



Biology and description of a new species of *Lophyrocera* Cameron (Hymenoptera: Eucharitidae) from Argentina

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Abstract

Descriptions of the adults, eggs and planidia of a new species of *Lophyrocera* (Hymenoptera: Eucharitidae) from north-western Argentina (Tucumán) are provided. Females deposit their eggs into the fruits of the shrub *Vassobia breviflora* (Sendth) (Solanaceae). The host of *L. variabilis* is an unidentified species of *Camponotus* Mayr (Formicidae: Formicinae).

Key words: eggs, planidia, host ant, host plant, *Lophyrocera*

Introduction

Lophyrocera Cameron (Hymenoptera: Eucharitidae) includes six species distributed across South and Central America and the western United States: *L. daguerrei* (Gemignani) (Argentina), *L. plagiata* (Walker) and *L. pretendens* (Walker) (Brazil), *L. chilensis* (Brèthes) (Chile), *L. stramineipes* Cameron (Panama), and *L. apicalis* Ashmead (USA: Arizona, California, Colorado, South Dakota, Texas, and Washington) (Heraty 2002; Noyes, 2008). Only *Lophyrocera daguerrei* (Gemignani) has been documented to occur in Argentina (Gemignani, 1947; De Santis, 1967, 1998; Heraty, 2002). This species was originally described by Gemignani (1947) in the genus *Tetramelia* Cameron, and subsequently transferred to *Lophyrocera* by De Santis (1998). *Tetramelia* was treated as a junior synonym of *Lophyrocera* by Heraty (2002). The ant host for *Lophyrocera* is currently unknown, and the only information on biology was based on observations of the oviposition behaviour of *Lophyrocera* sp. at Rancho Grande Reserve, Porto Velho, Rondonia, Brazil (Heraty, 2002). *Lophyrocera* is nested within a clade of eucharitids that parasitize *Camponotini*, and members of this tribe are the inferred hosts for the genus (Heraty, 2002). A new species, *Lophyrocera variabilis*, was discovered in north-western Argentina, and its description and information on life history and immature stages are included herein.

Materials and methods

Thirteen nests of *Camponotus* sp. (Formicidae: Camponotini) were sampled from roadsides in Los Chorrillos, Tucumán (26°18'37"S 64°58'13"W and 26°18'40"S 64°57'55"W; 1350-1400 m). The adults, brood, and debris were placed in 550 c.c. styrofoam containers; water was added slowly to the bottom of the container through a plastic tube every 30 minutes over 12 hours, causing the ants to bring their progeny to the surface. This behaviour was used to collect the immature stage.

Sixteen females of *Lophyrocera* were collected in the field from *Vassobia breviflora* (Sendth) (Solanaceae) and provided twigs with leaves, and green and developed (red) fruits of that plant in 10x3.5 cm plastic tubes.

Thirty branches of *Vassobia* with fruit and leaves at the field site were cut and placed into a plastic bag, and about 10 mature fruit that had fallen to the ground were collected separately. These field collected samples (branches and fruits) were held at 4°C and examined in the laboratory for eggs and planidia.

Morphological terms are from Heraty (2002) and Darling (1988), with details on sculpture from Eady (1968). Museum abbreviations: **MACN**, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina; **IFML**, Instituto Fundación Miguel Lillo, Tucumán, Argentina; **FSCA**, Florida State Collection of Arthropods, Gainesville, Florida, USA; **UCRC**, University of California, Riverside, California, USA.

Lophyrocera variabilis n. sp.

(Figs 1-19)

Type Material. Holotype female. ‘Argentina, Tucumán: Los Chorrillos, 28-XI-04, 26°18’37”S 64°58’13”W, P. Fidalgo-J. Torrén’s’ deposited in MACN. **Paratypes:** TUCUMÁN: Los Chorrillos, same data as holotype (2 females, FSCA; 2 females, IFML); same locality, 27-XI-04, P. Fidalgo-J. Torrén’s (2 females, 5 males, MACN; 3 females, UCRC); Los Chorrillos, 26°18’40”S 64°57’55”W, 12-XI-2003, P. Fidalgo-J. Torrén’s (1 male, FSCA); same locality, 17-XI-03, P. Fidalgo-J. Torrén’s (2 males, IFML); same locality, 03-XI-04, P. Fidalgo-C. Porter (5 males, UCRC).

