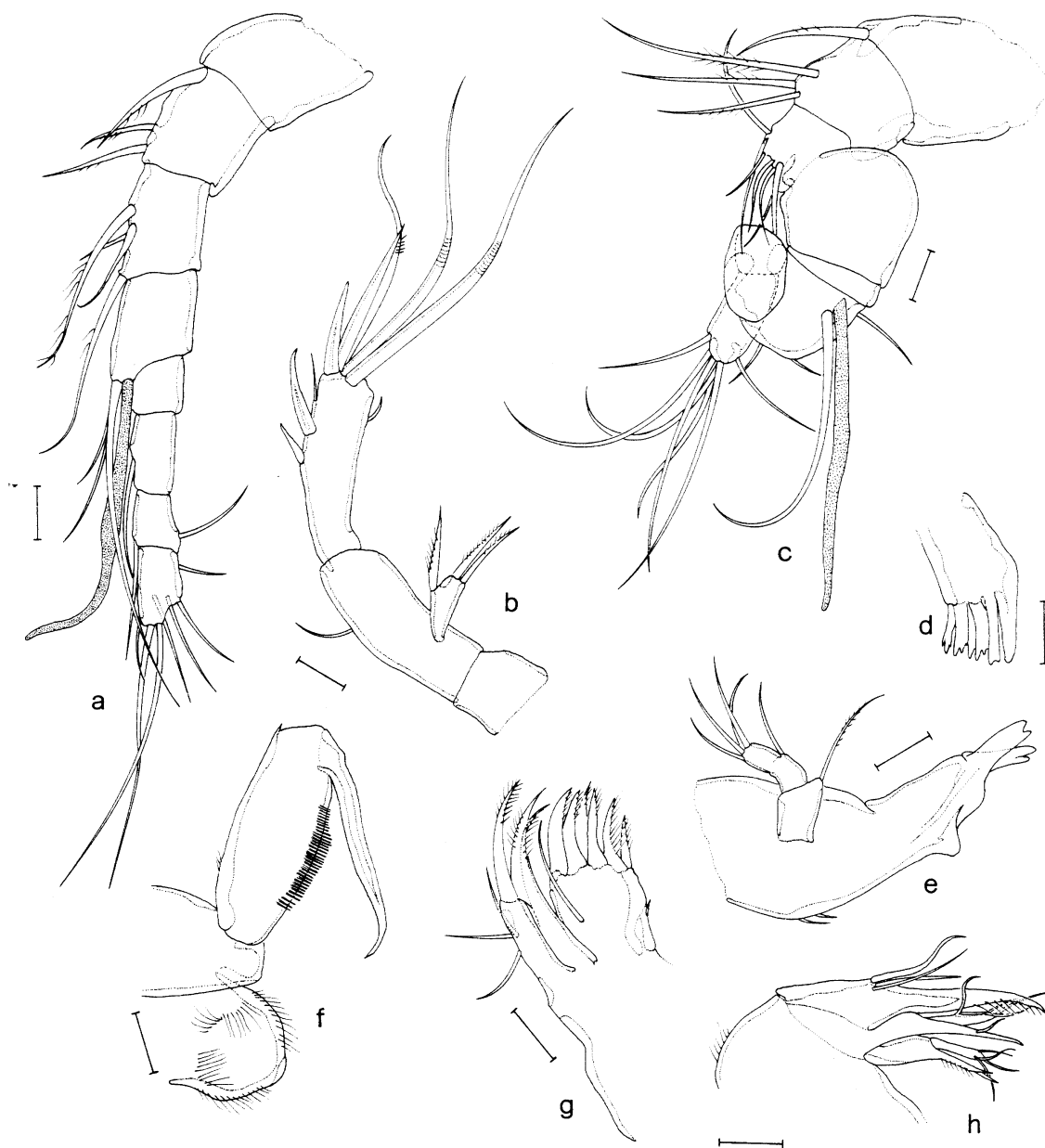


Figure 1. *Lessinocamptus caoduroi* n.sp. a, b, d–h holotype ♀; c allotype ♂. (a) Antennule, ♀; (b) antenna, ♀; (c) antennule, ♂; (d) gnathobase of mandible, ♀; (e) mandible, ♀; (f) maxilliped, ♀; (g) maxillule, ♀; (h) maxilla, ♀. Scale bars, 10  $\mu$ m.

Antennule (Figure 1c) geniculate, 8-segmented; segment 4 bearing 1 aesthetasc longer than 4 distal segments. Antenna and mouthparts as in female.

Swimming legs, exopods and setal formula as in female. P1 and P2 (Figure 3c) endopods as in female. P3 (Figure 3e): endopod 3-segmented, but division between segment 2 and 3 very difficult to observe;

segment 1 bearing 1 inner spine; segment 2 with spini-form process not reaching tip of longer terminal seta of segment 3; segment 3 bearing 2 setae of different length, the inner one approximately 1/3 length of the outer one. P4 (Figure 3g) as in female. P5 (Figure 3h): baseopod with 2 spines; left and right baseopods fused together; exopod armed with 3 strong

