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Anoplura of Tropical West Africa with descriptions of New Species and Nymphal Stages [1]

By Ke Chung KIM [2] and K.C. EMERSON [3]

ABSTRACT

New records of the Anoplura found on mammals in Dahomey, Nigeria, and Togo are reported, including 2 families, 8 genera and 29 species. Two new species of *Hoplopleura* and 1 new *Polyplax* species are described and illustrated. Nymphal stages of 1 *Hoplopleura* and 5 *Polyplax* species are also described and illustrated. The species discussed in this paper are: *Enderleinellus euxeri* Ferris, *Hoplopleura chippauxi* Paulian and Pajot, *H. hybomyis* Kim and Emerson, n. sp., *H. inexpectans* Johnson, *H. intermedia* Kellogg and Ferris, *H. myomyis* Kim and Emerson, n. sp., *H. pelomydis* Ferris, *H. rukenyae* Ferris, *H. somereni* Waterston, *H. spiculifer* (Gervais), *H. veprecula* Ferris, *Haemodipsus lyriocephalus* (Burmeister), *Lemurphthirus galagus* Bedford, *Neohaematopinus keniae* Ferris, *Polyplax abyssinica* Ferris, *P. cummingsi* Ferris, *P. grammomydis* Werneck, *P. kaiseri* Johnson, *P. brachyrrhynchus* Cummings, *P. oxyrrynchus* Cummings, *P. reclinata* (Nitzsch), *P. smallwoodae* Johnson, *P. spinulosa* (Burmeister), *P. parataterae* Kim and Emerson, n. sp., *P. subtaterae* Bedford, *P. taterae* Ferris, *Proenderleinellus calvus* (Waterston), *Scipio aulacodi* (Neumann), and *Prolinognathus foleyi* Fahrenholz.

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(2) The Frost Entomological Museum, Department of Entomology, The Pennsylvania State University, University Park, Pennsylvania, 16802, U.S.A.

(3) 2704 North Kensington Street, Arlington, Virginia 22207, and U.S. National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A.

The first most comprehensive study of the Anoplura fauna of Africa was made by JOHNSON (1960). Subsequently, papers pertaining to the African Anoplura have been published by BENOIT (1959a, b; 1961a, b; 1962a, b, c; 1964; 1965; 1969a, b), PAULIAN (1960, 1961), JOHNSON (1962a, b; 1963), KUHN and LUDWIG (1965), PAULIAN and PAJOT (1966), PAJOT (1966, 1967, 1968), EMERSON and KIM (1968), KIM and EMERSON (1968), KLEYNHANS (1969), KIM and EMERSON (1970), and LEDGER (1971).

The current project, on the Anoplura of Africa and Madagascar, is based for the most part on collections made by personnel of Division of Mammals, Department of Vertebrate Zoology, U.S. National Museum of Natural History, Smithsonian Institution, namely Charles B. ROBBINS (CBR), James W. LEDUC (JWL), Harry J. HERBERT (HJH), Julius C. GEEST (JCG), and Henry W. SETZER (HWS).

The mammals from Dahomey, Nigeria, and Togo were identified by Dr. H.W. SETZER of the U.S. National Museum of Natural History, Smithsonian Institution. Zoological nomenclature of the mammals used by ANDERSON and JONES (1967) and ANSELL (1960) is followed in this paper. Morphological terminology of KIM (1965; 1966a, b) is followed for descriptions of the Anoplura. A complete citation of references and synonymy is given for those species which were not previously discussed by KIM and EMERSON (1968 and 1970).

In this paper the Anoplura of Dahomey, Nigeria, and Togo are discussed, including 2 families, 8 genera, and 29 species, and 2 new species of *Hoplopleura*, 1 new species of *Polyplax*, and nymphal stages of 1 *Hoplopleura* species and 5 *Polyplax* species are described and illustrated.

The following species are included in this paper :

1. *Enderleinellus euxeri* Ferris, 1919 - ex *Euxerus erythropus*
2. *Hoplopleura chippauxi* Paulian and Pajot, 1966 - ex *Arvicanthis niloticus*
3. *Hoplopleura hybomyis* Kim and Emerson, sp. nov. - ex *Hybomys trivirgatus*
4. *Hoplopleura inexpectans* Johnson, 1960 - ex *Praomys jacksoni, Lemniscomys barbarus*
5. *Hoplopleura intermedia* Kellogg and Ferris, 1915 - ex *Mastomys natalensis, M. erythroleucus*

6. *Hoplopleura myomyis* Kim and Emerson, sp. nov. - *Myomys daltoni, M. fumatus*
7. *Hoplopleura pelomydis* Ferris, 1921 - ex *Lemniscomys striatus*
8. *Hoplopleura rukenyae* Ferris, 1921 - ex *Mus minutoides*
9. *Hoplopleura somereni* Waterston, 1923 - ex *Dasymys incomtus, Mus musculoides*
10. *Hoplopleura spiculifer* (Gervais, 1844) - ex *Lemniscomys barbarus*
11. *Hoplopleura veprecula* Ferris, 1921 - ex *Tatera kempii*
12. *Haemodipsus lyriocephalus* (Burmeister, 1839) - ex *Lepus capensis*
13. *Lemurphthirus galagus* Bedford, 1927 - ex *Galago senegalensis*
14. *Neohaematopinus keniae* Ferris, 1923 - ex *Heliosciurus gambianus*
15. *Polyplax abyssinica* Ferris, 1923 - ex *Arvicanthis niloticus*
16. *Polyplax cummingsi* Ferris, 1916 - ex *Dasymys incomtus*
17. *Polyplax grammomydis* Werneck, 1953 - ex *Crocidura* sp.
18. *Polyplax kaiseri* Johnson, 1960 - ex *Gerbillus gerbillus*
19. *Polyplax brachyrrhynchus* Cummings, 1915 - ex *Acomys cahirinus*
20. *Polyplax oxyrrhynchus* Cummings, 1915 - ex *Acomys cahirinus, A. dimidiatus*
21. *Polyplax reclinata* (Nitzsch, 1864) - ex *Crocidura sp.*
22. *Polyplax smallwoodae* Johnson, 1960 - ex *Lophuromys sikapusi*
23. *Polyplax spinulosa* (Burmeister, 1839) - ex *Rattus rattus*
24. *Polyplax parataterae* Kim and Emerson, sp. nov. - ex *Tatera kempii*
25. *Polyplax subtatetae* Bedford, 1936 - ex *Taterillus nigeriae, T. gracilis*
26. *Polyplax taterae* Ferris, 1923 - ex *Lemniscomys striatus*
27. *Proenderleinellus calvus* (Waterston, 1917) - ex *Cricetomys gambianus*
28. *Scipio aulacodi* (Neumann, 1911) - ex *Thryonomys swinderianus*
29. *Prolinognathus foleyi* Fahrenholz, 1939 - ex *Procavia ruficeps*

