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## Discovery of two new Andean species of *Scolomus* (Townes & Townes), with a key to all known species (Hymenoptera: Ichneumonidae: Metopiinae)

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### Abstract

*Scolomus* Townes & Townes is a widely distributed genus of the family Ichneumonidae, with most species occurring in the New World. Herein two new species from Chile are described and illustrated. *Scolomus maculatus* sp. nov., which is characterized by a large rhomboid areolet and very wide RS vein in the fore wing, resembling a petiole; head and pronotum green, mesoscutum yellow with dark brown spots on its lateral lobes and around the scutellum. *Scolomus clypeatus* sp. nov., which is characterized by its wide clypeus, 3.00× as wide as long, with a rectangular aspect; head, mesoscutum, post-scutellum and pronotum entirely yellow. The first key to all known species of the genus is also presented.

**Key words:** Ichneumonoidea, parasitoid wasps, South America, Andean Region, Valdivian Forest, Chile, *Apolophus*

### Introduction

Metopiinae (Hymenoptera: Ichneumonidae) is a group of koinobiont endoparasitoids currently with 26 genera and over 750 species (Yu *et al.*, 2012). Metopiines are easily distinguished from other ichneumonids for their distinct appearance: strongly convex face, broad pronotum, comparatively thick antenna, and foreshortened tarsomeres (Broad & Shaw, 2005).

*Scolomus* Townes and Townes is a small, widely distributed metopiine genus, currently including four species and with a convoluted taxonomic history. It was originally described as part of Tryphoninae (Townes & Townes, 1950), based on two species from southern South America, but later transferred to Ctenopelmatinae (Townes & Townes, 1966). Later on, Gauld & Wahl (2006) noticed the similarity between *S. magellanicus* Walkley and species of the metopiine genus *Apolophus* Townes, and synonymized the latter genus with *Scolomus* based on presumably apomorphic features: head elongate with very long malar space; face flat and with weak supra-clypeal suture; ovipositor slender and slightly upcurved; large and convex hypopygium; and first metasomal segment with a dorsal concavity and deeply impressed glymma, almost meeting on midline.

Interestingly, the affinities of *Apolophus* are also not clear; the genus had been placed in Metopiinae more or less tentatively by Townes (1971), since it lacked the dorsal protrusion of the face that is typical for metopiines. Porter (1988) suggested that *Apolophus* may be part of the Mesochorinae, but did not formally transfer the genus. Broad and Shaw (2005) recorded the first host record for *A. borealis* Townes, which is a primary larval–pupal parasitoid of Lepidoptera like other metopiines. Based on this, Gauld & Wahl (2006) placed *Scolomus* (including *Apolophus*) in Metopiinae rather than Ctenopelmatinae, but noted the need for a phylogenetic analysis to sort the relationships among the “ophioniform” subfamilies and their constituent genera (*sensu* Wahl 1991, 1993).

Herein we describe two new species of *Scolomus* from Chile and provide the first identification key for all known species of the genus.

## Material and methods

General morphological terminology follows Gauld *et al.* (2002), with the exception of wing venation which is based on Sharkey and Wharton (1997). The information contained in "Type Material" sections corresponds to the specimen label *verbatim*. The specimens studied here belong to the following institutions (curators in parentheses): AMNH: American Museum of Natural History, New York, U.S.A. (Robert Kula). FSCA: Florida State Collection of Arthropods, Gainesville, U.S.A. (Kevin Williams); UACH: Universidad Austral de Chile, Valdivia, Chile (Dolly Lanfranco). A female *S. maculatus* paratype will be deposited at FSCA: Florida State Collection of Arthropods (Kevin Williams), a pair of *S. maculatus* paratypes will be deposited at MNRJ: Museu Nacional / Universidade Federal do Rio de Janeiro (Felipe Vivallo) and the other specimens at MHNS: Museo de Historia Natural de Santiago (Mario Elgueta).

Photographs were prepared using a Leica DFC 450 camera attached to a Leica M205C stereomicroscope. Measurements and stack merging were done using the extended-focus software "Leica Application Suite V3" and later edited with Adobe Photoshop® (v. 7.0). All measurements were rounded to the nearest 0.05.

## Results

### *Scolomus* Townes & Townes, 1950

*Scolomus* Townes & Townes, 1950: 420. Type species: *Scolomus viridis* Townes and Townes, by original designation.

*Apolophus* Townes, 1971: 111. Type species: *Apolophus borealis* Townes, by original designation.

