

# BULLETIN

# ZOÖLOGISCH MUSEUM

U N I V E R S I T E I T V A N A M S T E R D A M

Vol. 11 No. 5 1987

## CAVE-DWELLING CYCLOPOIDS (CRUSTACEA, COPEPODA) FROM VENEZIA GIULIA (NORTHEASTERN ITALY)

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### ABSTRACT

Description of some troglobiont cyclopids from cave waters of Venezia Giulia (northeastern Italy). *Acanthocyclops gordani* Petkovski, *Acanthocyclops venustus stammeri* (Kiefer), *Acanthocyclops troglophilus* (Kiefer), *Diacyclops charon* (Kiefer) and *Diacyclops tantalus* (Kiefer), are recorded for the first time from Italy; *Diacyclops antrincola* Kiefer is new to north-eastern Italy; *Metacyclops gasparoi* n.sp. is new to science and belongs to *minutus*-group.

### INTRODUCTION

Biological studies on cave waters and karst springs of Venezia Giulia (Provinces of Trieste and Gorizia, northeastern Italy) (Stoch, 1985b) provided, besides several widely distributed forms (already reported from epigeal freshwater environments near Trieste: Stoch, 1985a), some interesting troglobiont species as well: *Acanthocyclops gordani* Petkovski, 1971, *A. venustus stammeri* (Kiefer, 1930), *A. troglophilus* (Kiefer, 1932), *Diacyclops charon* (Kiefer, 1931) and *Diacyclops tantalus* Kiefer, 1937, are new to Italy. The original descriptions of these species were not accurate (except for that of *Acanthocyclops gordani*) and until now their exact taxonomic status was not established. The discovery of these cyclo-

pids in Venezia Giulia is of great biogeographical interest since, up to now, these species were reported from some few localities in Yugoslavia only. Another interesting species, *Diacyclops antrincola* Kiefer, 1967, was only known from Central and Southern Italy, Yugoslavia, Greece and Turkey. Finally, a species new to science, *Metacyclops gasparoi* n.sp., is described.

In this paper the synonymies and a detailed description of the most interesting species are given, followed by the description of the new species; the taxonomic status and the distribution of each species are also discussed.

Part of material has been deposited in the Zoölogisch Museum, Amsterdam (ZMA).

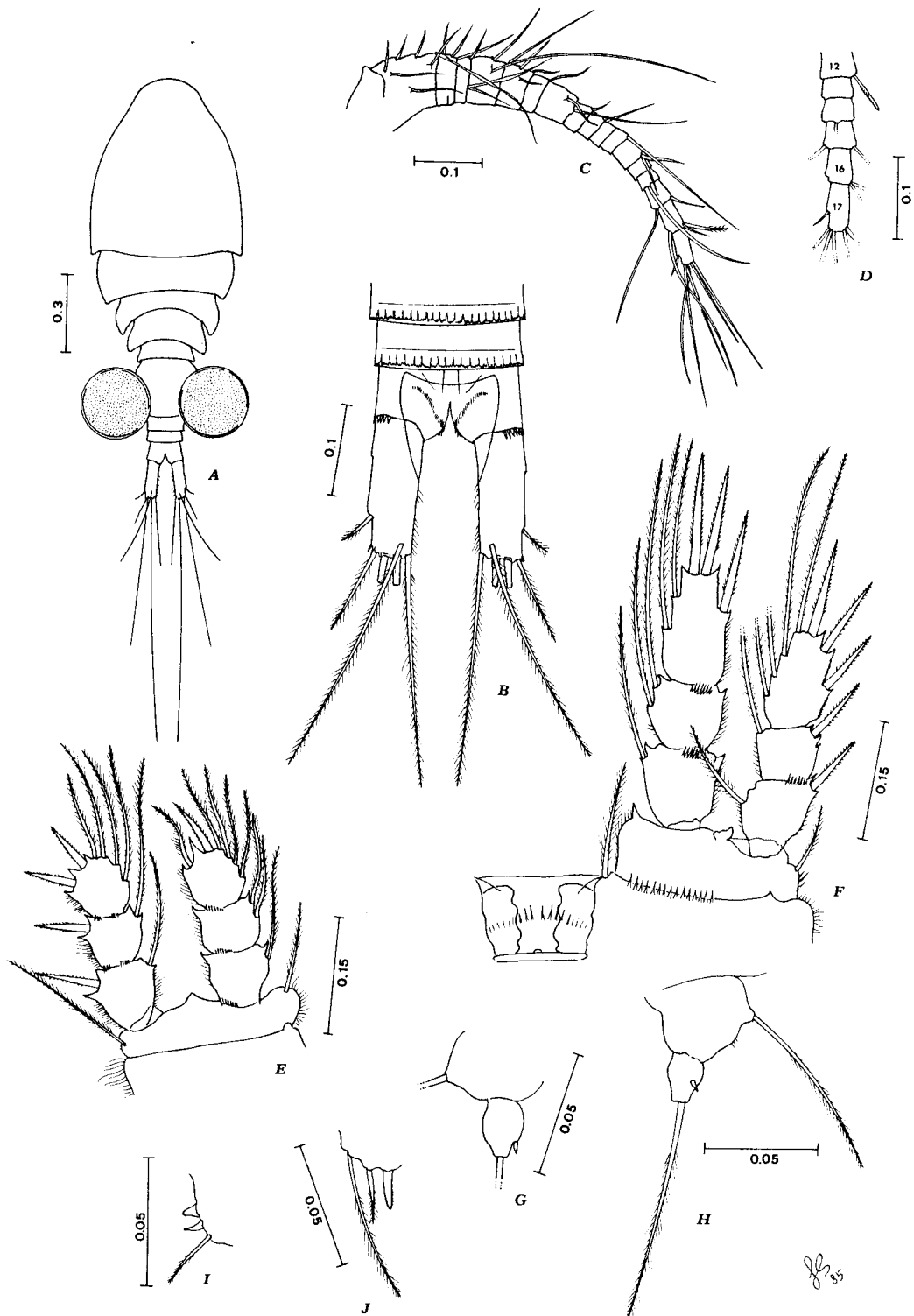


Fig. 1. *Acanthocyclops gordani* Petkovski, 1971 (Well near Peschiera del Timavo). ♀: A, habitus; B, anal plate and furcal rami; C, antennula; D, distal articles of antennula; E, P1; F, P4; G, H, P5; I, P6. ♂; J, P6. Scales in mm.

## DESCRIPTIVE PART

### *Acanthocyclops gordani* Petkovski, 1971

*A. gordani* Petkovski, 1971: 89, figs. 25-34; Petkovski, 1978: 163.

#### Loc. typ.

Subterranean waters near Farmaci (Montenegro, Yugoslavia).

#### Localities cited

Known only from type-locality (Petkovski, 1971) and a cave near Rovinj, Istria (Yugoslavia) (Petkovski, 1978).

