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## Rediscovery of two African species of *Lachesilla* Westwood in Yemen (Psocodea: 'Psocoptera': Lachesillidae), with first description of their males and description of a new species

## Redescubrimiento de dos especies africanas de *Lachesilla* Westwood en Yemen (Psocodea: 'Psocoptera': Lachesillidae), con la primera descripción de sus machos y descripción de una especie nueva

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### ABSTRACT

*Lachesilla anura* Badonnel and *L. grandis* Badonnel are recorded from Yemen and both sexes are illustrated based on this newly-studied material. Males of these species were previously unknown. A male specimen described and tentatively assigned to *L. anura* by Badonnel is herein described as *Lachesilla guineensis* Lienhard, n. sp. The female genitalia of *L. anura* are unique in the genus *Lachesilla* Westwood, especially due to the complete absence of gonapophyses and the presence of particularly complex sclerotizations surrounding the spermapore.

**Key words:** Taxonomy, new species, female genitalia, Mozambique, Guinea.

### RESUMEN

*Lachesilla anura* Badonnel y *L. grandis* Badonnel se registran para Yemen y se ilustran ambos sexos con base en material recientemente estudiado. Los machos de ambas especies eran desconocidos. Un espécimen macho determinado previamente como *L. anura* por Bodonnel, en este trabajo se describe como *Lachesilla guineensis* Lienhard, n. sp. La genitalia femenina de *L. anura* es única en el género *Lachesilla* Westwood, debido especialmente a la completa ausencia de gonapofisis y a la presencia de esclerotizaciones particulares que rodean al espermaporo.

**Key words:** Taxonomy, new species, female genitalia, Mozambique, Guinea.

The psocid genus *Lachesilla* Westwood (Psocodea: Psocomorpha: Lachesillidae) is very species-rich (about 350 described species) and has a worldwide distribution (Lienhard and Smithers 2002; Lienhard 2016a, 2016b and 2012-2020). A phylogenetic analysis of this large genus was recently published by Saenz Manchola *et al.* (2019). These authors showed that the morphology of male genitalia is particularly important for defining subgroups within the genus.

The rediscovery, in a psocid collection from Yemen, of two African species (*L. anura* Badonnel and *L. grandis* Badonnel) described by Badonnel (1931) in one of his first papers on psocids, each based on a single female from Mozambique, allows me to describe their males for the first time and to present some additional figures for the females. Each of these species can now be assigned to one of the established species groups.

In his paper on the psocids of French Guinea, Badonnel tentatively assigned a male to *L. anura*, giving a detailed description of this specimen (Badonnel 1948). The association of both sexes in the new *L. anura* material from Yemen showed that Badonnel's male does not belong to this species. This specimen is deposited in the Psocoptera collection of the Geneva Natural History Museum and becomes now the holotype of a new species described below.

### MATERIAL AND METHODS

The material examined is deposited in the Muséum d'histoire naturelle, Geneva, Switzerland (MHNG). Dissection and slide mounting followed the methods described by Lienhard (1998). Measurements are indicated in mm

(BL, FW) or  $\mu\text{m}$  (F, T, t1, t2).

Abbreviations used in the description: BL = body length (in alcohol); F = metafemur (length); FW = forewing (length); IO/D = shortest distance between compound eyes divided by longitudinal diameter of compound eye in dorsal view of head; T = metatibia (length); t1, t2 = tarsomeres of metatarsus (length, measured from condyle to condyle). Abbreviations of wing veins and cells follow Yoshizawa (2005).

### RESULTS AND DISCUSSION

Family Lachesillidae Karny  
Genus *Lachesilla* Westwood  
*Lachesilla grandis* Badonnel, 1931  
(Fig. 1A-F)

*Lachesilla grandis* Badonnel, 1931: 240 (female)

**Diagnosis.** The species belongs to the *forcepeta* species group according to the group diagnosis given by Mockford (1993); within this group it is characterized by details of the morphology of its terminalia.