**Diagnosis.** Head elongate, malar space exceptionally long, 1.20–1.80× basal mandibular width; clypeus large, subquadrate, supra-clypeal suture weakly impressed to absent, thus in most species with face and clypeus forming approximately uniform smooth plane; occipital carina ventrally incomplete; mandible slender, lower tooth 0.50–1.00× as long as upper tooth. Fore wing with areolet rhomboid to pentagonal; pterostigma broad and triangular, maximum length 2.30–3.00× its maximum width; hind wing with basal abscissa of vein *M+Cu1* strongly arched; distal abscissa of vein *Cu1* joining vein *cu-a* far closer to vein *1A* than vein *M*. First metasomal tergite with anterior median depression bordered laterally by raised sides, glymma deep, almost meeting at midline and often separated only by translucent partition; female hypopygium large, arched, but not folded medioventrally; ovipositor slender, slightly upcurved and lacking dorsal subapical notch.

**Distribution.** Widely distributed in the Holarctic and Neotropical regions, including the Andean biogeographic zone (*sensu* Morrone, 2015) but Townes stated he had examined undescribed species of *Apolophus* from Argentina, Chile, Colombia and Ecuador.

**Included species.** *S. borealis* Townes (Nearctic, West Palearctic); *S. magellanicus* Walkley (Andean); *S. talamanca* Gauld & Sithole (Neotropical); *S. viridis* Townes (Andean).

### Key to the species of *Scolomus*

- 1 Mandible stout with small acuminate teeth of the same length. Labrum apex always visible, even with mandibles closed. Wings with a pentagonal areolet, veins 2RS and rs-m touching 3RSa separately. Subtegular ridge produced as a sharp, curved spine. Deep groove between the propodeum and metanotum. . . . . 2
- Mandible slender with upper tooth distinctly longer than the lower tooth. Labrum more or less concealed when mandibles closed (Figs 1, 3, 5). Areolet slightly petiolate, rhombic, with 2RS vein joining rs-m shortly before touching 3RSa (Figs 2, 4, 6). Subtegular ridge not produced as a sharp spine. Shallow groove between the propodeum and metanotum . . . . . 3
- 2(1) Propodeum without areola, posterior transverse carina incomplete. Lateral longitudinal carina sharper and more distinct near propodeal spiracle . . . . . *S. magellanicus* Walkley 1962
- Propodeum with areola delimited by the lateromedian longitudinal, anterior and posterior transverse carinae. Lateral longitudinal carina faint, indistinct near propodeal spiracle. . . . . *S. viridis* Townes & Townes 1950
- 3(1) Propodeum with no trace of lateromedian longitudinal carina. Head and mesoscutum with reddish brown marks, fore leg orange brown. Central America . . . . . *S. talamanca* (Gauld & Sithole 2002)
- Propodeum with lateromedian longitudinal carina discernible. Head and mesoscutum without reddish brown marks, fore leg brown or green . . . . . 4
- 4(3) Body mostly blackish, without extensive green areas. Female supra-clypeal area with simple, uniformly distributed setae. Propodeum with lateral longitudinal carina incomplete. Holarctic. . . . . *S. borealis* (Townes 1971)

- Body with extensive green areas. Female supra-clypeal area with clusters of seemingly bifurcate setae. Propodeum with lateral longitudinal carina complete. Chile ..... 5
- 5(4) Clypeus width  $3.00\times$  its height (Fig. 1). Distance between eye and lateral ocellus  $1.50\times$  diameter of lateral ocellus. Areolet  $0.80\times$  as wide as long. Hypopygium  $1.55\times$  as long as wide, in lateral view. Ovipositor  $12.50\times$  as long as basal width. Head, mesoscutum, postscutellum and pronotum entirely brownish yellow ..... *S. clypeatus* sp. nov.
- Clypeus width  $1.55\times$ – $2.30\times$  its height (Fig. 3, 5). Distance between eye and lateral ocellus  $0.90\times$ – $1.00\times$  diameter of lateral ocellus. Areolet  $1.00\times$  as wide as long. Hypopygium  $1.90\times$  as long as wide, in lateral view. Ovipositor  $5.30\times$  as long as basal width. Head and pronotum greenish, mesoscutum yellow with dark brown spots on lateral lobes and around scutellum ..... *S. maculatus* sp. nov.

***Scolomus clypeatus* Araujo & Santos sp. nov.**

(Figs 1, 2)

**Diagnosis:** Body covered with silvery pubescence; female supra-clypeal area with clusters of setae, seemingly bifurcate due to their aggregate nature. Clypeus approximately rectangular, wider than in other species, width  $3.00\times$  its height, and with distinct elongate bristles (longer than the other bristles of the body). Head yellow with antenna and region between ocelli dark brown. Mesosoma dark brown, except pronotum, mesoscutum, tegula, axilla, scutellum, postscutellum and metanotum, yellowish. Female with hypopygium large and triangular in lateral view. Fore wing with large rhomboid areolet.

