
The Male of *Leptothorax wilda* with Notes on the Subgenus *Nesomyrmex* (Formicidae, Hymenoptera)

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Abstract

The male of *Leptothorax wilda* M.R. Smith is described for the first time. The peculiar features of its genitalia appear typical as well in other examined species from the Neotropical and Ethiopian biogeographic regions. Each of the parameres house a large telomerale gland apparently connected to a dentiform process protruding angularly and ventrally from the inner wall of the valve. Possible functions of these structures are hypothesized. The dorso-median part of the basal ring is strongly developed into a protruding plate. These data allied to others, some being already known, significantly contribute to evaluate the taxonomic status of the *Nesomyrmex* species group within the tribe Leptothoracini.

Introduction

The reclassification of the species in the tribe Leptothoracini has been undertaken mainly to establish the natural limits of the constituent genera on a larger and more reliable morphological basis and hence to contribute to the clarification of their phylogenetic relations. This project has been prompted particularly by unexpected and significant morphological discoveries among the males which remain globally not well known in this tribe. Recently released, part one of a planned series of five publications presents, after a general introduction, the taxonomic revision and the biology of the genus *Formicoxenus* in the holarctic region (Francoeur *et al.* 1985).

To honor Dr. George C. Wheeler, a respected myrmecologist on the occasion of his 90th birth anniversary, we offer in this short paper new

and most interesting data on the *Nesomyrmex* male genitalia, together with the description of the male of *Leptothorax wilda*.

Description of the *Leptothorax wilda* Male

This species was originally described by Smith (1943) upon female morphs. The following description of the male is based on seven specimens. One was collected by J. Longino in a colony found in the Santa Anna Wildlife Refuge, Hidalgo Co., Texas (accession no. 11701). The other six, labelled as androtypes, are somewhat callowed; they were obtained in laboratory rearing by Diane E. Wheeler. The mother colony was collected near the type locality, Brownsville, Cameron Co., Texas (accession no. 12501). From the latter set, one specimen is deposited in each of these institutions: Museum of Comparative Zoology, Harvard University, Cambridge, Mass., and the U.S. National Museum, Washington, D.C. The others remain in the senior author's collection.

Body length: 3.21-3.59 mm; other measurements in table 1. In full face view, head rather elongate and subrectangular (fig. 1). Eyes large, convex and protuberant, situated mostly (> 90%) in the anterior half of head, below the anterior ocellus. Three medium size ocelli (0.09-0.11 mm), the posterior ones close to but not reaching the occipital margin in full face view. Antennae long and slender with 12 meres, without distinct club; scape cylindrical, feebly recurved basad, of medium length, equal to first 3.5 funicular meres. Funiculus mere one very short, all others elongated, at least twice as long as broad; length of second over 3.0 times its width, fifth long and incompletely subdivided. Antennal fossae deep and circular.

Cheeks very short. Median part of clypeus raised and well delimited, with an anterior margin entire, thin, arcuate and projecting over the closed mandibles. Palpi: 5, 3. Mandibles triangular with five acute teeth, the apical the largest. Occiput slightly convex with more or less rounded angles. Wing shape as in figure 4; the forewing with a closed marginal (= radial), a long and straight submarginal but no discoidal cells. Alitrunk in lateral view elongated and low, dorsum straight (fig. 3); mesoscutum running into the pronotum through a curved and continuous slope; propodeum angulo-convex, with a circular and distinct spiracle, no spines or carinae; metapleural lobes rather vestigial, low and rounded. The median part of pronotum reduced, much narrower than the lateral parts which are enlarged and regularly shaped. In dorsal view (fig. 2) mesonotum almost reaching the collar; humeri of pronotum angulate; Mayrian furrows reduced, not fused posteriorly; median part of metanotum raised, forming a

transverse rectangular small flat plate. Profile of petiole low and elongate, without peduncle and distinct node, dorsum weakly convex; in dorsal view enlarged medio-laterally with convex sides. Postpetiole broader than long, slightly produced like a fused double bulb; with an antero-ventral angle in side view.

Table 1. Measurements (in mm) and indices of seven *Leptothorax wilda* males.

