

A new species of *Ochridacyclops* (Kiefer, 1937) (Copepoda, Cyclopoida) from Japan

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Abstract

A new species of cyclopoid copepod, *Ochridacyclops nipponensis* is described from Japan. This is the third species of the genus. The type material was collected from small streams in the mountainous regions in Shikoku. The new species can easily be distinguished from other members of genus by its 12-segmented antennule, by the proportional length of genital double-somite relative to the length of 3 free abdominal somites, and by the shape of caudal rami. The male is unknown.

Introduction

The genus *Ochridacyclops* comprises *Ochridacyclops arndti* (Kiefer, 1937) and *Ochridacyclops brevicaudatus* (Shen & Tai, 1964). A subspecies, *Ochridacyclops arndti f. prespensis* was described by Petkovski (1954). *O. arndti* was originally found in the endemic sponges, *Ochridaspongia*, of Lake Ohrid (Stankovic, 1960). *O. arndti f. prespensis* was found in other sponge species from freshwater habitats near Lake Ohrid. *O. arndti f. prespensis* Petkovski, 1954 is regarded as a subspecies based on smaller body, equal size of inner and lateral furcal setae and shorter caudal rami. In contrast, *O. brevicaudatus* was collected from plankton in China. In the present paper *Ochridacyclops nipponensis*, reported by Ishida (1990, 1993) as *Ochridacyclops sp.*, is described in detail.

Material and methods

Material was collected from small streams in the mountainous regions in Ino-machi (33° 33.5'N 133° 24.8'E), Kochi Prefecture, Shikoku on 11 March 1991 by scraping the bottom with a fine mesh hand net and fixed in formalin. Copepods were dissected in lactophenol and

examined as temporary mounts using differential interference contrast on an Olympus BH-2 microscope. Fragments of broken cover glass were added to support the cover glass. All drawings were made with the aid of a camera lucida. The terminology proposed by Huys & Boxshall (1991) is adopted as is the setal notation for the antenna proposed by Boxshall & Evstigneeva (1994). The type material is stored in the collection of The Natural History Museum, London, Registration numbers: Holotype female, 1995.1003; 2 paratype females 1004–1005.

Description

Ochridacyclops nipponensis sp. nov.

Adult female

Body length: 545 µm, body width: 190 µm. Body cyclopiform (Figure 1A); prosome with cephalothorax narrowing anteriorly and free pedigerous somites decreasing in width from anterior to posterior. Fourth pedigerous somite with lateral patch of short setules at posterolateral angles. Genital double-somite (Figure 1B) about as long as broad; length of genital double-somite about equal to length of 3 free abdom-

inal somites. Seminal receptacles divided into broad anterior and posterior lobes. Fifth pedigerous somite with fringe-like array of elongate setules along posterolateral margins. Anal somite with spinular row ventrally along posterior margin (Figure 1F), extending laterally round somite to anal operculum. Anal operculum weakly developed, barely convex, smooth; row of spinules present in anal cleft either side of midline.

Caudal rami about 2.5 times longer than broad. Caudal rami with 6 setae; seta (I) absent; posterolateral seta (III) with spinular row at base extending dorsally and ventrally; small seta (II) on dorsolateral surface with spinular row.

Antennule 12-segmented (Figure 2B). First segment with spinular row ventrally. Segment 2 with partial suture line. Apical segment lacking marginal membrane. Segment 9 with short aesthetasc. Another aesthetasc present at segment 11. Apical segment with aesthetasc fused to adjacent seta at base. Setal formula 8, 4, 2, 6, 4, 2, 2, 3, 2 + 1 aesthetasc, 2, 2 + 1 aesthetasc, 7 + 1 aesthetasc; one seta on segment 6 spiniform.