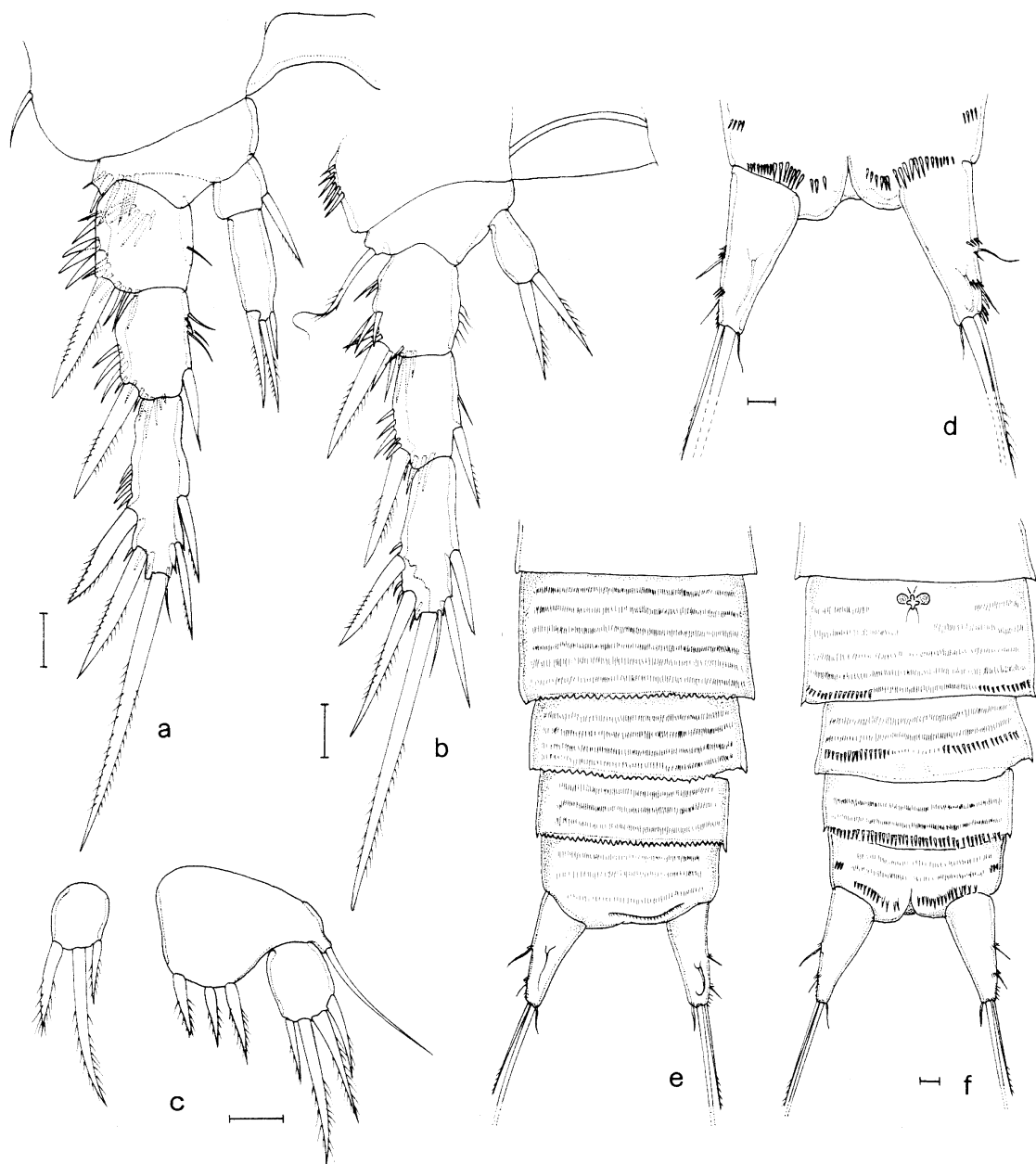


Figure 2. *Lessinocamptus caoduroi* n.sp. holotype ♀. (a) P3; (b) P4; (c) P5; (d) caudal rami, ventral view; (e) abdomen and caudal rami, dorsal view; (f) abdomen and caudal rami, ventral view. Scale bars, 10  $\mu$ m.

spiniform setae. P6 (Figure 3d) bearing 2 short and stout setae.

#### Remarks

*Lessinocamptus caoduroi* n.sp. is chosen as the type species of the new genus because both sexes were collected and described in detail. No variation was

observed between the specimens. The morphological characters described above differ from those of all known canthocamptids and allow an easy identification; differences from the other two congeneric species are reported below.

