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# *Archaeodiacyclops,* new genus with "archaic" features (Crustacea, Copepoda, Cyclopoida), with description of new species from water bodies of northern Sakhalin Island

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## Abstract

Representatives of freshwater cyclopid *Archaeodiacyclops okhensis* **gen. nov.**, **sp. nov.** were found in river ecosystems of northern Sakhalin Island (East Russia). General structure of these specimens corresponds to genus *Diacyclops*. An unusual feature of these specimens is the retained hairs on the inner side of the caudal branches, which are usually absent in the genus *Diacyclops*. Analysis of the world fauna of the genus *Diacyclops* made it possible to describe a new genus and include the newly described species there, along with five already known species. The main diagnostic features for the new genus, in addition to the structure of the fifth pair characteristic of *Diacyclops*, are the combination of the unreduced structure of antennules (17-segmented), swimming legs (3-segmented) and caudal rami with presence of hair-setules on the inner side. The new genus includes 5 species, distributed mainly in the water bodies of the Americas. The finding of the newly described species outside this region is an additional evidence of some similarity of American and East Asian freshwater faunas. The article provides an identification key for species of a new genus.

**Key words:** *Diacyclops*, taxonomy, freshwater copepods, "archaic" features, new genus, new species

## Introduction

The genus *Diacyclops* Kiefer, 1927 was isolated from the genus *Cyclops* Müller O.F., 1785 of the family Cyclopidae Rafinesque, 1815 simultaneously with *Acanthocyclops* Kiefer, 1927 and *Megacyclops* Kiefer, 1927. Kiefer, like some of his predecessors, based the separation of genera on the structure of the fifth pair of legs (Kiefer 1927). Before him, Vosseler, J. (1886) proposed to divide the then unified genus *Cyclops* into two groups: (A) bearing 3 appendages on the distal segment of the fifth pair of legs and (B) bearing 1 or 2 appendages on this segment. These two groups were subsequently named Bifida and Trifida by Graeter (1903), and Kiefer (1929) isolated them into the subfamilies Cyclopinae and Eucyclopinae.

The genus *Cyclops* s. str. shares with the genera *Megacyclops*, *Acanthocyclops* and *Diacyclops* the presence of an inner spine and apical seta on the distal (second) segment of P5. The fifth pair of legs of *Cyclops* differs well from these three genera by the presence of clearly visible, rather long spinules on the outer side of distal segment, opposite to the inner spine. In addition, on the dorsal side of the caudal rami there is a clearly visible longitudinal fold, and their inner surface is covered with hairs. The division of the genera *Megacyclops*, *Acanthocyclops* and *Diacyclops* is based on the relative length and position of the inner spine of P5 (Kiefer 1927). In *Megacyclops*, this spine is tiny, placed closer to the middle, practically not divided from the segment and resembles a tiny hook on its inner surface, not extending beyond the segment. Antennules of *Megacyclops* are always 17-segmented, swimming legs are three-segmented, and inner surface of caudal rami is covered with hairs. In *Acanthocyclops*, inner spine of P5 is longer, located more distally, extending beyond the segment, but its length does not exceed the length of the distal segment. Antennules of *Acanthocyclops* are 11–17-segmented, swimming legs are three-segmented, and the inner surface of caudal rami is usually bare or rarely with hairs. In *Diacyclops*, the inner spine of P5 is also located distally, but its length exceeds the length of the distal segment. Antennules of *Acanthocyclops*

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are 11–17-segmented, swimming legs are two- or three-segmented, and the inner surface of the caudal rami is usually bare or rarely with hairs.

The genus *Diacyclops*, described by Kiefer in 1927, included at that time more than 20 taxa (Kiefer, 1927). Subsequently, this genus was greatly enriched with new species and at the time of the last published summary it was already clearly over enlarged and included about 120 taxa (Dussart & Defaye, 2006), and after that it continued to be replenished with descriptions of new species. As mentioned above, species of *Diacyclops* differ greatly in morphology, which gives a reason for its fragmentation, and currently several new genera, such as *Rheocyclops* Reid & Strayer, 1999, *Itocyclops* Reid & Ishida, 2000, *Reidcyclops* Karanovic, 2000, *Monchenkocyclops* Karanovic, Yoo & Lee, 2012, *Zealandcyclops* Karanovic, 2005 and some others have been separated from *Diacyclops*. Most of these new genera inhabit subterranean and interstitial waters and differ from *Diacyclops* in the reduction of the proximal segment of P5, which can be fused with the last thoracic somite, the distal segment armed with two setae instead of a spine and a seta, and other reductions (Reid *et al*. 1999; Reid & Ishida 2000; Karanovic, 2000). Some representatives of *Zealandcyclops* and *Monchenkocyclops* possess *Diacyclops*-like P5 but differ by having two-segmented endopodites of all swimming legs (Karanovic 2005; Karanovic *et al*. 2012).

While studying the fauna of Sakhalin Island, we discovered a new taxon, morphologically close to *Diacyclops salisae* Reid, 2004. Similar to this North American species, the Sakhalin new species possesses a *Diacyclops*-like P5, maximum segmentation of antennules, known in continental cyclopids, hairs on the inner side of caudal branches. Segmentation of other structures, such as antennae and swimming legs, is also not reduced. These features allows us to assess these species as more primitive, "archaic", compared to other members of the genus *Diacyclops*, since oligomerization indicates a more advanced evolution of the taxon according to theory of Dogiel (Dogiel, 1954; Seifried, 2003). Analysis of the world fauna of *Diacyclops* revealed 3 more species with similar "archaic" structural features described from water bodies of Americas (Kiefer 1935; Reid 1998; Fiers *et al*. 2000). Among the morphological characters of these taxa, a certain heterogeneity is also found, which made it possible to divide these species into two more groups, based on a number of morphological characters (Fig. 1). This article is devoted to the description of a new species, and separating of a new genus from the genus *Diacyclops*.

## Materials and methods

The specimens for this study were collected during the expedition to Sakhalin Island in July 2022. A total of 88 samples were collected from various water bodies on the island from Yuzhno-Sakhalinsk to Okha. Representatives of the new species described in this work were found in two samples in the vicinity of Okha town, northern Sakhalin (Fig.1):

Sample 58: Sakhalinka River, under the bridge (53°37'03.4 "N 142°56'20.6 "E), in macrophyte thickets, collected with a hand net, water temperature 16.4 ˚C, pH 7.4. Date of collection 28.07.2022 12:23. Of copepods, the sample contained 1 female and 1 male of *Archaeodiacyclops okhensis* **sp. nov.**, and 1 female of *Paracyclops fimbriatus* (Fischer, 1853).