**Description of the male.** Head and thorax yellowish brown, vertex with some slightly darker patches, compound eyes black, antennae pale brown. Wing membranes hyaline, legs pale brown. Abdomen whitish, laterally with weakly developed red brown hypodermal annulation, terminalia yellowish brown to medium brown, tips of sclerotized processes dark brown.

Ocelli well developed, dorsal margin of postclypeus regularly rounded, lacking an indentation in front of the median ocellus. Pulvillus enlarged and membranous along

its whole length (Fig. 1C). Forewing venation as in Fig. 1D. Terminalia (Fig. 1EF): clunium simple, lacking processes; epiproct with a short medio-dorsal process bearing some sclerotized papillae; paraproct simple, lacking posterior process; hypandrium posteriorly with a sickle-shaped sclerotized frame and a rounded medio-distal lobe closely associated to the phallosome; claspers laterally separated from hypandrium, strongly curved, in the apical half with a narrowly rounded lobe and two strongly sclerotized pointed processes; phallosome a simple apically bifurcated rod.

**Measurements.** Male from Yemen (slide no. 7463): BL 1.74; FW 2.0; F 386; T 750; t1 243; t2 101; IO/D 1.94.

**Description of the female.** See Badonnel (1931: 240-241, figs 12-13), with the following complements based on the specimens from Yemen and re-examination of the holotype.

Coloration and general morphology as in male. Wing membrane hyaline; the weak pigmentation along some veins in the apical half of the female forewing mentioned by Badonnel (1931: fig. 12) is almost invisible in the Yemen females. Terminalia (Fig. 1AB): clunium, epiproct and paraprocts simple; subgenital plate weakly sclerotized, with a pair of latero-distal lobes, bearing a very subtle scale-like sculpture, and a large internal sclerotized area; external gonapophysis well-developed, pilose in distal half and broadly rounded; spermapore plate largely membranous, with a pair of large brown patches posteriorly and a pair of small patches laterally near anterior angle of clunium, spermapore with a narrow sclerotized rim.

**Measurements.** Female holotype (measured for this study): FW 2.3; T 832; t1 243; t2 112. Female from Yemen (slide no. 7593): BL 2.0; FW 2.2; F 442; T 874; t1 265; t2 112; IO/D 1.85.

**Material examined.** Holotype female (MHNG), dissected and slide-mounted by Badonnel (two slides containing terminalia, 1 forewing, 1 hindwing, 1 metatibia and tarsus; rest of specimen lost); MOZAMBIQUE: Chimoio [1928 or 1929?], leg. P. Lesne.

YEMEN (MHNG): 1 male, between Taiz and Ar Rahidah, 14.iii.1993, leg. A. van Harten; 1 female, Al Lahima, in Malaise trap, 1.i-9.iv.2001, leg. A. van Harten; 1 male, Al Lahima, in Malaise trap, 9.iv-5.vi.2001, leg. A. van Harten; 1 female, Ar Rujum, in Malaise trap, 9.iv-5.vi.2001, leg. A. van Harten; 1 female, Ta'izz, in light trap, x.2001, leg. A. van Harten & A. R. Al Yarimi.

**Distribution.** Mozambique (type locality), Nigeria (one female tentatively assigned to *L. grandis* by New, 1973), Yemen (see above).

**Etymology.** From Latin «grandis» (large), because this species belongs to the largest species in the genus *Lachesilla*.

*Lachesilla anura* Badonnel, 1931  
(Fig. 2A-H)

*Lachesilla anura* Badonnel, 1931: 242 (female)

**Diagnosis.** The species belongs to the *pedicularia* species group according to the group diagnosis given by Mockford (1993); within this group it is characterized by its highly apomorphic genitalia, especially in the female (see remarks, below).

**Description of the male.** Head and thorax medium brown, compound eyes black, antennae pale brown. Fo-

rewing membrane almost hyaline, only pterostigma distally with some dark brown pigment along distal portion of vein R<sub>1</sub>, hindwing membrane hyaline, legs pale brown. Abdomen with some red brown hypodermal pigmentation, terminalia dark brown.

