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# On *Argentodromas bellanella* gen. nov., sp. nov. (Crustacea, Ostracoda) from a Stream in Northeastern Argentina (South America)

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Analia Díaz and Koen Martens (2018) Argentodromas bellanella gen. nov., sp. nov. is here described from streams in the province of Misiones, in northeastern Argentina. The new genus and species belong to the family Notodromadidae. Most species in the family have morphological adaptations to a hyponeustic mode of life: their carapaces have lip-like protrusions of the valve margins near the mouth and a flat plate-like expansion of the ventral part. The new genus can be distinguished from other genera in the subfamily Notodromadinae based on valve ornamentation (surface of valves covered with polygonal elevations and many pores with setae), the ventral plate-like expansion which is set with 3-4 rows of rounded elevations and bordered with an elevated outer list, eye tubercles softly pronounced, and soft parts features (male prehensile palps moderately asymmetrical and both with elongated first segments, posterior seta of caudal ramus longer than terminal claws and anterior seta present, hemipenis with rounded outer lobe and small rounded inner lobe). For comparative purposes, valves and carapaces of species in three other Notodromadinae genera (*Newnhamia, Kennethia, Notodromas*) are also illustrated and re-diagnosed.

Key words: Notodromadidae, New genus, Morphology, Argentina, Hyponeustic.

#### BACKGROUND

There are approximately 2000 described species and *ca* 200 described genera of recent, free-living, non-marine ostracods in the world (Martens et al. 2008; Martens and Savatenalinton 2011). One family, the Cyprididae, comprises about half of all described species (*ca* 1000) in *ca* 100 genera. The other families are much less speciose. The family Notodromadidae Kaufmann, 1900, for example, comprises thus far fewer than 40 subjective species. This family is divided into four subfamilies: Centrocypridinae Hartmann and Puri, 1974, Cyproidinae Hartmann,

1963, Notodromadinae Kaufmann, 1900, and Oncocypridinae De Deckker, 1979b.

The subfamily Notodromadinae comprises four genera up to now: *Gurayacypris* Battish, 1987, *Notodromas* Lilljeborg, 1853, *Newnhamia* King, 1855 and *Kennethia* De Deckker, 1979a.

Most species in this subfamily have a hyponeustic mode of life and cling upside down to the water film at the surface. They have adapted to this lifestyle using special structures on the ventral side of the valves: lip-like protrusions of the valve margins near the mouth and a flat platelike expansion of the ventral part of the carapace. However, most species also have different shapes

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and external ornamentation, some carapaces have rounded tubercles only, other have pointed tubercles, most have transitional forms (De Deckker 1979a b; George and Martens 2003).

Here, we describe a new species and genus of notodromadinid ostracods from a stream in northeastern Argentina. It is only the third species of this subfamily reported from the entire continent and its occurrence in a lotic habitat is exceptional.

## MATERIALS AND METHODS

Moconá Provincial Park is located in the southeast of the province of Misiones in northeastern Argentina. This park is a protected area located near the border with Brazil (27°08'S; 53°53'W) on the banks of the River Uruguay (Fig. 1). Moconá Provincial Park is part of the Biosphere Reserve Yabotí, which has been on the UNESCO list since 1995. Moconá Provincial Park protects one of the most threatened biomes in the world: the Atlantic Forest, which is classified as Threatened and with High Conservation Priority at a Regional Scale. The park is surrounded by two rivers: the Pepirí Yabotí Miní stream and the Uruguay River. The dynamics of waterways inside the park have a strong influence on the entire climate of the park (Bertolini 1999). The terrain is rugged, with elevations ranging from 140 m asl in the Uruguay river banks and Yabotí stream to 349 m in the centre-east of the Park. The banks of the Uruguay River are formed by steep ravines slopes, which end practically at the river itself (Krauczuk 1998).

