NOTES ON HOPLOPLEURID LICE FROM TAIWAN (ANOPLURA, INSECTA)[1]

By **Ke Chung Kim**[2]

Abstract: The sucking lice of 3 genera and 5 species are discussed: *Phthirunculus sumatranus* Kuhn & Ludwig, *Neohaematopinus callosciuri* Johnson, *Neohaematopinus petauristae* Ferris, *Polyplax asiatica* Ferris, and *Polyplax reclinata* (Nitzsch). Nymphal stages of 4 species and adult stage of *P. sumatranus* are described and illustrated on the basis of Taiwanese specimens.

The anopluran fauna of the island of Taiwan is poorly known. This paper reports findings on the sucking lice of squirrels (Sciuridae), a rat, and a shrew from the island of Taiwan. This report is based on the collection made by Dr R. E. Kuntz, USN, deposited in the collections of the U.S. National Museum, Smithsonian Institution, Washington, D. C.[3] The present material provides new information on poorly known species and zoogeography of the sucking lice.

Morphological terminology for the Anoplura previously published by Kim (1965, 1966a, b) has been applied here.

The host identifications were made by Dr David H. Johnson, formerly curator of mammals, U. S. National Museum. For further information on hosts, refer to Kuntz (1970). In this paper names and zoological classification of the host animals are those of Anderson & Jones (1967), Ellerman & Morrison-Scott (1951) and Kuntz (1970).

The sucking lice of 3 genera and 5 species are discussed: *Phthirunculus sumatranus* Kuhn & Ludwig, *Neohaematopinus callosciuri* Johnson, *Neohaematopinus petauristae* Ferris, *Polyplax asiatica* Ferris, and *Polyplax reclinata* (Nitzsch). Nymphal stages for each of 4 species are described and illustrated. The male and female of *P. sumatranus* Kuhn & Ludwig taken on *Petaurista petaurista grandis* Swinhoe are compared with those from the type host, *P. petaurista marchio* Thomas. The Taiwanese population of *P. sumatranus* has some definite morphological differences from the originally-described population from the Sumatran giant flying squirrel. For this reason *P. sumatranus* is re-described on the basis of specimens collected on *P. petaurista grandis*.

Host and Hoplopleurid Lice

Order INSECTIVORA
Family SORICIDAE

Suncus murinus (Linn.): *Polyplax reclinata* (Nitzsch)

Order RODENTIA
Family SCIURIDAE

Petaurista petaurista grandis Swinhoe: *Phthirunculus sumatranus* Kuhn & Ludwig, *Neohaematopinus petauristae* Ferris

Callosciurus erythraeus centralis Bonhote: *Neohaematopinus callosciuri* Johnson

Callosciurus erythraeus thaiwanensis Bonhote: *Neohaematopinus callosciuri* Johnson

Family MURIDAE

Bandicota indica nemorivaga Hodgson: *Polyplax asiatica* Ferris

Family HOPLOPLEURIDAE
Subfamily Enderleinellinae

Phthirunculus sumatranus Kuhn and Ludwig FIG. 1–5

Phthirunculus sumatranus Kuhn & Ludwig, 1965: 245-50, 8 f.

The genus *Phthirunculus* was first established on the basis of *P. sumatranus* taken from *Petaurista petaurista marchio* Thomas from Sumatra, and was placed in the subfamily Enderleinellinae (Kuhn & Ludwig 1965). *P. sumatranus* was described on the basis of 3 males and 10 females. The specimens studied here are the first collection of *P. sumatranus* since the original description was published.

The specimens studied show some distinct morphological differences from the original description and paratype female. In the Taiwanese population the thoracic sternal plate is subquadrangular with its anterior end notched and its posterior end rounded (FIG. 2). The Sumatran population shows the thoracic sternal plate subcircular, with its posterior end produced and pointed. In the male

[1]Authorized for publication on 24 June 1970 as paper No. 3800 in the journal series of the Pennsylvania Agricultural Experiment Station.

