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Two new species of the genus *Austrocotesia* Austin & Dangerfield (Hymenoptera: Braconidae) from the Andean region of South America

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Abstract

The microgastrine braconid wasp genus *Austrocotesia* was erected by Austin & Dangerfield as a new, apparently endemic Australasian genus. In the past 8 years a series of specimens clearly belonging to the genus have been collected throughout South America and Mesoamerica. In the present paper, *Austrocotesia croizati* n. sp. and *A. renei* n.sp. are described and illustrated from the Andean region of South America. In addition, a key to the known species is presented, and the relationships and taxonomic status of the genus are briefly discussed.

Key words: Hymenoptera, Braconidae, Microgastrinae, *Austrocotesia*, taxonomy, new species, Neotropics

Introduction

The genus *Austrocotesia* was erected by Austin and Dangerfield (1992), based on the recognition of three species restricted to New Guinea (*A. delicate*) and the adjacent Australian region of North Queensland (*A. exigua* and *A. paradoxa*). At that time the genus was unknown from elsewhere in the world. The presence of the genus in South America became evident during the study of material for the creation of the Microgastrinae key to genera for the Manual of the New World Genera of the family Braconidae (Whitfield 1997). The genus was then recorded in the Manual, but none of the New World species were then described.

Austrocotesia is of special interest phylogenetically because it, along with *Miropotes* Nixon, appears to be among the earliest-diverging lineages of Microgastrinae, at least in

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analyses based on morphological data (Whitfield *et al.* 2002). As remarked upon by Mason (1981), a high proportion of the apparently early-diverging lineages were originally described as endemic Australasian or Neotropical; recent work has shown that at least some of these genera show a broader Gondwanan distribution (e. g., *Parapanteles* Ashmead-Valerio *et al.* 2005). It is not yet known whether this pattern of early Gondwanan lineages provides a good indication of clade ages. Many genera (including apparently recently-derived ones) are cosmopolitan yet appear not to be old enough, using molecular clock estimates, to have predated the breakup of Gondwanaland (Whitfield, 2002).

To date there has been no comprehensive revisionary treatment of the faunistic composition of the genus *Austrocotesia* within its Neotropical distribution. In this paper, we provide a foundation for the revision of the genus in the New World by describing the first two Neotropical species from the Andean region [*sensu* Morrone (2002)].

Material and methods

Initial identification of specimens was made using the key to the Neotropical microgastrine genera (Whitfield 1997), and key and species descriptions to the *Austrocotesia* species (Austin and Dangerfield 1992).

The principal morphological terminology used in the species descriptions is that of Huber and Sharkey (1993) and Schuh (1989); except for that of the morphology of the propodeum, which is used *sensu* Townes (1969, Fig. E) and Austin and Dangerfield (1992, Fig. 1). The cuticular sculpturing terminology follows that of Harris (1979), while the terminology for the wing venation is a variation of the Comstock-Needham system used by Sharkey and Wharton (1997, Fig. 15).

Photographs for the type specimens were taken using a Philips XL30 ESEM-FEG electron microscope at the Beckman Microscopy Suite (University of Illinois at Urbana-Champaign). Wing illustrations were traced in Adobe Illustrator ver. 10 after digital photographs were taken using a JVC GC-QX5HD digital still camera mounted on a Leica MZ12.5 stereomicroscope.

Descriptive Taxonomy

Austrocoatesia Austin and Dangerfield

Austrocotesia Austin and Dangerfield, 1992. *Invertebrate Taxonomy* 6, 1–76.
Type species *Austrocotesia exigua* Austin and Dangerfield.

The following generic diagnosis is a modified description after Austin and Dangerfield (1992) and employs additional character state designations from Whitfield *et al.* (2002):

Head. Antenna with basal flagellomeres exhibiting two ranks of placodes; glossa truncate; maxillary palpus with five segments; head wider than mesosoma; temples round in dorsal view; ocelli small and arranged in a small obtuse triangle on an upwardly elongated vertex; postocciput nitid.