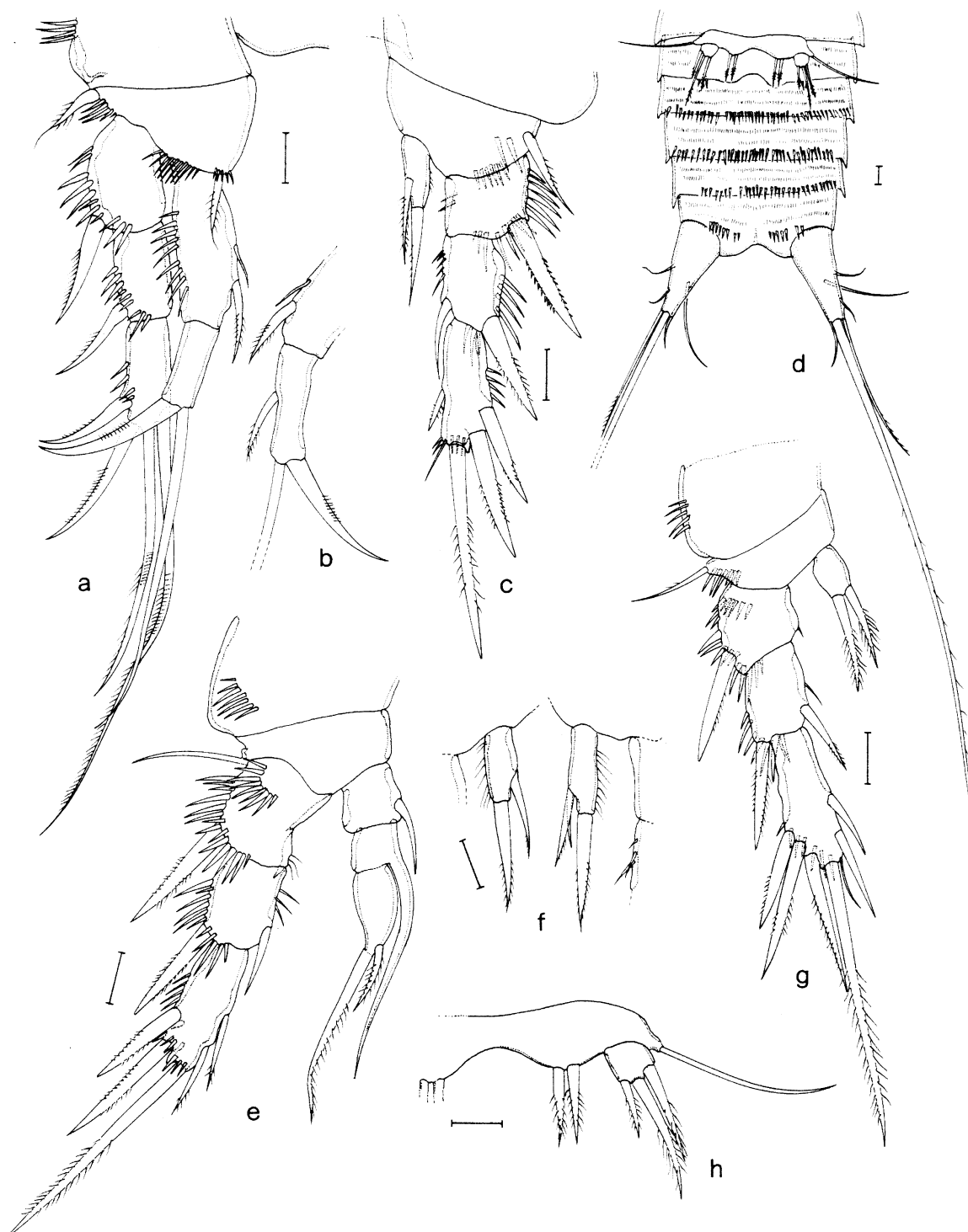


Figure 3. *Lessinocamptus caoduroi* n.sp. a, b, f holotype ♀; c, d, e, g, h, allotype ♂. (a) P1 ♀; (b) endopod P1 ♀; (c) P2 ♂; (d) P5, abdomen and caudal rami ♂, ventral view; (e) P3 ♂; (f) P2 endopods ♀; (g) P4 ♂; (h) P5 ♂. Scale bars, 10  $\mu$ m.

### *Distribution and habitat*

The new species was found only in percolating waters of the vadose zone of caves (elevation over 1000 m a.s.l.). The distribution of the species is presently restricted to the High Lessinian Mountains.

*Lessinocamptus insoletus* (Chappuis, 1928), n.comb.  
(Figures 4–5)

Synonymy (citations in catalogues as *Canthocamptus insoletus* are not reported)

*Canthocamptus insoletus*: Chappuis, 1928: 26; Lang, 1948: 937; Borutzky, 1952: 340; Dussart & Defaye, 1990: 89 (as incertae sedis); Janetzky, Enderle & Noodt, 1996: 67

(*Canthocamptus*) *insoletus*: Chappuis, 1954: 5

*Moraria insoleta*: Dussart, 1969: 311

*Moraria insolete*: Pesce, 1985: 136

*Morariopsis insoletus*: Cottarelli, 1996: 30

### *Material examined*

Cave 'Buso della Rana' (cadastre number 40 V/VI), Monte di Malo, Lessinian Mountains, province of Vicenza, m 340 a.s.l.; small rivulet of percolating water; water temperature = 9.9 °C, pH = 8.9, conductivity = 260  $\mu\text{S cm}^{-1}$ ; 20 August 1994, leg. F. Gasparo & F. Stoch, 1♀ (completely dissected and mounted on slide in Faure's medium, coll. F. Stoch).

### *Female*

Length, excluding caudal setae, 390  $\mu\text{m}$  (somewhat contracted). Hyaline fringes of posterior margins of urosomites crenulated (Figure 5d); all urosomites with transverse rows of tiny setules. Genital segment and genital field as in Figure 5c, ventral side with 2 sensilla near caudal margin. Two urosomites posterior to genital segment (Figure 5c) each with 1 row of spinules on ventral margin. Anal somite with 2 rows of spinules (Figure 4h) near posteroventral margin above each caudal ramus; longer spinules inserted between caudal rami. Anal operculum slightly convex, smooth, with fine hairs. Caudal rami about 2.3 times longer than wide (Figure 4h), slightly longer than anal somite. Anterolateral and posterolateral caudal setae short, accompanied by spinules; outer terminal seta short spiniform (Figure 4h); terminal accessory seta short, slightly longer than outer terminal spiniform seta; dorsal seta short, shorter than half length of caudal ramus.

Antennule (Figure 4a) 8-segmented; segment 1 unarmed, segment 2 bearing 4 setae; segment 4 bearing 1 aesthetasc longer than 4 distal segments. Antenna

as in Figure 4b, with exopod 1-segmented, bearing 3 setae.