Variable	Range	Mean	S. D.
Head width	0.51 - 0.56	0.53	0.016
Head length	0.58 - 0.63	0.61	0.015
Scape length	0.33 - 0.37	0.36	0.016
Front width	0.18 - 0.20	0.19	0.010
Front length	0.16 - 0.20	0.17	0.016
Eye diameter	0.28 - 0.30	0.29	0.009
Alitrunk width	0.48 - 0.53	0.50	0.018
Alitrunk length	1.04 - 1.11	1.07	0.026
Cephalic index	85.48 - 89.88	87.53	1.459
Ocular index	50.63 - 59.61	54.54	2.899
Scape index	64.51 - 70.72	66.98	2.073
Front index	86.70 - 120.89	109.97	11.354
Thoracic index	45.85 - 48.91	47.18	1.077

Head, alitrunk, petiole and postpetiole with regular reticulate sculpture, weaker on postero-lateral lobes of pronotum, mesosternum and postpetiole. Gaster smooth and shining. Faint, irregular rugulae on occiput, propodeum and postpetiole. No tubercle on dorsum of body. Sparse fine, erect hairs on vertex, mesonotum, two on the metanotal plate, sternum of postpetiole, and posterior margin of gastric tergites. Pubescence very dilute and irregular. Body yellowish brown to dark brown on fully sclerotized specimens, head darker, appendages and mandibles paler.

Genitalia illustrated in natural position in figures 5-9. Terminology as in Francoeur *et al.* (1985). Basically leptothoraciform; capsule robust; basal ring entire with a dorso-median plate protruding anteriorly; the genital foramen rather vertical; innermost and median valves equal, shorter than parameres; spatha large. Paramere short; basitelsonal suture weakly sclerotized posteriorly; distal end of telomere distinctly set off and clasperlike in ventral view, housing an internal gland ap-

parently connected to an acute dentiform process protruding angularly and ventrally from the internal wall of the valve. General shape of volsella rectangular with a straight dorsal margin; calx and cuspis largely rounded, not separated by an angle; digitus long, with a dorso-largely rounded, not separated by an angle; apodeme produced upward through an acute angle; dorsal margin angulo-convex; ventral margin dentate except for a basal short sector shifted before the first tooth. Subgenital plate with large lateral wings, apical end triangular; socii short and globular. Abdominal sternite VIII with two separated bundles of hair.

As compared with those of *L. wilda*, the main differences of the *Leptothorax asper* male genital armature (fig. 12-18) are: a longer penis valve with a ventral margin having a greater number of teeth, the first tooth positioned at the level of the apodeme base due to a more vertical inermous basal sector, and a more slender volsella. Also the abdominal sternite VIII exhibits a more abundant and continuous pilosity on its apical margin.

Associated with the peculiar development of the ventral face of the telomeres, the position of the telomerical glands led us to hypothesize that they play a role during the copulation. A better covering and holding of the female genitalia by the telomeres, added to the production of a viscous or sticky secretion, would provide a more stable contact between the terminalia of the couple. This may increase the duration of the mating and/or ensure a more favorable environment for the sperm transfer. We cannot speculate further because we do not know the condition in which those species mate. Our readings reveal nothing about special glands in the parameres of other groups of Hymenoptera. On the other hand, Torre-Bueno (1950) mention for the Ephemeroptera the presence of mating glands: "large unicellular globular gland embedded in the hypodermal layer of the male forceps". In some Coenagrionidae (Odonata) the claspers of the male appear to be cemented to a dorsal lobe of the pronotum of the female by a sticky secretion; the origin of this secretion is not clearly determined (Chapman 1982). We are still looking for living material to further study this question in *Nesomyrmex*.

Some Characters of the *Nesomyrmex* Species

From the males:

Until now the male of seven other species have been examined: *asper* (dissected), *echinatinodis*, *itinerans*, *pleuriticus*, and *spininodus* (dissected) from the Neotropical region (as revised by Kempf 1959), *angu-*

latus (dissected, fig. 19-20), and sp. (dissected, Madagascar) from the Ethiopian region.

The general habitus of the *Nesomyrmex* male remains rather different when compared with those of the other subgenera of *Leptothorax* (*sensu lato*). The head is elongate-rectangular with the eyes situated in a distinctly more anterior position. The alitrunk is slender in profile due to a lower and more compact mesonotum and flattened sides. The reduction of the median part of pronotum and angulate humeri are peculiar as well as its stronger relation with the mesothorax. The antennae are either long with cylindrical funicular meres, as those of the *Leptothorax* species (*sensu stricto*, see Francoeur *et al.* 1985) or shorter with compact funicular meres, like in the *Myrafant* species. However the scape of both types, compared to the one of *Leptothorax* (*s.s.*) males, is longer and slender, and its base is never bulbous. The petiole is not pedunculate. Marginal cell of anterior wings remain closed. The mandibles are triangular and dentate like those of *Myrafant*.

