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## *Acutihumerus patagoniensis* (Sieg, 1986) (Tanaidacea: Kalliapseudidae): supplementary description and remarks on its taxonomic status

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### Abstract

*Acutihumerus patagoniensis* (Sieg, 1986) was originally described based on a single specimen from Golfo Nuevo, northern Patagonia, Argentina. Over 3000 specimens referable to this species from just a few miles of its type locality are now available. Based on these specimens, the description of *A. patagoniensis* is completed and the ontogenetic changes of the male cheliped are described and illustrated. *Acutihumerus patagoniensis* has recently been considered a junior synonym of *A. cavooreni* (Băcescu & Absalao, 1985) from southern Brazil. However, these species can be distinguished mainly by the male chela: *A. patagoniensis* has a much wider notch palm than *A. cavooreni*. Furthermore, most of the males herein reported from off the Río de la Plata have a chela with a narrow notch, a fact that suggests that this area might be a zone of hybridization or contact between *A. patagoniensis* and *A. cavooreni*. Hence, we claim that the recently proposed synonymy has not been proven, and the resolution of this taxonomic problem must await additional specimens of *A. cavooreni* from its type locality (Rio Grande do Sul, Brazil).

**Key words:** Kalliapseudidae, *Acutihumerus patagoniensis*, male cheliped, new records, *Acutihumerus cavooreni*

### Introduction

Băcescu & Absalao (1985) described *Hemikalliapseudes cavooreni* from a few specimens dredged at 25 m depth south of the mouth of Lagoa dos Patos, Rio Grande do Sul, Brazil; soon after, Sieg (1986) described *Bacescapseudes patagoniensis* on the basis of a single male collected in Golfo Nuevo, northern Patagonia, Argentina, at 20–50 m depth. Guțu (1998) suggested that *B. patagoniensis* was a junior synonym of *H. cavooreni* and, more recently (Guțu 2006), erected the genus *Acutihumerus* to accommodate *H. cavooreni*. In contrast, Araújo-Silva & Larsen (2010) stated that *Acutihumerus patagoniensis* is a valid species based on a cladistic analysis. However, Drumm & Heard (2011) and Guțu (2011) reported many inconsistencies in the data matrix prepared by Araújo-Silva & Larsen (*op. cit.*). Finally, Drumm & Heard (2011) formally synonymised *A. patagoniensis* with *A. cavooreni* (to become a subjective junior synonym of the latter).

In the present contribution, *A. patagoniensis* is treated as a full species as over 3000 specimens identified here as this taxon are now available from Playa Colombo, a beach near the mouth of Golfo Nuevo, northern Patagonia; this is just a few nautical miles from the type locality of this species (Fig. 1). Based on this large sample, a supplemental description of *A. patagoniensis* is presented below.

### Material and methods

Specimens were stained with Chlorazol Black E<sup>®</sup>, and the appendages dissected and temporarily mounted in glycerine. Drawings were prepared using a Carl Zeiss Axioskop compound microscope equipped with a camera lucida. Line drawings were captured in digital format and inked with a Wacom tablet after Coleman (2003).

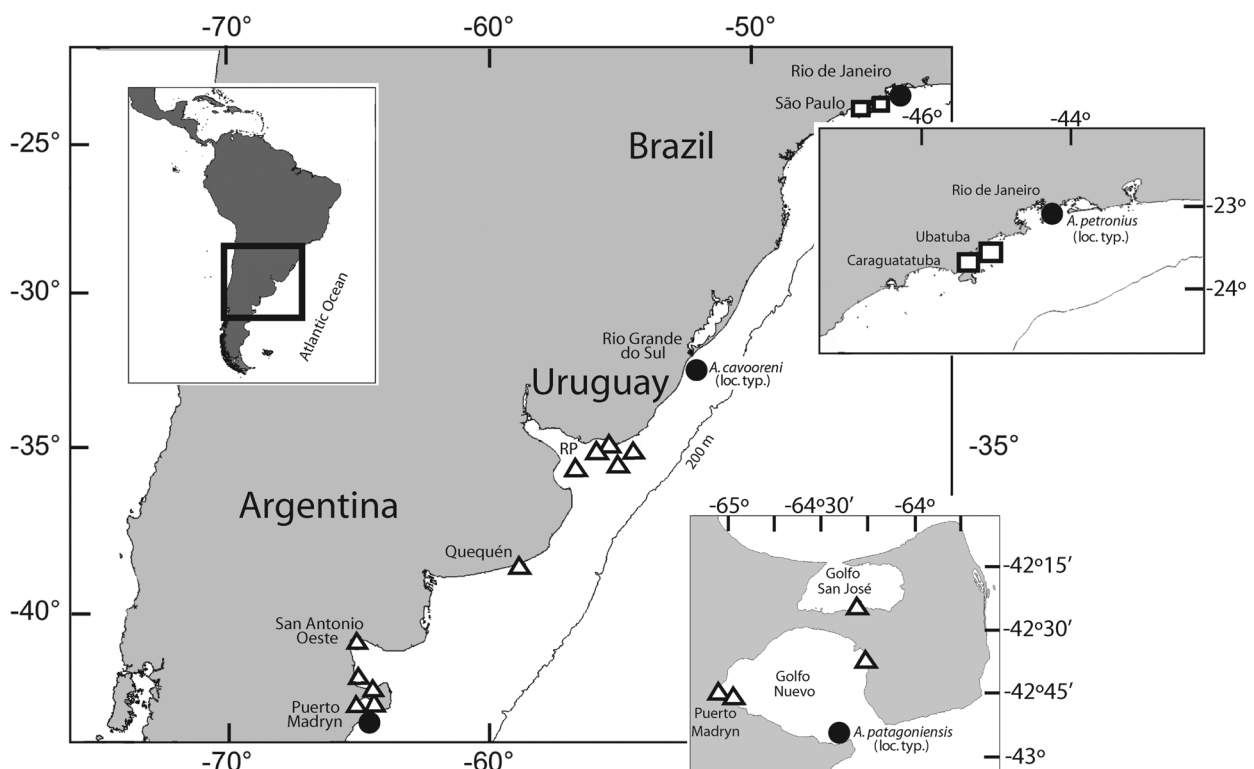
The specimens were collected on board the research vessels *Aldebarán* (INAPE, Uruguay) and *Eduardo*