Mandible as in Figure 4c; coxa with 1 proximal row of spinules, 1 subdistal lateral tooth and gnathobase with 4 teeth and 1 seta at dorsal corner; mandibular palp 2-segmented: segment 1 bearing 1 long seta; segment 2 bearing 1 lateral and 4 terminal setae. Maxillule (Figure 4d) with praecoxa armed with 3 small spinules; arthrite with 5 short distal spines and 1 seta; coxa with 2 claws, distal part plumed; basis with 1 distal claw and 5 setae. Maxillary syncoxa (Figure 4f) with 2 endites each bearing 2 claws; allobasis bearing 1 endite transformed in a short, strong and blunt spine; endopod fused with basis and bearing 3 setae. Paragnaths as in Figure 4e. Maxilliped (Figure 4g) prehensile; basis with 1 row of spines along inner margin, and 2 small rows of spinules along outer margin; endopodal claw smooth.

Swimming legs exopods 3-segmented, bearing stout and sometimes blunt spines; setal formula of exopods: P1 0.0.022; P2 0.1.112; P3 0.1.212; P4 0.1.212. Couplers without ornamentation. P1 (Figure 5a): basipod with inner seta; endopod 2-segmented, with segment 1 bearing 1 inner spine, segment 2 with 2 distal setae. P2 (Figure 5b): basipod with short outer spine; endopod 1-segmented, ovoid, slightly shorter than exopod segment 1, with 1 strong terminal spine, as long as segment. P3 (Figure 5f): endopod 1-segmented, bearing 2 spiniform setae and 1 short spine. P4 (Figure 5g): endopod 1-segmented, short, bearing 2 spiniform setae. P5 (Figure 5e): baseoendopod with 4 spiniform setae and 1 short anterior spine; exopod armed with 4 strong setae, seta II longer than the others.

### *Male*

It was not possible to examine the type material, therefore the following characters are after Chappuis (1928), critically revised.

Length, excluding caudal setae, approximately 600  $\mu\text{m}$ . Hyaline fringes of posterior margins of urosomites crenulated as in female. Urosomites with transverse rows of tiny setules as in female, and with one row of spinules on ventral margin. Anal operculum convex, smooth, with fine hairs. Caudal rami about 2 times longer than wide, with setation as in female. Antennule geniculate, segment 4 large. Antenna endopod 1-segmented, bearing 3 setae as in female.

Swimming legs exopods and setal formula as in female. P1 endopod eventually lacking inner seta on segment 1. P2 endopod 1-segmented, ovoid, as in

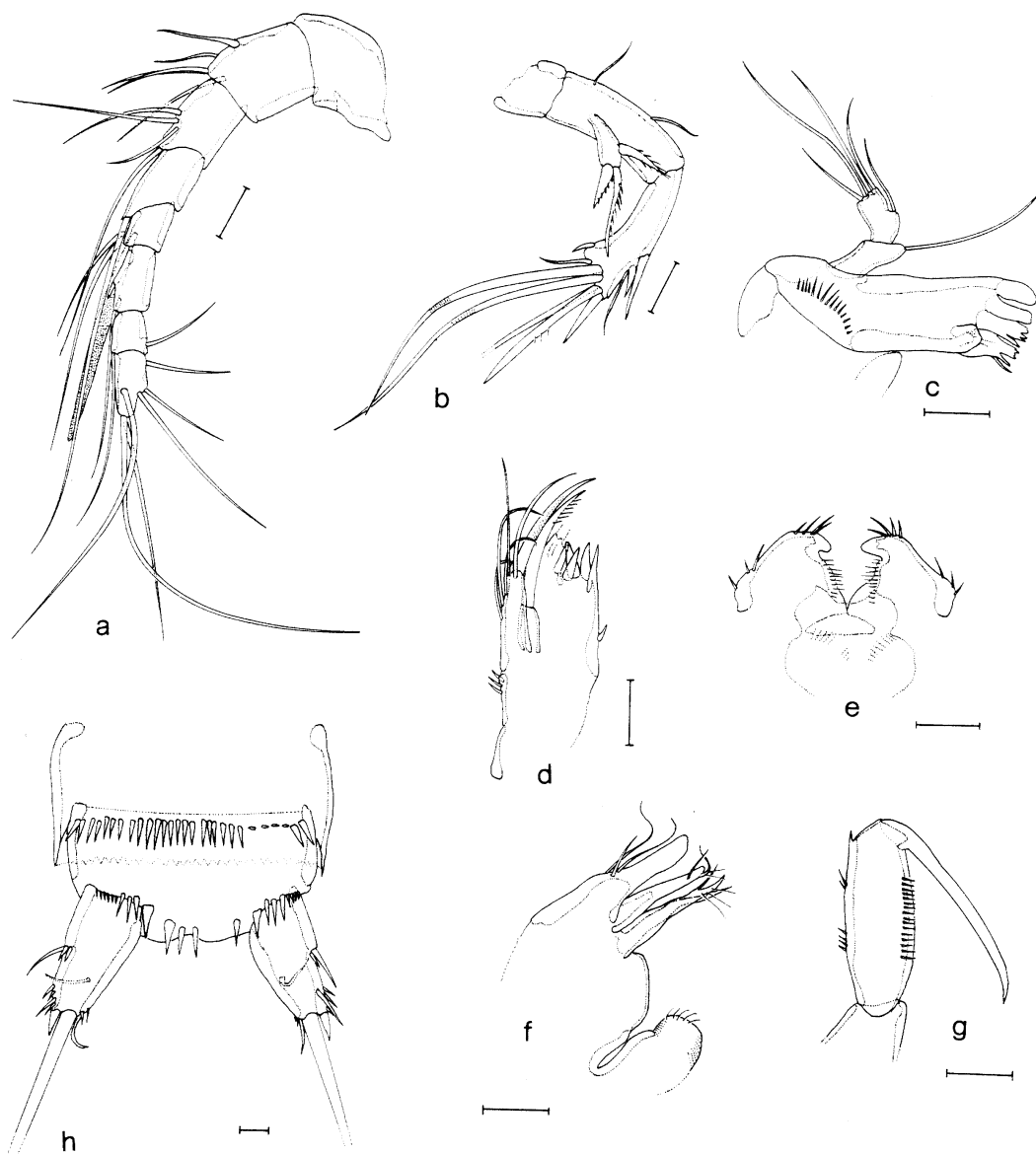


Figure 4. *Lessinocamptus insoletus* (Chappuis) ♀. (a) Antennule; (b) antenna; (c) mandible; (d) maxillule; (e) paragnaths; (f) maxilla; (g) maxilliped; (h) anal segment and caudal rami, ventral view. Scale bars, 10  $\mu$ m.

