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## A new genus of Eucharitidae (Hymenoptera: Chalcidoidea), with notes on life history and immature stages

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### Abstract

*Neolirata* new genus (Eucharitidae: Eucharitini) is recognized based on males and females, with new descriptions of eggs, planidia and pupae. Redescriptions are provided for *N. alta* (Walker) and *N. daguerrei* (Gemignani) (**comb. nov.** transferred from *Lirata*) and a new description of *N. furcula* **sp. nov.** is presented. Females of *N. alta* deposit their eggs on the underside of leaves of *Pseudabutilon virgatum* (Cav.) Fryxell (Malvaceae) and *N. daguerrei* on the underside of *Urvillea chacoensis* Hunz (Sapindaceae). A key to species is included.

**Key words:** *Neolirata*, eggs, planidia, pupae, host plant, poneromorph, ant, parasitoid

### Introduction

Eucharitidae (Hymenoptera: Chalcidoidea) are parasitoids of the immature stages of ants, and potentially are the most diverse group of hymenopteran parasitoids of eusocial insects (Heraty 2002; Murray et al. submitted). Four subfamilies and 54 genera are recognized, distributed in almost every zoogeographical region of the world (Heraty 2002; Heraty et al. 2004; Heraty et al. in press).

Cameron (1884) described *Lirata*, with *L. luteogaster* Cameron as its type species. Heraty (2002) provided a detailed diagnosis and description of the genus, a key to species, and descriptions of new species. *Lirata* previously included eight species from the Neotropical region (Argentina, Brazil, Ecuador, Panama, Paraguay and Venezuela) that belong to the *Kapala* clade, a group of poneromorph ant parasitoids within the Eucharitini (Hymenoptera: Eucharitidae) (Heraty 2002). In recent phylogenetic analyses using molecular data (Murray et al. submitted), two of the species of *Lirata* treated were placed distant from the rest. These differences from other *Lirata* were supported by our reanalysis of their morphological features. Here we establish a new genus based on two species moved from *Lirata* (*L. alta* Walker and *L. daguerrei* Gemignani) and describe a new species from Brazil. Descriptions of the immature stages and plant host associations are provided for the two transferred species.

### Material and methods

Adults of *N. alta* were collected at San Vicente, Tucumán, Argentina on *Pseudabutilon virgatum* (Cav.) Fryxell while ovipositing on the underside of leaves of the host plant. Adults of *N. daguerrei* were collected at Tapia, Tucumán, Argentina on *Urvillea chacoensis* Hunz, and eggs were also found on the underside of leaves. For both collections, leaves with eggs were placed into a 10 x 10 cm cylindrical glass container with dampened cotton until emergence of the first instar larvae (planidia). Planidia and some eggs were preserved in ethanol. Planidia were later cleared in 10% KOH and both larvae and eggs slide-mounted in Hoyer's medium.

Images were obtained using GT-Vision® Ento-Vision software on a Leica M16 zoom lens linked to a JVC KY-F75U 3-CCD digital video camera, and Leica Application Suite (version 3.5.0) software operating on a Leica MZ12 linked to a digital video camera Leica DFC295. Images were enhanced with Corel PhotoPaint and Corel

Draw (version 15), or processed with Deep Focus (Stuart Ball). The distribution map was made using Simple Mappr (Shorthouse 2010). Specimens are deposited in the American Museum of Natural History, New York, USA (AMNH); The Natural History Museum, London, England (BMNH); Canadian National Collection, Agriculture Canada, Ottawa, Ontario, Canada (CNCI); Collection of Arthropods of the State of California, USA (CSCA); Colorado State University, Fort Collins, Colorado, USA (CSUC); Instituto Fundación Miguel Lillo, Tucumán, Argentina (IFML); Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina (MACN); Museum National d'Histoire Naturelle, Paris, France (MNHP); Museo de Zoología de São Paulo, Brazil (MZSP); National Museum of Natural History, Washington (USNM); Naturhistorisches Museum Wien, Vienna, Austria (NHMW); University of California, Riverside, California, USA (UCRC) and Zoologisk Museum, Copenhagen, Denmark (ZMUC). GPS coordinates in brackets are estimated from GoogleEarth. Morphological terms are from Heraty (2002) and Heraty and Darling (1984), with details on sculpture from Eady (1968) and Harris (1978).

## Results

### *Neolirata*, new genus

**Type species.** *Lirata daguerrei* Gemignani.

**Diagnosis.** Heraty (2002) placed eight species in *Lirata* and, at the time, was confident of the monophyly of the group based on it having an elongate basal flagellomere and median scutellar depression. Four different phenotypic groups were recognized. Two of these species, *Lirata alta* and *L. daguerrei*, were recognized based on a sharp carina separating the ocelli, the mesosoma coarsely rugose, and the antennal flagellum of females 9 or 10 (rarely 8) segmented (Heraty 2002). As well, the median ocellus is slightly anterior to the lateral ocelli, the lateral margin of the mesoscutum abuts the prepectus and does not form a lateral flange, and the scutellum is broadly rounded and not medially elevated. The other *Lirata* species, including the type species *L. luteogaster*, have the scutellum distinctly humped with a median longitudinal depression, whereas the three species described here within *Neolirata* have a broadly rounded scutellum without a distinct median depression (Figs 1, 2, 4, 14, 15). Phylogenetic analysis based on molecular data for 18S, 28S, COI and COII suggest that *L. luteogaster* and a species related to *L. pustula* Heraty (representing two of the phenotypic groups from Heraty 2002) are monophyletic within the *Kapala* clade but distant from a monophyletic *L. alta* and *L. daguerrei* in the same clade (Murray et al. submitted). Together, these data suggest that *Lirata* needs to be divided. We propose a new genus, *Neolirata*, for *L. alta*, *L. daguerrei*, and *L. furcula* n. sp.

**Description.** Body length, moderate to large (3.7–7.0 mm). Mesosoma black; wings hyaline, fore wing venation pale brown.