*Holmberg* (INIDEP, Argentina), small fishing ships or inflatable boats (at Quequén, San Antonio Oeste, and Puerto Madryn), and by scuba divers (at Puerto Lobos, Golfo San José, and Golfo Nuevo).

Most of the material examined during this study is housed in the invertebrate collections of the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (MACN). Some specimens are also deposited in the Museo Nacional de Historia Natural de Montevideo, Uruguay (MNHNM).

Several specialised characters were used in the description of the chelipeds. Carpal and propodal lengths were taken along the dorsal side of the articles. The fixed finger of the propodus has a tooth-like projection (apophysis) on its dorsal margin and the size and angle of this feature varies with the age of the specimen. To measure the angle, the tangent to the propodus inferior margin and the line bisecting the apophysis were considered. To calculate the fixed finger to U-shaped notch ratio, an imaginary line was traced from the base of the robust tooth to the farthest point on the notch, and after that the fractions falling over the finger and the notch were measured. Fig. 2 shows how these measures were taken. When more than one cheliped was measured, data for these additional chelipeds appear between parentheses.

The following seta types were distinguished: simple seta completely lacking outgrowths on their shaft; setulate seta bearing long setules along the shaft; serrulate seta with one or more rows of short and extremely thin setules in its distal half.



**FIGURE 1.** Map showing the distribution of the genus *Acutihumerus*. Open triangles: material studied in this paper. Black circles: type localities of *A. cavooreni*, *A. patagoniensis* and *A. petronius*. Open squares: previous records of *A. cavooreni* from Ubatuba (Drumm & Heard, 2011) and Caraguatatuba (Miranda, 2010); RP: Río de la Plata.

## Systematics

### Order Tanaidacea Dana, 1849

### Suborder Apseudomorpha Sieg, 1980

### Family Kalliapseudidae Lang, 1956

### Subfamily Hemikalliapseudinae Guțu, 1972

## *Acutihumerus* Guțu, 2006

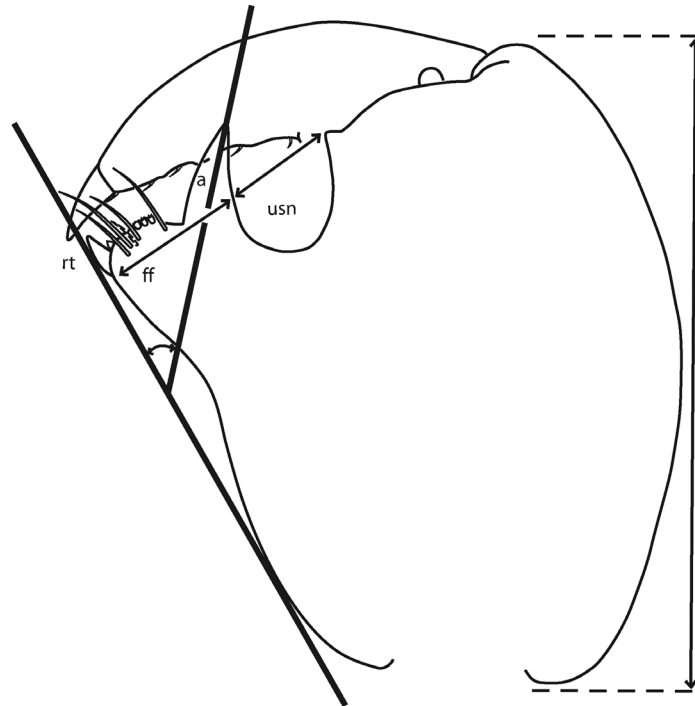
*Acutihumerus*: Guțu (2006): 178; Araújo-Silva & Larsen (2010): 35; Drumm & Heard (2011): 24.