Ocelli well developed, dorsal margin of postclypeus clearly notched in front of median ocellus (Fig. 2D). Pulvillus setiform, with a slightly enlarged tip. Forewing venation as in Fig. 2A. Terminalia (Fig. 2E-H): clunium dorsally with two posterior processes on each side, one of them short and medially directed, the other one much longer and posteriorly directed; epiproct with a pair of short and slightly denticulate pointed processes; paraproct with a well-developed posterior process; hypandrium with a dorso-medial lobe ending in a pointed process; claspers basally fused with hypandrium, posteriorly ending in a straight pointed process similar to the hypandrial process; phallosome reduced to a simple «lacinia-shaped» rod bearing an oval hole in distal half, apical one third slightly thicker than basal two thirds.

**Measurements.** Male from Yemen (slide no. 7487): BL 1.3; FW 1.6; F 290; T 560; t1 168; t2 99; IO/D 2.3.

**Description of the female.** See Badonnel (1931: 242-243, fig. 14), with the following complements based on the specimens from Yemen and re-examination of the holotype.

Coloration and general morphology as in male, but forewing membrane distally with dark pigmentation along most vein branches and in cell cup (Fig. 2A), according to Badonnel (1931: fig. 14) also in cell a1. Terminalia (Fig. 2BC): clunium, epiproct and paraprocts simple; subgenital plate well-sclerotized, subdivided by a hyaline transversal membrane into a distally rounded narrow apical lobe and a large basal part; gonapophyses completely absent; spermapore plate with complex membranous and sclerotized structures surrounding the spermapore and, on each side near posterior angle of clunium, two weakly sclerotized tiny patches (muscle insertions?).

**Measurements.** Female from Yemen (slide no. 7488): BL 1.4; FW 1.5; F 280; T 550; t1 160; t2 99; IO/D 2.6.

**Material examined.** Holotype female (MHNG), dissected and slide-mounted by Badonnel (only terminalia in slide, rest of specimen lost); MOZAMBIQUE: surroundings of Chemba, Mai [1928 or 1929?], leg. P. Lesne.

YEMEN (MHNG): 1 female, Wadi Mauka'a (Taiz), 18.ii.1992, leg. M. Mahyoub; 1 female, between Taiz and Ar Rahidah, Wadi Warazan, 22.iii.1992, leg. A. van Harten; 1 male, Ta'izz, in light trap, 5.i-2.ii.1998, leg. A. van Harten & Ahmed Ahwad; 1 male and 5 females, Al Kadan, in light trap, v.2002, leg. A. van Harten & T. Abdul-Haq; 1 male, Ta'izz, in light trap, vi.2002, leg. A. van Harten & A. R. Al Yarimi; 1 male, Al Kadan, in light trap, i.2003, leg. A. van Harten & T. Abdul-Haq.

**Distribution.** Mozambique (type locality) and Yemen (see above).

**Etymology.** From Greek «oura» (tail, appendage) and «an-» (negative), making allusion to the absence of an ovipositor, a character already considered as particularly interesting by Badonnel (1931: 242).

**Remarks.** *L. anura* is herein tentatively assigned to the *pedicularia* species group according to the group diagnosis given by Mockford (1993). However, several characters observed in this species seem to be unique not only in this species group but in the whole genus *Lachesilla*. The fe-

male genitalia are unique due to the complete absence of gonapophyses, the presence of particularly complex sclerotizations of the spermapore plate and the separation of a narrow apical lobe of the subgenital plate from its main body by a hyaline transversal membrane. The phallosome of *L. anura* is a simple apically truncate rod; it appears to be more simplified than in any other species of the genus (see figures in Saenz Manchola *et al.* 2019), and the presence of an oval hole in its distal half seems to be unique in the genus. The distinctly notched dorsal margin of the postclypeus is also very unusual in *Lachesilla* (notch present in both sexes, see Fig. 2D). In general, this margin is regularly rounded, slightly flattened or only very shallowly indented in this genus. Despite these striking autapomorphies, the definition of a new species group for *L. anura* would clearly be premature. However, the completely reduced ovipositor and the specialized subgenital plate, spermapore plate and phallosome may be indications of an unusual reproductive biology in this species.