#### Material examined

Well near Peschiera del Timavo, 3948 VG (Duino-Aurisina, prov. Trieste), leg. F. Gasparo and F. Stoch, 15-VIII-1985, several specimens (♂♂, ♀♀, 1 ovigerous ♀, copepodids) (p.p. ZMA).

Cave E. of the Monfalcon Railway Station, 4913 VG (prov. Gorizia), leg. F. Gasparo and F. Stoch, 9-VI-1985, 1 ♂.

Well near Jamiano, 360 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 9-VI-1985, 1 ♂.

Cave near Comarie, 4221 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 10-VIII-1985, 1 ♀; 1-IX-1985, 1 ♀; 20-X-1985, 1 ♀, copepodids.

#### Description.

The morphological characteristics of the specimens examined (fig. 1) agree with the original description of Petkovski (1971); the following features are diagnostic for this species: (1) antennules 17-segmented (fig. 1 C-D); (2) setae at the inner edge of the endopod 3 of P3-P4 transformed into spines (fig. 1F); (3) spine formula of 3rd exopodite segment (P1-P4): 2.3.3.3; bristle formula: 4.4.4.4; (4) P5 (fig. 1G-H) with wide proximal article; distal article with short inner spine, well-articulated; (5) genital segment wider than long, anterolaterally rounded; (6) furcal ramus (fig. 1B) short (3.5 times as long as wide); inner margin with row of setules. Dorsal seta twice longer than outer one in the types; in the specimens from Venezia Giulia the dorsal seta is longer than the inner one.

Ovisacs (ovigerous female from well near Peschiera del Timavo) with one egg (fig. 1A)

## Remarks

*A. gordani* is a stygobiont species and belongs to a group of species distributed also in Greece (*A. dussarti* Pesce & Maggi, 1977; *A. cephalenus* Pesce, 1979) and Iran (*A. dussarti orientalis* Pesce & Maggi, 1982). This group shows features of both *Acanthocyclops* and *Megacyclops*; for this reason, the distinction of these two subgenera (or genera), according to the structure of P5 and the presence of setules on the inner margin of furcal rami, has probably to be rejected.

I do not agree with the opinion of Pesce (1979) who arranged in the same phyletic line of the *A. gordani*-group, the species *A. kieferi* (Chappuis, 1925), *A. rhenanus* Kiefer, 1937 and *A. sensitivus* (Graeter & Chappuis, 1914). These species differ from *A. gordani* in the number of segments of the antennules (*A. kieferi* and *A. rhenanus*) or the form of the receptaculum seminis (*A. sensitivus*) and probably belong to other groups.

Petkovski (1971) considered *A. gordani* as a probable hybrid between *A. troglophilus* Kiefer, 1932 and a *Megacyclops* species. The discovery of the populations of Carso Triestino (coexisting with *A. troglophilus*), morphologically identical with those of Montenegro, and the presence of an ovigerous female in the samples, confirm the validity of *A. gordani* as a good species, well distinguished from all the other known species of the genus.

### *Acanthocyclops venustus stammeri* (Kiefer, 1930)

*Cyclops (Acanthocyclops) Stammeri* Kiefer, 1930: 222, figs. 1-4; Kiefer, 1933: 39.

*Cyclops stammeri* Stammer, 1932: 582; Chappuis, 1933: 10; Wolf, 1937 (III): 49.

*Acanthocyclops venustus Stammeri*, Kiefer, 1938: 97; Kiefer, 1957b: 76.

*Acanthocyclops venustus stammeri*, Monchenko, 1984: 29, figs. 1-12.

*Acanthocyclops stammeri* (partim), Rylov, 1948: 232, fig. 51 (1-4).

*Megacyclops (Megacyclops) capillatus* (partim), Plesa, 1969: 83.

*Acanthocyclops venustus*, Rosol & Sterba, 1983: 68.

#### Loc. typ.

Skocjanske Jame (Slovenia, Yugoslavia)

