325

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Systematic Analysis of Afrotropical *Newsteadia* (Hemiptera, Coccoidea: Ortheziidae) with Descriptions of Nine New Species

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Adult females of nine new species of *Newsteadia* ortheziids are described and detailed redescriptions are provided for the four species previously known from the Afrotropical Region including *N. gomyi* Richard, *N. mauritiana* Mamet, *N. montana* Mamet and *N. wacri* Strickland. A key is presented for the 13 species known to occur in the area and a detailed discussion is presented on the homology of the wax plates that cover the body of these fascinating scale insects.

Keywords: Africa, scale insect, ensign scales, quarantine.

This is the eighth paper in a series (Kozár 1998, Kozár and Konczné Benedicty, 1999, 1999a and 2000; Kozár and Foldi, 2000; Kozár and Miller, 2000; Kozár and Konczné Benedicty, 2001) resulting from examination of a rich collection of ortheziids taken from soil samples around the World. J. Balogh and S. Mahunka had the foresight to implement a program to sample the soils in every zoogeographical region using primarily Berlese funnels (Mahunka and Mahunka-Papp, 1992) and most of the specimens included in the present paper resulted from this program. Although Mahunka's intent was to collect mites, he also collected a wealth of specimens of previously unknown or poorly characterized species of ortheziids.

The genus *Newsteadia* comprises 15 species in the Australian and Pacific Regions (Kozár and Konczné Benedicty, 2000); 8 in the Oriental and Palaearctic Regions (Kozár and Konczné Benedicty, 1999); 13 in the Afrotropical Region; 10 in the Neotropical Region (Morrison, 1952; Kozár and Konczné Benedicty, 2001); and 3 from the Nearctic Region (Morrison, 1952; Howell, 1975). Thus the number of species (including 2 fossil species) in the genus *Newsteadia* is 48.

The purpose of the present paper is to provide a systematic analysis of *Newsteadia* species that occur in the Afrotropical Region. Because many species of this family are plant feeders and are intercepted at ports-of-entry in many countries, including the United States and Hungary, it is important to know the identities of as many species as possible. Invasive species could become established from nearly any place in the World making it crucial to know as much as possible about their classification, distribution and behavior.

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Materials and Methods

The insects studied were prepared on microscope slides or are preserved in alcohol and are deposited in the following collections: The Natural History Museum, London (BMNH); Muséum National d'Histoire Naturelle, Paris (MNHN); Plant Protection Institute, Hungarian Academy of Sciences, Budapest (PPI); South African National Collection of Insects, Pretoria (SANC) and National Museum of Natural History, Washington, D.C. (USNM). All holotypes of new species are deposited in PPI. Measurements and numbers are from ten specimens when available, and are given as a range followed by the average in parentheses.

We have used the terminology as presented by Kozár and Miller (2000) with a few exceptions as explained below. Several species of *Newsteadia* have unique arrangements of wax plates over the body, but these differences are sometimes difficult to describe. In Kozár and Miller (2000) we developed a numbering a system to designate the wax plates that we hypothesized as homologous. It is unfortunate that the first group that we studied *(Ortheziola)* appears to be the most derived of the ortheziids (Kozár and Miller, 2000). In *Ortheziola,* many of the abdominal wax plates have apparently become fused and were given a single designation of number 7. After studying many other ortheziids, it is obvious that wax plate 7 is comprised of several separate plates. To conform to the terminology of the earlier paper, we have maintained the designation of number 7 for these plates but have given them individual letter designations. Thus, the anterior-most plate is 7a and the posterior one is 7g. To further complicate matters, in *Newsteadia* and several other ortheziid genera there are separate lateral and medial wax plates. Therefore, the anterior-most lateral wax plate is designated 7al and the anterior-most medial plate is 7am.

In *Ortheziola* the clusters of spines comprising the ovisac band were relatively uniform throughout the genus. However, in *Newsteadia* these clusters often are different among species; as with other wax plates, it is difficult to describe these differences using standard position terminology. To solve this problem, we developed a numbering system to distinguish among the ovisac spine clusters. Ovisac band cluster 1 (C1) is designated as the group of spines mesad of the second abdominal spiracle (counting from the front of the body and contiguous with the anteromedial portion of the ovisac band); ovisac band cluster 2 (C2) is designated as the group of spines mesad of the third abdominal spiracle; C3 is mesad of the 4th spiracle; C4 is mesad of the 5th spiracle; C5 is one of two ovisac band clusters that is located at the posterior end of the ovisac band and is between C4 and C6; ovisac band cluster C6 is located at the posteromedial end of the ovisac band and is adjacent to the body mid-line. The individual clusters can be distinguished from each other by the position of the filamentous setae that occur at the anterior end of each cluster. In many instances, the clusters are contiguous and the only objective way of locating a particular cluster is to look for the filamentous setae.

In several instances, there appear to be two transverse bands of spine clusters at the posterior end of the ovisac, e.g., *N. africana, N. biracemus, N. scissa* and *N. wacri.* We hypothesize that the posterior-most cluster is not part of the "C" ovisac band cluster series mentioned above, but is formed from wax plate 7gl. This hypothesis is supported by

examining the more primitive wax plate pattern shown in *Orthezia.* In the illustration of *O. sarcobati* Morrison (shown in Morrison, 1952), it is evident that the terminal wax plate posterior of the anal ring is 7gl. It also is evident that this plate could easily form the posterior end of the ovisac if ovisac band clusters C5 and C6 were lost, as apparently has happened in some species of *Newsteadia.* This would explain the various arrangements of these wax plates and ovisac band clusters in species of *Newsteadia. Newsteadia* wacri has 7gl, and has C5–C6 contiguous; *N. biracemus* has 7gl, and has C5 and C6 separate; *N. southafricensis* has 7gl, C5 separate, and C6 absent; *N. spiraculum* has 7gl, and C5 and C6 both absent. There are even further examples of reduction of the "C" clusters. For example, in *N. angustilinea* only C1, C2 and part of C3 are present; clusters C4, C5 and C6 are absent, but 7gl is present at the posterior end of the ovisac area.

The ovisac area is here defined as the space delimited by the ovisac band or, when the posterior parts of the band are absent, the space delimited by the anterior and lateral portions of the ovisac band and the 7gl wax plate.

Flagellate setae, when present, occur proximally in relation to the tarsal sensorium very near the constriction that apparently is a remnant of the separation between the tibia and tarsus. Flagellate setae are thicker that hair-like setae and have a more rounded apex.

The enlargement of the antenna on each illustration is of the dorsal surface as opposed to the ventral surface which is shown on the main portion of the illustration.

Results

Genus Newsteadia Green

Douglasia Green, 1902: 95. Type species: *Coccus floccosus* De Geer, by monotypy and original designation. Junior homonym of *Douglasia* Stainton, 1854 (Lepidoptera).

Orthezia (Newsteadia) Green, 1902a: 284–285. Replacement name for *Douglasia* Green.

Newsteadia Green; Newstead, 1903: 241. Change of status.

The genus *Newsteadia* (originally *Douglasia*) was described by Green (1902a) as a subgenus of *Orthezia* and included only *Orthezia (Newteadia) floccosa* De Geer, which he designated as the type species. He considered it to be different from other ortheziids because it had 7-segmented antennae, a very long first antennal segment, and the tibia and tarsus fused. Green based his discussion on specimens sent to him by Mr. C. French who discovered them on timbers in a mine in Gippsland, Australia. We now know that the original determination by Green was a misidentification. Although Morrison (1925) speculated that *Newsteadia floccosa* was introduced to Australia, this is now considered incorrect because the specimens from the mine are part of the type series of *N. gullanae* (Kozár and Konczné Benedicty, 2000) and apparently represent an Australian endemic. The designation of a misidentified series of specimens by Green (1902a) as the type species of *Newsteadia* raises questions about whether *N. gullanae* or *N. floccosa* should be the type species of the genus. The International Code of Zoological Nomenclature

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Tao, C. C. C. (1999): List of Coccoidea (Homoptera) of China. Special Publication, Taiwan Agricultural Research. Institute. No. 78, 1–176.

(Anonym, 1999) is very specific on how to resolve this issue. According to Article 70.3, an author who discovers the misidentification of a type species can select the species that will best serve stability and universality. Because *Coccus floccosus* De Geer, 1778 has always been considered the type (Morrison and Morrison, 1966), we here select it as the type species since it best maintains stability and universality.

Current concepts of the genus are slightly different from the original diagnosis provided by Green in 1902 and 1902a. The presence of the first or first and second antennal segments that are conspicuously larger than the remaining segments remains a unique *Newsteadia* character. The presence of a fused tibia-tarsus is shared by *Newsteadia* and *Matileortheziola, Mixorthezia, Nipponorthezia* and *Ortheziola.* Most species of *Newsteadia* have 6- or 7-segmented antennae, but several have 3- or 4-segments; species of *Orthezia* and *Arctorthezia* sometimes have 7-segmented antennae. *Newsteadia* also is characterized by having 5 pairs of abdominal spiracles which are consecutive, beginning with abdominal segment 1 (compared with *Nipponorthezia* with 6 consecutive spiracles, *Orthezia* with 8 consecutive spiracles or with 7 with the anterior pair absent; *Ortheziola* with 4 spiracles, 3 consecutive beginning with segment 1 and 1 near the anal ring; *Arctorthezia* with 7 or 8 spiracles in the same arrangement as *Orthezia; Mixorthezia* with 8 consecutive spiracles; *Matileortheziola* with only 1 near the anal ring). The position of the abdominal spiracles in relation to the ovisac band also is diagnostic. In *Newsteadia,* these spiracles are positioned in a membranous area between the ovisac band clusters and the dorsal wax plates, e.g. between C1 and 7bl and between C2 and 7cl. On *Mixorthezia* and *Nipponorthezia,* they also are positioned in the membranous area between the ovisac band clusters and the dorsal wax plates; on *Arctorthezia* and *Orthezia,* they are in the dorsolateral wax plates; on *Ortheziola,* the anterior 2 pairs are in membranous areas inside of the marginal wax plates, the third pair is located within the ovisac area, and the posterior pair is near the anal ring on the dorsum; on *Matileorthezia,* the single spiracle is near the anal ring on the dorsum. The lack of spines within the ovisac area is a nearly unique characteristic known only in the "insignis group" of *Orthezia* and in *Newsteadia.* Incorporation of wax plate 7gl into the posterior part of the ovisac band is a character unique to most species (if not all) of *Newsteadia* including all species from the Afrotropical region. For a key to the adult females of most genera of the Ortheziidae see Morrison (1952).

DIAGNOSIS

Without spines in the ovisac area; tibia and tarsus fused; with 5 pairs of abdominal spiracles these arranged consecutively beginning on abdominal segement 1; abdominal spiracles in membranous area between ovisac band clusters and dorsolateral wax plates; frequently with 6- or 7-segmented antennae; wax plate 7gl forming part of the ventral ovisac band.

Key to adult females

1. Antennae 6-segmented 2
   Antennae 7-segmented 9

2(1). Sensillum on second antennal segment subapical, not touching distal apex of segment; fleshy subapical seta absent from antenna 3
Sensillum on second antennal segment apical, touching distal apex of segment; fleshy subapical seta present on antenna 8

3(2). Dorsal medial wax plates (7bm, 7cm, 7dm) not divided medially, occasionally only 1 spine thick, but without quadrilocular pores separating medial plates into 2 pieces; ovisac band clusters C3 and C4 with sufficient spines to be contiguous; setae on antennal segment 3 spinelike 4
Dorsal medial wax plates (7bm, 7cm, 7dm) divided medially, with quadrilocular pores between lateral pieces of medial plates; ovisac band clusters C3 and C4 reduced to separate clusters of spines; setae on antennal segment 3 elongate *montana* Mamet

4(3). With less than 60 setae on middle tibia-tarsus 5
With more than 60 setae on middle tibia-tarsus 7

5(4). Flagellate seta present near tarsal sensorium; area surrounding spiracular atrium unsclerotized; claw digitules elongate, with flexible tip; with quadrilocular pores immediately anterior of anterior section of ovisac band 6
Flagellate seta absent near tarsal sensorium; area surrounding spiracular atrium sclerotized; claw digitules short conical, with nonflexible tip; without quadrilocular pores immediately anterior of anterior section of ovisac band *spiraculum* Miller and Kozár, n.sp.

6(5). Filamentous setae associated with anterior band of pores in ovisac area; middle trochanter-femur with more than 40 setae *multispina* Miller and Kozár, n.sp.
Filamentous setae absent from anterior band of pores in ovisac area; middle trochanter-femur with less than 35 setae *turbinespina* Miller and Kozár, n.sp.

7(4). Antennal segment 1 with more than 8 setae; tibia-tarsus with more than 80 setae; without quadrilocular pores immediately anterior of anterior ovisac band *mauritiana* Mamet
Antennal segment 1 with less than 7 setae; tibia-tarsus with less than 75 setae; with quadrilocular pores immediately anterior of anterior ovisac band *gomyi* Richard

8(2). Conspicuous medial coxal depression present between hind pair of legs; antennal setae on segments 3, 4, and 5 spinelike *perpauca* Miller and Kozár, n.sp.
Medial coxal depression absent between hind pair of legs; antennal setae on segments 3, 4, and 5 filamentous *angustilinea* Miller and Kozár, n.sp.

9(1). Anterior portion of ovisac band undivided medially 10
Anterior portion of ovisac band divided medially *scissa* Miller and Kozár, n.sp.

10(9). Filamentous setae associated with anterior band of pores in ovisac area 11
Filamentous setae absent from anterior band of pores in ovisac area 12

11(10). Ovisac band clusters C4, C5 and C6 contiguous; discoidal pores all smaller than quadrilocular pores within ovisac area; apical antennal segment with 5 or more setae *africana* Miller and Kozár, n.sp.
Ovisac band clusters C4, C5 and C6 separate; some of discoidal pores equal to or larger than quadrilocular pores within ovisac area; apical antennal segment with 4 or fewer setae *biracemus* Miller and Kozár, n.sp.

12(10). Ovisac cluster C6 absent; C5 comprised of a small isolated group of spines, not contiguous with C4; plate 1 not divided longitudinally; middle tibia-tarsus less than 600 μm long; antennal segment 2 with 5 or fewer setae *southafricensis* Miller and Kozár, n.sp
Ovisac cluster C6 present; C5 comprised of a large group of spines, contiguous with C4; plate 1 divided longitudinally; middle tibia-tarsus more than 700 μm long; antennal segment 2 with 6 or more setae *wacri* Strickland

Description of Species

Newsteadia africana Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted singly on slide. The slide is labeled as follows: left label, "SOUTH AFRICA, Nelspruit Nature Reserve, from litter, 1986.12.18., Leg. S. Endrődy-Younga, (2397)4898", right label „*Newsteadia africana* Miller and Kozár, HOLOTYPE (PPI)". In addition there are 4 slides containing 4 adult female paratypes and 1 immature (not a paratype) with the following data: SOUTH AFRICA: Dweza Forest, 1985.02.27, Leg. S. Endrődy-Younga, lot No. (2173)4897 (PPI, USNM). An additional slide containing 1 adult female paratype has the same data except the lot No. (2174)4833 (BMNH). One other collection containing 1 adult female paratype has the following data: SOUTH AFRICA: Kitsuk Forest St., 1986.10.26, Leg. S. Endrődy-Younga, lot No. (2320)4895 (PPI). Another is: ANGOLA: Alto Cuido Poste Cacalo, River Cevvuezumba, 1954.O5.25, Leg. A. De Barros Maccado, lot No. 6O15 1B (MNHM).

Etymology. The species epithet *"africana"* is named for the continent in which it was collected.

DESCRIPTION OF ADULT FEMALE

Mounted specimen *(Fig. 1):* Holotype adult female 1.9 mm long [paratypes 1.8–3.0(2.4) mm]; 1.6 mm wide [paratypes 1.3–2.3(1.8) mm]. Antennae 7-segmented; 1st segment 168 μm long [paratypes 162–205(184) μm], 2nd segment 168 μm long (paratypes 155 μm), apical segment 220 μm long [paratypes 212–242(227) μm]; segment 1/segment 2=1.0 [paratypes 1.0–1.3(1.1)]; apical segment/segment 1=1.3 [paratypes 1.2–1.4(1.3)]; apical segment/segment 2=1.3 [paratypes 1.4–1.6(1.5)]; with 8 setae on segment 1 [paratypes with 6–8(7)]; 4 setae on segment 2; without setae on segment 3, 4, 5 and 6; with 6 setae on segment 7; apical seta 118 μm long [paratypes 100–105(102) μm], subapical seta

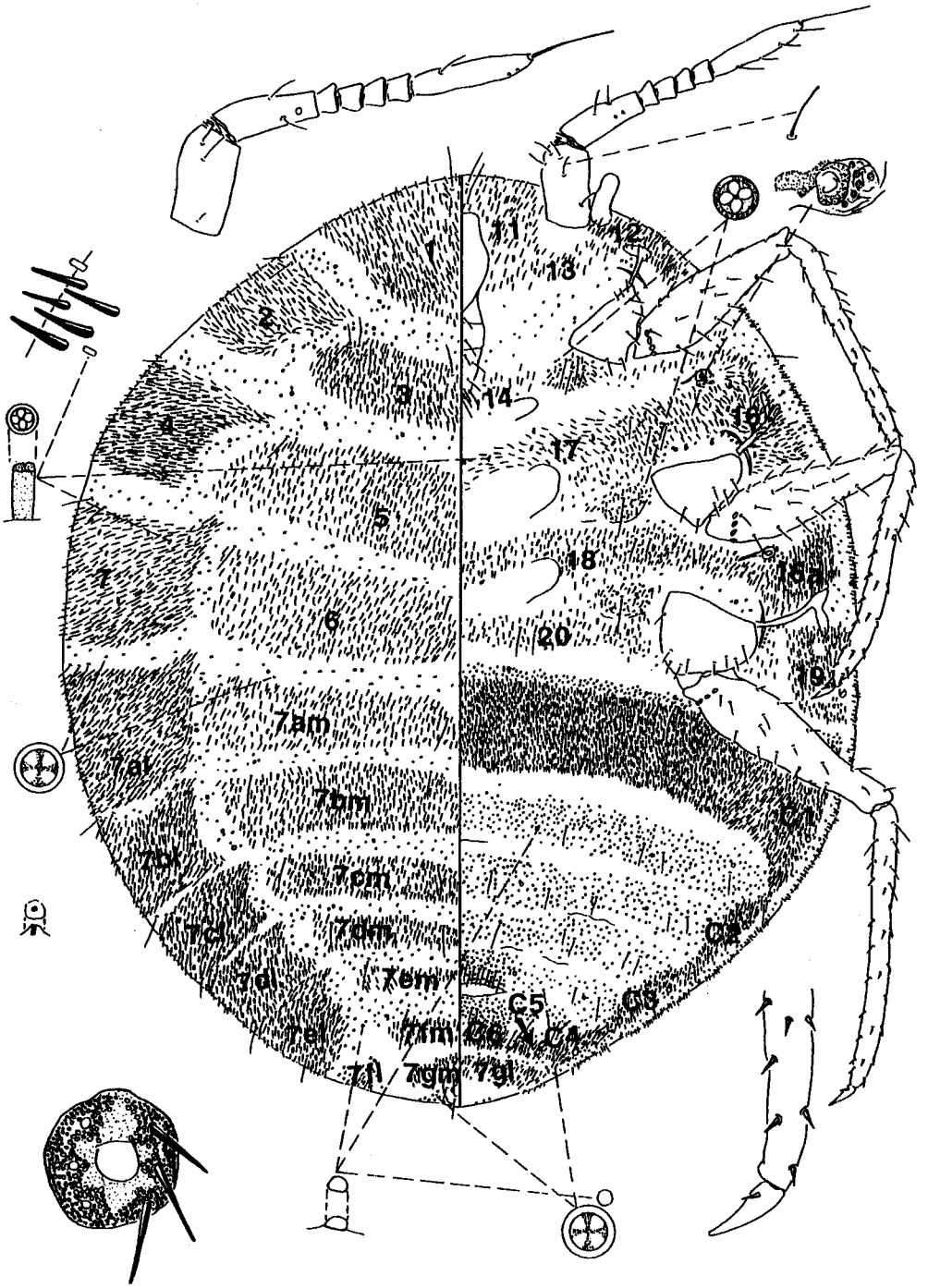

Fig. 1. *Newsteadia africana* Miller and Kozár, sp. n., female

58 μm long (paratypes 55 μm), medial sensory seta absent; sensorium on segment 2 subapical. Antennal setae of 3 kinds: apical and subapical setae slightly fleshy; other setae on segments 6 and 7 spinelike; setae on segments 1 and 2 elongate, with slightly capitate apices except spinelike or slightly fleshy basal seta on segment 1.