In his paper on the psocids of French Guinea, Badonnel (1948) tentatively assigned a male to *L. anura* giving a detailed description of this specimen. The association of both sexes in the new *L. anura* material from Yemen showed that Badonnel's male does not belong to this species but represents an undescribed species of the *forcepeta* species group. This new species is described below.

*Lachesilla guineensis* Lienhard, n. sp.  
<http://zoobank.org/A0BA9275-B4F8-41E9-A130-EF4AD6936757>

«*Lachesilla anura* (?)» [misidentification]; Badonnel, 1948: 85 (male)

**Diagnosis** (based on the male, female not known). Differing from *L. anura* by the absence of paraproctal and clunial processes and by the claspers largely separated from the main body of the hypandrium. In *L. guineensis*, n. sp. the apex of the hypandrium is membranous, while in *L. anura* it bears a heavily sclerotized pointed process. The pulvillus of *L. guineensis*, n. sp. is enlarged and membranous, whereas in *L. anura* it is setiform, with a weakly enlarged tip. According to the species group diagnoses given by Mockford (1993) this species belongs to the *forcepeta* group, within this group it is characterized by details of the morphology of its terminalia.

**Description of the male.** See Badonnel (1948: 85-86, figs 8-11), with the following complements. Pretarsal claws with an enlarged membranous pulvillus (as figured above for *L. grandis*, Fig. 1C). Clunium and paraproct simple, lacking processes. Epiproct with a pair of short, apically rounded and slightly granulate postero-lateral processes. Distal part of hypandrium membranous, closely associated to the weakly sclerotized and deeply bifurcate apical part of the phallosome. Claspers only antero-laterally jointed to the main body of the hypandrium, sickle-shaped, with pointed apex, lacking secondary lobes or processes.

**Measurements.** Male holotype (measured for this study): FW 1.6 (1.5 according to Badonnel 1948); F 350; T 610 (erroneously indicated as 1.5 mm by Badonnel 1948); t1 166; t2 97.

**Holotype.** Male (MHNG), GUINEA, Mont Nimba, B<sub>1</sub>, 32, Ravin 2, 9.ii.1942, 1500m, M. Tô, leg. M. Lamotte.

**Distribution.** Guinea (type locality).

**Etymology.** Type locality situated in Guinea (West Africa).

**Remarks.** The holotype of this species was dissected and slide-mounted by Badonnel. The slide contains the following parts of the specimen: terminalia, right forewing, right hindwing, 1 hind leg, 1 antenna (lacking the apical three flagellomeres), 1 mandible, 1 maxillary palpus. The remaining parts of the holotype are lost. The slide bears Badonnel's hand-written label with the never published, thus unavailable name «*Lachesilla guineensis* Badonnel» (written in ink) and the subsequently added remark «*anura?*» (written with pencil). This «collection name» was finally rejected by Badonnel when tentatively assigning this male to *L. anura* (Badonnel 1948: 85).

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I dedicate this paper to my colleague and friend Alfonso N. García Aldrete, the world's authority for the psocid genus *Lachesilla*, whom I met for the first time in Paris in November 1981 when we both were working in André Badonnel's lab at the Muséum National d'Histoire Naturelle. The material examined for this study is a very small part of Antonius van Harten's Psocoptera collection from Yemen deposited at the Geneva Natural History Museum. In the name of the Museum and of the scientific community I am extremely grateful to him for having collected numerous psocids in different parts of the world and depositing them in this institution. I also thank John Hollier for checking my English.

