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VERSITA

Acanthochondria helicoleni sp. nov. (Copepoda, Chondracanthidae) parasitic on *Helicolenus lahillei* (Scorpaeniformes, Sebastidae) from Argentinean waters

Delfina M.P. Cantatore* and Juan T. Timi

Laboratorio de Parasitología, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Funes 3350, (7600) Mar del Plata, Argentina. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)

Abstract

A new species of a parasitic copepod, *Acanthochondria helicoleni* sp. nov. (Copepoda, Chondracanthidae), is described and illustrated from specimens collected within the branchial chambers of the rubio, *Helicolenus lahillei* Norman, 1937, from the Argentinean waters. The new species most closely resemble *A. serrani* Braicovich et Timi, 2009 collected in the same region, but differs in the general measurements and proportions of the body; primarily by the relative length of neck, shape of head, shape and size of genito-abdominal tagma and relative size of the trunk postero-lateral processes.

Keywords

Copepoda, *Acanthochondria*, systematic, marine fish, Argentina

Introduction

During a parasitological survey carried out on *Helicolenus lahillei* Norman, 1937 (Scorpaeniformes, Sebastidae) from Argentinean-Uruguayan Common Fishing Zone, copepods belonging to the genus *Acanthochondria* Oakley, 1927 were found. These copepods represented a new species, which is herein described and illustrated.

Materials and methods

A total of 129 specimens of *Helicolenus lahillei*, captured in the Argentinean-Uruguayan Common Fishing Zone (36°23′–36°49′S, 54°00′–54°11′W), was examined for parasitic copepods. Parasites were removed from branchial chambers (branchiostegal pocket and gill arches) of fishes, fixed in 10% formaldehyde solution and then transferred to 70% ethanol for storage until being studied and measured. Appendages were dissected, cleared in lactic acid, and examined under a light microscope. Illustrations were drawn with the aid of a drawing tube.

All measurements were based on all specimens, unless otherwise indicated, and given in millimetres (mm) as mean ± standard deviation with ranges in parentheses. The terms prevalence and mean intensity of infestation were used according to Bush *et al*. (1997). The type material was deposited in the Carcinological Collection of the Museo de La Plata (CHMLP), La Plata, Argentina.

As the morphologically most similar species was *A. serrani* Braicovich et Timi, 2009, recently described in the same region (see discussion), multivariate analysis were performed in order to discriminate both species and to identify the morphometric variables responsible for such differentiation. A total of 7 parasitic copepods collected from *Helicolenus lahillei* and 10 female parasitic copepods collected from *Serranus auriga* deposited in the personal collection of the authors were measured for the following variables: total length (TL), head length (HL), head width (HW), neck length (NL), neck width (NW), trunk length (TrL), maximum width of trunk anterior to constriction (TrM1W), maximum width of trunk at constriction (TrM2W), maximum width of trunk posterior to constriction (TrM3W), postero-lateral processes length (TrPrL), distance from head to leg 1 (L1) and distance from head to leg 2 (L2). To eliminate the copepod size effect on the data set when comparing specimens of different sizes the absolute measurements were transformed to ratios. Therefore, variation should be attributable to body shape differences, and not related to the different sizes of the parasites. The transformations were: HL/TL, HW/TL, NL/TL, NW/TL, TrL/TL, TrM1W/TL, TrM2W/TL, TrM3W/TL, L1/NL, L2/NL, TrPrL/TrL, HL/TrL, HW/HL and NW/NL. Multivariate non-

*Corresponding author: cantator@mdp.edu.ar

parametric analysis of similarity (ANOSIM), similarity percentages (SIMPER) and non-metric multidimensional scaling ordination (NMDS) were performed to test for differences in multivariate measurements from the two species, to identify the relative measurement primarily providing the discrimination between groups and to graphically visualize such discrimination, respectively. The fit of the NMDS ordination was quantified by a value of stress. All multivariate similarity analyses were based on 1000 permutations and performed on Euclidean distances using the PRIMER package V6 (Clarke and Warwick 2001, Clarke and Gorley 2006).