Mesosoma. Pronotal lateral area with one ventral groove present; propleuron posterior outer corner simple and without posterior fringe; epicnemial carina present; scutellum with medioposterior band smooth and lunulae of nearly uniform width throughout; metanotum sublateral hairs absent and anterior margin adpressed to scutellum; propodeal dorsoanterior area evenly and gently curved relative to posterior area, mediolongitudinal carina present but only anteriorly, areola complete and typically broadly pentagonal in shape or somewhat poorly developed but similarly shaped, transversal carinae present and very short in length, costulae not completely present (anteriorly absent); hind coxae normal in size; legs tarsal claws simple or pectinated, and fore telotarsus normal in shape.

Metasoma. First metasomal tergum with basal excavation present and without medial longitudinal groove, apical half arched and without medial excavation, first tergum narrowing towards apex, at least 1.5x as long as wide and not covering full width of dorsal surface, or parallel-sided; junction of first and second terga movably articulated; second metasomal tergum narrowly triangular in shape; delimitation between second and third tergum by a distinct suture; hypopygium folded medially and without longitudinal pleats; female genitalia with eighth tergum 2–4 times taller than long, second valvifer tall and lorate, ovipositor sheaths elongated with setosity throughout their length and well exposed beyond the apex of hypopygium, ovipositor tapered throughout its length and gently curved in lateral view; male genitalia with apex of digitus acute and directly dorsally, ventral edge of digitus strongly convex.

Wings. Vein 3RS straight or weakly curved; fore wing with vein 1M+1Rs weakly angled (20–60°), areolate closed, veins 2A absent, vein r present; hind wing cells 1R and 2R of approximately same width, vein 2r-m present, vein 2A absent, veins 2Cu and cu-a straight, vannal lobe separated from remainder wing by a sharp notch, distally flattened beyond widest point and with vannal setosity long, evenly and dense.

Key to the known females of the species of the genus *Austrocotesia* Austin and Dangerfield (modified after Austin and Dangerfield, 1992)

1) Australasian; no white band present at midlength of antenna 2
- New World; mid white band present near midlength of antenna (Figs. 1A, 2A) and antenna reaching well past mid metasoma 4
2) Antenna reaching to about middle of metasoma; first metasomal tergum virtually parallel-sided *A. paradoxa* Austin & Dangerfield
- Antenna reaching well past or beyond posterior gaster of metasoma; first metasomal tergum clearly narrowing posteriorly 3

3- First metasomal tergum broadest at midlength, narrowing slightly in posterior 1/3; second metasomal tergum slightly wider than long and longitudinally striate .... *A. exigua* Austin & Dangerfield

- First metasomal tergum broadest anteriorly, strongly tapering over posterior half; second metasomal tergum with narrow smooth sub-triangular median field .... *A. delicata* Austin & Dangerfield

4- Sternaulus with transverse lineate sculpturing throughout its length (Fig. 1D); first metasomal tergum more than 4x as long as posteriorly broad, with basal 2/3 brownish yellow, distal area paler yellow (Fig.1A&B); mesosoma mostly yellowish brown dorsally ..... *A. croizati* Valerio & Whitfield n.sp.

- Sternaulus margined by just one anterior but otherwise nearly smooth (Fig. 2Ex); first metasomal tergum less than 4x as long as posteriorly broad (Fig. 2D X); mesosoma and first metasomal tergum almost entirely golden yellow .... *A. renei* Valerio & Whitfield n.sp.

Austrocotesia croizati **Valerio & Whitfield n. sp.**
(Figs. 1A–1F)

Female. Body length = 3.55 mm.

Body color: mainly yellow; antenna with mid flagellomeres white as well as anterior lateral half of metasoma, remainder of metasoma light yellow except dorsal area; remainder antenna brownish yellow as are most of lateroexternal areas of scape and pedicel, ocular area, anterior 1/3 and lateroposterior areas of mesonotum, lunulae, metanotum, axilla through metanotum, propodeum carinae as well as first tergum lateral carinae, anterior 2/3 of first metasomal tergum, metasoma second tergum as well as anterior 1/3 of third tergum and fourth to seventh terga, ovipositor sheaths, legs with tibia and tarsomeres (except distal 1/2 of hind tibia and basal 1/4 of hind basitarsus; compound eyes silver; ocellus light yellow); remainder of body yellow. Wings hyaline, fore wing veins brownish yellow as well as hind wing veins (except veins M+CU, 1A and cu-a light yellow.