Antenna 4-segmented (Figure 1E), comprising coxobasis and 3-segmented endopod. Coxobasis ornamented with rows of spinules laterally (Figures 1E, G) and armed with 2 inner setae; outer spinulose seta representing exopod. First endopodal segment with inner distal seta and midsurface 2 rows of spinules. Second endopodal segment with 9 setae, of which 6 on inner margin and 3 arranged along inner part of distal margin; seta VIII longer and more robust than others; segment ornamented with spinules along outer margin. Third endopodal segment armed with 7 setae around apex; segment ornamented with incomplete spinular row along outer margin.

Labrum (Figure 2A) comprising slender anterior part and broad posterior part. Posterior margin forming strong teeth; ventral surface ornamented with paired rows of long spinules.

Mandible (Figure 2C) with coxal gnathobasic blades mostly simple, dorsal seta with spinules along inner rim. Palp represented by 3 setae, 2 of which long and plumose, third short and naked. Inner and outer margin of coxa near base of palp ornamented with spinular rows.

Maxillule (Figure 2D) with praecoxal arthrite bearing 7 setae articulating at base and 3 spines fused to segment; proximalmost seta spinulose, spines naked. Proximal segment of palp derived from coxa and basis, bearing 1 strong spinulose and 2 spinulose inner margin setae, plus outer spinulose seta representing exo-

pod. Distal segment of palp, representing endopod, armed with 3 spinulose setae.

Maxilla 5-segmented (Figure 2E). Praecoxal endite with 2 spinulose setae. Coxa with proximal endite represented by single spinulose seta, distal endite with well developed process carrying strong spinulose seta and naked seta apically. Basis drawn out into powerful spinulate claw and armed with strong accessory claw with spinular row along convex margin and naked seta. First endopodal segment carrying 2 spinulose setae, second carrying 1 spinulose and 2 naked setae.

Maxilliped 4-segmented (Figure 2F), syncoxa armed with 2 spinulose and 1 naked seta representing endites. Basis armed with 1 spinulose and 1 naked inner seta; ornamented with 2 transverse rows of spinules near outer distal angle. First endopodal segment bearing claw-like seta with 5 spinules at midlength. Second endopodal segment with 3 setae, 2 of which naked; innermost seta strong and spinulose.

Legs 1 to 4 each with spinular rows on posterior surface of exopodal segments 1 and 2, and endopodal segment 2; ornamented with transverse spinular rows on intercoxal sclerite and with spinules along inner margin of basis; also with long spinules along outer margins of endopodal segments. Legs 2 to 4 ornamented with spinular rows at midlength of intercoxal sclerite posteriorly. Legs 1 to 3 with spinular row near base of endopodal segment 1 anteriorly.

Leg 1 (Figure 3A) with 3-segmented protopod. Praecoxa represented by triangular sclerite at outer proximal angle with spinular row on outer corner. Coxa with inner spinulose seta; bearing spinular rows near inner and outer margin posteriorly and spinular row midway along lateral margin anteriorly. Basis with long outer angle seta and spiniform seta on inner margin bearing spinular row at base; ornamented with spinules along inner margin and spinular rows near base of endopod anteriorly. Endopodal segments 1 and 2 with terminal spinular rows anteriorly.

Leg 2 (Figure 3B) with 3-segmented protopod. Praecoxa represented by triangular sclerite at outer proximal angle with spinular row on outer corner. Coxa with inner spinulose seta; bearing spinular rows near inner and outer margin posteriorly and spinular row midway along lateral margin anteriorly. Basis with long outer angle seta bearing spinular row at base. Endopodal segments 1 and 2 with terminal spinular rows anteriorly. Exopodal segment 2 with spinular row on inner angle.

