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L161—O-1096
Three New Fleas of the Genus *Strepsylla* Traub
(Siphonaptera: Hystrichopsyllidae)

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AND

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It is particularly appropriate to include in the present volume a paper on the genus *Strepsylla* Traub, 1950, a group of rodent fleas which were discovered partly as a result of Dr. Schmidt’s interest in the fauna of Guatemala and Mexico.

The genus *Strepsylla* (subfamily Neopsyllinae) to date includes four species, all of which were collected from various rodents in Mexico. The present paper includes the description of three additional species from similar hosts, one from Guatemala and two from Mexico. This study is based upon material collected during investigations of arthropods of potential medical importance. The studies were sponsored by United States or Mexican governmental agencies.

*Strepsylla dalmati* sp. nov. Plate 10; plate 11, fig. 1; plate 12, fig. 1; plate 13, fig. 1.

Separable from all known *Strepsylla* in that the last segment of the metatarsus has only four pairs of plantar bristles, the proximal or ventral pair being absent. Separable from described species, but agreeing with the new species next discussed, in that the dorsal margin of the male immovable process (pl. 10, fig. 3, *P.*, and pl. 12, fig. 1) is evenly convex instead of somewhat sinuate (cf. pl. 12, fig. 3, *P.*) and in that there is a dense patch of many thin short bristles above and/or proximal to the recurved spiniform on the distal arm

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of the male ninth sternum (pl. 10, fig. 2) instead of the usual 3–6 thin bristles (cf. pl. 11, fig. 3). Also diagnostic for this species is the hyperdevelopment of the disto-dorsal lobes of the aedeagus (pl. 13, fig. 1, D.L.) as compared with the apparent reduction or lack of development of the lateral lobes (L.L.), with the result that D.L. extends well caudal of L.L. (cf. pl. 13, fig. 4).

Head, male (pl. 10, fig. 1): Frontal tubercle small, acute, median. First pre-antennal row consisting of five or six small bristles; second row of four much longer bristles, that near eye (third bristle) shorter than others of row. Genal ctenidium arising immediately ventral to reduced eye; mesal spine acuminate, extending beyond subrounded, overlapping, shorter, lateral spine. Maxillary lobe extending to apex of third segment of maxillary palpi. Labial palpi five-segmented, extending to base of fore-trochanter. Scaph of antenna with very short proximal and subapical bristles. Second antennal segment with an apical fringe of small bristles, not extending beyond second segment of fairly symmetrical club. Post-antennal region with two rows of bristles arranged approximately 4–4(5), these rows preceded by a fairly long bristle near base of scape.

Thorax (pl. 10, fig. 1, pl. 11, fig. 1): Pronotum with one row of about six large bristles on a side, these with smaller and thinner intercalary bristles somewhat displaced caudal. Pronotal comb with a total of about 14 fairly broad spines. Mesonotum (MSN.) with three rows of bristles, bristles of last row much larger than the others. Mesonotal flange on each side with two pseudosetae (P.S.S.). Mesepisternum (MPS.) with a short median bristle and a long submedian one. Mesepimeron (MPM.) with four bristles, that near ventral margin longest. Metanotum (MTN.) with two rows of bristles and an anterior third row indicated by two or three small bristles. Lateral metanotal area (L.M.) well demarcated; one ventral bristle near caudal angle. Metepisternum (MTS.) with three bristles near postero-dorsal angle; one very long, the others very short. Squamulum (SQ.) short and broad, weakly sclerotized. Pleural arch (P.L.A.) strongly convex, well developed. Metepimeron (MTM.) with an anterior row of four thin bristles and a posterior group of four stout ones, three of the latter quite long.