Head. Head height/width = 1.25; compound eye height/width = 1.38; tentorial pit distance/distance tentorial pit to compound eye = 2.5; clypeus width/height = 2.2; vertex width/distance between anterior ocellus and edge of torulus = 2.46; first flagellomere length/width = 3.71; length first flagellomere/length of second flagellomere = 1.04; length of first flagellomere/length of third flagellomere = 1.04; distal flagellomere length/penultimate flagellomere length = 1.42; distal flagellomere length/width = 2.13; malar space height/basal width of mandible = 1.14; ocell-ocular distance/lateral ocelli distance = 2.16. Head densely and finely punctate and setose, except for glabrous frons, scrobal areas, ocell-ocular region and postocciput.

Wings. Fore wing length = 3.7 mm; 1CUa length/2Cub length = 0.55; 1M length/ m-cu length = 1.79; pterostigma length/height = 1.5. Hind wing: 1M length/2M length = 2.5; 1M length/M+CU length = 1.53; length r-m/length Cua = 0.65; 1RSa length/2r-m = 2.

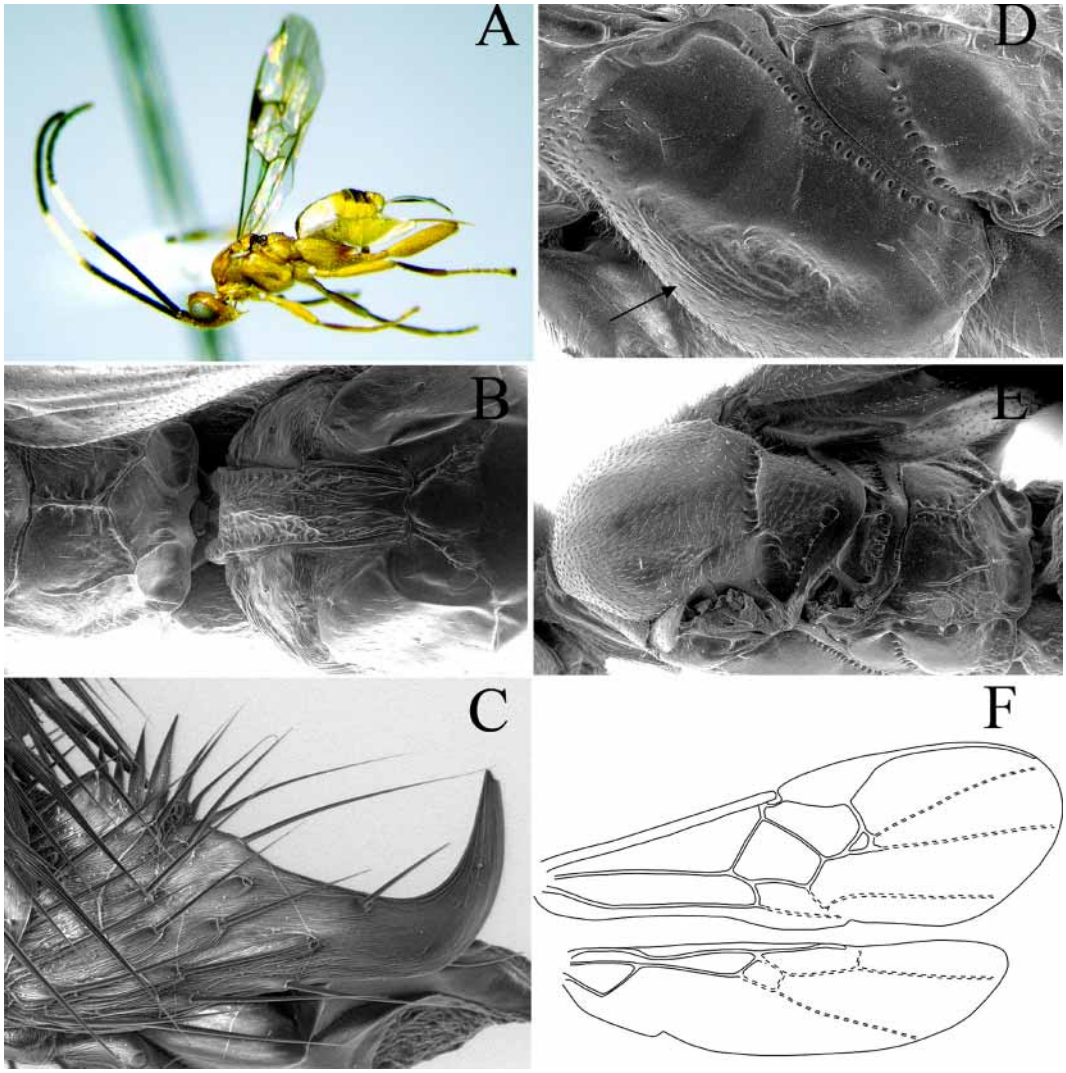

FIGURE 1. ***Austrocotesia croizati*** n. sp. habitus (A), first metasomal tergum (B), hind leg tarsal claws (C), mesopleuron (arrow points at transversal lineate sculpturing on sternauli (D), mesonotum dorsal view (E) and wing venation (F).

Mesosoma. Propleuron covered by fine and dense punctate sculpturing; propleural lateral areas with anterior 1/4 exhibiting three narrow costulae, the anterior one much wider than the other two, remainder of pronotum nitid; mesonotum with dense and fine punctate sculpturing throughout, sculpturing becoming more widely spaced and slightly larger next to scutellar groove; scutellar groove with eight well defined costulae; axilla through mesosoma with three shallow costulae at mid area, remainder of axilla nitid except at anterior edge of lunulae with a series of projecting short ridges, remainder of lunulae nitid; scutellum with fine, shallow and dense punctate sculpturing throughout, lateral areas with con-