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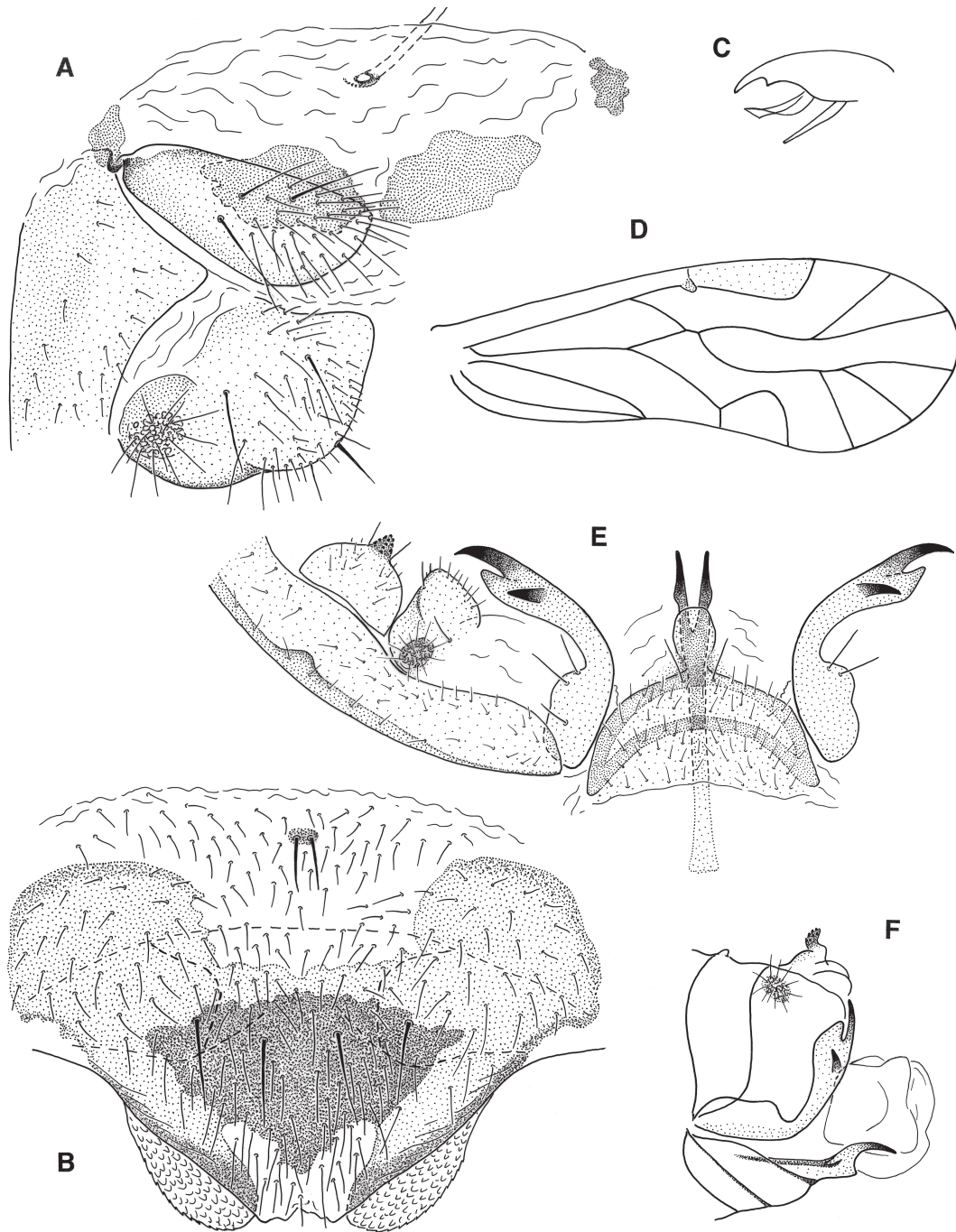


Figure 1. *Lachesilla grandis* Badonnel. A-B: Female (from Yemen). C-F: Male (from Yemen). A. Right paraproct, right gonapophysis, ventro-lateral part of clunium, spermapore plate with distal part of spermathecal duct. B. Subgenital plate. C. Pretarsal claw of metatarsus. D. Forewing. E. Clunium, epiproct, left paraproct, claspers, hypandrium and phallosome (interrupted line, evaginated endophallic membrane not shown). F. Abdominal apex (schematic, in lateral view, endophallic membrane evaginated).

