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Acanthocyclops tokchokensis, a New Cyclopoid Copepod Species from Wells in Tŏkchŏk Island of Korea (Copepoda, Cyclopoida, Cyclopidae)

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***Acanthocyclops tokchokensis*, a new species of cyclopoid copepods from wells in Tŏchŏk Island of Korea, is described and illustrated.**

KEY WORDS: Copepoda, Cyclopoida, Cyclopidae, *Acanthocyclops tokchokensis*, Korea

In process of comprehensive taxonomic study on subterranean copepod fauna of Korea, the authors examined lots of specimens collected from two wells of Tŏkchŏk Island in Yellow Sea (54 km west from Inch'ŏn Harbor and 88 km west from Seoul). As a result, the specimens turned out to be *Eucyclops serrulatus*, *Tropocyclops prasinus*, and unidentified harpacticoids with a new species belonging to the genus *Acanthocyclops*.

The genus *Acanthocylops* Kiefer, 1927 comprises of about 40 species or subspecies (Dussart and Defaye, 1985), most of which were collected from various subterranean waters like caves, wells, and interstitial waters, and rarely from littorals of streams or lakes, mainly in Europe including western U.S.S.R., especially from the Alps and Lake Baikal (Dussart, 1969; Petkovski, 1971, 1975; Pesce, 1978-1979; Pesce and Lattinger, 1983; Flössner, 1984). In East Asia, only one species from China, five species from Japan (Ito, 1952, 1957, 1964; Ishida, 1984), and one species from far-eastern part of U.S.S.R. (Borutzky, 1966) have been known.

Subterranean cyclopoid fauna of Korea has been completely unknown so far. Kim and Park (1969) and Kim and Lee (1978) once reported *Acanthocyclops morimoroi* Ito, 1952 from the Han River, but it must be misunderstood by confusing the larval form of *Cyclops vicinus* Uljanine, 1875 with *A. morimotoi* because male of *A. morimotoi* is somewhat similar to the copepodid larva (stage V) of *C. vicinus* morphologically (Kim and Chang, 1989). Therefore, the present study is the first record of subterranean cyclopoid fauna of Korea, not to mention of *Acanthocyclops*.

The specimens were dissected, mounted, and measured in polyvinyl lactophenol. Type specimens are deposited in the Department of Biology, Taegu University.

Acanthocyclops tokchokensis, new species (Figs. 1-3)

Material Examined.-Holotype: ♀, a well at Chinmal Village, Chin-ri in Tŏkchŏk Is. (37°13′64″N, 126°09′42″E), May 6, 1988, collected by Min-Ok Song. Allotype: ♂, collection details same as holotype. Paratypes: 4 ♂♂, 2 ♀♀, collection details same as holotype; 1 ♂, 2 ♀♀, a well at Sŏp'o-ri in Tŏkchŏk Is. (37°13′26″N, 126°07′03″E), May 6, 1988, collected by M. O. Song. Holotype, allotype and 4 paratypes (2 ♂♂, 2 ♀♀) were dissected and mounted in polyvinyl lactophenol tinted with lignin pink (slide no. CC11-15).