**Type species:** *Hemikalliapseudes cavooreni* Băcescu & Absalao (1985).

**Diagnosis.** See Guțu (2006).

**Geographic distribution.** From Angra dos Reis (Rio de Janeiro State) to Golfo Nuevo (northern Patagonia).

**Species:** *Acutihumerus cavooreni* (Băcescu & Absalao, 1985), *Acutihumerus patagoniensis* (Sieg, 1986), *Acutihumerus petronius* Araújo-Silva & Larsen, 2010.



**FIGURE 2.** *Acutihumerus patagoniensis*. Measurements of the male chela. Abbreviations: a, apophysis; ff, fixed finger; rt, robust tooth; usn, U-shaped notch.

## *Acutihumerus patagoniensis* (Sieg, 1986)

Figs. 3–5

*Bacescapseudes patagoniensis*: Sieg (1986): 22, 25–30, figs. 11–14 (description of male); Guțu (1998): 180; Guțu (2006): 171, 179; Araújo-Silva & Larsen (2010): 30, 32, 35, 45; Drumm & Heard (2011): 10, 24 (junior synonymy of *A. cavooreni*).

*Acutihumerus patagoniensis*: Araújo-Silva & Larsen (2010): 47, 48; Drumm & Heard (2011): 24; Guțu (2011): 346, 347.

*Acutihumerus patagonensis*: *lapsus calami*, Araújo-Silva & Larsen (2010): 41, 42.

## **Description of *Acutihumerus patagoniensis* from Playa Colombo, Golfo Nuevo.**

**Material examined.** Off Puerto Madryn, Golfo Nuevo, Brenda Doti, Ignacio Chiesa, Romina Centurión and Daniel Roccatagliata colls.: Sta. 3, 42°46.324'S, 65°01.361'W, 10 m, 3 Feb 2006, one ♂ and four ♀ (MACN-In. 39637). Sta. 8, 42°46.999'S, 64°59.256'W, 9 m, 3 Feb 2006, eleven ♂ and 55 ♀ (MACN-In. 39638). Sta. 9, 42°46.991'S, 64°59.088'W, 12 m, 3 Feb 2006, three ♂ and six ♀ (MACN-In. 39639). Sta. 11, 42°47.019'S, 64°58.890'W, 11 m, 3 Feb 2006, three ♂ and 26 ♀ (MACN-In. 39640).

Playa Colombo, Golfo Nuevo, approximately 42° 37'30"S, 64°14'W: shallow waters, 22 Jan 1990, by scuba diving, Daniel Martínez coll., 1701 ♂ and 780 (67 ovigerous) ♀ (MACN-In. 39641). Same locality, 2 m, 3 Nov 1995, by scuba diving, Fernando Meijide and Pablo Ianovski colls., 399 ♂ and 158 (47 ovigerous) ♀ (MACN-In. 39642).

Playa Villarino, Golfo San José: 42°24'25"S, 64°17'38"W, 2–5 m, Mar 2006, by scuba diving, Juan Pablo Livore coll.: 20 ♂ and 86 (39 ovigerous) ♀. (MACN-In. 39699). 42°24'34"S, 64°17'38"W, 1–5 m, Mar 2006, by scuba diving, Juan Pablo Livore coll.: five (two ovigerous) ♀ (MACN-In. 39643).

Puerto Lobos: 41°59.808'S; 65°03.539'W, approximately 10 m, 20 Jun 2011, by scuba diving, Marina Güller coll.: one ♂ and one ♀ (MACN-In. 39644).

**Diagnostic characters.** Rostrum broad and with a slight concave indentation. Eye lobes well developed. Cheliped segment with a mid-ventral crest (cephalothoracic hyposphenium). Sterna of pleonites 1–2 with a forwardly directed hook. Epimera of pleonites 1–5 with an acute postero-inferior projection. Pleotelson margins with distinct notch and a hook-like spine. Antenna article 1 with inner lobe. Antennal squama, mandible palp, maxilliped palp and cheliped with simple (not setulate) setae. Maxilliped propodus and dactylus with serrulate setae. Basis of pereopods 2 and 3, anterior margin with a proximal hook curving upwards. Basis of pereopod 6 with a row of setulate setae dorsally. Chela palm of large males with a broad and deep U-shaped notch.

**Dimorphic chelipeds.** Significant ontogenetic changes in the morphology of the male cheliped are shown here (Figs. 3 and 4). The propodus becomes larger and varies between slightly and distinctively longer than wide, from the juvenile to adult stages. In the juvenile male (Fig. 3B) the apophysis on fixed finger is small and triangular, but as the male grows it develops into a large and robust projection. Also, as the male grows, the apophysis rotates, turning almost parallel to the ventral margin of the propodus in the largest male. The tooth on the ventrodistal angle of the propodus is here referred to as “robust tooth”. The area between the robust tooth and the apophysis decreases in size as the male grows, being reduced to a small unevenness on the ventral margin of the propodus in the largest males. In contrast, the U-shaped notch is poorly developed in the juvenile male, but became wider and deeper as the specimen become larger. A detailed description of this ontogenetic process of the male cheliped is reported below:

*Juvenile male* (MACN-In. 39641a, carapace length 0.49 mm, Fig. 3B). Propodus 0.9 times as long as carpus. Fixed finger with a small tooth-like projection (from now on called apophysis) on dorsal margin. U-shaped notch small, approximately 0.3 times fixed finger width. Dactylus, cutting margin even and with a few small setae; distal end with a sharp claw.