Family HOPLOPLEURIDAE

Subfamily **ENDERLEINELLINAE**

Genus **Enderleinellus** Ewing

1. **Enderleinellus euxeri** Ferris

Enderleinellus euxeri Ferris, 1919 : 37-39; Anderson, 1924a : 11; Anderson, 1924b : 5; Werneck, 1947 : 296, f. 31-36, 301; Ferris, 1951 : 108; Johnson, 1960 : 8, f. 1-5; Kuhn and Ludwig, 1965 : 237.
Hoplophthirus euxeri (Ferris), Ewing 1929 : 194.
Enderleinellus (Hoplophthirus) euxeri Ferris, Hopkins, 1949 : 461.

This species was originally known from *Xerus erythropus* (= *Euxerus microdon*) in British East Africa, and Johnson (1960) recorded it from *Thos* sp. (probably *Canis mesomelas*) in Sudan.

Specimens examined. - Ex *Euxerus erythropus* (E. Geoffroy, 1803), Dahomey : Diho, Central Region, 15 Jan. 1960, 5 ♂ and 9 ♀ (CBR-2144); Nigeria : Sokoto, Northern Region, 8-9 May 1966, 2 coll. (HJH-2372, 2385).

Subfamily **HOPLOPLEURINAE** Ferris

Genus **Hoplopleura** Enderlein

2. **Hoplopleura chippauxi** Paulian and Pajot (Figs. 1 - 2)

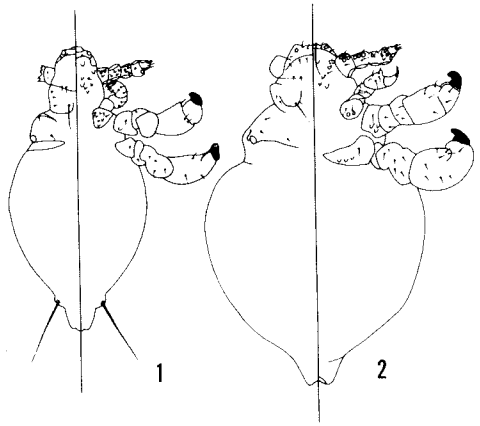
Hoplopleura chippauxi Paulian and Pajot, 1966 : 41-42, fig. 1-2.

This species was described from 4 males taken off *Arvicanthis* sp. in Bangui, Central African Republic. No nymphal stages were previously known. Several nymphs were available for study, and thus, three nymphal stages are herewith described and illustrated.

Description. - Nymph 1 (Fig. 1): Total body length 0.73 mm (n = 2). *Head* definitely longer than wide; postantennal angle not developed; 2 SHS and 3 MHS distinct; DPHS long; VPHS minute; other setae minute or missing; antennae 5-segmented, with contiguous sensoria on segments 4 and 5; venter and ventral side of antennae with numerous tubercles. *Thorax* much wider than head; DPtS distinct; DPTS short; DMsS missing; no trace of spiracle present; coxal plates with tubercles. *Legs* as in adults. *Abdomen* with only 1 MAS on each side; no other setae present; anal segment prolonged.

Nymph 2 (Fig. 2): Total body length 0.84 mm. *Head, thorax,* and *legs* same as in nymph 1, unless otherwise mentioned. *Head* with postantennal angle highly developed; OS, AS, and PAS distinct; DPHS long, borne on distinct lobe, with an accessory seta. *Thorax* with DMsS. *Abdomen* oval, without any setae; anal segment prolonged.

Nymph 3 : Total body length 1.02 mm (n = 4). Same as in nymph 2.



Figs. 1-2. — *Hoplopleura chippauxi* Paulian and Pajot. 1. nymph 1; 2. nymph 2.

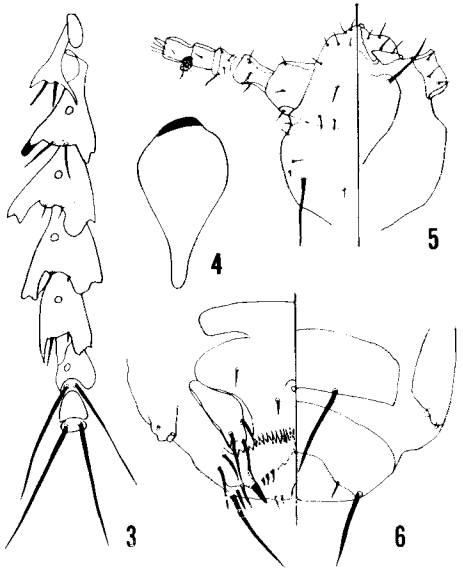
Specimens examined. - Ex *Arvicanthis niloticus* (Desmarest, 1822), Dahomey, Borgou Region : Bimbereke, 19-20 Jan. 1968, 12 ♂, 26 ♀, and 13 nymphs (JWL-630; CBR-2190); Banikoara, 5 Feb. 1968, 2 (CBR-2454); Nikki, 19-24 Feb. 1968, 11 ♂, 35 ♀, and 2 nymphs (JWL-831, 886, 910, 932, 933; CBR-2895, 2901, 2921, 2922, 2923, 2924); Parakou, 29 Feb. 1968, 2 ♀ (JWL-997, 1003); Central Region : Diho, 13-15 Jan. 1968, 1 ♂ and 3 ♀ (JWL-530; CBR-2066, 2117, 2139); Nigeria : Dada, Northern Region, 28 May 1967, 1 coll. (JCG-3225); Togo : Dapango, 13 May 1968, 3 ♀ (JWL-1849); Padori, 18 May 1968, 1 ♀ (JWL-1912).

3. **Hoplopleura hybomyis** sp. nov. (Figs. 3 - 6)

Type-data. - Ex *Hybomys trivirgatus* (Temminck, 1853) (Fam. Muridae), Holotype female and paratype female, University of Lagos, Federal District, Nigeria, 2 Nov. 1966. Types are deposited in the

collection of the U.S. National Museum of Natural History, Washington, D.C. 20560.