Sample 59: Okha River, Okha town, under the bridge, Sovetskaya street 32A (53°35'21.6 "N 142°57'14.7 "E), in macrophyte thickets, collected with a hand net, water parameters were not measured. Date of collection 28.07.2022 15:00. Of copepods, the sample contained 3 females of *Archaeodiacyclops okhensis* **sp. nov.**, 24 females of *Eucyclops speratus* (Lilljeborg, 1901) and 2 females of *Paracyclops fimbriatus*.

Both of these samples were fixed with 4% formalin. For morphological examination, specimens were placed in a drop of glycerol, measured, photographed and drawn using a drawing tube mounted on a compound microscope. For drawing the ornamentation, the structures were pressed with cover glass and studied using an oil immersion lens. For permanent slides, dissected specimens were mounted on the glass slide according to the method of Prof. F. Kiefer, in glycerol surrounded by Canada balsam. The material was deposited in the Federal Collection of the Zoological Institute of the Russian Academy of Sciences.

Abbreviations used in the text are: A1, antennule; A2, antenna; Bas, basipodite; Coxa, coxopodite; Enp, endopodite; Exp, exopodite; P1–P6, pairs of legs.

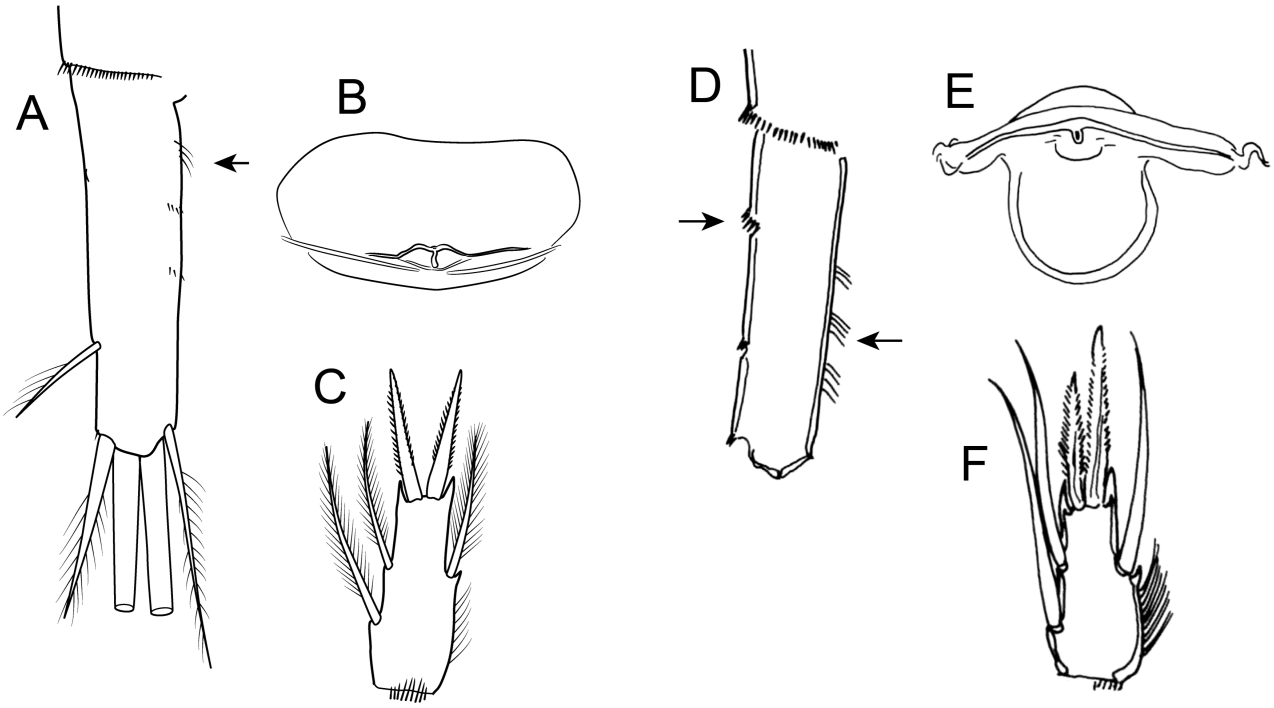


**FIGURE 1.** Main morphological features of the genus *Archaeodiacyclops* gen. nov. A–C—*salisae*-group; D–F—*uruguayensis*-group; A, D—caudal ramus, arrows indicate setules on inner and outer margins; B, E—*receptaculum seminis*; C, F—length ratio of distal spines of P4 Enp3 (D–F—after Reid 1998).

## Results

### Order Cyclopoida Burmeister, 1835

### Family Cyclopidae Rafinesque, 1815

### Subfamily Cyclopinae Kiefer, 1927

### Genus *Archaeodiacyclops* Alekseev & Chaban gen. nov.

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**Diagnosis.** Medium-sized species (833–1410 μm) with slender, cyclopiform habitus. Genital double-somite about as long as broad, widest at first third. *Receptaculum seminis* with bulky anterior part and almost unexpanded posterior part in *salisae*-group or with thin anterior part and sac-like posterior part in *uruguayensis*-group. Anal somite with denticles along most of the lower margin; anal operculum weakly developed, almost straight in *salisae*-group or rather strongly developed in *uruguayensis*-group. Caudal branches cylindrical, parallel, from 3.3 to 5.1 times as long as wide; inner surface bears rows of hairs-setules and denticles (one proximal row of hairs in *salisae*-group and several rows of hairs in *uruguayensis*-group); outer surface may bear transverse row of denticles in proximal third of branch (*uruguayensis*-group); lateral seta longer than width of caudal branch, attached at level of lower quarter/third of length of outer margin, plumed with long hairs, with or without denticles at point of attachment; innermost seta is longer than outer one (1.2–1.6: 1) and shorter or subequal to length of caudal rami (0.6–1.1: 1), uniformly plumed with long hairs; outermost seta from 0.5 to 0.8 times as long as caudal ramus, uniformly plumed with long hairs, has denticles at point of attachment; dorsal seta shorter than outermost seta, subequal or longer (0.75–1.2: 1) and from 0.4 to 0.8 times as long as caudal ramus, usually with few long hairs distally.

Antennule 17-segmented, short, does not extend beyond middle of first free thoracic somite. Antenna with long exopodite seta; endopodite segment 2 with 9 setae. Labrum with rounded lateral projections and 10-12 blunt

teeth on cutting edge; frontal surface with 2 rows of long hairs. Mandible with several teeth and plumose seta on cutting edge; palp with two long plumose and one short naked seta. Maxillule of typical cyclopid structure; palp surface without ornamentation. Maxilla 5-segmented, with first two segments partly fused, without ornamentation on surface. Maxilliped 4-segmented; segment setation: 3/2/1/3 or 3/1/1/3; second segment ornamented with two or three lateral rows of spinules and one medial group of spinules; third segment bearing one medial group of spinules.

