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A new Batillipedidae (Tardigrada, Arthrotardigrada) from Argentina

AGUSTÍN G. MENECHELLA, VERÓNICA N. BULNES & NÉSTOR J. CAZZANIGA
Universidad Nacional del Sur, Departamento de Biología, Bioquímica y Farmacia. San Juan 670, (8000) Bahía Blanca, Argentina. E-mail: menechellaagustin@gmail.com

Abstract. A new species of marine tardigrade, *Batillipes acuticauda* sp. n., has been found in midlittoral sand sediments collected at Monte Hermoso beach (Buenos Aires province, Argentina). The new species differs from all other members of Batillipedidae by its combination of caudal apparatus, lateral processes and toe patterns. It is the first description of an arthrotardigrade from Argentina.

Key words: *Heterotardigrada*, Batillipes, *South America*, *taxonomy*

Introduction

Knowledge of marine tardigrades from Argentina is virtually nil. Just a single note reported four juvenile specimens from two beaches in Buenos Aires Province (Rossi & Claps, 1983); they were assigned to *Batillipes mirus*, but the identity of this species in the Southern Hemisphere has been called into question (Kristensen & Mackness, 2000).

While in Brazil Cavalcanti-da-Rocha *et al.* (2013) were able to cite 27 marine species in 19 genera of tardigrades, the lack of knowledge of Argentinean tardigrade fauna probably is but a consequence of disinterest by local zoologists.

Six species of *Batillipes* were cited from Brazil (Cavalcanti-da-Rocha *et al.*, 2013): *B. annulatus* de Zio, 1962, *B. dicrocercus* Pollock, 1970, *B. lesteri* Kristensen and Mackness, 2000, *B. mirus* Richters, 1909, *B. pennaki* Marcus, 1946, and *B. tubernatis* Pollock, 1971. We here describe a new species, *Batillipes acuticauda* **n. sp.**, found in Monte Hermoso beach, Argentina (38°59'33" S 61°15'55" W).

Material and methods

The specimens were collected from sand samples taken with 2.5 cm diameter plastic corers, fixed with 4 % formalin, sieved through a 50 µm mesh (Giere, 2009), sorted under a stereomicroscope, permanently mounted with glycerol, and examined by phase contrast microscopy. Dimensions are given in µm and as percentage to body length units (U) (Rho *et al.*, 1999). Measurements of sensory structures were taken, when possible, on the right appendage. The type series is deposited in the Colección Nacional de Invertebrados, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (In-MACN), Buenos Aires, Argentina.

Results

Taxonomic accounts

Family BATILLIPEDIDAE Ramazzotti, 1962

Genus *Batillipes* Richters, 1909

Type species: *Batillipes mirus* Richters, 1909, by monotypy.

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***Batillipes acuticauda* n. sp.**
(Figure 1–2, Table 1)

Diagnosis. Small sized *Batillipes* without eyespots; caudal apparatus consists of a broad-based spike, sharpening distally, directly inserted on the body surface; lateral processes between legs III and IV flattened, four times longer than wide, extending from short after the insertion of the third pair of legs up to the insertion of cirrus E; cephalic appendages long; spine of leg IV short; cirrus E inserted dorsally to the leg IV; all toes of leg IV of different length.

Type locality. Sandy midlittoral at Monte Hermoso, Buenos Aires Province, Argentina (38°59'33" S 61°15'55" W).

Type series. Holotype: Adult female (In-MACN 39773), in one slide, collected on June 6, 2013 by A. Menechella. Paratypes: Five adult specimens (In-MACN 39774); each specimen in one slide, all collected on June 6, 2013 by A. Menechella.

Other studied material (not in the type series): 48 specimens collected from April to June 2013 at the type locality and preserved as vouchers in our laboratory, A. Menechella leg.

Etymology. The specific name *acuticauda* is a compound Latin noun meaning "sharp tail".

Description of the holotype. Body length from the anterior margin to the base of the caudal appendage 91.2 µm; body width between legs III and IV 36.5 µm (40.02 U). Body broaden towards the rear end, hyaline (Fig. 2). Cuticle with small punctuations. Evident constriction between head and body (Fig. 1A). All cephalic appendages sharply pointed, with short cirrophori. Medial dorsal cirrus 12.5 µm long (13.71 U), inserted dorsally. Antero-dorsal internal cirrus 15.8 µm long (17.32 U) with an apparent cirrophorus (1.38 µm); antero-ventral external cirrus 8.8 µm (9.65 U). With a small dome-like papilla (secondary clava) between the internal and external cirri. Lateral cirrus (17.3 µm long: 18.97 U) and primary clava (14.5 µm: 15.90 U) originated from the same cirrophorus. Primary clava undivided, cylindrical and smooth, with rounded tips and the van der Land's body inside its base. Eyespots absent. Buccal tube 9.5 µm long (10.42 U); pharyngeal bulb 11.3 x 10.4 µm (12.39 x 11.40 U). Stylets located on stylets' supports. Pharyngeal bulb with three placoids.