Specimens of the new genus and species were collected on March 2nd, 2010 from Moconá National Park (province of Misiones, Argentina) using an enamelled white spoon and fine mesh strainers. Samples were taken from a small permanent stream, with a maximum depth of 30 cm, running along a path in the middle of the forest. There was no floating vegetation in the stream, but it was surrounded by grass.

Comparative material of the genera *Notodromas* was collected from Belgium, while material of *Kennethia* and *Newnhamia* was collected from Australia (see below for details).

Ostracods were sorted under a binocular microscope and dissected with valves stored dry in micropaleontological slides and with soft parts in glycerine in sealed slides. Drawings of soft parts were made using the *camera lucida* and a compound microscope (Olympus, BX51

at Royal Belgian Institute of Natural Sciences (RBINS), Brussels). Valves were illustrated and measured using scanning electron microscopy (Philips XL30 SEM at RBINS, Brussels). Type material of the new genus and species is deposited in the Carcinological Collection of the Museo of La Plata, La Plata (Argentina) (MLP-Cr numbers). References to location of type material of comparative taxa: NHMS = Natural History Museum of Sydney.

Abbreviations used in text and figures are as follows: A1 = Antennula, A2 = Antenna, Cp = Carapace, CR = Caudal ramus, CRa = Attachment of caudal ramus, Db = Dorsal branch of CRa, H = Height of valves, L = Length of valves, Lpp = Left prehensile palp, Is = Lateral shield of hemipenis, LV = Left valve, Md = Mandibula, ms = Medial shield of hemipenis, Mx1 = Maxillula, Rpp = Right prehensile palp, RV = Right valve, T1 = First thoracopod, T2 = Second thoracopod, T3 = Third thoracopod, Vb = Ventral branch of CRa, W = Width of carapace, ZO = Zenker organ.

Thoracopod terminology follows Broodbakker and Danielopol (1982), for the second antenna the revised model proposed by Martens (1987), and for the second and third thoracopods the nomenclature of Meisch (2000). Higher taxonomy of the Ostracoda follows the synopsis by Horne et al. (2002). Measurements are expressed in  $\mu$ m with numbers of individuals, arithmetic means ± SD shown in parentheses.

#### RESULTS

#### Taxonomy and morphology

#### Order Podocopida Sars, 1866 Superfamily Cypridoidea Baird, 1845 Family Notodromadidae Kaufmann, 1900 Subfamily Notodromadinae Kaufmann, 1900

Argentodromas gen. nov. Díaz and Martens urn: lsid:zoobank.org:pub:F251BB95-49E2-4000-A3D6-D18DB76B3ECF

*Etymology*: The first part of the genus name, "*Argento*", refers to the country Argentina, the second part refers to the genus *Notodromas* to which the new genus is closely related.

*Type species: Argentodromas bellanella* gen. nov., sp. nov. (designated here).

*Diagnosis:* Surface of carapace covered with polygonal elevations and many pores with setae.



Fig. 1. Map showing the position of the sampled stream in the Misiones province, Argentina.

Large part of ventral surface set with 3-4 rows of rounded elevations and bordered with an elevated outer list. Eye tubercles weakly developed. Prehensile palps moderately asymmetrical and both with first segments elongated. Posterior seta of CR longer than terminal claws, anterior seta present. Hemipenis with elongated and rounded outer lobe and pronounced subrectangular lateral lobe.