fused and relatively lightly impressed rugulose sculpturing with large costula posteriorly; metanotum mediodistally with a strong polished costula; axilla through metanotum essentially nitid except for distal edge with a series of short and well defined ridges; propodeum with transverse carinae short and well defined, areola present, more or less pentagonal and complete, costulae almost reaching anterior edge of pronotum, medial longitudinal carina present anteriorly with few lateral projections, remainder of propodeal area nitid; mesopleuron with sternaulus with dense transverse ridges throughout its length, anterior edge punctate, dorsal edge with well defined scrobiculate sculpturing present, remainder of mesopleuron nitid; metanotum with medial pit present and pleural suture present and exhibiting transversal ridges across its length, dorsal edge with few transversal ridges.

Legs. Hind femur length/width = 3.75; hind tibia length/hind femur length = 1.13. Fore telotarsus normal, not modified (i.e. without hairlike projection opposite indentation); tarsal claws pectinate; dorsal area of hind coxae with transverse ridges on distal 1/3.

Metasoma. First tergum length/distal width = 4.7; second tergum length/distal width = 0.54; third tergum length/distal width = 0.56; ovipositor $\geq$ 1.33x length of hind tibia; ovipositor sheaths $\geq$ 1.19x as long as hind tibia length. First metasomal tergum with smooth rugulose sculpturing throughout except on distal 1/4, distal 1/4 with sinuate longitudinal carinae; second metasomal tergite nitid and strongly triangular in shape; remainder of metasomal terga nitid.

Male. Similar to female, but areola less well defined on posterior 1/2 of propodeum and body more darker in coloration than females.

Material examined. Female holotype, "Colombia, Nariño, R.N. La Planada Vía Hondón, 1°15'N 78°15'W, 1930m, Malaise 11/2/00-11/16/00, G. Oliva, Leg. M.1411." Paratypes: two males, Ecuador, Pichincha, Santo Domingo, 16 Km S.E. Tinalandia, 680 m, 15/vi/1976, Col. Peck; Colombia, Nariño, Ricaurte, PN la Planada, 1°15'N 77°24'W, 1800 m, IAVHHB145. Holotype deposited at Instituto Alexander von Humboldt (IAVH, Colombia) and paratypes deposited at the Canadian National Collection (CNC, Canada).

