

Redescription of the female and first description of the male of *Microcyclops karvei* (Kiefer & Moorthy, 1935) (Copepoda, Cyclopoida)

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Abstract. *Microcyclops karvei*, a poorly known cyclopoid, is redescribed on the basis of specimens from Uzbekistan. Problems with its taxonomy are discussed.

Kurzfassung. *Microcyclops karvei*, ein wenig bekannter Zyklopede, wird anhand von Material aus Uzbekistan neu beschrieben. Taxonomische Probleme werden diskutiert.

Key words. Cyclopoida, *Microcyclops karvei*, redescription, Uzbekistan.

Introduction

The taxonomy of the genus *Microcyclops* is extremely confused, and there are many species which are inadequately described. *Microcyclops karvei* (Kiefer & Moorthy, 1935) is one of the most poorly known representatives of the genus. The species was originally described from only one specimen collected from a "step well" in the state of Mysore, south India (KIEFER & MOORTHY 1935). It was subsequently recorded in Cambodia (LINDBERG 1952), Iran (HEMSEN 1952), Tajikistan (ULOMSKY 1959) and Uzbekistan (MUKHAMEDIEV 1986). The original and subsequent descriptions are inadequate from the point-of-view of modern copepod taxonomy. The type specimen (a dissected female on a slide) is fragmentary so that only a few characters can be discerned. In this note we redescribe the female and describe the male of *M. karvei*, based on specimens collected from ricefields in Uzbekistan.

Material and methods

Material examined: One ♀ from a ricefield in the vicinity of Nukus, northern Uzbekistan, July 1978; 2 ♀ and 1 ♂ from ricefields in Gurlen District, Khorezm Province, Uzbekistan, June-August 1963; Type specimen - 1 dissected female from Mysore, India, deposited in the Staatliches Museum für Naturkunde, Karlsruhe, Germany, Cat. # 2331; 1 ♀ from South Africa deposited in the Staatliches Museum für Naturkunde, Karlsruhe, Germany, Cat. # 7760.

All drawings have been made by means of a drawing tube, using the specimens from the Khorezm Province of Uzbekistan. Designations of furcal setae follow DUSSART & DEFAYE (1995): Me, lateral furcal seta; Ti, innermost apical furcal seta; Tmi, inner medial apical furcal seta; Tme, outer medial apical furcal seta; Te, outer apical furcal seta; Sd, dorsal furcal seta. Pereopods (legs) 1-5 are designated as P1-5, endopodite as enp.

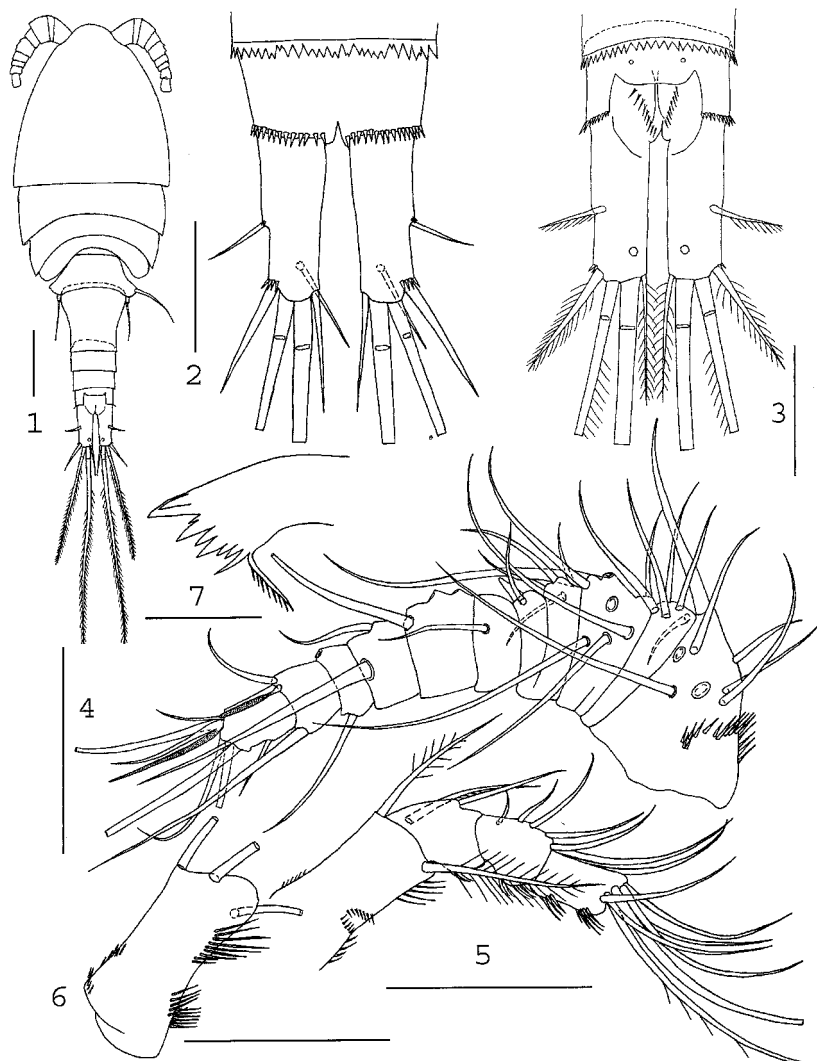
Tab. 1. Biometrics of females of *Microcyclops karvei*. The data in parentheses are derived from published figures. Sources: India (1) KIEFER & MOORTHY (1935); – India (2) LINDBERG (1939); – Iran (1) HEMSEN (1952); – Iran (2) LINDBERG (1942); – Tajikistan ULOMSKY (1959); – North Uzbekistan this study; – Uzbekistan, Ferghana valley MUKHAMEDIEV (1986); – South Africa F. KIEFER collection.