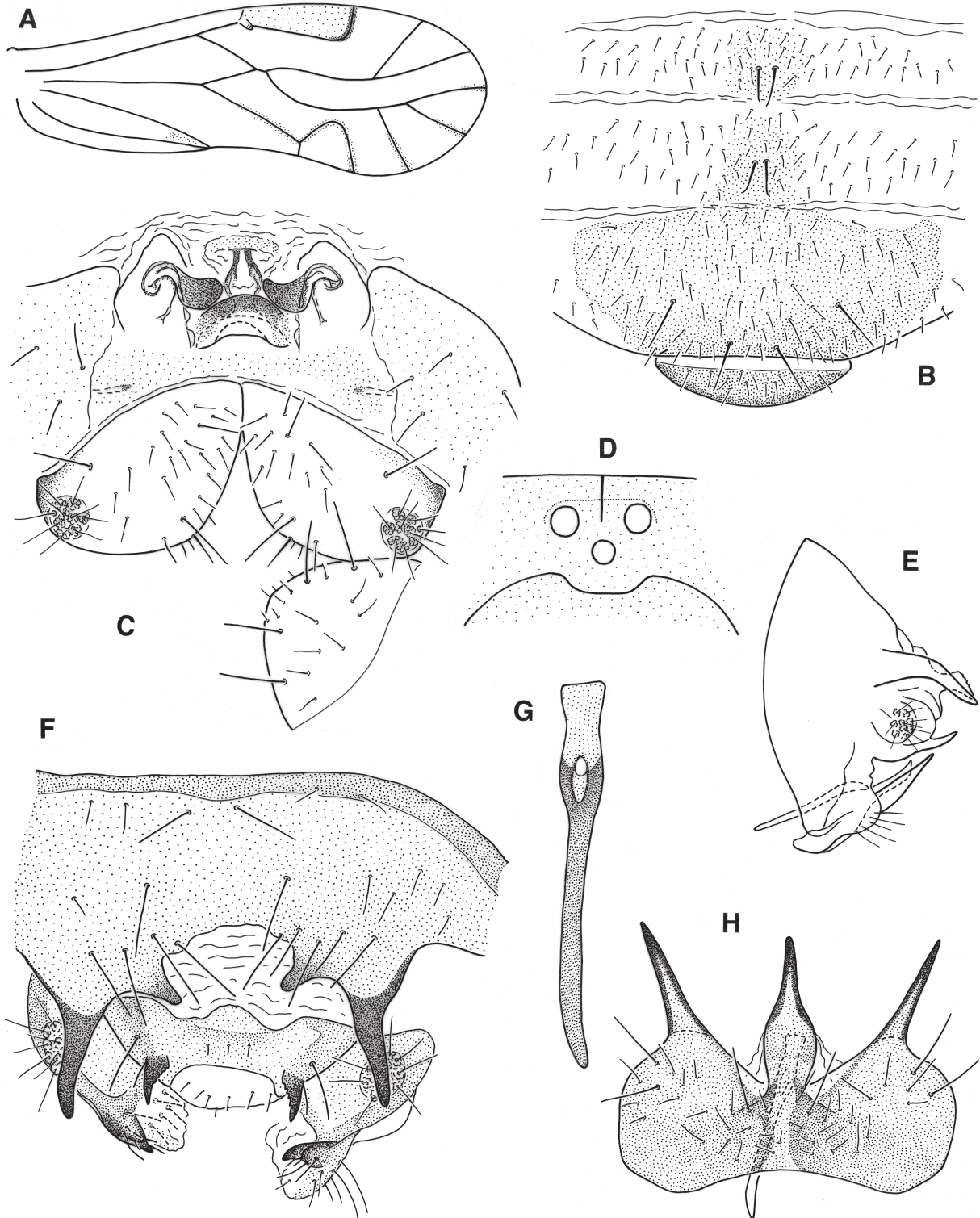


Figure 2. *Lachesilla anura* Badonnel. A-D: Female (from Yemen). E-H: Male (from Yemen). A. Forewing. B. Subgenital plate and sternites of abdominal apex. C. Epiproct, paraprocts, ventro-lateral parts of clunium and spermapore plate. D. Median part of vertex, ocellar region and dorsal margin of postclypeus (frontal view). E. Abdominal apex (schematic, in lateral view). F. Median part of clunium, epiproct and paraprocts (dorsal view). G. Phallosome. H. Hypandrium, claspers and phallosome (interrupted line).