Leg 3 (Figure 3C) with 3-segmented protopod. Praecoxa represented by triangular sclerite at outer

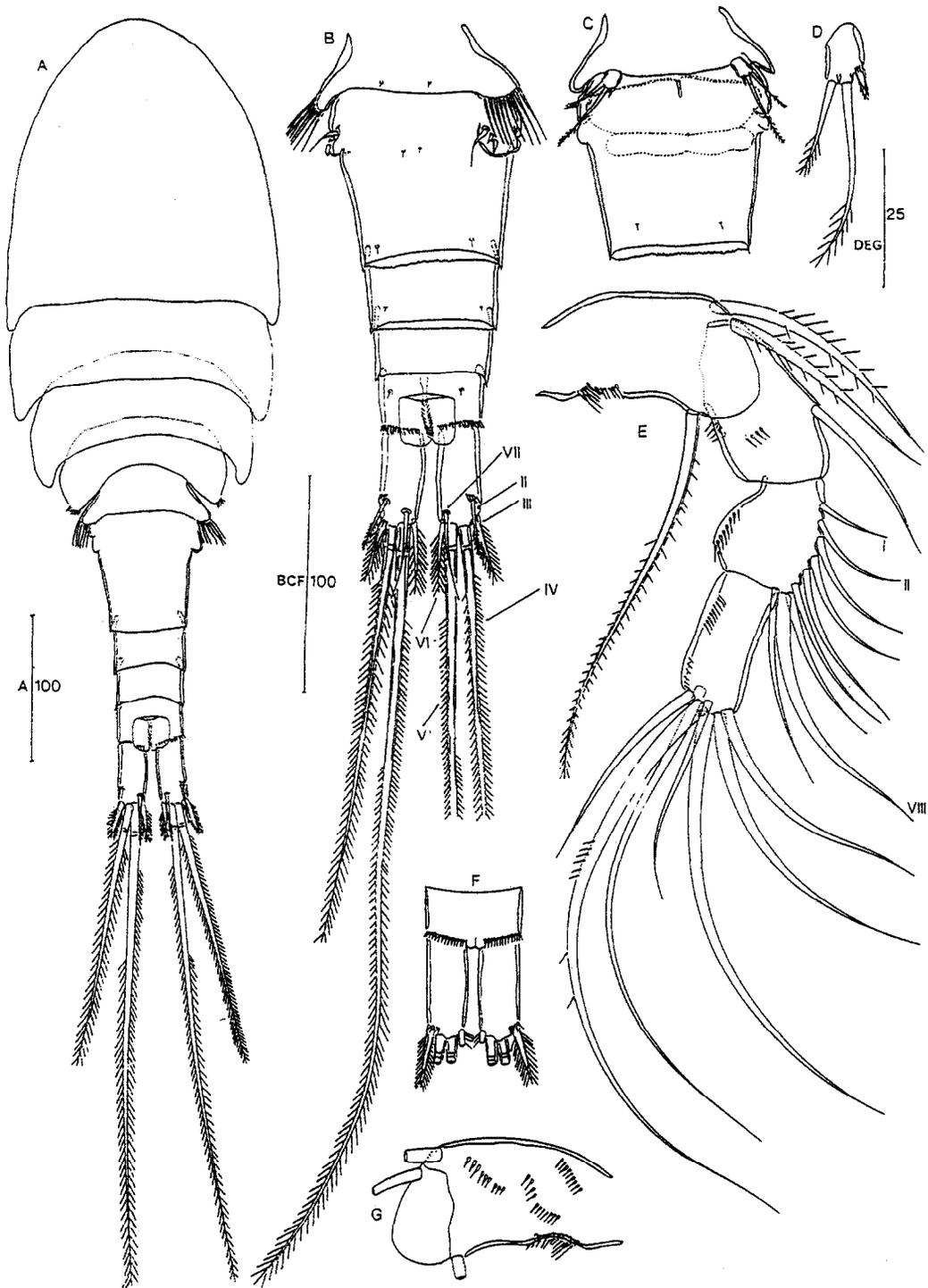


Figure 1. *Ochridacyclops nipponensis* sp. nov. Adult female. A, Dorsal view; B, Urosome, dorsal view; C, Genital double-somite, ventral view; D, Leg 5, ventral view; E, Antenna, anterior view; F, Anal somite and caudal rami, ventral view; G, Basis of antenna, posterior view. All scale bars in μm .