	India (1)	India (2)	Iran (1)	Iran (2)	Tajikistan	North Uzbekistan	Uzbekistan, Ferghana	South Africa
L	620	703	708	798	-	690-775	605-638	-
A1	9	10	9	10	9	10	9	10
A2	7	-	-	-	-	6-7	-	6
Fu L:W	2.81	3.22	3.00	2.92	2.80-2.90	2.70-3.20	~3.0	2.70
Ti : furca	-	(0.65)	-	0.93	-	0.71-0.82	(0.9)	0.73
Ti : Te	-	1.06	1.45-1.72	1.31	-	1.00-1.05	(1.1)	1.08
Ti : Sd	-	(1.33)	2.02-2.21	-	-	1.25	(1.3)	-
P4Enp2 L : W	2.36	2.23	2.35	2.23	2.50	2.10-2.40	(2.4)	2.13
P4Enp2 Int. Sp. :	0.65	0.79	0.61	0.64	-	0.56-0.75	(0.5)	0.65
L								
P4Enp2 Int. Sp. :	1.88	2.00	1.90	1.79	1.80-1.90	1.70-2.00	1.90	2.10
Ex. Sp.								
P5 L:W	-	(2.40)	-	-	-	2.60-2.80	(2.0)	-

Results

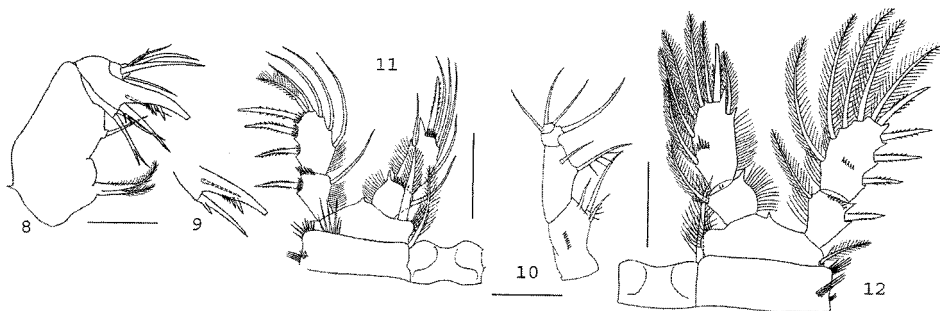
Microcyclops karvei Kiefer & Moorthy, 1935