**Head.** In frontal view subtriangular (Figs 3, 20, 21). Eyes rounded and with long erect setae; median ocellus in line with lateral ocelli, anterior ocellus separated from lateral ocelli by strong transverse carina (Fig. 2). Frons and lower face smooth or striate, scrobal depression shallow and broadly impressed; interocular area narrow, produced as fine, sharp median ridge. Occiput smooth, its dorsal margin with sharp carina. Clypeus smooth, anteclypeus present, clypeal margin transverse or only slightly rounded; supraclypeal area swollen but without distinct lateral margins. Genal depression absent; hypostomal lobes broadly separated. Mandibles falcate with a 3/2 formula and long apical tooth. Labrum with 5–7 cylindrical digits, each digit with a terminal flattened seta (Fig. 8). Palpal formula 2:1 with long palpomeres; maxillary complex relatively large. *Antenna* of both sexes with 11 or 12 segments; scape long and thin, length reaching or exceeding vertex. Female: flagellum with 9 or 10 segments (Figs 3, 16, 17); funicular segments strongly or weakly serrate; MPS small and recessed into depressions, dense apically, absent basally. Male: scape without pores and smooth; anellus absent; flagellum with 9 segments (Fig. 5), funicular segments pectinate with narrow branches, that of F2 elongate and about as long as F3; MPS few and located on apices of branches; secondary segmentation absent.

**Mesosoma.** Pronotum abutting mesoscutum, without overlap of sclerites. Mesoscutum with lower anterior margin reflected, lateral margin over spiracle with thin marginal carina, posterolateral margin over tegula with pronounced marginal carina; dorsum with broadly spaced, erect hairs; notauli complete but without distinct

margins; transscutal articulation (TSA) present. Scutoscutellar sulcus (SSS) transverse, well marked, not meeting TSA, and with knob-like processes on each cross ridge; axilla and scutellar disc longitudinally carinate; lateral axillar lobe small; axillular groove present. Frenal line distinct laterally but not medially; scutellar disc broadly rounded medially; frenum with pair of long spines exceeding apex of gaster, the spines cylindrical and broadly separated basally, longitudinally carinate (Figs 6, 7, 18, 19). Metanotum with narrow smooth flange laterally, only slightly overlapping propodeum. Propodeum with spiracle broadly separated from dorsal margin and ventral margin of spiracle with elongate, narrow emargination. Propodeal disc evenly sculptured and lateral to postspiracular furrow weakly expanded, callus with a few long hairs. Metepimeral groove irregular and obscured by strong sculpture. Femoral groove present, vertical, obscured by strong sculpture; mesepimeron irregularly sculptured to evenly rugose, transepimeral sulcus absent; acropleuron evenly rounded and grooved for reception of upper corner of prepectus; mesepisternum with anteromedial margin overlapping posterior margin of prepectus, ventral margin wedge-shaped and extending vertically anterior to mesocoxa. Prepectus fused with pronotum and in same plane, triangular, anteriorly with strong vertical carina meeting pronotal spine dorsally, and with dorsal apex narrowly separated from tegula; spiracle narrowly enclosed. *Legs*. All coxae smooth and shiny; calcar acicular, rarely slightly bent apically; mesocoxa without lateral groove or carina; metacoxa elongate; metatibia with 2 spurs. *Wings*. Fore wing venation distinct; stigmal vein longer than broad, perpendicular to fore wing margin; postmarginal vein slightly longer than stigmal vein; disc with dense covering of short setae, without marginal fringe. Hind wing venation incomplete medially; fringe present or absent.

*Metasoma*. Petiole of female longer than broad and longer than metacoxa; petiole of male about as long as metafemur; petiole cylindrical or subtriangular; base of petiole truncate with vague or distinct carina not overlapping nucha. Gastral terga smooth, with scattered setae or bare; posterior margin of Gt<sub>1</sub> with 1 longitudinal line of weakness (both sexes); tergal scar present and linear; cerci present. Gs<sub>1</sub> smooth, in males articulating with apex of petiole. Hypopygium with tuft of about 4–18 hairs on each side. Genitalia typical for family. Valvulae acicular, short; valves with apex smooth. Gonostylus fused to second valvifer. Sclerotized epiproct absent.

**Etymology.** From Greek *neo* which means “new”, referring to the new genus based on two species originally described within *Lirata*. Gender feminine following designation of *Lirata* as feminine (ICZN Article 30.2.4).

**Distribution.** Neotropical: Southeastern Brazil to northwestern Argentina (Map 1). Notably, the geographic coordinates of two males of *N. alta* from Amazonas (Brazil) may be an error of interpretation of this locality, as they fall outside of the range of other specimens in the genus.

### Key to species of *Neolirata* gen. nov.

- 1 *Both sexes*: Scutellar spines straight, directed outward from mesosoma (Fig. 18). Face striate (Figs 16, 20). *Female*: Antenna with 10 flagellomeres; basal flagellomere sharply serrate . . . . . *N. alta* (Walker)
- *Both sexes*: Scutellar spines strongly bowed medially or nearly parallel (Figs 7, 19). Face smooth (Figs 3, 17). *Female*: Antenna with 8, 9 or 10 flagellomeres; basal flagellomere blunt serrate or cylindrical with a small serrate tip . . . . . 2
- 2 *Both sexes*: Scutellar spines long, thin and bowed medially with apices closely spaced (Figs 6, 7). *Female*: Antenna with 8 or 9 flagellomeres; basal flagellomere cylindrical with a small serrate tip, 7.0–8.3× as long as basal width, and 1.1–1.4× as long as scape (Fig. 3) . . . . . *N. daguerrei* (Gemignani)
- *Both sexes*: Scutellar spines stout and nearly parallel (Fig. 19). *Female*: Antenna with 10 flagellomeres; basal flagellomere blunt serrate, 3.6–5.0× as long as basal width and 0.8–0.9× length of scape (Fig. 17) . . . . . *N. furcula* sp. nov.