Differential diagnosis within Notodromadinae: Argentodromas gen. nov. is closely related to Newnhamia, but differs in the shape and structure of the carapace. In Newnhamia the carapace is oval in shape in anterior view and the surface of valves is covered with polygonal elevations and rounded or pointed tubercles. The largest part of the ventral plate-like surface is set with 2-3 rows of rounded elevations and bordered by an elevated outer list. Newnhamia also has clearly pronounced eye tubercles and has a completely different structure of hemipenis (with rounded ms in the new genus). Argentodromas gen. nov. differs from Kennethia, the second Australian genus, because of the lack of the large dorsal expansion on the LV and of the very pronounced external ornamentation in both valves in the latter genus. Argentodromas gen. nov. differs from Notodromas (of which *Gurayacypris* is most likely a synonym) mainly in the ornamentation of the carapace (almost smooth in Notodromas) and the eve tubercles that are less well-developed in the new genus, as well as in the more strongly asymmetrical prehensile palps and the different hemipenis shape in Notodromas (large main body and only one hook-like expansion - see Meisch 2000, Fig. 99L). Finally, Argentodromas gen. nov. differs from Centrocypris in the morphology of carapace and limbs, especially in the valve ornamentation (at least the type species of Centrocypris has a ventral row of strong spines along the ventral margin in both valves - see Martens et al. 2008, Fig. 1).

#### Argentodromas bellanella gen. nov., sp. nov. Díaz and Martens (Figs. 2-4)

*Type locality*: Moconá National Park, Misiones province, Argentina (27°08'S; 53°53'W) (see Fig. 1). All material collected by Analía R. Díaz on March 2nd, 2010.

*Material examined*: Holotype: a male, with soft parts dissected and store with glycerine in sealed glass slides and valves stored dry in a plastic micropalaeontological slide (MLP-Cr 26923). Allotype: a female, dissected and stored as the male (MLP-Cr 26924). Paratypes: 7 females, 3 males (MLP-Cr 26925).

*Etymology*: The first part of the specific epithet name, "*bella*", is an adjective that means beautiful in Italian, the second part "*nella*" refers to the mother's name of the first author (AD).

*Diagnosis*: Carapace with weak polygonal ornamentation, rounded in lateral view. Eye cups very weakly developed, recognizable mostly because of absence of ornamentation in these spots. Ventral plate like expansion consisting in 3-4 longitudinal rows of rounded elevations. CR with anterior seta present in both sexes. Hemipenis with two shields, ms distally rounded.

*Measurements*: Males: LV = 619-700 (4, 644  $\pm$  38); H = 408-452 (4, 441  $\pm$  22); RV = 652-690 (4, 660  $\pm$  19); H = 408-428 (4, 426  $\pm$  13). Females: LV = 667-700 (7, 680  $\pm$  14), H = 440-476 (5, 451  $\pm$  17); RV = 650-736 (7, 689  $\pm$  33), H = 490-523 (5, 506  $\pm$  13).

Description: Male valves (Figs. 2A-G) smaller than female valves (Figs. 2H-L) but similar in appearance. Carapace sub-triangular in lateral view, anteriorly broadly rounded. In both valves, greatest height situated almost in the middle. Surface of valves covered with rather weak polygonal elevations and many pores with setae. Eye cups weakly developed, to almost absent.

Valves sub-equal in dorsal view (Figs. 2C, K) with RV slightly bigger than LV. In ventral view (Figs. 2F, G) large part of the surface set with 3-4 rows of rounded elevations and bordered with an elevated outer list. Eye tubercles softly pronounced. RV (Figs. 2E, J) in inner views, anterior calcified inner lamella broad, posterior one narrower. Selvage largely displaced inwardly in RV (Figs. 2E, J), less so in the LV (Figs. 2D, I).

A1 (Fig. 3A)  $\stackrel{\circ}{\rightarrow}$  without sexual dimorphism. First (fused) segment with 2 long ventral setae + 2 short dorsal setae. Second segment with 1 apical seta. Third segment with 2 very short apical setae in both outer and inner side and 2 long apical setae. Fourth segment with 2 long apical setae. 3 long apical setae on fifth segment. Apical (6th) segment with 2 long + 1 short seta and one aesthetasc y<sub>a</sub>, of c the same length as the setae.