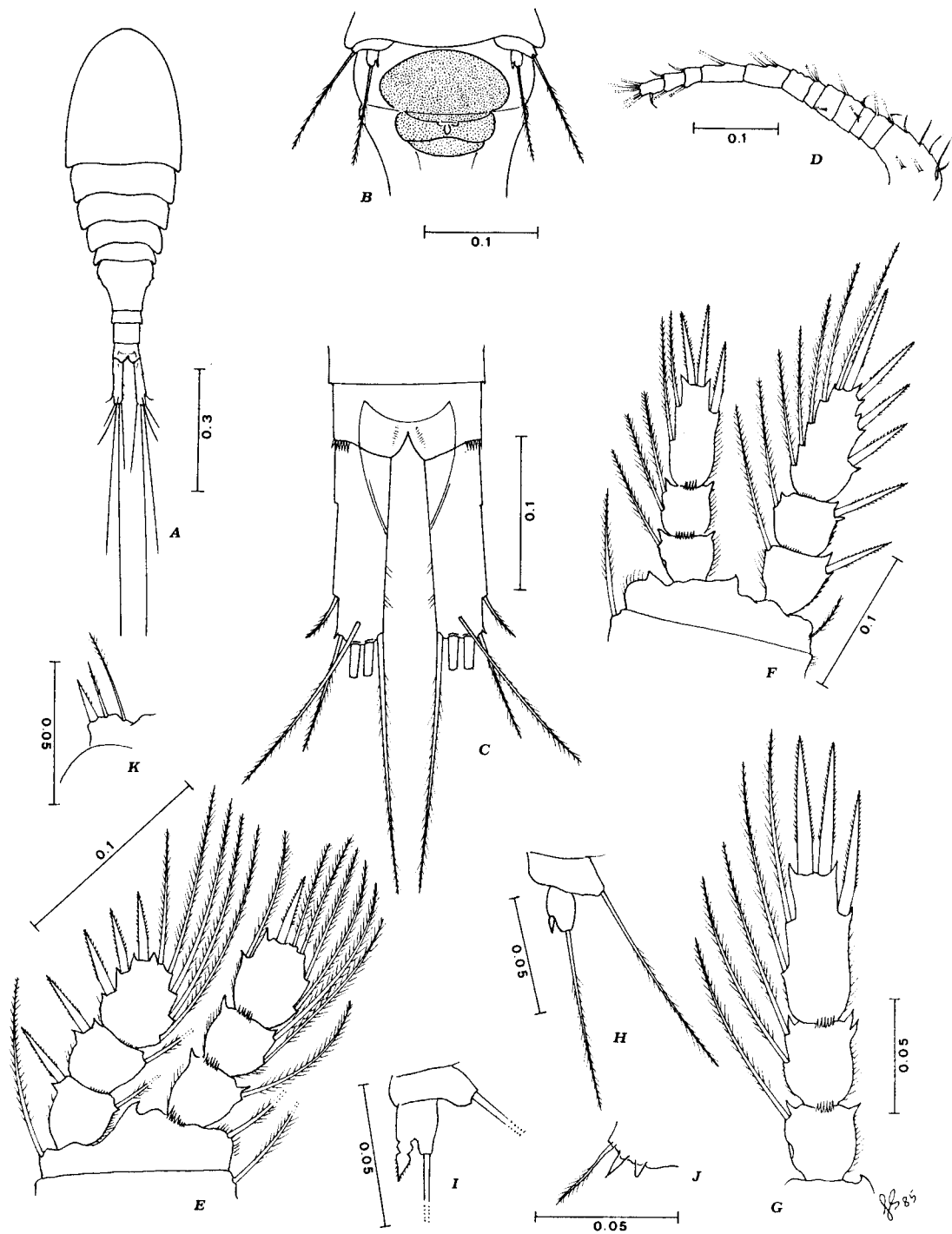


Fig. 2. *Acanthocyclops venustus stammeri* (Kiefer, 1930) (Well near Jamiano). ♀: A, habitus; B, genital segment and receptaculum seminis; C, anal plate and furcal rami; D, antennula; E, P1; F, P4; G, endopodite of P4; H, P5; I, abnormal right P5; J, P6. ♂: KP6. Scales in mm.

### Localities cited

Yugoslavia: Skocjanske Jame (= Höhle von St. Canzian): Kiefer, 1930 and Stammer, 1932; Postojnska Jama (= Adelsberger Höhle): Stammer, 1932 and Kiefer, 1933; Cave near Novo Mesto and well near Podgorica: Kiefer, 1938; Russia: interstitial water of the Caucasian rivers Dzhubga and Psezuapse: Monchenko, 1984.

### Material examined

Well near Jamiano, 360 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 24-II-1985, 1 ♀; 9-VI-1985, 2 ♀♀; 10-VIII-1985, 1 ♀; 15-IX-1985, 2 ♀♀ (1 ♀ ZMA).

Cave near Comarie, 4221 VG (Doberdò del Lago, prov. Gorizia), leg. F. Stoch, 21-VII-1984, 1 ♂.

### Description of female

Mean body length (including furcal rami) approximately 1.2 mm; eyes pigmented.

Genital segment (fig. 2B) anterolaterally rounded, longer than wide; receptaculum seminis as in fig. 2B. Posterior margin of abdominal segments serrate. Anal plate (fig. 2C) well-developed, with smooth margin.

Furcal ramus (fig. 2C) four times as long as wide; inner margin with few setules. Inner distal apical seta almost twice as long as outer; dorsal seta 0.8 times as long as outer one. Median setae (fig. 2A) shorter than body length (inner median bristle as long as body in description of Kiefer, 1930).

Antennula 12-segmented (fig. 2D), not reaching posterior margin of cephalothorax.

Rami of swimming legs 3-segmented; spine formula of 3rd exopodites 3.4.4.4; bristle formula (exp/enp):

	P1	P2	P3	P4
1	1/1	1/1	1/1	1/1
2	1/2	1/2	1/2	1/2
3	5/4	5/4	5/4	5/2

Endopodite 3 of P1 (fig. 2E) 1.1-1.2 times as long as wide, apical spine shorter than article.

Endopodite 3 of P4 (fig. 2 F-G) 2.2-2.3 times as long as wide, with two apical spines of comparable length, shorter than article. Seta at inner edge of this article transformed into spine. Inner edge of endopodite 1 of P4 with slight incurvation.

P5 (fig. 2 H-I): basal article very short; inner spine

of the distal article short (only in one aberrant specimen distal article of right P5 armed with a longer spine: fig. 2I). Bristles very long.

P6 (fig. 2J): two short and stout spines and a seta.

### Description of male

Body shape, furcal rami and swimming legs as in female.

P6 (fig. 2K) bearing a spine and two setae of different length.

### Remarks

This stygobiont subspecies, considered by some authors (see Kiefer, 1957b and Rosol & Sterba, 1983) synonymous with *A. venustus venustus* (Norman & Scott, 1907), differs from the typical form and the other known subspecies of *A. venustus* (see Kiefer, 1931c, 1936, 1938, 1957a, 1957b; Graeter, 1908; Klie, 1928, Sterba, 1956; Pesce & Maggi, 1979; Rosol & Sterba, 1983; etc.) in several characteristics: body surface without spinules, length of furcal rami and low number of setules at the inner margin, shape of endopodite 3 of P4, etc.

Plesa (1969) considered *A. venustus* (Norman & Scott, 1907), *A. stammeri* (Kiefer, 1930) and *A. troglophilus* (Kiefer, 1932) synonymous with *A. capillatus* (Sars, 1863); this opinion, already criticized by Petkovski (1971: 91), is not justified and cannot be accepted after the discovery of *A. venustus stammeri* and *A. troglophilus* co-occurring in the same water body (well near Jamiano).

*A. venustus stammeri* belongs to the *A. capillatus* -group, characterized by 12-segmented antennules and a chaetotaxis formula of exopodites 3 of 5.5.5.5.

### *Acanthocyclops troglophilus* (Kiefer, 1932)

*Cyclops (Acanthocyclops) troglophilus*, Kiefer, 1932: 55, figs. 14-18.

*Cyclops troglophilus*, Wolf, 1937 (III): 48.

*Acanthocyclops venustus troglophilus*, Kiefer, 1938: 97; Kiefer, 1957b: 76; Petkovski, 1971: 89

*Acanthocyclops stammeri* (partim), Rylov, 1948: 232.

*Megacyclops (Megacyclops) capillatus* (partim), Plesa, 1969: 83.

*Acanthocyclops venustus* f. *troglophilus*, Rosol & Sterba, 1983: 76.

