



## A new *Diacyclops* (Copepoda, Cyclopoida, Cyclopidae) from northwestern Argentina

Cecilia Locascio de Mitrovich<sup>1</sup> & Silvina Menu-Marque<sup>2</sup>

<sup>1</sup>ILINOIA, Facultad de Ciencias Naturales e Instituto Miguel Lillo, Universidad Nacional de Tucumán, Miguel Lillo 205, 4000 Tucumán, Argentina

E-mail: ceciloc@unt.edu.ar

<sup>2</sup>Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, 1428 Buenos Aires, Argentina

E-mail: silvina@bg.fcen.uba.ar

**Key words:** Cyclopoida, *Diacyclops*, Argentina, morphology, taxonomy, new species

### Abstract

No species of the genus *Diacyclops* has been so far cited from continental Argentina. Specimens collected from a roadside pool in the province of Catamarca on a plateau at 3700 m a.s.l. turned out to belong to a new species, *Diacyclops andinus*, which is described and illustrated in detail for both sexes. Main diagnostic features are: spine formula of swimming legs 3, 4, 4, 4; terminal spines of the distal endopod segment of leg 4 subequal; smooth furcal rami. The new species is a member of the *D. bicuspidatus* group, and is probably near the base of this line.

### Introduction

To date very few species of *Diacyclops* have been cited from South America (Reid, 1998). A sample obtained from a pool located at about 25° 30' S, 66° 58' W in the southern Puna, close to 3700 m a.s.l., yielded a few specimens of cyclopoids which turned out to belong to a new species.

### Methods

Material was preserved in 10% formalin. Specimens were observed whole in a drop of lactic acid in a depression slide at low magnification, measured and drawn with a camera lucida attached to a BH-2 Olympus microscope. They were later washed with alcohol, stained with a drop of chlorazol black E, and transferred to dilute glycerine, where they were dissected. Temporary thick slides were prepared to observe appendages from several angles and draw them at 400×. Some details were so minute that further preparation of thin permanent microscope slides was needed to observe them with an immersion objective at 1000×.

Type material is deposited in the Invertebrate Collection of the Museo Argentino de Ciencias Naturales

Bernardino Rivadavia (MACN), Buenos Aires, Argentina.

### Taxonomic account

Family Cyclopidae Burmeister, 1834

Genus *Diacyclops* Kiefer, 1927, emend. Morton, 1985, Reid et al., 1989

*Diacyclops andinus* n. sp. (Figs 1–3)

**Material:** Female holotype, MACN No. 34200; male allotype, MACN No. 34201, both alcohol preserved. Paratypes, 1 dissected female and 2 dissected males, MACN No. 34202. All specimens from a pool in the province of Catamarca, Argentina, 25 October, 1997.

### Description

**Female:** Total length of holotype excluding caudal setae 1.31 mm, dissected paratype 1.32 mm. A large *Diacyclops* with typical cyclopoid habitus (Fig. 1a). Cephalosome 39% of total length, prosome 56% of total length. Maximum width at end of cephalosome 0.48 mm.

Urosome (Fig. 1b) with genital segment as long as wide, anterior third broader, seminal receptacle T shaped (Fig. 1c), resembling that of certain *Mesocyclops*. Urosomites with smooth posterior borders. Anal