A2 (Fig. 3B)  $\stackrel{\circ}{\rightarrow}$ . Protopodite with 3 setae. Aestheasc Y long, inserted on first endopodal segment; this segment apically with 5 natatory setae not extending beyond tips of terminal claws, 6th seta shorter. Second endopodal segment with 2 dorsal and 2 ventral apical setae. Third endopodal segment with 3 setae and with G1-claw



**Fig. 2.** Argentodromas bellanella gen. nov., sp. nov. Male (MLP-Cr 26923). (A) RV, ext. view; (B) LV, ext. view; (C) Cp, dorsal view; (D) LV, int. view; (E) RV, int. view; (F) Cp, ventral view; (G) detail of anterior part of (F). Female (MLP-Cr 26924). (H) RV, ext. view; (I) LV, int. view; (J) RV, int. view; (K) Cp, dorsal view; (L) detail of muscle scars. Scale bars: A-F, H-K = 200 µm, G, L = 50 µm



**Fig. 3.** Argentodromas bellanella gen. nov., sp. nov. (A) Female (MLP-Cr 26924) A1; (B) Female (MLP-Cr 26924) A2; (C) Male (MLP-Cr 26923) A2; (D) Female (MLP-Cr 26924) Md; (E) Male (MLP-Cr 26923) Mx1; (F) Male (MLP-Cr 26923) Respiratory plate Mx1; (G) Female (MLP-Cr 26924) T1. Scale bar: A-G = 100  $\mu$ m.

with a characteristic skewed tip. Aesthetasc ( $y_1$  and  $y_2$  missing). Apical segment with 1 long claw, 1 short claw-like seta and 1 long aesthetasc ( $y_3$ ) and a seta.

A2 (Fig. 3C)  $\circ$  with 2 + 1 setae on the first segment of the protopodite. Subapical segment with aesthetasc y2 ventrally inserted. Apical segment with 1 long and one shorter claw, 1 short aesthetasc and 1 apical seta fused with the aesthetasc.

Md (Fig. 3D)  $\stackrel{\circ}{\rightarrow}$  without sexual dimorphism. Coxa with 9 subequal strong teeth. One short smooth seta also present. Mandibular palp with 4 segments. Second segment with 6 plumose ventral "S" setae, two long dorsal setae and three long subapical dorsal seta, this segment also with 4 short apical setae,  $\alpha$ -seta smooth and with a relatively broad basis,  $\beta$ -setae plumose and with a swollen basis,  $\gamma$ -seta short and plumose Apical segment with 1 claw-like seta, 2 shorter setae and three smooth long setae of subequal length.

Mx (Fig. 3E)  $\delta$  without sexual dimorphism. With terminal segment of palp subquadrate. First palp segment with 3 apical setae, one of them with a characteristic swollen base. Second segment with 5 smooth setae. Third endite with 6 smooth *zahnborsten*, a group of 4 dorso-apical setae and one smooth seta ventrally inserted. First endite with 2 serrated setae and with two long hirsute setae laterally inserted. Respiratory plate (Fig. 3F) with c 19 rays.

T1 (Fig. 3G)  $\stackrel{\circ}{\rightarrow}$ . Endite bearing 11 mostly smooth setae of sub-equal length, d-seta strong plumose and b-seta smooth, two a-setae present, with unequal length and not inserted closely together. Female endopodite (palp) with a single, long seta on top. Males with endopods developed in asymmetrical prehensile palps. Rpp (Fig. 4A) with terminal segment banana-shaped with apical sensory organ. First segment longer than the largest width, subapically with 2 short sensory organs. Lpp (Fig. 4B) with terminal segment sickleshape and curved, apically with 1 strong sensory organ. First segment large, subapically with 2 short sensory organs.

T2 (Fig. 4C)  $\delta$ . without sexual dimorphism. Without d-setae. First, second and third segment of endopodite with one apical seta. Terminal segment with one large apical claw, flanked by 2 long apical setae.

T3 (Fig. 4D)  $\delta$ . without sexual dimorphism. With 3 setae on the first segment and one apical seta on the second segment. Third segment with 1 lateral seta. Terminal segment separated, with 1 long apical claw + 1 seta shorter and a reflexed sub-apical seta.