VENTER

Labium with narrow apex, 195 μm long [paratypes 182–185(184) μm], with 10 setae on each side [paratypes with 9–11(10) setae], all setae of approximately same shape, setiform, apical setae occasionally with slightly expanded apex. Legs with middle trochanter-femur 460 μm long [paratypes 455–470(462) μm], middle tibia-tarsus 550 μm [paratypes 490–520(505) μm], tibia-tarsus/trochanter-femur 1.2 (paratypes 1.1); middle trochanter-femur with 35 elongate setae (paratypes 30 setae); middle tibia-tarsus with 36 setae [paratypes 38–41(39) setae], proximal setae elongate, distal setae spinelike and conical; without flagellate sensory setae near tarsal sensorium. Claw digitules conical. Without pores immediately posterior of anterior section of ovisac band, with pores anterior of anterior section of ovisac band, hair-like setae present on all segments anterior of vulva within ovisac area. Ovisac band not divided anteriorly, anterior section about 10 or 11 spines wide; lateral and posterior portion of ovisac band with 6 band clusters on each side of body, all ovisac band clusters contiguous, small space on median line of C6; longest spines in ovisac band about 30 μm long [paratypes 30–31(30) μm]; all ventral wax plates present and well developed. Wax plates on head (plates 1 and 11) complete, undivided. Coxal depressions mesad of each coxa absent or very weakly developed, with small cluster of hair-like setae, wax spines, tubular quadrilocular, and small-sized sessile quadrilocular pores. Anterior thoracic spiracles with definitely defined area around atrium of spiracle, each containing 5 or 6 sessile quadrilocular pores [paratypes 7–11(8) pores]; diameter of anterior thoracic spiracles 35 μm [paratypes 31–32(31) μm]. Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, and in segmental rows in ovisac band. Quadrilocular pores of 2 kinds: tubular quadrilocular protruding from derm, long, 8–9(9) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac band and scattered between wax plates elsewhere, more abundant within ovisac area. Discoidal pores of 1 small size, associated with sessile quadriloculars; larger discoidal pores absent. Minute tubular ducts present (shown as small upside-down mushrooms with a dark center on illustration).

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, thick, from 3 to 8 spines wide, 1.2 to 3.4 times as wide as lateral wax plates (plates 7al to 7fl); anterior edge of medial abdominal wax plates straight. Medial plates on thorax (plates 3, 5, 6) about 3/4 or wider compared with lateral thoracic plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex 26–28(27) μm. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars

present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores of small size only, associated with sessile quadriloculars. Minute tubular ducts present. Anal ring with 5 or 6 rows of pores; longest anal ring seta 62 μm long (paratypes 55 μm), shorter than width of anal ring; ring 90 μm wide [paratypes 85–92(89) μm].

COMMENTS

Newsteadia africana is similar to 4 other African species *(N. biracemus, N. scissa, N. southafricensis, N. wacri)* that have: 7-segmented antennae; 1 or fewer setae on antennal segments 3, 4 and 5; no medial sensory seta on segment 7; elongate setae on most leg and antennal segments; no flagellate sensory seta on tibia; conical claw digitule; ovisac band cluster C5 present. *Newsteadia africana* is most similar to *N. biracemus* by having setae associated with all quadrilocular pore bands within the ovisac area and by having ovisac band cluster C6 present. *Newsteadia africana* differs by having: 6 setae on antennal segment 7 [*N. biracemus* 2–3(3) setae on antennal segment 7]; apical seta 100–105(102) μm long [*N. biracemus* apical seta 70–82(77) μm long]; subapical seta 55–58(56) μm long [*N. biracemus* subapical seta 28–42(35) μm long]; band clusters C5 and C6 contiguous (*N. biracemus* band clusters C5 and C6 separate); all discoidal pores within ovisac area smaller than diameter of quadrilocular pores (*N. biracemus* some discoidal pores within ovisac area about equal to diameter of quadrilocular pores). Outside of Africa, *N. africana* is similar to *N. gullanae* but differs by having: no setae on antennal segments 3, 4 and 5 (*N. gullanae* has 1–3 setae on antennal segments 3, 4 and 5); medial sensory seta absent from antennal segment 7 (*N. gullanae* has medial sensory seta present on antennal segment 7); ovisac band clusters C5 and C6 present (*N. gullanae* has ovisac band clusters C5 and C6 apparently absent); labium 182–195(188) μm long (*N. gullanae* has labium about 314 μm long).

Newsteadia angustilinea Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted on a slide by itself. The slide is labeled as follows: left label TANZANIA, Matonibo, 45 km, S. Morongora,1987.02.04., S. Mahunka, A., Zicsy, T. Pócs, lot No. 530, right label *Newsteadia angustilinea* Miller and Kozár, HOLOTYPE (PPI). Paratypes: None.

Etymology. The species epithet *"angustilinea"* is derived from the Latin adjective *"angustus"* meaning narrow and the Latin noun *"linea"* meaning line. This name refers to the narrow lines of dorsal spines on the medial areas of the abdomen.

DESCRIPTION OF ADULT FEMALE

Mounted specimen *(Fig. 2):* Holotype adult female 0.8 mm long; 0.7 mm wide. Antennae 6-segmented; 1st segment 162 and 170 μm long, 2nd segment 92 and 96 μm long, apical segment 138 and 135 μm long; segment 1/segment 2=1.8; apical segment/segment 1=0.9 and 0.8; apical segment/segment 2=1.5 and 1.4; with 8 setae on segment 1; 4 and 5 setae on segment 2; with 4 setae on segment 3; with 2 setae on segment

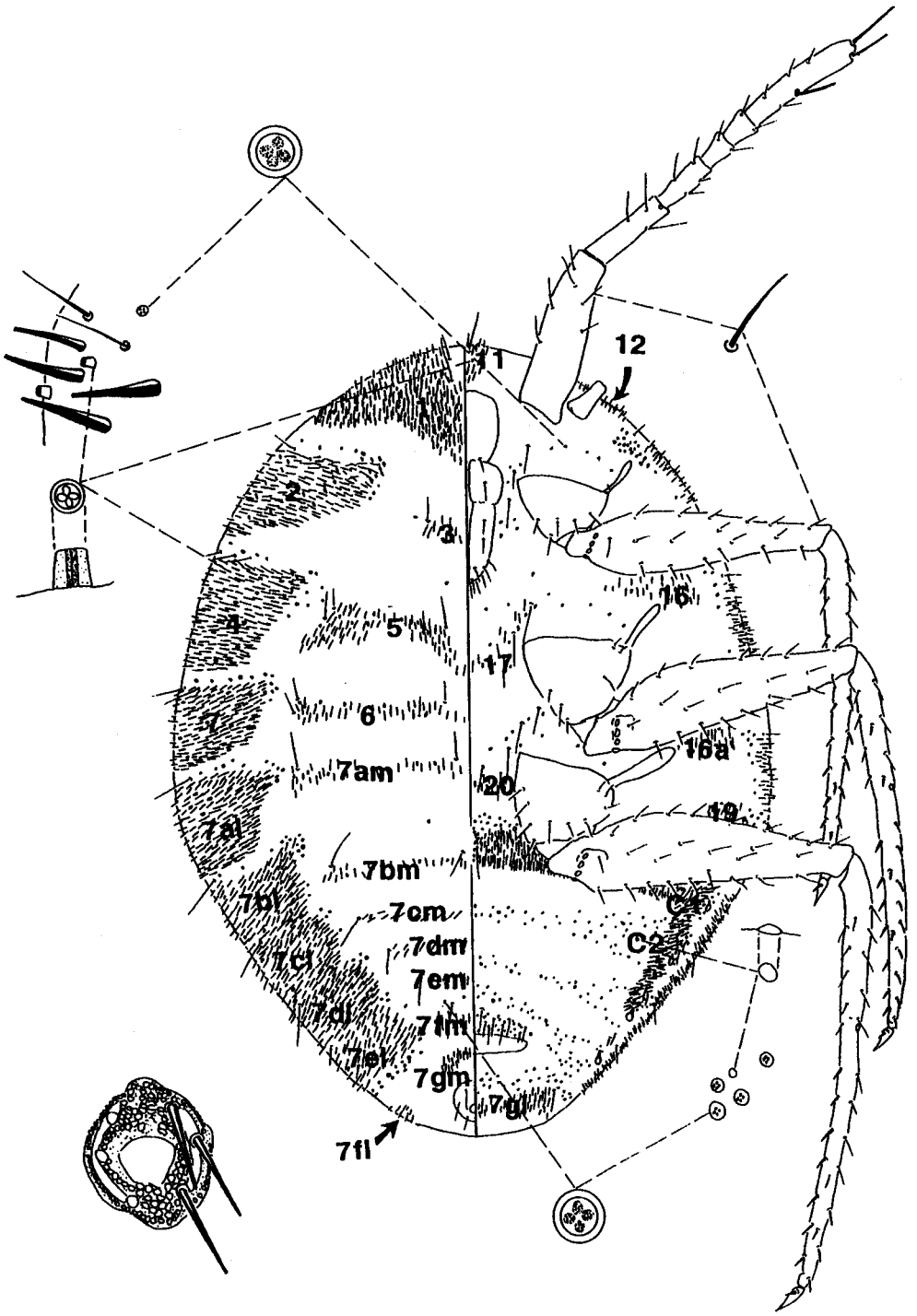

Fig. 2. *Newsteadia angustilinea* Miller and Kozár, sp. n., female

4; with 2 seta on segment 5; with 8 setae on segment 6; apical seta 120 and 118 μm long; subapical seta 48 and 40 μm long; medial sensory seta 50 and 48 μm long; sensorium of segment 2 apical. Antennal setae of 2 kinds: apical, subapical and medial sensory setae slightly fleshy; other setae elongate and filamentous with acute apices.

VENTER

Labium with broad apex, 140 μm long, with 11 setae on each side, all setae of approximately same shape, setiform, apices acute. Legs with middle trochanter-femur 305 and 308 μm long, middle tibia-tarsus 395 and 398 μm, tibia-tarsus/trochanter-femur 1.3; middle trochanter-femur with 27 and 36 elongate setae; middle tibia-tarsus with 42 and 43 setae, proximal setae elongate, filamentous, distal setae more robust; without flagellate sensory setae near tarsal sensorium. Claw digitules conical. Without pores immediately posterior of anterior section of ovisac band, with pores immediately anterior of anterior section of ovisac band, hair-like setae restricted to area immediately anterior of vulva within ovisac area. Ovisac band divided anteriorly, with a few sessile pores and hair-like setae in division, anterior section 4 or 5 spines wide; lateral and posterior portion of ovisac band with 4 band clusters on each side of body, clusters C4, C5 and C6 absent; all band clusters contiguous, except C3 isolated on 1 side of holotype, contiguous on other side; longest spines in ovisac band about 20 μm long; wax plates 13, 14, 15 and 18 absent; with a few spines mesad of middle and hind legs; wax plates 11, 16, 16a and 19 reduced. Wax plates 1 and 11 partially divided longitudinally. Coxal depressions absent except slight concentration of setae, spines and pores mesad of middle legs. Anterior thoracic spiracles without associated sclerotized area around atrium, each with 2 sessile quadrilocular pores near spiracular atrium; diameter of anterior thoracic spiracles 16 and 18 μm. Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, restricted to area around vulva within ovisac area. Quadrilocular pores of 2 kinds: tubular quadriloculars protruding from derm, short, about 4 μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac band and scattered between wax plates elsewhere, more abundant within ovisac area. Discoidal pores of 1 small size, associated with sessile quadriloculars; larger discoidal pores absent. Minute tubular ducts apparently absent.

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, unusually thin, usually only 1 spine wide, approximately 1.8 times as wide as lateral wax plates (plates 7lm to 7lf); anterior edge of medial abdominal wax plates straight. Medial wax plates on thorax (plates 3, 5, 6) less than width of lateral thoracic wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex 22 μm long. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores apparently absent. Minute tubular ducts scattered in plates (not illustrated). Anal ring with 3 or 4 rows of pores; longest anal ring seta 38 μm long, shorter than width of anal ring; ring 52 μm wide.

COMMENTS

Newsteadia angustilinea is most similar to *N. perpauca* by having: antennal segment 1 nearly twice as long as segment 2; greatly reduced number of dorsomedial spines; greatly reduced number of ventral spines on thorax and head; sensorium on antennal segment 2 apical; ovisac band clusters reduced to C1 and C2; anterior part of ovisac band divided medially; apical, subapical, and medial sensory setae present on apical antennal segment; and apex of labium relatively broad. *Newsteadia angustilinea* differs by having: coxal depressions absent (*N. perpauca* conspicuous coxal depression between hind coxae); and setae on antennal segments 3, 4 and 5 filamentous (*N. perpauca* setae on antennal segments 3, 4 and 5 spinelike). *Newsteadia angustilinea* also resembles *N. scissa* by having the anterior section of the ovisac band divided; reduced number of spines in dorsomedial wax plates on abdomen; broad apex on labium; reduced number of spines in ventral area of head and thorax; and conical claw digitules. *Newsteadia angustilinea* differs by having: 6-segmented antennae (*N. scissa* 7-segmented antennae); antennal segment 1 conspicuously longer than 2 (*N. scissa* antennal segment 2 slightly longer than segment 1); no coxal depression (*N. scissa* weakly developed coxal depression near mid coxa); reduced number of spines in dorsomedial wax plates on thorax (*N. scissa* many spines in dorsomedial wax plates on thorax); medial sensory seta on apical antennal segment present (*N. scissa* medial sensory seta on apical antennal segment absent); sensorium on antennal segment 2 apical (*N. scissa* sensorium on antennal segment 2 subapical); and relatively acute apex to filamentous setae on antennae and legs (*N. scissa* capitate apex on filamentous setae on antennae and legs). Of the species that occur outside of the African Continent, *N. australiensis* and *N. baloghi* also have the anterior portion of the ovisac band divided, but they are very different in appearance otherwise.

Newsteadia biracemus Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted singly on slide. The slide is labeled as follows: left label SOUTH AFRICA, Alexandria Forest St., 1987.12.04., Leg. S. Endrődy-Younga (2550)4831" right label *Newsteadia biracemus* Miller and Kozár HOLOTYPE (PPI);" there are 3 other slides from this series each containing 1 adult female paratype (BMNH, PPI, USNM). A second series of 9 adult female paratypes on 9 slides were collected at the same locality 2 days later (2550)4832 (BMNH, MNHN, PPI, SANC, USNM). In addition there are 3 slides containing 2 adult female paratypes and 2 immatures (not paratypes) with the following data: SOUTH AFRICA: Karkloof Forest, 1989.12.05., Leg. S. Endrődy-Younga, lot No. (2746)4830 (PPI, MNHN). One additional slide contains 2 adult female paratypes and 1 immature paratype with the following data: SOUTH AFRICA: Karkloof Nature Reserve, 1,440 m, 1989.12.13., Leg. S. Endrődy-Younga, lot No. (2768)4829 (PPI). Two slides each contain 1 adult female paratype: SOUTH AFRICA: Tsitsikama National Park, 1997.12.03., on moss, Leg. F. Kozár and J. Giliomee, lot No. number (36)4821 (PPI, SANC). One slide with 1 adult female paratype: SOUTH AFRICA: Nelspruit Nature Reserve, 1986.12.18., Leg. S. Endrődy-Younga, lot No. (2397)4898 (PPI).

Etymology. The species epithet *biracemus* is derived from the Latin prefix *bi-* meaning two and the Latin noun *racemus* meaning cluster. It is a noun in apposition and refers to the two pairs of spine clusters that are the remnants of one of the posterior plates of the ovisac band.

DESCRIPTION OF ADULT FEMALE

Mounted specimen *(Fig. 3):* Holotype adult female 1.3 mm long [paratypes 1.3–2.2(1.6) mm]; 0.9 mm wide [paratypes 1.0–1.6(1.2) mm]. Antennae 7-segmented; 1st segment 175 μm long [paratypes 142–198(168) μm], 2nd segment 127 μm long [paratypes 102–145(128) μm], apical segment 200 μm long [paratypes 159–222(192) μm]; segment 1/segment 2=1.4 [paratypes 1.2–1.4(1.3)]; apical segment/segment 1=1.1 [paratypes 1.1–1.2(1.1)]; apical segment/segment 2=1.6 [paratypes 1.4–1.6(1.5)]; with 5 and 6 setae on segment 1 [paratypes with 4–8(6) setae]; 3 setae on segment 2 [paratypes 2–6(3) setae]; without setae on segments 3, 4 and 5; with 1 seta on segment 6 [paratypes with 0–1(0) setae]; with 3 setae on segment 7 [paratypes with 2–3(3) setae]; apical seta 70 μm long [paratypes 72–82(77) μm]; subapical seta 41 μm long [paratypes 28–42(35) μm]; medial sensory seta absent; sensorium on segment 2 subapical. Antennal setae of 3 kinds: apical and subapical setae fleshy; other setae on segments 6 and 7 elongate, spinelike; setae on segments 1 and 2 elongate, with rounded or slightly capitate apices, except elongate and spinelike on basal seta of segment 1.