Holotype female.-Body (Fig. 1A) 0.92 mm long,

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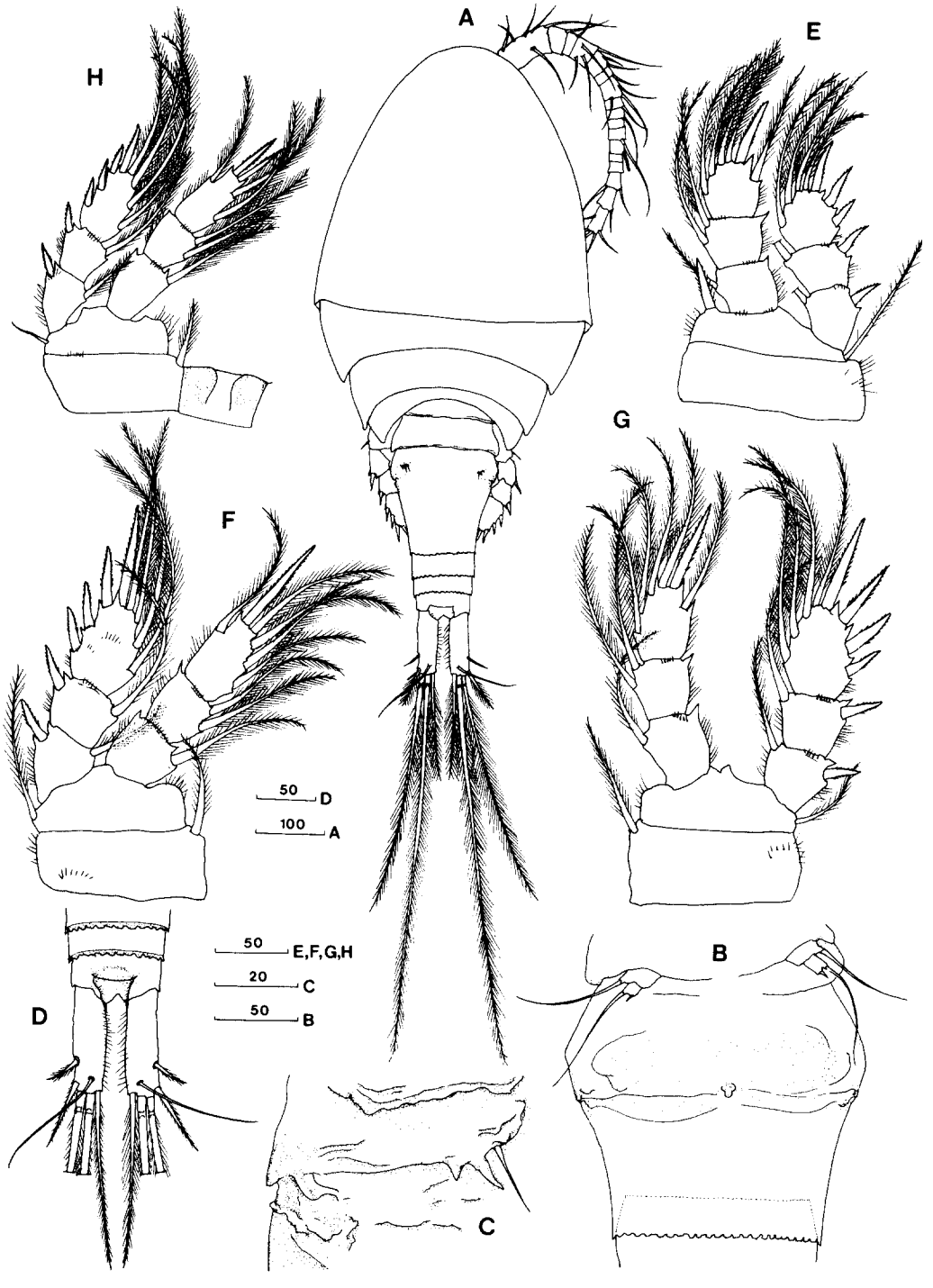

Fig. 1. *Acanthocyclops tokchogensis*, n. sp., female: A, habitus, dorsal; B-F, leg 1-leg 5; G, genital segment, ventral; H, projections on dorsal surface of genital segment. (unit of scales in μm).

excluding caudal seta, and greatest width 0.40 mm. Prosome oblong-oval, much longer than urosome (1.45 times); widest at posterior margin of cephalothorax, and gradually tapering behind. Cephalothorax somewhat protruding anteriorly, more than 2 times longer than next three thoracic somites combined. Posterior corners of thoracic somites a little projected. Genital somite as long as wide, or slightly wider than long; both sides of dorsal surface near proximal quarter of genital somite attaching a few sclerotized sheaths and wrinkles with two strong conical projections and one spine (Fig. 1H). Seminal receptacle not well-defined, and shown as in Fig. 1G. Posterior margins of all the abdominal segments strongly fringed. Anal plate slightly convex and smooth on its posterior margin.

Caudal rami (Fig. 1A) nearly parallel, 3.25 times as long as wide, with fine hairs along inner lateral margin. Lateral seta inserted at distance from base of ramus, equal to about 71% of length of ramus; slightly longer than width of ramus itself. Inner apical seta 2.32 times longer than outer apical one. Dorsal seta about 1.8 times longer than outer apical one. Inner (median) caudal seta about 1.7 times longer than outer one, and nearly two third as long as whole body length.