Legs: Metacoxa with a short patch of mesal spiniforms at anterior margin of distal fourth. Profemur with about nine small thin lateral bristles. Longest bristles of tarsus of foreleg occur on segment I, where two dorso-lateral ones reach to near apex of second segment. Metatarsus with second segment bearing an apical bristle extending to near apex of fourth segment. No bristles on any other tarsal segment reaching beyond apex of following segment. Fifth segment of pro- and mesotarsus with five pairs of plantar bristles, but the first pair displaced mesad, ventral in position and inserted between the basal lateral pair of plantar bristles; this ventral pair absent on metatarsus. Measurements (in microns) of tibiae and segments of tarsi (petiolate base deleted) as follows:

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<thead>
<tr>
<th>Leg</th>
<th>Tibia</th>
<th>Tarsal Segments</th>
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**Abdomen:** Terga with apical spinelets arranged as follows (total number): 9–12–8–8–4. Typical terga with two rows of bristles, both rows extending slightly below level of somewhat sagittate spiracle. Unmodified sterna typically with about two or three ventral bristles on a side. Three antepygidal bristles (pl. 10, fig. 3, A.B.), middle one nearly twice as long as others.

**Modified abdominal segments, male** (pl. 10, fig. 3): Eighth tergum (8T.) arising from region of base of A.B. and directed ventrad to middle of body, then turning caudad, its margin lightly sclerotized; posterior margin recurving toward conspicuous eighth spiracle. Eighth tergum associated with a large, weakly sclerotized downward-directed process, the lower half of which is a triangle (8T.T.) with an acute apex. Eighth sternum (8S.) with a row of three long bristles per side near ventro-caudal angle; about seven shorter bristles anterior to row, these mainly marginal; dorsal margin convex, extending to near base of immovable process of clasper; posterior margin slightly sinuate, rounded at junction with ventral margin.

Immovable process of clasper (P. and pl. 12, fig. 1) broader (higher) than long, with a dorso-marginal row of thin bristles, a caudo-marginal row of similar but more widely spaced bristles on distal third only, and a subapical mesal patch of about six small thin curved bristles; dorsal margin slightly but evenly convex. The only bristle on the lower portion of P. is immediately below the insertion of the movable finger (F.) and may represent the acetabular bristle(s) of ceratophyllid fleas. Sclerotized process above acetabular region (herein termed “acetabular shore,” A.SH.), subtruncate, with one subdorsal bristle and two apico-marginal bristles. Base of clasper (CL.) arising from level of antepygidal bristles. Movable finger or digitoid (F. and pl. 12, fig. 1) slightly more than twice as long as broad at maximum; anterior margin biconcave; caudal margin evenly rounded from apex to near midpoint but then becoming emarginate as digitoid is proximally somewhat constricted; ventral margin quite straight. Movable finger with a caudo-marginal row of bristles extending from apex to midpoint, and a group of about six lateral and three mesal thin bristles at level of midline; apical half with thin scattered small bristles, some submarginal. Manubrium (MB.) very long and narrow and somewhat sinuate. Proximal arm of ninth sternum (P.A.9) with apex expanded, its margin straight; the dorso-caudal angle produced into a rounded short “nose” (NO.) which equals in length the acute antero-dorsal angle. Distal arm of ninth sternum (D.A.9 and pl. 10, fig. 2) about as long as proximal arm, its sclerotized portion slightly narrowing distally; apex ovate and bearing two long narrow bristles, a stout bristle, a tiny bristle above this, and a conspicuous short broad spiniform; a subapical group of thin median and submarginal bristles below these; a marginal and submarginal dense row of thin bristles proximal to level of origin of a truncate, semimembranous flap (FL.) that is spiculose apically. This flap with a single, proximal curved (i.e., partially looped) spiniform near ventral margin; a thin bristle distal to spiniform on flap and another proximal to it.