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[3]Studies under Dr R. E. Kuntz on Taiwan were originally supported by Public Law 480 Section 104 (c), and through funds provided by the Bureau of Medicine and Surgery, Navy Department Work Unit MR 005.20-0098. This study has also been aided in great part by contract (NR 10306901 N0014-66-C0091) between the Office of Naval Research, Department of the Navy, and the Southwest Foundation for Research and Education.

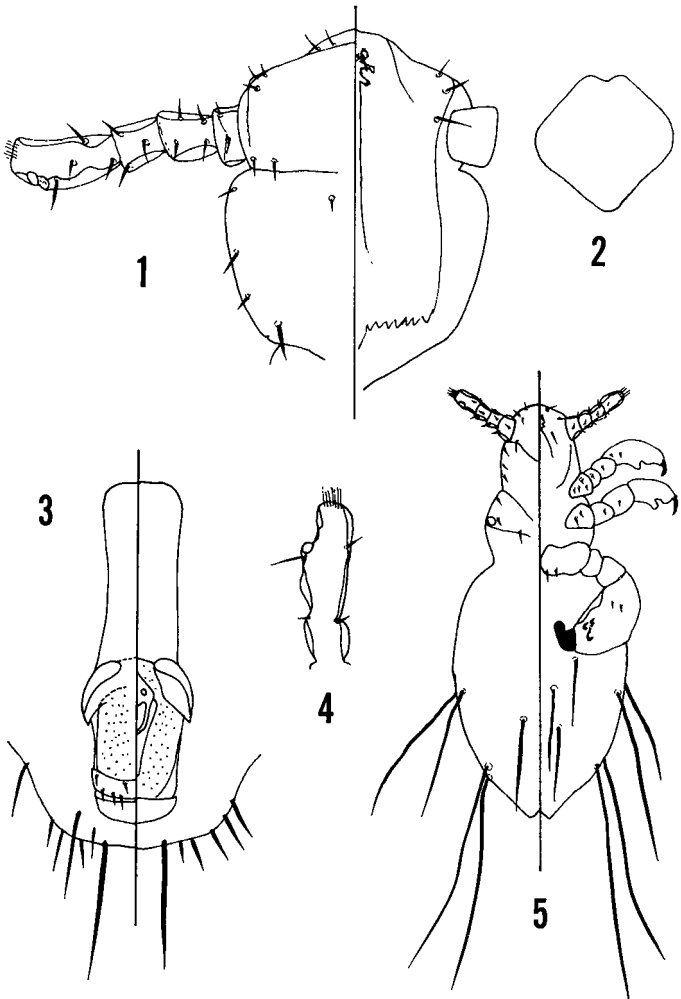

FIG. 1–5. *Phthirunculus sumatranus* Kuhn & Ludwig. (1) ♂ head. (2) ♂ thoracic sternal plate. (3) ♂ genitalia. (4) Terminal segment of Nymph 2 antenna. (5) Nymph 2.

genitalia of Taiwanese specimens the parameres are much longer than those found in the Sumatran population. In view of adult and nymphal morphology, *Phthiruneulus* is definitely closely related to *Enderleinellus*, and thus the inclusion of this taxon in the subfamily Enderleinellinae by Kuhn & Ludwig (1965) is well justified.

♂. Total body length about 0.96 mm. *Head* (FIG. 1; slightly wider than long and anteriorly rounded; postantennal angle not pronounced and posterolateral angle not developed; OS, CS and PAS present; AS and PCHS absent; 2 SHS distinct; 3 MHS distinct; PDPHS short, placed posterolaterally; ACHS minute; VPHS short. Antennae 4-segmented, its terminal segment compound and with 2 sensoria. *Thorax* slightly wider than head; DPtS and DMtS distinct; DPTS long; sternal plate (FIG. 2) subquadrangular, with its anterior end notched; notal pit not distinct. *Legs:* Fore and middle legs similar in shape and size, with tibia and tarsus distinct and claws abruptly bent at apex; hind leg much larger than other legs, with tibiotarsus and claws enlarged. *Abdomen* with no tergal and sternal plates developed; dorsally with 8 rows of setae, 0-1-0, 2-0-2, 4-6-4, 4-6-4, 4-7-4, 4-6-4, 4-6-4 and 0-2-0; ventrally with 6 rows of setae, 1-2-1, 3-1-3, 5-4-5, 5-6-5, 0-14-0, 3-3-3; no paratergites developed; only 3 spiracles distinct, with immediate surrounding area slightly sclerotized; segments 8 and 9 each with a pair of long lateral setae on each side; anal segment prolonged. *Genitalia* (FIG. 3) with basal apodeme wide and longer than the apical 1/2 of the genitalia; parameres long, with anterior part enlarged and heavily sclerotized and posterior part poorly sclerotized; radula transverse, dorsally with 10 setae; pseudopenis transverse without apical arm; endomere posteriorly connected.