The genitalia present a set of features meaningfully singular among the *Leptothorax* (*s.l.*). Distinctive characters are: the existence in the telomere of an inner gland and of a protruding process from the inner lateral wall of the paramere; the large and rounded cuspis running towards the calx without angle in the volsella; the basic shape of the penis valve with an inermous shifted sector preceding the dentate part of its ventral margin; the protruding dorso-median plate of the basal ring. The shape and length of parameres are intermediate between leptothoraciform and myrafantiform types. The volsellae are basically related to the former, while the socii are similar to the latter. Within the true *Leptothoracines* the three genital valves of the *Nesomyrmex* species are the closest to those of the *Myrmica* male.

This original blend of characters is also encountered with particularities of its own in the genus *Cardiocondyla*. We have noted a reduced telomerical gland associated to a longer and ventrally protruding telomerical process in *C. sp.* (from Java) and *C. wroughtonii* (from Florida). Such a telomerical tooth was reported by Reiskind (1965) for *C.* (= *Prosopidris*) *papuana*, but not observed by Kugler (1983). By their male terminalia (and other male and female traits not discussed here) these two species units appear more closely related than *Leptothorax* (*s.s.*) is to *Nesomyrmex*.

From the females:

The morphologically fully developed female or gyne shows a pronotum with a reduced median part and angulate or even dentate humeri as in the male. The alitrunk is long and narrow, flattened above

and on the sides, like *Leptothorax* (s.s.) species. Anterior wings with a closed marginal, a long and straight submarginal, but no discoidal cells.

The less developed female or ergate has a shouldered pronotum, with distinct anterior angles, which are often sharp, sometimes toothed.

In both forms the eyes are positioned nearer the apex of head. The anterior border of clypeus is thin, convex or arcuate, and projecting over the mandibles. The number of teeth in mandibles is typically five as for *Myrafant* species, while it is six in *Leptothorax* (s.s.). The antennae have 11 or 12 meres. The dorsum of body is variously adorned with points, verrucous or spiniform prominences supporting hairs.

From the larvae :

G.C. and J. Wheeler (1955, 1976) characterized the *Nesomyrmex* larvae as pogonomymecioid like those of *Leptothorax* (s.s.). They are either pheidoloid or crematogastroid in the other subgenera of *Leptothorax* (s.l.). These differences offer unused clues to clarify generic limits, and establish higher taxonomic units. Interestingly the genus *Cardiocondyla* has pheidoloid larvae.

Conclusions

The *Nesomyrmex* species exhibit an interesting set of morphological characters which appears as a mixture of leptothoraciform and myrafantiform features, together with primitive and advanced characteristics of their own. The male genitalia while closest to the *Myrmica* type share peculiar features with the *Cardiocondyla* male armature. As a distinct unit, *Nesomyrmex* probably have a basic importance to understand the phylogenetic relations within the tribe. It already cannot be assimilated or ever be confused with the *Leptothorax* and *Myrafant* when these are rightly emended. When compiled the similarities appear greater with the former.

Though our survey of the tribe is not yet completed, all the distinct features encountered suggest strongly to give *Nesomyrmex* a full generic status within the new frame we are developing for the tribe from a larger and renewed morphological basis. The synonymy to *Leptothorax* (sensu lato) by Bolton (1982) was proposed without a full morphological analysis and after a traditional usage which failed to separate or unveil characters pertaining to species group, genus, and subtribe levels in this case. The problem is beyond the scope of this note, but will be dealt with in part 2 of our revisionary series on the tribe Leptothoracini.

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Literature Cited

Bolton, B.

- 1982 Afrotropical species of the myrmicine ant genera *Cardiocondyla*, *Leptothorax*, *Melissoptarsus*, *Messor* and *Cataulacus* (Formicidae). Bull. British Mus. Nat. Hist. (Entomol.) 45 (4): 307-370.

Chapman, R.F.

- 1982 The Insects, structure and function. Harvard Univ. Press, Cambridge, Mass. 919 p.

Francoeur, A., R. Loiselle et A. Buschinger.

- 1985 Biosystématique de la tribu Leptothoracini (Formicidae, Hymenoptera) 1. Le genre *Formicoxenus* dans la région holarctique. Naturaliste can. 112: 343-403.