Diagnosis. - *H. hybomyis*, sp. n. is a member of the *hesperomydis-affinis* group, and closely related to *H. setzeri* Johnson, *H. oenomydis* Ferris, and is some ways also to *H. patersoni* Johnson. *H. hybomyis* sp. n. is separable from all these species by having paratergal lobes



Figs. 3-6. — *Hoplopleura hybomyis* Kim and Emerson, n. sp. holotype, female. 3. paratergites; 4. thoracic sternal plate; 5. head; 6. female genitalia.

of abdominal segment 7 very short or inconspicuous, paratergites of segment 8 with no apical lobes, and ventral paratergal seta of segments 5 and 6 as long as or shorter than apical lobe with minute dorsal seta.

Description. - FEMALE. Total body length 1.12 mm. *Head* (Fig. 5) short with postantennal angle distinct; lateral sides behind antennae not parallel; posterolateral angle not developed; AS, CS, OS, PAS, and

2 SHS distinct; DPHS long, without ADHS; 3 MHS distinct, borne on postantennal angle and MMHS and PMHS placed near DPHS; VPHS long, reaching the base of 2nd antennal segment; antennae 5 segmented, with sensoria on terminal two segments coalesced. *Thorax* slightly wider than head; sternal plate (Fig. 4) oboval with no anterior process and long slender posterior process, and its posterior process blunt at apex; DPtS minute, placed at anterolateral corner of the thorax; DMtS missing; DPTS long; ADTS long. *Legs* as in other members of *Hoplopleura*. *Abdomen* with 14 tergites and 15 sternites, all wide and long, and 5 spiracles present, each on paratergite of segments 3-7; segments 1 and 2 without tergites; segment 1 with 2 rows of setae, each 0-4-0; segment 3 with 1 tergite bearing setae 0-4-0; segments 4-6 each with 3 tergites and 3 rows of 0-4-0 setae; segment 7 with 3 tergites and 3 rows of setae, 0-4-0, 0-3-0, 0-2-0; segment 8 with one large tergite bearing setae 0-1-1-0; segment 1 without sternal plate; sternal plate of segment 2 laterally produced and articulate with paratergites with setae 0-8-0; segment 3 with 3 sternites, the first sternite produced laterally and articulated with paratergites bearing 2 groups of 2 large spiniform setae, 0-2-2-2-0, the second and third sternites bearing setae 0-4-0, 0-6-0 respectively; segments 4-6, each with 3 sternites and each sternite with setae 0-4-0; segment 7 with 2 sternites and 2 rows of setae, 0-5-0, 2-3-2; paratergites of segments 3-7, each with dorsal lobe broad and ventral lobe slender (Fig. 3); paratergites of segments 3 and 4 with both paratergal setae about as long as or slightly longer than apical lobes; paratergites of segments 5 and 6 each with ventral seta about as long as apical lobe and dorsal seta minute placed on the corner of median emargination; paratergite of segment 7 with a pair of long setae; paratergite of segment 8 subtriangular, with a pair of long setae. *Genitalia* (Fig. 6): Genital plate strongly indented laterally, with 2 setae placed diagonally on each side; gonopods elongated 2 setae and 1 very long seta; genital lobe distinct with spiniform genital seta; spermatheca not sclerotized; vulvar fimbriae distinct.

MALE : Unknown.

4. **Hoplopleura inexpectans** Johnson

Hoplopleura inexpectans Johnson, 1960 : 20-21, figs. 21, 22, 23B, 24B, 25B, 31, 34A, 34B); Benoit, 1961 : 234; Paulian and Pajot, 1966 : 42; Kim and Emerson, 1968: 8-10, figs. 15; Benoit, 1969: 112.

This species has been recorded from *Praomys taitae* (type host), *P. jacksoni*, *P. tullbergi* (Paulian and Pajot, 1966), and other hosts (*Malacomys* and *Lophuromys*) which are most likely accidental hosts. We are unable to verify the identity of the species previously recorded from *P. tullbergi* in Brazzaville, The Congo Republic. Specimens at hand taken off *P. tullbergi* in Nigeria represent a new taxon (6. *H. myomyis* sp. n.) along with material found on *Myomys* and *Hylomyscus*.

Specimens examined. - Ex *Praomys jacksoni* (De Winton, 1897), NIGERIA: University of Lagos, Federal District, 2, 5 Nov. 1966, 2 coll. (JCG-303, 379); Northern Region: Kudu, 26 March 1967, 2 coll. (JCG-1837, 1839); Ugar Jabar, 26, 31 March 1967, 5 coll. (JCG-2350, 2351, 2353, 2356); Ugar Jabar, 26 March 1967, 1 ♂ (JCG-2263); Western Region: Igbo-Ora, 22, 23, 25 Oct. 1966, 6 coll. (JCG-242, 249, 255, 261, 274; HWS-4881); ex *Lemniscomys barbarus* (Linnaeus, 1767), Panyam, Northern Region, Nigeria, 10 April 1967, 1 ♀ (JCG-2486) (straggler ?).

5. **Hoplopleura intermedia** Kellogg and Ferris, 1915

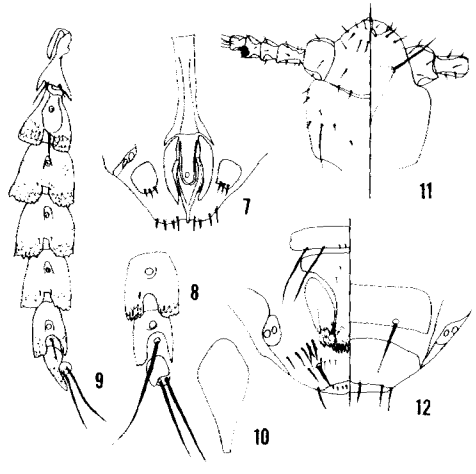
Since KIM and EMERSON (1968) was published, this species has been reported from Mozambique (KIM and EMERSON, 1970), Kivu and Rwanda, Republic of Zaïre (BENOIT, 1969), Republic of Central Africa and Brazzaville, and Republic of the Congo (PAULIAN and PAJOT, 1966).