♀. Total body length 1.05 mm. Head, thorax, legs and abdomen as in ♂ except for usual sexual dimorphism, unless mentioned otherwise. *Abdomen* dorsally with 9 rows of setae, 0-1-0, 3-7-3, 4-7-4, 4-7-4, 4-7-4, 4-7-4, 0-15-0, 0-10-0 and 0-1-0; ventrally with 6 rows of setae, 0-2-0, 3-6-3, 4-8-5, 5-7-5, 0-16-0, and 3-4-3; 3 AnS and 2 AcS distinct. *Genitalia:* Genital plate not well defined, with 3 setae on each side; gonopods not well defined, with 1 long seta; genital lobe distinct, with a long genital seta; spermatheca not distinct.

NYMPH 1 and 3: Unknown.

NYMPH 2 (FIG. 5): Total body length 0.52 mm. *Head* longer than wide; anterior margin rounded; postantennal and posterolateral angles not developed; OS, CS and PAS distinct; only 1 SHS present on each side; ACHS and PCHS absent; 3 MHS distinct; PDPHS minute; VPHS minute; frontal and occipital sutures distinct; antennae 4-segmented, its terminal segment compound and with 1 large sensorium (FIG. 4). *Thorax* slightly wider than head; DPtS and DMtS distinct; DPTS short; mesothoracic spiracle distinct; no sternal plate developed; coxal plates I and II similar; coxal plates III enlarged and mostly in contact. *Legs* as in the adults. *Abdomen* with no tergal and sternal plates; no segmentation; 3 spiracles distinct; 2 DCAS, 2 MAS, each MAS paired, and 6 VCAS present; anal segment notched.

Specimens Examined: Ex *Petaurista petaurista grandis*, Wu-sheh, Nan-tou Hsien, Taiwan, 20.V.1959, R. E. Kuntz, 2 ♂♂, 1 ♀ and 1 nymph 2 (PF-6291).

Subfamily POLYPLACINAE

Neohaematopinus callosciuri Johnson FIG. 6–8

Neohaematopinus callosciuri Johnson, 1959: 581, fig. 27, 28, 34b, 35c, 42, 43.—Johnson, 1964: 78, fig. 43A E.

This species was originally described on the basis of the male holotype and female paratype taken from *Callosciurus finlaysoni*, Thailand, and has been recorded from *Callosciurus caniceps*, *C. erythraeus*, *C. nigrovittatus*, *C. notatus*, *C. tenuis*, *C. prevosti*, *Lariscus insignis* and *Glyphotes simus* (Johnson 1964). Along with *Neohaematopinus sciurinus* Mjörberg and *N. sciuri* Jancke intraspecific variation of *N. callosciuri* is striking, as Johnson (1964) pointed out. Intensive study of adults and nymphs from different localities of *N. callosciuri* and related species is needed to clarify the extent of intraspecific variation and the status of the taxa involved. Nymphal stages of *N. callosciuri* have not been described until now.

The type specimens of this species are deposited in the U.S. National Museum, Washington, D. C.