**Description. Holotype female** (Figs 1, 2). Approximate body length: 6.37 mm. Fore wing length: 5.44 mm; antenna length: 5.80 mm; number of flagellomeres: 30; head  $1.20\times$  as wide as high (front view); distance between eye and lateral ocellus  $1.50\times$  as long as diameter of lateral ocellus; frons smooth, female supra-clypeal area with clusters of setae, seemingly bifurcate due to their aggregate nature; clypeus  $3.00\times$  as wide as high; mandible  $6.35\times$  as long as basal width (front view); malar space  $1.60\times$  as long as mandible basal width; number of palpomeres: 5:4; pronotum polished; mesopleuron punctate on upper, anterior, and lower margins; areolet rhombic,  $0.80\times$  as wide as long; hind wing with five hamuli; vein CU/1b absent; hind femur  $5.10\times$  as long as wide; hind tibia  $7.30\times$  as long as wide; hind basitarsus  $5.90\times$  as long as wide; mesosoma generally smooth, polished and finely punctate; propodeum smooth, with isolated punctures, costula and anterior transverse carina present; median longitudinal carina of propodeum present and incomplete; lateral longitudinal and posterior transverse carinae complete; anterior transverse and median longitudinal carinae incomplete; area basalis, petiolaris and posteroexterna discernible; T1 smooth, with isolated punctures; dorsolateral carina of T1 absent; post-petiole  $2.20\times$  as long as maximum width; glymma deep, seemingly with thin membrane between both sides; T2  $3.30\times$  as long as its height (lateral view); tergites III–VII similarly sculptured; hypopygium large and triangular in lateral view,  $1.55\times$  as long as wide; ovipositor short and needle-shaped,  $12.50\times$  as long as basal width.



**FIGURES 1–2.** *Scolomus clypeatus* new species. 1: holotype female, head (frontal view); 2: holotype female, habitus. Scale bars (mm): Figs 1 = 0.4; Figs 2 = 2.0.

Head yellow with antenna and interocellar area dark brown. Mesosoma dark brown, except pronotum, mesoscutum, tegula, axilla, scutellum, postscutellum and metanotum, yellowish. Wing hyaline; pterostigma brown. Metasoma with T1-T4 green, T5 onwards dark brown. All coxae, trochanters, femora and tibiae yellowish green, tarsi brown. Body covered by silvery pubescence.

**Type material:** Holotype female: Chile, Cautín, Conquillo National Park. 16-18-I-2015. B. Santos col. (AMNH).

**Type locality:** CHILE: *Región de la Araucanía*: Cautín (Conquillo National Park).

**Distribution:** CHILE: *Región de la Araucanía*: Cautín (Conquillo National Park).

**Etymology:** The specific epithet of this species make reference to its clypeus, wider than the other species of the genus.

**Comments:** *Scolomus clypeatus* **sp. nov.** is most similar to *S. maculatus* **sp. nov.** because of the clusters of seemingly bifurcate setae in the supra-clypeal area of females; both also have the body predominantly green, present as well in the other Chilean species, *S. magellanicus*. The two species can be differentiated by (1) the width of the clypeus: *S. clypeatus* **sp. nov.** has a larger clypeus, with rectangular aspect (Fig. 1),  $3.00\times$  as wide as long, (vs.  $2.30\times$  in *S. maculatus*); (2) distance between eye and lateral ocellus  $>1.50\times$  the diameter of lateral ocellus in *S. clypeatus* **sp. nov.** (vs. up to  $1.00\times$  in *S. maculatus*.); (3) *S. clypeatus* **sp. nov.** has a smaller areolet,  $0.80\times$  as wide as long (vs.  $1.00\times$  in *S. maculatus* **sp. nov.**); (4) in lateral view, hypopygium  $1.55\times$  as long as wide in *S. clypeatus* **sp. nov.** (vs.  $1.90\times$  in *S. maculatus* **sp. nov.**); (5) ovipositor  $>10.00\times$  as long as basal width in *S. clypeatus* **sp. nov.** (vs.  $5.30\times$  in *S. maculatus* **sp. nov.**); (6) color: *S. clypeatus* **sp. nov.** has the head, mesoscutum, postscutellum and pronotum entirely yellow (vs. head and pronotum green, mesoscutum yellow with dark brown spots on its lateral lobes and around the scutellum in *S. maculatus*). Both new species have a lightly petiolate areolet, rhombic, with vein 2RS joining rs-m shortly before touching 3RSa, while *S. magellanicus* has a pentagonal areolet, with vein 2RS and rs-m touch 3RSa independently. The male of this species is unknown.