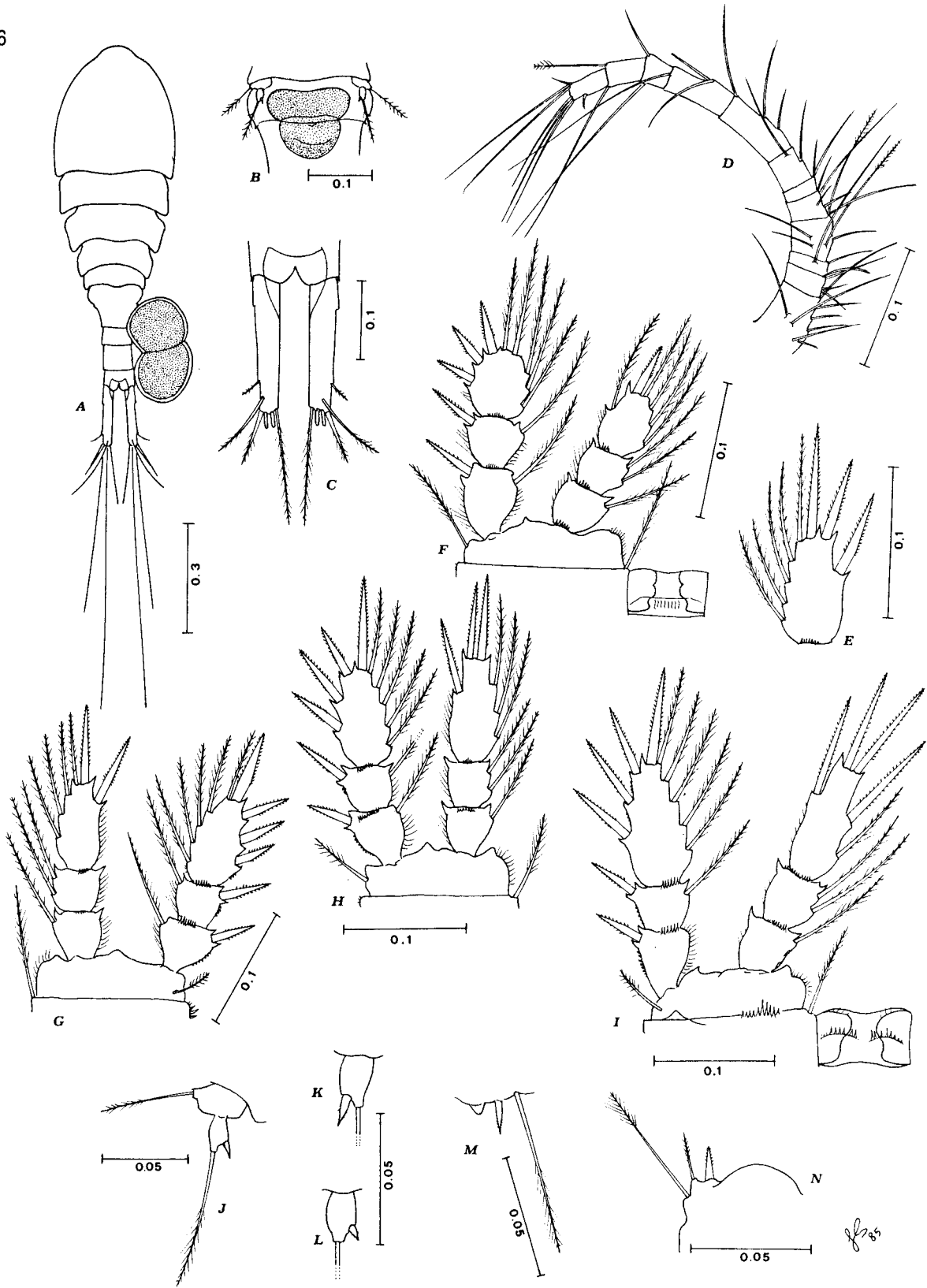


Fig. 3. *Acanthocyclops troglophilus* (Kiefer, 1932) (Well near Jamiano). ♀: A, habitus ; B , genital segment and receptaculum seminis; C, anal plate and furcal rami; D, antennula; E, exopodite 3 of P3; F, P1; G, P2; H, P3; I, P4; J, K, L, P5; M, P6. ♂: N, P6. Scales in mm.

**Loc. typ.**

Vjeternica pecina, near Zavala (Herzegovina, Yugoslavia).

**Localities cited**

Yugoslavia: Vjeternica pecina near Zavala: Kiefer, 1932 and 1938; Baba pecina near Cvaljina, northern from Zavala: Kiefer, 1938.

**Material examined**

"Antro delle Ninfe", 2687 VG (S. Dorligo della Valle, prov. Trieste), leg. F. Gasparo and F. Stoch, 24-VIII-1985, ♂.

Well near Jamiano, 360 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 10-VIII-1985, 1♂, 1♀ (♀ ZMA); 15.9.1985, 1 ovigerous female.

Cave near Comarie, 4221 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 10-VIII-1985, 2 copepodids; 1-IX-1985, 2♂♂; 1♀.

**Description of female**

Mean body length (including furcal rami) approximately 1.3 mm; colourless, eye pigment lacking.

Genital segment as long as wide, anterolaterally rounded; receptaculum seminis as in fig. 3B. Posterior margin of abdominal segments serrate. Anal plate well-developed.

Furcal ramus (fig. 3C) approximately 5.8 times as long as wide; inner margin smooth (with a few setules in the specimens studied by Kiefer, 1932). Inner apical seta approximately twice as long as outer one. Dorsal seta shorter than outer one (outer seta: dorsal seta = 4 : 5).

Antennula 12-segmented (fig. 3D), as long as cephalothorax.

Rami of swimming legs (fig. 3 F-I) 3-segmented; spine formula of exopodites 3: 3.4.4 (3).4; bristle formula as follows (exp/enp):

P1	P2	P3	P4
1	1/1	1/1	1/1 0/1
2	1/2	1/2	1/2 1/2
3	5/4	5/4	5/3 5/1

Endopodite 3 of P1 (fig. 3F) 1.3 times as long as wide, with apical spine shorter than article.

Exopodite 3 of P3 (fig. 3E, H) with 3 to 4 spines; endopodite 3 with outer seta and apical inner seta

transformed into spines.

Intercostal plate of P4 (fig. 3I) with rows of spinules and setules. Precoxal plate with a row of spinulae and a small tubercle. Endopodite 3 of P4 2.4-2.7 times as long as wide; two apical spines, a little shorter than article; distal inner and outer seta transformed into spines in all specimens examined.

Distal article of P5 (fig. 3J-L) with a stout spine; basal segment longer than in *A. venustus stammeri*.

P6 (fig. 3M) armed with two spines (inner one very short and stout) and a long bristle.

Ovisacs (ovigerous female from well near Jamiano) with two eggs (fig. 3A).

**Description of male.**

Mean body length (including furcal rami) approximately 1.0 mm; colourless, eye pigment lacking. Furcal rami approximately 4.4 times as long as wide; swimming legs as in female.

P6 armed with a spine and two setae, outer one twice as long as inner one (fig. 3N).

**Remarks**

This troglobiont species has been described by Kiefer (1932) on a small number of specimens; the morphological characteristics of our specimens differ from the original description with regard to the inner margin of the furcal rami (smooth in the Italian specimens) and the inner setae of endopodites 3 of P3-P4, which are transformed into spines. In my opinion, these differences have no taxonomic value: the setules on the inner margin of furcal rami are lacking in some specimens of *A. venustus stammeri* and *A. venustus venustus* (see Plesa, 1969) as well; the tendency to spine-formation has been observed in other *Acanthocyclops* (Mastrantuono, 1980) and *Diacyclops* species (see the description of *D. tantalus* given below).

Some authors consider this taxon a subspecies of *A. venustus* or synonymous with *A. venustus stammeri*; the discovery of *A. troglophilus* and *A. venustus stammeri* in the same samples from Venezia Giulia gives us the opportunity to elevate *A. troglophilus* to specific rank.