CR (Figs. 4E, F). Relative curved in males, posterior seta long, anterior seta short but always present.

Attachment of CR (Fig. 4G) & . Short, X-shaped.

Hemipenis (Fig. 4H) with one long and distally rounded protruding medial shield (ms) and one sub-rectangular lateral shield (ls).

ZO (Fig. 4I)  $\delta$ . Large and well-developed with 14-15 spinous whorls.

### *Newnhamia fenestrata* King, 1855 (Figs. 5A-E)

Generic Differential Diagnosis (modified after De Deckker 1979a and George and Martens 2003): Valves rounded in lateral view, externally covered with polygonal elevation and rounded or pointed tubercles (Figs. 5A, B, C, D,). Ventral side of carapace (Fig. 5E) with anterior lip-like expansions of valve margins, near mouth; large part of ventral surface plate-like, set with 2-3 rows of rounded elevations and bordered by an elevated outer list. Each valve with prominent, rounded and opaque antero-dorsal eye-tubercles (Figs. 5C, D). Mandibular palp with 6 plumose internal setae and about 10 apical setae on terminal segment. Maxillula with 6 zahnborsten on third endite and two very large setae near first endite. T2 without d-setae, penultimate segment divided, terminal segment with one long claw and two subapical setae, the latter unusually long in at least some species. T3 with terminal segment separate from penultimate segment. Caudal ramus with distal seta.

*Type locality and type material*: Swamp 2 km east of Princetown, near Port Campbell, Victoria, Australia, 38°41'0"S 142°09'0"E: Neotypes ( $\beta$ ,  $\varphi$ ), NHMS - Xe 19841, 19842.

Material examined here: several dozen specimens, collected by P. De Deckker and K. Martens from a pond near Good Hope resort, near Canberra (ACT/NSW - coordinates.: 35°6'26"S 148°51'670"E) on 25.03.2013.

#### Kennethia cristata De Deckker, 1979a (Figs. 5F-K)

*Generic Differential Diagnosis* (modified after De Deckker 1979a): Carapace with polygonal elevations (Figs. 5F, G, I, L), eye tubercles separate and well-developed. Carapace in dorsal



**Fig. 4.** Argentodromas bellanella gen. nov., sp. nov. (A) Male (MLP-Cr 26923) Rpp; (B) Male (MLP-Cr 26923) Lpp; (C) Male (MLP-Cr 26923) T2; (D) Male (MLP-Cr 26923) T3; (E) Female (MLP-Cr 26924) CR; (F) Male (MLP-Cr 26923) CR; (G) Male (MLP-Cr 26923) CR; (H) Male (MLP-Cr 26923) Hemipenis; (I) Male (MLP-Cr 26923) ZO. Scale bars: A-H = 100 μm, I = 50 μm.

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**Fig. 5.** Newnhamia fenestrata (A-E) and Kennethia cristata (F-L) Newnhamia fenestrata. Females. (A) LV, int. view; (B) RV, int. view; (C) Cp, dorsal view; (D) Cp, left lateral view (E); Cp, ventral view. Kennethia cristata. Females. (F) Cp, right lateral view; (G) Cp, left lateral view; (H) Detail of muscle scars; (I) Cp, dorsal view; (J) LV, int. view; (K) RV, int. view; (L) Cp, ventral view. Scale bars: A-G, I-K = 250 µm, H = 50 µm.

view (Fig. 5I) slenderer than in *Newnhamia*. Carapace in ventral view (Fig. 5L) with plate-like expansion less broad than in *Newnhamia* and anterior lips less pronounced. LV with rounded dorsal margin, carrying a large crest (Figs. 5G, J). RV subtriangular (Figs. 5F, K). Soft part morphology not well-known, but most likely similar to that of *Newnhamia*.

*Type locality and Holotype*: Sweepwash Lagoon, Victoria, Australia, 38,080S 141,110E: Holotype ( $\delta$ ), NHMS - Xe10806.