Kempf, W.W.

- 1959 A synopsis of the New World species belonging to the *Nesomyrmex* group of the ant genus *Leptothorax* Mayr (Hymenoptera: Formicidae). Studia Entomol. 2(1-4): 391-432.

Kugler, J.

- 1983 The males of *Cardiocondyla* Emery (Hymenoptera: Formicidae) with the description of the winged male of *Cardiocondyla wroughtonii* (Forel). Israel J. Entomol. 17: 1-21.

Reiskind, J.

- 1965 A revision of the ant tribe Cardiocondylini (Hymenoptera, Formicidae). 1. The genus *Prosopidris* Wheeler. Psyche 72 (1): 79-86.

Smith, M.R.

- 1943 The first record of *Leptothorax*, subgenus *Goniothorax* Emery in the United States, with the description of a new species (Hymenoptera: Formicidae). Proc. Entomol. Soc. Washington 45 (6): 154-156.

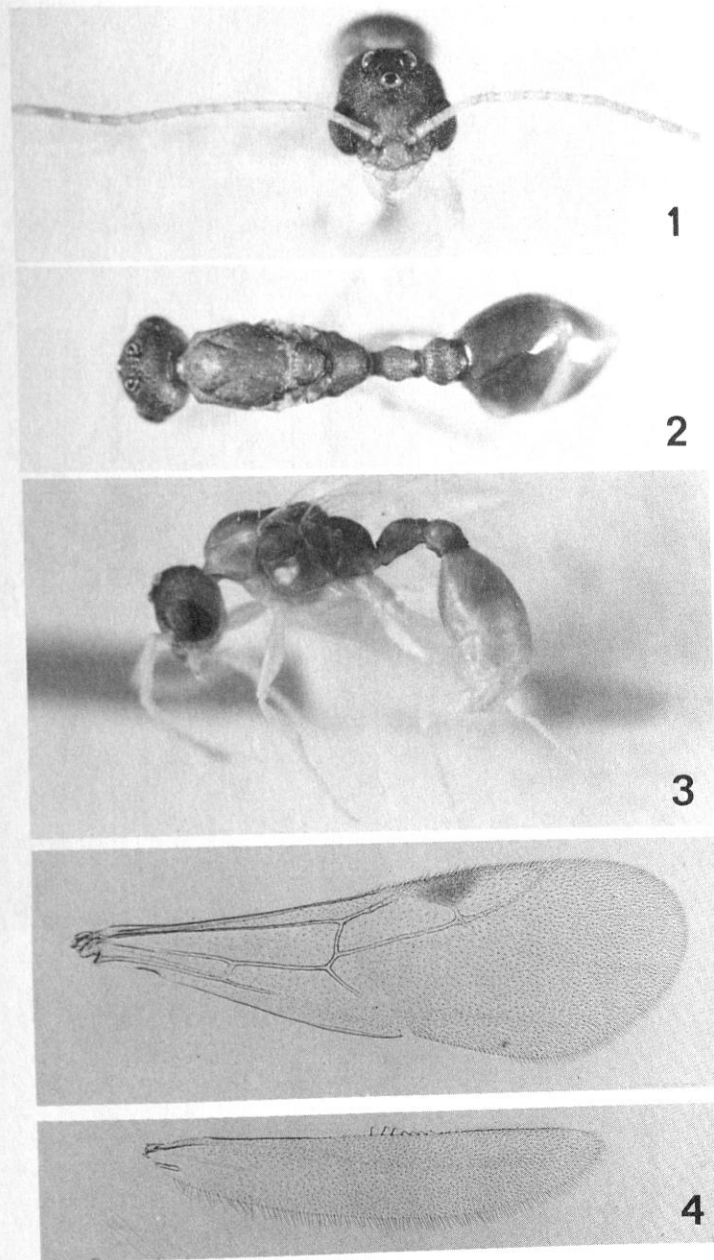
Torre-Bueno, J.R. de la,

1950 A glossary of Entomology. Brooklyn Entomol. Soc., Brooklyn, N.Y. 336 p.

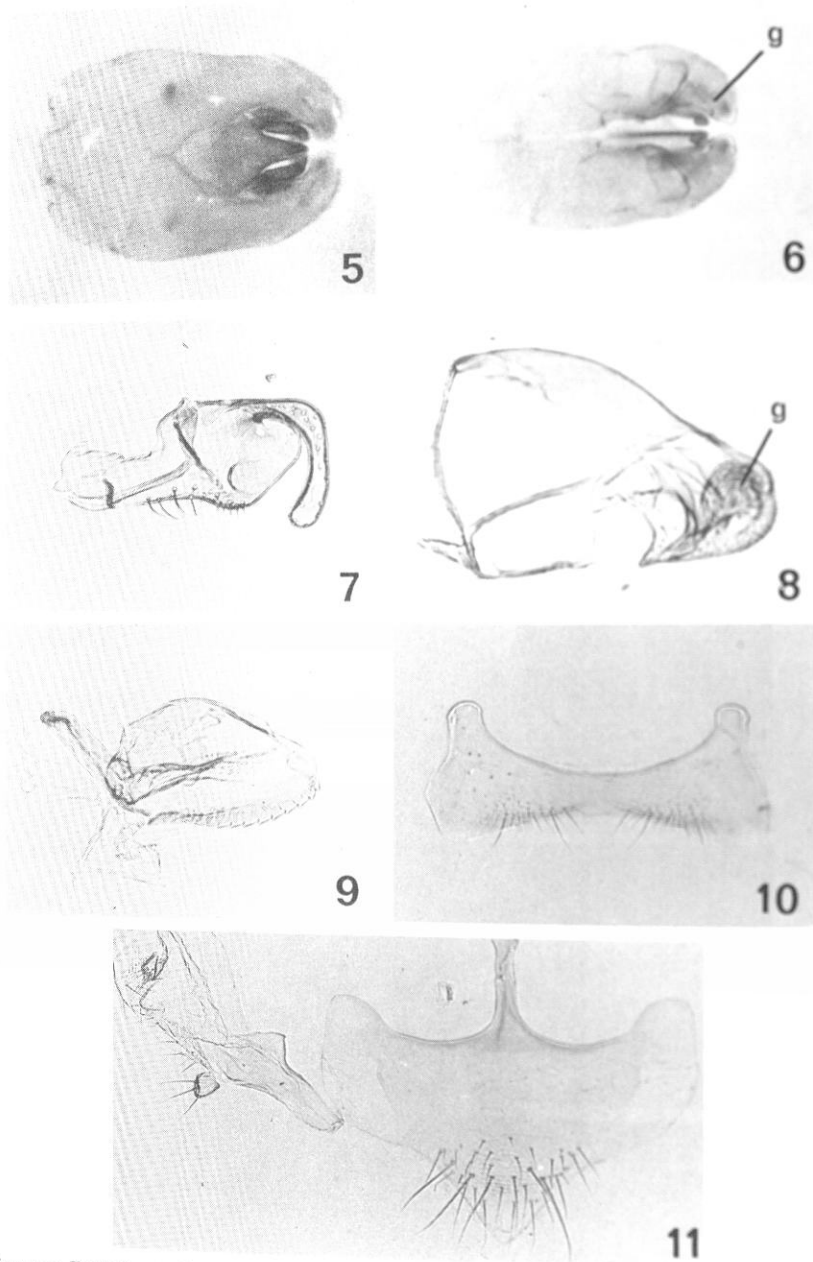
Wheeler, G.C. & J. Wheeler.