*Male I* (MACN-In. 39641b, carapace length 0.69 mm, Fig. 3C). As the previous form except for: propodus 1.5 times carpus length. Apophysis roughly slanted 34°–43° upwards about propodus ventral margin. Area between robust tooth and apophysis narrower. U-shaped notch narrower than or as broad as fixed finger (slightly wider than fixed finger in other specimens examined). Dactylus, cutting margin with a proximal rounded process.

*Male II* (MACN-In. 39641c, carapace length 0.82 mm, Fig. 3D). As the previous form except for: propodus 1.9 times carpus length. Apophysis roughly slanted 24°–31° upwards about propodus ventral margin. Area between robust tooth and apophysis narrower. U-shaped notch 1.3 times broader than fixed finger. Dactylus, proximal rounded process larger.

*Male III* (MACN-In. 39641d, carapace length 0.95 mm, Fig. 3E). As the previous form except for: propodus huge, 2.6 times carpus length. Fixed finger, robust tooth blunt; apophysis roughly slanted 10°–16° upwards about propodus ventral margin, i.e., it becomes almost parallel to propodus ventral margin. Area between robust tooth and apophysis vestigial. U-shaped notch much wider, approximately 2.9 (2.3–2.6) times broader than fixed finger. Dactylus claw blunt. Note: in other specimens examined, the robust tooth, the apophysis and the claw are sharper than in the specimen drawn.

*Juvenile female* (MACN-In. 39641e, carapace length 0.53 mm, Fig. 3A). Propodus 0.43 times as long as carpus. Similar to juvenile male but lacking U-shaped notch and incipient apophysis.

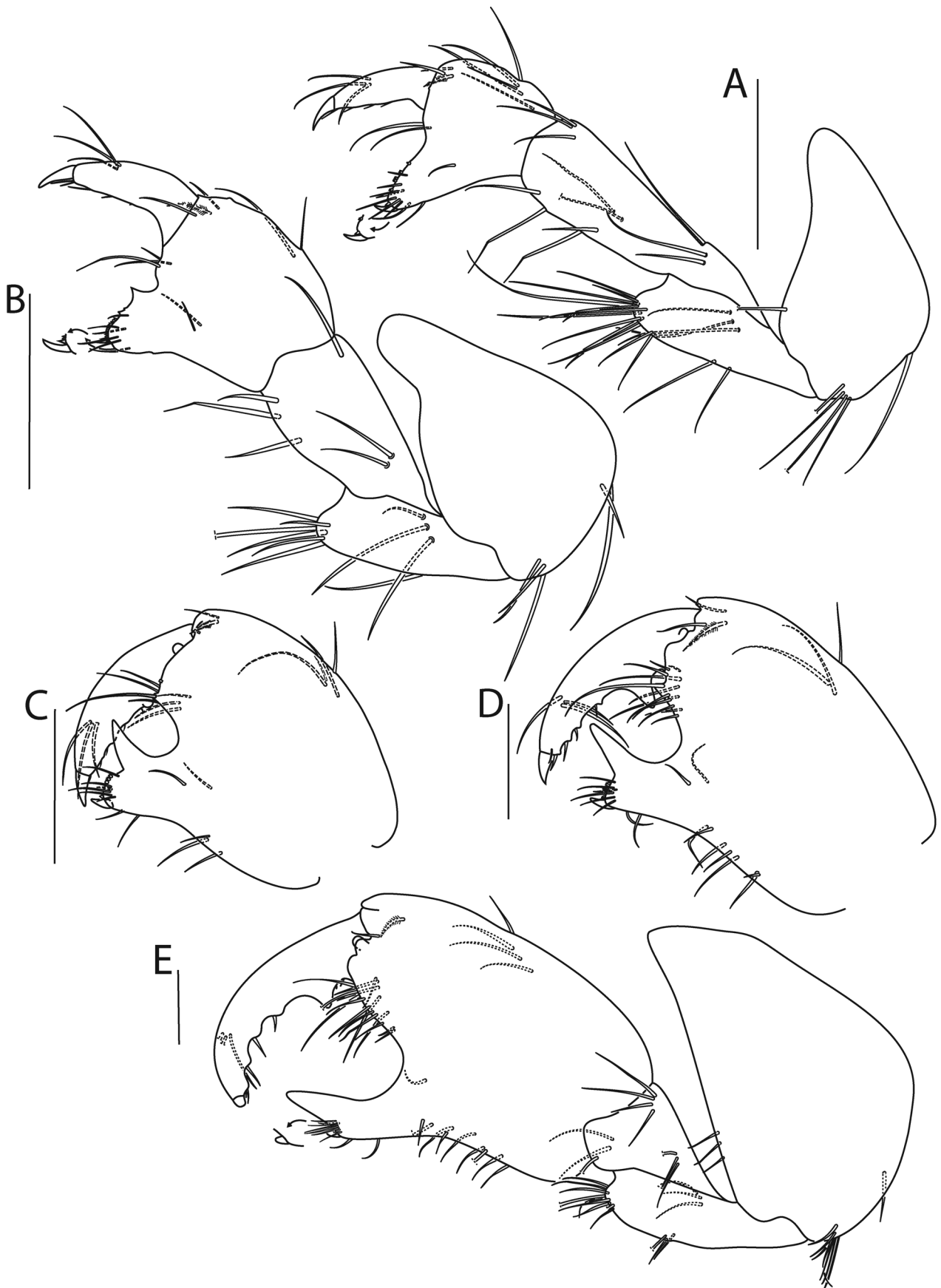
*Ovigerous female* (MACN-In. 39641f, carapace length 0.88 mm). As juvenile female but propodus 0.63 times as long as carpus.