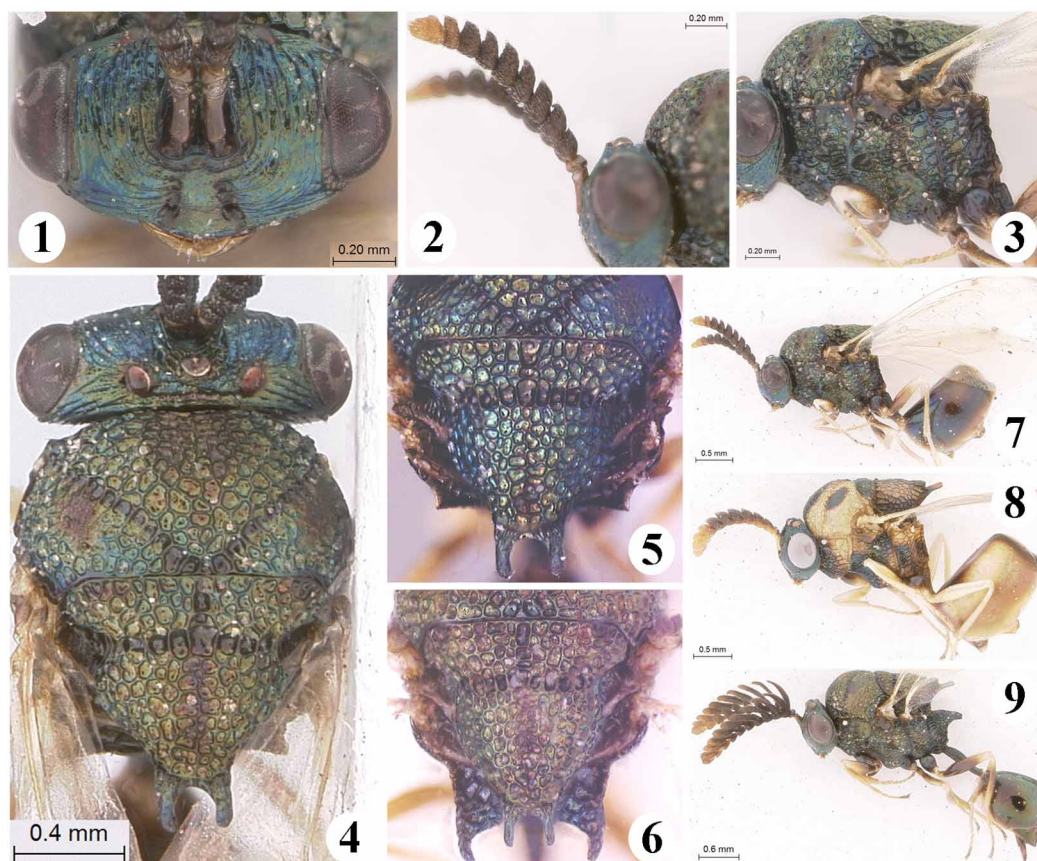
Diagnosis. A generic diagnosis was provided by Heraty (1985) and Heraty (2002). *L. variabilis* n. sp. can be differentiated from other species by the following combination of characters: females have 11 antennal segments with lobate flagellomeres (Fig. 10); propodeal disc with truncate process in dorsal view (Fig. 5); and frenal spine 2.6-3.0X as long as broad. Only the females of *L. variabilis* and *L. plagiata* have yellow and dark brown color patterns on the mesosoma. In *L. plagiata* the antennae are 12-segmented with subserrate flagellomeres (fig. 222 in Heraty, 2002).