Small rounded lateral processes between the first three pairs of legs. Lateral processes extending from short after the insertion of leg III up to the insertion of leg IV flattened and elongated (18.3 µm: 20.07 U). Caudal apparatus single, broadly based conical spike (12.7 µm: 13.93 U) sharpening distally (Fig. 1C).

The rosette-like female gonopore is situated 6 µm ahead of the anus, with a connecting groove. The anus consists of two enlarged cuticular lobes (Fig. 1B). All toes of different length in every leg (leg IV: 2.9, 6.1, 2.1, 6.8, 3.2 and 1.9 µm). Suction discs roughly rectangular (1.82 x 1.25 µm). Leg IV sense organs slender, with a spike-like terminal portion (5.7 µm: 6.25 U). Cirrus E long (14.1 µm: 15.46 U) and slender, located dorsally to the insertion of leg IV.

Size variability of the studied material is shown on Table 1.

TABLE 1. Size parameters of *Batillipes acuticauda* **n. sp.** (in µm). For paired structures, the measurements were taken on the right appendage. Data are presented as mean ± standard deviation [minimum–maximum]. Final numbers in the last column (n = x) indicate the number of specimens (other than the type series) on which the measurement of each character was possible.

	Holotype	Paratypes (n = 5)	Other studied specimens (n = 48)
Body length	91.2	103.5 ± 12.3 [84.6–116.0]	104.6 ± 13.2 [74.6–125.8] n = 48
Median cirrus	12.5	16.1 ± 2.6 [12.6–18.2]	16.5 ± 2.2 [11.8–22.3] n = 30
Internal cirrus	15.8	16.6 ± 2.5 [13.5–19.7]	16.8 ± 1.5 [13.5–21.5] n = 33
External cirrus	8.8	9.8 ± 1.3 [7.6–10.8]	9.6 ± 1.1 [6.6–11.6] n = 34
Lateral cirrus	17.3	23.9 ± 2.5 [19.8–26.2]	22.9 ± 2.7 [15.1–28.5] n = 38
Clava	14.5	15.3 ± 1.3 [13.7–16.8]	14.9 ± 1.3 [11.1–16.7] n = 41
Cirrus E	14.1	11.3 ± 2.4 [8.8–13.7]	11.2 ± 2.6 [6.1–16.4] n = 38
Leg IV spike	5.7	5.9 ± 1.0 [4.3–6.7]	6.1 ± 0.8 [4.0–7.9] n = 44
Caudal spike	12.7	9.7 ± 1.3 [7.9–10.9]	11.0 ± 2.3 [4.9–15.3] n = 47

Discussion

Batillipes acuticauda **n. sp.** belongs to the species group D defined by Kristensen & Mackness (2000) by having uneven 3rd and 4th toes on leg IV. It differs from most other species of the genus by the caudal apparatus, which is conical and odd.