Comments. This species is characterized by the brownish yellow coloration on the mesosoma and the first metasomal tergum, and can be distinguished from *A. renei* by the totally yellow coloration of the mesosoma and the first metasomal tergum, as well as the extensive transverse lineate sculpturing in the sternaulal groove, and the extensive sinuate lineate sculpturing on the distal 1/4 of the first metasomal tergum. This species also tends to be larger in body size than *A. renei*, based on our limited sample.

Etymology. Gender, masculine. This species is named in honor of Leon Croizat (1894–1982), the father of Panbiogeography.

***Austrocotesia renei* Valerio & Whitfield n. sp.**
(Figs. 2A–2F)

Female. Body length = 2.8 mm.

Body color: mainly yellow; mid antenna flagellomeres whitish as is most of metasoma (except dorsal area) as well as placodes in flagellomeres, remainder antenna (except remainder scape and pedicel from lateroexternal area, this area is very narrow in lateral view) brownish yellow as ocellar area, toruli carinae, anterior lateral area of lunulae, metanotum and axilla through metanotum, propodeal carinae and anterior margin as well as lateral carinae of first metasomal tergum and lateral edge of propleuron, metasomal terga (except first tergum), ovipositor sheaths, hind leg tarsomeres (except basal 1/4 of basitarsomere) and tarsal spurs; compound eyes silver; ocelli yellowish; remainder of body yellow; wings generally hyaline with a very faint brownish tinge, fore wing veins brownish yellow except base of vein M+CU yellow; hind wing vein R1 brownish yellow but remainder of veins more strongly yellowish in coloration.

Head. Head height/width = 1.21; compound eye height/width = 1.36; tentorial pit distance/distance tentorial pit to compound eye = 3; clypeus width/height = 1.75; vertex width/distance between anterior ocellus and edge of torulus = 2.82; first flagellomere length/width = 3.16; length first flagellomere/length of second flagellomere = 1; length of first flagellomere/length of third flagellomere = 1; distal flagellomere length/penultimate flagellomere length = 1.4; distal flagellomere length/width = 2.33; malar space height/basal width of mandible = 0.86; ocell-ocular distance/lateral ocelli distance = 2.4.
Clypeus and face with very fine punctate sculpturing and setosity that is also present in remainder of head; temple and ocell-ocular space glabrous as well as postocciput; ocelli rather small.

Wings. Fore wing length = 2.75 mm; 1CUa length/2Cub length = 0.6; 1M length/ m-cu length = 1.63; pterostigma length/height = 1.86. Hind wing: 1M length/2M length = 2.5; 1M length/M+CU length = 1.66; length r-m/length Cua = 0.92; 1RSa length/2r-m = 1.22.

Mesosoma. Propleuron with fine and inconspicuous punctation throughout its length; pronotal lateral area anteriorly with two small costulae, remainder nitid; pronotum otherwise with dense, fine punctate sculpturing which is less conspicuous next to scutellar groove; axilla through mesonotum with two or three carinae in upper 1/3, remainder nitid; scutellar groove with 7 well defined costulae, medial one 2x as large as lateral ones; scutellum with fine punctate sculpturing throughout, lateral areas nitid; lunulae nitid except at anterior edge with a few projecting ridges that are short and narrow; mid distal area of metanotum with one large smooth costula; axilla through metanotum nitid except posteriorly with a series of short and narrow projecting ridges; propodeum with very well defined areola as well as anterior section of medial longitudinal carina, costulae absent on anterior 1/3, transverse carinae very short but well defined, remainder of propodeum devoid of sculpturing; mesopleuron with sternaulus nitid except anterior edge with a well defined carina, dorsal edge with small and well defined scrobiculate sculpturing, remainder of mesopleuron nitid; metapleuron with medial pit present and with transverse ridges across its width, dorsal edge with a few transverse ridges, remainder of metapleuron nitid.