*A. troglophilus* belongs to the *A. capillatus*-group, but differs from all known members of this group in the length and shape of the furcal rami, the shape of the receptaculum seminis, the morphology of the intercoxal plate of P4, the armature of endopodite 3 of P4, the armature of P6, etc.

***Diacyclops antrincola* Kiefer, 1967**

*Diacyclops antrincola* Kiefer, 1967: 133, figs. A and 1-6; Petkovski, 1971: 93, figs. 35-37; Petkovski, 1978: 163; Pesce et al., 1978: 41, fig. 7; Maggi & Pesce, 1979: 90, fig. 2; Pesce & Fabrizi, 1979: 67, figs. 2-3; Pesce & Maggi, 1979: 183; Pesce, 1980a: 564; Pesce & Maggi, 1981: 171; Pesce & Maggi, 1983: 42.

**Loc. typ.**

Grotta del Fiume (Marche, Italy).

**Localities cited**

Phreatic and cave waters of central and southern Italy (Marche: Kiefer, 1967; Pesce & Maggi, 1979; Pesce, 1980a - Abruzzi: Pesce & Fabrizi, 1979 - Puglia: Pesce et al., 1978) Yugoslavia (Istria: Petkovski, 1978 - Macedonia: Petkovski, 1971), Greece (Maggi & Pesce, 1979; Pesce & Maggi, 1981, 1983) and Turkey (Pesce, 1980b).

**Material examined**

Well near Peschiera del Timavo, 3948 VG (Duino-Aurisina, prov. Trieste), leg. F. Gasparo and F. Stoch, 15-VIII-1985, many specimens (♂♂, ♀♀, copepodids (2♂, 3♀ ZMA).

Well near Jamiano, 360 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 1-IX-1985, 1♂, 1♀.

Cave near Comarie, 4221 VG (Doberdò de Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 10-III-1985, 1♀; 20-X-1985, 1 copepodid.

**Description.**

The morphological characteristics of the specimens from Venezia Giulia agree with the descriptions given by Kiefer (1967) and Petkovski (1971). The following are the features of this species: (1) antennules 12-segmented; (2) rami of swimming legs 3-segmented; (3) spine formula of exopodites 3 (P1-P4): 2.3.3.3; setal formula 4.4.4.4 and setal formula of endopodite 2 (P1-P4): 1.1.1.2; (4) endopodite 3 of P4 twice as long as wide, armed with two spines which are longer than the article; (5) furcal rami ap-

proximately 5 times as long as wide; inner distal seta twice as long as outer; dorsal seta long (dorsal seta: inner seta = 3 : 5).

**Remarks**

This stygobiont (or eustygophilous ?) species belongs to the *D. crassicaudis*-group; the specimens from Venezia Giulia can be classified with the northern populations of *D. antrincola* as defined by Pesce & Fabrizi (1979) (furcal rami more than 5 times as long as wide, dorsal seta long).

The discovery of this species in northeastern Italy is interesting from a biogeographical point of view; its geonomy seems to be periadriatic instead of transadriatic (as pointed out by Pesce & Fabrizi, 1979).

***Diacyclops charon* (Kiefer, 1931)**

*Cyclops (Diacyclops) charon* Kiefer, 1931a: 220, figs. 4-5; Kiefer, 1931b: 703, figs. 4-8; Kiefer, 1933: 39.

*Cyclops charon* Stammer, 1932: 583; Chappuis, 1933: 11; Wolf, 1937: 50.

*Diacyclops charon* Dussart, 1969: 165, fig. 81; Petkovski, 1981: 72; Petkovski, 1985: 136.

**Loc. typ.**

Postojnska Jama (Slovenia, Yugoslavia)

**Localities cited.**

Postojnska Jama (= Höhle von Adelsberg): Kiefer, 1931a, 1931b, 1933; Stammer, 1932; Chappuis, 1933; Dussart, 1969; karstic spring near Dvor-Zuzemberk: Petkovski, 1985 (Slovenia, Yugoslavia). Baba Pecina near Struici, in Popovo Polje: Petkovski, 1981 (Herzegovina, Yugoslavia).

**Material examined**

Karst spring near Aurisina (Duino-Aurisina, prov. Trieste), leg. F. Gasparo and F. Stoch, 6-IV-1985, 1♀, copepodids.

"Antro delle Sorgenti" near Bagnoli, 105 VG (S. Dorligo della Valle, prov. Trieste), leg. F. Stoch 15-IV-1983, 1♂ juv., copepodids; leg. F. Gasparo, 26-II-1983, 1♀ juv., copepodids; leg. F. Gasparo, and F. Stoch, 22-VII-1984, 1♀; 28-VII-1984, 1♀; 18-VIII-1985, 1♀, 1♂ juv.

Well near S. Giovanni di Duino, 226 VG (Duino-Aurisina, prov. Trieste), leg. F. Gasparo, 11-XII-1983, 1♀.

Well near Jamiano, 360 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 24-II-1985, several specimens (1♂, ♀♀, 1 ovigerous female); 9-VI-1985, 2♀♀; 10-VIII-1985, several specimens (♀♀, 1 ovigerous female,