### ***Scolomus maculatus* Araujo & Vivallo **sp. nov.****

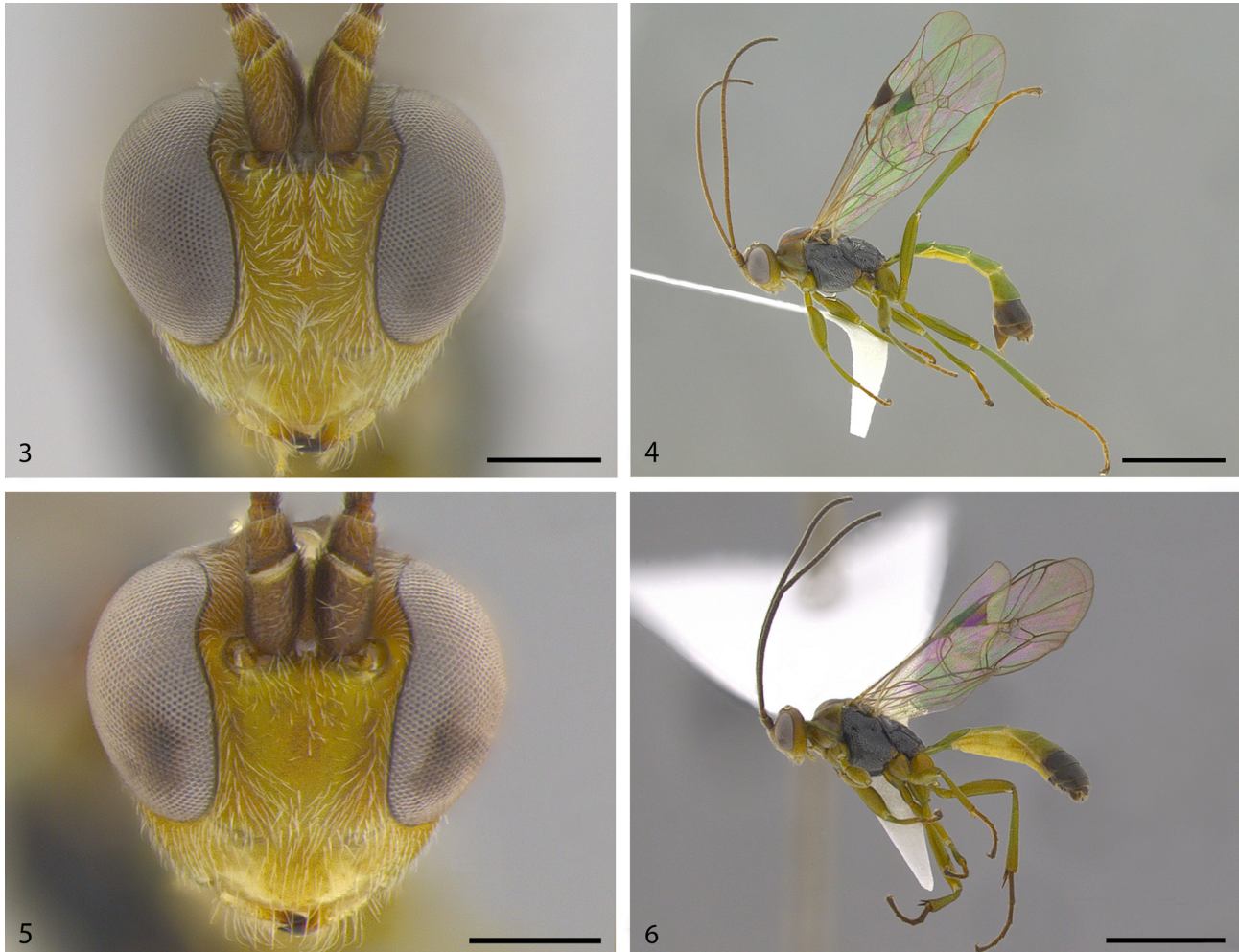
(Figs 3–6)

**Diagnosis:** Body covered with silvery pubescence; female supra-clypeal area with clusters of setae, seemingly bifurcate due to their aggregate nature (Fig. 3). Mandible slender, sickle-shaped (Figs 3, 5). Antenna and interocellar area dark brown. Head and pronotum green. Postscutellum and mesoscutum yellow, the latter presenting dark brown spots on its lateral lobes and around the scutellum. Mesosoma segments two and three dark brown. Female with hypopygium large and triangular in lateral view. Fore wing with large rhomboid areolet and very wide RS vein, resembling a petiole.