NYMPH 1 (FIG. 6): Total body length 0.66 mm ($\bar{X}$) (N = 8), range 0.59–0.70 mm. *Head* longer than wide; anterior margin rounded; postantennal and posterolateral angle slightly developed; CS, OS, PAS, and AS distinct; 2 SHS present on each side; no ACHS and PCHS present; 3 MHS present on each side; PDPHS long, borne on well-defined posterolateral protuberance; ADHS placed anterior to PDPHS; VPHS long, reaching the base of antennal segment 2; antennae 3-segmented with 1 sensorium on each of segments 4 and 5; basal segment of antennae with 1 distinct tubercle. *Thorax* wider than head; DPtS and DMtS distinct; mesothoracic spiracle distinct; DPTS long; coxal plates similar, each with tubercle; no sternal plate developed; no ADTS. *Legs:* Fore legs smaller than other legs, with bifurcate claw; middle and hind legs similar in shape and size, each with enlarged tibiotarsus and blunt claw. *Abdomen* with 9 DCAS and 2 MAS on each side; 8 VCAS present on each side, 3 setae (1th, 5th and 6th VCAS) minute; cuticle scaly; anal segment not prolonged but bifurcate.

NYMPH 2 (FIG. 7): Total body length 0.80 mm ($\bar{X}$) (N = 7), range 0.73–0.88 mm. Similar to nymph 1, unless mentioned otherwise. *Head* with 4 MAS. *Thorax* with tubercle placed at posteromesal angle of each coxal plate. *Abdomen* with 7 rows of DCAS, 1, 1, 4, 1, 4, 2 and 2, and 7 rows of VCAS, 4, 4, 4, 4, 4, 4, and 2; 3 VLAS present on each side; 5 paratergites developed on segments 2–6; 5 spiracles present, the first one being borne on second paratergite; segments 2 and 3 each with 1 very long paratergal seta; segments 4–6 each with a pair of long paratergal setae; segments 7 and 8 each with a pair of long setae.

NYMPH 3 (FIG. 8): Total body length 1.21 mm ($\bar{X}$) (N = 10), range 1.08–1.42 mm. Similar to nymphs 1 and 2, unless otherwise mentioned. *Head* with prominent posterolateral angle. *Thorax* with much larger coxal tubercles. *Abdomen* with 9 rows of DCAS, 7 rows of VCAS and 5 VLAS: first 3 rows of DCAS each with 6 setae, next 4 rows each with 8 DCAS, eighth row with 4 DCAS, and last row with 2 DCAS; first 5 rows of VCAS each with 8 setae, sixth row with 4 VCAS and seventh row with 2 VCAS; segments 2 and 3 each with 1 long dorsal and short ventral paratergal setae; segments 4 and 5 each with 1 long ventral and 1 short dorsal setae; segment 6 with small paratergite.

Specimens Examined: Ex *Callosciurus erythraeus centralis*, Puli, Nan-tou Hsien, Taiwan, 30.XII.

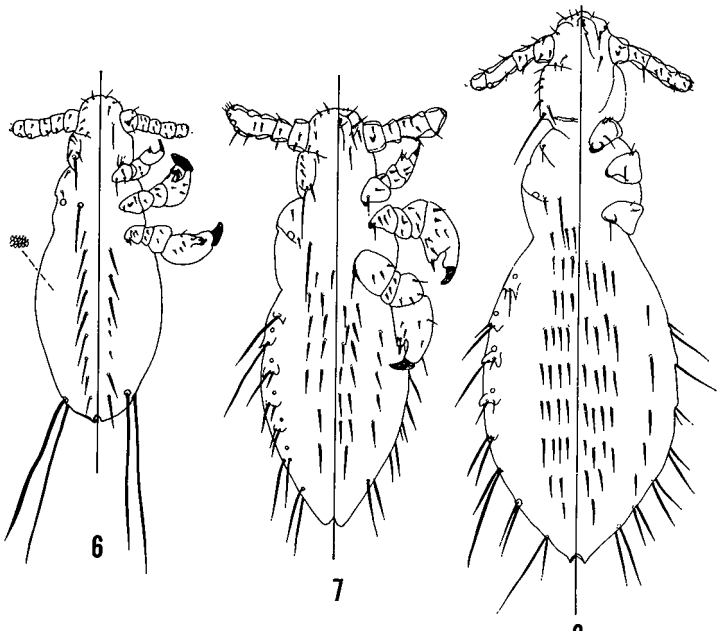

FIG. 6–8. *Neohaematopinus callosciuri* Johnson. (6) Nymph 1. (7) Nymph 2. (8) Nymph 3.