VENTER

Labium with acute apex, 163 μm long [paratypes 155–183(173) μm], with 9 and 10 setae on each side [paratypes with 8–13(10) setae], all setae of approximately same shape, setiform, apical setae occasionally with slightly expanded apex. Legs with middle trochanter-femur 420 μm long [paratypes 370–425(404) μm], middle tibia-tarsus 540 μm [paratypes 440–570(492) μm], tibia-tarsus, trochanter-femur 1.3 [paratypes 1.2–1.3(1.2)]; middle trochanter-femur with 39 elongate setae [paratypes 29–36(32) setae]; middle tibia-tarsus with 36 setae [paratypes 31–39(36) setae], proximal setae elongate, distal setae robust; without flagellate sensory setae near tarsal sensorium. Claw digitules conical. Without pores immediately posterior of anterior section of ovisac band (2 paratypes with a few discoidal pores in this area), with pores immediately anterior of anterior section of ovisac band; hair-like setae present on all segments anterior of vulva within ovisac area (1 paratype with few in this area). Ovisac band not divided anteriorly, anterior section about 6 to 8 spines wide; lateral portion of ovisac band with 6 band clusters on each side of body, C4, C5 and C6 forming separate pore clusters; with definite space on median line of C6; longest spines in ovisac band about 29 μm long [paratypes 26–31(29) μm]; head and thoracic wax plates present, but often represented by diffuse spines. Wax plates on head (plates 1 and 11) complete, not divided longitudinally. Coxal depressions mesad of coxae absent, only with small cluster of hair-like setae, wax spines, tubular quadrilocular, and small-sized sessile quadrilocular pores. Anterior thoracic spiracles with area of weak sclerotization attached to atrium, each with 3 sessile quadrilocular pores [paratypes 2–5(3) pores] in this area; diameter of anterior thoracic

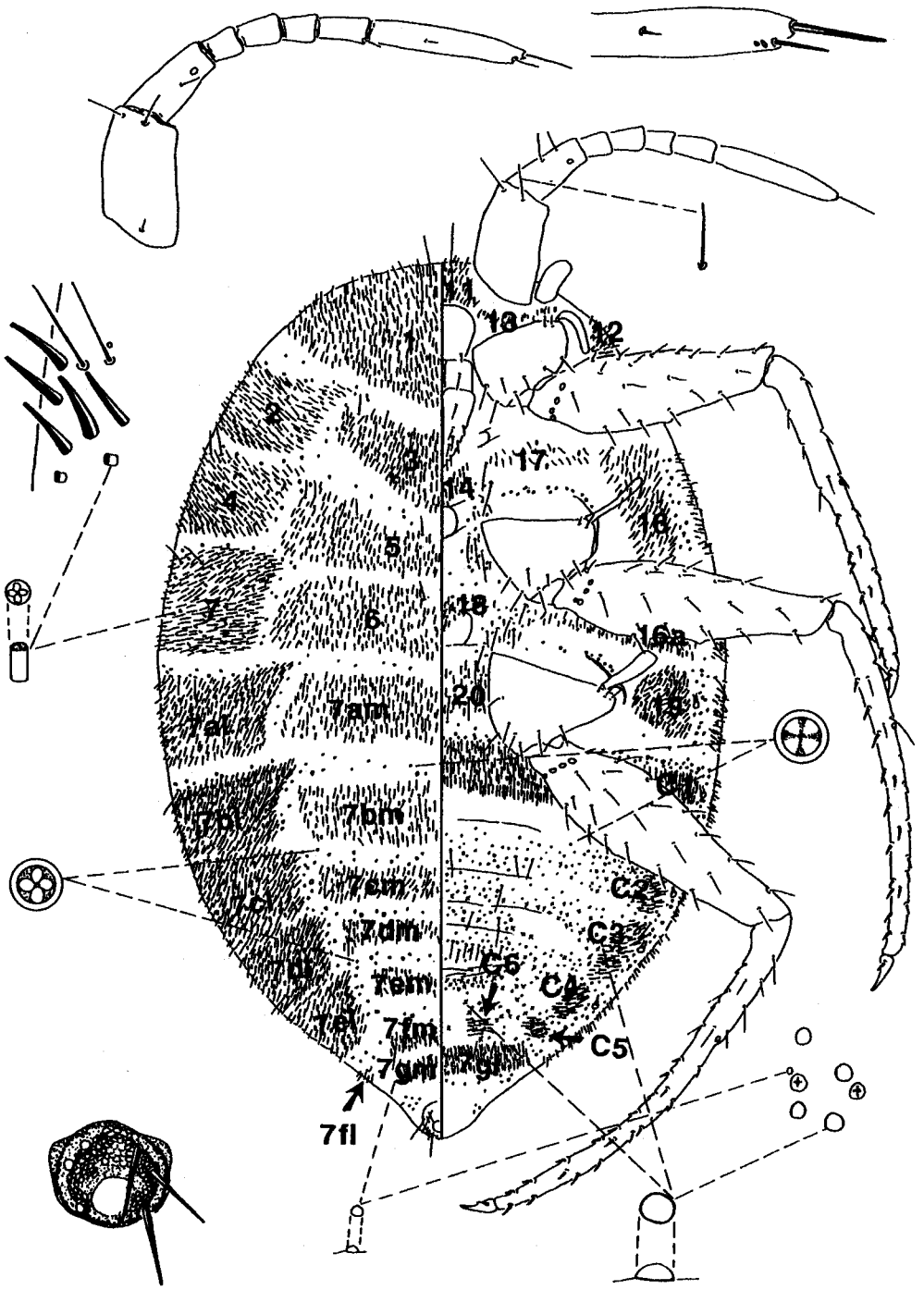

Fig. 3. *Newsteadia biracemus* Miller and Kozár, sp. n., female

spiracles 28 μm [paratypes 25–32(30) μm]. Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, and in segmental rows in ovisac area. Quadrilocular pores of 2 kinds: tubular quadrilocular protruding from derm, short in length, 3–5(4) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac band and scattered between wax plates elsewhere, more abundant within ovisac band. Discoidal pores of 2 sizes, associated with sessile quadriloculars; larger discoidal pores present within ovisac area. Minute tubular ducts absent in holotype, present in some paratypes (not illustrated).

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, relatively wide, usually 2 to 6 spines wide, approximately 1/2 times as wide as lateral wax plates (plates 7al to 7fl). Medial wax plates on thorax (plates 3, 5, 6) about 3/4 or wider compared with lateral thoracic wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex 26–31(28) μm. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores of small size only, associated with sessile quadriloculars. Minute tubular ducts present in some specimens (not illustrated). Anal ring with 4 or 5 rows of pores; longest anal ring seta 48 μm long [paratypes 53–60(57) μm], shorter than width of anal ring; ring 75 μm wide [paratypes 75–80(78) μm].

COMMENTS

Newsteadia biracemus is similar to 4 other African species that possess a unique combination of characters. For a description of these characters and a list of the other 4 species see the "Comments" section of *N. africana.* Within Africa, this species is most similar to *N. africana;* a discussion of the differences is included in the "Comments" section of that species. This species is unique among the species of *Newsteadia* by having ovisac band C6 reduced to a small, isolated cluster of spines on each side of body. As far as we can determine, this condition may occur in only 1 other species, i.e., *N. vasarhelyii* Kozár and Konczné Benedicty. *Newsteadia biracemus* differs by having: elongate setae on the trochanter-femur (*N. vasarhelyii* has spinelike setae on the trochanter-femur); 1 or fewer setae on each of antennal segments 3, 4 and 5 (*N. vasarhelyii* has 2 or more setae on each of antennal segments 3, 4 and 5); no flagellate setae on tibia (*N. vasarhelyii* has flagellate setae on tibia); and a conical claw digitule (*N. vasarhelyii* has a more elongate claw digitule).

Newsteadia gomyi Richard, 1979: 1082.

MATERIAL EXAMINED

We have not examined the holotype but it was compared with the 3 paratypes mentioned below by Danièle Matile Ferrero, and she indicates that it is conspecific with

the paratypes. The paratypes are mounted singly, are adult females and are labeled as follows: left label LA REUNION, Takamaka, 26.I.1972, Y. Gomy réc.,5992,1, MNHM - Paris; right label PARATYPE, *Newsteadia gomyi* Rich. adulte." Slide 2: left label "La Reunion, Piste de la, plaine d'Affouches PK2, 28.XI.1971, Y. Gomy réc., 5996,1, MNHM - Paris; right label PARATYPE, *Newsteadia gomyi* Rich., tamisagesour feuilles goyaviers." Slide 3: left label LA REUNION, Gîte forestier de, Bébour 22.IV.1972, Y. Gomy réc., 5993,2, MNHM - Paris; right label PARATYPE, *Newsteadia gomyi* Rich., adulte A, tamisages humus." The holotype was collected as part of the material from Gîte forestier de Bébour and is MNHN 5993,1. Richard (1979) indicted that the type series is composed of 5 adult females and several immatures of different stages. Specimens also were collected at: Hauts de Saint-Demis, 2.XII.1971, tamisage terreau et souches and plaine de Caffres, N.-D. De la Paix, 9. I. 1972, tamisage sous feuilles mortes.

DESCRIPTION OF UNMOUNTED ADULT FEMALE

According to Richard (1979) the adult female is covered with a series of waxy plates.

MOUNTED ADULT FEMALE

Paratype adult females *(Fig. 4)*: 1.7–2.3(2.0) mm long; 1.2–1.7(1.4) mm wide. Antennae 6-segmented; 1st segment 170–192(179) μm long, 2nd segment 135–175(152) μm long, apical segment 255–275(262) μm long; segment 1/segment 2 = 1.1–1.3(1.2); apical segment, segment 1 = 1.4–1.6(1.5); apical segment/segment 2 = 1.6–1.9(1.8); with 6 setae on segment 1; with 4–7(6) setae on segment 2; with 3–5(4) setae on segment 3; with 2–3(2) setae on segment 4; with 2 setae on segment 5; with 3–4(4) setae on apical segment; apical seta about 52 μm long; subapical seta absent; medial sensory seta 20–34(28) μm long; sensorium on segment 2 subapical. Antennal setae of 2 kinds: apical and medial setae slightly fleshy; other setae spinelike.

VENTER

Labium with relatively acute apex, 200–232(221) μm long, with 14–19(16) setae on each side, 2 or 3 setae at apex elongate, capitate, other setae varying from spinelike to elongate. Legs with middle trochanter-femur 525–630(578) μm long, middle tibia-tarsus 620–750(703) μm, tibia-tarsus/trochanter-femur 1.2–1.3(1.2); middle trochanter-femur with 51–55(54) setae; middle tibia-tarsus with 64–68(66) setae, all setae slightly spinelike; with 1 flagellate sensory setae near tarsal sensorium. Claw digitules setiform. Without pores immediately posterior of anterior section of ovisac band; with pores immediately anterior of anterior section of ovisac band; filamentous setae on 2 segments anterior of vulva in ovisac area. Ovisac band not divided anteriorly, anterior section about 14–18 spines wide; lateral portion of ovisac band with 4 band clusters on each side of body, clusters C5 and C6 absent; all band clusters nearly contiguous; longest spines in ovisac band about 28–33(31) μm long. All thoracic and head wax plates well developed. Wax plate 11 partially divided longitudinally. Coxal depressions absent. Anterior thoracic spiracles without sclerotized area attached to atrium, each with 4–9(6) loosely associated sessile quadrilocular pores;

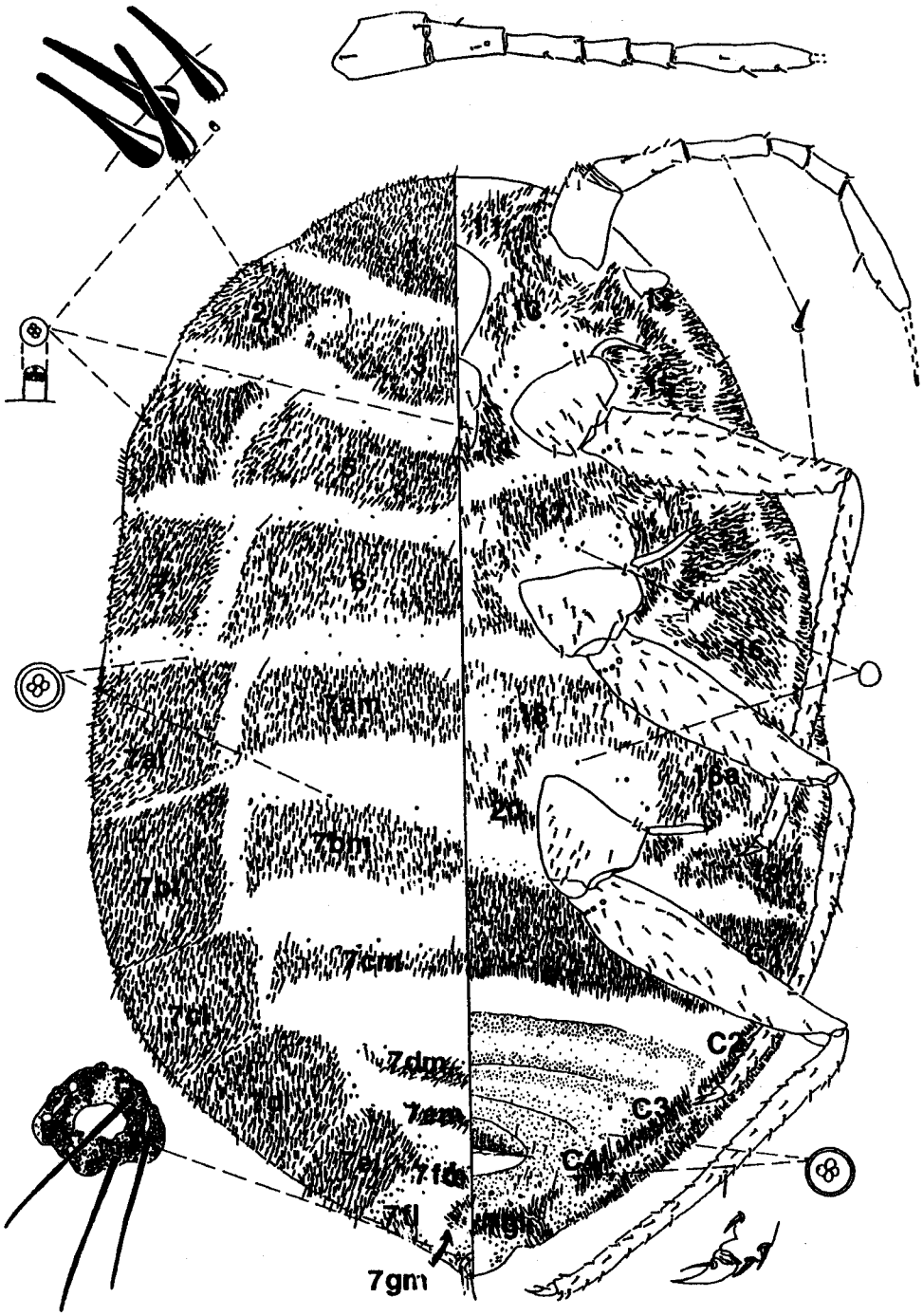

Fig. 4. *Newsteadia gomyi* Richard

diameter of anterior thoracic spiracle 38–45(40) μm. Hair-like setae few, scattered in medial areas of thorax, with hair-like setae on 2 segments anterior of vulva in ovisac area. Quadrilocular pores of 2 kinds; tubular quadriloculars protruding from derm, short, 3–5(4) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, present in bands within ovisac area and scattered between wax plates; with 1 broken row of pores immediately anterior of ovisac band. Discoidal pores of 1 small size, associated with sessile quadriloculars; larger discoidal pores absent. Microtubular ducts apparently absent.

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially; plates 7am and 7bm relatively wide, 7 or 8 spines wide, plates 7cm to 7gm thinner, 2 to 4 spines wide; anterior edge of medial abdominal plates relatively straight. Medial wax plates on thorax (plates 3, 5, 7) about 3/4 or wider compared with lateral thoracic plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex 23–32(28) μm long. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars scattered near medial margin of lateral plates. Discoidal pores of small size only, associated with sessile quadriloculars. Minute tubular ducts apparently absent. Anal ring with 6–8 rows of pores; longest anal ring seta 95–100(98) μm long, conspicuously longer than width of anal ring; anal ring 62–70(65) μm wide.

COMMENTS

Newsteadia gomyi is 1 of 6 species (*N. mauritiana, N. montana, N. multispina, N. spiraculum* and *N. turbinespina*) that have the following combination of characters: 6-segmented antennae; at least some setae on antennal segments 3 and 4; subapical sensory seta absent from antennal segment 6; and ovisac band clusters C5 and C6 absent. *Newsteadia gomyi* is most similar to *N. turbinespina* but differs by having: anal-ring setae longer than width of anal ring (*N. turbinespina* has anal-ring setae about same length or shorter than width of anal ring); 1st segment of antenna greater than 150 μm long (*N. turbinespina* has 1st segment of antenna less than 150 μm long); apical segment of antenna greater than 225 μm long (*N. turbinespina* has apical segment of antenna less than 225 μm long); middle trochanter-femur more than 450 μm long (*N. turbinespina* has middle trochanter-femur less than 450 μm long); middle tibia-tarsus greater than 550 μm long (*N. turbinespina* has middle tibia-tarsus less than 550 μm long); trochanter-femur with more than 35 setae (*N. turbinespina* has trochanter-femur with fewer than 35 setae). *Newsteadia gomyi* also is similar to *N. mauritiana;* for a comparison see the "Comments" section of the latter. Of the species that occur outside of the African Continent, *N. gomyi* is remarkably similar to *N. samoana* Morrison. Both species have: 6-segmented antennae; spinelike setae on the legs and antennae; no subapical sensory seta on antennal segment 6; an elongate claw digitule; abundant wax plates on ventral surface of thorax and head; long anal-ring setae relative to width of anal ring; and flagellate setae on tibia. *Newsteadia gomyi* differs by having: no quadrilocular pores in area surrounding atrium of spiracle (*N.*

samoana has several quadrilocular pores in area immediately surrounding atrium of spiracle); antennal segment 1 longer than segment 2 (*N. samoana* has antennal segment 1 shorter than segment 2); length of apical antennal segment divided by segment 2=1.6–1.9(1.8) (*N. samoana* has length of apical antennal segment divided by segment 2=1.3).

Newsteadia mauritiana Mamet, 1943: 117

Newsteadia mauritiana Mamet, 1943a: 144 (Nomen Nudum).

Mamet, 1943a: 144; Mamet, 1947: 31; Mamet, 1947a: 49; Strickland, 1947: 520; Mamet, 1948: 39; Morrison, 1952: 62; Hoy, 1962: 516; Richard, 1979: 1079; Tao, 1999: 7.

MATERIAL EXAMINED

We have not examined the holotype but it was compared with the 2 paratypes mentioned below by Danièle Matile Ferrero, and she indicates that it is conspecific with the paratypes. The paratypes are mounted singly, are adult females and are labelled as follows: left label *Newsteadia mauritiana* Mamet sp. n., on fungus growing on rotting wood., Mauritius (Cocotte Mt.), 24.I.1942 PARATYPE, Leg. Ray. Mamet Rm., MNHN 8712,3, right label PARATYPE, MNHN 8712,3. The holotype was collected in the same location but on 27.XII.1941 and is MNHN 8712,1; the second paratype is the same and is MNHN 8712,2. Mamet (1943) indicated that it was collected at 2,463 ft. altitude on Cocotte Mountain. He states that it was found on moss growing on rotting wood, in the midst of an indigenous forest." The species has not been recollected.