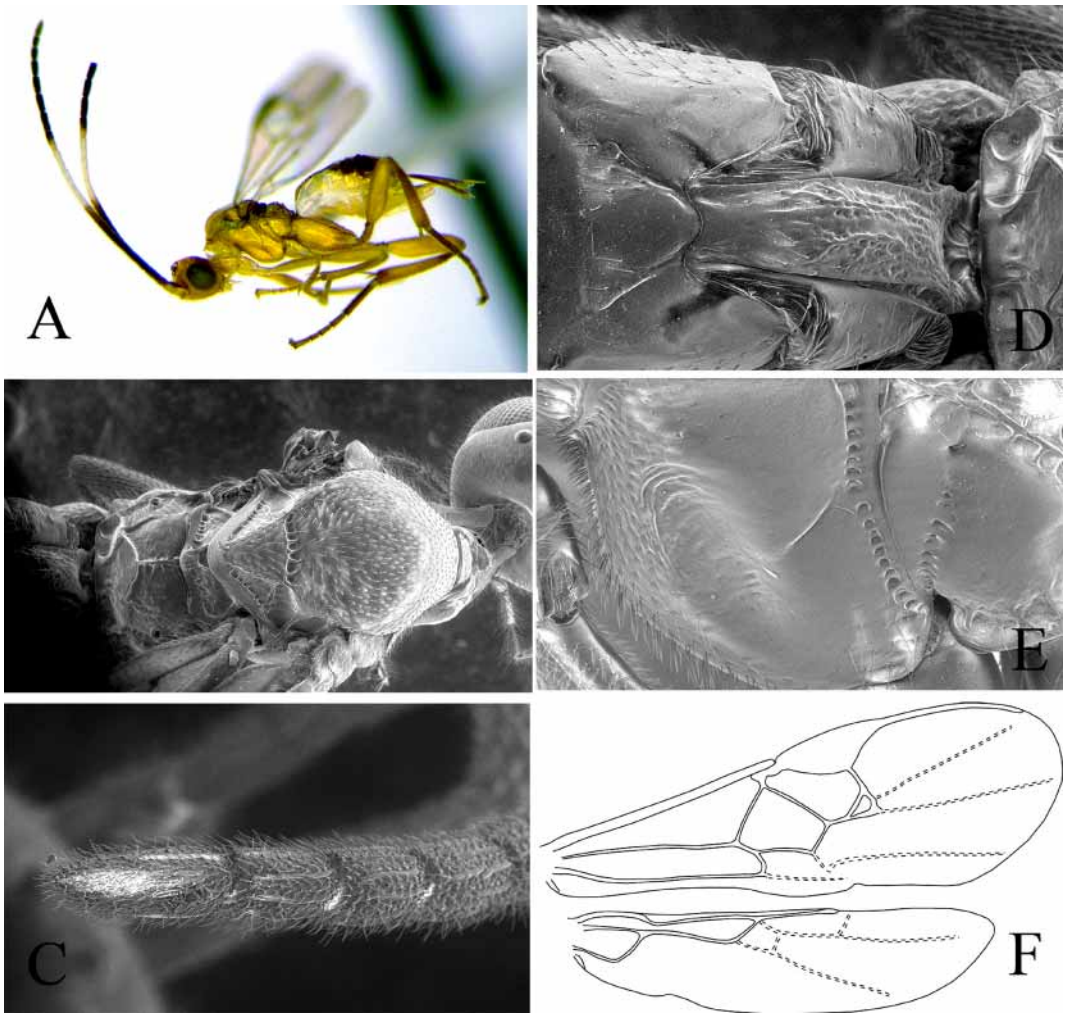

FIGURE 2. ***Austrocotesia renei*** n.sp. habitus (A), mesosoma dorsal view (B), distal flagellomeres (C), anterior metasomal tergites (D), mesopleuron (E), wings (F).

Legs. Hind femur length/width = 3.55; hind tibia length/hind femur length = 1.28. Tarsal claws pectinate; fore telotarsus simple and not modified; hind coxae with dorsal face of distal 1/3 with a few transverse carinae.