**Aedeagus:** Aedeagal apodeme (AE.A.) about four times as long as broad, its cephalic end broad, somewhat rounded, slightly narrowed caudally. Aedeagus proper shorter than apodeme. Base of very well-developed pouch wall (pl. 13, fig. 1, B.P.W.) sclerotized, fairly straight, oblique. Ventral margin of wall of aedeagal pouch (P.W.) well sclerotized and apically with a distinct ventral hump. Median dorsal lobe (M.D.L.) shallowly sinuate, terminating at apex of rod-like sclerite (A.S.T.) dorsal to base of sclerotized inner tube (S.I.T.). A broad,
triangular sclerite, herein termed the cordate sclerite (CO.S.) overlying apical portion of A.S.T. and part of S.I.T. Subapical dorsal lobe (S.D.L.) fairly well differentiated. Disto-dorsal lobes (D.L.) well developed, about three times as long as broad, arising from apex of A.S.T.; apically subrounded. Lateral lobes (L.L.) reduced, inconspicuous, not extending beyond apex of sclerotized inner tube. Crochets (CR.) large, conspicuous, apparently somewhat articulating as a ball-and-socket arrangement with the hump on P.W. Crochets longer than broad; proximal portion broadly ovate; dorsally produced into a long narrow spur; sclerotized portion appearing apically acuminate but actually with a lightly sclerotized, dorsally convex wing extending to apex. Armature of inner tube reduced, not visible. Crescent sclerite (C.S.) well developed. Lobes of apodemal strut (AP.S.) not clearly differentiated. Ventral intramural rod (I.R.) of endophallus distinct, terminating in a weakly sclerotized vesicle (V.); semi-membranous lunate structure (L.U.S.) very narrow. Penis rods (P.R.) uncoiled. Third aedeagal apodemal rod (A.A.R.) fairly well sclerotized.

Tenth abdominal segment with dorsal lobe of proctiger (pl. 10, fig. 3, D.A.L.) bearing a dorso-marginal fringe of thin bristles. Ventral lobe of proctiger similar but with apical bristles. Subanal sclerite (proximo-ventral sclerite of proctiger, V.P.) well developed and bearing the relatively large semi-membranous dorsal filamentous tuft (T.) characteristic of genus (see pl. 10, fig. 3; not shown in pl. 12, fig. 1).

Comment.—The species is named for Dr. Herbert T. Dalmat of the United States Public Health Service, who has contributed much to our knowledge of the natural history and control of arthropod-borne diseases in Guatemala.

Holotype.—Male, from Jalapa, five miles east of Mataquescuintla, La Soledad Grande, Guatemala. Altitude 8,300 feet. Collected by Luis de la Torre, March 21, 1952, on the Chicago Natural History Museum Guatemala Zoological Expedition. Deposited in collections of Chicago Natural History Museum. (No other specimen known.) Host: Peromyscus guatemalensis.

Strepsylla schmidtii sp. nov. Plate 11, figs. 2, 5; plate 12, fig. 2; plate 13, fig. 4.

Near S. dalmati sp. nov. as indicated above, but separable in that the last segment of the metatarsus is typical, i.e., with five pairs of plantar bristles, although the proximal pair is smaller than the others and displaced ventrad. Further distinguishable as follows: Crochet (pl. 13, fig. 4, CR.) bifurcate, recurved dorsally so that the stout upper lobe or spur extends nearly three-fourths as far apicad as the ventral. Median portion of ventral margin of distal arm of ninth sternum (pl. 11, fig. 2) sinuate and heavily sclerotized. In S. dalmati, by contrast, the crochet lacks a caudad-directed upper lobe pl. 13, fig. 1, CR.) and the D.A.9 (pl. 10, fig. 2) is ventrally straight and weakly sclerotized.
Only pertinent differences from *S. dalmati* are listed. Labial palpi reaching to apex of fore-trochanters. Metepimeron with bristles arranged 3-3-1. Fifth segment of all tarsi with a ventral pair and four lateral pairs of plantar bristles. Measurements (in microns) of tibiae and tarsal segments are as follows:

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<td>Meta-</td>
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Terga with apical spinelets arranged as follows (total number): male, 4–8–4 (paratype, 3)–5(4)–2. Typical sterna with one or two small submarginal bristles preceding the vertical row of three.

**Modified abdominal segments, male:** Eighth sternum (pl. 11, fig. 5) dorsally and caudally fairly evenly rounded; two long bristles near ventro-caudal angle; two smaller, thinner bristles above these; in addition, about 14 thin short ventro-marginal bristles arranged in one or two irregular rows. Immovable process of clasper (pl. 12, fig. 2, *P.*) essentially as in *dalmati* except as follows: one or two lateral short bristles near dorso-caudal angle; acetabular shore particularly heavily sclerotized and with two or three marginal bristles at apex; two marginal bristles at insertion of movable finger (*P.*). The lateral group of bristles on digitoid near middle of posterior portion of *F.* consisting of 10–14 bristles. Finger not noticeably constricted basally; anterior margin very slightly convex; ventral portion of caudal margin evenly rounded. Proximal arm of ninth sternum apically truncate but scarcely produced at antero-dorsal angle, while the “nose” at dorso-caudal angle is conspicuous, relatively much longer than in *S. dalmati* sp. nov. Distal arm of ninth sternum (pl. 11, fig. 2) lacking a subapical group of bristles; basal two-thirds with ventral margin biconcave, the hump sclerotized.