The male can be differentiated from the other species by the head 1.7–1.8X as broad as high; head with strong striae in frons and face; antenna dark brown except the apex of F8, F9, F10 and clava honey yellow; frenal spine 3.5-4.5X as long as broad (Fig. 6); petiole 1.9–2.5X as long as hind coxa, and body dark green (Fig. 9).

Female. Length 3-4 mm. Females usually with head, mesosoma and petiole dark green with metallic reflections; dorsal surface of pedicel, flagellomeres 2–7, coxae and proximal 3/4 of femora dark brown; rest of antenna and rest of legs honey yellow (Fig. 7); gaster usually dark brown with green metallic reflections; wing infusate, with venation light brown.

Females exhibit color variation ranging from mesosoma, coxae, and gaster dark green with metallic reflections (Fig. 7) to having extensive yellow patches on the mesosoma, coxae apically and gaster (Fig. 8).

Head 1.6-1.8X as broad as high (Fig. 1). Posterior ocellar line (POL) 3–3.2X lateral ocellar line, POL 1.5–1.9X ocellar ocular line. Gena with transverse striae converging to clypeus, frons with striae around scrobal depression reaching to vertex, vertex with striae transverse; head with small and erect scattered setae. Eyes separated by 1.8–2.0X their height. Labrum with 7 digits (Fig. 11), each digit with a terminal acicular seta, clypeus and supraclypeal area with weak striae; carina between posterior and anterior ocelli continued laterally on frons, occipital carina present. Malar space 0.7–0.85X height of eye. Antenna with 11 segments (Figs 2, 10); scape swollen basally, not reaching ventral margin of median ocellus. Length of flagellum 1.4–1.6X height of head; basal flagellomere 2.5–3.0X as long as basal width, F3 1.1–1.3X as long as basal flagellomere; flagellomeres and clava lobate.



FIGURES 1–9. *Lophyrocera variabilis* n. sp.: 1, head (female, frontal); 2, antenna (female, lateral); 3, head and mesosoma (female, lateral); 4, head and mesosoma (female, dorsal); 5, scutellum and frenal spine (female, dorsal); 6, frenal spine and propodeal processes (male, dorsal); 7 and 8, female habitus; and 9, male habitus.

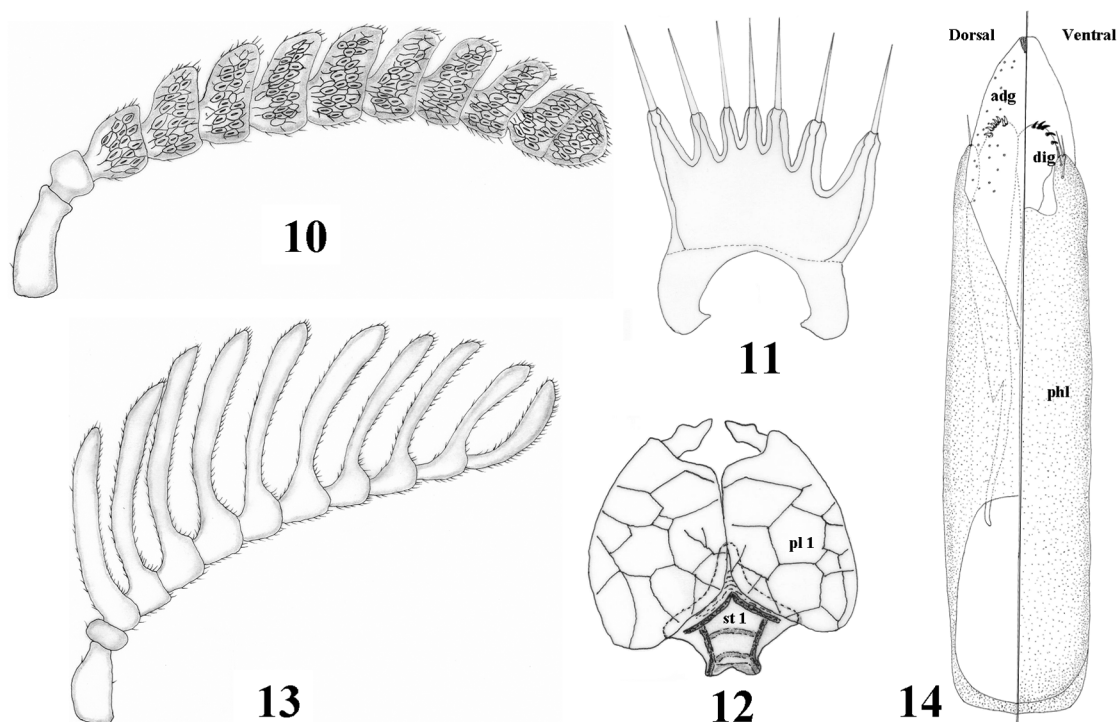
Mesosoma (Fig. 4): reticulate rugose; mesoscutum 1.6–2X broader than long dorsally, rounded anteriorly, without setae, side lobe with dorsal surface rugose to smooth. Notauli vaguely impressed, crossed by strong carinae. Scutoscutellar sulcus weakly impressed, scutellum extended slightly over frenum; frenum with pair of short, cylindrical or depressed spines, rugose basally and smooth apically, 2.6–3.0X as long as broad (Fig. 5). Propodeal disc strongly sculptured between processes, with processes truncate; callus ridge-like, without setae. Mesepimeron longitudinally impressed below midline; mesepimeron evenly sculptured. Prepectus quadrate, with apex broadly separated from tegula (Fig. 3). Prosternum (st₁) trapezoidal, strigose anteriorly (Fig. 12).