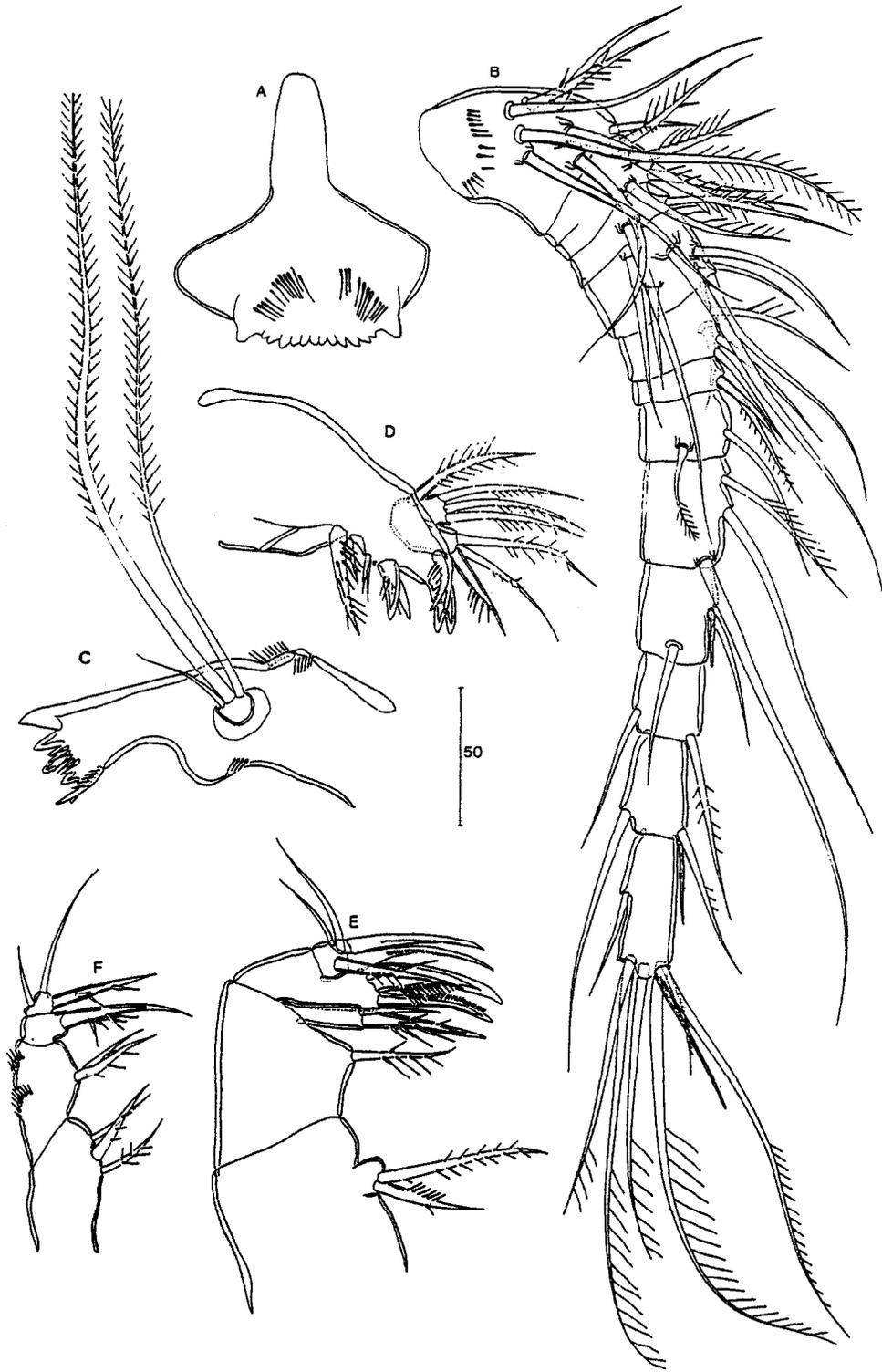


Figure 2. *Ochridacyclops nipponensis* sp. nov. Adult female. A, Labrum, ventral view; B, Antennule, ventral view; C, Mandible, posteroventral view; D, Maxillule, ventral view; E, Maxilla, posterior view; F, Maxilliped, anterior view. Scale bar in μm .