Aedeagus (pl. 13, fig. 4) with disto-dorsal lobe (*D.L.*) not as specialized as in *S. dalmati* sp. nov., its length only about one and one-half times the breadth of the cordate sclerite (*C.O.S.*). Lateral lobes (*L.L.*) extending well apicad of disto-dorsal lobe; apically oblong-ovate. Crochets (*C.R.*) very large, and bifurcate, with an oblong-ovate ventral portion and a long, equally broad, recurved dorsal spur that extends apicad about three-fourths of the length of the ventral lobe. Sclerotized inner tube (*S.I.T.*) with ventral portion apically ribbed. Lunate structure (*L.U.S.*) fairly broad.

**Holotype.**—Male (B 22037), from Chiapas, Mexico, 17 kilometers northwest of Teopisca. Altitude 6,500 feet. Collected on August 31, 1953, by Deane P. Furman and M. A. Price of the University of California, during investigations of Mexican ectoparasites supported by the Research and Development Board, Office of the Surgeon General, Department of the Army. Deposited in the United States National Museum (no. 62614). Host: *Peromyscus boylii* levipes.

**Paratype.**—A male, partially castrated, with same data (B 22036) in the collection of the senior author. Female unknown.
Comment.—The species is named for Dr. Karl Patterson Schmidt in partial recognition of his contributions to our knowledge of the fauna of Mexico and Central America.

Strepsylla villai sp. nov. Plate 11, figs. 3, 4; plate 12, fig. 3; plate 13, figs. 3, 5.

Belongs in the group of species in which P. is dorsally somewhat sinuate and in which the postero-dorsal margin of P. is rather humped, thereby agreeing with S. mina Traub, 1950, S. fautini Traub, 1950, S. davisae Traub and Johnson, 1952, and S. taluna Traub and Johnson, 1952. Readily distinguishable from S. mina by the absence of very long bristles on F. Separable from S. fautini in that the lateral lobes of the aedeagus (pl. 13, fig. 5, L.L.) are apically rounded, slightly expanded, instead of being ovate distally and somewhat relatively narrowed subapically, and also in that the distal arm of the male ninth sternum (pl. 11, fig. 3) is falcate, i.e. produced into a fairly long beak instead of being merely a bluntly rounded projection shorter than the length of the adjacent spiniform. The falcate distal arm also separates this species from S. davisae. Readily distinguishable from S. taluna in that the abdominal spiracles (pl. 13, fig. 3) are lanceolate, apically rather pointed (as in S. davisae), instead of being blunt, somewhat rounded.

Only pertinent differences from S. dalmati sp. nov. are listed. Lateral metanotal area with a short bristle below the long one. Second segment of metatarsus with one bristle extending slightly beyond apex of fourth segment. Fifth segment of all tarsi with a ventral pair and four lateral pairs of bristles. Measurements (in microns) of tibiae and segments of tarsi as follows:

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<td>Meta-</td>
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Male terga with apical spinelets as follows (total number): 7–7–6–4. Typical sterna with one or two small submarginal bristles preceding the vertical row of three. Two antepygidal bristles, the upper bristle twice as long as the lower one.