female but lacking terminal spine; probably this spine was broken in the male examined by Chappuis (1928), or the specimen had a teratological segment. P3 endopod 3-segmented (Chappuis reported 2 segments, but the division between segment 2 and 3 is very difficult to observe, and the drawing shows the shape of a normally 3-segmented endopod); distal article with 1 seta. P4 endopod as in female. P5 baseoendopod with 2 spines; exopod armed with 3 strong setae.

#### Remarks

*Lessinocamptus insoletus* (Chappuis) can be easily distinguished from *L. caoduroi* n.sp. by its possession of the following characters:

- ornamentation of dorsal side of urosomites
- anal segment bearing stouter spinules
- shorter caudal rami
- outer terminal caudal seta transformed in a short



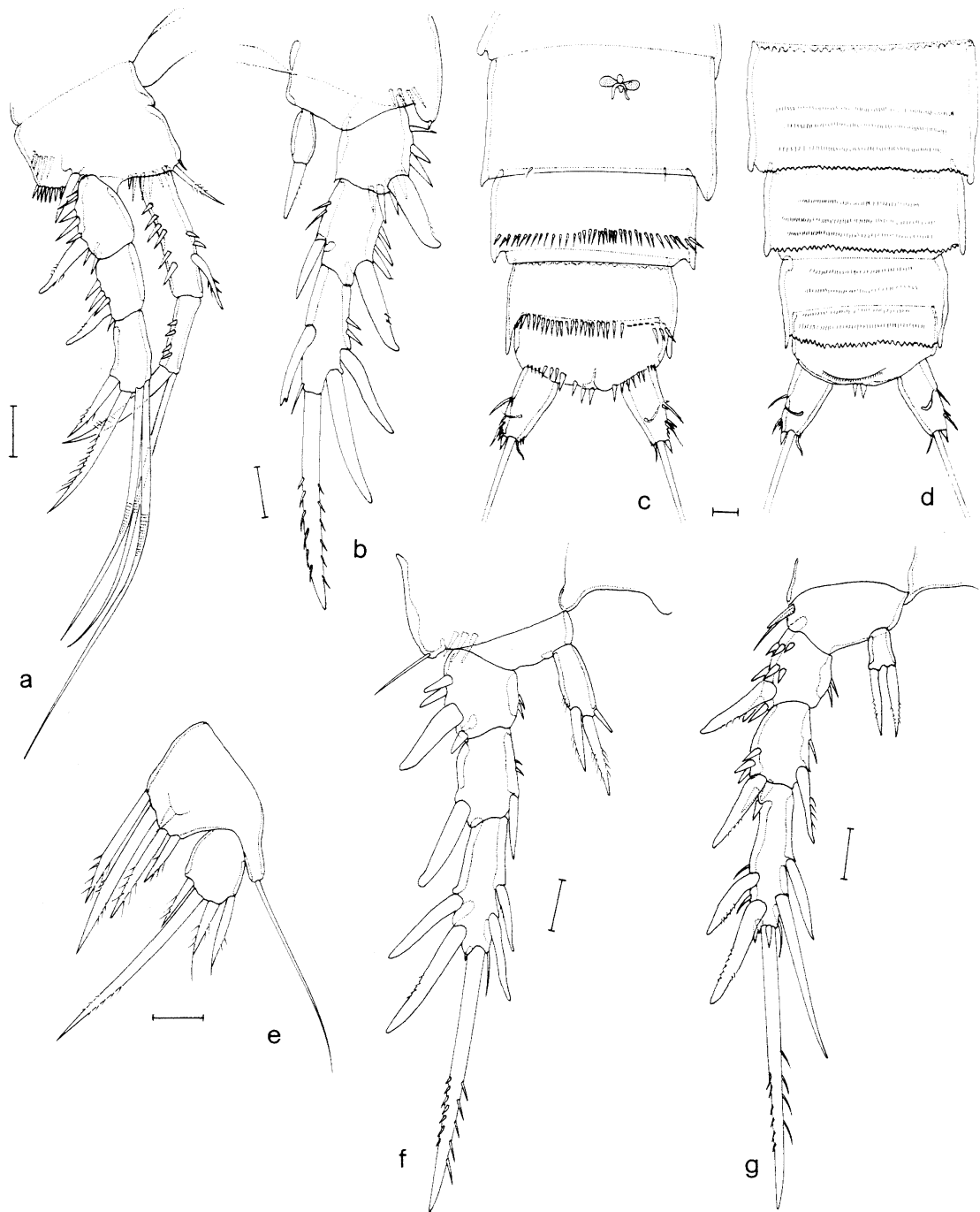


Figure 5. *Lessinocamptus insoletus* (Chappuis) ♀. (a) P1; (b) P2; (c) abdomen and caudal rami, ventral view; (d) abdomen and caudal rami, dorsal view; (e) P5; (f) P3; (g) P4. Scale bars, 10  $\mu$ m.

and stout spine

- spines of maxilla and of swimming legs stout and blunt
- P2 endopod short, with only 1 terminal spine
- female P3 endopod 1-segmented
- female P5 baseoendopod with 4 longer spiniform setae and a short anterior spine
- female P5 endopod bearing a longer seta II.