Fore coxa smooth, with scattered setae on anterior surface; mid coxa shorter and broader than procoxa, smooth with a lateral carina; hind coxa weakly reticulate, 1.1–1.4X as long as broad, with lateral carina. Fore wing infuscate, 2.4–2.7X as long as broad; costal cell 0.3–0.4X length of wing, scattered short ventral setae; venation distinct, submarginal vein dorsally with few short setae, basal area bare; stigmal vein rectangular, 1.4–1.8X as long as broad; postmarginal vein as long breadth of stigmal vein; pilosity reduced to microtrichia. Hind wing 3.5–3.7X as long as broad; marginal vein incomplete medially; fringe present.

Petiole 2.0–2.2X as long as broad and 1.4–1.6X as long as hind coxa, petiole depressed dorsally, rugose and with longitudinal carinae. Gastral terga weakly reticulate, Gt₁ with scattered setae (Fig. 8); hypopygium with 6 setae.

Male. Length 3.3–4.6 mm (Fig. 9). Similar to female except for following: slightly darker color than female; antenna with apex of F8, F9, F10 and clava honey yellow, rest of segments dark brown. Antenna 12-segmented, flagellar segments pectinate (Fig. 13); branches flattened, branch of F2 0.6–0.7X as long as height

of head; frenal spines more slender, 3.5–4.5X as long as broad (Fig. 6); propodeal processes longer than female, extending as far as apex of frenal spines, sickle-like, broad basally and thin at the apex (Figs 6 and 9); wing venation indistinct; petiole 3.5–4.8X longer than broad, 1.9–2.5X as long as hind coxa; gaster smaller than female. Genitalia typical of most Eucharitidae (Fig. 14).



FIGURES 10–14. 10–12, *Lophyrocera variabilis* n. sp. (female): 10, antenna; 11, labrum; 12, prosternum and propleura (ventral). 13–14, *L. variabilis* n. sp. (male): 13, antenna; 14, genitalia. (adg= aedeagus, dig= digitus, phl=phallobase, pl₁= propleura, st₁= prosternum).

Eggs. Undeveloped eggs are whitish and translucent with a smooth chorion; length of egg body 0.13 mm with the caudal stalk equal or slightly longer than egg body (Fig. 17). The egg is similar to other Eucharitinae as described by Heraty and Darling (1984).