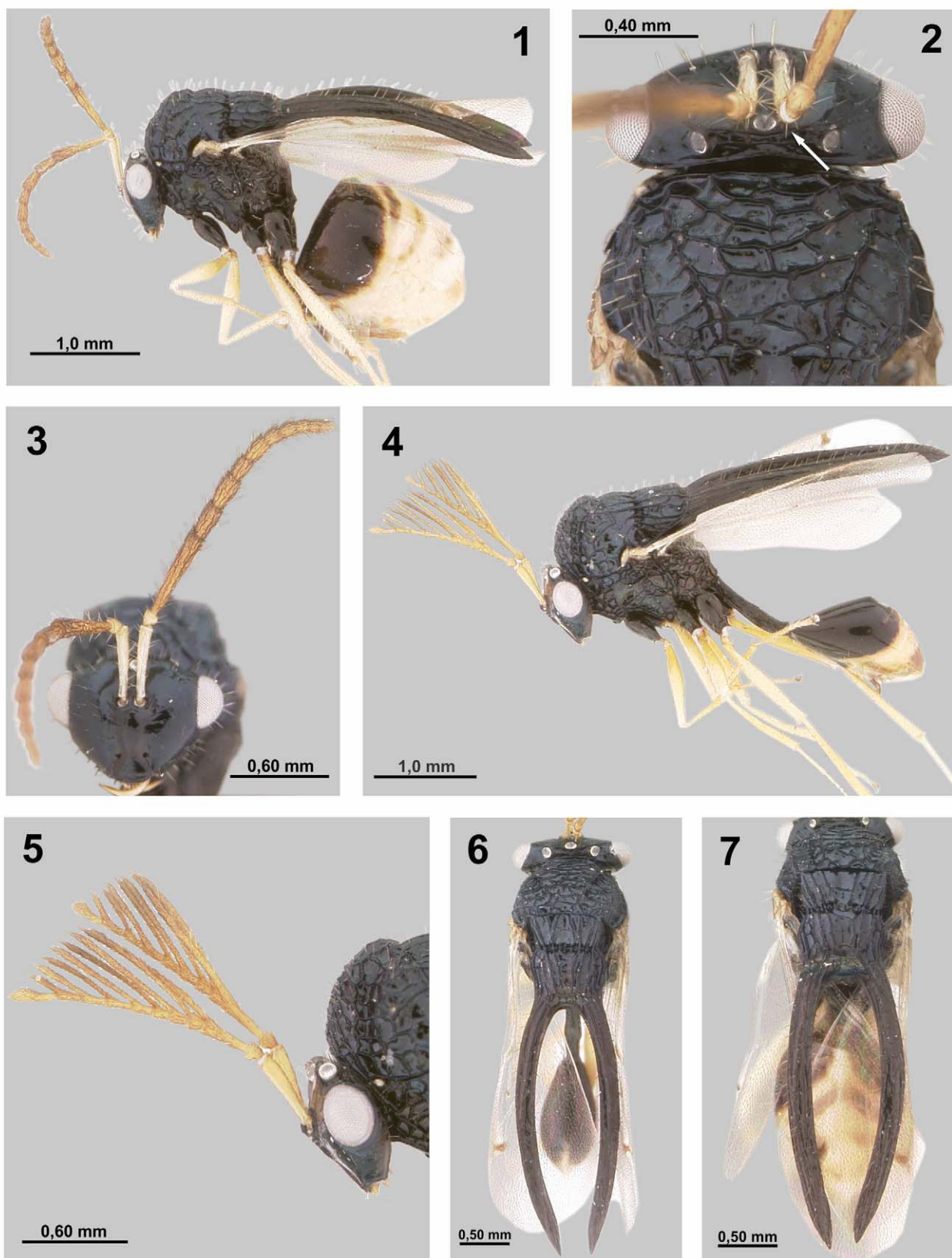
### *Neolirata daguerrei* (Gemignani)

(Figs 1–13)

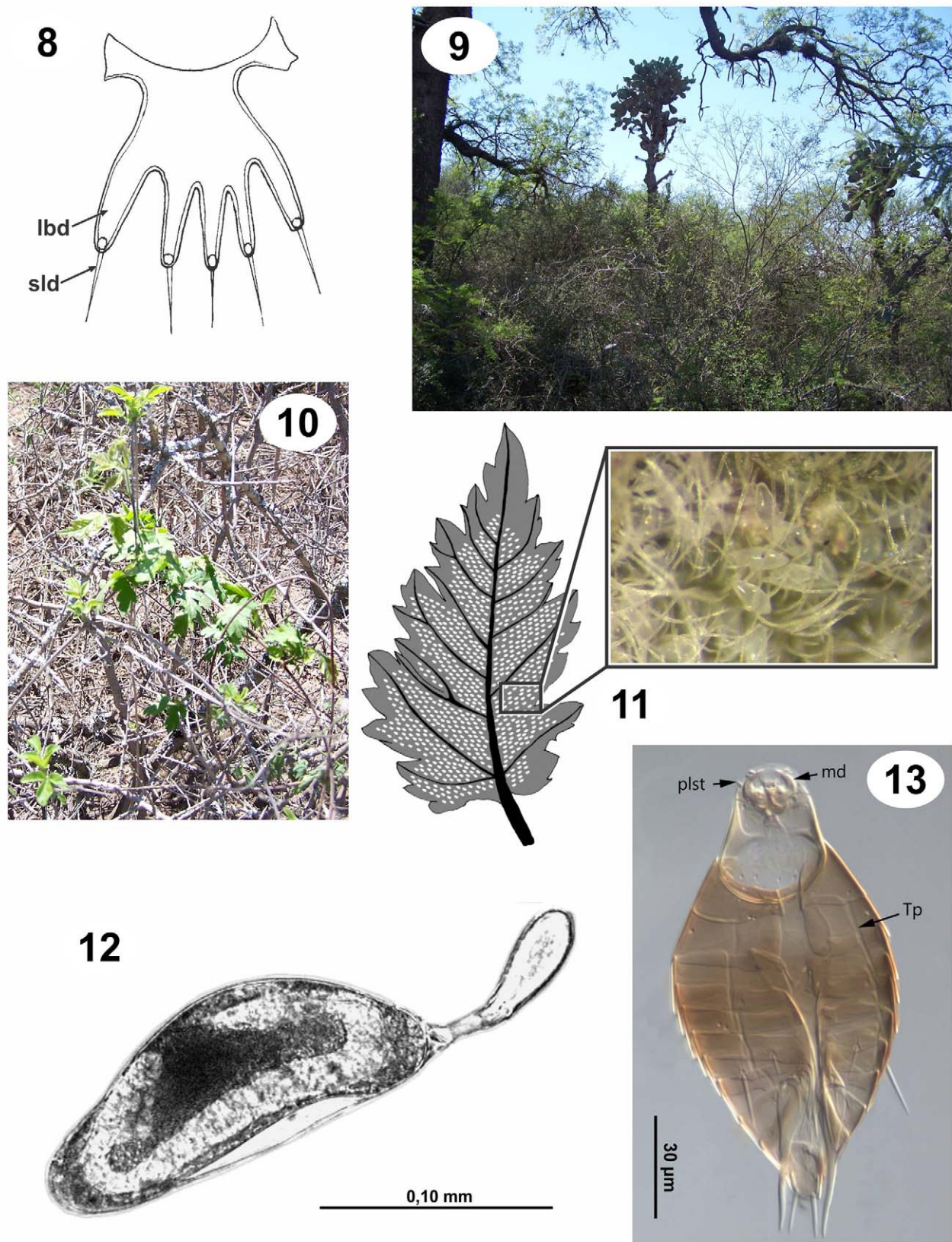
*Lirata daguerrei* Gemignani, 1937: 160–161; Heraty, 2002: 186–188. Holotype female in MACN [examined].