1958, R. E. Kuntz, 8 nymph 1, 1 nymph 2, and 4 nymph 3 (PF-5533); ex *Callosciurus erythraeus thaiwanensis* Bonhote, Shih-men, ping Tung Hsien, Taiwan, 31.III.1958, R. E. Kuntz, 4 nymph 1, 2 nymph 2, and 7 nymph 3 (PF-1762, 1765); and numerous material from Thailand and Malaysia.

Neohaematopinus petauristae Ferris FIG. 9, 10

Neohaematopinus petauristae Ferris, 1923: 258, f. 166, 167A, C, E.—Ferris, 1951: 195.—Johnson, 1959: 594.

Petauristophthirus petauristae: Eichler 1949: 594.

This species was originally described on the basis of male and female (holotype) taken from *Petaurista petaurista* Pallas [—this was known as *P. inornata;* fide Ellerman & Morrison-Scott (1951)] in Kashmir, and has also been known from *P. alborufus candidulus* Wrougton [=*P. taylori* by Johnson (1959)] in Thailand.

No nymphal stage has been described previously, and thus 3 nymphal stages are herewith described and illustrated.

Type specimens of this species are deposited in the collections of the U.S. National Museum, Washington, D. C.

NYMPH 1 (FIG. 9): Total body length 0.82 mm ($\bar{X}$) (N 6), range 0.67–0.92 mm. *Head* about as long as wide, and anteriorly rounded; OS, CS, AS and PAS distinct; postantennal angle not pronounced; posterolateral angle developed; 2 SHS and 3 MIS present on each side; ADHS and PDPHS present on posterolateral protuberance; ADHS placed anterior to PDPHS; PDPHS long; 1 additional seta present anterolateral to PDPHS; VPHS short, reaching basal segment of antennae; antennae 5-segmented, with a tubercle on basal segment and 2 sensoria on segments 4 and 5. *Thorax* slightly wider than head, with DPtS distinct and DPTS long; DMtS minute or absent; coxal plates similar in size and shape; no ADTS present; no sternal plate developed. *Legs:* Fore legs smaller than others, with thin acuminate claw; middle and hind legs similar in size and shape, each with large blunt claw. Abdomen with 9 DCAS, 7 VCAS and 2 MAS on each side; no LAS developed; no paratergite developed; anal segment slightly prolonged.

NYMPH 2 (FIG. 10): Total body length 1.03 mm ($\bar{X}$) (N = 6), range 0.91–1.10 mm. Similar to nymph 1, unless otherwise mentioned. *Thorax* with DMtS distinct. *Abdomen* with 9 rows of DCAS and 7 rows of VCAS; each row of DCAS and VCAS with 4 setae except for last row which consists of 2 setae; 3 DLAS and 3 VLAS present on each side, second