Swimming legs two-branched, three-segmented. Exp1 and Exp2 with 1 inner seta and 1 outer spine. Exp3 spine formula 2/3/3/3 or 3/4/4/4; setal formula 4.4.4.4. Enp1 with 1 inner seta; Enp2 with 2 inner setae. Enp3 spine formula 1/1/1/2; setal formula 5.5.5.3. All swimming legs with finely plumose setae, except lateral-most seta of P1 Exp3, which has tiny spinules along its lateral side. Intercoxal plate has simplified ornamentation; in a number of species it is bare on both sides; in some there are hairs on frontal side of some swimming legs; in some species, there are denticles on caudal side of P4 intercoxal plate. Inner spine of P4 Enp3 may be longer or shorter than outer spine, or they may be subequal. Distal setae of P4 Enp3 may extend beyond tips of distal spines in some species. P1 Bas with inner spine, which may be homogeneously covered with setules of similar length or heterogeneously covered with long setules proximally and short setules distally. P1 Bas with or without distal arc of spinules between Enp and Exp frontally.

Fifth pair of legs two-segmented; first (proximal) segment about as wide as long or slightly wider, with 1 outer seta; second (distal) segment cylindrical, longer than wide, armed with 1 apical seta and 1 inner spine. Inner spine is almost as long as distal segment or longer (0.9–2.0:1), with several denticles at insertion site.

Sixth leg represented by small plate armed with two short smooth spines and plumose longer outer seta.

Males are noticeably shorter and more slender than females. Structure of appendages similar to females, although length ratios slightly differ. Antennule geniculate. P6 armed with strong inner spine and two plumose setae.

New genus currently includes five species.

**Type species**. *Archaeodiacyclops okhensis* **sp. nov.**

**Other species**. *Archaeodiacyclops uruguayensis* (Kiefer, 1935) comb. nov.; *A. salisae* (Reid, 1992) comb. nov.; *A. ecabensis* (Fiers & Ghenne, 2000) comb. nov.; *A. pilosus* (Fiers & Ghenne, 2000) comb. nov.

**Etymology**. New genus is named using prefix *Archae-* in reference to a number of "archaic" characters in its structure, namely 17-segmented A1 (the largest number known in the subfamily), caudal branches with hairs on inner side, as well as unreduced segmentation of swimming legs.

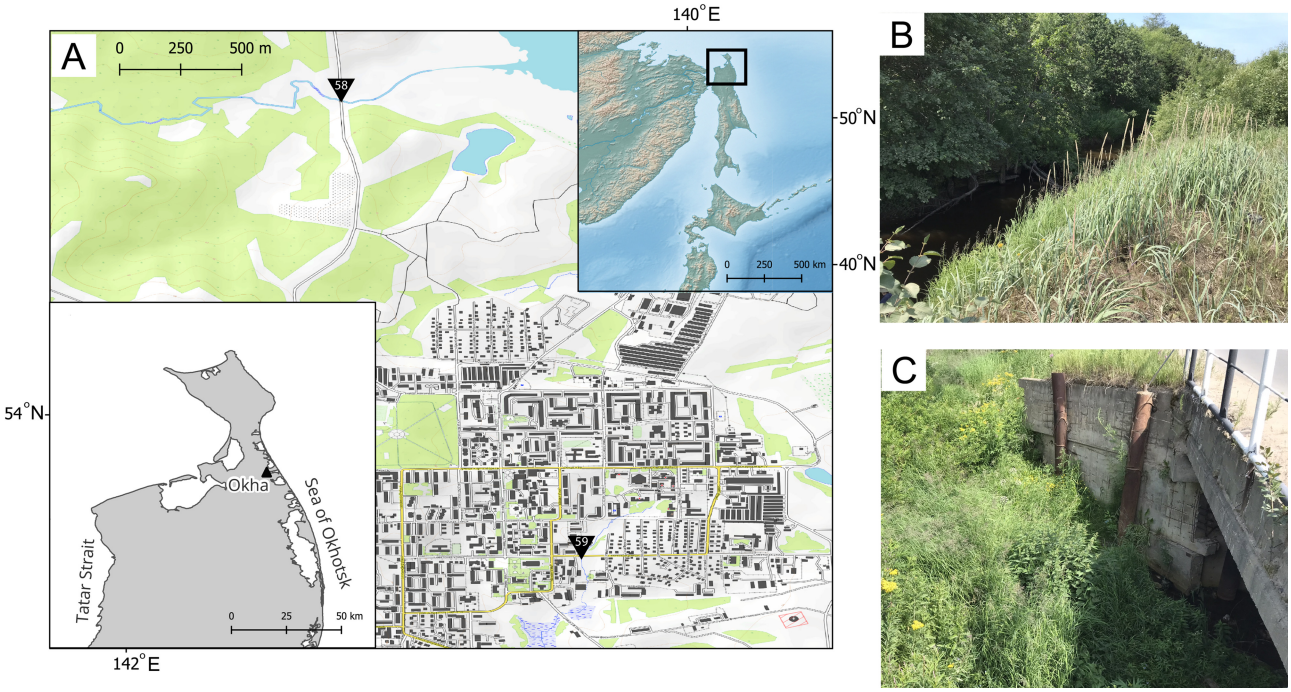


**FIGURE 2.** Sampling location of *Archaeodiacyclops okhensis* **sp. nov.**: A—a map of the area, black triangles indicate sampling points; B—sampling station 58; C—sampling station 59.

***Archaeodiacyclops okhensis* Chaban & Alekseev sp. nov.**
(Figs. 3-6)
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**Type material**. Holotype female, mounted on permanent slide, #55606; paratype male, mounted on permanent slide, #55607; preserved paratypes: 3 females undissected, #55608; deposited in Federal Collection of Zoological Institute of Russian Academy of Sciences.

**Type locality**. Russia, North of Sakhalin Island, Sakhalinka river on outskirts of Okha town, under bridge (53°37'03.4"N 142°56'20.6"E).