Results

Description

***Acanthochondria helicoleni* sp. nov.** (Figs 1–29)

Material examined: 7 ovigerous females (6 with attached males) from branchiostegal pocket and gill arches of the rubio, *Helicolenus lahillei*, Norman 1937.

Female: Body (Figs 1–3) divided into relatively slender head, elongated neck, stout trunk bearing posterior processes, and small genito-abdomen. Total length 7.19 ± 0.78 (6.10–8.12) (from anterior margin of head, excluding antennules, to distal end of posterior processes). Head (Figs 1–3) devoid of processes, much longer than wide, 1.11 ± 0.12 (0.98–1.26) long and 0.76 ± 0.06 (0.66–0.86) wide, bearing median longitudinal sclerotized bar on dorsal surface. Neck region distinguishable from trunk but not clearly delimitated, neck formed by first and second pedigerous somites, 3.11 ± 0.41 (2.58–3.70) long and 0.37 ± 0.04 (0.30–0.42) wide, ratio length/width 8.38 ± 0.28 (8.16–8.81). Leg 1 located 0.26 ± 0.05 (0.20–0.30) from head; legs 1 and 2 separated from each other by 0.44 ± 0.01 (0.42–0.47). Trunk stout, 2.97 ± 0.28 (2.16–2.90) long (including processes), constricted at about mid-length, 1.35 ± 0.17 (1.00–1.50) wide at constriction and slightly narrower anteriorly 1.50 ± 0.16 (1.20–1.63) wide than posteriorly, 1.67 ± 0.12 (1.46–1.84); postero-lateral processes 0.44 ± 0.06 (0.36–0.51) long, with a blunt tip, extending up to distal limit of genito-abdomen. Pair of small processes on postero-ventral surface of trunk near the junction with genito-abdomen (Fig 4). Dwarf male attached to one of these processes with their antennae. Genito-abdomen (Fig. 4) as long as wide; genital segment with pair of short setae on anterior margin of oviduct-orifice slits; abdomen small, with rounded posterior margin. Caudal ramus (Fig. 5) conical, longer than wide, (0.08 × 0.02, n = 1), swollen basal portion armed with 1 seta on dorsal surface, 2 setae on ventral surface and two spines near base of ventral setae; numerous spinules on terminal portion probably representing modified caudal setae largely fused to the ramus at its base. Egg sacs (Fig. 6) cylindrical, 3.00 ± 0.31 (2.70–3.80) (n = 6) long and 0.72 ± 0.20 (0.50–0.96) (n = 6) wide, with multiseriate arrangement of eggs.

Antennule (Figs 7 and 8) cylindrical with slightly swollen basal portion and tapering towards terminal end; basal portion with 2 inflated setae on anterior margin, terminal portion with armature 2, 2, 8. Antenna (Fig. 9) 2-segmented; first segment unarmed; second segment heavily sclerotized consisted of curved claw with minute seta on medial surface of base and band of transverse striation on hook. Labrum (Fig. 10) with patch of spinules along its posterior margin and small knob on lateral margin. Mandible (Fig. 11) with 20–25 teeth on convex side and 19–24 teeth on concave side of terminal falcate process. Paragnath not observed. Maxillule (Fig. 12) suboval, bearing 2 setae, and patch of spinules on inner surface. Maxilla (Fig. 13) 2-segmented; first segment squat and unarmed; terminal segment claw-like, armed with row of 10–14 denticles along terminal margin and carrying spinule and slender setae near base. Maxilliped (Fig. 14) 3-segmented; first segment stout; second segment bearing two patches of denticles on inner and inner-distal surfaces; terminal segment ending in curved claw-like structure bearing hooklet on inner surface. Leg 1 (Fig. 15) slightly smaller than leg 2 (Fig. 16); both legs bilobate bearing fine spinules at tip of each ramus, and generally 3 spines on exopod. Protopodal seta on outer margin of both legs.