Antennule (Fig. 2A) slighly longer than cephalothorax when reflexed, of 17 articles. Terminal article with no distinguishable hyaline lamella, much longer than penultimate and antepenultimate ones. Article 12 with slender asthetasc not reaching distal margin of article 14. Antenna (Fig. 2B) consisting of 4 articles; article 1 bearing a long hairly bristle on inner distal corner with a few groups of spinules on both surfaces; a bristle attached near middle of outer margin of article 2; last article with seven curved bristles of varying lengths. Mandible, maxillule, maxilla, and maxilliped as in Fig. 2C-F, respectively. Any significant characteristics not detectable.

Thoracic legs 1-4 (Fig. 1B-E) three-segmented. Spine formula of exopod 3, 3, 4, 4, 4. Setal formula on inner margins of exo- and endopod 3 for legs 1-4 as follows:

	leg 1	leg 2	leg 3	leg 4
segment 1	1/1	1/1	1/1	1/1
segment 2	1/2	1/2	1/2	1/2
segment 3	4/4	4/4	4/4	4/2

Connecting plate (precoxal plate) of leg 1 with two naked lateral lobes; a stout seta on inner corner of basis reaching middle of endopod 2. Endopod 3 of leg 4 somewhat elongated, about 1.8 times as long as wide. Apical spines of endopod 3 nearly same in length with each other (or outer one slightly longer than inner one), about 3/4 times as long as the segment. Precoxal plate without tubercles, spinules or hairs.

Basal segment of leg 5 (Fig. 1F) not enlarged, about 2 times broader than distal one. Distal segment 1.46 times longer than wide. Inner spine rather short (less than half of distal segment), locating nearly on distal end.

Allotype male.-Body length 0.72 mm, and greatest width 0.28 mm. Prosome much slenderer than in female. Genital somite (Fig. 3A) 1.3 times wider than long. First post genital somite a little longer than next somites. Caudal rami somewhat shorter than female's, about 2.9 times as long as wide, and inner margin with short hairs. Endopod 3 of leg 4 (Fig. 3E) 1.9 times longer than wide; outer apical spine a little longer than inner one (1.1 times), but shorter than endopod 3 (0.81 times). Leg 6 (Fig. 3B) with one innermost spine and two outer setae. Inner seta markedly shorter than another seta. Other characters nearly same as in female.

Variations.-In all the mounted specimens, next characteristics were consistent: any seta on the outer margins of endopod 3 in legs 1-4 not transformed into spine; setal formula 4, 4, 4, 4 and spine formula 2, 3, 3, 3; row of hairs on inner margin of caudal ramus. Length to width ratio of caudal ramus ranges 3.19-3.25 in females and 2.54-2.86 in males.

Habitat.-Type specimens collected from a rather polluted, so unused well situated in steep hillside, not far from coast; water depth 2.5 m. water temperature 17.5°C, pH 6.2 measured by "pHydrion paper (6.0 to 8.0)".

Etymology.-The specific name is taken from the type locality, Tŏkchŏk Island in Korea.

Remarks.-*Acanthocyclops tokchokensis*, n. sp. has 17 articulated antennule and the feature makes it distinguishable from the other troglobiotic or highly differentiated subterranean congeneric species with 11- or 12-articulated antennule such as *Acanthocyclops kieferi* (Chappuis, 1925), *A. venus-*