Specimens examined. - Ex *Mastomys natalensis* (Smith, 1834), DAHOMEY: Atacora Region: Kouande, 27 April 1968, 1 ♂ and 9 ♀ (JWL-1378, 1379); Porga, 3, 4 May 1968, 1 ♂ and 1 ♀ (CBR-3501; JWL-1487); Borgou Region: Nikki, 22 Feb. 1968, 1 ♂ and 4 ♀ (CBR-2876); Bimbereke, 22 Jan. 1968, nymph (JWL-668); Banikoara, 5, 8 Feb. 1968, 1 ♂ and 3 ♀ (CBR-2503, 2508, 2457); Central Region: Zizonkame, 10, 15, and 17 April 1968, 6 ♀ and nymph (CBR-3134, 3184, 3467); Diho, 13 Jan. 1968, 3 ♂, 5 ♀ and nymph (JWL-472, 499; CBR-2054, 2058); Eastern Region: Ketou, 6-9 March 1968, 28 ♀ and 3 nymphs (CBR-3081, 3082, 3083, 3078, 3100, 3102; JWL-1024, 1091); Mono Region: Kpodave, 21, and 24 June 1968, 2 ♀ (CBR-4193, 4250); NIGERIA: Northern Region: Karaduwa, 15 Jan. 1967, 4 coll. (CJG-1158, 1165, 1173, 1188); Kabwir, 12-14 Dec. 1965, 5 coll. (HJH-1627, 1630, 1635, 1644, 1645); Tsanchaga, 9 Jan. 1967, 1 coll. (JCG-997); Panisan, 22, 23 Jan., and 1 Feb. 1967, 3 coll. (JCG-1345, 1397, 1618); Panyam, 8, 9, and 11 Dec. 1965, 8 coll. (HWS-4516, 4542, 4544, 4578, 4582; HJH-1593, 1598); Panyam Fish Farm, 8-10 Dec. 1967, 10 coll. (JCG-2395, 2396, 2397, 2402, 2407, 2422, 2440, 2442, 2443, 2449); Iella, 8 Dec. 1966, 3 coll. (JCG-755, 770, 773); Maiduguri, 4, 6 April 1966, 3 coll. (HJH-2168, 2186, 2188); Bida, 7-9 Jan. 1967, 3 coll. (JCG-925, 947, 977); Tangaza, 2-5 Dec. 1966, 8 coll. (JCG-619, 620, 657, 658, 663, 692, 694, 713); Kudu, 3-5 March 1967, 11 coll. (JCG-1722, 1737, 1748, 1767, 1768, 1774, 1776, 1777, 1778, 1786, 1800); Mada River, 11, 13, and 14 March 1967, 5 coll. (JCG-1859, 1923, 1955, 1982, 1994); Ugar Jabar, 23-27, 29, 31 March, and 1 April 1967, 13 coll. (JCG-2213, 2219, 2228, 2241, 2247, 2250, 2213, 2260, 2268, 2294, 2313, 2318, 2367); Fika, 19, 21, and 23 May 1966, 4 coll. (HJH-2487, 2488, 2505, 2525); Kabwir, 12-14 Dec. 1965, 5 coll. (HWS-4593, 4598, 4504, 4611, 4618); Kware, 28, 30 Nov. 1966, 3 coll. (JCG-536, 541, 574); Shagunui 10, 12 June 1966, 2 coll. (HJH-2623, 2645); Midwestern Region: 30 m west of Benin City, 1 Jan. 1966, 1 coll. (HJH-1715); Eastern Region: Aguleri, 24 Feb. 1966, 1 coll. (HJH-2026); Western Region: Upper Ogun Ranch, 16 Dec. 1966, 3 coll. (JCG-875, 882, 892); Ibadan, 19, 21, 22 Jan. 1966, 3 coll. (HJH-1797, 1807, 1812); Ilashe, 10, 12 Nov. 1966, 2 coll. (JCG-453, 382); Igbo-Ora, 20, 22, 24 Oct. 1966, 4 coll. (JCG-218, 225; HWS-4875, 4900); TOGO: Dapango, 12, 13 May 1968, 4 ♀ (CR-3823, 3853, 3818); ex *Mastomys erythroleucus* (Temminck, 1853), DAHOMEY: Bimbereke, Borgou Region, 22, 23 Jan. 1968, 1 ♂ and 10 ♀ (CBR-2265, 2267, 2290); Ketou, Eastern Region, 9 March 1968, 3 ♀, (CBR-3095); ex *Taterillus nigeriae* Thomas, 1911, DAHOMEY: Kouande, Atacora Region, 27 April 1968, 1 ♀ (JWL-1385); Banikoara, Borgou Region, 8 Feb. 1968, 1 coll. (CBR-2489) (stragglers ?); ex *Tatera welmanni* (St. Leger, 1929), NIGERIA: Kware, Northern Region, 28 Nov. 1966, 1 ♂ and 1 ♀ (JCG-537) (stragglers ?); ex *Tatera kempii* Wroughton, 1906, NIGERIA: Bida, Northern Region, 8-9 Jan. 1967, 3 ♀ (JCG-946, 987) (stragglers ?); ex *Praomys jacksoni* (De Winton, 1897), NIGERIA: Ugar Jabar, Northern Region, 26 March 1967, 1 ♀ (JCG-2263) (straggler ?); ex Bat, Fika, Nigeria, 23 May 1966, 1 ♀ (HJH-2541) (straggler ?).

6. **Hoplopleura myomyis** sp. nov. (Figs. 7 - 12)

Type-data. - Holotype ♀ and allotype ♂, ex *Myomys daltoni* (Thomas, 1892), Panisau, Northern Region, Nigeria, 22 January 1967 (JCG-1343). Paratypes: Ex *Myomys daltoni*, NIGERIA: Northern Region: Bida, 9 Jan. 1967, 3 ♀ (JCG-978); Karaduwa, 13, 17 Jan. 1967, 6 ♂ and 12 ♀ (JCG-1114, 1292); Mada River, 14 March 1967, 1 ♂ (JCG-1992); Panisau, 22, 23 Jan. 1967, 4 ♂ and 16 ♀ (JCG-1343, 1361, 1367); 9 April 1967, 2 ♀ (JCG-2414); Ugar Jabar, 27 March 1967, 1 ♀ (JCG-2290); ex *Myomys fumatus* (Peters, 1878), DAHOMEY: Atacora Region: Kouande, 29 April 1968, 1 ♂ and 1 ♀ (CBR-3434).