Male: Body (Figs 17 and 18) ventrally curved, 0.99 ± 0.10 (0.86–1.14) long (measured from base of antennae to distal end of urosome, excluding caudal rami), 0.59 ± 0.11 (0.44–0.78) wide; cephalothorax comprising more than half of total body length; metamerism of body indistinct. Genital segment (Figs 19 and 20) with pair of ventral ridges. Caudal ramus (Figs 19 and 20) similar to that of female, but lacking spines and having attenuated accessory process at tip.

Antennule (Fig. 21) moderately long, with armature formula 1, 1, 2, 2 and 7. Antenna (Fig. 22) robust, basal segment equipped with seta on dorsal surface and terminal claw with minute hyaline seta and knob on ventral surface. Labrum (Fig. 23) with patch of spinules along its posterior margin, anterior median knob and lateral ear-like processes. Mandible (Fig. 24) with 9–10 teeth on convex side and 5–6 teeth on concave side of terminal falcate process. Maxillule (Fig. 25) semicircular bearing 2 setae. Maxilla (Fig. 26) similar to that of female except terminal process devoid of teeth. Maxilliped (Fig. 27) as in female, except with fewer denticles on second segment. Legs bilobate, leg 1 (Fig. 28) larger than leg 2 (Fig. 29); protopods with long lateral setae, larger in leg 2; endopods reduced to lobes; exopods bearing a process each, that of leg 1 bifurcate.

Type host: *Helicolenus lahillei* Norman, 1937 (Scorpaeniformes, Sebastidae).

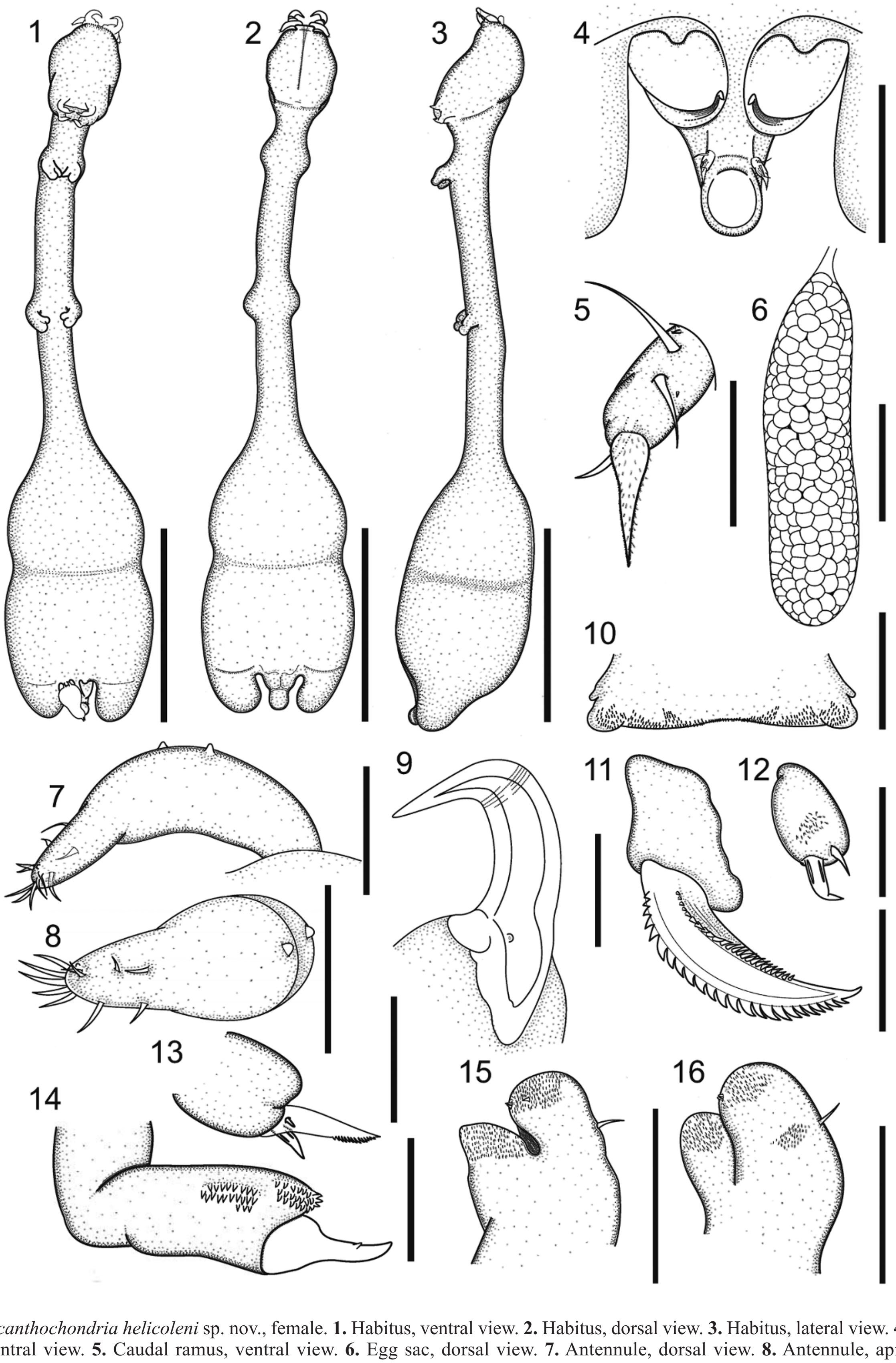
Site of infection: Branchiostegal pocket and gill arch.