**Addenda to Sieg (1986) description.** The specimens from Playa Colombo fully agree with the description of *A. patagoniensis* presented by Sieg but supplementary information is reported below:

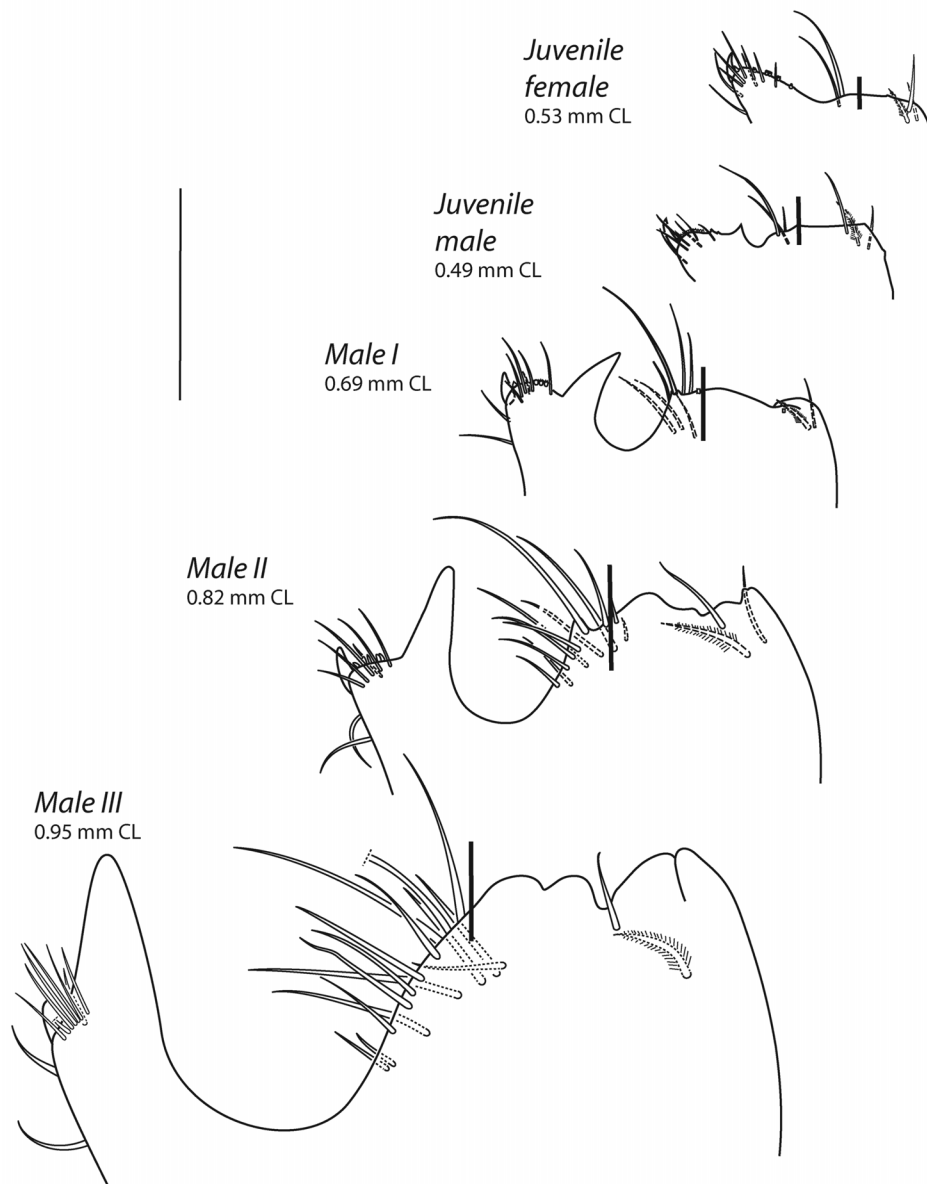
Eye lobes as shown in Fig. 5A, not pigmented. Corneal lenses not detected, but visual elements distinguished at high magnification in soft (decalcified) specimen.