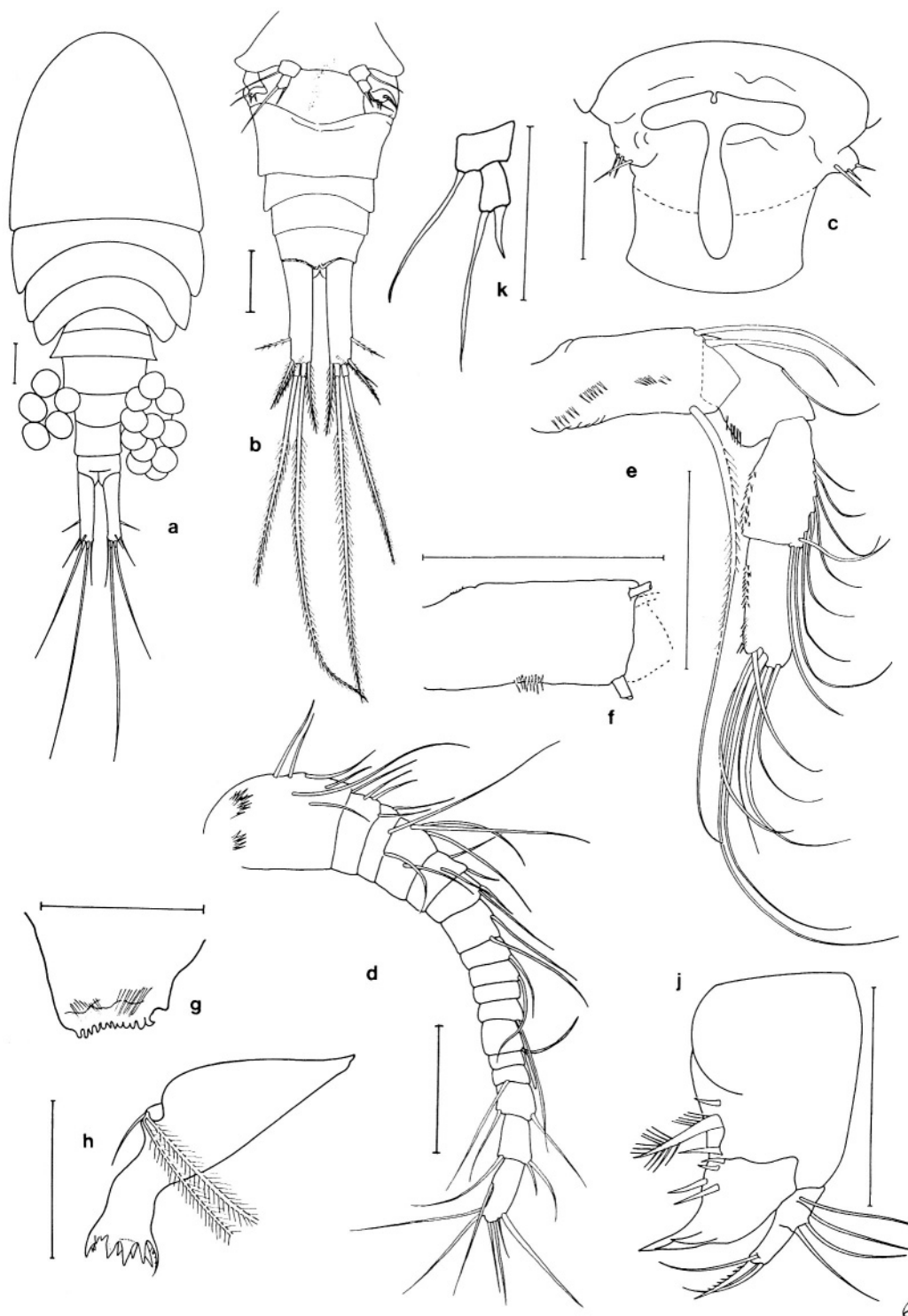


Figure 1. (a–j) Female. (a) habitus, dorsal; (b) urosome, ventral; (c) genital segment, ventral; (d) antennule; (e) antenna, caudal view; (f) basis of antenna, frontal view; (g) labrum; (h) mandible; (i) maxillule; (j) maxillule; (k) P5.