Table 1. A comparison between *Ochridacyclops* species.

Character	<i>O. arndti</i>	<i>O. brevicaudatus</i>	<i>O. nipponensis</i>
Body length	750 μm	460 μm	545 μm
Inner and outer setae of P5	About equal in length	Inner about 2 times longer than outer	Inner about 2 times longer than outer
Spinular row on anal somite	Absent	?	Present
P4 endopod: ratio inner spine to apical segment	0.86:1.0	0.77:1.0	1.4:1.0
Spine formula exopods 1-4	3.4.4.3	3.4.3.3	3.4.4.3
Posterior lobe	Broad	Globular	Broad
Seminal recept.			
Length:width caudal rami	2.5:1.0	1.4:1.0	2.2:1.0
Relative lengths caudal setae	Seta VI longer than seta III	Seta VI longer than seta III	Seta VI about equal to seta III

proximal angle with spinular row on outer corner. Coxa with inner spinulose seta; bearing spinular row near outer margin posteriorly and spinular row midway along lateral margin anteriorly. Basis with short outer angle plumose seta bearing spinular row at base. Endopodal segments 1 and 2 with spinular rows at outer margin anteriorly. Exopodal segment 2 with spinular row on inner angle.

Leg 4 (Figure 3D) with 3-segmented protopod. Praecoxa represented by triangular sclerite at outer proximal angle. Coxa with inner spinulose seta; bearing spinular rows near outer margin posteriorly and spinular row midway along lateral margin posteriorly. Basis with outer angle plumose seta bearing spinular row at base. Endopodal segment 2 with terminal spinular rows anteriorly and posteriorly. Spine and seta formula as follows:

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	1-I	I-1;I-1;III,1,4	0-1;0-2;1,I,4
Leg 2	0-1	1-0	I-1;I-1;III,I,5	0-1;0-2;1,I,4
Leg 3	0-1	1-0	I-1;I-1;III,I,5	0-1;0-2;1,I,4
Leg 4	0-1	1-0	I-1;I-1;II,I,5	0-1;0-2;1,II,2

Leg 5 (Figure 1D) comprising single free segment, armed with 1 short, strong inner spine only 60% as long as free segment and 2 plumose setae, middle plumose seta about 2 times longer than outer one. Row of minute spinules present on segment at base of inner spine.

Leg 6 (Figure 1B) represented by 1 naked seta and 2 tiny spinules dorsolaterally.

Male: unknown.

Discussion

The new species was originally reported as *Ochridacyclops* sp. by Ishida (1993) who illustrated some of the diagnostic characters. The new species differs from the known species of *Ochridacyclops* in its 12-segmented antennule. Both other species have 11-segmented antennules in the female. *O. arndti* was incompletely described by Kiefer (1937) who provided no description or illustrations of the mouthparts, but the new species can easily be distinguished from *O. arndti* and *O. brevicaudatus* by the characters listed in Table 1.

Ochridacyclops and *Paracyclops* are closely related. These two genera are similar in most respects, including the segmentation and setation of swimming legs 1 to 4 and the form of the seminal receptacles. Although the unsegmented fifth leg of *Ochridacyclops* has an elongated rectangular shape with a relatively smaller inner spine than in *Paracyclops* species, it is difficult to accept this as the sole generic level discriminant. It is especially difficult to assess the validity of *Ochridacyclops* in the absence of a detailed description of the male antennule of the genus, since the male antennule provides a number of significant taxonomic characters in *Paracyclops* (Karaytug & Boxshall, 1996). Comparison between the male antennules of