Modified abdominal segments, male: Eighth sternum (pl. 11, fig. 4) emarginate, the sinus on the caudal margin fairly shallow; a single long bristle near the ventro-caudal angle, and one or two longish and two or three small submarginal bristles near this angle; a marginal row of about 10–12 small bristles per side. Immovable process (P., pl. 12, fig. 3) biconvex, with a dorso-marginal row of bristles, but with a few gaps in the region of the fairly shallow sinus, the bristles submarginal in the vicinity of the dorsal filamentous tuft (T.); a submarginal group of five or six thin mesal bristles on the posterior hump; the apical half of the caudal margin
with thin bristles resembling those of the dorsal margin but more widely spaced; about three submarginal long thin bristles in a line near attachment of F. Ace-
tabular (A.SH.) apically biconvex, each small projection bearing a small bristle. Movable finger (F.) about two and a half times as long as broad; anterior margin slightly convex; caudal margin curved except for a small crenulated portion near the ventro-caudal angle; a row of marginal or submarginal thin bristles on the apical two-thirds of the caudal margin; a group of 12 to 15 lateral thin submarginal or median bristles at proximal third. Distal arm of ninth sternum (pl. 11, fig. 3) with a stout subapical spiniform; above this, at angle of falcate tip, three marginal bristles; ventral (apparently caudal) margin with a stout bristle immediately below spiniform; five well-spaced thin marginal bristles ranging from this stout bristle proximal to apical third of arm. The truncate, semi-membranous flap (FL.) bearing a median, looped spiniform, with a row of short thin marginal bristles distad and proximad to level of spiniform.

Aedeagus (pl. 13, fig. 5) with disto-dorsal lobes (D.L.) about three times as long as broad, extending almost as far distad as the well-developed lateral lobes (L.L.). Crochets very large, ventrally fairly evenly convex, with an elongate dorsal wing which is longer than the remainder of the crochet is broad. Lateral lobes very broad, about twice the diameter of the disto-dorsal lobes; apically slightly expanded, rounded. Armature of inner tube (A.I.T.) represented as a dorsal wing of the sclerotized inner tube (S.I.T.).


**Comment.**—A female with the same data as the holotype may prove to be referable to this species. It cannot be differentiated from *S. mina.*

The species is named for the collector, Dr. Bernardo Villa R., the well-known mammalogist, who has graciously helped the authors on many occasions.

**Strepsylla taluna** Traub and Johnson. Plate 13, fig. 2.


The male of this species was described from one specimen from *Neotomodon alstonii* taken at Morelos, Mexico. A study of topotypic material from the same host makes it possible to point out that the crochet of the aedeagus (pl. 13, fig. 2, CR.) actually bears a lightly sclerotized dorsal wing that extends to the apex of the acuminate talon-like structure. The heavily sclerotized talon-like portion of the crochet is much narrower than in *Strepsylla villai* sp. nov., and the crochet of *S. taluna* lacks the elongate dorsal spur of the new species.
Additional records.—One male, collected by B. Villa at Km. 43 on Cuernavaca Highway, Distrito Federal, Mexico. Host: *Romerolagus diazi*.

One male, collected by A. Barrera, December 22, 1951, at La Venta, D.F., Mexico. Altitude 2,850 meters. Host: *Peromyscus maniculatus labecula*.

One male, same data, but collected September 21.

One male, collected by A. Barrera, October 12, 1951, at El Zarco, D.F., Mexico. Altitude 3,000 meters. Host: *Peromyscus hylocetes*.

Probable records.—One female, collected by A. Barrera, December 22, 1951, at La Venta, D.F., Mexico. Altitude 2,850 meters. Host: *Peromyscus truei gratus*.

One female, same data, but collected March 29, 1952. Host: *Peromyscus hylocetes*.

COMMENTS ON THE GENUS STREPSYLLA

It has been pointed out earlier that fleas of the genus *Strepsylla* are apparently widely distributed through much of Mexico, and that they seem to be characteristic parasites of indigenous mice and rats. The same statement may apply to Guatemala. It is also evident that fleas of this genus are apparently more common than collections indicate. Four of the species are known only in the male and three of these have been described from single specimens. The females of only two species are known or have been associated with males. It is quite likely that fleas of the genus *Strepsylla* are nest-inhabiting forms and are less likely to be found on the host than are other species.