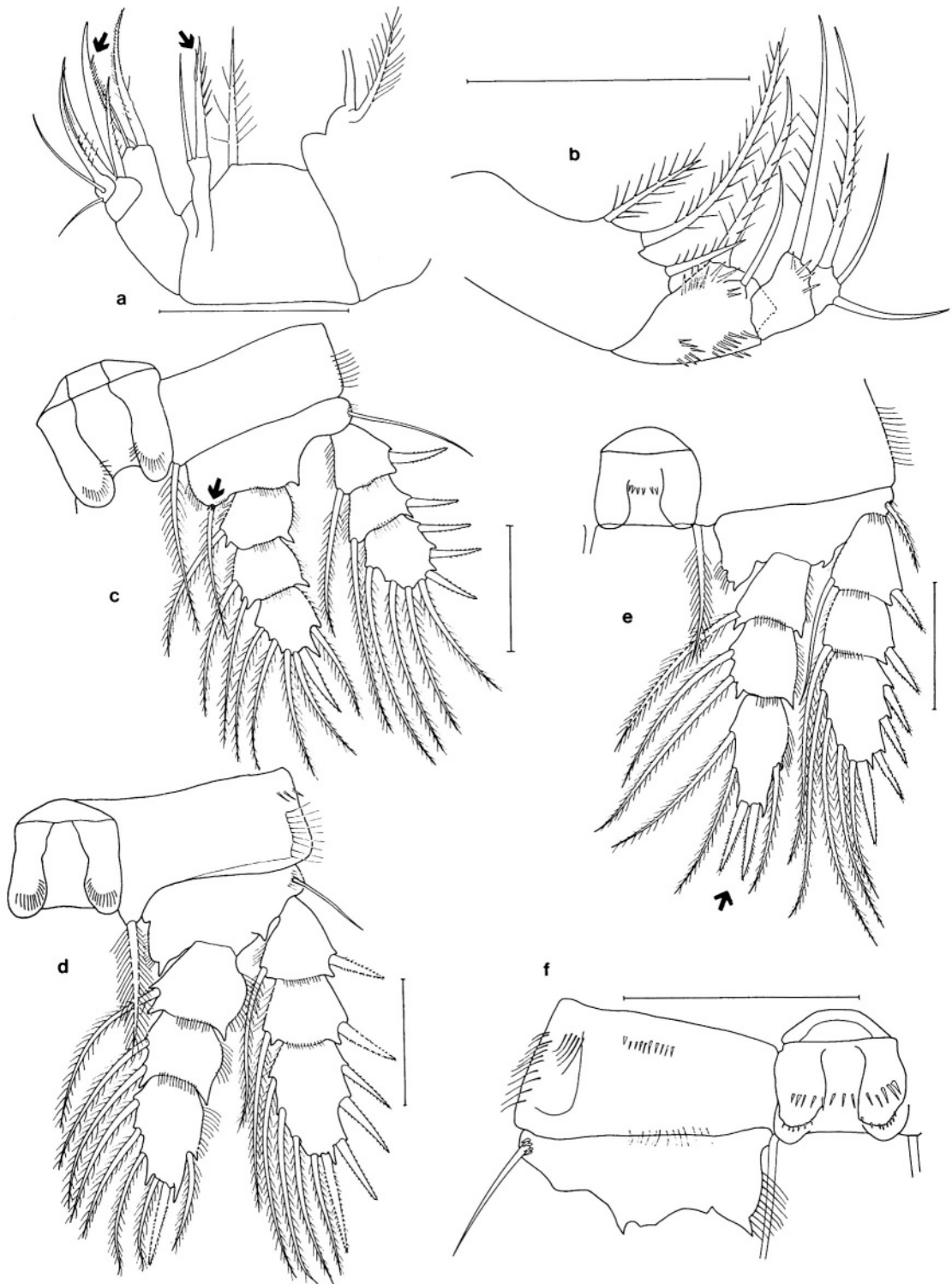


Figure 2. (a–e) Female. (a) maxilla; (b) maxilliped; (c) P1; (d) P3; (e) P4; (f) Male, P4 coupler.