DESCRIPTION OF UNMOUNTED ADULT FEMALE

According to Mamet (1943) "*Adult female* with waxy dorsal and ventral lamellae short and compact. *Ovisac* short."

MOUNTED SPECIMEN

Paratype adult females *(Fig. 5)* 1.8 and 1.9 mm long; 1.4 and 1.7 mm wide. Antennae 6-segmented; 1st segment 175 and 195 μm long, 2nd segment 130 and 152 μm long, apical segment 260 and 275 μm long; segment 1/segment 2=1.3; apical segment/segment 1=1.6 and 1.3; apical segment/segment 2=1.7 and 2.1; with 10–14(12) setae on segment 1; with 9–12(10) setae on segment 2; with 6–9(8) setae on segment 3; with 2–4(3) setae on segment 4; with 3–4(4) setae on segment 5; with 7–10(8) setae on apical segment; apical seta about 78 μm long; subapical seta absent; medial sensory seta 30 and 35 μm long; sensillum on segment 2 subapical. Antennal setae of 2 kinds: apical and medial setae slightly fleshy; remaining setae spinelike.

VENTER

Labium with apex relatively acute, 215 and 218 μm long, with 10–18(14) setae on each side, 2 or 3 setae at apex elongate, capitate, other setae spinelike. Legs with middle

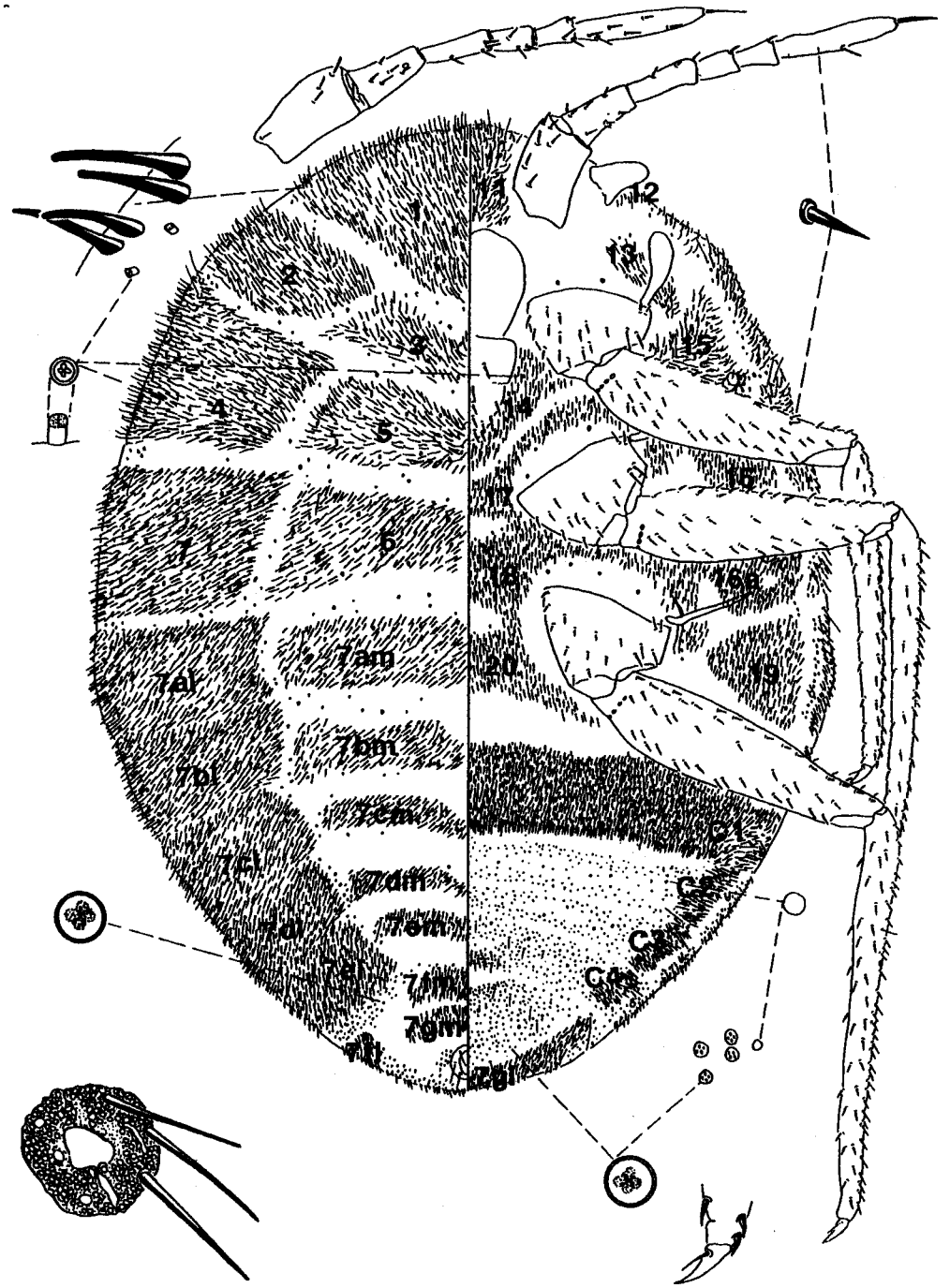

Fig. 5. *Newsteadia mauritiana* Mamet

trochanter-femur 560 and 590 μm long, middle tibia-tarsus 690 and 730 μm, tibia-tarsus/trochanter-femur 1.2; middle trochanter-femur with 69 and 71 setae; middle tibia-tarsus with 84 and 92 setae, all setae spinelike and robust; with 1 flagellate sensory setae near tarsal sensorium. Claw digitules setiform. Without pores immediately posterior and anterior of anterior section of ovisac band. Ovisac band not divided anteriorly, anterior section about 12 spines wide; lateral portion of ovisac band with 4 band clusters on each side of body, without clusters C5 and C6; all wax ovisac band clusters contiguous except weak division between C3 and C4; longest spines in ovisac band about 37 μm long. Wax plates on thorax and head all well developed, except plate 13 reduced. Wax plates 1 and 11 undivided longitudinally. Coxal depressions absent. Anterior thoracic spiracles without definite sclerotized area attached to atrium, each with 8 and 9 loosely associated sessile quadrilocular pores; diameter of anterior thoracic spiracle 38 and 42 μm. Hair-like setae few, scattered in medial areas of thorax, with several setae on 2 segments anterior of vulva within ovisac area. Quadrilocular pores of 2 kinds: tubular quadriloculars protruding from derm, short, approximately 5 μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, present in bands within ovisac area and scattered between wax plates. Discoidal pores of 1 small size, associated with sessile quadriloculars; larger discoidals absent. Minute ducts present in small numbers laterally.

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, relatively wide, 3 to 6 spines wide, approximately 1/2 times as wide as lateral plates (plates 7al to 7fl). Medial wax plates on thorax (plates 3, 5, 6) about 3/4 times or wider compared with lateral thoracic wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex about 34 μm long. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars scattered near medial margin of lateral plates. Discoidal pores of small size only, associated with sessile quadriloculars. Anal ring with 5 or 6 rows of pores; longest anal ring seta 108 μm long, nearly twice as long as width of anal ring; anal ring 60 and 78 μm wide. Minute tubular ducts apparently absent.

COMMENTS

N. mauritiana is similar to 5 other African species. For a list of these species and their similarities see the "Comments" section of *N. gomyi*. *N. mauritiana* seems to be most similar to *N. gomyi* but differs by having: no sessile quadrilocular pores immediately anterior of anterior portion of ovisac band (*N. gomyi* has several sessile quadrilocular pores immediately anterior of anterior portion of ovisac band); 10–14(12) setae on antennal segment 1 (*N. gomyi* has about 6 setae on antennal segment 1); 9–12(10) setae on antennal segment 2 [*N. gomyi* has 4–7(6) setae on antennal segment 2]; 84–92(88) setae on middle tibia-tarsus [*N. gomyi* has 64–68(66)] setae on middle tibia-tarsus]; wax plate 13 reduced between front leg and antenna (*N. gomyi* has wax plate 13 well developed between front leg and antenna). Of the species that occur outside of the African Continent, *N. mauritiana*

is similar to *N. samoana* Morrison. Both species have: 6-segmented antennae; spinelike setae on the legs and antennae; no subapical sensory seta on antennal segment 6; an elongate claw digitule; abundant wax plates on ventral surface of thorax and head; long anal-ring setae relative to width of anal ring; and flagellate setae on tibia. *N. mauritiana* differs by having: no quadrilocular pores in area immediately surrounding atrium of spiracle (*N. samoana* has several quadrilocular pores in area immediately surrounding atrium of spiracle); no sessile quadrilocular pores immediately anterior of anterior portion of ovisac band (*N. samoana* has many sessile quadrilocular pores immediately anterior of anterior portion of ovisac band); wax plate 13 reduced between front leg and antenna (*N. samoana* has wax plate 13 with abundant spines between front leg and antenna); more abundant setae on legs (*N. samoana* has less abundant setae on legs).

This species has also been reported from Taiwan (Tao, 1999), but we could not obtain specimens for confirmation.

Newsteadia montana Mamet, 1947: 31–32 and 1948: 39

Newsteadia montana Mamet, 1943a: 144 (Nomen Nudum).
Morrison, 1952: 62; Hoy, 1962: 516; Richard, 1979: 1079.

MATERIAL EXAMINED

Holotype: adult female, mounted alone on slide with following: left label "*Newsteadia montana* sp. n., on fungus growing on rotting wood, Mauritius (Le Pouce Mt.), 20.XII.1942 - TYPE, Leg. Ray. Mamet, MNHN 8713,1" right label "TYPE, MNHN 8713,1." Mamet (1947) indicated that it was collected at 2,000 ft. altitude on Le Pouce Mountain. The species description was originally based on a single specimen and no additional material has been discovered.

DESCRIPTION OF UNMOUNTED ADULT FEMALE

According to Mamet (1943a) "*Adult female* covered dorsally with pure white waxy secretion. Lamellae fairly compact and pure white: they are short and slightly curved upwards in the anterior and lateral marginal areas and much longer around the posterior margin; between the marginal series they are in low transverse ridges. Ovisac short. Venter covered with fine, whitish, waxy secretion except around the insertion to the appendages."

MOUNTED SPECIMEN

Holotype adult female *(Fig. 6)*: 1.5 mm long; 1.2 mm wide. Antennae 6-segmented on 1 side, 3-segmented on other, latter apparently aberrant; 1st segment 190 μm long; 2nd segment 176 μm long; apical segment 224 μm long; segment 1/segment 2=1.1; apical segment/segment 1=1.2; apical segment/segment 2=1.3; with 5 setae on segment 1; with 4 setae on segment 2; with 5 setae on segment 3; with 2 setae on segment 4; with 2 setae on segment 5; with 4 setae on apical segment; apical seta 118 μm long; subapical seta

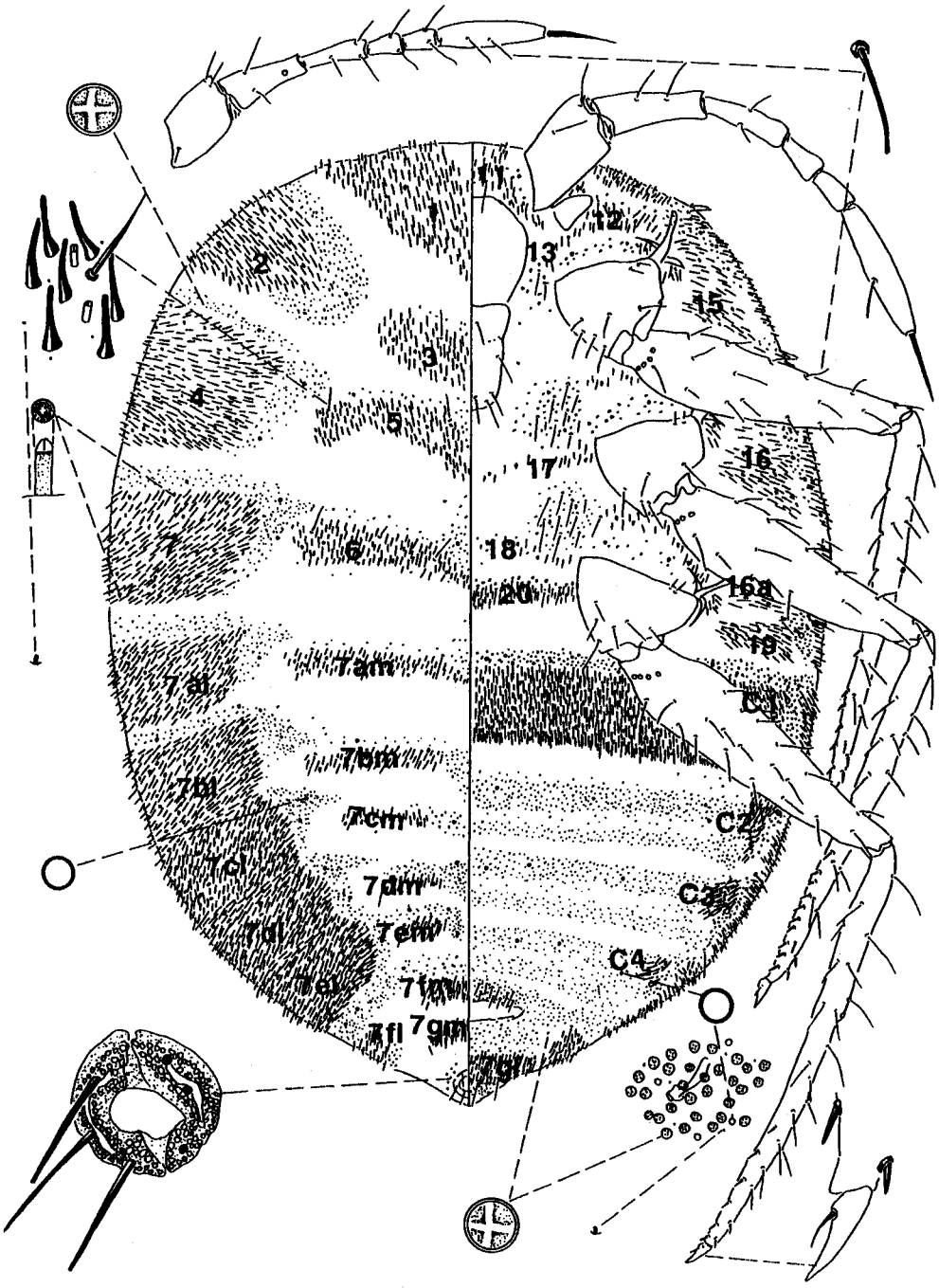

Fig. 6. *Newsteadia montana* Mamet

absent; medial sensory seta 50 μm long; sensorium on segment 2 subapical. Antennal setae of 2 kinds: apical and medial setae slightly fleshy; other setae elongate, with blunt or slightly capitate apices.

VENTER

Labium with apex broad, 162 μm long, with 10 setae on each side, all setae elongate, with capitate apices. Legs with middle trochanter-femur 490 μm long; middle tibia-tarsus 645 μm; tibia-tarsus/trochanter-femur 1.3; middle trochanter-femur with 34 setae; middle tibia-tarsus with 50 setae; proximal setae slightly capitate, distal setae spinelike, robust; without flagellate sensory setae near tarsal sensorium; trochanter with 4 sensory pores on each surface. Claw digitules setiform. Without pores immediately posterior of anterior section of ovisac band, with pores immediately anterior of anterior section of ovisac band, hair-like setae restricted to area immediately anterior of vulva. Ovisac band not divided anteriorly, anterior section 9–10 spines wide; lateral portion of ovisac band with 4 band clusters on each side of body, C3 and C4 reduced in size, C5 and C6 absent, C2, C3 and C4 separated by space without spines; longest spines in ovisac band about 37 μm long; wax plates 11, 12, 15, 16, 16a, 19 and 20 definitely present, plates 13, 17 and 18 represented by few setae, plate 14 absent. Wax plates 1 and 11 partially divided longitudinally. Coxal depressions absent or weakly developed near meta- and mesothoracic legs. Anterior thoracic spiracles without sclerotized area associated with atrium, each spiracle with 11 or 12 loosely associated sessile quadrilocular pores; diameter of anterior thoracic spiracle 32 μm. Hair-like setae few, scattered in medial areas of thorax, with setae restricted to immediately anterior of vulva in ovisac area. Quadrilocular pores of 2 kinds; tubular quadriloculars protruding from derm, long, approximately 9 μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, present in bands within ovisac area and scattered between wax plates. Discoidal pores of 1 small size, associated with sessile quadriloculars; large discoidals absent. Minute tubular ducts present in small numbers laterally (shown as small upside-down mushrooms with a dark center on illustration).

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) divided medially, with conspicuous clusters of quadrilocular pores separating lateral pieces, thin, usually 2 or 3 spines wide, approximately 1/4 times as wide as lateral wax plates (plates 7al to 7fl); anterior edge of medial wax plates straight. Medial wax plates on thorax (plates 3, 5, 6) about 1/2 width of lateral thoracic wax plates (plates 2, 4, 7). Spines at margin of wax plates elongate, with rounded apex about 35 μm long. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars unusually abundant near medial margin of lateral plates. Discoidal pores of small size only, associated with sessile quadriloculars. Minute tubular ducts present in plates (shown as small upside-down mushrooms with a dark center on illustration). Anal ring with 3 or 4 rows of pores; longest anal ring seta 51 μm long, about as long as width of anal ring; anal ring about 52 μm wide.

COMMENTS

Newsteadia montana is similar to 5 other African species. For a list of these species and their similarities see the "Comments" section of *N. gomyi. Newsteadia montana* is different from the other 5 species mentioned by having: wax plates 7bl, 7cl, 7dl, 7el divided medially and with sessile quadrilocular pores between lateral pieces of each of these plates; wax plates 17 and 18 reduced to a few spines; weak indiction of coxal depressions near mid and hind legs; and filamentous setae on legs and antennae. This species shares some similarites with *Newsteadia minima* Morrison by having wax plates 7bl, 7cl, 7dl, 7el divided medially and with sessile quadrilocular pores dividing lateral pieces of plates. *Newsteadia montana* differs by having: filamentous setae on antennae and legs (*N. minima* has spinelike setae on antennae and legs); no subapical sensory seta on apical antennal segment (*N. minima* has subapical sensory seta on apical antennal segment); ovisac band C4 contiguous with C3 (*N. minima* has ovisac band C4 separate from C3); anal-ring setae longer than width of anal ring (*N. minima* has anal-ring setae about same length as width of anal ring).

Newsteadia multispina Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted on a slide by itself. The slide is labeled as follows: left label "COMORO ARCH., Ndzouani (Anjuan), Is. Lake Dzialandz, 2 km W. Dindri Village, 1992.08.06., (900–1000 m.), T. Pócs No. 783", right label *Newsteadia multispina* Miller and Kozár, HOLOTYPE (PPI).