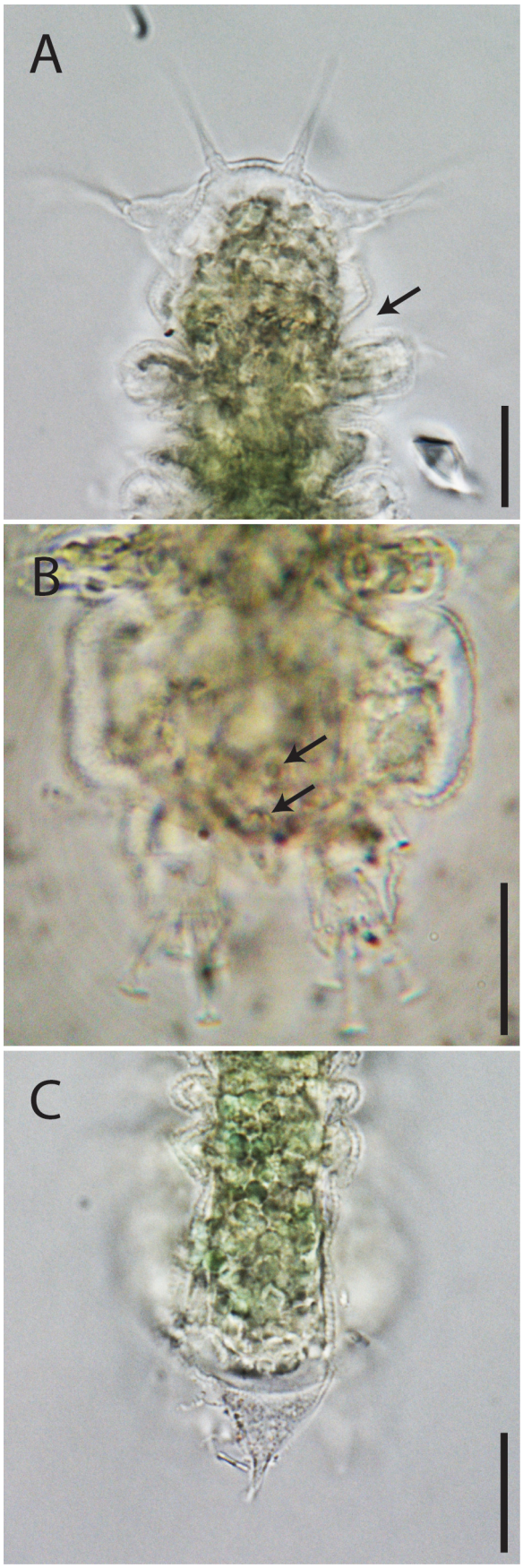

FIGURE 1. *Batillipes acuticauda* **n. sp.** (MACN 39773-Ty): A, anterior body of the holotype (arrow: head-body constriction); B, posterior body of the holotype (arrows indicate the position of the gonopore and anus); C, detail of the caudal appendage. Scale bars A-B-C: 15 µm.