**Etymology.** The species is named after the town where it was found.

**Description of female holotype**. Female body length without caudal setae 1029–1233 μm. Habitus slender, with largest width near posterior margin of cephalothorax (Fig. 2A). Cephalothorax 1.1 times as long as wide, with maximum width close to posterior margin. Two last thoracic somites laterally slightly produced and curved. Genital double-somite slightly longer than wide, tapering posteriorly, with lateral sharp angles anteriorly (Fig. 2D); *receptaculum seminis* with large round anterior part and almost not extended posteriorly; pore-canal short, straight. Hyaline frills of abdominal somites smooth. Anal somite with small thin spinules along posterior margin; anal operculum weakly developed, almost straight (Fig. 3B).

Caudal rami 4.5–5.1 times longer than wide, almost parallel (Fig. 2C); lateral surface smooth except tiny spines at insertion of outermost caudal setae; medial surface with one proximal row of hair-setules and two more posterior rows of tiny spines; dorsal and ventral surfaces are covered with groups of tiny spines poorly visible under low magnification (more abundant on ventral surface) (Fig. 3A, B). Lateral seta inserted at about posterior 1/4 of lateral margin of ramus, without spines at insertion place. Innermost seta 1.3–1.4 times as long as outermost seta, and 0.6 times as long as ramus length. Dorsal seta 0.8–0.9 times as long as outermost seta. All caudal setae plumose (dorsal setae with only few hairs). Distal setae length ratio beginning from outermost one: 1.0/ 5.5–5.9/ 8.0–8.3/1.3–1.4.

Antennule (A1) 17-segmented, short, not reaching posterior edge of cephalothorax. Setation of antennular segments, beginning from first: 8/4/2/6/4/2/2/1/1/0/1/1+ae/0/1/2/2+ae/7+ae (Fig. 3C). First segment with one row of spinules. Aesthetasc on 12$^{th}$ segment reaching 1/3 of 15$^{th}$ segment or distal border of 14$^{th}$ segment. Aesthetasc on 16$^{th}$ segment reaching 3/4 to 9/10 of 17$^{th}$ segment.

Antenna (A2) composed of basipodite with two medial setae and one long exopodal seta, and three endopodal segments; endopodite setation: 1, 9, 7 (Fig. 5A). Basipodite ornamentation composed of few sparse proximal groups of spines, rather variable (Fig. 5B–D); medial setae smooth, exopodal seta covered with short spinules.

Mouthparts. Labrum (Fig. 3D) composed of large plate ornamented with two groups of long setules; distal margin with 10 large blunt teeth between rounded lateral projections. Mandible (Fig. 3E) composed of coxa and palp bearing three setae (two long plumose and one short naked) as typical for the family; coxal gnathobase with group of long spinules, plumose seta, adjacent shorter seta with two denticles and blunt teeth of different size. Maxillule composed of praecoxa and palp of typical cyclopid structure; setation and ornamentation according to figure 4B; palp naked. Maxilliped (Fig. 4C) 4-segmented as typical for the family; segment setation: 3/2/1/3; second segment ornamented with two lateral rows of spinules and one medial group of spinules; third segment bearing one medial group of spinules. Maxilla (Fig. 4A) 5-segmented as typical for the family, with first two segments partly fused, without ornamentation.

All swimming legs with 3-segmented endo- and exopodites; distal exopodite spine formula 3/4/4/4; setal formula according to genus description. In one of specimens, P4 asymmetrical with 3 spines on one of the Exp3 and 4 spines on another. All setae of swimming legs not modified, slender and plumose, except distal seta of P1 Exp3 which is covered with denticles along outer side and hairs along inner side. P1 Bas with inner spine, which heterogeneously covered with long setules proximally and short setules distally; this spine reaching distal margin of Enp2 (Fig. 4E). P1 Bas without distal arc of spinules between Enp and Exp frontally. P1–P3 intercoxal plates frontal surface with long hair-setules, caudal surfaces naked. P1–P4 Bas inner outgrowths covered with dense hairs. P4 Coxa caudal surface ornamented with abundant lateral groups of hair-setules/spinules, and two longitudinal rows of spinules proximally and distally. P4 intercoxal plate caudal surface with central row of rather long spinules (Fig. 2F); frontal surface naked. P4 inner coxal seta homogeneously covered with long hairs; this seta extending beyond inner outgrowth. P4 Enp3 1.9–2.3 times as long as wide; inner/outer distal spines length ratio 1.0–1.1: 1; inner spine 0.7 times as long as segment; distal setae reaching 1/2 to 3/4 of adjacent spines. P4 Exp3 distal spine 0.8–0.9 times as long as segment.