1955 The ant larvae of the Myrmicine tribe Leptothoracini. Ann. Entomol. Soc. Am. 48 (1-2): 17-29.

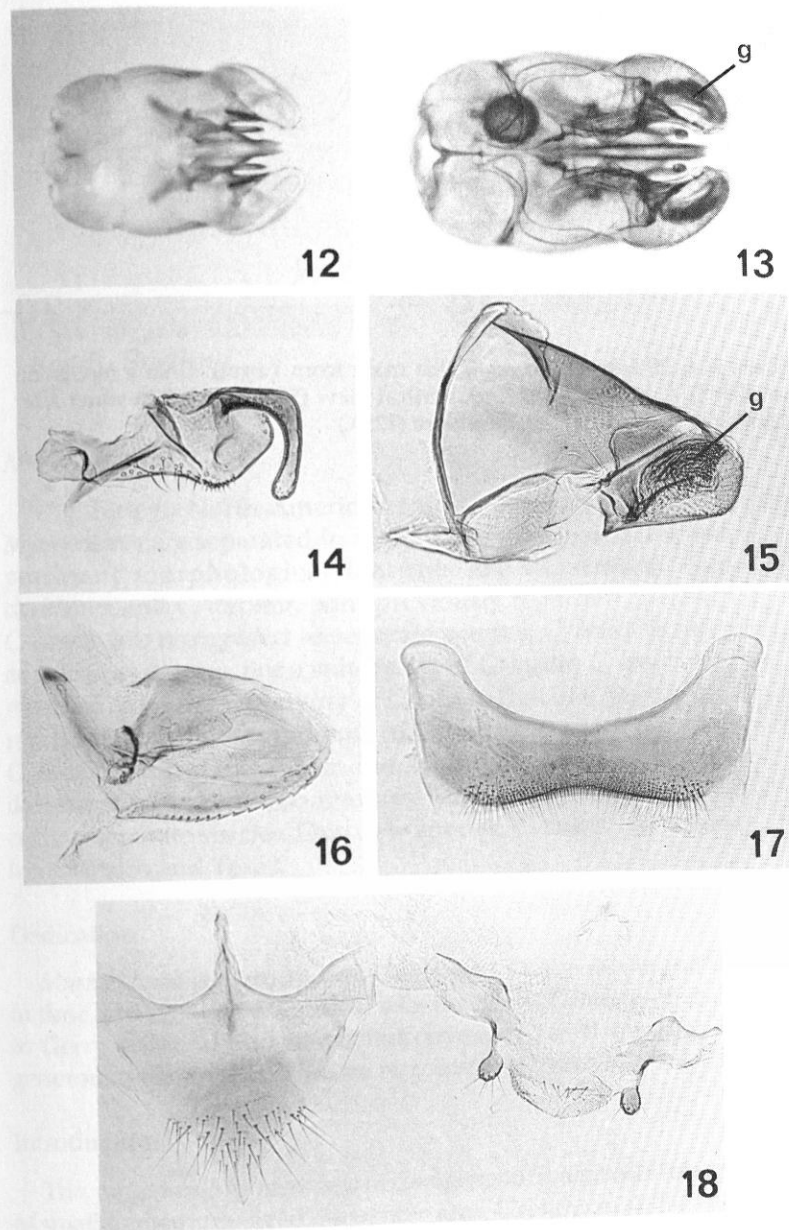
1976 Ant larvae: review and synthesis. Memoirs Entomol. Soc. Washington no. 7. 108 p.



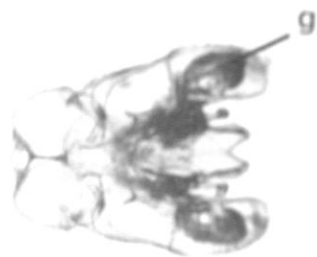
Figures 1-4. *Leptothorax wilda* male from the vicinity of Brownsville, Texas. 1. Head in full face view (30X). 2. Dorsal view of body (25X). 3. Lateral view of body (22X). 4. Anterior and posterior right wings (50X).



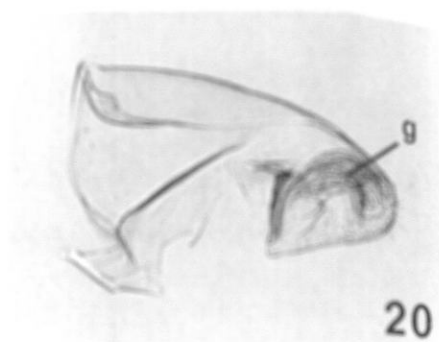
Figures 5-11. *Leptothorax wilda* male from Santa Anna Wildlife Refuge, Texas. Genital capsule: 5. dorsal view (50X); 6. ventral view (50X). Genitalia: 7. volsella (160X); 8. paramere (125X); 9. penis valve (160X); 11. socii and subgenital plate (160X). 10. Abdominal sternite VIII (125X). Telomerous gland: g.



Figures 12-18. *Leptothorax asper* male from Caracas, Venezuela (accession no. 12407). Genital capsule: 12. dorsal view (50X); 13. ventral view (64X; air bubble at the base of the left paramere). Genitalia: 14. volsella (160X); 15. paramere (125X); 16. penis valve (160X); 18. subgenital plate and socii (125X). 17. Abdominal sternite VIII (125X).



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Figures 19 & 20. *Leptothorax angulatus* male from Legon, Ghana (accession no. 12408). Genital capsule: 19. ventral view (50X; swollen in water after clearing in KOH 10%). 20. Paramere (125X).