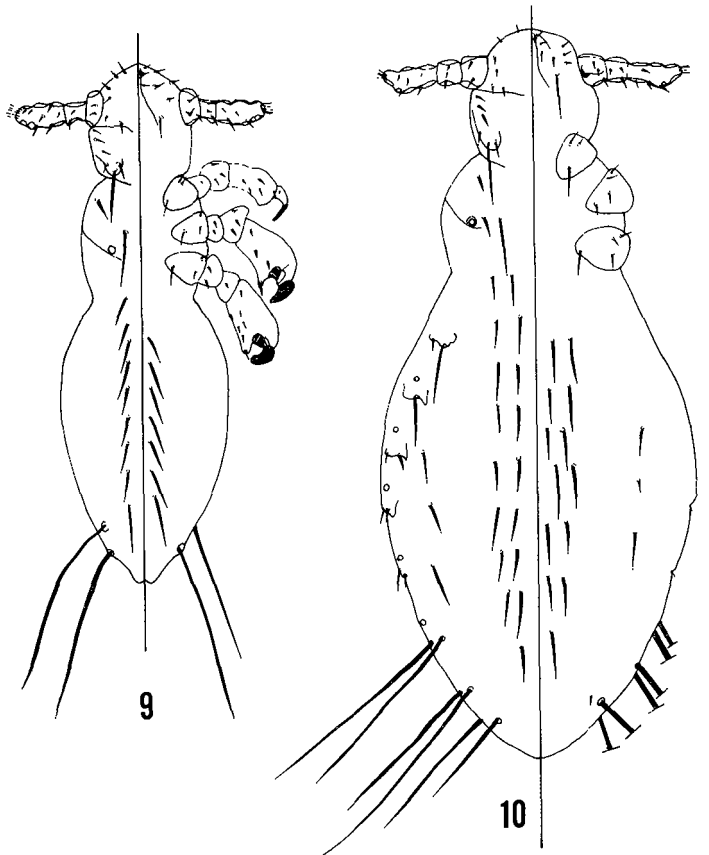

FIG. 9, 10. *Neohaematopinus petauristae* Ferris. (9) Nymph 1. (10) Nymph 2.

VLAS minute; 5 paratergites developed and 5 spiracles distinct; segments 2 and 3 each with 1 long dorsal and 1 minute ventral paratergal setae; segments 4–6 each with paratergal setae minute; 3 pairs of MAS present on each side; anal segment rounded at apex.

NYMPH 3: Total body length 1.54 mm (X̄) (N = 4), range 1.39–1.61 mm. Similar to nymphs 1 and 2, unless mentioned otherwise. *Head* with PCHS minute and ACHS missing; VPHS long, reaching the base of antennal segment 2. *Thorax:* Coxal plates each with 2–3 spiniform setae. *Abdomen:* with 9 rows of DCAS, 4, 6, 7, 8, 8, 9, 8, 7 and 2, and 7 rows of VCAS, 10, 9, 10, 8, 9, 4 and 2; 6 DLAS and 5 VLAS present on each side; 8 paratergites developed; segment 2 and 3 each with 1 long and 1 short paratergal setae; segments 4–6 each with a pair of subequal paratergal setae; segments 7 and 8 each with a pair of very long paratergal setae.

Species Examined: Ex *Petaurista grandis* Swinhoe, Taiwan: Wu-shih, 20.V.1959, R. E. Kuntz, 61 ♂♂, 95 ♀♀, 56 nymph 1, 69 nymph 2, and 124 nymph 3, (PF-6291); Wan-ta, Nan-tou Hsien, 29.X.1961, R. E. Kuntz, 1 ♀ (12382).

Polyplax asiatica Ferris

Polyplax asiatica Ferris, 1923: 233, f. 152D.—Hopkins, 1949: 483. - Ferris, 1951: 206.—Ansari,

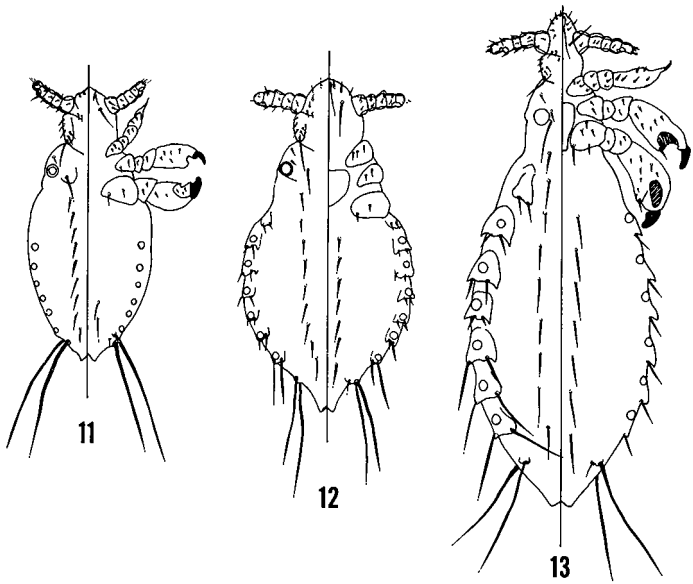

FIG. 11–13. *Polyplax reclinata* (Nitzsch). (11) Nymph 1. (12) Nymph 2. (13) Nymph 3.

1951: 127. · Johnson, 1958: 77 (Sinks *P. turkestanica turkestanica* and *P. turkestanica major*).—Johnson, 1959: 594.—Johnson, 1960: 81.

Polyplax turkestanica turkestanica Blagoveshtchensky, 1950: 81, f. 1, 2.