Planidium (Fig. 18). As described for other Eucharitinae (Heraty & Darling, 1984) but distinguished as follows: length 0.08 mm (caudal cerci 0.10), width 0.04 mm. Cranium with labial plate present, including hatched-shaped posterior labial plate; two pairs of dorsal sensilla. Body with 12 tergites, tergopleural line absent; tergites I and II fused dorsally, with 2 pairs of setae dorsally; tergites III and V with single pair of setae ventrally; tergite IV with one pair of setae and VI with 2 pairs of setae; other segments without setae; ventral margin of tergites V–VI extended posteriorly as long narrow processes; the other tergites with processes shorter than V and VI.

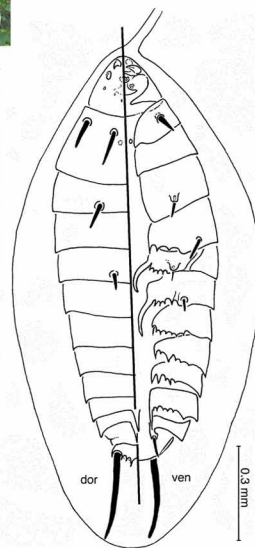
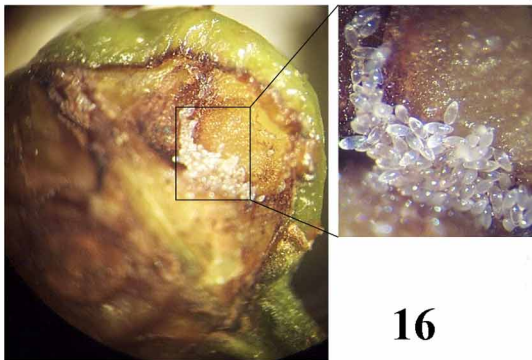
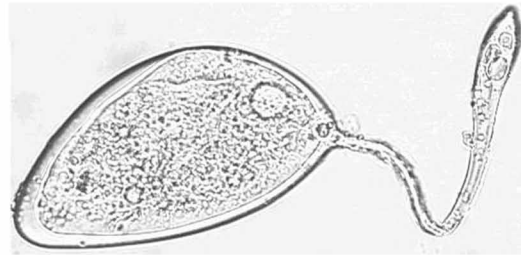
Pupa. Typical robust form for Eucharitidae (Fig. 19), with a series of raised ridges along metasomal tergites in common with other members of the *Stilbula* clade within the Eucharitini (Heraty and Barber, 1990). Thirty-two parasitized cocoons had only a single pupa of *L. variabilis* n. sp., whereas 3 cocoons had two pupae of *L. variabilis* (Fig. 19). *Lophyrocera* pupae were found in cocoons ranging from 4–5 mm in length.

Habitat, host associations, and life history of *Lophyrocera variabilis*

Habitat, and location. The habitat consists of mixed yunga and chaco vegetation. The area of collection was in a scrubland between 2–5 m along the roadside, located on a mountain slope at an altitude of about 1380 m in Los Chorrillos, Tucumán. The host plant, *Vassobia breviflora*, were observed only along the roadside

because was difficult verify in the distant mountainsides.

Vassobia breviflora (Sendth) (Solanaceae), common name “Chalchal de la gallina”, is a spiny shrub in north-central Argentina which grows to a hieight of 2-4 m and blooms in spring and produces fruit in summer (Fig. 15). The mature fruit is globe-shaped, red in color, 4-5 mm diameter, and with numerous seeds (Pensiero *et al.*, 2006).



FIGURES 15-19. Host plant and immature stages: 15, *Vassobia breviflora* habitus; 16, saggital section of unripe fruits of *V. breviflora* with eggs; 17, egg; 18, planidium; 19, pupae.

Host ants. The host is a species of *Camponotus* Mayr (Formicinae: Camponotini). Nests are in irregular mounds of earth made of small stones and organic material slightly elevated above the ground. Ant colonies were located either directly under the host plants or within a few meters.