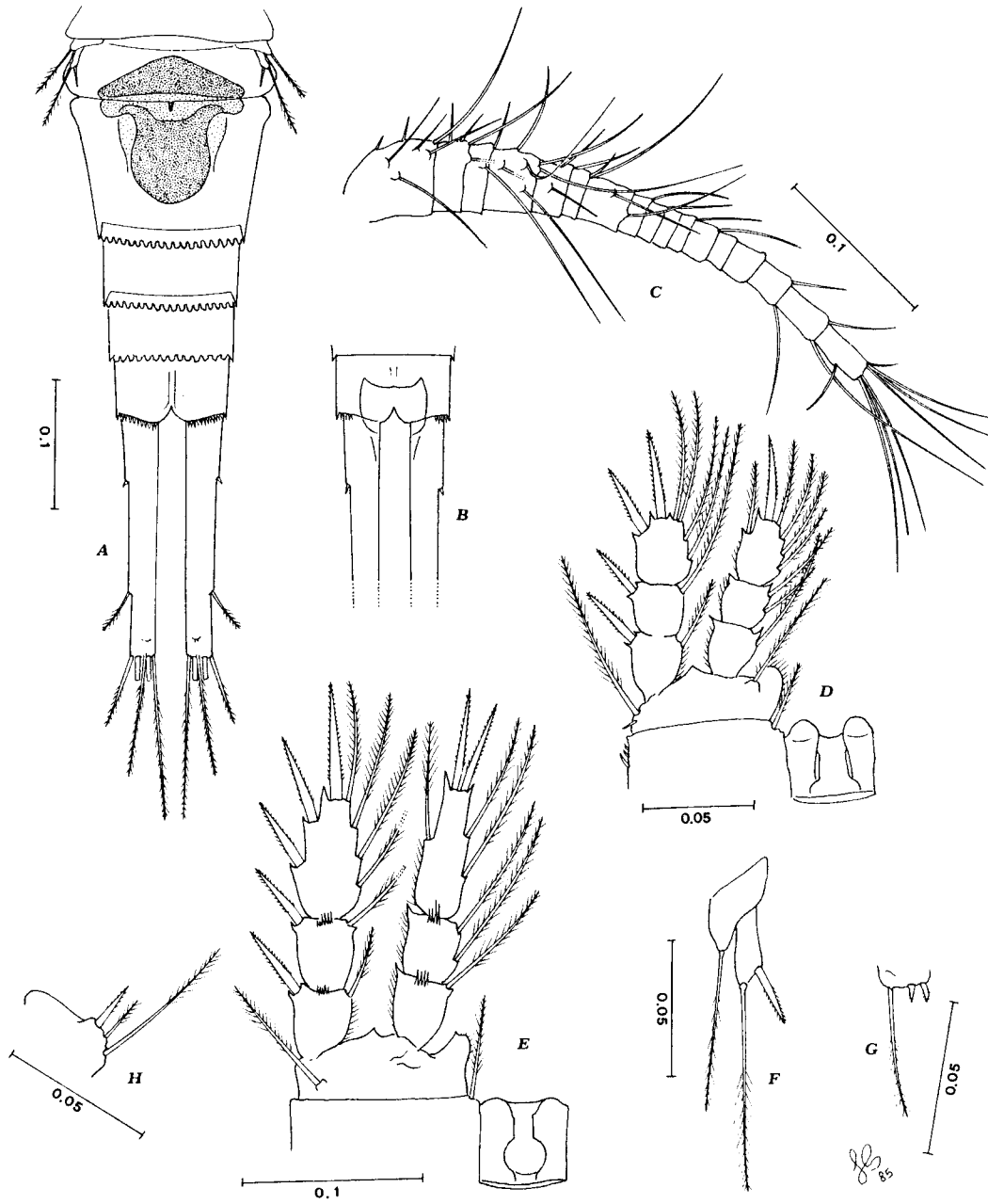


Fig. 4. *Diacyclops charon* (Kiefer, 1931) (Well near Jamiano). ♀: A, abdomen, receptaculum seminis and furca, ventral view; B, anal plate; C, antennula; D, P1; E, P4; F, P5; G, P6. ♂: H, P6. Scales in mm.

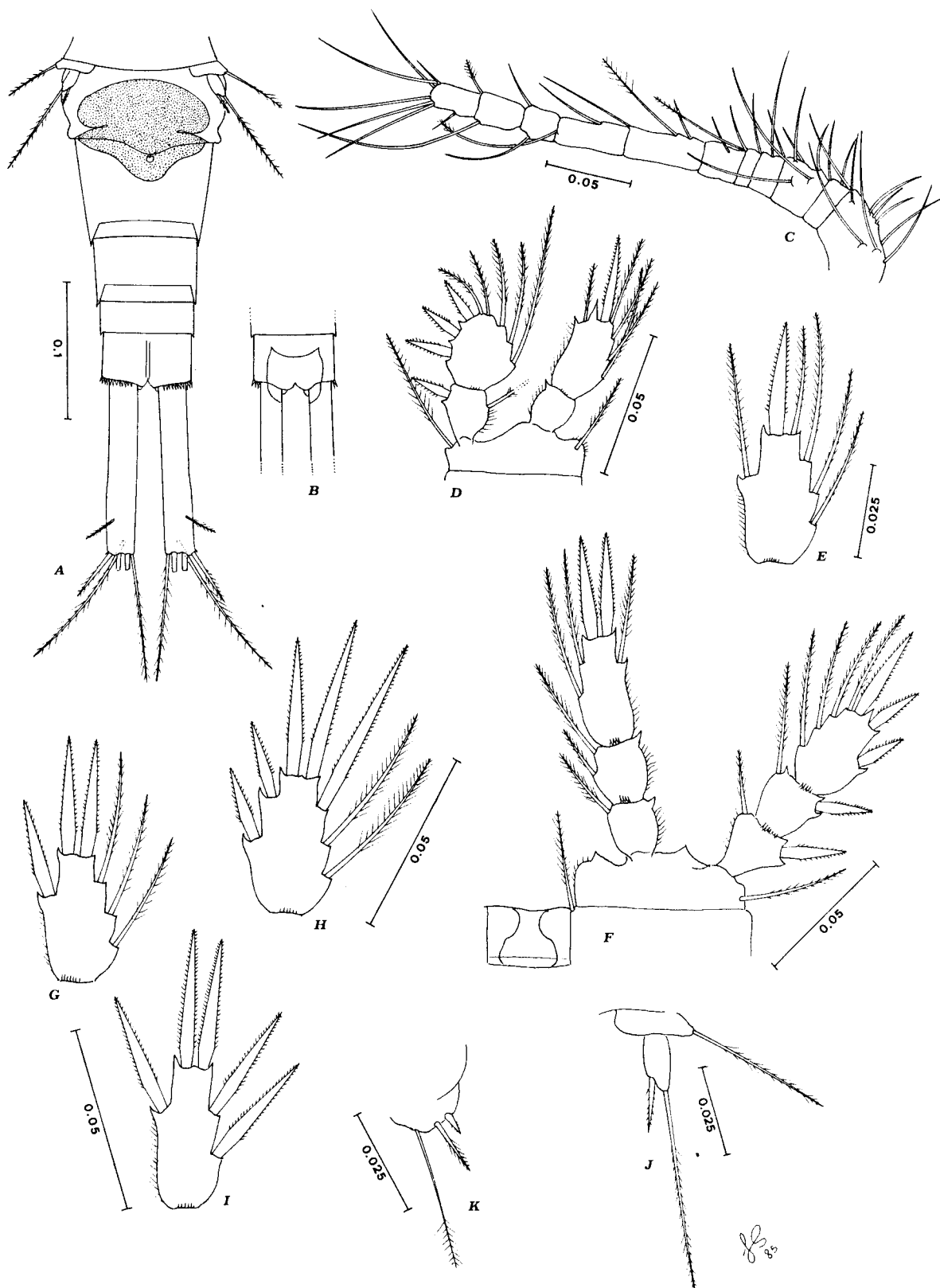


Fig. 5. *Diacyclops tantalus* Kiefer, 1937 (Well near Jamiano). ♀: A, abdomen, receptaculum seminis and furca, ventral view; B, anal plate; C, antennula; D, P1; E, endopodite 3 of P3; F, P4; G, endopodite 3 of P3; H, exopodite 3 of P4; I, endopodite 3 of P4; J, P5. ♂: K, P6. Scales in mm.

copepodids) (3♀ ZMA) 1-IX-1985, 1♂; 15-IX-1985, 1♀.