*Material examined here*: 3 females from Pleasant View Lakes, 35 km NE of Albany, southwestern part of Western Australia, collected by D.J. Cale on 22.10.2011.

### Notodromas monacha (O.F. Müller, 1776) (Fig. 6)

Generic Differential Diagnosis (modified after Meisch 2000): Carapace rounded in lateral view, with strong sexual dimorphism in shape and structure. Eye-cups clearly visible, but less prominent than in the Newnhamia. Male valves with pointed caudal margin and without flap-like structure on LV (Figs. 6A-F). Female valves with posterior margin evenly rounded (Figs. 6G, H, J, K); LV with postero-ventral flap-like structure (Figs. 6J, L, M). Carapace in dorsal and ventral views (Fig. 6C, E, I, L) evenly rounded, with greatest width in the middle, RV only very weakly overlapping LV, both valves in fact subequal. Plate-like ventral expansion almost as long as entire CP, but set with few ridges; antero-ventral lip-like expansions prominent. T2 without d-setae, flanking setae longer than half the length of the end claw. T3 with terminal segment separate from penultimate segment. Caudal ramus without distal seta.

*Type locality and Type material*: unknown (see Karanovic 2012)

*Material examined here*: Pool near "Buikske Rond", Destelbergen, Oost-Vlaanderen, Belgium (coordinates: 51°03'12.3"N, 3°49'16.3"E). Collected on 1/6/2011 by K. Martens and J. Higuti.

*Remarks*: *Gurayacypris* Battish, 1987 is most likely a junior synonym of *Notodromas*.

#### DISCUSSION

#### **Ecology of Notodromadidae**

The Notodromadidae (one of 4 families in the Cypridoidea) is not very speciose world-

wide. Nevertheless, the species in this family can be locally guite abundant. For example, around Canberra (ACT, Australia), species of Newnhamia occur in nearly every second pond (personal observation, KM). Species in the Notodromadinae are hyponeustonic (except maybe from the illknow African and Indian Centrocypris species, see De Deckker 1979a) and are well-adapted to this way of life by the ventral, plate-like structure with longitudinal ridges that apparently increase the adherence to the water surface of their aquatic habitats. Similar structures are found in species of the cladoceran subfamily Scapholeberinae, which are also known to have a hyponeustic lifestyle (Dumont and Pensaert 1983). Such microcrustaceans exploit the water tension and supposedly feed on food particles caught at the water's surface, such as pollen. However, the notodromadinid ostracods are also capable of swimming rapidly amongst aquatic macrophytes (Meisch 2000).

The present specimens were collected from a small rocky stream in a forest; this is unusual, as almost all known notodromadinid species occur in lentic small water bodies (both permanent and temporary) and also in larger lakes, close to the shore. The occurrence of A. bellanella gen nov., sp. nov. in a lotic habitat is thus unusual. George and Martens (2003) described Newnhamia *dumonti* from specimens that were raised from eggs recovered from riverine sand. At that stage, the authors assumed that their species normally lived in lentic pools, like the other congeners, and that the eggs were accidentally washed in the river bed. The present observation, where a true notodromadinid occurs in running water, may indicate that N. dumonti may also prefer lotic habitats.

The eye cups in *A. bellanella* are very weakly developed, to almost absent. Their exact position is best recognisable by the absence of ornamentation in those spots. This is not unique in the Notodromadidae, as these structures are also more weakly developed in *Notodromas monacha* (Figs. 6C, I) than *Kennethia* (externally: Figs. 5F, G, I, internally Figs. 5J, L) and *Newnhamia* (Figs. 5C, D).