Date of collection: February, 2008.

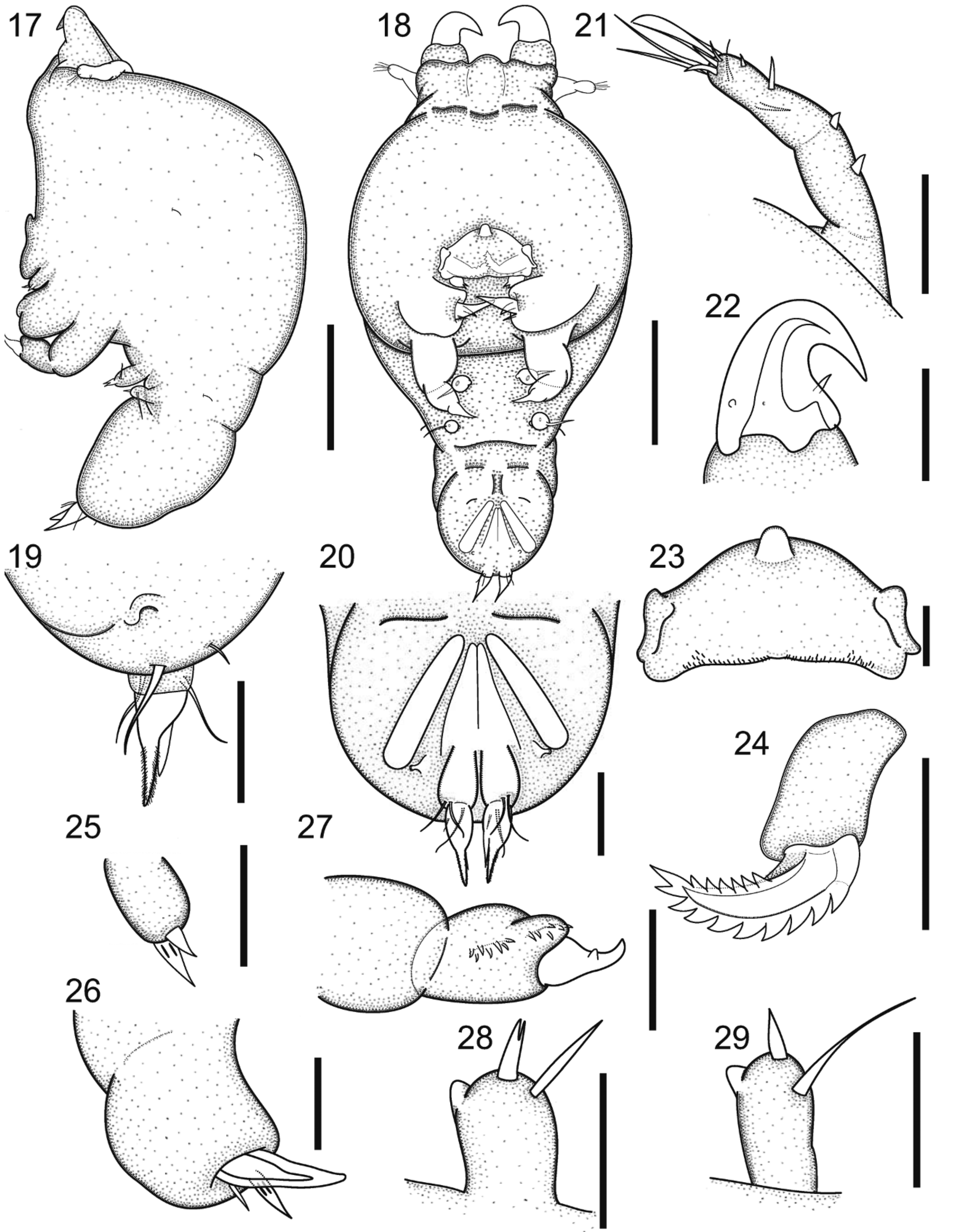
Prevalence: 7.03% (9 fishes infected of 128 fishes examined).