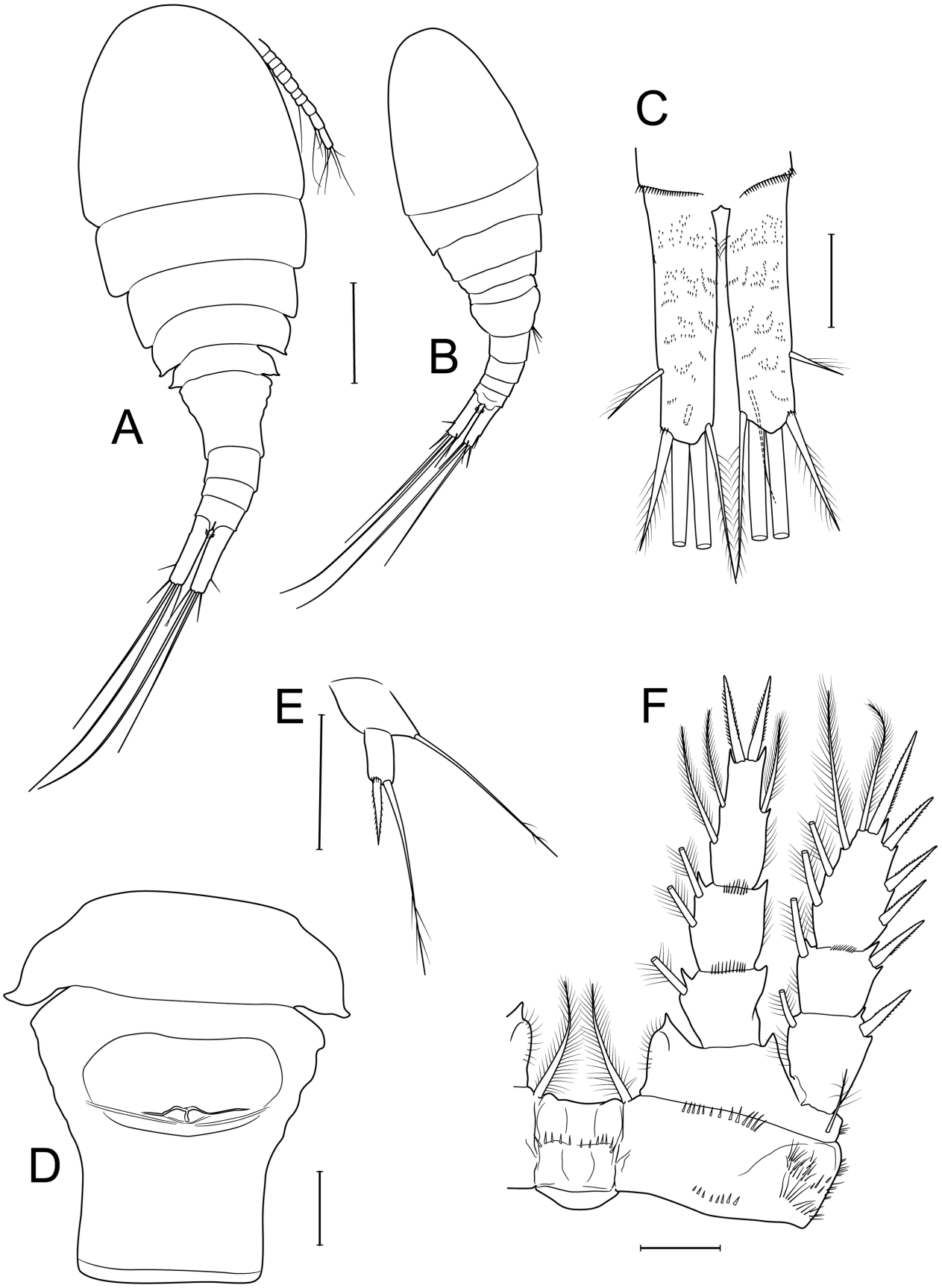


**FIGURE 3.** *Archaeodiacyclops okhensis* Chaban & Alekseev **sp. nov.** : female, A, C–F; male, B. A, B—habitus; C—caudal rami, ventral; D—genital double-somite, ventral; E—P5; F—P4, caudal. Scale bars: A, B—200; C–F—50 μm.

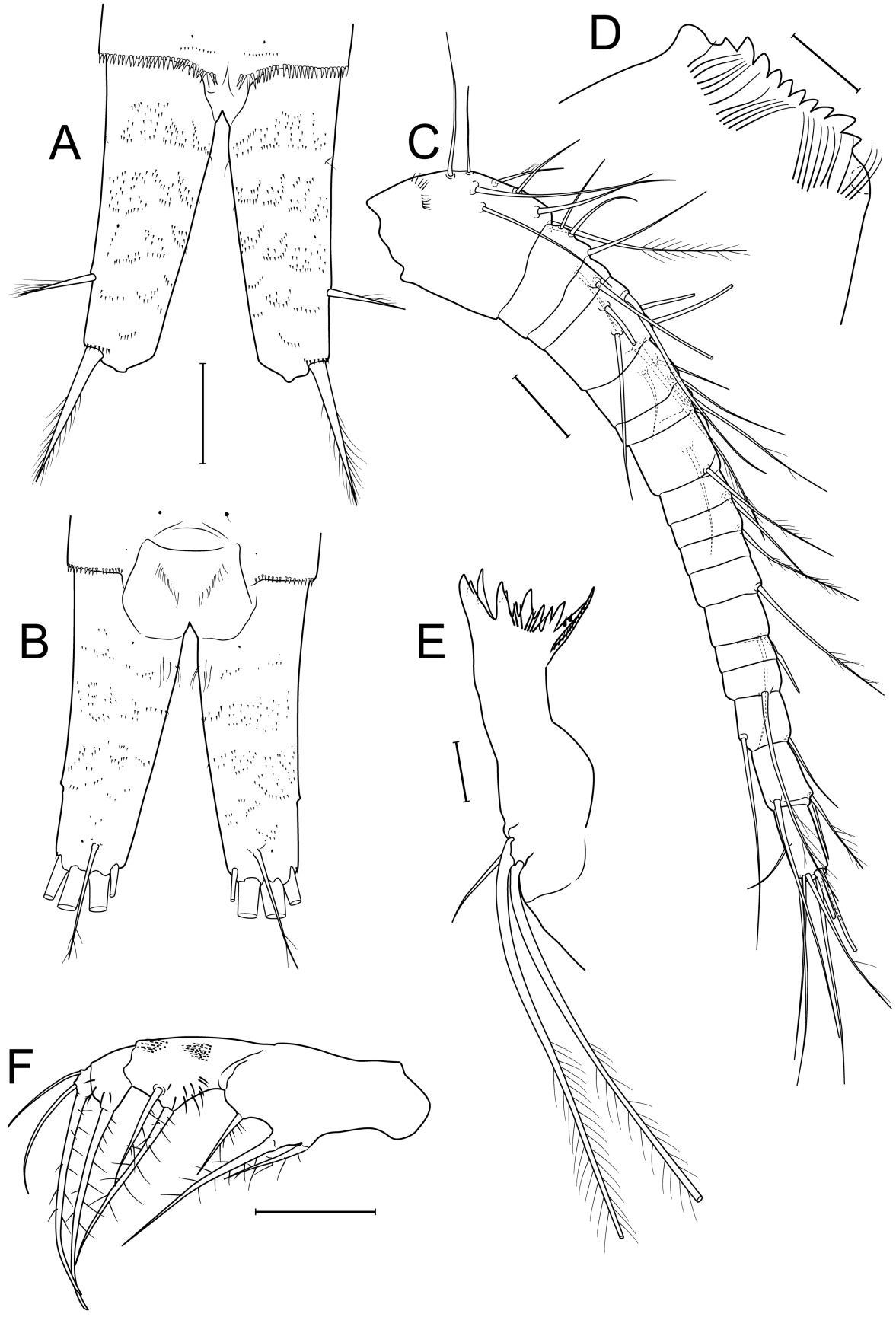


**FIGURE 4.** *Archaeodiacyclops okhensis* Chaban & Alekseev **sp. nov.**: female. A, B—caudal rami, ventral and dorsal ornamentation; C—antennule; D—labrum; E—mandible; F—maxilliped. Scale bars: A–C, F—50; D, E—20 μm.