Cave near Comarie, 4221 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 15-IX-1985, 1♂ juv.

### Description of female

Mean body length (including furcal rami) approximately 1.0 mm; unpigmented, eyeless.

Posterior margin of abdominal segments serrate. Genital segment (fig. 4A) slightly longer than wide; receptaculum seminis characteristic, posterior part long (fig. 4A). Anal plate well developed, with smooth margins.

Furcal rami very long (fig. 4A), 7-7.2 times longer than wide, as in *D. bicuspidatus*. Inner distal seta twice as long as outer one; dorsal seta shorter than inner one.

Antennula 17-segmented (fig. 4C), longer than cephalothorax.

Swimming legs with 3-segmented rami (Dussart, 1969, reported erroneously P1 as 2-segmented). Spine formula 3.3.3.3.

Endopodite 3 of P1 slightly longer than wide, bearing a distal spine longer than article (fig. 4D).

Endopodite 3 of P4 (fig. 4E) 3.2 times as long as wide, armed with 2 subequal distal spines, shorter than article; intercoxal plate as in fig. 4E.

P5 as in *D. bicuspidatus* (fig. 4F), inner spine on distal article stout.

P6 bearing 2 short spines and a long seta (fig. 4G).

### Description of the male

Mean body length (including furcal rami) approximately 0.9 mm; furcal rami slightly shorter than in female (6.5 times as long as wide); swimming legs as in female.

P6 (fig. 4H) armed with a spine, a seta slightly shorter than the spine, and a outer seta twice as long as inner one.

### Remarks

*D. charon* is a troglobiont species and belongs to *D. bicuspidatus* -group; it is well distinguished from all other known species of the genus by the shape of

the receptaculum seminis, the ratio of furcal rami versus distal setae, the morphology and armature of endopodite 3 of P4, etc.

### *Diacyclops tantalus* Kiefer, 1937

*Diacyclops tantalus* Kiefer, 1937: 16, figs. 1-4; Kiefer, 1938: 102.

*Acanthocyclops languidoides* var. *tantalus*, Rylov, 1948: 260.

*Diacyclops tantalus*, Lescher-Moutoué, 1979: 94; Petkovski, 1984: 32; Petkovski, 1985: 137.

### Loc. typ.

Caves in Popovo Polje (Hercegovina, Yugoslavia).

### Localities cited

Baba Pecina near Cvaljina north from Zavala, Vjeternica Pecina and Donja Vjeternica near Zavala: Kiefer, 1937 and 1938 (Hercegovina, Yugoslavia).

### Material examined

Well near Jamiano, 360 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 10-VIII-1985, 2♂♂, 1♀ (ZMA); 1-IX-1985, 2♂♂; 15-IX-1985, 1♀.

Cave near Comarie, 4221 VG (Doberdò del Lago, prov. Gorizia), leg. F. Stoch, 21-VII-1984, 1♂, 1♀; leg. F. Gasparo and F. Stoch, 15-IX-1985, 1♂, 1♀.

### Description of female

Mean body length (including furcal rami) approximately 0.75 mm; unpigmented, eyeless.

Genital segment longer than wide (fig. 5A), anterolaterally rounded. Receptaculum seminis as in fig 5A. Anal plate well developed.

Furcal rami long (fig. 5A), approximately 6.7 times as long as wide, distally widened. Inner apical seta more than twice as long as outer one. Dorsal seta very long, longer than outer one.

Antennules 11-segmented (fig. 5C), shorter than cephalothorax.

Articulation formula of swimming legs: 2.2/3.2/3.3/3.3. Spine formula 3.3.4.3(5).

Endopodite 2 of P1 twice as long as wide, armed with an apical spine slightly shorter than article (fig. 5D). Endopodite 3 of P4 (fig. 5F) twice as long as wide, armed with two apical spines, as long as article.

Armature of distal segments of both rami of P3 and P4 shows tendency of spine-formation; some specimens have endopodite 3 of P3-P4 (fig. 5G-H) with some setae transformed into spines; specimens with endopodite 3 of P4 armed with spines only (fig. 5I) are common.

P5 as in fig. 5J; inner spine stout.

#### Description of male

Mean body length (including furcal rami) approximately 0.65 mm; furcal rami shorter than in female ( $L/l=5.3$ ) swimming legs as in female. Eye and body pigment lacking.

P6 (fig. 5K) armed with 1 short spine and 2 setae, outer one approximately twice as long as inner one.

#### Remarks

This troglobiont species belongs to *D. languidoides*-group; we agree with Petkovski (1984, 1985) in considering *D. tantalus* as an independent species, well differentiated from all the other known species of the genus.

Petkovski (1954) described a new form (f. *slovenica*) from a karst spring near Ljubljana (Slovenia) and recently (1985) raised it to specific level (*D. slovenicus*). The differences between *D. slovenicus*, *D. tantalus* and the specimens from Venezia Giulia are: (a) endopodite 3 of P4 in *D. slovenicus* and in the Italian specimens armed with two apical spines instead of a spine and a bristle. Considering the variability of the spinulation of the swimming legs, this feature has no taxonomic value (see also Lescher-Moutoué, 1979); (b) inner spine of distal joint of P5 well developed in *D. slovenicus* and in the specimens from Italy; outer seta of the same article very long in the Giulian populations, short in *D. slovenicus*; (c) furcal rami shorter in *D. slovenicus* ( $L/l=4.1-4.6$ ) than in the Italian specimens and *D. tantalus*; (d) dorsal seta of furcal rami shorter than the inner one in *D. slovenicus*; in the specimens from Venezia Giulia this seta is very long, as in *D. tantalus*.

Taking into account the morphological characteristics cited above, the Italian populations seem to occupy an intermediate position between *D. tantalus*

and *D. slovenicus*; considering the length of the furcal rami, dorsal seta of the furca and outer seta of P5, we consider the Italian specimens more closely related to *D. tantalus* than to *D. slovenicus*.

#### *Metacyclops gasparoi* n.sp.

#### Material examined

Well near Jamiano, 360 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 1-IX-1985, 2♂♂, 2♀♀; 15-IX-1985, 2♀♀.

Cave near Comarie, 4221 VG (Doberdò del Lago, prov. Gorizia), leg. F. Gasparo and F. Stoch, 1-IX-1985

#### Loc. typ.

Well near Jamiano, 360 VG (com. Doberdò del Lago, prov. Gorizia, Friuli-Venezia Giulia region, Italy).

#### Mat. typ.

Holotype, 1♀ completely dissected and mounted in Faure's medium with nigrosine (ZMA Co. 102.754), and paratypes (1♂, 1♀) in alcohol 70% and glycerine (ZMA Co. 102.755).

#### Description of female

Mean body length (including furcal rami) approximately 0.65 mm; colourless, eye pigment lacking.

Genital segment approximately as long as wide, anterolaterally rounded; receptaculum seminis (fig. 6B), characteristic, as in *M. subdolus*. Anal plate large, well-developed (fig. 6C).