Diagnosis. - *H. myomyis*, sp. n., is a member of *H. hesperomydis* group, and closely allied to *H. inexpectans* Johnson, *H. intermedia* Kellogg and Ferris, *H. captiosa* Johnson, and *H. zelotomydis* Johnson. Separable from *captiosa* and *zelotomydis* by having paratergites of abdominal segment 3 with one long and one minute (or sometimes completely lacking) setae, and separable from *inexpectans* and *intermedia* by having paratergite 7 in both sexes with single long seta. Further separable by the following characters: apical setae on paratergites 4-6 are removed laterally, not inserted on the margin of the plate; head with accessory setae next to DPHS; and male with parameres long and flattened laterally.



Figs. 7-12. —*Hoplopleura myomyis* Kim and Emerson, n. sp. 7, 8, allotype, male; 9-12, holotype, female. 7, male genitalia; 8, paratergites of abdominal segments 6-8; 9, paratergites; 10, thoracic sternal plate; 11, head; 12, female genitalia.

Description. - FEMALE: Total body length 1.21 mm (n = 3). *Head* (Fig. 11) about as long as wide; postantennal and posterolateral angles developed; AS, PAS, 2 SHS, ADHS and PCHS distinct; DPHS long; 4 MHS present on each side, the anterior 2 setae placed close together and MMHS placed close to DPHS; VPHS long, reaching base

of antennal segment 2; antennae 5 segmented, with basal segment slightly enlarged and sensoria contiguous on segments 4 and 5. *Thorax* slightly wider than head; sternal plate elongated, with posterior process gradually tapering and anterior process rounded (Fig. 10); DPtS minute; DMsS minute, placed anterior to mesothoracic spiracle; DPTS long. *Legs* as in other members of the genus. *Abdomen* with 15 tergites, 13 sternites, 8 paratergites and 6 spiracles; segment 2 with 4 setae and no tergite; segment 3 with 3 tergites, each with a row of setae, 0-4-0, 0-5-0, and 0-4-0 respectively; segments 4-6 each with 3 tergites, each with setae of 0-6-0; segment 7 with 2 tergites each bearing setae of 0-6-0 and 0-4-0 respectively; segment 2 with single sternite extended laterally to articulate with paratergites bearing 9 setae; segment 3 with 3 sternites, 1st extended laterally to articulate with paratergites bearing 2 groups of 2 spiniform setae, 2nd with setae 0-7-0, and 3rd with setae 0-8-0; segments 4 and 5 each with 3 sternites, each sternite with setae of 0-8-0; segment 6 with 3 sternites, each with setae of 1-6-1; usual genitalic sclerotization present; paratergites (Fig. 9) highly developed, on segments 1-8; paratergites 2-7 bilobed; paratergite 2 triangular, with apical lobes long, pointed and basal process elongated; the lobes of paratergites 3-6 rounded, truncated, scaly, with emargination narrow and deep; paratergite 3 with 1 ventral apical seta on margin, longer than the lobe and 1 dorsal seta minute, set in from margin; paratergites 4-6 each with both apical setae set in from margin and ventral seta so minute to be invisible; paratergite 7 with single apical seta slightly longer than the lobes and ventral lobe pointed; paratergite 8 with single apical lobe dorsally and 2 long apical setae. *Genitalia* (Fig. 12): Genital plate well developed, with 2 pairs of setae in middle; gonopod elongated, with 3 apical setae; genital lobe weak, with genital seta slightly thickened; 3 weak setae present mesad to genital lobe; several long setae present on the base of genital lobe; 8th tergite with one long seta on each side; 9th tergite with 6 setae; spermatheca indistinct.

MALE: Total body length 97.3 mm (n = 3). Similar to female except for usual sexual dimorphism and sclerotization associated with genitalia. *Abdomen* with dorsal paratergal lobe of segment 8 much shorter (Fig. 8). *Genitalia* (Fig. 7) with basal apodeme slender; parameres long, and pointed at apex; pseudopenis V-shaped, with posterior process elongated; endomeres U-shaped.

Specimens examined. - Type series and the following material (which may represent contaminations); NIGERIA: ex *Praomys tullbergi*, Midwestern Region: Sapoba Forest Reserve, 9 Jan. 1966, 3 ♂ and 22 ♀ (HJH-1787, 1761, 1786); Federal District: University of Lagos, 2 Nov. 1966, 5 ♀ (JCG-303); ex *Taterillus gracilis*, NIGERIA: Northern Region: Bida, 9 Jan. 1967, 1 ♀ (JCG-1227); ex *Hylomyscus alleni*, Western Region: Igbo-Ora, 19-21 Oct. 1966, 4 ♂ and 20 ♀ (JCG-216; HWS-4858, 4850, 4863); ex Bats ?, Western Region, Igbo-Ora, 26 Oct. 1966, 1 ♀ (JCG-295) (straggler ?).

7. **Hoplopleura pelomydis** Ferris, 1921

A complete synonymy and descriptions of adult and nymphs are found in KIM and EMERSON (1968). This species has been further recorded from *Lemniscomys griselda* in Mozambique (KIM and EMERSON, 1970), *Pelomys minor* and *Pelomys fallax* in Zaïre (BENOIT, 1964), and *Lemniscomys striatus* and *Pelomys fallax* in Kivu, Zaïre (BENOIT, 1969).

Specimens examined. - Ex *Lemniscomys striatus* (Linnaeus, 1758), DAHOMEY: Eastern Region: Ketou, 8-9 March 1968, 3 ♂ and 5 ♀ (CBR-3060, 3061; JWL-1071, 1105); NIGERIA: Federal District: University of Lagos, 7 Nov. 1966, 1 coll. (JCG-409); Midwestern Region: Sapoba Forest Reserve, 6, 9 Jan. 1966, 2 coll. (HJH-1742, 1778); Northern Region: Panyam, 7, 10 Dec. 1965, 2 coll. (HJH-1602, 4502); 11 Apr. 1967, 1 coll. (JCG-2537); Tsanchaga, 8 Jan. 1967, 2 coll. (JCG-974, 975); TOGO: Pewa, 24, 25 May 1968, 1 ♂, 5 ♀ and 1 nymph (JWL-1957; CBR-3981).