Etymology. The species epithet *"multispina"* is derived from the Latin adjective *"multus"* meaning many and the Latin noun *"spina"* meaning spine or thorn. This name is an adjective and refers to the thousands of spines that cover the body.

DESCRIPTION OF ADULT FEMALE

Mounted specimen *(Fig. 7):* Holotype adult female 1.6 mm long; 1.0 mm wide. Antennae 6-segmented; 1st segment 150 μm long; 2nd segment 140 and 135 μm long; apical segment 208 and 210 μm long; segment 1/segment 2=1.1; apical segment/segment 1=1.4; apical segment/segment 2=1.5 and 1.6; with 4 setae on segment 1; 4 and 5 setae on segment 2; with 4 setae on segment 3; with 2 and 1 setae on segment 4; with 2 seta on segment 5; with 5 setae on segment 6; apical seta 52 μm long (may be broken at tip); subapical seta absent; medial sensory seta 30 and 32 μm long; sensorium on segment 2 subapical. Antennal setae of 2 kinds: apical and medial sensory setae slightly fleshy; other setae spinelike.

VENTER

Labium with narrow apex, 180 μm long, with 10 and 11 setae on each side, all setae of approximately same shape, setiform, apices acute. Legs with middle trochanter-femur 440 μm long; middle tibia-tarsus 515 μm; tibia-tarsus/trochanter-femur 1.2; middle

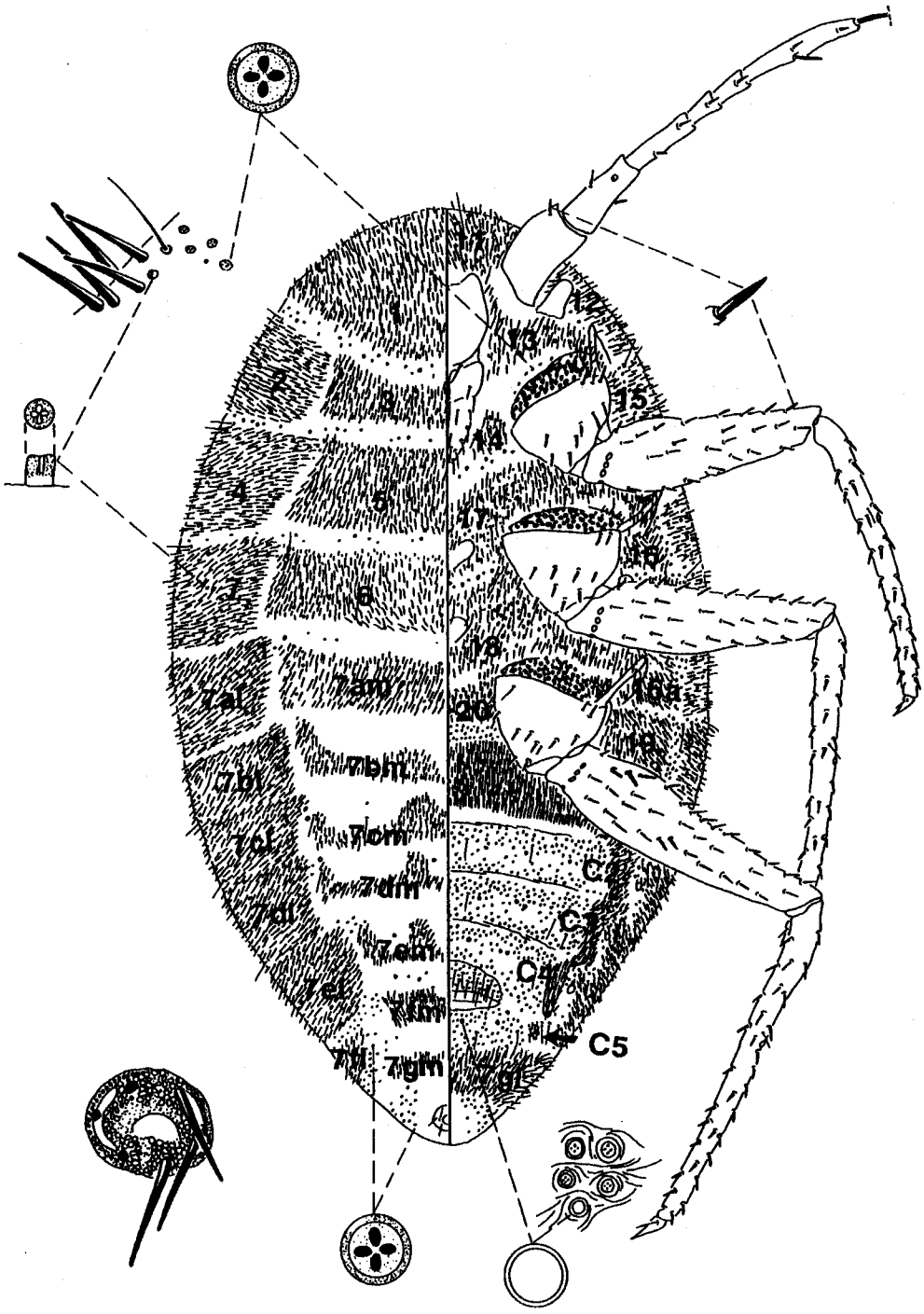

Fig. 7. *Newsteadia multispina* Miller and Kozár, sp. n., female

trochanter-femur with 49 spinelike setae; tibia-tarsus with 46 setae, proximal setae spinelike, distal setae more robust; with flagellate sensory setae near tarsal sensorium. Claw digitules setiform. Without pores immediately posterior of anterior section of ovisac band, with pores immediately anterior of anterior section of ovisac band, hair-like setae scattered in pore bands within ovisac area. Ovisac band undivided anteriorly, anterior section 10 or 11 spines wide; lateral and posterior portion of ovisac band with 5 band clusters on each side of body, cluster C5 represented by small group of setae, cluster C6 absent; all band clusters contiguous except C5 which is slightly isolated; longest spines in ovisac band about 26 μm long; all wax plates on thorax and head present and conspicuous. Wax plates on head (plates 1 and 11) undivided longitudinally. Coxal depressions absent except slight concentration of setae, spines and pores mesad of middle legs. Anterior thoracic spiracles without associated sclerotized area around atrium, each with 2 sessile quadrilocular pores loosely associated with spiracular atrium; diameter of anterior thoracic spiracles 38 μm. Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, and in segmental rows in ovisac area. Quadrilocular pores of 2 kinds; tubular quadrilocular protruding from derm, short, about 3 μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac area and scattered between wax plates elsewhere, more abundant within ovisac area. Discoidal pores of 2 sizes, associated with sessile quadriloculars; larger discoidal pores present in pore bands within ovisac area. Minute tubular ducts apparently absent.

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, of moderate width, 3 to 7 spines thick, approximately 1/2 times as wide as lateral wax plates (plates 7al to 7fl); anterior edge of medial abdominal wax plates strongly curved. Medial wax plates on thorax (plates 3, 5, 6) at least 3/4 width of lateral wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with truncate apex, 25 μm long. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Small discoidal pores present between plates. Minute tubular ducts apparently absent. Anal ring with 4 or 5 rows of pores; longest anal ring seta 55 μm long, slightly longer than width of anal ring; ring 50 μm wide.

COMMENTS

Newsteadia multispina is similar to 5 other African species. For a list of these species and their similarities see the "Comments" section of *N. gomyi*. *Newsteadia multispina* is most similar to *N. turbinespina* but differs by having: filamentous setae present in anterior segmental row within ovisac area (*N. turbinespina* has filamentous setae absent from anterior segmental row within ovisac area); apical antennal segment 208–210(209) μm long [*N. turbinespina* has apical antennal segment 155–175(165) μm long]; setae on

coxae and antennal segment 1 spine like (*N. turbinespina* has setae on coxae and antennal segment 1 filamentous); some discoidals within ovisac area as large as sessile quadrilocular pores (*N. turbinespina* has all discoidals within ovisac area much smaller than sessile quadrilocular pores). Of the species that occur outside of the African Continent, *N. multispina* is similar to *N. tasmaniensis* Kozár and Konczné Benedicty. Both species have: 6-segmented antennae; no subapical sensory seta on antennal segment 6; an elongate (setiform) claw digitule; abundant wax plates on ventral surface of thorax and head; and lack ovisac band cluster C6. *Newsteadia multispina* differs by having: no quadrilocular pores in area immediately surronding atrium of spiracle (*N. tasmaniensis* has several quadrilocular pores in area immediately surrounding atrium of spiracle); anterior edge of wax plates 7bm, 7cm, 7dm, and 7em forming conspicuous sigmoid curve (*N. tasmaniensis* has anterior edge of wax plates 7bm, 7cm, 7dm, and 7em straight or only weakly sigmoid); spinelike setae on legs and antennae (*N. tasmaniensis* has filamentous setae on legs and antennae); filamentous setae present on all segments within ovisac area (*N. tasmaniensis* has filamentous setae restricted to 2 or 3 segments within ovisac area); 1 flagellate seta on each tibia (*N. tasmaniensis* has no flagellate setae on tibia).

Newsteadia perpauca Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted on a slide with 2 other specimens; it is lower left specimen. A map is given on the back of the slide showing the position of the holotype. The slide is labeled as follows: left label "ANGOLA Foret-Galerie R. Mussaloniuca, Riv. Gauche de Lachiapa, 1962.04.20., Lune and A. De Barros Machado, lot No. 850", right label "*Newsteadia perpauca* Miller and Kozár, HOLOTYPE and PARATYPES (PPI)." In addition to the holotype, there are 2 adult female paratypes on the holotype slide and 12 adult female paratypes on 7 additional slides from the same lot (PPI). There are 5 slides containing 5 adult female paratypes and 2 immatures (not paratypes) with the following data: ANGOLA: near Dundo, R. Mussungue Gallery Forest, Affl. Luachimo, (+7.25S, 20.50E), Leg. E. Luna de Carvalho, 1963.12.18., lot No. (814) (PPI, USNM). Three slides contain 4 adult female paratypes and 1 immature (not a paratype) as follows: ANGOLA: R. Kahongo Gallery Forest, Affl. Luachimo, Mwaoka (+7.25S, 20.51E), Leg. E. Luna de Carvalho, 1964.04.20., lot No. (820) (BMNH, PPI). The fourth slide contains 1 adult female paratype as follows: CONGO: Lefine Reservation, Nambouli River, in soil, 1964. 01. 13., lot No. (519) (PPI). A final slide that contains 1 specimen possibly of this species is mixed with 5 paratypes of *Newsteadia scissa* Miller and Kozár. It is not a paratype. The specimen label information is as follows: ANGOLA: Gallery Forest R. Luachimo, Parque Carrisso (+7.22S,20.50E), 1963. 04. 26., lot No. (810).

Etymology. The species epithet *"perpauca"* is derived from the Latin adjective *"perpaucus"* meaning *"very few"* and refers to the reduced number of spines on the venter.

DESCRIPTION OF ADULT FEMALE

Holotype adult female *(Fig. 8)*: 1.0 mm long [paratypes 1.0–1.1(1.0) mm]; 0.7 mm wide [paratypes 0.7–0.9(0.8) mm]. Antennae 6-segmented (1 paratype with segment 3 partially divided into a 7th segment); 1st segment 175 μm long [paratypes 175–188(180) μm]; 2nd segment 88 μm long [paratypes 82–105(94 μm]; apical segment 160 μm long [paratypes 145–190(161) μm]; segment 1/segment 2=2.0 [paratypes 1.8–2.1(1.9)]; apical segment/segment 1=0.9 [paratypes 0.8–1.0(0.9)]; apical segment/segment 2=1.8 [paratypes 1.5–2.1(1.7)]; with 6 and 7 setae on segment 1 [paratypes with 4–7(6) setae] (1 paratype with 11 setae on 1 side and 7 on other); 3 and 4 setae on segment 2 [paratypes with 3–5(4) setae] (1 paratype with 8 setae on 1 side and 5 on other); 4 and 5 setae on segment 3 [paratypes with 2–4(3) setae]; 1 and 2 setae on segment 4 [paratypes with 1–3(2) setae] (1 paratype with 7 setae on 1 side and 2 another); 2 and 3 setae on segment 5 [paratypes with 1–2(2) setae]; with 7 setae on segment 6 [paratypes with 6–7(6) setae]; apical seta 128 μm long [paratypes 118–128(123) μm]; subapical seta 30 μm long [paratypes 31–35(33) μm]; medial sensory seta 40 μm long [paratypes 40–48(44) μm]; sensorium on segment 2 at distal end of segment. Antennal setae of 3 kinds: apical, subapical, and medial setae slightly fleshy; other setae on segments 3 to 6 spinelike; setae on segments 1 and 2 elongate, rarely with slightly capitate apices.

VENTER

Labium tapering to broad apex, 160 μm long [paratypes 130–160(141) μm], with 11 setae on each side [paratypes with 10–12(11) setae], all setae of approximately same shape, setiform, apex acute, 1 or 2 pairs of setae near apex of labium with slightly enlarged apex. Legs with middle trochanter-femur 303 μm long [paratypes 300–320(311) μm]; middle tibia-tarsus 432 μm [paratypes 413–450(425) μm]; middle tibia-tarsus, trochanter-femur 1.4 [paratypes 1.3–1.4(1.4]; middle trochanter-femur with 33 elongate setae [paratypes 34–42(38) setae]; middle tibia with 40 setae [paratypes 43–47(45) setae], proximal setae elongate, distal setae spinelike; without flagellate sensory setae near tarsal sensorium. Claw digitules conical. Without pores immediately posterior of anterior section of ovisac band, with pores immediately anterior of anterior section of ovisac band, hair-like setae restricted to area immediately anterior of vulva within ovisac area (2 paratypes with 2 or 3 setae on segments anterior of vulvar segment within ovisac area). Ovisac band divided anteriorly, with a few sessile pores and hair-like setae in division, anterior section 4–6 spines wide; lateral and posterior portion of ovisac band with 2 band clusters on each side of body, C3 to C6 absent; C1 and C2 contiguous; longest spines in ovisac band about 18 μm long [paratypes 18–21(20) μm]; wax plates 13, 14, 18 and 19 absent; wax plate 20 present in coxal depression between hind legs; occasionally with a few setae representing wax plates 17, 18 and 19. Wax plate 11 represented by small cluster near anterior end of body, partially divided longitudinally. Coxal depression mesad of hind leg only, with definite cluster of hair-like setae, wax spines, tubular quadriloculars, and sessile quadrilocular pores. Anterior thoracic spiracles without well-defined sclerotized area around atrium, containing 1 loosely associated sessile quadrilocular pore [paratypes 1–5(2) pores];

diameter of anterior thoracic spiracles 20 μm [paratypes 20–23(21) μm]. Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, usually restricted to immediately anterior of vulva in ovisac area. Quadrilocular pores of 2 kinds; tubular quadrilocular protruding from derm, long, 7–9(8) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac area and scattered between wax plates elsewhere, more abundant within ovisac area. Discoidal pores of 1 small size, associated with sessile quadriloculars; larger discoidal pores absent. Minute tubular ducts present (not illustrated).

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) and on meso- and metathoracic segments divided medially (paratypes often with plates divided on meso- and metathoracic segments only), dorsomedial wax plates on posterior abdominal segments thin, 1 or 2 spines wide, approximately 1/4 times as wide as lateral wax plates (plates 7al to 7f); anterior margin of medial abdominal wax plates straight. Medial wax plates on thorax (plates 3, 5, 6) about 3/4 width of lateral thoracic wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with truncate apex, 21 μm long [paratypes 20–23(21) μm]. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores of small size only, associated with sessile quadriloculars. Minute tubular ducts present. Anal ring with 4 or 5 rows of pores; longest anal-ring seta 40 μm long [paratypes 38–42(40) μm], shorter than width of anal ring; ring 58 μm wide [paratypes 52–62(56) μm].

COMMENTS

Newsteadia perpauca is very similar to *N. angustilinea*. For a comparison of these species, see the "Comments" section of the latter species.

The specimen from Gallery Forest R. Luachimo in Angola differs from other representatives of this species by having: long antennal setae on nearly all segments; a large ventral head wax plate; more ventral spines; an inconspicuous medial depression between metathoracic legs. Because of these differences, we have excluded it from the type series.

Newsteadia scissa Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted on a slide with 5 other specimens; it is in the middle row on the right side. A map is given on the back of the slide showing the position of the holotype. The slide is labeled as follows: left label, ANGOLA, Foret-Galerie R., Luachimo, Parque Carrisso (+7.22S, 20.50E), 1963.04.26., lot No. 810 right label *Newsteadia scissa* Miller and Kozár, HOLOTYPE and PARATYPES (PPI). In addition to the

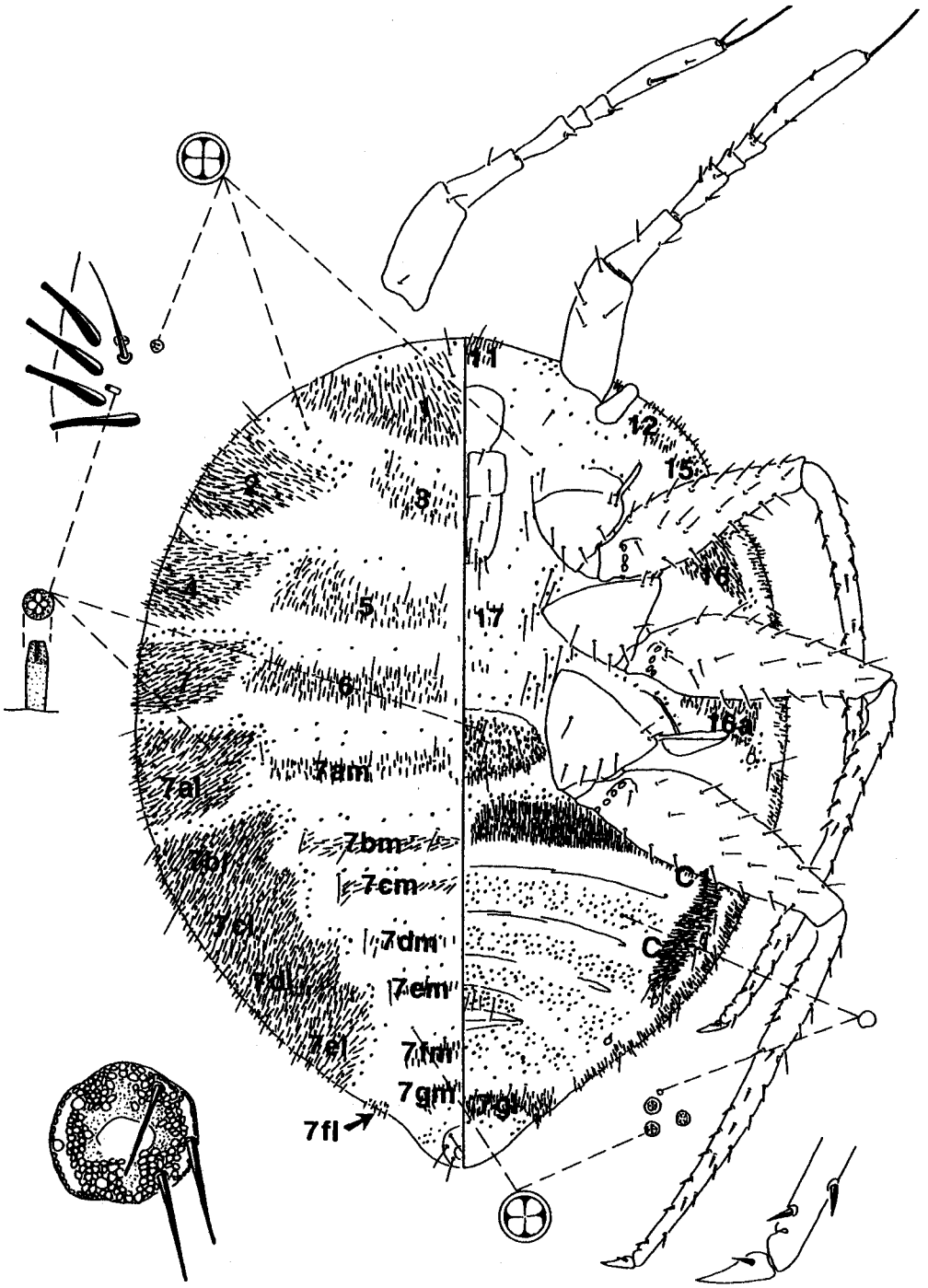

Fig. 8. *Newsteadia perpauca* Miller and Kozár, sp. n., female

holotype, there are 3 adult female paratypes and 2 immatures (not paratypes) on the holotype slide. There are 9 other slides from the same lot, containing 22 adult female paratypes and 2 immatures (not paratypes) (BMNH, MNHN, SANC). One of these slides, containing 5 adult female paratypes of *N. scissa,* also has a specimen of what is tentatively identified as *N. perpauca* Miller and Kozár. There are 3 additional slides containing 8 adult female paratypes and 3 immatures (not paratypes) with the following data: ANGOLA: near Dundo, Luahime Forest, Leg. A. De Barros Machado, 1962.03.28., lot No. (806) (PPI, USNM). An additional slide containing 1 adult female paratype has the following data: ANGOLA: Camaxilo, Leg. A. De Barros Machado, 1962.07.06., lot No. number (807) (PPI).