*Lirata daguerrei*; Heraty, 2002: 187–188 (figs 210–213).

**Diagnosis.** Distinguished by the following combination of characters: face smooth (Fig. 3); scutellar spines long, thin and bowed medially with apices closely spaced (Figs 6, 7); gastral terga with scattered setae.



**FIGURES 1–7.** *Neolirata daguerrei*: 1, habitus (female); 2, head (female, dorsal; carina indicated); 3, antenna and head (female, frontal); 4, habitus (male); 5, antenna (male, lateral); 6, mesosoma (male, lateral); 7, mesosoma (female, dorsal).



**FIGURES 8–13.** *Neolirata daguerrei*: 8, Labrum (female), lbd, labral digit; sld, seta of labral digit. 9–13, biology and immature stages of *N. daguerrei*: 9, habitat; 10, *Urvillea chacoënsis*; 11, underside of leaf of *U. chacoënsis* with eggs (eggs represented in white area); 12, egg; 13, planidia. md, mandible; plst, pleurostomal seta or spine; Tp, tergopleural line.

**Female.** Description and characterization in accordance with that provided by Gemignani (1937). Variation in material examined as follows. Length: 3.6–4.5 mm. Head 1.3–1.5× as broad as high; eyes separated by 2.1–2.4× their height; malar space 0.8–1.0× as long as eye height (Fig. 3); labrum with 5 digits (Fig. 8). Flagellum length 1.9–2.2× head height; scape 5.0–5.7× as long as broad and 0.5–0.6× head height; basal flagellomere 1.1–1.4× as long as scape, 7.0–8.3× as long as basal width, and 2.4–3.0× as long as next segment (Fig. 3). Scutellar spines 1.6–1.9× as long as mesosoma (Figs 1, 7). Metacoxa 1.7–2.0× as long as broad. Fore wing 2.4–2.7× as long as broad. Petiole 3.3–3.5× as long as broad and 1.3–1.6× as long as metacoxa. Gastral terga with scattered setae.

**Male.** Length 3.7–4.5 mm. Similar to female except for following. Head 1.4–1.5× as broad as high; eyes separated by 1.8–2.1× their height; malar space 0.7–0.9× as long as eye height. Antenna with 11 segments, flagellum pectinate, same coloration as female but with pale brown flagellum (Fig. 4); scape 4.0–5.2× as long as broad; basal flagellomere 3.3–4.0× as long as basal width; branch of basal flagellomere similar or slightly longer than head height and 4.1–4.7× as long as basal length (Fig. 5). Mesosoma with more irregular, sharp carinae; scutellar spines 1.7–1.9× as long as mesosoma (Figs 4, 6). Legs with same coloration as female but a little darker, especially femora; metacoxa 1.7–1.9× as long as broad. Petiole 5.0–6.4× as long as broad and 1.8–2.0× as long as metacoxa (Fig. 4).

**Egg.** The egg morphology is similar to other Eucharitinae as described by Heraty and Darling (1984), except that the caudal stalk is thicker and shorter. Length of egg body 0.17 mm and caudal stalk 0.07 mm (Fig. 12). Undeveloped eggs are whitish and translucent with a smooth chorion; by the third day the developing embryo can be observed clearly.

**Planidium.** As described for other Eucharitinae by Heraty and Darling (1984), but distinguished as follows: length 0.10 mm, width 0.04 mm (Fig. 13); cranium with a pair of short pleurostomal spines; with three pairs of dorsal sensilla, dorsal cranial spines absent; tergopleural line (Tp) separating pleural and dorsal tergites present on tergites TII–VIII; TI and TII fused dorsally, with two pairs of small setae dorsally and two pairs ventrally; TIII with one pair of setae ventrally; TV with one pair of setae ventrally, extending half length of TVII; TVI with one pair of stout setae lateral to Tp, extending to TIX; TVII with one pair of small setae ventrally; TIX with two long lateral processes ventrally developed as a long spine; as observed by Heraty (2002) for *L. pustula*, this projection extends beyond the caudal cerci; caudal cerci stout.

**Habitat and location.** Most specimens were collected in Tapia (Tucuman, Argentina), 26°33'55"S 65°17'25"W (Fig. 9). In this region, it is common to find *Opuntia* sp. (Tuna or Quimilo), *Prosopis* sp. (Algarrobo), *Valessia glabra* (Ancoche), *Celtis tala* (Tala) and *Schinopsis balancae* (Quebracho colorado). This vegetation corresponds to the chaco serrano ecoregion (*sensu* Digilio & Legname 1966). The host plant, *Urvillea chacoensis*, was widely distributed, but the specimens associated with *N. daguerrei* were collected in a small area about 5 meters west of the old road to Salta.

**Host plant.** *Urvillea chacoensis* (Sapindaceae), common name “Farolito”, is a climbing vine that grows over other plants distributed throughout the collection area, which blooms from November to March with fruits present from February to May; its leaves are marginally serrate and pubescent (Ferrucci 2004). The leaves persist until a month after fruit maturation and reappear in the warmer seasons (Fig. 10).

**General observations and collections.** Collections of adults and host plants were made in 2004 (March 9), 2005 (March 10), 2006 (February 26 and March 5), 2007 (March 12 and 17) and 2009 (March 12 and 13). Females placed in plastic tubes were observed ovipositing on the undersides of the leaves of *U. chacoensis* (Fig. 11). A single gravid female oviposited about 28 eggs per mm<sup>2</sup> randomly between the spicules that form the pubescence on the underside of a leaf. Eggs hatched within 9 days, although some eggs containing mature larvae did not hatch. Planidia are very mobile and jump, which suggests that larvae have phoretic association with foraging ants for transfer to the ant nest.