Mean intensity: 1.11.

Type locality: Argentinean-Uruguayan Common Fishing Zone (AUCFZ).



Figs 1–16. *Acanthochondria helicoleni* sp. nov., female. **1.** Habitus, ventral view. **2.** Habitus, dorsal view. **3.** Habitus, lateral view. **4.** Genito-abdomen, ventral view. **5.** Caudal ramus, ventral view. **6.** Egg sac, dorsal view. **7.** Antennule, dorsal view. **8.** Antennule, apical view. **9.** Antenna. **10.** Labrum. **11.** Mandible. **12.** Maxillule. **13.** Maxilla. **14.** Maxilliped. **15.** Leg 1. **16.** Leg 2. Scale bars: Figs 1–3 = 2 mm; Figs 4, 6 = 1 mm; Figs 15, 16 = 0.25 mm; Figs 7–10, 13 = 0.1 mm; Figs 5, 11, 12, 14 = 0.05 mm



Figs 17–29. *Acanthochondria helicoleni* sp. nov., male. **17.** Habitus, lateral view. **18.** Habitus, ventral view. **19.** Genito-abdomen, lateral view. **20.** Genito-abdomen, ventral view. **21.** Antennule. **22.** Antenna. **23.** Labrum. **24.** Mandible. **25.** Maxillule. **26.** Maxilla. **27.** Maxilliped. **28.** Leg 1. **29.** Leg 2. Scale bars: Figs 17–29 = 0.025 mm

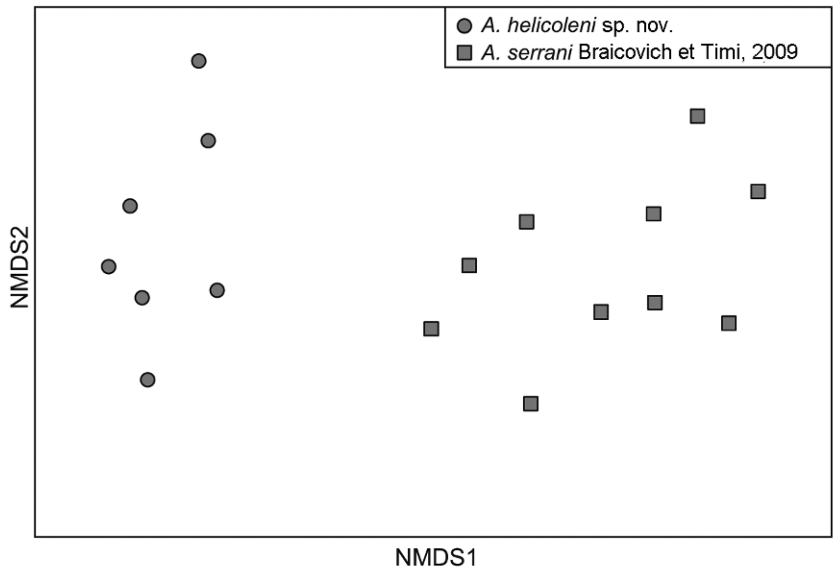


Fig. 30. Non-metric Multidimensional Scaling (NMDS) scattergram for multivariate relative measurements of *Acanthochondria serrani* Braicovich et Timi, 2009 and *A. helicoleni* sp. nov. specimens

Material deposited: Holotype no. MLP 26533 (female), allotype no. MLP 26534 (male), and paratypes (2 females with attached male) no. MLP 26535 are deposited in the Carcinological Collection of the Museo de La Plata (CHMLP), La Plata, Argentina.