**Description. Holotype female** (Figs 3, 4). Approximate body length: 6.50 mm. Fore wing length: 5.20 mm; antenna length: 5.00 mm; number of flagellomeres: 30; head  $1.05\times$  as wide as high (front view); distance between eye and lateral ocellus:  $1.00\times$  the diameter of lateral ocellus; frons smooth, female supra-clypeal area with clusters of setae, seemingly bifurcate due to their aggregate nature; clypeus width  $1.55\times$  its height; mandible  $4.60\times$  as long as basal width (front view), slender, with two small teeth (Fig. 3); number of palpomeres 5:4; malar space  $1.75\times$  as long as mandible basal width; pronotum polished; mesopleuron punctate on upper, anterior, and lower margins; areolet rhombic,  $1.00\times$  as wide as long; hind wing with five hamuli; vein CU/1b absent; hind femur:  $5.30\times$  as long as wide; hind tibia  $8.95\times$  as long as wide; hind basitarsus  $9.85\times$  as long as wide; mesosoma generally smooth, polished and finely punctate; propodeum smooth, with isolated punctures and a distinctly delimited costula; anterior transverse carina distinct and complete; lateromedian longitudinal carina of propodeum present but incomplete; lateral longitudinal and posterior transverse carinae complete; areas basalis, petiolaris and posteroexterna discernible; T1 smooth, with isolated punctures; dorsolateral carina of T1 absent; postpetiole  $2.90\times$  as long as maximum width; glymma deep, with seemingly thin membrane between both sides; T2  $3.90\times$  as long as its height (lateral view); tergites III–VII similarly sculptured; hypopygium large and triangular in lateral view,  $1.90\times$  as long as wide; ovipositor short, needle-shaped,  $5.30\times$  as long as basal width;

Head and pronotum green. Postscutellum and mesoscutum yellow, the latter presenting dark brown spots on its lateral lobes and around the scutellum. Mesosoma segments two and three dark brown. Wing hyaline; pterostigma brown. Metasoma with T1–T4 olive green, T5 onwards dark brown. Coxae, trochanters, femora and tibiae avocado green, tarsus brown. Body covered by silver pubescence, more dense in the meso- and metapleura.

**Male** (Figs 5, 6). Approximate body length: 5.68 mm. Fore wing length: 4.45 mm; antenna length: 4.38 mm; number of flagellomeres: 33; distance between eye and lateral ocellus 0.90× as long as diameter of lateral ocellus; clypeus 2.30× as wide as high; mandible 5.00× as long as wide (front view); malar space 1.80x as long as mandible basal width; hind femur: 4.25× as long as wide; hind tibia 7.40× as long as wide; hind basitarsus 7.70× as long as wide; dorsolateral carina of T1 absent; rounded spiracle; T2 3.80× as long as its height (lateral view); gonoforceps cylindrical; coloration as in female.



**FIGURES 3–6.** *Scolomus maculatus* new species. Figs 3: holotype female, head (frontal view); 4: holotype female, habitus; Figs 5: paratype male, head (frontal view); 6: paratype male, habitus. Scale bars (mm): Figs 3 and 5 = 0.4; Figs 4 and 6 = 2.0.

**Type material:** Holotype female: ONCOL 2 6/03/07 (UCh). Paratypes. Female: Oncol 1 20/05/07 (UCh). Male: Oncol 1 5/12/06 (UCh). Curi – 3 19-01-07 (UCh). CURI – 3 6/06/07 (UCh). Curi – 3 20/02/07 (UCh). Altos de Vilches Talca, Chile x-18/25-64 1200m C. C. Porter (FSCA). Mesochorus \ Altos de Vilches Talca, Chile x-18/25-64 1200m C. C. Porter (FSCA).

**Type locality:** CHILE: *Región de los Ríos*: Valdivia (Parque Oncol).

**Distribution:** CHILE: *Región de los Ríos*: Valdivia (Parque Oncol and Reserva Punta Curiñanco). *Región del Maule*: Talca (Altos de Vilches).

**Etymology:** The specific epithet refers to dark brown stains present on the mesoscutum of this species.

**Comments:** See comments under *S. clypeatus* sp. nov. The specimens studied showed no variation among them.

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