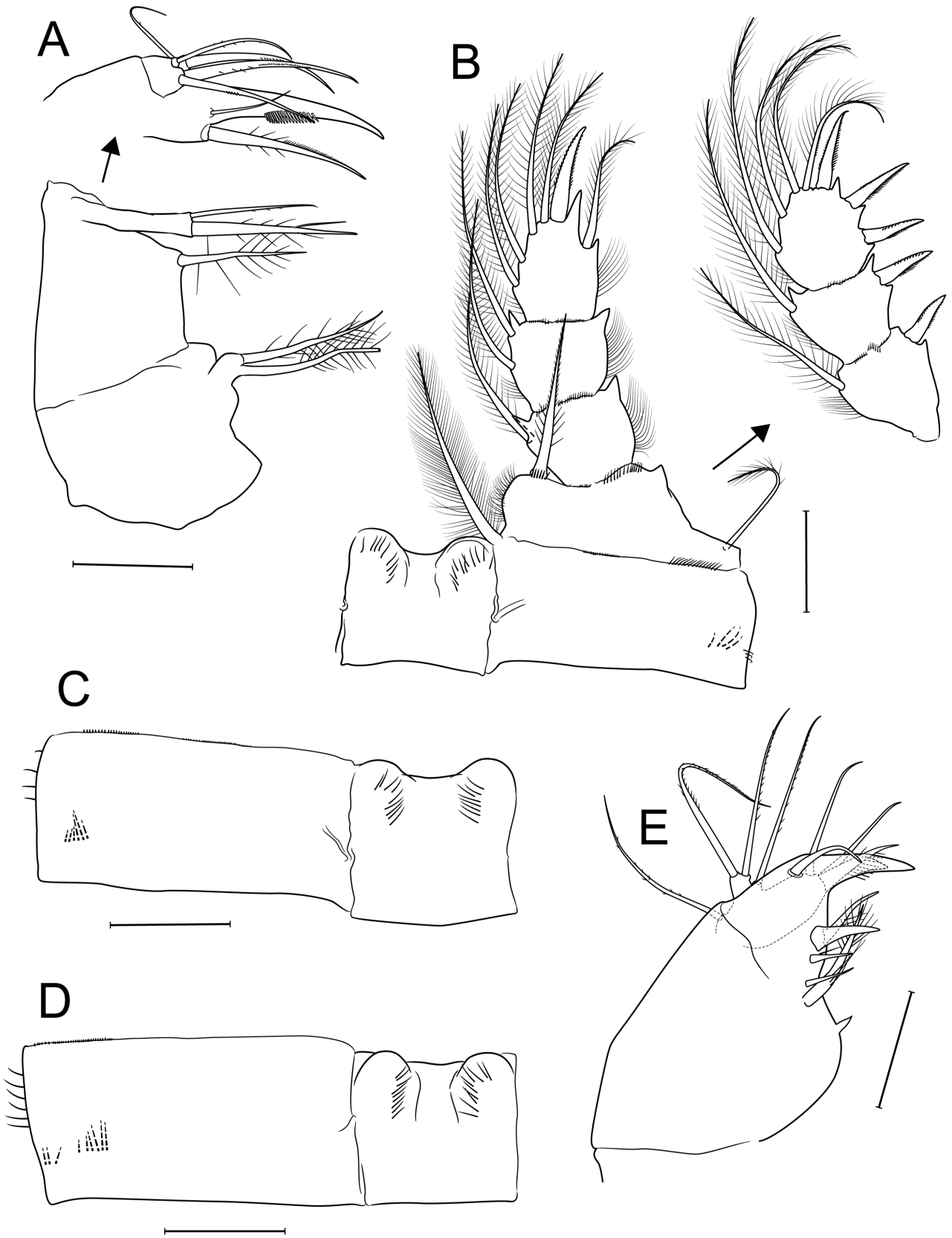


**FIGURE 5.** *Archaeodiacyclops okhensis* Chaban & Alekseev **sp. nov.**: female. A—maxilla; B—P1, frontal; C—P2 coxopodite and intercoxal plate, frontal; D—P3 coxopodite and intercoxal plate, frontal; E—maxillule. Scale bars 50 μm.