8. **Hoplopleura rukenyae** Ferris, 1921

A complete description and illustration of adult stage was made by JOHNSON (1963), and a synonymy and description of nymphal stages was made by KIM and EMERSON (1968). Additional records of this species have been made: ex *Mus triton* and *Mus minutoides* (= *Leggada bella*) in Rwanda, Katanga, and Kivu, Zaïre (BENOIT, 1961 and 1969); ex *Mus* ? (*Leggada*) sp. in Central African Republic (PAULIAN and PAJOT, 1966); and ex *Mus triton* in Mozambique (KIM and EMERSON, 1970).

Specimens examined. - Ex *Mus minutoides* Temminck, 1853, DAHOMEY: Nikki, Borgou Region, 22 Feb. 1968 (CBR-2850), 1 ♀; Ketou, Eastern Region, 5 March 1968, 1 ♂ and 2 ♀ (JWL 1010).

9. **Hoplopleura somereni** Waterston, 1923

KIM and EMERSON (1970) listed additional records of this species from *Dasymys incomtus* in Mozambique.

Specimens examined. - Ex *Dasymys incomtus* (Sundevall, 1847), DAHOMEY: Zizonkame, Central Region, 15 April 1968, 7 ♂ and 11 ♀ (CBR-3130, 3131); NIGERIA: Lagos, Federal District, 6-7 Nov. 1966, 2 coll. (JCG-391, 413); ex *Mus musculoides*, NIGERIA: Ilashe, Western Region, 10 Nov. 1966, 1 ♀ (JCG-444).

10. **Hoplopleura spiculifer** (Gervais, 1844)

This species was originally described from specimens taken off *Lemnyscomys barbarus* (as *Mus barbarus*) from Algeria, and a complete synonymy was made by JOHNSON (1960).

Specimen examined. - Ex *Lemniscomys barbarus* (Linnaeus, 1767), Mada River, North Region, Nigeria, 12 March 1967, 1 ♀ (JCG-1908).

11. **Hoplopleura veprecula** Ferris, 1921

KIM and EMERSON (1970) redescribed the adult stage and listed a complete synonymy.

Specimen examined. - Ex *Tatera kempii* Wroughton, 1906, DAHOMEY: Kouande, Atacora Region, 27 April 1968, 1 ♀ (CBR-3397).

Subfamily **POLYPLACINAE**

Genus **Haemodipsus** Enderlein

12. **Haemodipsus lyriocephalus** (Burmeister, 1839).

Specimens examined. - Ex *Lepus capensis* Linnaeus, 1758, NIGERIA: Karaduwa, Northern Region, 15 Jan. 1967, 1 coll. (JCG-1178).

Genus **Lemurphthirus** Bedford

13. **Lemurphthirus galagus** Bedford, 1927

Lemurphthirus galagus Bedford, 1927: 263, figs.; Bedford, 1929: 501; Ferris, 1932: 300-3, figs. 183-4; Hopkins, 1949: 446; Ferris, 1951: 185, figs. 85; Ferris, 1954: 92; Paulian and Pajot, 1966: 47; Benoit, 1969: 167.

This species was originally described from species taken off *Galago senegalensis* (= *G. moholi*) in Transvaal, South Africa, and subsequently known from *Galago demidovii* in the Republic of Congo (PAULIAN and PAJOT, 1966).

Specimens examined. - Ex *Galago senegalensis* E. Geoffroy, 1796, DAHOMEY : Kouande, Atacora Region, 29-30 April 1968, 6 ♀ and 1 nymph (CBR-3444, 3445, 3446, 3477, 3478).

Genus **Neohaematopinus** Mjöberg

14. **Neohaematopinus keniae** Ferris, 1923

Neohaematopinus keniae Ferris, 1923 : 258, figs. 165D, 1 ; Johnson, 1960 : 47-8, figs. 51, 53, 56, 59, 61; Benoit, 1961 : 237-8; Benoit, 1962b : 52 ; Kuhn and Ludwig, 1965a : 241-2, fig. 10.

Neohaematopinus kenyae Ferris, 1951 : 192-3 ; Benoit, 1969a : 167 ; Benoit, 1969b : 107.

This species was originally described from specimens taken off *Heliosciurus gamibanus* (= *H. keniae*) and *Aethosciurus ruwenzorii* (= *H. ruwenzorii*) in Kenya, and subsequently recorded by BENOIT (1969a, b) from *Paraxerus cepapi* and *A. ruwenzorii* in Zaïre.

Specimens examined. - Ex *Heliosciurus gambianus* (Ogilby, 1835), DAHOMEY : Kouande, Atacora Region, 30 April 1968, 2 ♀ (CBR-3481); Ayitedjou, Eastern Region, 16 June 1968, 1 ♂ and 1 ♀ (JWL-2158).

Genus **Polyplax** Enderlein

15. **Polyplax abyssinica** Ferris 1923

KIM and EMERSON (1968) made a complete synonymy and described nymphal stages. This species was originally described from females only, and the male was described subsequently by JOHNSON (1960).

Specimens examined. - NIGERIA : Northern Region; ex *Arvicanthis niloticus* (Desmarest, 1822), Dada, 28 May - 2 June 1967, 7 coll. (JCG-3225, 3287, 3351, 3487, 3489, 3497, 3526); Iella, 7-9 Dec. 1966, 18 coll. (JCG-736 to 739, 741 to 743, 765 to 767, 771, 772, 783, 799, 803, 807, 811, 814); Karaduwa : 13, 14 Jan. 1967, 13 coll. (JCG-1105, 1106, 1110, 1112, 1120, 1122, 1124, 1126, 1146, 1149, 1164, 1190); Kware, 26-29 Nov. 1966, 11 coll. (JCG-505, 517, 525, 528, 549, 554, 562, 572, 579, 580, 590); Mada River, 13 March 1967, 1 coll. (JCG-1987); Panisan, 22, 23, 29, 31 Jan. 1967, 7 coll. (JCG-1334, 1377, 1339, 1340, 1341, 1423, 1546, 1589); Panyam Fish Farm, 11 April 1967, 1 coll. (JCG-2580); Sokoto, 10, 11 May 1966, 2 coll. (HJH-2400, 2429); Tangaza, 2, 3, 5 Dec. 1966, 8 coll. (JCG-634, 635, 636, 661, 662, 669, 718, 719). Possible contaminations include : ex *Desmodilliscus braueri* Wettstein, 1916, Sokoto, 26 Nov. 1966, 1 ♀ (JCG-501); ex *Taterillus gracilis* (Thomas, 1892), Bida, 9 Jan. 1967, 1 ♀ and 3 nymphs (JCG-1226); ex *Atelerix spiculus* (Thomas and Wroughton, 1907), Sokota, 26 Nov. 1966, 1 ♂, 1 ♀ and 1 nymph (JCG-506) 1 ex *Gerbillus gerbillus* (Olivier, 1801), Tangaza, 3 Dec. 1966, 1 ♀ (JCG-653); ex *Myomys daltoni* (Thomas, 1892), Karaduwa, 13 Jan. 1967, 1 ♀ (JCG-1114); Iella, 8 Dec. 1966, 1 ♂ (JCG-752); ex *Mus musculoides* Temminck, 1853, Ilashe, 13 Nov. 1966, 1 ♂ and 5 nymphs (JCG-489); ex *Hylomyscus alleni* (Waterhouse, 1837) Western Region : Igbo-Ora, 19 Oct. 1966, 3 nymphs (HWS-4850); ex *Crocidura* sp., Ilashe, 12 Nov. 1966, 1 ♂ and 3 nymphs (JCG-476).