Female. Body length 690-775 μm . Body widest at cephalothorax (Fig. 1). Lateral margins of last cephalothoracic somite smooth. Genital double-somite expanded anteriorly, with rounded lateral sides. – Anal somite: caudal margin with many uniformly sized spinules on ventral, lateral and dorsal sides (Figs. 2-3). Furcal rami: parallel, 2.7-3.2 times as long as wide. Insertions of Te and Me furcal setae provided with spinules. Plumage of Tmi and Tme furcal setae homogenous. Ti about as long as Te and Sd and shorter than furcal rami. – Antennules (Fig. 4): 10-segmented, short, not reaching posterior margin of cephalothorax, armoured as follows (segment number in Roman numerals, setal number in Arabic numerals, aesth = aesthetasc, sp = spine): I(8)-II(5)-III(8)-IV(5+sp)-V(1)-VI(3)-VII(2)-VIII(2)-IX(2+aesth)-X(7+aesth). Segments 3 and 4 with transverse grooves. – Antenna (Figs. 5, 6): basoendopodite with 3 setae, inner seta hardly longer than outer setae. Its caudal side with 2 rows of long spinules. Second endopodite with 6-7 setae. – Labrum with 6 teeth. – Distal edge of mandible with 10 teeth (Fig. 7). Mandibular palp with 2 long and 1 short setae. – Inner movable claw-like seta at basis of maxilla with 1-2 thin teeth on inner margin (Figs. 8-9). – Maxilliped as in Fig. 10. – Endo- and exopodites of P1-P4 biarticulate. Spine formula: 3-4-4-3. Inner margin of P1 basipodite with long spine-like seta reaching beyond the middle of P1enp2 (Fig. 11). Intercostal plates without ornamentation (Figs. 11-15). Coxa of P4 with 6 strong spinules on inner distal corner of frontal side (Fig. 14). Inner margins of basipodites P1-P4 with setules (Figs. 11-14). Outer margins of exopodites smooth. P4enp2 2.1-2.4 times as long as wide. Its inner spine 0.56-0.75 times as long as the segment and 1.7-2.0 times as long as the outer spine. – Free segment of P5 2.6-2.8 times as long as wide, with apical seta; no spinous process present on medial surface (Fig. 16).



Figs. 1-7. *Microcyclops karvei*, female. 1. habitus; 2. furcal ramus ventrally; 3. furcal ramus caudally; 4. antennule; 5. antenna, caudal side; 6. basipodite of antenna, frontal side; 7. mandible. Scales: 1: 100 μ m; 2-6: 50 μ m; 7: 20 μ m.

Male. Body length 460 μ m. Morphology of male in general the same as morphology of female, except in the normal sexual dimorphism. However, P4enp2 of male relatively longer (L:W = 3.5) than that of female (Fig. 18). Second endopodite of antenna with only 5 setae. Free segment of P5 with tiny spine on inner side (Fig. 19). Inner spine of P6 slightly shorter than middle seta and about twice shorter than outer seta (Fig. 20). Furcal rami of about the same proportion (L:W = 3.2) as in female (Fig. 17).



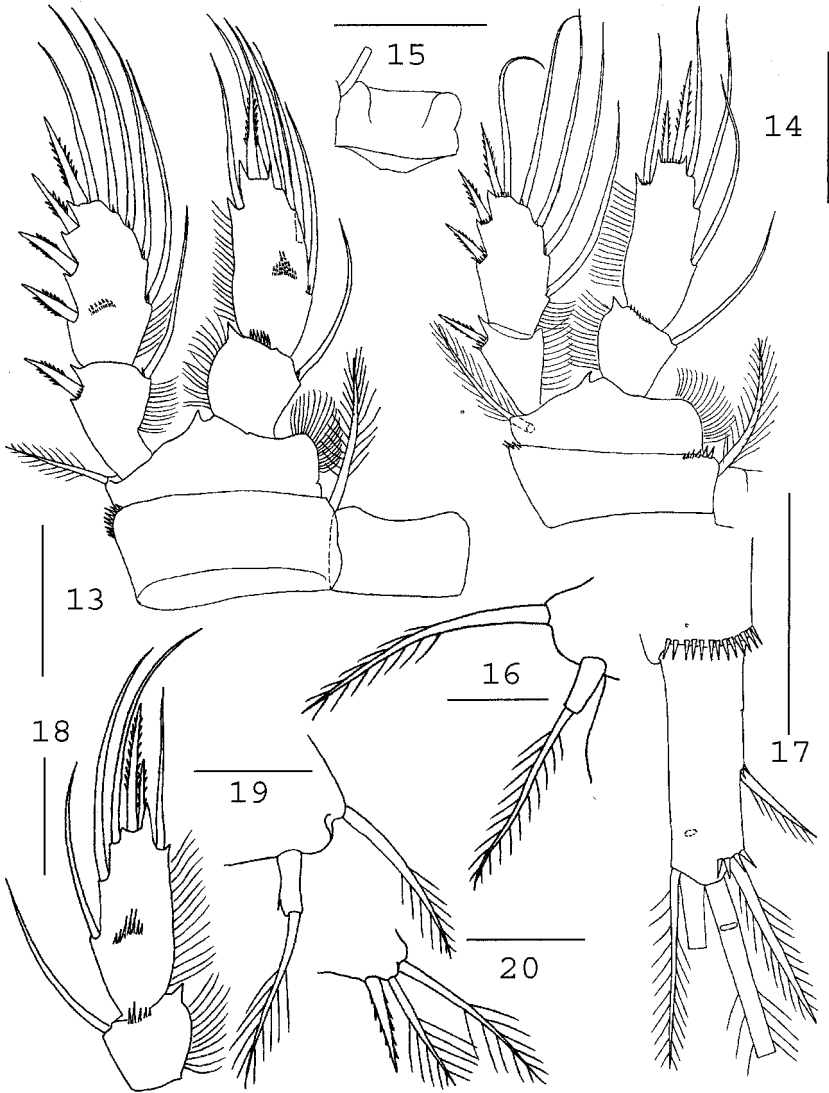
Figs. 8-12. *Microcyclops karvei*, female. 8. maxilla; 9. inner claw-like setae at basis of maxilla; 10. maxilliped; 11. P1; 12. P2. Scales: 8-10 μm ; 11-12: 50 μm .