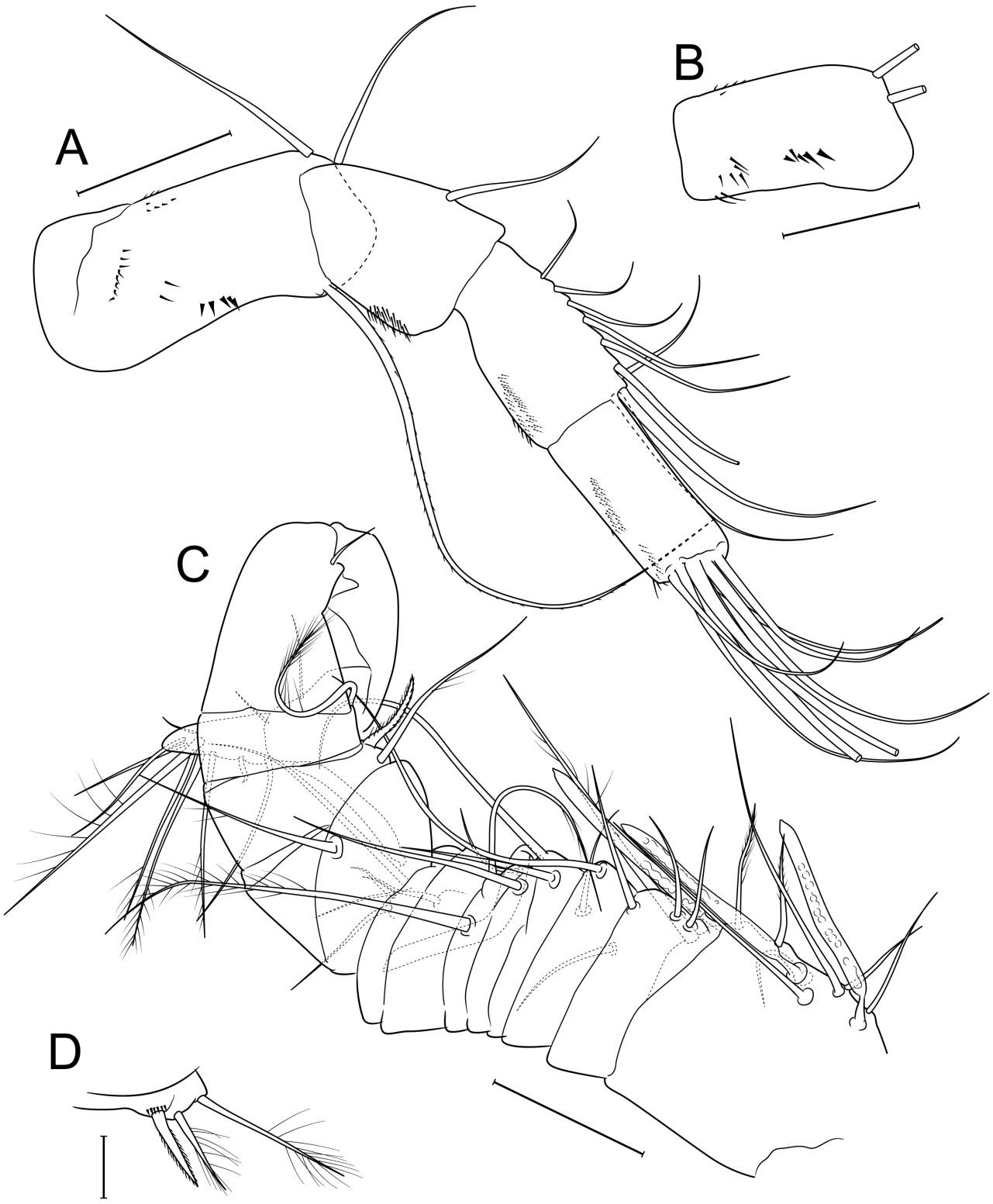


**FIGURE 6.** *Archaeodiacyclops okhensis* Chaban & Alekseev **sp. nov.**: female, A, B; male, C, D. A—antenna, caudal; B—antenna basipodite, frontal; C—antennule; D—P6. Scale bars 50 μm.

P5 two-segmented; proximal segment armed with outer seta; distal segment cylindrical, longer than wide, armed with apical seta and inner spine (Fig. 2E). Inner spine is almost as long as distal segment (0.9–1.2: 1), with several denticles at insertion site. P5 setae length ratio beginning from inner spine: 1.0/ 2.9–3.8/ 2.8–3.6.

P6 consists of small plate armed with two short smooth spines and plumose longer outer seta.

**Male.** Habitus shorter and slenderer than in female (Fig. 2B). Body length 798 μm (paratype). Cephalothorax 1.2 times as long as wide, with maximum width close to posterior margin. Two last thoracic somites without lateral curved extensions. Hyaline frills of abdominal somites coarsely dentate dorsally and ventrally. Caudal rami 4.1 times longer than wide, almost parallel; lateral surface with spines at insertion of outermost caudal setae and tiny denticles at insertion of lateral setae and at proximal third of branch; medial surface with one proximal row of hair-setules and three more posterior rows of tiny spines; dorsal and ventral surfaces are covered with groups and rows of tiny spines poorly visible under low magnification (more sparse than in female). Innermost seta longer than in female, 1.6 times as long as outermost seta, and 0.7 times as long as ramus length. Distal setae length ratio beginning from outermost one: 1.0/ 6.0/ 9.4/1.6. Antennule 14-segmented, with long slender aesthetascs. P6 with inner spine and two longer plumose setae (Fig. 4D). P6 appendages length ratio beginning from spine: 1/ 1.1/ 1.9.

*Differential diagnosis*. *Archaeodiacyclops okhensis* **sp. nov.** differs from *A. uruguayensis* comb. nov., *A. ecabensis* comb. nov. and *A. pilosus* comb. nov. in the presence of only one group of long hairs on the inner side of caudal rami, shape of *receptaculum seminis*, exopodite formula of swimming legs, ratio of distal spines of P4 Enp3. *A. okhensis* **sp. nov.** is most closely related to *A. salisae* comb. nov., having a similar habitus, shape of *receptaculum seminis*, ratio of distal spines of P4 Enp3, exopodite formula of swimming legs, the presence of only one group of hairs on the inner side and the absence of a proximal group of spinules on the outer side of caudal rami. *A. okhensis* **sp. nov.** differs from *A. salisae* comb. nov. in the presence of proximal angular projections on genital double-somite, relatively shorter caudal innermost setae, relatively shorter setae of P4 Enp3 not reaching tips of adjacent spines, and the presence of hairs on frontal side of P1 intercoxal plate.

For distinguishing species of the new genus, an identification key is provided below.

## Identification key for subgenera and species of *Archaeodiacyclops* genus

1. P1–P4 Exp3 spine formula 3/4/4/4; CR with only one group of long setules placed proximally on inner margin (see Fig.1A, arrow), outer margin without proximal group of spinules; RS with large anterior part and without sac-like posterior part (see Fig.1B); inner spine of P4 Enp3 slightly longer than outer spine, or subequal (see Fig. 1C) . . . . . 2 (*salisae*-group)
- P1–P4 Exp3 spine formula 2/3/3/3; CR with several groups of long setules on inner margin, outer margin with proximal group of spinules (see Fig.1D, arrows); RS with thin anterior part and sac-like posterior part (see Fig.1E); inner spine of P4 Enp3 shorter than outer spine (see Fig.1F) . . . . . 3 (*uruguayensis*-group)
2. Genital double-somite with angular lateral projections anteriorly (see Fig.3D); CR with length ratio of innermost/outermost setae < 1.5. . . . . *Archaeodiacyclops okhensis* Chaban & Alekseev **sp. nov.**
- Genital double-somite with rounded lateral margins; CR with length ratio of innermost/outermost setae > 1.5 . . . . . *Archaeodiacyclops salisae* (Reid, 2004) comb. nov.
3. Anal operculum squarish . . . . . 4
- Anal operculum arcuate . . . . . *Archaeodiacyclops ecabensis* (Fiers & Ghenne, 2000) comb. nov.
4. Anal operculum strongly produced, extend beyond anal segment posterior margin and almost reaching proximal row of spinules on outer margin of CR . . . . . *Archaeodiacyclops pilosus* (Fiers & Ghenne, 2000) comb. nov.
- Anal operculum weakly produced, not extending beyond base of CR . . . . . *Archaeodiacyclops uruguayensis* (Kiefer, 1935) comb. nov.

## Discussion

The mention of some "archaic" features of the structure requires the defining attributes of ancestral form archetype. In accordance with the principle of oligomerization proposed by Prof. Dogiel (Dogiel 1954; Monchenko & Vaupel Klein 1999), in the process of evolution and adaptation to new conditions, invertebrates simplify their structure, which is clearly visible in parasitic species, as well as in specialized forms that are well adapted to various biotopes. For example, the reduction in the number of segments of swimming legs, often found in stygobiont and interstitial species, is associated with the tightness of the inhabited space among sand grains of interstitial habitats, or in karst crevices of underground biotopes (Brancelj & Dumont 2007). Once lost, structures are highly unlikely to be regained (Beutel *et al*. 2022). Thus, species that inhabit these specific biotas and possess reduced structures are evolutionarily more advanced.