**Host ants.** Unknown.

**Material examined.** Holotype female: ARGENTINA, **Entre Ríos:** Concordia, [31°23'17"S 58° 0'50"W], i.1931, J. B. Daguerre, UCRC\_ENT 00242256, (MACN). Chaco: Las Palmás, [27° 3'14"S 58°40'43"W], xii.1950, Duret, UCRC\_ENT 0237905–6 (2 ♂, AMNH). **Formosa:** Formosa (RN 11), 26°15'54"S 38°15'57"W, 26.iii.2003, J. Heraty & P. Fidalgo, UCRC\_ENT 0091465, 0091838, 0091963–5 (1 ♀, 4 ♂, UCRC). **Salta:** Rosario de Lerma, [24°59'47"S 65°34'6.61"W], 10.xi.1983, M. Wasbauer, MT, UCRC\_ENT 00340706 (1 ♂, CSCA). **Tucumán:** Tacanas, [27° 8'14"S 64°49'8"W], i.1948, J. M. Arnau, UCRC\_ENT 00357425 (1 ♀, IFML); Trancas, [26°13'5"S 65°17'5"W], xii.1952, Arnau, UCRC\_ENT 00242257 (1 ♂, MACN); Tapia, 26°33'55"S 65°17'25"W, 16.iii.1993,

Cuezzo & Fidalgo, MT, UCRC\_ENT 00357426 (2 ♂, IFML); same location, 09.iii.2004, J. Torrén & P. Fidalgo, UCRC\_ENT 00357428-9 (2 ♀, IFML); same location, 10.iii.2005, J. Torrén & P. Fidalgo, UCRC\_ENT 00357430-1 (2 ♂, IFML); same location, 26.ii.2006, J. Torrén, UCRC\_ENT 00357432 (1 ♀, IFML); same location, 05.iii.2006, Torrén, UCRC\_ENT 00357433-5 (1 ♀, 2 ♂, IFML); same location, 12.iii.2007, J. & J. Heraty and J. Torrén, UCRC\_ENT 00242258–9, 00340707–710 (1 ♀, 1 ♂, MACN; 2 ♀, 2 ♂ UCRC); same location, 17.iii.2007, J. & J. Heraty and J. Torrén, UCRC\_ENT 00242260-1 (1 ♀, 1 ♂, MACN); same location, 17–19.iii.2007, J. & J. Heraty and J. Torrén, MT, UCRC\_ENT 00242262 (1 ♂, MACN); same location, 12.iii.2009, J. Torrén, UCRC\_ENT 00242263 (1 ♂, MACN); same location, 26°34'27"S 65°17'7"W, 06.iv.2012, J. Torrén, UCR\_ENT 00357427 (1 ♂, IFML); Ticucho, 26°32'30"S 65°15'16"W, 13.iii.2009, J. Torrén, UCRC\_ENT 00357436 (1 ♀, IFML). BRAZIL, **Brasília**: [no locality], Duport, UCRC\_ENT 00245113 (1 ♀, ZMUC). **Minas Gerais**: Lagoa Santa, [19°37'42"S 43°53'48"W], Reinhardt, UCRC\_ENT 00245112 (1 ♀, ZMUC). **Lete Lagoa**: Lagoa do Leite, [12°29'02"S 42°29'56"W], Reinhardt, UCRC\_ENT 00245111 (1 ♀, ZMUC). **São Paulo**: Villa Americana, [22°44'19"S 47°19'54"W], ii.1924, F.X. Williams, UCRC\_ENT 00239549 (1 ♀, BMNH); Campinas, [22°54'20"S 47°03'04"W], xii.1939, H.F.G. Sauer, UCRC\_ENT 00248045 (1 ♀, AMNH); Ipiranga, [23°35'29"S 46°36'28"W], 19.ix.1906, H. Luederwaldt, UCRC\_ENT 00036239 (1 ♀, MZSP). **Bahia**: Engruzilhada, 480m, [15°31'51"S 40°54'31"W], xii.1973, M. Alvaregena, UCRC\_ENT 00320678 (1 ♂, CNCI). **Minas Gerais**: Lavras, [21°14'35"S 44°59'46"W], 5 xii.1978, W.D. Fronk, UCRC\_ENT 00259041 (1 ♀, CSUC); Mar de Espanha, [21°52'06"S 43°00'33"W], 27-28.ii.1962, J. Bechyné, UCRC\_ENT 00036241 (1 ♀, MZSP); Pedra Azul, [16°00'42"S 41°17'19"W], xi.1972, Seabra & Oliveira, UCRC\_ENT 00320677 and UCRC\_ENT 00320679 (2 ♂, CNC). **Rio de Janeiro**: Petrópolis, [22°30'16"S 43°10'56"W], 5-7.iii.1962, J. Bechyné, UCRC\_ENT 00036240 (1 ♂, MZSP). PARAGUAY, **San Bernardino**, [25°18'47"S 57°17'43"W], iii, Fiebrig, UCRC\_ENT 00317120 (1 ♂, NHMW).

### *Neolirata alta* (Walker)

(Figs 14, 16, 18, 20, 22–25)

*Thoracantha alta* Walker, 1862: 383. Dalla Torre, 1898: 365 (catalog); De Santis, 1980: 208 (catalog). Syntype female in BMNH; type no. 5.634 [examined].

*Kapala alta*; Ashmead, 1904: 472. Change of combination.

*Lirata alta*; Heraty, 2002: 186–187 (figs 205–209). Change of combination.

**Diagnosis.** Distinguished by the following combination of characters: face striate (Figs 16, 20); basal flagellomere of female sharply serrate (Fig. 16), scutellar spines longitudinally striate, straight, and directed outward from mesosoma (Fig. 18); gastral terga almost bare, with a few scattered setae.

**Female.** Length: 6.0–7.0 mm. Head, mesosoma, coxae and petiole black; flagellum dark brown to black; femora, distal  $\frac{3}{4}$  of scape, and pedicel testaceous; base of scape and rest of legs yellowish; distal antennal flagellomeres sometimes light brown (Figs 14, 16). Wings slightly infusate, venation dark brown.

**Head** 1.6× as broad as high; with strong or weak striae. Frons with striae converging to scrobal depression; lower face, including gena, with transverse striae; occipital carina pronounced, extending far beyond lateral ocelli. Eyes separated by 2.6–2.7× their height (Fig. 20); malar space as long as eye height. Labrum with 6 or 7 digits. Clypeus slightly swollen, with weak striae; epistomal sulcus well marked; supraclypeal area swollen and striated as rest of the face, demarcated laterally by a shallow sulcus. Maxillary complex not observed. *Antenna* with 10 segments, scape long, smooth, laterally compressed, 2.8× as long as broad and 0.4–0.5× head height; length of flagellum 1.7–1.8× head height, basal flagellomere 0.8–0.9× length of scape, 4.2–5.0× as long as basal width and 1.7–1.9× as long as next flagellomere; all segments of flagellum serrate, with acute apices, clava rounded (Fig. 16).