16. **Polyplax cummingsi** Ferris, 1916

KIM and EMERSON (1968) made a full synonymy and descriptions of nymphs. KIM and EMERSON (1970) further recorded this species from *Dasymys incomtus, Aethomys chrysophilus,* and *Mus triton.*

Specimens examined. - Ex *Dasymys incomtus* (Sundevall, 1847), NIGERIA : Northern Region : Mada River, 13 March 1967, 1 coll. (JCG-1954); Panyam, 11 Dec. 1965, 1 coll. (HWS-4574).

17. **Polyplax grammomydis** Werneck, 1953

KIM and EMERSON (1970) reported this species from *Grammomys dolichurus* in Mozambique.

Specimen examined. - DAHOMEY : Ex *Crocidura* sp., Zizonkame, Central Region, 18 April 1968, 1 ♂ (CBR-3220).

18. **Polyplax kaiseri** Johnson, 1960

Specimen examined. - Ex *Gerbillus gerbillus* (Olivier, 1801), NIGERIA : Tangaza, Northern Region, 3 Dec. 1966, 1 ♀ (JCG-653).

19. **Polyplax brachyrrhynchus** Cummings, 1915 (Fig. 13)

Polyplax brachyrrhynchus Cummings, 1915 : 246, f. 2 ; Ferris, 1916 : 172 ; Ferris, 1923 : 220, f. 142, 143; Johnson, 1960 : 81-2, f. 131, 134, 136, 137, 141, 142.

Symoca brachyrrhyncha Fahrenholz, 1938 : 245; Ferris, 1951 : 220, f. 95.

Symoca brachyrrhyncha minor Fahrenholz, 1939 : 32 ; Ferris, 1951 : 220 (sinks *minor* Fahrenholz).

This species was originally described from large number of specimens taken off *Acomys cahirinus* in Assint, Egypt. *P. brachyrrhynchus* has subsequently been recorded from *Acomys hystrella*, Uganda and *A. percivali*, Kenya (FERRIS, 1923); *A. dimidiatus*, and *A. russatus* in Egypt (JOHNSON, 1960). The present material includes a good series of adults and nymphs. Nymphs 2 and 3 are herewith described and illustrated for the first time.

Description. - NYMPH 3: (Fig. 13) Total body length 1.30 mm (n = 4). *Head* longer than wide; postantennal angle not developed; CS, OS, PAS, 2 SHS, and 3 MHS present on each side; DCHS indistinct; VPHS short, barely reaching beyond the base of antennal segment 1; DPHS long, borne on lobe; antennae 5-segmented, with 2 contiguous sensoria on segments 4 and 5. *Thorax* about as wide as head; DPTS small; DPtS and DMsS minute; no sternal plate present; coxal plate with several minute setae. *Legs*: Foreleg smallest, with acuminate claw; midleg larger than foreleg but smaller than hindleg; hindleg largest, with blunt claw and enlarged tibio-tarsus. *Abdomen* elongate, with 9 pairs of DCAS and 7 pairs of VCAS; 7 paratergites distinctly developed, with 6 spiracles; paratergite 1 without spiracle but with a pair of minute setae; paratergite 2 with a long apical seta; paratergites 3-5 without apical setae; paratergites 6-7 each with a pair of long setae; segment 8 with a long MAS; anal segment rounded.

NYMPH 2: Total body length 1.02 mm (n = 2). Similar to nymph 3, unless otherwise stated below. *Abdomen* without distinct paratergites and apical setae.

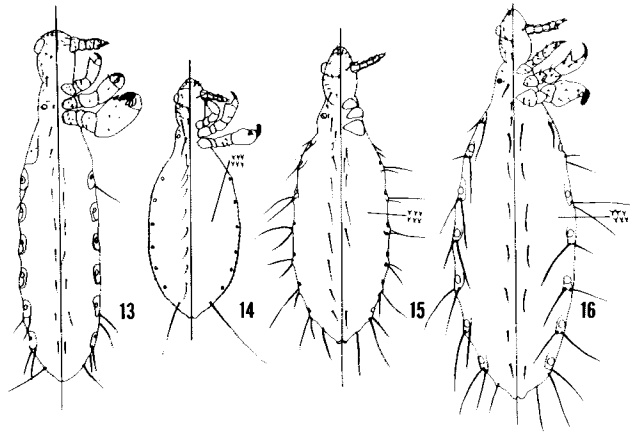
NYMPH 1: Unknown.

Remarks. - Nymphs of *P. brachyrrhynchus* resemble *P. smallwoodae*, but are distinguishable by having highly developed head chaetotaxy, PtS and MsS on the thorax, and lacking apical setae on paratergites 3-5.

Specimens examined. - Ex *Acomys cahirinus* (G. Geoffroy, 1803), DAHOMEY: Borgou Region: Banifoara, 9-10 Feb. 1968, 6 ♂, 19 ♀, and 2 nymphs (CBR-2521, 2523, 2558, 2563, 2564, 2569, 2565); Bimbereke, 19-21 Jan. 1968, 9 ♂, 101 ♀, and 10 nymphs (JWL-632, 586, 631; CBR-2229, 2182, 2222, 2220, 2230, 2231); Bimbereke, 19 Jan. 1968, 1 ♀ (CBR-2181); TOGO: Dapango, 9-13 May 1968, 11 ♂, 20 ♀, and 7 nymphs (JWL-1774, 1776, 1813, 1836, 1745, 1746, 1744, 1748, 1835; CBR-3819, 3820, 3700, 3822, 3688, 3783, 3825).