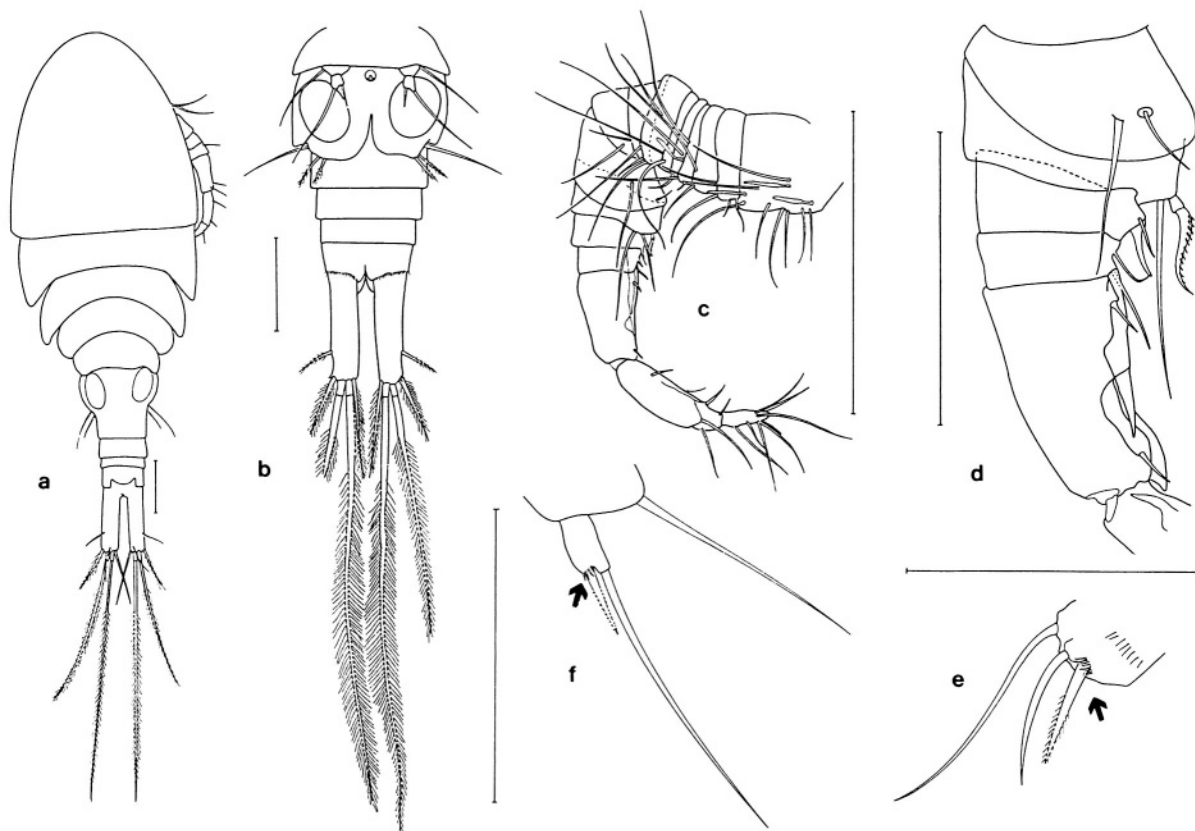


Figure 3. (a-f) Male. (a) habitus, dorsal; (b) urosome, ventral; (c) antennule; (d) detail of antennule segments 10-14; (e) P6; (f) P5.

somite with smooth dorsal margin and conspicuous row of spines ventrally. Operculum with smooth rounded margin. Caudal rami 0.17 mm, naked, parallel, length about  $4\times$  width. Lateral seta inserted at distal fourth of external margin, sparsely plumose. Caudal rami setae with homogeneous plumage, inner longer than outer seta, this last one thicker. Relative lengths of terminal caudal rami setae from external to medial, 16:59:100:21.

Holotype ovigerous, with 2 egg sacs containing 14 and 16 eggs. Eggs round or oval, around 0.06 to 0.07 mm in diameter.

Antennule (Fig. 1d) 17-segmented, scarcely reaching end of cephalosoma when fully extended. Segments smooth except 2 combs of spinules on the first one. Distalmost article about twice long as broad. Segments (Arabic numerals) with number of setae (in brackets) and aesthetascs: 1 (7), 2 (3), 3 (3), 4 (4), 5 (3), 6 (2), 7 (2), 8 (1), 9 (1), 10 (0), 11 (1), 12 (1+1 aesth.), 13 (0), 14 (1), 15 (2), 16 (3), 17 (8). Without hyaline membrane.

Antenna (Fig. 1e) 4-segmented, basis with long exopod seta surpassing end of the endopod, 2 setae on distolateral corner, 3 rows of spinules on caudal side and one on frontal side (Fig. 1f). Endopod 3-segmented, first segment with a single seta inserted at mid external margin and patch of spinules on the opposite side, second segment bearing 9 external marginal setae of increasing length towards the distal end and spinules on the medial margin, distal segment with several patches of spinules on the medial margin and 7 terminal setae.

Labrum (Fig. 1g) with 12 marginal teeth between lateral corners and two convergent brushes of hairs on the ventral side.

Mandible (Fig. 1h) and maxillule (Fig. 1j) typical of the genus.

Maxilla (Fig. 2a) 5-segmented. Strongest of 2 spines of the coxal endite with a peculiar bifid end. Strong beak-like claw of the third segment bearing a row of teeth on the middle third of the inner margin ending in a stronger curved tooth on the distal end.

Maxilliped (Fig. 2b) 4-segmented. Second segment bearing on the caudal surface a row of strong, long spinules, parallel to the medial margin and two curved rows of shorter spines at the middle and distal regions close to the external margin. Few short spinules at the distal end of the third segment.

Legs 1–4 (Fig. 2c–e) with both exopod and endopod 3-segmented. Segment 3 of exopod of legs 1–4 with 3, 4, 4, 4 spines and 4, 4, 4, 4 setae respectively. Coxal outer margin with a submarginal row of long hairs in all legs and additional combs of teeth at basal and distal mid-margins of leg 4 (Fig. 2e). Medial margin of basis hairy in all legs. Seta close to external margin of basis present in all legs, together with a bunch of setules at its base in legs 1–4. Medial margin of exopod and external margin of endopod segments bearing fine hairs. Strong seta on medial expansion of leg 1 basis reaching the middle of distal exopod segment, accompanied by 3 spinules at its base. Terminal spines of the third segment of the endopod of leg 4 subequal. Couplers (intercoxal sclerites) of legs 1–3 with smooth rounded protrusions on free margin and submarginal crescent-shaped rows of hairs. Leg 4 coupler heavily ornamented, bearing the pair of smooth marginal protrusions as in other legs, but accompanied by a second pair of submarginal mounds bearing short spinules on the frontal side and a continuous row of strong teeth on the caudal side. The leg 4 coupler of dissected female paratype was so heavily darkened that only the row of large spines could be seen. Therefore, the leg 4 coupler of the male (Fig. 2f) was used to complement the description.