Cheliped segment of juveniles (both sexes), female (with rudimentary oostegites) and male I with an anvil-like hyposphenium, bearing several teeth on anterior projection and a tooth on posterior projection (Fig. 5D). Posterior projection vestigial in male II (Fig. 5E) and completely absent in male III (Fig. 5F). Ovigerous female lacking hyposphenium.

Pleonites 1 and 2 (Fig. 5B) with forwardly directed hook mid-ventrally. Pleonites 1–5 with an acute projection on postero-inferior angle. Margins usually even, rarely with teeth (Fig. 5C).



**FIGURE 3.** *Acutihumerus patagoniensis*. A, juvenile female cheliped (MACN-In. 39641e); B, juvenile male cheliped (MACN-In. 39641a); C, male I chela (MACN-In. 39641b); D, male II chela (MACN-In. 39641c); E, male III cheliped (MACN-In. 39641d). In all figures the outer surface is shown. Scale bars: 0.2 mm.



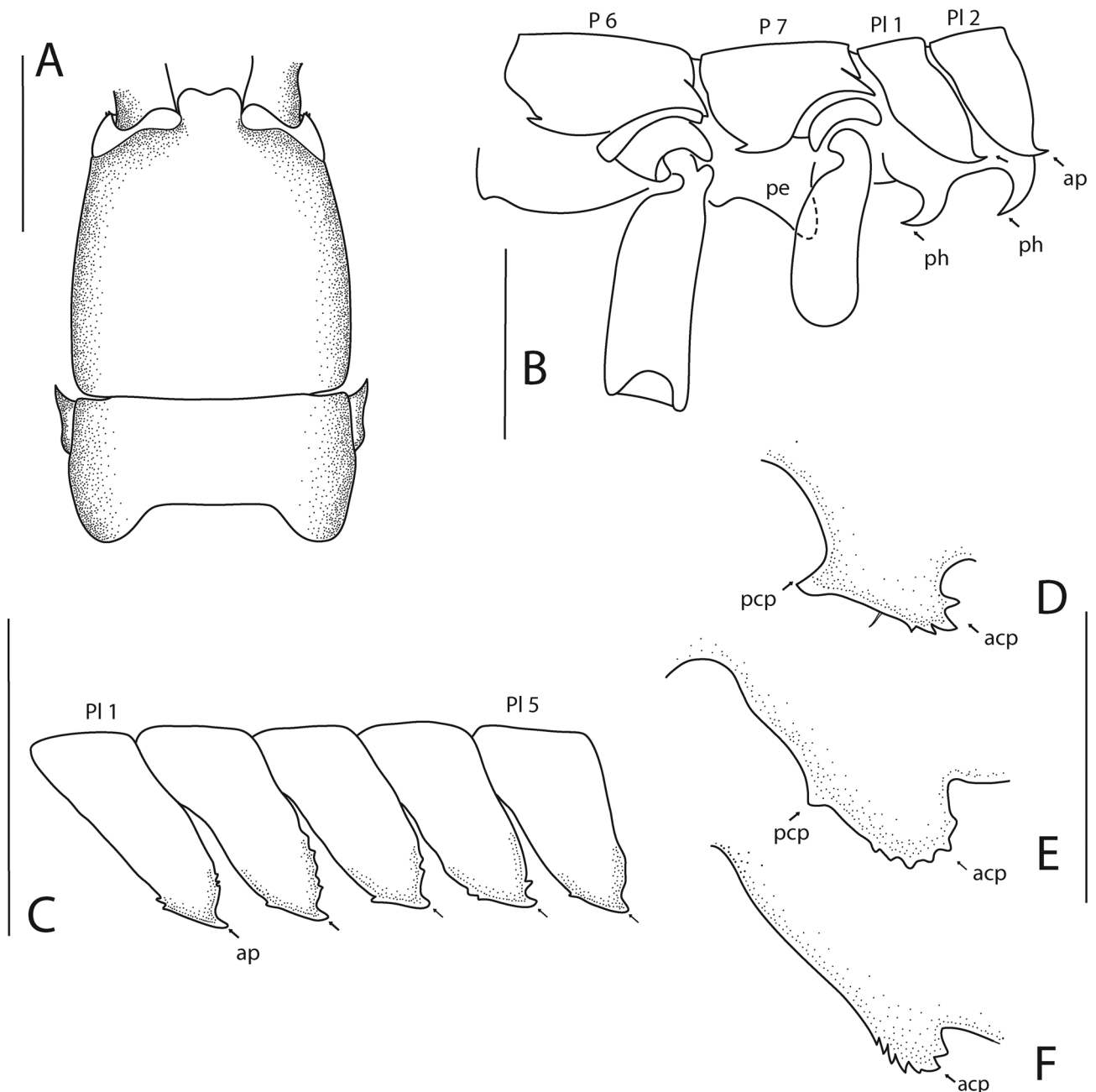
**FIGURE 4.** *Acutihumerus patagoniensis*. Gradual changes of the fixed finger and apophysis over a growing series. The propodus distal outlines were transferred from the preceding figure, and all adjusted to the same scale. The vertical bars indicate the propodus-dactylus inner articulation. Scale bar: 0.2 mm.