Etymology. The species epithet *"scissa"* is derived from the Latin adjective *"scissus"* meaning *"divided"* and refers to the unusual divided ovisac band.

DESCRIPTION OF ADULT FEMALE

Holotype adult female *(Fig. 9):* 1.1 mm long [paratypes 0.9–1.2(1.0) mm]; 0.8 mm wide [paratypes 0.6–1.0(0.8) mm]. Antennae 7-segmented; 1st segment 145 μm long [paratypes 128–155(143) μm]; 2nd segment 150 μm long [paratypes 138–172(151 μm]; apical segment 235 μm long [paratypes 178–242(215) μm]; segment 1/segment 2=1.0 [paratypes 0.8–1.0(0.9)]; apical segment/segment 1=1.6 [paratypes 1.3–1.6(1.5)]; apical segment/segment 2=1.6 [paratypes 1.2–1.6(1.4)]; with 4 setae on segment 1 [paratypes with 3–5(4) setae]; 3 setae on segment 2 [paratypes with 1–3(3) setae]; without setae on segment 3, 4, 5; with 1 seta on segment 6 [paratypes with 0–1(1) seta]; with 3 setae on segment 7 [paratypes with 3–5(3) setae]; apical seta 75 μm long [paratypes 60–82(71) μm], subapical seta 48 μm long [paratypes 39–45(42) μm], medial sensory seta absent; sensorium on segment 2 subapical. Antennal setae of 3 kinds: apical and subapical setae slightly fleshy; other setae on segments 6 and 7 spinelike; setae on segments 1 and 2 elongate, with slightly capitate apices, except spinelike or slightly fleshy basal seta on segment 1.

VENTER

Labium unusually broad apically, 170 μm long [paratypes 125–158(139) μm], with 9 setae on each side [paratypes with 8–11(10) setae], all setae of approximately same shape, setiform, apex acute. Legs with middle trochanter-femur 430 μm long [paratypes 380–430(412) μm]; middle tibia-tarsus 550 μm [paratypes 490–550(522) μm]; middle tibia-tarsus, trochanter-femur 1.3 [paratypes 1.2–1.3(1.3)]; middle trochanter-femur with 29 elongate setae [paratypes 22–35(30) setae]; middle tibia-tarsus with 43 setae [paratypes 39–46(42) setae], proximal setae elongate, distal setae spinelike; without flagellate sensory setae near tarsal sensorium. Claw digitules conical. With pores immediately anterior and posterior of anterior section of ovisac band, hair-like setae restricted to area anterior of vulva within ovisac area. Ovisac band divided anteriorly, with a few sessile pores and hair-like setae in division, anterior section 7–10 spines wide; lateral and posterior portion of ovisac band with 6 band clusters on each side of body, C4 reduced, represented by spines anterior of spiracle only; all ovisac band clusters contiguous, except on posterior part of C4; without space on median line of C6; longest spines in ovisac band about 28 μm long

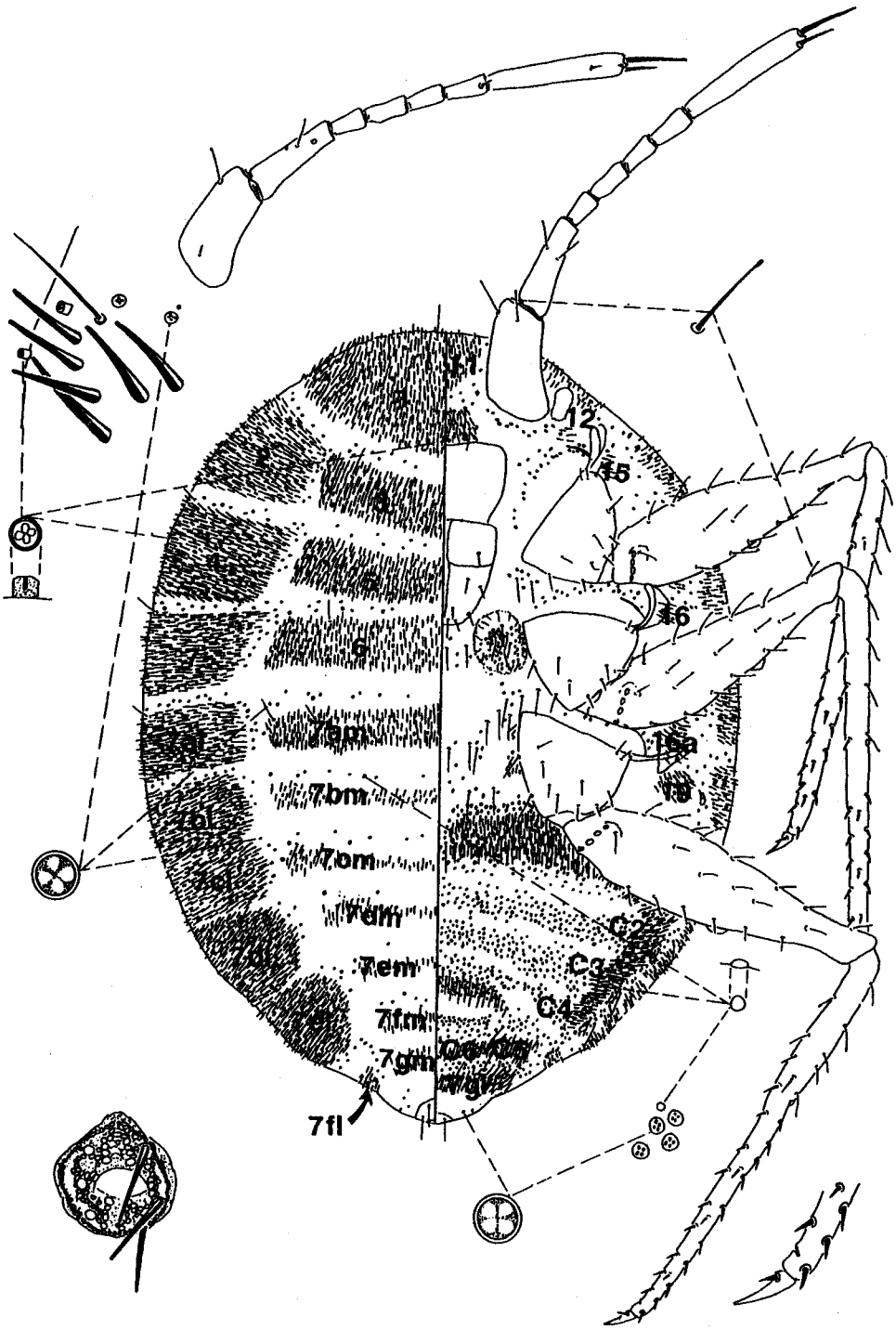

Fig. 9. *Newsteadia scissa* Miller and Kozár, sp. n., female

[paratypes 25–28(26) μm]; wax plates 13, 17, 18 and 20 absent, occasionally with a few spines mesad of legs; wax plates 15, 16, 16a and 19 reduced. Wax plate 11 divided into anterior and posterior cluster, not divided longitudinally. Coxal depressions mesad of middle leg only, with definite cluster of hair-like setae, wax spines, tubular quadrilocular, and sessile quadrilocular pores. Anterior thoracic spiracles without well-defined sclerotized area around atrium, each spiracle containing 1 and 2 loosely associated sessile quadrilocular pores [paratypes 0–4(1) pores]; diameter of anterior thoracic spiracles 28 μm [paratypes 24–30(25) μm]. Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, restricted to area immediately anterior of vulva in ovisac area. Quadrilocular pores of 2 kinds; tubular quadrilocular protruding from derm, short, 3–7(5) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac area and scattered between wax plates elsewhere, more abundant within ovisac area. Discoidal pores of 1 small size, associated with sessile quadriloculars; larger discoidal pores absent. Minute tubular ducts apparently absent.

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, thin, usually 1 or 2 spines wide, approximately 1/4 times as wide as lateral wax plates (plates 7al to 7fl); anterior edge of medial abdominal wax plates straight. Medial wax plates on thorax (plates 3, 5, 6) about 3/4 or wider compared with lateral thoracic wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex 22–28(25) μm. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores of small size only, associated with sessile quadriloculars. Minute tubular ducts apparently absent. Anal ring with 3 or 4 rows of pores; longest anal ring seta 42 μm long [paratypes 38–45(41) μm], shorter than width of anal ring; ring 62 μm wide [paratypes 50–62(59) μm].

COMMENTS

Newsteadia scissa is most similar to *N. perpauca* by having: greatly reduced number of dorsomedial spines on abdomen; greatly reduced number of ventral spines on thorax; anterior part of ovisac band divided medially; and apex of labium relatively broad. *Newsteadia scissa* differs by having: 7-segmented antennae (*N. perpauca* has 6-segmented antennae); antennal segment 1 slightly shorter than 2 (*N. perpauca* has antennal segment 1 conspicuously longer than 2); antennal segments 3, 4 and 5 without setae (*N. perpauca* has antennal segments 3, 4 and 5 with several setae); small coxal depression near middle pair of legs (*N. perpauca* has large coxal depression between hind pair of legs); no medial sensory seta on apical antennal segment (*N. perpauca* has medial sensory seta on apical antennal segment); sensorium on antennal segment 2 subapical (*N. perpauca* has sensorium on antennal segment 2 apical); ovisac band clusters C3, C4, C5 and C6 (*N. perpauca* has ovisac band clusters C3, C4, C5 and C6 absent); and capitate apex to filamentous setae

on antennae and legs (*N. perpauca* has relatively acute apex to filamentous setae on antennae and legs). For a comparison of *N. scissa* with *N. angustilinea* see the "Comments" section of the latter species. Of the species that do not occur on the African Continent, *Newsteadia scissa* is most similar to *N. australiensis* by having: anterior part of ovisac band divided medially; filamentous setae on legs and antennae; conical claw digitule; ovisac band clusters C3 and C4; reduced numbers of spines on venter of thorax. *Newsteadia scissa* differs by having: setae on antennal segments 3, 4 and 5 absent (*N. australiensis* has setae on antennal segments 3, 4 and 5 present); apical antennal segment without sensory medial seta (*N. australiensis* has apical antennal segment with sensory medial seta); 7-segmented antenna (*N. australiensis* has 6-segmented antenna); coxal depression associated with middle legs (*N. australiensis* has coxal depression associated with hind legs); full complement of ovisac band clusters (*N. australiensis* has ovisac band clusters C5 and C6 absent).

Newsteadia southafricensis Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted singly on slide. The slide is labeled as follows: left label, SOUTH AFRICA, Weza, Stark Wood Forest, 1989.11.17., (2686)4888 right label, *Newsteadia southafricensis* Miller and Kozár, HOLOTYPE (PPI). There is a single adult female paratype mounted on a second slide with the following data: SOUTH AFRICA, Weza, Stink Wood Forest, 1989.11.20., (2702)4886" (USNM).

Etymology. The species epithet is named in honor of the country from which it was collected.

DESCRIPTION OF ADULT FEMALE

Mounted specimen Holotype adult female *(Fig. 10):* 1.5 mm long (paratype 1.4 mm) long; holotype and paratype 1.0 mm wide. Antennae 7-segmented; 1st segment 168 μm long (paratype 168 and 170 μm); 2nd segment 138 μm long (paratype 122 and 135 μm); apical segment 192 μm long (paratype 200 and 202 μm); segment 1/segment 2=1.2 (paratype 1.2 and 1.4); apical segment/segment 1=1.1 (paratype 1.2); apical segment/segment 2=1.4 (paratype 1.5 and 1.6); with 4 setae on segment 1 (6 and 5 on paratype); with 3 and 4 setae on segment 2 (3 on paratype); without setae on segment 3, 4 and 5; with 1 seta on segment 6; with 3 setae on segment 7; apical seta 83 μm long (paratype 70 and 75 μm), subapical seta 35 μm long (paratypes 30 μm), medial sensory seta absent; sensorium on segment 2 subapical. Antennal setae of 3 kinds: apical and subapical setae slightly fleshy; other setae on segments 6 and 7 spinelike; setae on segments 1 and 2 elongate, except basal seta on segment 1 spinelike.

VENTER

Labium with relatively acute apex, 168 μm long (paratype 186 and 188 μm), with 10 and 11 setae on each side (paratype with 8 setae), all setae of approximately same

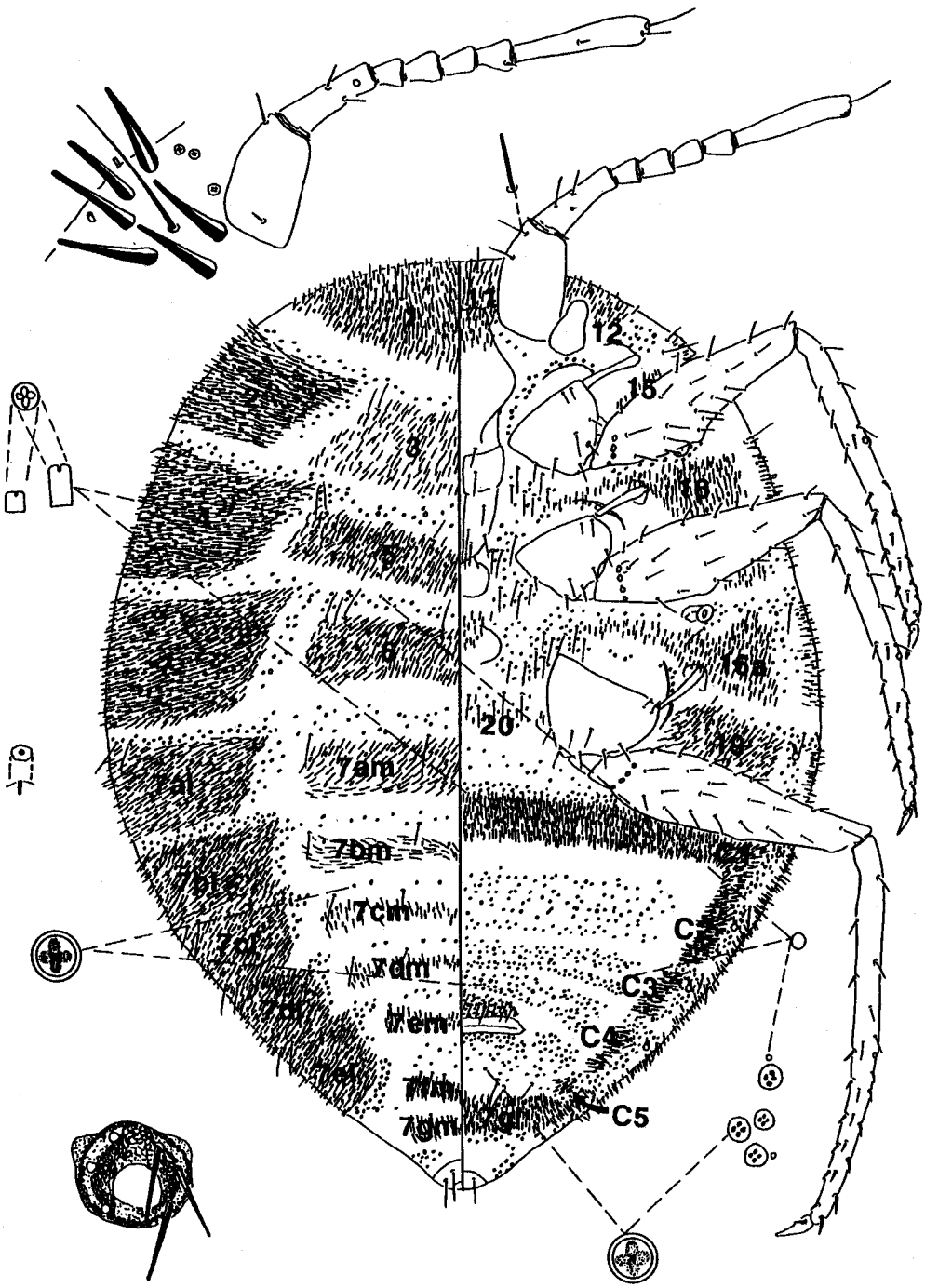

Fig. 10. *Newsteadia southafricensis* Miller and Kozár, sp. n., female

shape, setiform. Legs with middle trochanter-femur 400 μm long (paratype 368 and 390 μm); middle tibia-tarsus 510 μm long (paratype 448 and 500 μm); middle tibia-tarsus/ trochanter-femur on holotype and paratype 1.3; middle trochanter-femur with 27 elongate setae (paratype 22 and 29 setae); middle tibia-tarsus with 32 setae (paratype 34 and 41 setae), proximal setae elongate, distal setae spinelike; without flagellate sensory setae near tarsal sensorium. Claw digitules conical. Without pores immediately posterior of anterior section of ovisac band, with pores immediately anterior of anterior section of ovisac band, hair-like setae usually on only 1 segment immeditately anterior of vulva in ovisac area, paratype with setae on segment anterior of vulva and with 1 additional seta on third segment anterior of vulva in ovisac area. Ovisac band not divided anteriorly, anterior section about 4 to 7 spines wide; lateral and posterior portion of ovisac band with 5 band clusters on each side of body, cluster C6 absent; clusters C1 and C2 contiguous, C3, C4 and C5 separate; longest spines in ovisac band about 25 μm long; wax plates 13, 14 and 17 absent, plates 18 and 20 greatly reduced. Wax plates 11 and 1 undivided longitudinally. Coxal depressions mesad of coxae absent, only with small cluster of hair-like setae, wax spines, tubular quadrilocular, and sessile quadrilocular pores. Anterior thoracic spiracles without sclerotized area surrounding atrium, with cluster of 5 and 6 loosely associated sessile quadrilocular pores (paratype with 2 and 5 pores); diameter of anterior thoracic spiracles 28 μm (paratype 18 and 25 μm). Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, present immediately anterior of vulva in ovisac area. Quadrilocular pores of 2 kinds; tubular quadrilocular protruding from derm, medium in length, 5–6(5) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac area and scattered between wax plates elsewhere, abundant within ovisac area, with 2 or 3 rows anterior of ovisac band. Discoidal pores of 2 sizes, larger size uncommon near posterior margin of segments within ovisac area, small size associated with sessile quadriloculars. Minute tubular ducts scattered over surface (shown as small upside-down mushrooms with a dark center on illustration).