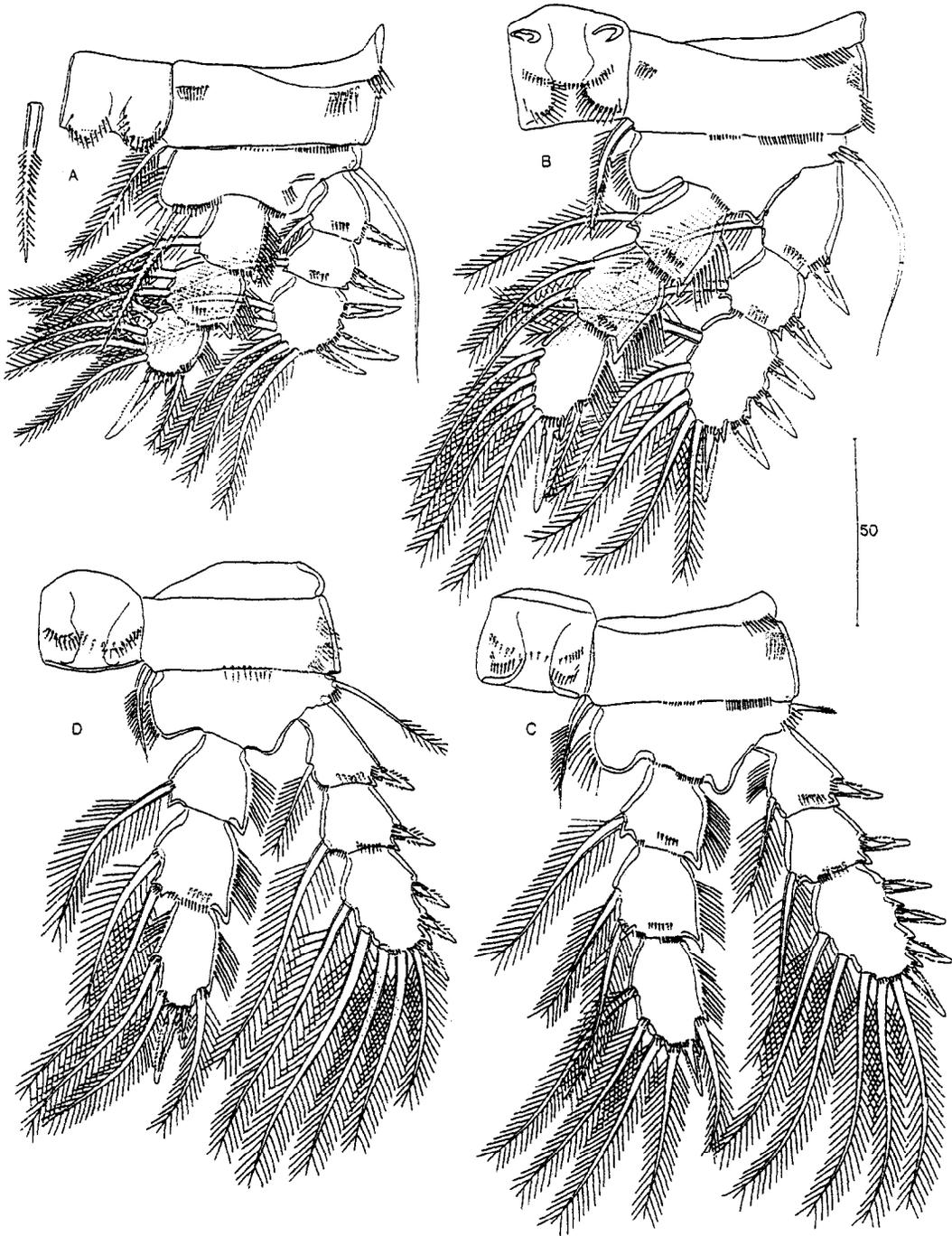


Figure 3. *Ochrudacyclops nipponensis* sp. nov. Adult female. A, Leg 1, anterior view with inset showing detail of inner basal element; B, Leg 2, anterior view; C, Leg 3, anterior view; D, Leg 4, anterior view. Scale bar in μm .

the two genera may provide new data of significance at the generic level.

The new species appears to be widely distributed in Japan, with records from Kyushu (Ishida, 1990) and Hokkaido (Ishida, 1993) as well as from Shikoku

where the type material was collected. It is known only from mountainous streams.

Acknowledgments

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