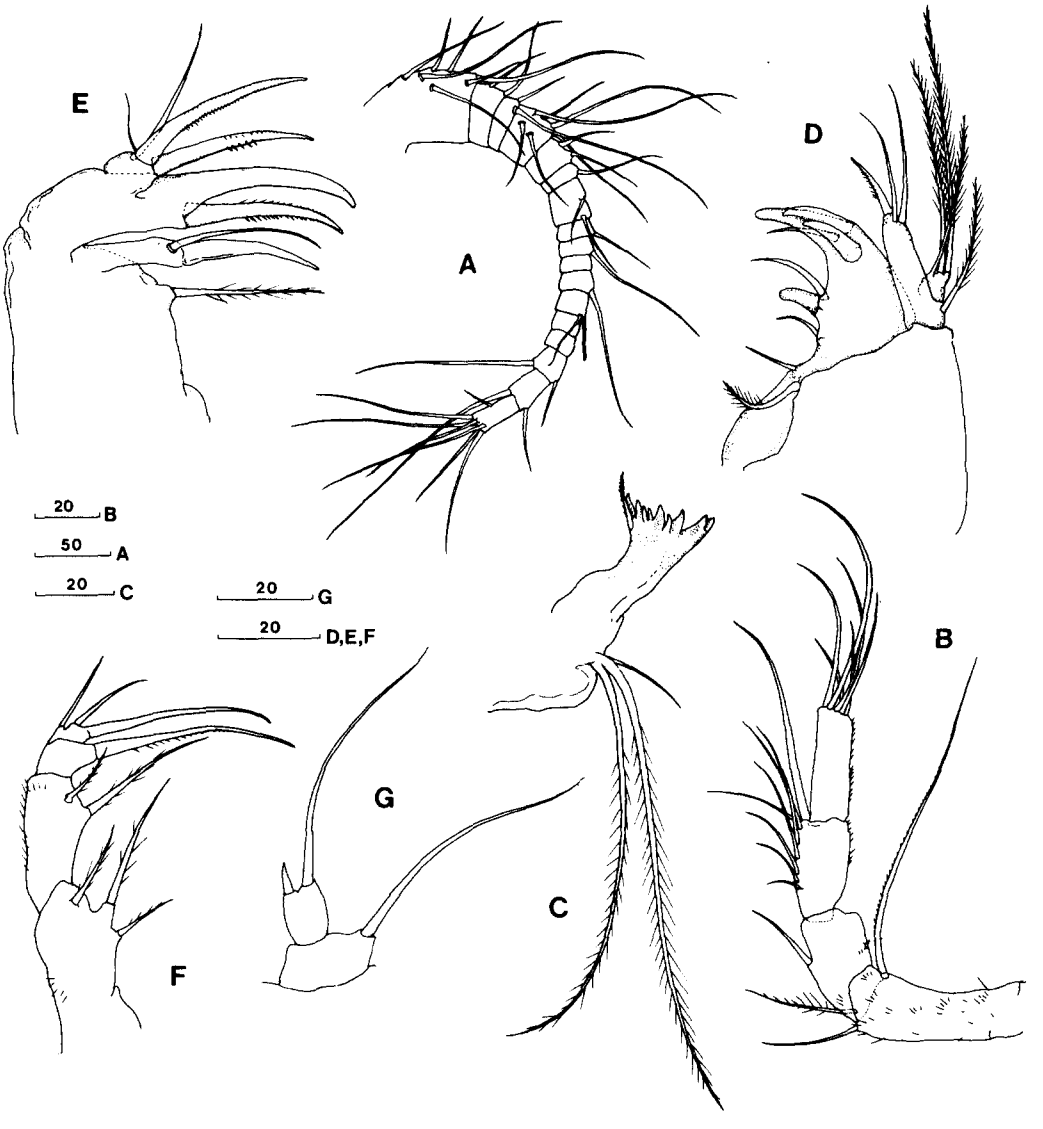

Fig. 2. *Acanthocyclops tokchogensis*, n. sp., female: A, antennule; B, antenna; C, mandible; D, maxillule; E, maxilla; F, maxilliped. (unit of scales in μm)