SUMMARY

In this paper, three new species of the genus *Strepsylla* Traub, 1950, are described and illustrated. *Strepsylla dalmati* sp. nov., from Guatemala (host *Peromyscus guatemalensis*), is unique in that the last segment of the metatarsus has only four pairs of plantar bristles. *S. schmidti* sp. nov., from Chiapas, Mexico (host *Peromyscus boylii levipes*), agrees with *S. dalmati* in that the dorsal margin of the male immovable process is evenly convex instead of being sinuate. It is distinguished by the fact that the crochet is bifurcate, possessing a stout dorsal spur that extends apicad nearly as far as the ventral portion. *S. villai* sp. nov., from Tlaxcala,
Mexico (host: *Peromyscus difficilis amplus*), has the usual type of clasper. The species is characterized by the fact that the distal arm of the ninth sternum is falcate, while the abdominal spiracles are lanceolate. All the seven known species of *Strepsylla* are from Mexico or Guatemala.

**LIST OF ABBREVIATIONS**

A.A.R. Aedeagal apodemal rod.
A.B. Antepygidial bristle.
A.E.A. Aedeagal apodeme.
A.I.T. Armature of inner tube.
A.P.S. Apodemal strut of aedeagus.
A.S.H. Acetabular shore.
A.S.T. Apical sclerite of inner tube.
B.P.W. Base of wall of aedeagal pouch.
CL. Clasper.
C.O.S. Cordate sclerite of aedeagus.
CR. Crochet.
C.S. Crescent sclerite of aedeagus.
D.A.L. Dorsal anal lobe of proctiger.
D.A.9 Dorsal arm of ninth sternum.
D.L. Disto-dorsal lobe of aedeagus.
F. Movable finger or digitoid of clasper.
FL. Semi-membranous flap associated with male ninth sternum.
I.R. Intramural rod of aedeagus.
L.L. Lateral lobe of aedeagus.
L.M. Lateral metanotal area.
L.U.S. Lunate structure of aedeagal pouch.
M.B. Manubrium.
M.D.L. Median dorsal lobe of aedeagus.
M.P.M. Mesepimeron.
M.P.S. Metepisternum.
M.S.N. Mesonotum.
M.T.M. Metepimeron.
M.T.N. Metanotum.
M.T.S. Metepisternum.
N.O. Nose-like extension of side of apex of proximal arm of ninth sternum.
P. Immovable process of clasper.
P.A.9 Proximal arm of ninth sternum.
P.L.A. Pleural arch of metathorax.
P.R. Penis rod.
P.S.S. Pseudosetae.
P.W. Wall of aedeagal pouch.
S.D.L. Subapical dorsal lobe of aedeagus.
S.I.T. Sclerotized inner tube of aedeagus.
S.Q. Squamulum.
T. Filamentous tuft of subanal sclerite.
V. Vesicle of aedeagus.
V.P. Subanal sclerite.
8S. Eighth sternum.
1T. First tergum.
8T. Eighth tergum.
8T.T. Triangular extension of eighth tergum.
REFERENCES

TRAUB, ROBERT

TRAUB, ROBERT and JOHNSON, PHYLLIS T.
EXPLANATION OF PLATE

*Strepsylla dalmatia* sp. nov.

Fig. 1. Head and prothorax.        Fig. 2. Distal arm of ninth sternum.
Fig. 3. Modified abdominal segments, male.
STREPSYLLA DALMATI
EXPLANATION OF PLATE

Fig. 1. *Strepsylla dalmati* sp. nov. Meso- and metathorax.

Fig. 2. *Strepsylla schmidti* sp. nov. Distal arm of ninth sternum.

Fig. 3. *Strepsylla villai* sp. nov. Distal arm of ninth sternum.

Fig. 4. *Strepsylla villai* sp. nov. Eighth sternum of male.

Fig. 5. *Strepsylla schmidti* sp. nov. Eighth sternum of male.
EXPLANATION OF PLATE
Movable and immovable processes of clasper.

Fig. 1. *Strepsylla dalmati* sp. nov.    Fig. 2. *Strepsylla schmidti* sp. nov.
Fig. 3. *Strepsylla villai* sp. nov.
EXPLANATION OF PLATE

Fig. 1. *Strepsylla dalmati* sp. nov. Endchamber of aedeagus.

Fig. 2. *Strepsylla taluna* Traub and Johnson. Endchamber of aedeagus.

Fig. 3. *Strepsylla villai* sp. nov. Spiracle.

Fig. 4. *Strepsylla schmidti* sp. nov. Endchamber of aedeagus.

Fig. 5. *Strepsylla villai* sp. nov. Endchamber of aedeagus.