**Mesosoma.** Mesoscutum rounded, elevated, and irregularly rugose-carinate; mid lobe in frontal view with transverse carinae, with longitudinal carinae dorsally, and dorsomedially with shallow depression; mesosoma with scattered erect setae; notauli well marked (Fig. 14). Axillae in dorsal view with a strong impression laterally, broadly rounded, and longitudinally carinate; scutellar spines cylindrical, tapered, straight, and directed outward from midline (Fig. 18), 1.4–1.5× as long as mesosoma with strong striae reaching to apex and scattered erect setae; inferior surface of frenum smooth with some carinae directed toward center (Fig. 18). Propodeal disc slightly swollen with irregular carinae; callus swollen, smooth, with some carinae dorsally and several long setae (Fig. 14).

Mesepisternum smooth except for weak transverse carinae; upper mesepimeron smooth except for strong carinae. Metacoxa semiglobose, 1.4× as long as broad. Metafemur with scattered erect setae. Fore wing 2.5–2.6× as long as broad, stigmal vein rectangular, 1.8–2.2× as long as broad (Fig. 18); postmarginal vein slightly longer than stigmal vein; wing disc with dense short setae.

**Metasoma.** Petiole 3.5–3.7× as long as broad and 1.5–1.6× as long as metacoxa; petiole subcylindrical with strong or weak longitudinal carinae. Gastral terga almost bare, with a few scattered setae.

**Male.** Unknown.

**Variation.** The specimen from Linhares (Brazil) differs from those collected in Argentina in antennal coloration, having the last 6 segments of the flagellum light brown, and in the striae of the head and petiole being weaker.

**Egg.** Length of egg body 0.18 mm and caudal stalk 0.08 mm (Fig. 24). The eggs are whitish and translucent with a smooth chorion, slightly flattened ventrally and convex dorsally. As in *N. daguerrei*, the morphology of the egg is similar to other Eucharitinae as described by Heraty and Darling (1984), except the caudal stalk is thicker and shorter.

**Planidium.** Similar to the description of the planidium of the type species, *N. daguerrei*. As noted for planidia of *N. daguerrei*, the ventral margin of TIX has a well-developed spine that extends beyond the caudal cerci (Fig. 25).

**Habitat and location.** Specimens were collected in Los Baños, Rosario de la Frontera (Salta), 25°50'14"S, 64°55'55"W, at about 851 meters; Tapia (Tucumán), 26°34'27"S 65°17'7"W, at about 707 meters and in San Vicente (Tucumán), 26°26'5"S 65°15'51"W, about 740 meters. The latter location is typical of the Chaco ecoregion (Fig. 19). The host plant is distributed throughout the area.

**Host Plant.** *Pseudabutilon virgatum* (Malvaceae) is a ligneous shrub that grows not more than 1 m in height, persists year round, and blooms in the humid seasons (spring-summer); its leaves are ovate and marginally serrate and last to the beginning of the cold season (May-June) (Figs 20, 21).

**General observations and collections.** Adults and the host plant in San Vicente, Tucumán were sampled in 2010 (March 24). The only female was collected ovipositing on *P. virgatum* (Figs 21, 22). The female oviposited ~32 eggs per mm<sup>2</sup> at random between the spicules that form a pubescence on the underside of a leaf (Fig. 22). Eggs hatched within 14 days, although some eggs with mature larvae did not hatch. The planidia, as in *N. daguerrei*, have the ability and the habit to jump.

**Host ants.** Unknown. However, there was a nest of *Ectatomma brunneum* Smith (Formicidae: Ectatomminae) a few meters from where the female was collected. This nest was excavated, but we were not able to locate immature stages of *N. alta*.

**Material examined.** Type female: BRAZIL [no locality], UCRC\_ENT 310053 (BMNH). **Amazona:** Ihla Jerusalém, [8°46'41"S 63°57'10"W], 5.ix.1964, J. & B. Bechyne, UCRC\_ENT 00313858 and 00313925 (2 ♀, BMNH). **Espírito Santo:** Parque Sooretama, Linhares, [19°12'13"S 40° 5'34"W], 17-27.x.1962, F.S. Pereira, UCR\_ENT 00036242 (1 ♀, MZSP). **Goiás** [no locality], 1914, E. André, UCRC\_ENT 00006003 (1 ♀, MNHP). ARGENTINA, **Tucumán:** San Vicente, 26°26'5"S 65°15'51"W, 24.iii.2010, J. Torrén, UCRC\_ENT 00357437 (1 ♀, IFML); Tapia, 26°34'27"S 65°17'7"W, 20.iii.2012, J. Torrén, UCRC\_ENT 00242264 (1 ♀, MACN). **Salta:** Rosario de la Frontera, Hotel Termal, 25°50'14"S 64°55'55"W, 899 m, 20.iii.2003, J. Heraty, UCRC\_ENT 00357438 (1 ♀, IFML). URUGUAY, **Montevideo:** [34°53'01"S 56°10'55"W], 20.i.1945, Berry, Montev. Pars. Lab., UCRC\_ENT 00248044 (1 ♀, USNM).