The ant was vouchered in the Tucumán collection (IFML) for future reference.

General observations, and collections. Collections of adults of *L. variabilis*, *V. breviflora*, and ant nests were made in 2003 (November 12 and 17), 2004 (November 3, 27, and 28), 2005 (November 26, and December 12, 17, and 23), and 2006 (November 4). The eucharitids were found near the nests of *Camponotus* sp., with males collected over the vegetation along the roadsides, and all females collected on the host plant. Most adults were collected November 27, 2004.

Some of the females that we put in plastic tubes were observed ovipositing in the immature fruits of *Vassobia*, but not in mature fruits or onto leaves.

Fifteen of the 30 branches of *V. breviflora* were checked for eggs or planidia, and the rest were placed in a glass container with dampened cotton. Of 210 fruits (immature and mature), 11 immature fruits contained immature eggs; none were found with mature eggs (darkened) or planidia. Eggs were retained on the same

container but they succumbed to desiccation and/or fungus after two weeks, and no planidia eclosed. Mature fruits taken from the ground had both mature eggs and planidia.

Life History of *L. variabilis* n. sp. Eggs were deposited under the epidermal layer of the fruit, with 1–3 egg masses per fruit. No information is available on how planidia escape the fruit or enter the host ant nest. The berries may be direct attractants for the ant host, with planidia being picked up along with the fruit pulp by foraging workers, and then transported directly to the nest brood (Heraty and Barber, 1990). In the field, we observed that ants visit the host plant and forage below the vegetation, but over the short period of time did not observe them foraging on the fruit. The genus *Camponotus* is one of the cited ants associated with Solanaceae, and probably consume the elaiosome from around the seeds (Delabie *et al.* 2003). *Camponotus* also are known to collect fruit pulp and small seeds (Davidson 1988), and a direct interaction of foragers with the ripe fruit, and planidia, is very likely.

In total, 35 *Lophyrocera* pupae were found in different developmental stages. Five females emerged between 8 and 18 days after the nests were collected and sorted, and 14 males emerged after 8 and 14 days; no larvae were found, and these were probably not collected or not floated in the experiment adding water. The parasitism rate ranges from 0–6.21% (mean= 1.45, SD= 2.19, n=13; Table 1).

Females placed in glass vials with branches that had leaves and fruit of *V. breviflora* oviposited only into unripe fruits (Fig. 16).

TABLE 1. Percentage parasitism of *L. variabilis* on *Camponotus* sp.

Ant nest	Extracted day	Ant pupae	<i>L. variabilis</i> pupae	Percentage (%)
1	12/11/2003	221	12	5.15
2	17/11/2003	200	0	0
3	17/11/2003	136	9	6.21
4	17/11/2003	24	1	4.00
5	17/11/2003	64	0	0
6	17/11/2003	34	0	0
7	17/11/2003	268	1	0.37
8	17/11/2003	184	3	1.60
9	17/11/2003	837	7	0.83
10	17/11/2003	148	0	0
11	27/11/2004	52	0	0
12	31/12/2005	274	2	0.72
13	04/12/2006	375	0	0

Discussion

Very little is known of the biology of *Lophyrocera*. Only six species have been described, but at least 13 to 14 species await description based on specimens in museum collections (Heraty, 2002). The only previous biological observation for the genus was that of adults of *Lophyrocera* sp. ovipositing into the skin of unripe berries of *Lantana* Linnaeus (Verbenaceae) at Porto Velho, Rondonia, Brasil (Heraty, 2002).

The oviposition behavior, life history and morphology of eggs and planidia do not differ greatly to that described for *Obeza* Heraty and the pupa is similar to *Pseudochalcura* Ashmead (Heraty & Barber, 1990). *Lophyrocera variabilis* oviposit under the epidermal layer, in unripe fruits of *Vassobia breviflora* (Solanaceae). Planidia were found only in mature fruit taken from the ground, and the pupae were taken from ant cocoons.

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