# Zoogeography

Notodromadidae have been found in all zoogeographical regions (except for Antartica), but species and genera have a high degree of continental endemism. For example, *Kennethia* 



**Fig. 6.** Notodromas monacha. Males (A-F). (A) Male RV, ext. view; (B) Male LV, ext. view; (C) Cp, dorsal view; (D) LV, int. view; (E) RV, int. view, (F) Cp, ventral view. Females (G-N). (G) RV, ext. view; (H) LV, ext. view; (I) Cp, dorsal view; (J) LV, int. view; (K) RV, int. view; (L) Cp, ventral view; (M) detail of posterior part of Cp, ventral view; (N) detail of anterior part of Cp, ventral view. Scale bars:A-L = 250  $\mu$ m, M = 150  $\mu$ m.

and Newnhamia are mostly (but not exclusively) endemic to Australasia, but at least one species of Newnhamia (N. dumonti) is described from India (George and Martens 2003), while Notodromas major, described by Mehes (1939) from New Caledonia belongs to Kennethia according to De Deckker (1979a). Notodromas thus far has a Holarctic distribution. Guravacypris kangraensis was recorded in Kangra, India by Battish (1987). The exact position of this species remains unclear, but based on the incomplete original description it is likely that Gurayacypris is actually a synonym of Notodromas, which would expand the distribution of this genus into the Oriental Region. *Centrocypris*-previously also lodged in the Notodromadinae, but now in its own nominate subfamily-was originally described from East Africa (Vávra 1895), but several species in this genus have also been reported from India (summary in Martens and Savatenalinton 2011).

Two species of Notodromadinae have previously been reported from South America: *Notodromas thomseni* described by Klie (1935) from Uruguay and *Notodromas patagonica* reported by Vávra (1898) from southern Argentina. *Notodromas thomseni* was referred to as *Kennethia* by De Deckker (1979a) while Vávra (1901) referred his own species *N. patagonica* to *Newnhamia*. Martens and Behen (1994) lodged both species in *Newnhamia* but only provisionally. Therefore, based on the original descriptions, it is clear that both South American species are different from *Argentodromas bellanella* gen. nov., sp. nov., but also that their correct generic assignment remains unclear.

#### **Taxonomy and Phylogeny**

The subfamily Indiacypridinae Hartmann and Puri, 1974 (with one genus Indiacypris Hartmann, 1964 and 3 species) was originally described within the Cyprididae (Hartmann and Puri 1974). De Deckker (1979b) re-investigated the type materials of the genus' type species, *I. dispar* Hartmann, 1964, and concluded that several features in Indiacypris and in Indiacypridinae were reminiscent of the llyocyprididae-for example, the central muscle scars, the seminal vesicles, the rakelike organs and the Mx1-palp, amongst others. In addition, it has also been suggested that members of Indiacypridinae belong to either Candonidae or Notodromadidae (see review in George and Martens 2004). The group has thus been assigned to all four families in the Cypridoidea at one stage

or another.

George and Martens (2004) subsequently redescribed *I. dispar* and described a new species from Kerala, India: *I. chalakkudensis*. They reassessed and corroborated the hypothesis by De Deckker (1979b), but whilst retaining the genus in the Ilyocyprididae, they indicated that *Indiacypris* might still hold an intermediate phylogenetic position between Cyprididae and Ilyocyprididae. In any case, *Indiacypris* should no longer be considered to be within the Notodromadidae.

In at least one subfamily of the Notodromadidae-the Oncocypridinae-the caudal ramus is reduced to a flagellum-like structure, as in Cypridopsinae, whilst in other subfamilies of the Notodromadidae the caudal ramus has a firm ramus and claws. This may indicate that the family Notodromadidae is polyphyletic and further studies on the group are necessary to better understand its phylogenetic relationships.

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**Authors' contributions:** AD collected the material, dissected the specimens and made the drawings. KM arranged for the SEM images to be made. AD and KM both contributed to writing the paper.

**Competing interest:** The authors declare that they have no competing interests.

**Availability of data and materials:** Available type material of the new species is described in the text.

**Consent for publication:** The authors give their consent to publish this paper.

**Ethics approval consent to participate:** No ethics approval is required for this research. The author declare that they have obtained all necessary permits to conduct the fieldwork.

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