Etymology: The specific name is derived from the generic name of the fish host, *Helicolenus lahillei*.

Multivariate analysis

The bidimensional plot of NMDS showed a clear distinction between species, with a low stress value (0.08) (Fig. 30). One-way ANOSIM test indicated that overall relative measurements between groups were significant different (Analysis of Similarity, Global R = 0.856, p<0.01), while SIMPER analysis identified HW/HL, L2/NL, L1/NL, HL/TrL, TrPrL/TrL as the relative measurements that contributed to more than 76% of the dissimilarity between species. Among these variables HL/TrL contributed less consistently in the inter-comparison.

Discussion

Acanthochondria Oakley, 1927 is the largest genus of the family Chondracanthidae Edwards, 1840, containing 48 valid species (Alves *et al*. 2003, Kalman 2003, Østergaard 2003, Braicovich and Timi 2009). By having a very long neck (at least 8 times longer than wide) consisting of first and second pedigers, female of *A. helicoleni* sp. nov. can be distinguished from most of its congeners. According to the last revised key to the genus *Acanthochondria* made by Kalman (2003), only *A. uranoscopi* Ho et Kim, 1995 and *A. diastema* Kabata, 1965 show these characteristics. *A. uranoscopi* differs from the new species in having the neck imperceptible extended into trunk; a pair of slender, long postero-lateral processes; a greater number of teeth in both mandible and maxilla; a rather long protopod on leg 2; and genito-abdomen wider than long (Ho and Kim 1995). Based on Ho and Dojiri (1988) redescription, *A. diastema* can be distinguished from the species described in the present work by having the neck indistinguishably fused to trunk, posterior process extending beyond distal limit of genito-abdomen, genito-abdomen wider than long, and the armature of the antennule.

After Kalman (2003) two new species were described, *A. triangularis* Alves, Luque et Paraguassú, 2003 and *A. serrani* Braicovich et Timi, 2009 from Brazil and Argentina, respectively (Alves *et al*. 2003, Braicovich and Timi 2009). Whereas *A. triangularis* shows a shorter neck (4 times as long as wide), leg 2 with elongate protopod and longer postero-lateral processes, *A. serrani* closely resembles the new species.

Both Argentinean species show marked similarities in the general shape female and the structure of the mouth parts; however, they differ in the general measurements and proportions of the body, being *A. helicoleni* sp. nov. larger than *A. serrani* and having no overlap in the size ranges for any character. However, it have been argued that changes in appearance of *Acanthochondria* can occur as a consequence of different degrees of contraction of preserved specimens, leading to take phenotypic features and artifacts for taxonomically valid characters (Kabata 1979). In the present study only adult females were measured, which were fixed and preserved in the same way, therefore the differences found cannot be due to copepod age and/or treatments effects. Indeed, statistical comparisons showed that all morphometric relationships differed significantly between the new species and *A. serrani*, disregarding a possible effect of preservation artifacts or intraspecific variability. Beyond that, some morphological features, such as genito-abdominal tagma, are less subject to artificial distortions (Kabata 1979). With this respect, the new species differs from *A. serrani* in both the shape and size of genito-abdomen and the relative position of caudal rami. In addition, other relative measurements such us head shape (HW/HL), differential elongation of the intersegmental area between pedigers 1 and 2 (L2/NL and L1/NL) and the length of trunk in relation to the length of the head and postero-lateral processes (HL/TrL and TrPrL/TrL) distinguished these species.

On the basis of the differences listed above, a new species, *Acanthochondria helicoleni*, is proposed.

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