#### *Distribution and habitat*

The species was found only in the cave 'Buso della Rana'. The single female specimen was discovered in a small rivulet of percolating water, whereas the males examined by Chappuis (1928, 1954) were collected in the hypogean brook. Intensive sampling in the brook did not yield any specimen of *L. insoletus*; it is therefore probable that the vadose zone is the main habitat of the species, which can be transported into the brook by percolating water.

*Lessinocamptus pivai* n.sp.(Figures 6–7)

#### *Material examined*

Cave 'Buso della Rana' (cadastre number 40 V/VI), Monte di Malo, Lessinian Mountains, province of Vicenza, m 340 a.s.l.: residual pools of the hypogean brook; water temperature = 10.1 °C, pH = 8.3, conductivity = 10  $\mu\text{S cm}^{-1}$ ; 17 July 1993, leg. F. Gasparo, E. Piva, F. Stoch, 2 ♂♂ (1 mounted on slide, 1 preserved in 70% ethanol, coll. F. Stoch); hypogean brook between the rooms 'Vigna' and 'Trivio'; water temperature = 9.9 °C, pH = 8.7, conductivity = 240  $\mu\text{S cm}^{-1}$ ; 20 August 1994, leg. F. Gasparo & F. Stoch, 2 ♂♂ (1 mounted on slide, 1 preserved in 70% ethanol, coll. F. Stoch).

#### *Type series*

Holotype ♂, completely dissected and mounted on slide in Faure's medium (collected 17 July 1993); paratypes 3 ♂♂ (partly mounted on slide, partly ethanol preserved); all from 'Buso della Rana' (40 V/VI), Lessinian Mountains, Vicenza, Italy. Holotype deposited in Museum of Natural History, Verona; paratypes in coll. F. Stoch.

#### *Etymology*

The new species is dedicated to Mr E. Piva (Vicenza), experienced biospeleologist, for his contribution to the knowledge of the cave fauna of the Province of Vicenza.

#### *Female unknown*

#### *Male*

Length, excluding caudal setae, 340–350  $\mu\text{m}$  (somewhat contracted). Hyaline fringes of posterior margins of urosomites smooth; urosomites without rows of setules. Urosomites (Figure 7d) each with 1 row of spinules on ventral margin. Anal somite with 2 rows of spinules (Figure 7d) near posteroventral margin above each caudal ramus, the 3 inner spinules being very long. Anal operculum slightly convex, smooth, with fine hairs. Caudal rami about 1.7 times longer than wide (Figure 7d), shorter than anal somite. Anterolateral and posterolateral caudal setae as long as caudal ramus, each accompanied by 1 spinule; outer terminal seta long (Figure 7d, right), 3 times longer than caudal ramus; terminal accessory seta as long as ramus; dorsal seta long, 2 times longer than caudal ramus.

Antennule (Figure 6a) geniculate, 8-segmented; segment 4 bearing 1 aesthetasc longer than 4 distal segments. Antenna as in Figure 6b, with endopod 1-segmented, bearing 1 seta and 1 stout sharp distal spine.

Labrum as in Figure 6c. Mandible as in Figure 6h,i; coxa with 1 proximal row of spinules, 1 subdistal lateral tooth and gnathobase with 4 teeth and 1 seta at dorsal corner; mandibular palp 2-segmented: segment 1 bearing 1 long seta; segment 2 bearing 1 lateral and 4 terminal setae. Maxillule (Figure 6e) with arthrite armed with 7 distal spines and 1 seta; coxa with 2 claws; basis with 3 setae. Maxillary syncoxa (Figure 6g) with 2 endites bearing 2 and 4 setae respectively; allobasis bearing 1 endite transformed in long claw; endopod fused with basis and bearing 3 setae. Maxilliped (Figure 6f) prehensile; basis with 1 row of spines along inner margin, and 1 small spinule along outer margin; endopodal claw smooth.

Swimming legs exopods 3-segmented, bearing slender spines; setal formula of exopods: P1 0.0.022; P2 0.1.112; P3 0.1.212; P4 0.1.212. Couplers without ornamentation. P1 (Figure 6d): basipod with inner seta; endopod 2-segmented, with segment 1 bearing 1 long and stout seta, segment 2 with 2 distal setae. P2 (Figure 7a): basipod with stout outer spine; endopod 2-segmented; segment 1 with 1 inner spine, segment 2 with 3 inner short spines and 1 long terminal spine, as long as the endopod. P3 (Figure 7b): endopod 3-segmented; segment 1 bearing 1 inner spine; segment 2 with spiniform process reaching the tip of the two terminal, subequal setae of segment 3. P4 (Figure 7c): endopod 1-segmented, bearing 2 setae. P5 (Figure 7e): baseoendopod with 2 slender spines; left