In describing the ancestral form, it is thus necessary to point out the preservation of the number of segments of the body itself and its appendages, as well as the structures associated with the body surface, namely the setules

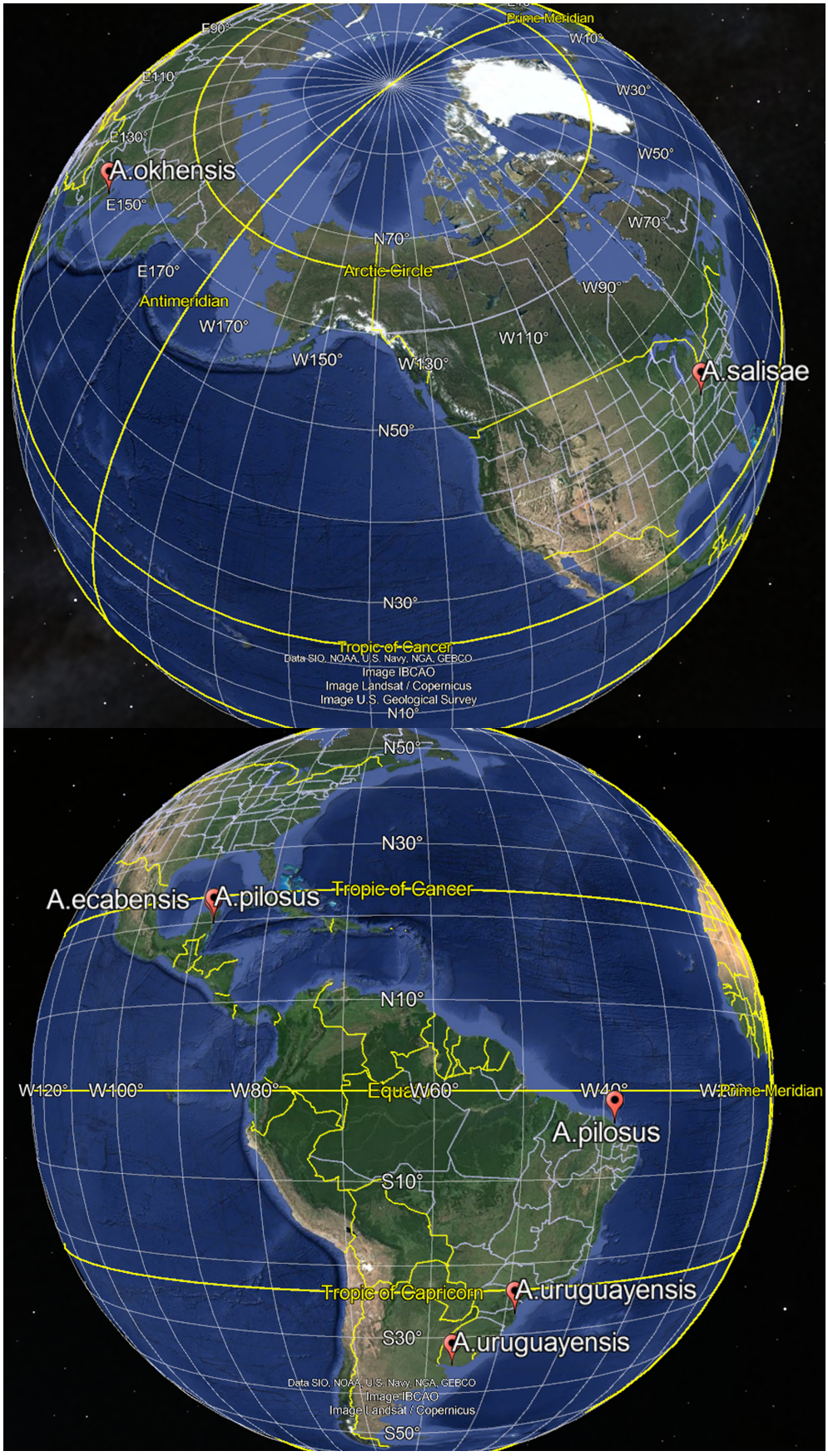


**FIGURE 7.** Distribution of the genus *Archaeodiacyclops* gen. nov. (made with Google Earth).

and denticles on the surface of body segments. The representatives of new genus, having the maximal number of segments of antennules, known for freshwater cyclopids (17), and also having preserved hair-setules on inner surface of caudal branches and unreduced number of segments of swimming legs and other appendages, stands out among representatives of their former genus *Diacyclops*, as having preserved the greatest number of "archaic" features (Table 1).

**TABLE 1.** Comparison of female structures oligomerization in *Diacyclops* groups and genera derived from *Diacyclops* genus (and possessing *Diacyclops*-like P5).

| Genera/groups | A1 | CR with inner hairs | P1 Enp/Exp segments | P2 Enp/Exp segments | P3 Enp/Exp segments | P4 Enp/Exp segments |
|---|---|---|---|---|---|---|
| *Archeodiacyclops* gen. nov. | 17 | + | 3/3 | 3/3 | 3/3 | 3/3 |
| *bicuspidatus*-group | 17 | – | 3/3 | 3/3 | 3/3 | 3/3 |
| *odessanus*-group | 14 | – | 3/3 | 3/3 | 3/3 | 3/3 |
| *stygius*-group | 11 | – | 2/3 | 2/3 | 3/3 | 3/3 |
| *deminutus*-group | 11 | – | 2/3 | 2/3 | 2/3 | 3/3 |
| *languidoides*-group | 11 | – | 2/2 | 2/3 | 3/3 | 3/3 |
| *languidus*-group | 16 | – | 2/2 | 2/3 | 3/3 | 3/3 |
| *crassicaudis*-group | 12 | – | 3/3 | 3/3 | 3/3 | 3/3 |
| *humphreysi*-group | 12 | + | 3/3 | 3/3 | 3/3 | 3/3 |
| *Zealandcyclops* | 11 | – | 2/2 | 2/3 | 2/3 | 2/3 |
| *Monchenkocyclops* | 11/12(?) | – | 2/3 | 2/3 | 2/3 | 2/3 |

Representatives of the new genus seem to be most widespread in the water bodies of the American continent, since 4 out of 5 species were described from there (Fig. 7). The finding of a species of this genus in the Far East, namely on the island of Sakhalin, is not an exceptional event for this part of Palearctic. Previously, closely related forms were described for the Far Eastern region of Palearctic and the North America for other genera of continental copepods, namely *Eucyclops borealis* Ishida, 2001, *E. tsushimensis* Ishida, 2001, *Megacyclops magnus* (Marsh, 1920) and several others (Marsh 1920; Ishida 2001; Ishida 2002; Ishida 2006). Similar trends, indicating the similarity of the North American and the Far Eastern faunas, were also noted for representatives of other groups of crustaceans, such as cladocerans (Korovchinsky *et al*. 2021; Zuykova *et al*. 2022).

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