Leg 5 (Fig. 1k): Medial subterminal spine of second segment slightly longer than segment itself, accompanied by 1 long terminal seta longer than outer seta on basal segment.

Leg 6 (Fig. 1b). Lateral seta more than twice length of middle spine, the medial spine being the shortest.

**Male:** Total length, excluding caudal rami, allotype 1.05 mm, paratypes 0.98–1.01 mm. Habitus (Fig. 3a), mouthparts, armature of swimming legs, leg 5, proportions of caudal rami and caudal rami setae similar to female. Urosome as illustrated (Fig. 3b).

Antennule (Fig. 3c) 17-segmented. Segments and setae: 1 (8+3 aesthetascs), 2 (4), 3 (2), 4 (3+1 aesth), 5 (2), 6 (2), 7 (1), 8 (2), 9 (1), 10 (2), 11 (2), 12 (2), 13 (2), 14 (2), 15 (3), 16 (3), 17 (8). One of the setae on segment 11 is sickle-shaped and serrated; one on 12 is transformed into a nail-like spine; there are two hyaline lamellae, one which arises at the base of 13

ending close to the end of 14 and another along the whole medial border of 15 (Fig. 3d).

Leg 6 (Fig. 3e) flap-shaped with a row of setules at the base of the medial spine and another more basal row of hairs; middle seta slightly longer and external seta more than twice as long as spine length, reaching middle of third urosomite.

Another dimorphic trait is the presence of minute spinules at the base of the medial spine of leg 5 (Fig. 3f) and two spinules at the base of each external caudal rami setae (Fig. 3b), which could not be detected in the female.

### Etymology

The specific epithet refers to the biogeographic region where the species was found.

### Discussion

*Diacyclops andinus* n. sp. belongs to the *bicuspidatus* group, which includes the most plesiomorphic species of the genus with 3-segmented rami in all swimming legs (Pesce, 1994). The diagnostic features which identify *D. andinus* are the 3, 4, 4, 4 spine formula of the swimming legs, the T-shaped seminal receptacle, the smooth posterior margins of the urosomites, the subequal terminal spines of last endopod segment of P4, the ornamentation of P4 coupler, the smooth caudal rami, the external seta inserted in the last fourth of the caudal ramus, and the bifid spine on the coxal endite of the maxilla.

The geographically closest species of the genus is *D. uruguayensis*, which occurs in freshwater habitats at low elevations along the Atlantic coast of Brazil and Uruguay (Reid, 1998). So far the new species has been found at high altitude at the type locality in the southern Puna, and unpublished drawings of material collected at San Guillermo Biosphere Reserve in the province of San Juan (28° 10' S lat.) match the description given here. Also belonging to *D. andinus* would be, according to the iconography, the material from Lake Chungará in the Chilean Altiplano assigned by Araya & Zúñiga (1985) to *D. bisetosus*. *Diacyclops andinus* can be readily distinguished from *D. uruguayensis* by the smooth caudal rami, the spine formula and the subequal terminal spines of distal segment of the exopod of P4.

*Diacyclops andinus* is so far the only species of the genus with spine formula 3, 4, 4, 4. This spine formula is typical of *Acanthocyclops*.

### Acknowledgements

We are indebted to Juan C. Ruiz Pesce for collecting the material, and to Dr Janet W. Reid for patiently answering our questions at every stage when writing this paper and providing us with unpublished literature. The criticisms of an anonymous reviewer and Dr Fabio Stoch, as well as the corrections of the editors are also appreciated.

### References

- Araya, J. & L. Zúñiga, 1985. Manual taxonómico del zooplancton lacustre de Chile. Comité Limnol. Chile Bol. Inf. Limnol. 8: 1–110.
- Pesce, G. L., 1994. The genus *Diacyclops* Kiefer in Italy: a taxonomic, ecological and biogeographical up-to-date review (Crustacea Copepoda Cyclopidae). *Arthropoda Selecta* 3: 13–19.
- Reid, J. W., 1998. Redescription and first records from Brazil of *Diacyclops uruguayensis* Kiefer, 1935 (Crustacea: Copepoda: Cyclopidae). *Rev. bras. Zool.* 15: 757–766.