Discussion

Comparison of the specimens from Uzbekistan with the type material revealed a good agreement in their morphology. The only difference was that the specimens from Uzbekistan which we studied had 10- rather than 9-segmented antennules. In this respect, our crustaceans agree with the description of *Microcyclops moghulensis* by LINDBERG (1939) from India and later reported from Iran (LINDBERG 1942) and Sri Lanka (FERNANDO 1974). However, HEMSEN (1952) and LINDBERG (1952) suggested that *M. karvei* and *M. moghulensis* might be synonyms, believing that the difference in the number of the segments of the antennules was a feature of intraspecific variability. This was confirmed by LINDBERG's (1952) observation of 10 segments in one individual crustacean and 9 segments in another. In Uzbekistan and neighbouring Tajikistan, individuals with both 9-segmented antennules (MUKHAMEDIEV 1986, ULOMSKY 1959) and 10-segmented antennules (the present study) have also been recorded. However, the presence of deep grooves in the segments of the antennules may hinder a correct count of the segments. Most species of the genus *Microcyclops* have 11- or 12-segmented antennules. In general, individuals from different regions of Asia are rather close in their biometric traits (Tab. 1).

HEMSEN (1952) and LINDBERG (1952) also suggested that *Microcyclops uenoi* Kiefer, 1937, described from Taiwan and with 11-segmented antennules, could also be a synonym of *M. karvei*. Study of a specimen deposited at the Staatliches Museum für Naturkunde in Karlsruhe (F. KIEFER collection, slide #3641) has shown that *M. uenoi*, as well as *M. karvei*, has many uniformly sized spinules on the caudal margin of the anal somite, seven setae on the second endopodite of the antenna, setules on the inner margins of the basipodites of P1-P4, and spinules on the inner distal corner of the frontal side of the P4 coxopodite. However, the P4Enp2 of *M. uenoi* is longer (L:W = 2.85-2.92) and has longer apical spines (L inner spine : L P4Enp2 = 0.90-0.94) (KIEFER 1937, 1938, SHEN et al. 1979). This enables us to consider *M. uenoi* and *M. karvei* as different taxa.

The range of *M. karvei* may therefore extend from Cambodia in the east to Iran in the west, and from Sri Lanka in the south to Uzbekistan in the north. However, there is an isolated find of *M. karvei* in Africa: slide #7760 of the F. KIEFER collection in Karlsruhe ("*Microcyclops* cf. *karvei*"). If this is not a mistake made during processing of the collected



Figs. 13-20. *Microcyclops karvei*. 13. P3 of female; 14. P4 of female; 15. intercoxal plate of P4 of female; 16. P5 of female; 17. furcal rami of male ventrally; 18. endopodite of P4 of male; 19. P5 of male; 20. P6 of male. Scales: 13-15, 17: 50 μ m; 16, 18-20: 25 μ m.

material, then the natural range of *M. karvei* should include Africa or else the species must have been accidentally introduced there.

Microcyclops karvei differs from most of its congeners by its 9-10-segmented antennules. From *M. sumatranus* Kiefer, 1930, also with 10-segmented antennules, *M. karvei* differs by

the presence of spinules near the insertions of the Me furcal setae and by the shorter furcal rami.

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