Furcal rami (fig. 6C) 5.5-5.7 times as long as wide, longer than in all other European species of the genus (similar to those of *M. problematicus* Dumont, 1973); inner distal seta twice as long as outer. Dorsal seta very long, longer than inner one (dorsal seta : inner seta : outer seta = 7 : 5 : 2.5).

Antennula (fig. 6D) 11-segmented; antenna (fig. 6E) 4-segmented, as in *M. minutus*, with third article proximally narrowed.

Both rami of P1-P4 2-segmented (fig. 6 F-I); spine formula of exopodites 2 of P1-P4: 3.4.4.3; bristle formula (exp/enp) as follows:

	P1	P2	P3	P4
1	1/1	1/1	1/1	0/1
2	5/4	5/5	5/4	5/3

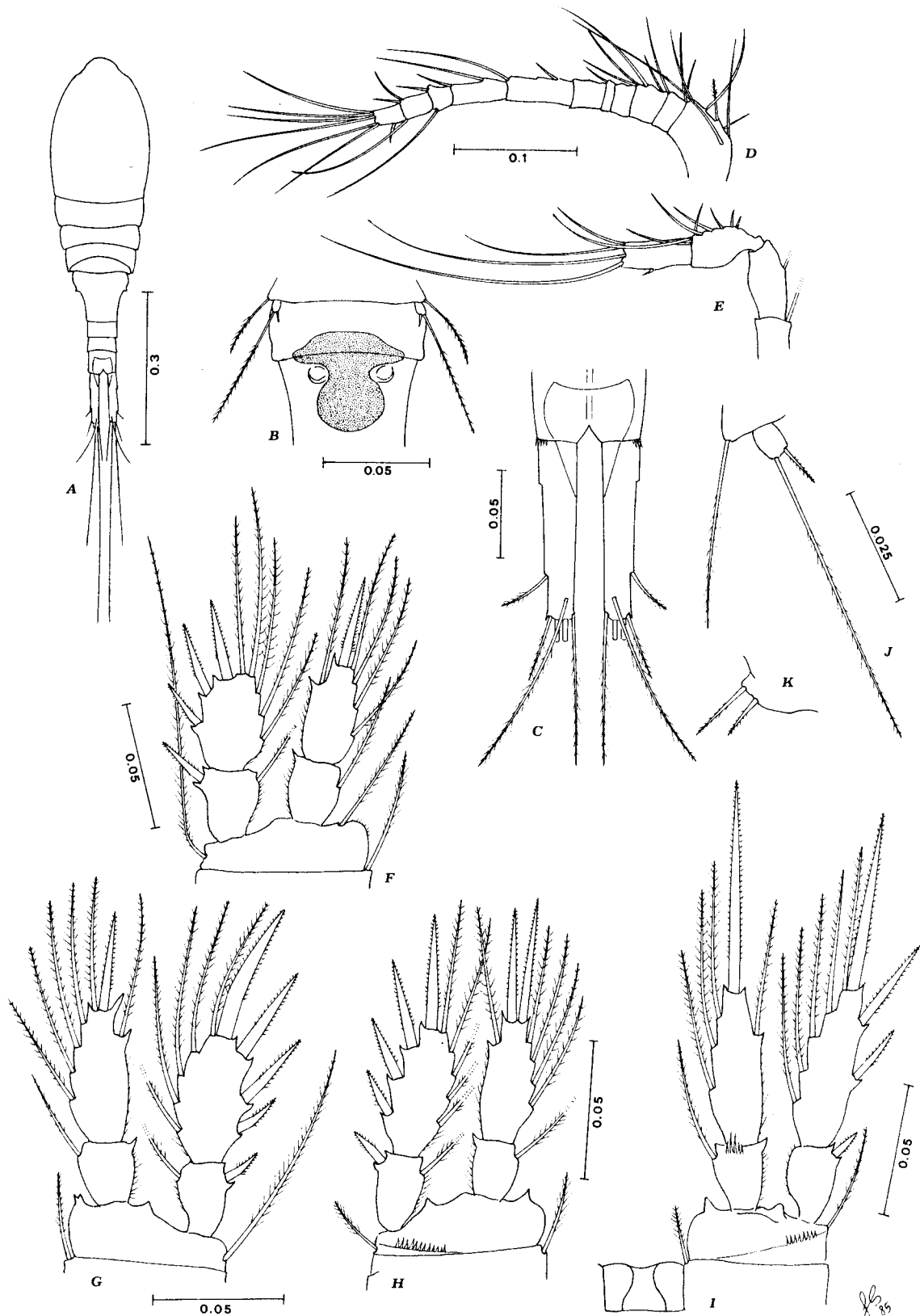


Fig. 6. *Metacyclops gasparoi* n. sp. (Well near Jamiano). ♀: A, habitus, B, genital segment and receptaculum seminis; C, anal plate and furca; D, antennula; E, antenna; F, P1; G, P2; H, P3; I, P4; J, P5. ♂: K, P6. Scales in mm.

Basal segment of P1 (fig. 6F) with outer seta very long, longer than exopodite. Distal article of endopodite approximately twice as long as wide; apical spine slightly shorter than article.

Exopodite 2 of P2 (fig. 6G) with 1 long and stout apical spine, as long as article; apical spine of endopodite 2 short (fig. 6G).

Endopodite 2 of P3 (fig. 6H) with 2 apical subequal spines, shorter than article; apical spine of exopodite 2 shorter than article.

Armature of P4 (fig. 6I) characteristic. Exopodite 1 without inner seta; its outer spine very short. Exopodite 2 approximately 4 times as long as wide; apical spine slightly longer than article. Endopodite 2 approximately 4 times as long as wide, with 1 very long apical spine, 1.5 times longer than article.

P5 (fig. 6J) of only one article, typical for the genus *Metacyclops*; outer seta very long; inner spine slender, slightly longer than article.

### Description of male

Mean body length (including furcal rami) approximately 0.57 mm; colourless, eye pigment lacking. Furcal rami ( $L/l = 5.2$ ) and swimming legs as in female.

P6 (fig. 6K) armed with 2 setae, outer one shorter than inner one.

### Remarks

*Metacyclops gasparoi* n.sp. is a trogllobiont species and belongs to *M. minutus*-group (sensu Lindberg, 1961). It differs from all known species of the genus by the following features: furcal rami long ( $L/l = 5.5-5.7$ ), dorsal seta very long; armature of the swimming legs characteristic; endopodite 2 of P4 with 1 very long apical spine; P5 with a very long bristle.

### ACKNOWLEDGEMENTS

The author is indebted to Dr. T.K. Petkovski (Prirodonaucen Muzej na Makedonija, Skopje) for the bibliographical suggestions and the critical review of the manuscript.

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Revised draft received : 12 May 1986  
 Distributed: 18-IX-1987