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, moderate in width, 2 to 7 spines wide, approximately 1/4 times as wide as lateral wax plates on posterior abdominal segments; anterior edge of medial abdominal wax plates straight. Medial wax plates on thorax (plates 3, 5, 6) about 3/4 or wider compared with lateral thoracic wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apices 19 μm long [paratypes 18–20(19) μm]. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of same 2 types as on venter: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores of small size only, associated with sessile quadriloculars; discoidal of large size absent. Minute tubular ducts scattered in wax plates. Anal ring with 4 or 5 rows of pores; longest anal-ring seta 50 μm long (paratype 48 and 56 μm), shorter than width of anal ring; ring 70 μm wide (paratype 68 μm wide).

COMMENTS

Newsteadia southafricensis is similar to 4 other African species that possess a unique combination of characters. For a description of these characters and a list of the other 4 species see the "Comments" section of *N. africana. Newsteadia southafricensis* is similar to *N. wacri* but differs by having: ovisac band cluster C5 reduced to few spines (*N. wacri* has ovisac band cluster C5 large with many spines); ovisac band cluster C6 absent (*N. wacri* has ovisac band cluster C6 present); antennal segment 2 length 122–138(130) µm [*N. wacri* has antennal segment 2 length 205–250(220) µm]; antennal segment 2 with 3–4(3) setae [*N. wacri* has antennal segment 2 with 7–13(10) setae]; tibia-tarsus 448–510(479) µm long [*N. wacri* has tibia-tarsus 820–950(900) µm long]; trochanter-femur with 22–29(27) setae [*N. wacri* has trochanter-femur with 43–64(52) setae]; and spiracular atrium 18–28(23) µm in diameter [*N. wacri* has spiracular atrium 43–52(48) µm in diameter]. Of the species that do not occur in the Afrotropical Region, *N. southafricensis* most closely resembles *N. gullanae* by having: reduced number of spines in ventral area of thorax; filamentous setae on legs and antennae; conical claw digitules; and 7-segmented antennae. *Newsteadia southafricensis* differs by having: setae on antennal segments 3, 4 and 5 absent (*N. gullanae* has setae on antennal segments 3, 4 and 5 present); ovisac band cluster C5 present (*N. gullanae* has ovisac band cluster C5 absent); and sessile pores immediately posterior of anterior portion of ovisac band absent (*N. gullanae* has sessile pores immediately posterior of anterior portion of ovisac band).

Newsteadia spiraculum Miller and Kozár, sp. n.

MATERIAL EXAMINED

Holotype: adult female is mounted on a slide by itself. The slide is labeled as follows: left label, SOUTH AFRICA, Colvie, on moss, 1997.12.03., Leg. F. Kozár and J. Giliomee, lot No. 40(4822), right label, *Newsteadia spiraculum* Miller and Kozár, HOLOTYPE (PPI).

Etymology. The species epithet *"spiraculum"* is derived from the Latin noun *"Spiraculum"* and is a noun in apposition meaning "breathing pore or spiracle". This name refers to the unusual spiracles that have an expanded area outside of the atrium that contains several quadrilocular pores.

DESCRIPTION OF UNMOUNTED ADULT FEMALE

The dorsum is covered with white, wax protrusions, the lateral ones are wide, and the ovisac is longer than the body of the female *(Fig. 14).*

MOUNTED SPECIMEN

Holotype adult female *(Fig. 11):* 1.8 mm long; 1.3 mm wide. Antennae 6-segmented; 1st segment 150 and 158 µm long; 2nd segment 140 and 132 µm long; apical segment 232 and 230 µm long; segment 1/segment 2=1.1; apical segment/segment 1=1.5; apical segment/segment 2=1.7; with 4 and 5 setae on segment 1; 3 and 5 setae on segment 2; with

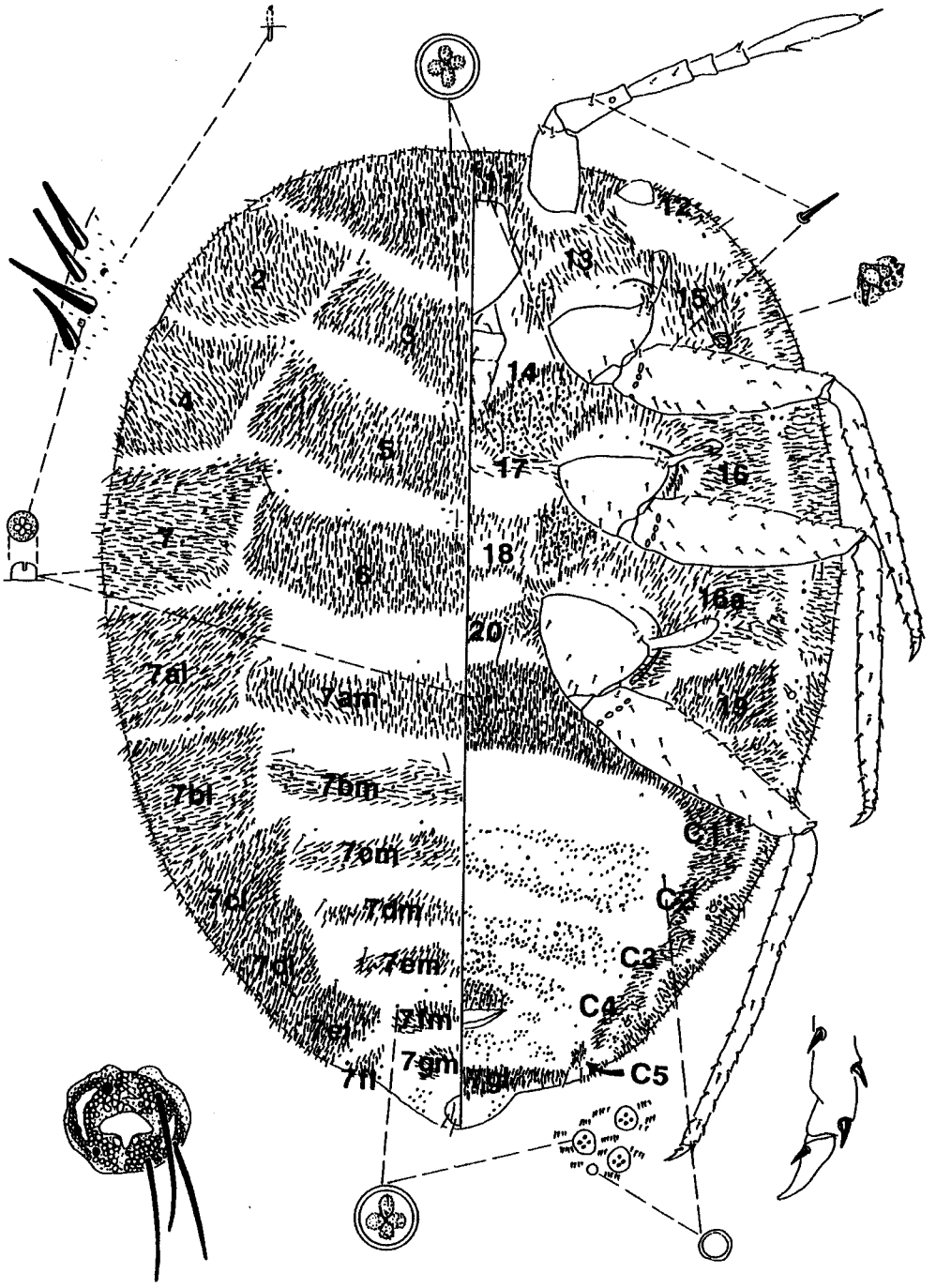

Fig. 11. *Newsteadia spiraculum* Miller and Kozár, sp. n., female

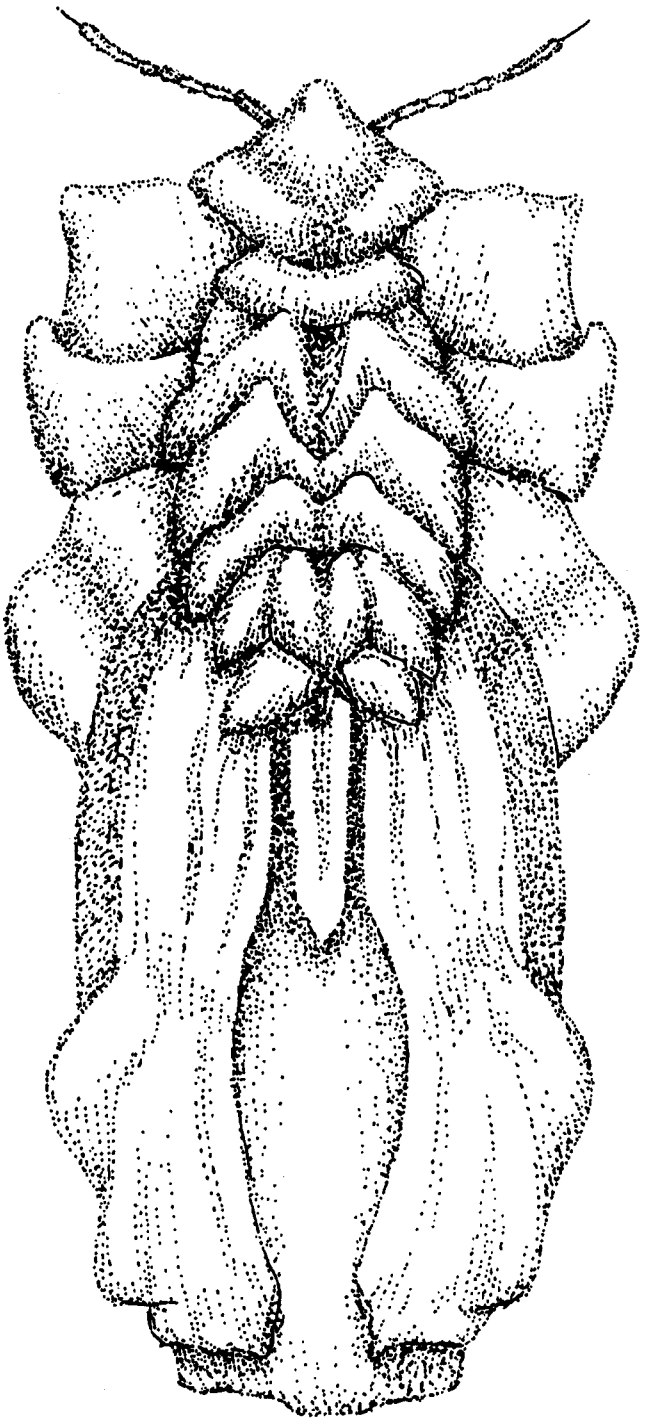

Fig. 12. *Newsteadia spiraculum* Miller and Kozár, sp. n., unmounted female

1 and 2 setae on segment 3; without setae on segment 4; with 2 seta on segment 5; with 3 setae on segment 6; apical seta 58 and 60 μm long; subapical seta absent; medial sensory seta 22 and 20 μm long. Antennal setae of 2 kinds: apical and medial sensory setae slightly fleshy; other setae spinelike.

VENTER

Labium with relatively acute apex, 178 μm long, with 12 setae on each side, all setae of approximately same shape, setiform, apices acute. Legs with middle trochanter-femur 432 and 440 μm long, middle tibia-tarsus 535 and 530 μm, middle tibia-tarsus, trochanter-femur 1.2; middle trochanter-femur with 30 and 35 spinelike setae; middle tibia-tarsus with 32 and 33 setae, proximal setae spinelike, distal setae more robust; without flagellate sensory setae near tarsal sensillum. Claw digitules conical. Without pores immediately anterior and posterior of anterior section of ovisac band, hair-like setae restricted to area immediately anterior of vulva within ovisac area, except 1 side of specimen with 1 seta in lateral area of anterior portion of ovisac area. Ovisac band undivided anteriorly, anterior section 10 or 11 spines wide; lateral and posterior portion of ovisac band with 5 band clusters on each side of body, C5 represented by small cluster of spines, C6 absent; all band clusters contiguous, except C5 which separate; longest spines in ovisac band about 30 μm long; all thoracic and head wax plates present. Wax plates 1 and 11 undivided longitudinally. Coxal depressions mesad of front and middle legs only, with definite cluster of hair-like setae, wax spines, tubular quadrilocular, and sessile quadrilocular pores. Anterior thoracic spiracles with well-defined sclerotized area around atrium, each containing 6 sessile quadrilocular pores; diameter of anterior thoracic spiracles 43 and 49 μm including sclerotized area outside of atrium. Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band, restricted to area immediately anterior or vulva in ovisac area. Quadrilocular pores of 2 kinds; tubular quadriloculars protruding from derm, short, about 5 μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac area and scattered between wax plates elsewhere, more abundant within ovisac area. Discoidal pores of 1 small size, associated with sessile quadriloculars; larger discoidal pores absent. Minute tubular ducts apparently absent.

DORSUM

Medial wax plates on abdomen (7am to 7gm) undivided medially, moderate in width, 3 to 7 spines wide, approximately 1/4 to 1/2 times as wide as lateral wax plates on posterior abdominal segments; anterior edge of medial abdominal segments slightly curved. Medial wax plates on thorax (plates 3, 5, 6) about 3/4 of width of lateral wax plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex, about 28 μm long. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores of small size only, associated

with sessile quadriloculars. Minute tubular ducts scattered in plates (not illustrated). Anal ring with 4 or 5 rows of pores; longest anal ring seta 68 μm long, longer than width of anal ring; ring 62 μm wide.

COMMENTS

Newsteadia spiraculum is similar to 5 other African species. For a list of these species and their similarities see the "Comments" section of *N. gomyi. Newsteadia spiraculum* differs from other African species with 6-segmented antennae by having: no flagellate setae on tibia; conical claw digitule; and coxal depressions near front and middle legs. Of the species that do not occur on the Afrotropical Region, *N. spiraculum* most closely resembles *N. samoana* by having: quadrilocular pores in area immediately surrounding spiracular atrium; spinelike setae on legs and antennae; ovisac band clusters C5 and C6 absent. *Newsteadia spiraculum* differs by having: flagellate setae on tibia absent (*N. samoana* has flagellate setae on tibia present); claw digitule conical (*N. samoana* has claw digitule relatively elongate); and coxal depression near front and middle coxae (*N. samoana* has coxal depressions absent or greatly reduced).

Newsteadia turbinespina Miller and Kozár, n. sp.

MATERIAL EXAMINED

Holotype: adult female is left specimen on slide with 1 other adult female paratype. The slide is labeled as follows: left label "TANZANIA, Kiuguru Mts., Bondwa Peak, foggy forest, from, moss, T. Pócs, 1973.02.25, lot No. 188" right label *Newsteadia turbinespina* Miller and Kozár, HOLOTYPE and PARATYPE (PPI), and gives a map of the location of the holotype.

Etymology. The species epithet *"turbinespina"* is derived from the Latin adjective *"turbineus"* meaning *"conical"* and the Latin noun *"spina"* meaning *"spine"*. It is an adjective and refers to the characteristic conical or spinelike setae on the trochanter-femur and antenna.