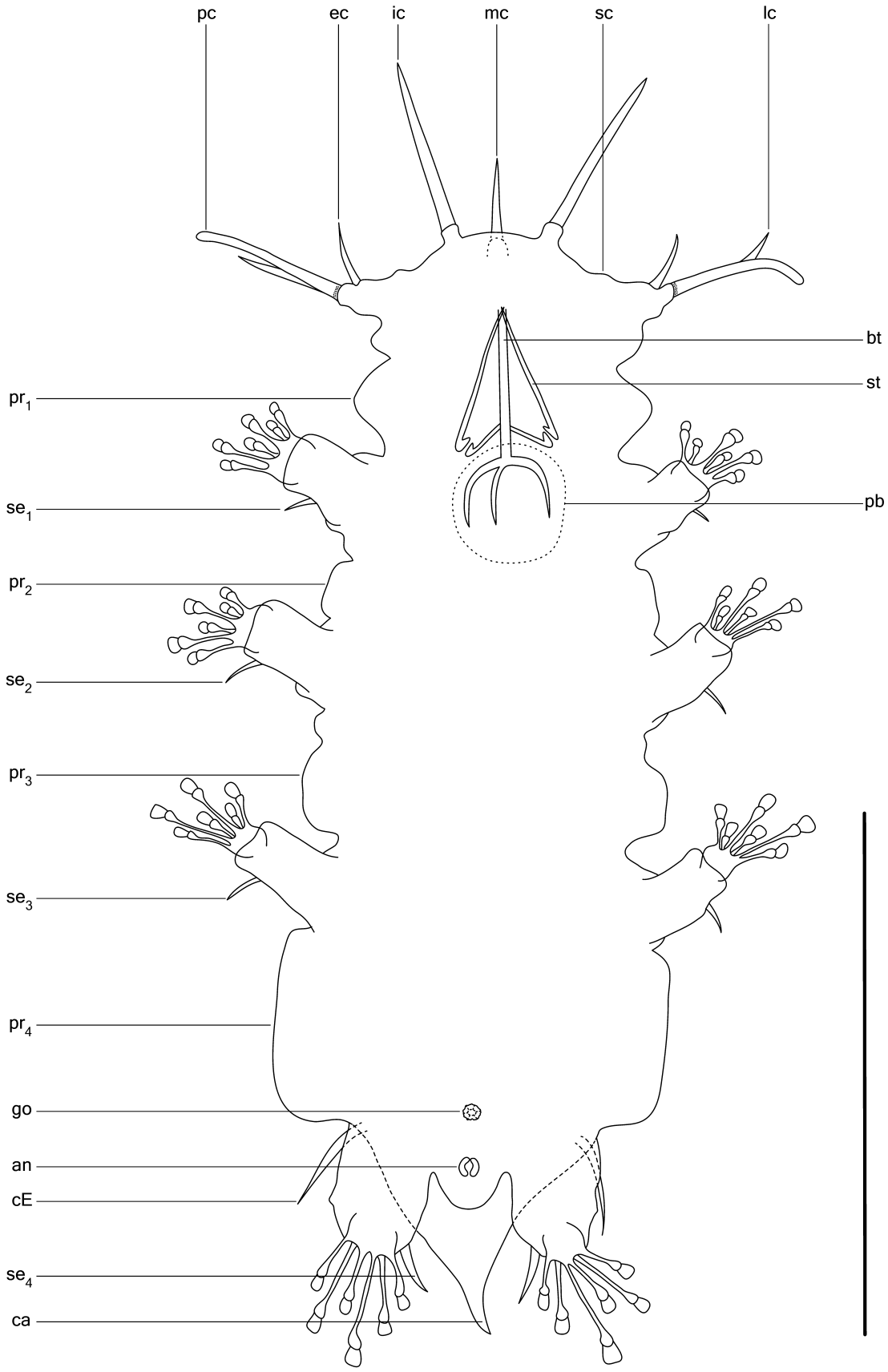

FIGURE 2. *Batillipes acuticauda* **n. sp.** Ventral view of an adult female specimen. Abbreviations: an—anus; bt—buccal tube; ca—caudal appendage; cE—cirrus E; ec—external cirrus; go—gonopore; ic—internal cirrus; lc—lateral cirrus; mc—median cirrus; pb—pharyngeal bulb; pc—primary clava; pr_{1-4}—lateral processes 1–4; sc—secondary clava; se_{1-4}—leg sense organs 1–4; st—stylet. Scale bar: 50 μm.

Batillipes acuticauda **n. sp.** differs from *B. lesteri* by the absence of eyespots; the form of the cephalic cirri (filiform in the new species, with swollen tips in *B. lesteri*); the spade-shaped suction discs (ovoid with a conspicuous brace in *B. lesteri*); the entirely different caudal apparatus and lateral processes between the legs III and IV.

The spade-shaped suction discs and the body folds behind the legs III of *Batillipes acuticauda* **n. sp.** are similar in *B. tubernatis,* but the latter is about twice the size; it has not either a constriction between the head and body, lateral processes between leg pairs III and IV, or a caudal appendage. In the original description of *B. tubernatis,* Pollock (1971) described no caudal appendage, but Höfling-Epiphanio (1972), McKirdy (1975) and Cavalcanti-da-Rocha *et al.* (2009) reported the occurrence of individuals with a pointed caudal appendage. The morphometric data provided by McKirdy (1975) allow to discriminate *B. acuticauda* **n. sp.** from *B. tubernatis* as the caudal apparatus of the former is nearly twice as long than in the caudated *B. tubernatis* (10.6 U vs 5.9 U).

The last two species of *Batillipes* that have been described (*B. spinicauda* Gallo D'Addabbo *et al.*, 2005 and *B. solitarius* Jørgensen *et al.*, 2014) differ from *B. acuticauda* **n. sp.** in the toe-pattern, lateral processes, and caudal appendage.

The conical caudal apparatus of *Batillipes acuticauda* **n. sp.** resembles that of *B. philippinensis* Chang & Rho, 1997 and *B. similis* Schulz, 1955 (D'Addabbo *et al.*, 1999). However, while *B. similis* possesses a prominent wing-shaped lateral body process between legs III and IV, in *B. acuticauda* n. sp. the fourth lateral process is flattened, elongated, extending from short after the insertion of leg III up to the insertion of cirrus E.

Batillipes philippinensis is characterized by a posterior body expansion, smooth clavae and well developed cephalic appendages like *B. acuticauda* **n. sp.** However, the third and fourth toes of the leg IV are of the same length in *B. philippinensis* (Kristensen & Mackness, 2000), the spine of the leg IV is long (20.8 U) (Chan & Rho, 1997), and the fourth lateral process are represented by a protuberance on each side. *B. acuticauda* **n. sp.** differs from *B. philippinensis* because all the toes of the leg IV are of different length, the spine is short (6.25 U), and the lateral process between legs III and IV is well developed.

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