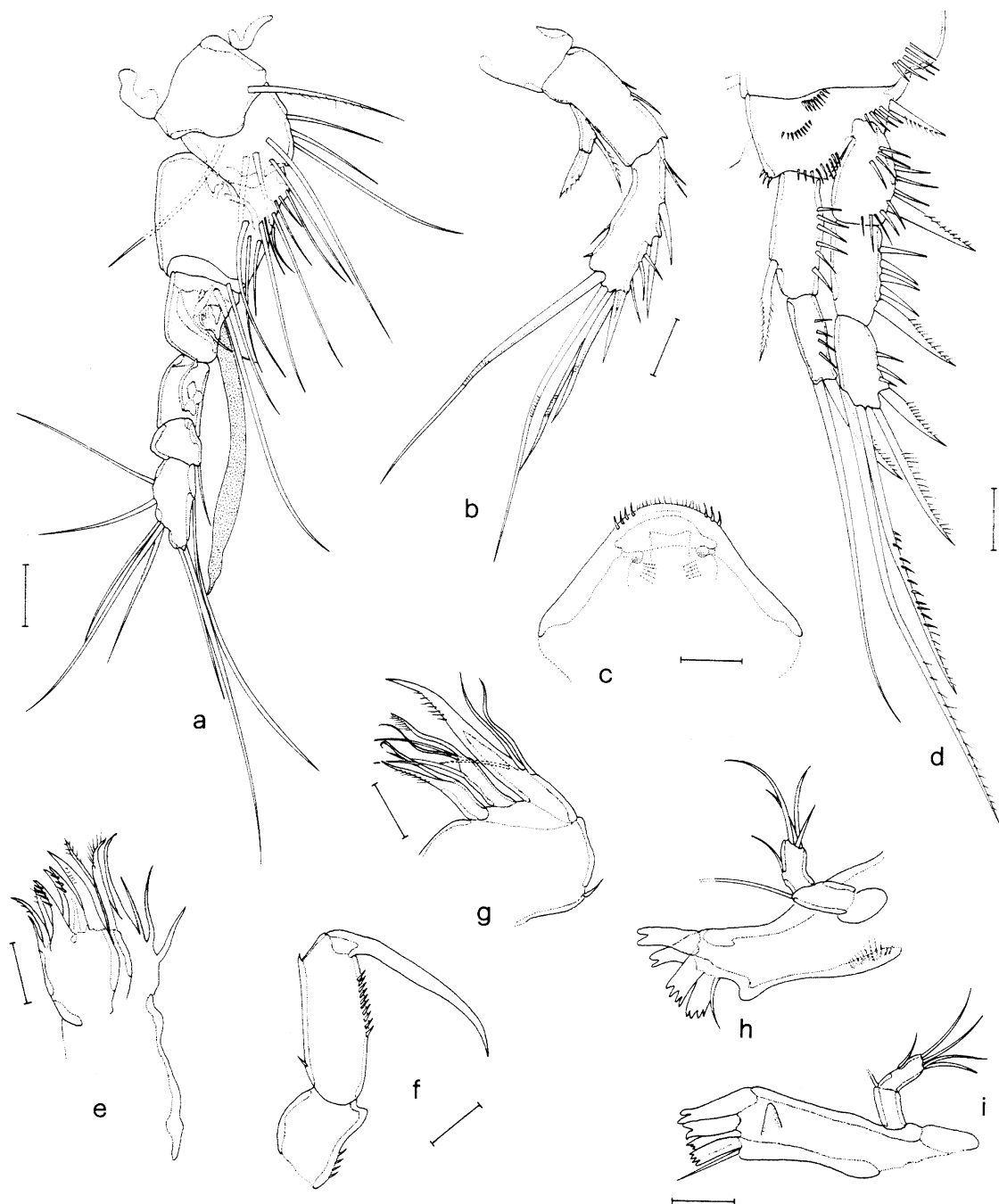


Figure 6. *Lessinocamptus pivai* n.sp. holotype ♂. (a) Antennule; (b) antenna; (c) labrum; (d) P1; (e) maxillule; (f) maxilliped; (g) maxilla; (h) mandible; (i) mandible, different angle of view. Scale bars, 10  $\mu$ m.

and right baseoendopods fused together; exopod partially fused with baseoendopod, armed with 3 strong setae, the medial one longer than the others. P6 (Figure 7d) bearing 2 very small setae.

#### Remarks

No variation of the morphological characters described above was observed in the four specimens examined. *Lessinocamptus pivai* n.sp. can be easily distinguished