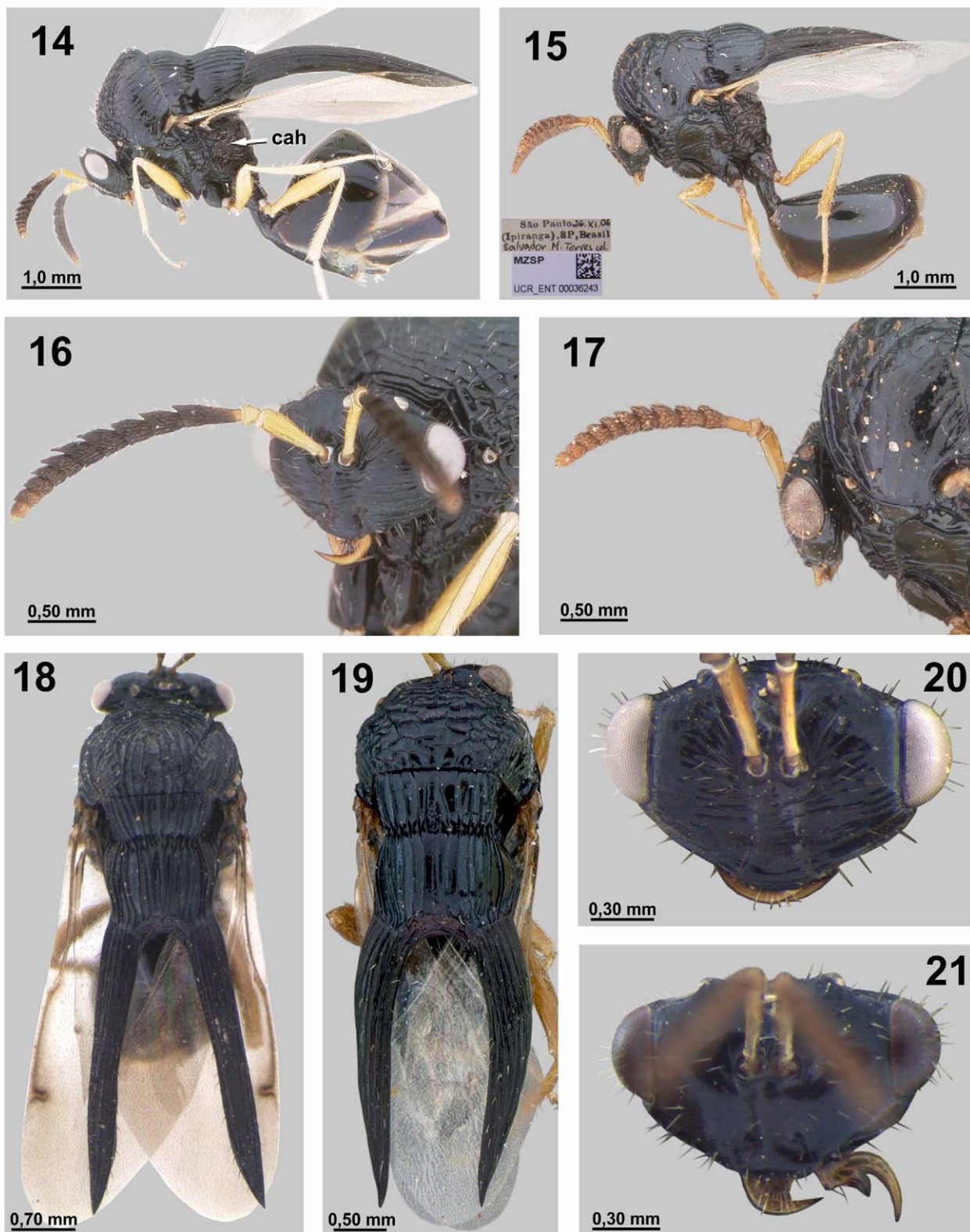
### *Neolirata furcula* n. sp.

(Figs 15, 17, 19, 21)

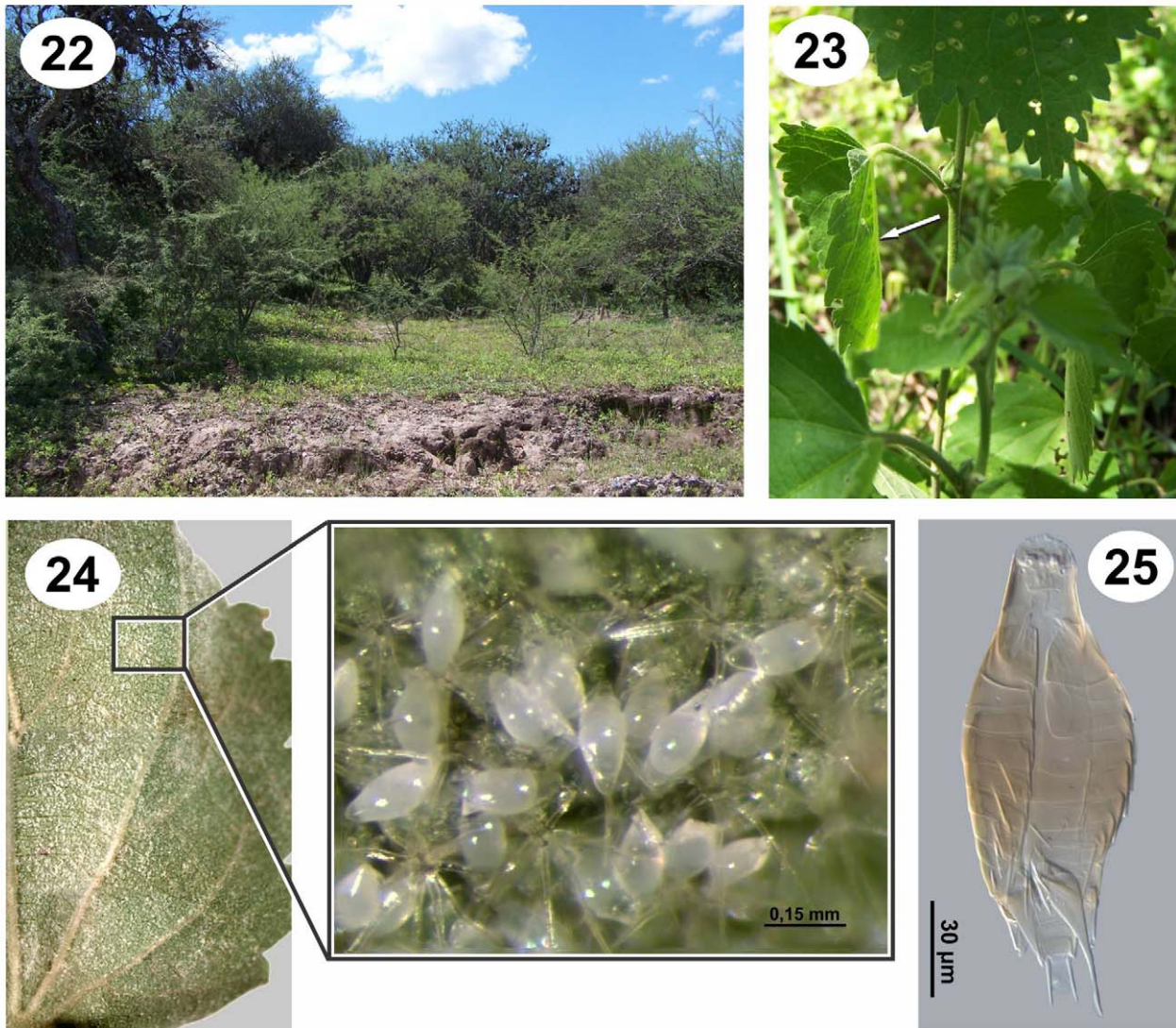
**Diagnosis.** Distinguished from other species by the following combination of characters: face smooth (Fig. 21); scutellar spines stout and bowed medially (Fig. 19); gastral terga bare.