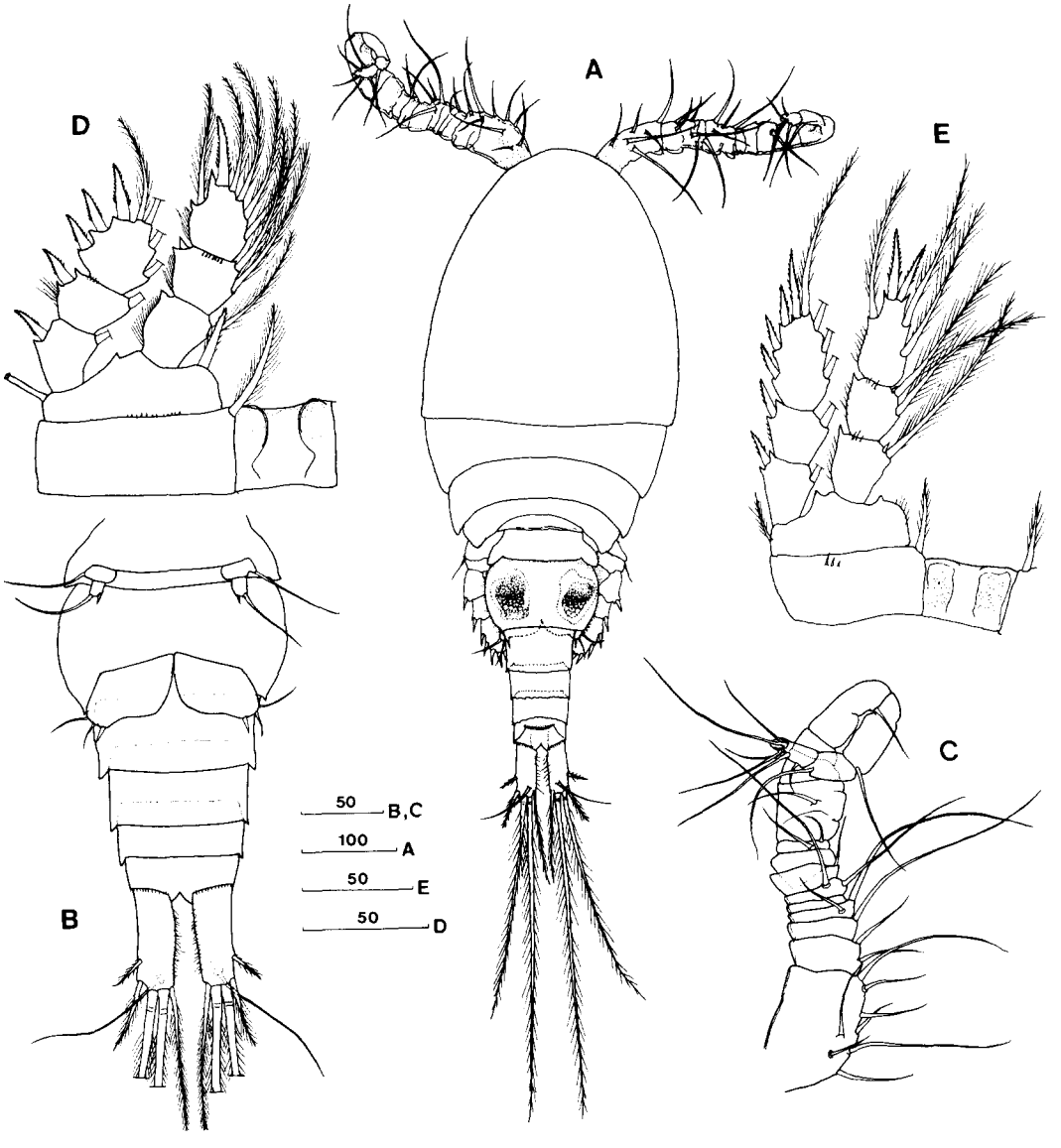

Fig. 3. *Acanthocyclops tokchogensis*, n. sp., male: A, habitus, dorsal; B, urosome, ventral; C, antennule; D, leg 1; E, leg 4. (unit of scales in μm).

tus (Norman and Scott, 1906), *A. miurai* (Ito, 1957), *A. morimotoi* (Ito, 1952), *etc.*

Among the other species with 17 articulated antennule, the present new species, *A. gordani* Petkovski, 1971, and *A. cephallenus* Pesce, 1978/1979 are quite characteristic in possessing the intermediate features of *Acanthocyclops* and *Megacyclops*, for instance, the relatively short caudal ramus with its inner margin sparsely haired, suggesting that the above three species are closely related with the genus *Megacyclops*, as Petkovski (1971) and Pesce (1978-1979) well pointed out. Though the present new species resembles especially *M. viridis* in many aspects such as 17-articulated antennule, the shape of caudal ramus, and the shape of endopod 3 of leg 4 including the apical spines on it, it is discernable from *M. viridis* by spine formula as well as the not-enlarged proximal segment of leg 5 and the inner spine located nearly on the distal end of distal segment of leg 5, which makes it to be confirmed as a member of the genus *Acanthocyclops*.

A. tokchokensis, n. sp. is distinguished from *A. gordani* Petkovski by spine formula and the longer endopod 3 of leg 4 than the apical spines on it, on the other hand, from *A. cephallenus* Pesce by spine formula, somewhat slender caudal ramus, and the longer outer apical spine than endopod 3 of leg 4, respectively.

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德積島 우물에서 채집한 검물벼룩 1신종, *Acanthocyclops tokchokensis* (검물벼룩목 : 검물벼룩과)

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德積島 鎭里와 西浦里의 우물에서 채집한 검물벼룩 1신종, *Acanthocyclops tokchokensis*, n. sp.를 기재한다.