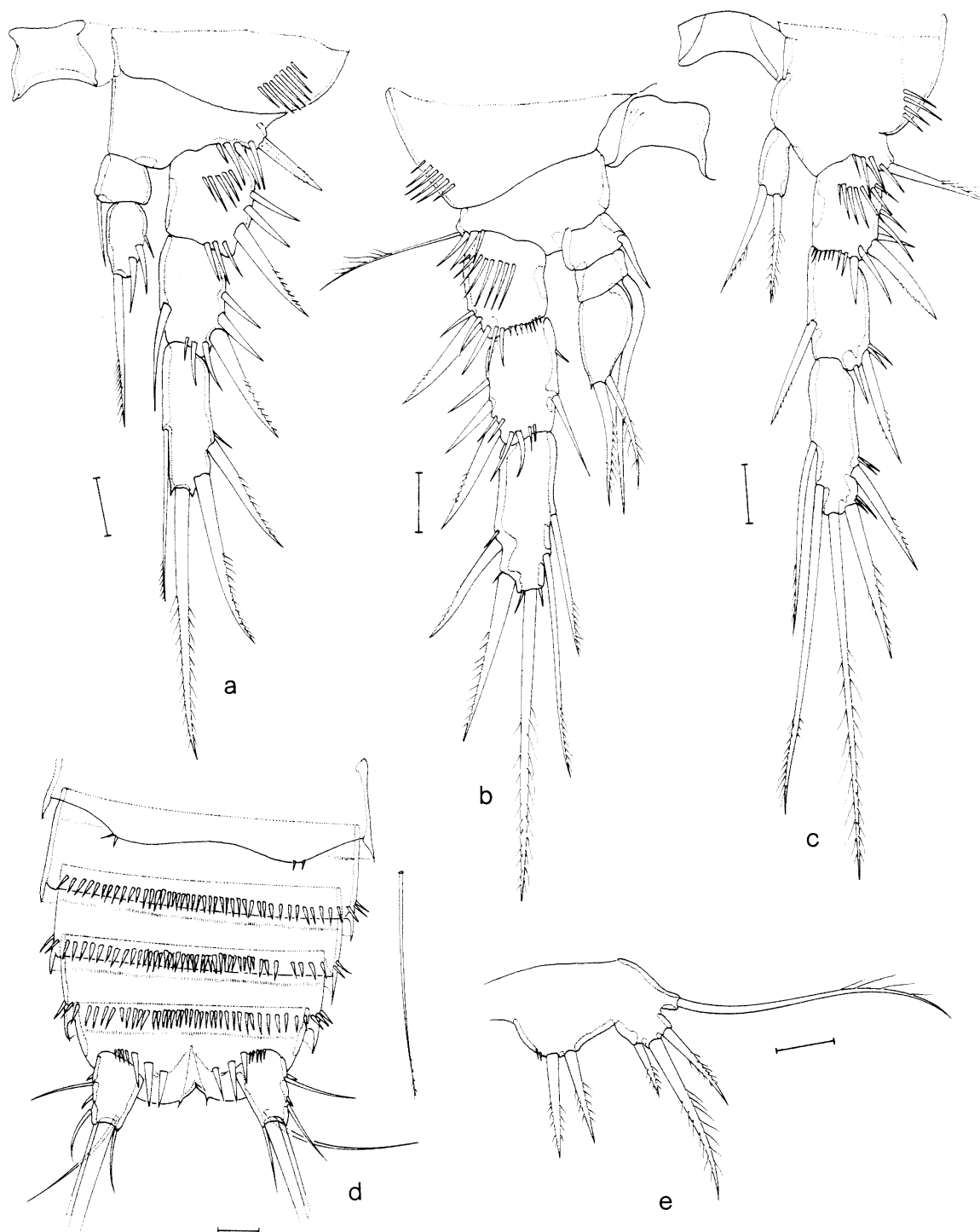


Figure 7. *Lessinocamptus pivai* n.sp. holotype ♂. (a) P2; (b) P3; (c) P4; (d) abdomen and caudal rami, ventral view, and outer terminal seta (right); (e) P5. Scale bars, 10  $\mu$ m.

from the other two species of *Lessinocamptus* by the following characters:

- posterior margins of urosomites smooth dorsally
- anal segment with long stout spinules
- shorter caudal ramus
- outer terminal caudal seta very long
- dorsal caudal seta very long, more than 2 times as long as caudal ramus
- antenna exopod bearing 1 seta and 1 spine
- P2 endopod 2-segmented, with long terminal spine
- P5 exopod fused with baseoendopod.

The plesiomorphic 2-segmented P2 endopod, the plesiomorphic setation of caudal ramus, the apomorphic armature of antennary exopod and the apomorphic structure of P5 are aberrant characters within the genus *Lessinocampus*; nevertheless, *L. pivai* n.sp. shares with the other two species the structure and setation of the mandibular palp, the setal formula of P1–P4 exopods, the shape of the P4 endopod and the setation of male P5. Additional material and the description of the female are required to assess its exact taxonomic position.

#### *Distribution and habitat*

The species was found only in the ‘Buso della Rana’ cave, in samples from the inner stretch of the hypogean brook.

#### **Acknowledgments**

The author is indebted to J. W. Reid (Smithsonian Institution, Washington) for the helpful comments on an early draft. F. Gasparo, G. Caoduro and E. Piva helped in the field work and provided several facilities in visiting the caves; I thank them all.

#### **References**

- Borutzky, E. V., 1952. Freshwater Harpacticoida. Fauna U.S.S.R., Crustacea, 3: 1–396 (English translation, Jerusalem, 1964).
- Caoduro, G., F. Gasparo & F. Stoch, 1995. Primi risultati delle indagini sulla fauna delle acque sotterranee della regione veronese. *Speleol. Veneta* 3: 92–96.
- Chappuis, P. A., 1928. Nouveaux Copépodes cavernicoles. *Bul. Soc. St. Cluj* 4: 20–34.
- Chappuis, P. A., 1954. Nouveaux Crustacés troglobies de l’Italie du Nord. *Mem. Mus. Civ. Stor. Nat. Verona* 4: 1–12.
- Cottarelli, V., 1996. Copepoda Harpacticoida. In Minelli A., S. Ruffo & S. La Posta (eds), *Checklist delle specie della fauna italiana*. Calderini, Bologna, 28: 23–34.
- Dussart, B. H., 1969. Les Copépodes des eaux continentales d’Europe occidentale. Boubée & Cie, Paris, tome I: 1–500, tome II: 1–292.
- Dussart, B. H. & D. Defaye, 1990. Répertoire mondial des Crustacés Copépodes des eaux intérieures. III. Harpacticoides. *Crustaceana*, Leiden, suppl. 16: 1–384.
- Janetzky, W., R. Enderle & W. Noodt, 1996. Crustacea Copepoda Gelyelloida und Harpacticoida. *Süßwasserfauna von Mitteleuropa*, 8: 1–228.
- Lang, K., 1948. *Monographie der Harpacticiden*. Lund 2 vols: 1–1682.
- Pesce, G. L., 1985. The groundwater fauna of Italy: a synthesis. *Stygologia* 1: 129–159.
- Petkovski, T. K. & A. Brancelj, 1988. *Elaphoidella serbica* n.sp., ein neuer Harpacticoides aus Ostserbien (Crustacea, Copepoda). *Fragm. Balc.* 14: 47–58.