Polyplax turkestanica major Blagoveshtchensky, 1950: 85, f. 3.

Specimens Examined: Ex *Bandicota indica nemorivaga* Hodgson, Chao Chou, Taiwan, 21–24.III.1958, R. E. Kuntz, 4 ♂♂, 4 ♀♀, and 4 nymphs (PF-4734); 58 ♀♀ and 17 nymphs (PF-4868).

Polyplax reclinata (Nitzsch) FIG. 11–13

Pediculus reclinata Nitzsch, 1864: 23.

Polyplax reclinata (Nitzsch), Freund, 1935: 14–15.—Jancke, 1932: 525 27, f. 2.—Werneck, 1959: 33.—Johnson, 1960: 55–57.—Johnson, 1964: 83.–Paulian & Pajot, 1966: 40.—Beaucournu & Houin, 1967: 67.—Beaucournu, 1968: 210-12.—Kim & Emerson, 1968: 37.—Benoit, 1969: 102–03, f. 7.

A full citation of reference and synonymy is found in Kim & Emerson (1968). The morphological variation within the species is discussed by Johnson (1960, 1964), Beaucournu & Houin (1967), and Benoit (1969). This species has been known from European *Sorex*, African and Japanese *Crocidura*, Asian *Suncus*, African *Sylvisorex* and *Scutosorex*, and *Myosorex*.

Nymphal stages are poorly known, and thus all the nymphal stages are herewith described and illustrated.

NYMPH 1 (FIG. 11): Total body length 0.58 mm ($\bar{X}$) (N = 1), range 0.55 0.61 mm. *Head* about as long as wide; anterior margin slightly pointed or generally rounded; postantennal angle distinct; posterolateral angle not developed; OS, CS, AS and PAS minute or missing; 2 SHS and 3 MHS present on each side; PDPHS long, placed on posterolateral protuberance; 2 ADHS present anterior to PDPHS; VPHS long, reaching the base of antennal segment 2; antennae 5-segmented, with 2 sensoria each on segments 4 and 5. *Thorax* much wider than head; DPtS minute or missing; DMtS distinct; DMTS long, placed on a protuberance; coxal plates III much larger than other coxal plates; no sternal plate developed; mesothoracic spiracle large. *Legs:* Fore legs smaller than other legs, with acuminate claw; middle legs slightly smaller than hind legs; hind legs larger than middle legs, with blunt claw. *Abdomen* with 9 DCAS, 2 VCAS, 6 spiracles, and a pair of MAS present on each side; AcS present at base of MAS; anal segment slightly produced and bifurcate.

NYMPH 2 (FIG. 12): Total body length 0.70 mm ($\bar{X}$) (N = 5), range 0.67–0.75 mm. Similar to nymph 1, unless mentioned otherwise. *Thorax* with DPtS, DMtS, and sternal plate.

Abdomen with 9 DCAS, 7 VCAS, and 7 paratergites on each side; no LAS present; 6 large spiracles present, the first one on second paratergite; first 5 paratergites each with a pair of subequal setae; paratergites 6 and 7 each with 1 long and 1 short paratergal setae; base of last MAS slightly sclerotized; anal segment distinctly prolonged.

NYMPH 3 (FIG. 13): Total body length 0.94 mm (X; (N = 5), range 0.85–1.06 mm. Similar to nymphs 1 and 2, unless otherwise mentioned. Head much smaller than thorax; ACHS present. *Thorax* much wider than head, with sternal plate elongated. *Abdomen* with paratergites much larger and paratergal setae longer; AcS present at base of last MAS; anal segment not prolonged.

Specimens Examined: Ex *Suncus murinus* Linnaeus, Taipei, Taiwan, 16.III.1957, R. E. Kuntz, 21 ♀♀, 21 ♂♂ and 150 nymphs (PP-4157); 5.XII.1957, 22 ♀♀, 13 ♂♂, and 150 nymphs.

Acknowledgment: I am indebted to Dr K. C. Emerson of the U. S. National Museum, Washington, D. C. and 2705 North Kensington St., Arlington, Virginia for making this collection available for study. My thanks go to Dr R. E. Kuntz for correcting the host data.

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