Maxilliped propodus and dactylus with serrulate setae. Note: these setae are depicted as simple in the original description of *A. patagoniensis* (see Sieg, 1986, fig. 12). Pereopods 2 and 3, basis with an upwardly directed tooth on the anterior margin (like that one shown for *A. cavooreni* by Băcescu & Absalao, 1985 in their fig. 2D). Pereopod 6 basis with a row of 7–10 setulate setae along dorsal margin. Note: Sieg (1986, fig. 13) showed four setulate setae (he called them “pinnate”) restricted to the proximal half of article, and Băcescu & Absalao (1985, fig. 2A) illustrated them as simple setae.

**Remarks on the specimens from Playa Colombo, Golfo Nuevo.**

The chela of the males from Playa Colombo have a broad and deep notch (as show by Sieg, 1986 in Fig. 14), and both sexes have simple (not setulate) setae on the antennule squama, mandible palp, maxilliped palp and cheliped.

Sieg (1986) stated that *A. patagoniensis* has well-developed eye lobes; however, they appear to be fused to carapace in his Fig.11. The eye lobes of the specimens studied herein (Fig. 5A) are similar to those illustrated by Băcescu & Absalao (1985, Fig. 1A) and Guțu (2006, Fig. 309) for *A. cavooreni*. Our specimens lack pigmented eyes, however, they have been in preservative for over 20 years and pigments could be degraded.



**FIGURE 5.** *Acutihumerus patagoniensis*. A, male II carapace and first pereonite in dorsal view (MACN-In. 39641c); B, male III pereonites 6–7 and pleonites 1–2 (MACN-In. 39641g); C, male III pleonites 1–5 in lateral view (MACN-In. 39641h); D–F, cephalothoracic hyposphenium of a female with rudimentary oostegites (MACN-In. 39641i), a male II (MACN-In. 39641j), and a male III (MACN-In. 39641k), respectively. Abbreviations: acp, anterior crest projection; ap, acute projection; ph, pleonal hook-like teeth; pcp, posterior crest projection; P, pereonite; pe, penis; Pl, pleonite. Scale bars: A–C: 0.5 mm; D–F: 0.2 mm (D–F, share the same scale).

The hook-like teeth on first two pleonites and the acute lateral projections on pleonites 1–5 have not been reported by Sieg (1986) but are mentioned by Băcescu & Absalao (1985) for *A. cavooreni*.

All the specimens herein reported have a distinct notch and a hook-like spine on the margins of the pleotelson, as shown by Sieg (1986) in his Fig. 14. Băcescu & Absalao (1985) stated that *A. cavooreni* has a strong excavation at each side, which they also showed in Fig. 1A, but Guțu (2006) illustrated the habitus of the holotype of this species with the pleotelson devoid of lateral notches. However, Dr. Modest Guțu kindly re-examined this holotype of *A. cavooreni* for us and he wrote [regarding the pleotelson of *A. patagoniensis*] “the single difference is that I couldn’t observe the spines; their absence might be an artefact caused by the decalcification.” Therefore, in the Fig.

309 presented by Guțu (2006) the lateral notches are lacking due to the ventral flexing of the pleotelson, as suggested by Araújo-Silva & Larsen (2010).

#### Remarks on the specimens from San Antonio Oeste and Quequén.

**Material examined.** San Antonio Oeste, Brenda Doti, Ignacio Chiesa, Marina Vera Diaz and Daniel Roccatagliata colls.: Sta. 2, 40°53.090'S, 65°04.434'W, 12 m, 3 Jan 2005: seven ♂ and ten (two ovigerous) ♀ (MACN-In. 39645). Sta. 4, 40°53.515'S, 65°04.166'W, 15 m, 3 Jan 2005: five ♂ and 15 (one ovigerous) ♀ (MACN-In. 39646). Sta. 7, 40°53.634'S, 65°04.033'W, 19 m, 3 Jan 2005: one ♂ (MACN-In. 39647). Sta. 11, 40°53.156'S, 65°04.268'W, depth unknown, 3 Jan 2005: 21 ♂ and 21 (four ovigerous) ♀ (MACN-In. 39648). Sta. 12, 40°53.078'S; 65°04.337'W, shallow waters, 3 Jan 2005: five ♂ (MACN-In. 39649).

Quequén, Brenda Doti, Ignacio Chiesa and Daniel Roccatagliata colls.: Sta. 20, 38°35.583'S; 58°42.060'W, 15.3 m, 15 Dec 2005: one ♂ and one ♀ (MACN-In. 39650). Sta. 1, 38°41.569'S, 58°42.374'W, 40 m, 15 Dec 2005: one ♂ and one ovigerous ♀ (MACN-In. 39651). Sta. 3, 38°41.380'S, 58°41.998'W, 39.5 m, 15 Dec 2005: one ovigerous ♀ (MACN-In. 39652).

These specimens fully agree with those from Playa Colombo except for: some setae of the palp of the maxilliped are barely setulate (with 1 or a few setulae).