**Female.** Length: 5.2–6.0 mm. Head, mesosoma, coxae and petiole black; flagellum dark brown; femora and scape yellowish-brown, with antennal flagellum beyond basal flagellomere slightly darker and last antennal flagellomeres sometimes light brown (Figs 15, 17). Wings hyaline, venation yellowish to light brown.





**FIGURES 14–21.** *Neolirata* spp. 14, *Neolirata alta*, habitus (female); 15, *N. furcula* sp. nov., habitus and labels (female, holotype); 16, *N. alta*, antenna and head (female, sublateral); 17, *N. furcula*, antenna (female, lateral); 18, *N. alta*, mesosoma (female, dorsal); 19, *N. furcula*, mesosoma (female, dorsal); 20, *N. alta*, head (female, frontal); 21, *N. furcula*, head (female, frontal). cah, callus hairs.



**FIGURES 22–25.** Biology and immature stages of *Neolirata alta*: 22, habitat; 23, *Pseudabutilon virgatum*; 24, underside of leaf of *P. virgatum* with eggs (magnified area with eggs); 25, planidium.

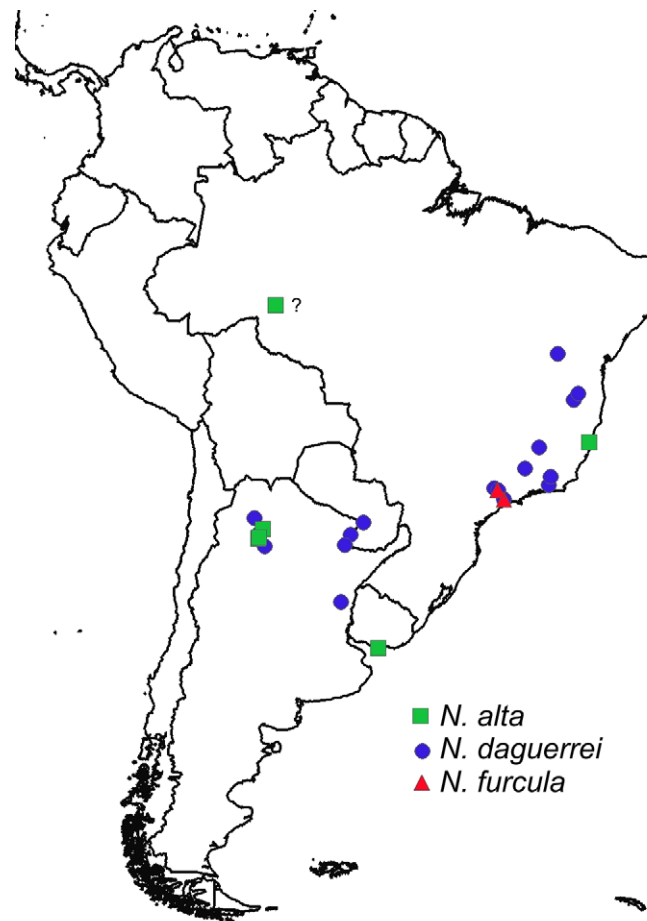
*Head* 1.5–1.7× as broad as high. Face smooth; occipital margin carinate. Eyes separated by 2.2–2.5× their height (Fig. 21); malar space 0.7–0.8× eye height. Labrum with 6 or 7 digits (Fig. 21). Clypeus slightly swollen; supraclypeal area slightly swollen, smooth, and demarcated laterally by shallow sulcus. Maxillary palp 2-segmented, labial palp reduced to a button-like segment. *Antenna* with 12 segments, scape long, smooth, laterally compressed, 3.0–4.0× as long as broad and 0.3–0.4× head height; length of flagellum 1.5–1.7× head height, basal flagellomere 0.8–0.9× length of scape, 3.6–5.0× as long as basal width and 1.6–1.8× as long as next flagellomere; flagellomeres blunt serrate, clava rounded (Fig. 17). *Mesosoma*. Mesoscutum broadly rounded, elevated, and rugose-areolate; mid lobe areolate with irregular transverse striae, side lobes almost smooth with few incomplete striae; mesosoma with scattered erect setae; notauli present only as a weak impression dorsomedially (Fig. 15). Axillae strongly impressed laterally, broadly rounded dorsally; scutellar spines thickened, cylindrical, strongly arched in dorsal view (Fig. 19), 1.0–1.1× as long as mesosoma, with carinae reaching to apex and scattered erect setae; inferior surface of frenum smooth with some carinae directed medially. Propodeal disc slightly swollen, with areolate carinae; callus swollen, irregular carinated, and with a few setae (Fig. 15). Mesepisternum smooth except for weak transverse carinae; upper mesepimeron smooth except for strong carinae. Coxae with scattered setae; metacoxa semiglobose, 1.3–1.4× as long as broad. Metafemur with scattered erect setae. Fore wing 2.5–2.6× as long as broad, stigmal vein 1.0–1.6× as long as broad; postmarginal vein slightly longer than stigmal vein; wing disc with dense short setae.

*Metasoma*. Petiole 1.9–2.4× as long as broad and 1.5–1.7× as long as metacoxa; petiole subcylindrical, flattened dorsally, and with strong or weak longitudinal carinae. Gastral terga bare. Hypopygium with cluster of long hairs apically.

**Male.** Unknown.

**Etymology.** From Latin noun *furcula* which means “fork”, referring to the disposition of the scutellar spines.

**Material examined.** Holotype female: BRAZIL, **São Paulo**: Ipiranga, [23°35'33"S 46°36'30"W], 26.xi.2006, S. M. Torres, UCR\_ENT 00036243 (MZSP). Paratypes: **São Paulo**: Ipiranga, [23°35'33"S 46°36'30"W], 14.i.1907, H. Luederwaldt, UCR\_ENT 00036254 (1 ♀, MZSP); same location, ii.2005, UCR\_ENT 00036244 (1 ♀, MZSP); Campinas, [22°54'17.90"S 47° 3'43.38"W], ii.1924, F.X. Williams, UCRC\_ENT 00309442–449 (8 ♀, BMNH).



**MAP 1.** Distribution of the three species of *Neolirata* gen. nov.

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