Metasoma. First tergum length/distal width = 3.77; second tergum length/distal width = 0.61; third tergum length/distal width = 0.56; ovipositor $\geq$ 1.26x length of hind tibia; ovipositor sheaths $\geq$ 0.75x as long as hind tibia. First metasomal tergite with confused ridged sculpturing, mid length of tergite dorsally raised with two longitudinal ridges that do not meet medially, distal 1/4 of tergite almost nitid; second tergite strongly triangular in shape and nitid; remainder of terga nitid; hypopygium slightly divided distally.

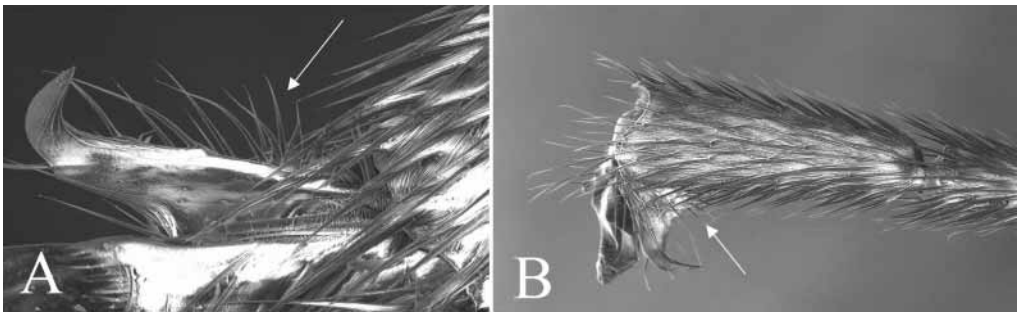

FIGURE 3. ***Austrocotesia renei*** n.sp. hind (A) and fore leg (B) tarsal claws (arrows point to pectination of the tarsal claws).

Material examined. Holotype "Ecuador, Pichincha, Santo Domingo, 16 Km SE Tinalandia, 680 m, 15/vi/1976." Holotype deposited in CNC.

Comments. This species is in many characters similar to *A. croizati*, but consistently differs in the characters mentioned in the key, and females of the two species appear quite distinct. The holotype of *A. renei* comes from the same locality as we have reported two males of *A. croizati* from, suggesting that males of the two species might be confused, but the sculpturing characters suggest otherwise. It remains a possibility that the Ecuadorian (but not Colombian) males described under *A. croizati* actually belong to *A. renei*, however. We have searched through large amounts of malaise trap material from the survey of Hymenoptera being conducted by M. J. Sharkey and B. V. Brown (among others) in Colombia for further males to associate, but have been unable to locate more specimens at this time.

Etymology. Gender, masculine. This species is named in memory of Rene Fonseca (OTS 13-01), "Un excelente individuo y un muy buen amigo. Todos te extrañamos."

Discussion

The apparent phylogenetically basal position of the genus *Austrocotesia* within the Microgastrinae was pointed out by Austin and Dangerfield (1992) based on the morphology of the female genitalia as well as the wing venation (which resembles the wing venation of the genus *Miropotes*) and the folded but not longitudinally pleated hypopygium. Subsequently Whitfield *et al.* (2002) confirmed its basal position based in a combined analysis of 3 genes (16S rRNA, 28S rRNA, and COI) with 53 morphological characters. In terms of their biology, nothing is known apart from their distribution (middle to high elevations) and the very infrequent occasions on which they have been collected in Mesoamerica and South America (Whitfield 1997, p. 336). Interestingly enough, in Australia and New Guinea all the specimens were collected between 350 and 1250 meters elevation, suggest-

ing that, if the New World representatives are ecologically equivalent, potentially the genus could be collected in mid elevation habitats in the New World.

Another interesting finding is the pectinate tarsal claws exhibited by the Neotropical species (Fig. 3). In the original genus description provided by Austin and Dangerfield (1992), the Australasian species were described as possessing simple tarsal claws with an elongate basal tooth. Their characterization may need to be evaluated for the Australian species, since the fine pectination of the tarsal claws (at least as seen in the New World species) would be difficult to see at low magnification.

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