#### Remarks on the specimens from off the Río de la Plata.

**Material examined.** RV Aldebarán (INAPE), Fabrizio Scarabino coll.: Sta. 2007-08 L8 RS, 35°09.3'S, 55°34.5'W, 11 m, Jun 2007: 67 ♂ and 59 (two ovigerous) ♀ (MNHNM 4201, MACN-In. 39653). Sta. 2005-03 L6, 35°11.9'S, 54°18.6'W, 29 m, 18 Sep 2005, four ♂ and eight ♀ (MNHNM 4202, MACN-In. 39654). FRV Eduardo Holmberg (INIDEP), Diego Giberto coll.: EH 09/99-L56: 34°59'S, 55°19'W, 16 m, 16 Nov 1999, six ♂ and three (two ovigerous) ♀ (MACN-In. 39655). EH 03/02-L11: 35°46'S, 56°31'W, 13 m, stomach contents of the Argentine Croaker, *Umbrina canosai* (Pargo), 2 Aug 2002, 14 ♂ and 15 ♀ (MACN-In. 39656). EH 03/02-L11, 35°46'S, 56°31'W, 13 m, 2 Aug 2002, one ♀ (MACN-In. 39657). EH 09/99 L77: 36.211'S, 56.378'W, 10 m, 19 Nov 1999, two ♂ and one ♀ (MACN-In. 39658).

Description as for the specimens from Playa Colombo, except for: male chela usually with a narrow U-shaped notch (a few males have a wide U-shaped notch). Antennal squama, mandible palp, maxilliped palp and cheliped frequently with sparsely-setulate setae, which have 1 or a few setulae, occasionally more. One or more pleonal epimera with small marginal teeth (rarely absent).

The chelae of most of the males examined by us are similar to those described by Băcescu & Absalao (1985, figs. 1L, 1M) and Guțu (2006, fig. 310) for *A. cavooreni*. In contrast, in a few specimens the male chela has a wide notch, i.e. it is similar to that of the Playa Colombo specimens. This fact suggests the presence of *A. cavooreni* in the Río de la Plata region. If this is true, the area of the Río de la Plata might be a zone of hybridization or contact between *A. cavooreni* and *A. patagoniensis*. However, the resolution of this taxonomical problem has to wait until new material from Brazil is available and *A. cavooreni* can be redescribed.

Regarding the chaetotaxy, Băcescu & Absalao (1985) reported that the mandible palp has setulate (they called them “feathered”) setae, and the antenna squama and cheliped simple setae (see their figs. 1D, 1F, 1K, 1L). The maxilliped was not described by these authors. Since the setulae are very thin and only visible under high magnification, Băcescu & Absalao (op. cit.) might have overlooked them. Unfortunately, the type material of *A. cavooreni* is in a bad preservation condition (Modest Guțu, pers. comm.) so we must wait for new material from Rio Grande do Sul to check if these specimens have setulate setae not only on the mandible palp but also on the antennal squama, maxilliped palp and cheliped.

#### Discussion

In the present contribution, several phenotypic differences have been recognized between the specimens from northern Patagonia and the Río de la Plata area. The specimens from northern Patagonia fully agree with the description presented by Sieg (1986). However, most of the specimens reported from off the Río de la Plata the male chela palm has narrow U-shaped notch, coinciding with the illustration presented by Băcescu & Absalao (1985) and Guțu (2006) for *A. cavooreni*. A second variation occurs in the chaetotaxy of the antenna squama,



mandible palp, maxilliped palp and cheliped. These appendages have simple setae in the specimens from Patagonia whereas in the specimens from off the Río de la Plata they may have plumose setae. A third variation was observed in the denticulation of the epimera of the pleonites. Teeth are usually present in the specimens from off the Río de la Plata but are rare among the specimens from northern Patagonia.

Guțu (1998) suggested that *A. patagoniensis* is a synonym of *A. cavooreni*, and Drumm & Heard (2011) formally proposed this synonymy. However, the resolution of the status of these two species is not fully resolved, and requires not only the detailed description of *A. cavooreni* but also the use of molecular techniques. In this regard, additional specimens from Rio Grande do Sul (type locality of *A. cavooreni*) and other localities from southern Brazil and Uruguay are needed.

All the records to date of *A. cavooreni*, *A. patagoniensis*, and *A. petronius* are shown in Fig.1. Regarding *A. cavooreni*, Drumm & Heard (2011) listed the catalogue numbers of three samples deposited in the Museu de Zoologia da Universidade de São Paulo without mentioning their collecting data. Two of these samples (MZUSP 19687 and MZUSP 19688) come from Enseada da Fortaleza, Ubatuba, São Paulo State, for the third sample listed (MZUSP 19689) data is not available (Dr. Marcos Tavares, pers. comm.). The discovery of *A. cavooreni* in Caraguatatuba, São Paulo State reported by Miranda (2010) was added to the map as well. These specimens are deposited at the MZUSP under numbers 23856 to 23863. None of the specimens recorded from São Paulo State were examined by us.

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