DESCRIPTION OF ADULT FEMALE

Holotype adult female *(Fig. 13):* and paratype 1.3 mm long; holotype 0.9 mm wide (paratype 1.0 mm). Antennae 6-segmented; 1st segment 120 and 125 μm long (paratype 118 and 125 μm); 2nd segment 110 and 118 μm long (paratype 118 μm); apical segment 175 μm long (paratype 155 and 160 μm); segment 1/segment 2=1.1 (paratype 1.0 and 1.1); apical segment/segment 1=1.4 and 1.5 (paratype 1.2 and 1.4); apical segment/ segment 2=1.4 and 1.6 (paratype 1.3 and 1.4); with 5 and 7 setae on segment 1 (paratype 4 and 5); with 3 and 4 setae on segment 2 (paratype 5 and 6); with 3 setae on segment 3 (paratype 4); with 1 and 2 setae on segment 4 (paratype 0 and 2); with 2 and 1 setae on segment 5 (paratype 2); with 4 and 5 setae on apical segment (paratype 4); apical seta about 80 and 83 μm long (paratype 88 μm), subapical seta absent, medial sensory seta 28 μm long (paratype 28 and 30); sensillum on second segment supapical. Antennal setae of 3 kinds;

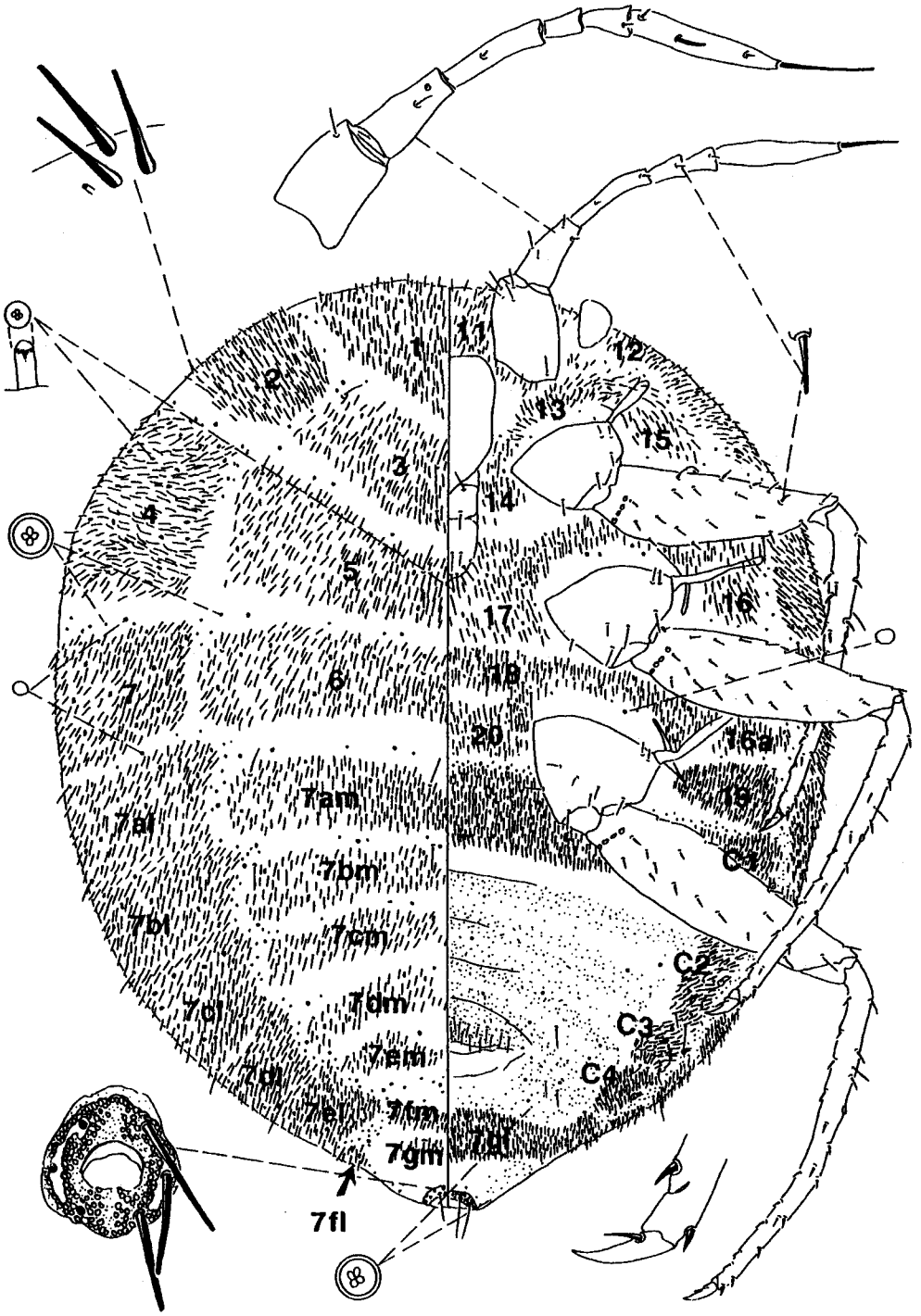

Fig. 13. *Newsteadia turbinespina* Miller and Kozár, n. sp., female

apical and medial setae slightly fleshy; other setae on segments 3 to 6 spinelike; setae on segments 1 and 2 elongate.

VENTER

Labium with broad apex, 185 μm long (paratype 162 μm); with 12 setae on each side, 2 or 3 setae at apex elongate, slightly capitate or with rounded apex, other setae of approximately same size and shape. Legs with middle trochanter-femur 355 and 360 μm long (358 and 360 on paratype), middle tibia-tarsus 490 μm long (465 on paratype), middle tibia-tarsus, trochanter-femur 1.4 (1.3 on paratype); middle trochanter-femur with 21 and 23 setae (25 and 26 on paratype); tibia-tarsus with 41 setae (34 and 40 on paratype), setae on tibia-tarsus mostly spinelike, setae on trochanter-femur generally more elongate with rounded apex; with flagellate sensory setae near tarsal sensorium. Claw digitules setiform. Without pores immediately posterior of anterior section of ovisac band, with pores immediately anterior of anterior section of ovisac band, hair-like setae on 1 or 2 segments anterior of vulva. Ovisac band not divided anteriorly, anterior section about 9 or 10 spines wide; lateral and posterior portion of ovisac band with 4 band clusters on each side of body, clusters C5 and C6 absent, clusters C1, C2 and C3 contiguous; longest spines in ovisac band about 22–25(24) μm long; all wax plates on thorax and head well developed. Wax plate 11 undivided longitudinally. Coxal depressions absent. Anterior thoracic spiracles without associated sclerotized area, with 0 and 1 sessile quadrilocular pores, paratype with 1 and 2; diameter of anterior thoracic spiracle 34 μm (paratype 28 μm). Hair-like setae few, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band. Quadrilocular pores of 2 kinds; tubular quadriloculars protruding from derm, medium in length, 6–8(7) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, present in bands within ovisac area and scattered between wax plates; with 2 broken rows of pores immediately anterior of ovisac band. Discoidal pores of 1 small size, associated with sessile quadriloculars; discoidals of large size absent. Minute tubular ducts apparently absent.

DORSUM

Medial wax plates on abdomen (plates 7am to 7gm) undivided medially, but constricted to 1 or 2 setae in medial area, moderate in width, approximately 1/2 as wide as lateral wax plates (plates 7al to 7gl) ; anterior edge of medial plates on abdomen indented medially. Medial wax plates on thorax (plates 3, 5, 6) about 3/4 width of lateral plates (plates 2, 4, 7). Spines at margin of wax plate elongate, with rounded apex 18–20(19) μm long. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars scattered near medial margin of lateral plates. Discoidal pores of small size only, associated with sessile quadriloculars. Anal ring with about 6 rows of pores; longest anal-ring seta 55 μm long, shorter than width of anal ring; anal ring 78 μm wide (paratype 62 μm).

COMMENTS

Newsteadia turbinespina is similar to 5 other African species. For a list of these species and their similarities, see the "Comments" section of *N. gomyi. Newsteadia turbinespina* is similar to both *N. gomyi* and *N. multispina.* For a comparison of these species, see the "Comments" section of the latter 2 species. Of the species occurring outside of the African Continent, *N. turbinespina* is most similar to *N. tasmaniensis;* both species have 6-segmented antennae; no subapical sensory seta on apical antennal segment; elongate claw digitule; few filamentous setae in ovisac area; ovisac band clusters C5 and C6 absent; and all of ventral wax plates present on thorax and head. *Newsteadia turbinespina* differs by having: no quadrilocular pores in area immediately surrounding spiracular atrium (*N. tasmaniensis* has several quadrilocular pores in area immediately surrounding spiracular atrium); broad apex to labium (*N. tasmaniensis* has relatively narrow apex to labium); and setae on trochanter-femur spine like (*N. tasmaniensis* has setae on trochanter-femur filamentous).

Newsteadia wacri Strickland, 1947: 518

Richard, 1979: 1079.

MATERIAL EXAMINED

Holotype: adult female is mounted alone on a slide labeled as follows: right label, NEWSTEADIA WACRI 1947, TYPE 474, "Gold Coast [Ghana], Tafo, E.P., Coll: J. Mc A. Todd". Left label "Ex: Bole of Theobroma cacao, L., (H5284), BM. 1947.474". We have examined the holotype and 2 other slides containing 4 adult females and 1 immature from the same locality but on *Triplochiton scleroxylon.* These were discussed in the original description and are considered to be paratypes. According to the original description there were 18 adult females in the type series; all are deposited in BMNH. We also have examined a single slide containing 5 adult females that were sent to Morrison by Strickland in 1949. They are as follows: GHANA: Oyoleo, on rotting banana and cacao litter, July, 19, 1947, Coll: A. H. Strickland (USNM).

DESCRIPTION OF UNMOUNTED ADULT FEMALE

According to Strickland (1947) "Adult female completely covered with white wax in the form of plates of a definited pattern. One large triangular plate covering the head and apex of the body, overlaid by a second, and smaller, plate on the first thoracic segment. Two pairs of triangular plates on the succeeding thoracic segments. Two wide plates on the anterior abdominal segments, and one large triangular plate covering the terminal abdominal segments. Six to seven pairs of plates situated laterally, the anterior pair being gently curved backwards, and overlapping the edges of the ovisac in mature specimens. Ovisac dorsally of six to seven wax strips cemented together to form a slightly curved, striated, plate; ventrally, a trough of wax, evidently secreted entire. Body color when wax removed, very pale ochreous yellow."

MOUNTED SPECIMEN

Holotype adult female *(Fig. 13)*: 2.0 mm long [paratypes and other specimens 1.7–2.1(2.0)]; holotype 1.2 mm wide [paratypes and other specimens 1.2–1.6(1.4) mm]. Antennae 7-segmented; 1st segment 210 μm long [paratypes and other specimens 190–215(204) μm]; 2nd segment 250 μm long [paratypes and other specimens 205–238(220) μm]; apical segment 285 μm long [paratypes and other specimens 254–310(277) μm]; segment 1/segment 2=0.8 [paratypes and other specimens 0.9–1.0(0.9)]; apical segment/ segment 1=1.4 [paratypes and other specimens 1.2–1.6(1.4)]; apical segment/segment 2 = 1.1 [paratypes 1.2–1.4(1.3)]; with 8 and 10 setae on segment 1 [paratypes and other specimens 7–10(8) setae]; with 11 and 12 setae on segment 2 [paratypes and other specimens with 7–13(10) setae]; without setae on segments 3 and 4 [paratypes and other specimens with 0–1(0) setae]; with 1 seta on segment 5 [paratypes and other specimens with 0–1(0)]; with 2 and 1 setae on segment 6 [paratypes with 0–2(1) seta]; with 5 setae on apical segment [paratypes and other specimens with 5–6(5) setae], apical seta 78 μm long [paratypes and other specimens 75–95(85) μm]; subapical seta 50 μm long [paratypes and other specimens 49–50(50) μm]; medial seta absent. Antennal setae of 2 kinds: apical and subapical setae slightly fleshy; all other setae elongate with blunt or slightly capitate apices.

VENTER

Labium relatively acute apically, 225 μm long [paratypes and other specimens 193–215(201) μm], with 10 setae on each side [paratypes and other specimens with 9–13(11) setae], all setae of approximately same shape, setiform, apical setae occasionally with slightly expanded apex. Legs with middle trochanter-femur 700 μm long [paratypes and other specimens 613–710(670) μm], middle tibia-tarsus 910 μm [paratypes and other specimens 820–950(900) μm], middle tibia-tarsus, femur-trochanter 1.3 [paratypes and other specimens 1.3–1.4 (1.3)]; middle trochanter-femur with 59 setae [paratypes and other specimens with 43–64(52) setae]; middle tibia-tarsus with 77 setae [paratypes and other specimens 52–81(64) setae], distal setae spinelike, proximal setae elongate, with blunt or capitate apices; without flagellate sensory setae near tarsal sensorium; with roughened protrusion in middle of femur. Claw digitules conical. With a few sessile pores on segment posterior of ovisac band, with sessile pores on segment anterior of ovisac band, hair-like setae in cluster immediately anterior of vulva, absent elsewhere in ovisac area. Ovisac band not divided anteriorly, anterior section about 10 or 11 spines wide; lateral and posterior portion of ovisac band with 6 band clusters on each side of body, clusters contiguous; C6 undivided medially; longest spines in ovisac band about 25 μm long; all wax plates on thorax and head present, plates 13, 17 and 18 reduced; wax plate 11 undivided, plate 1 divided longitudinally. Coxal depressions present near each pair of legs as follows: metathoracic legs each with depression anteromedial of coxa, also with single fused depression in medial area posterior of metathoracic legs; mesothoracic legs each with anteromedial and posteromedial depressions; prothoracic legs each with single anteromedial depression. Anterior thoracic spiracles without associated sclerotized area, each with 7 and 9 loosely associated sessile quadrilocular pores [paratypes and other specimens with 6–11(8) pores]; diameter of anterior thoracic spiracles 45 μm [paratypes

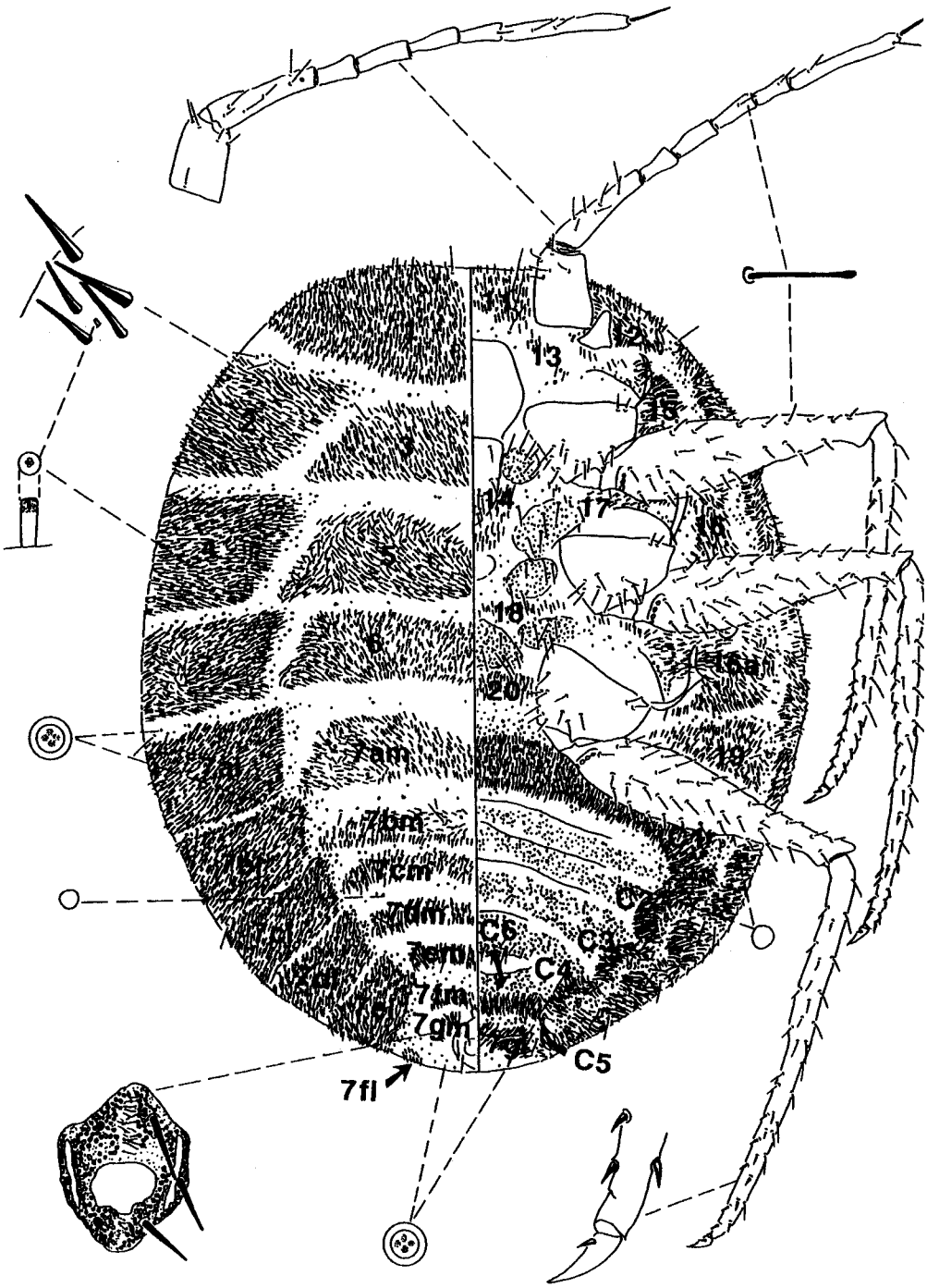

Fig. 14. *Newsteadia wacri* Strickland

and other specimens 43–52(48) μm]. Hair-like setae in moderate numbers, scattered in medial areas of thorax, with several setae near anterior and lateral edge of ovisac band. Quadrilocular pores of 2 kinds; tubular quadrilocular protruding from derm, relatively long, 8–10(9) μm long, associated with wax plates; sessile quadriloculars usually with 4 loculi, rarely with 3 or 5, present in bands within ovisac area and scattered between wax plates and within ovisac area. Discoidal pores of 1 size, associated with sessile quadriloculars; discoidal of large size absent. Minute tubular ducts absent.

DORSUM

Medial wax plates on abdomen (7am to 7 gm) undivided medially, wide, 3 to 8 spines wide, approximately 1/2 to 3/4 as wide as lateral wax plates (plates 7al to 7fl); anterior edge or medial abdominal wax plates generally straight, plate 7am slightly curved. Medial wax plates on thorax (plates 3, 5, 6) about 3/4 times width of lateral plates (plates 2, 4, 7). Spines at margin of wax plates elongate, with rounded apex 20 μm long [paratypes and other specimens 18–23(23) μm], in ovisac band 25 μm [paratypes and other specimens 23–25(24) μm]. Hair-like setae present in marginal clusters near anterior edges of marginal wax plates, and near anterolateral and anteromedial edge of each dorsomedial wax plate. Quadrilocular pores of 2 types: tubular quadriloculars present in wax plates; sessile quadriloculars present between wax plates. Discoidal pores of small size only, associated with sessile quadriloculars. Minute tubular ducts apparently absent. Anal ring with 3–5 rows of pores; longest anal ring seta 58 μm long [paratypes and other specimens 55–62(59) μm], shorter than width of anal ring; ring 92 μm wide [paratypes and other specimens 88–98(90) μm].

COMMENTS

Newsteadia wacri is similar to 4 other African species that possess a unique combination of characters. For a description of these characters and a list of the other 4 species see the "Comments" section of *N. africana.* Within Africa, this species is most similar to *N. southafricensis;* for a comparison of these species see the "Comments" section of the latter species. Of the species that do not occur in the Afrotropical Region, *N. wacri* most closely resembles *N. gullanae* by having: reduced numbers of spines in ventral area of thorax; filamentous setae on legs and antennae; conical claw digitules; no flagellate setae on tibiae; sessile pores immediately posterior of anterior portion of ovisac band; and 7-segmented antennae. *Newsteadia wacri* differs by having: ovisac band clusters C5 and C6 present (*N. gullanae* has ovisac band clusters C5 and C6 absent); several indefinite coxal depressions (*N. gullanae* has no coxal depressions); antennal segment 1 slightly shorter than segment 2 (*N. gullanae* has antennal segment 1 conspicuously longer than segment 2); middle tibia-tarsus about 900 μm long (*N. gullanae* has middle tibia-tarsus about 664 μm long); antennal segment 2 about 220 μm long (*N. gullanae* has antennal segment 2 about 150 μm long).

Discussion

Results of this research present a modified system for designating apparently homologous wax plates throughout the Ortheziidae as first presented by Kozár and Miller (2000). A new system is established for designating the apparently homologous sections of the ovisac band. An hypothesis is presented suggesting that many Afrotropical species of *Newsteadia* have the posterior end of the ovisac band that is at least partially composed of the dorsolateral wax plate from abdominal segment 7 (7gl). This condition is present in other species of *Newsteadia* but does not occur in species of other ortheziid genera.

There currently are 13 species of *Newsteadia* known from the Afrotropical region which is second in species diversity only to the Australian-Pacific region which contains 15 species. It is apparent that many more species remain to be discovered when Berlese, or other sampling strategies are implemented in different parts of the World.

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