20. **Polyplax oxyrrhynchus** Cummings, 1915 (Figs. 14 - 16)

JOHNSON (1960) recorded additional material of this species from *Acomys russatus* and *A. dimidiatus* collected in Egypt. Nymphal stages have not been previously known. Three nymphal stages are herewith described and illustrated.



Figs 13-16. — Nymphs. 13. *Polyplax brachyrrhynchus* Cummings, nymph 3; 14-16. *P. oxyrrhynchus* Cummings: 14. nymph 1; 15. nymph 2; 16. nymph 3.

Description. NYMPH 1 (Fig. 14): Total body length 0.92 mm. *Head* longer than wide, with no definite postantennal angle; PAS, OS, CS, 2 SHS and 3 MHS present on each side; ACHS and PVHS distinct; VPHS long, reaching the apex of antennal segment 2; antennae 5-segmented, with contiguous sensoria on segments 4 and 5. *Thorax* about as wide as head, with long DPTS; MsS not distinct; PtS distinct; forecoxae separated; no trace of sternal plate present. *Legs* as in adult. *Abdomen*: Cuticle with microtrichiae; 2 vertical rows of 9 DCAS present; venter void of any setae; one MAS present on each side; 6 spiracles distinct.

NYMPH 2 (Fig. 15): Total body length 1.14 mm. *Head* same as in nymph 1. *Thorax* with one long DPTS, short PtS and MsS present on each side; forecoxae close together. *Legs* as in adult. *Abdomen* with

traces of paratergites on segments 2-6 or 2-7; 2 vertical rows of 9 DCAS and of 6 VCAS; 7th and 8th VCAS absent; paratergites of segments 2-7 each with a pair of long apical setae; 6 spiracles distinct.

NYMPH 3 (Fig. 16): Total body length 1.54 mm (n = 3). *Head, thorax,* and *legs* same as in nymph 2. *Abdomen* same as in nymph 2 except for the following characters: 7 VCAS present, with only 8th VCAS missing; paratergites distinctly developed, each with large spiracle and a pair of long apical setae; anal segment slightly prolonged.

Specimens examined. - Ex *Acomys cahirinus* (G. Geoffroy, 1803), DAHOMEY: Borgou Region: Banikorara, 9-10 Feb. 1968, 3 ♂, 4 ♀, and 1 nymph (CBR-2523, 2566, 2558, 2522); Bimbereke, 20-21 Jan. 1968, 5 ♀ and 7 nymphs (CBR-2229, 2216, 2230; JWL-631); TOGO: Dapango, 9-13 May 1968, 5 ♂, 9 ♀, and 23 nymphs (JWL-1835, 1840, 1774, 1747, 1813, 1773, 1744, 1745, 1746, 1748, 1835; CBR-3819, 3820, 3699); Ex *Acomys dimidiatus* (Cretzschmar, 1826), EGYPT: Sudan Adm. Area, Jebel Elba, Bir Kansisreb, 3 March 1954, H. Hoogstraal, 1 nymph 3 (NAMRU-3; B-22204; HH 10007-14); Eastern Desert Gov., Bir Abraq, 23 Feb. 1954, H. Hoogstraal, 2 nymph 3, 1 nymph 2, and 1 nymph 1 (NAMRU-3; B-22180, 22190; HH 9933-39, 9963-64).

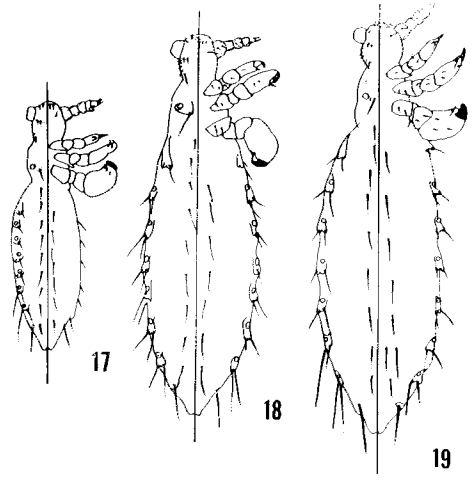
21. **Polyplax reclinata** (Nitzsch, 1864)

A complete synonymy is found in KIM and EMERSON (1968). Additional records from *Crocidura occidentalis, C. sururae* and *Scutisorex somereni* have been made by BENOIT (1969) and from *Crocidura* sp. by PAULIAN and PAJOT (1966) from Central Africa.

Specimens examined. - Ex *Crocidura* sp., DAHOMEY: Atacora Region: Soubroukou, 22, 23 April 1968, 1 ♂ and 4 ♀ (CBR-3311; JWL-1311); Borgou Regions: Nikki, 23 Feb. 1968, 1 nymph (JWL-898); Central Region: Zizenkame, 16 April 1968, 1 nymph (CBR-3455); Eastern Region: Ayitedjou, 16-18 June 1968, 1 ♂ and 14 ♀ (CBR-4155, 2013, 2015, 4146; JWL-2172); Mono Region: Kpodaoe, 21 June 1968, 6 ♂ and 15 ♀ (JWL-2181, 2182); NIGERIA: Eastern Region: Oban, 16-18 March 1966, 3 coll. (HJH-2130, 2140, 2143); Midwestern Region: Sapoba, 14 July 1966, 1 coll. (SBA-62); Western Region. Ilashe, 10, 12, 13 Nov. 1966, 3 coll. (JCG-449, 476, 486); Northern Region: Karadwa, 16 Jan. 1967, 1 coll. (JCG-1236); TOGO: Pagala, 27, 30, 31 May 1968, 4 ♂ and 9 ♀ (JWL-2111, 2030, 2130).

22. **Polyplax smallwoodae** Johnson, 1960 (Figs. 17 - 19)

P. smallwoodae was originally described on the basis of several adults taken off *Lophuromys* sp., Angola, and *L. sikapusi pyrrhus,* Uganda. KIM and EMERSON (1968) listed a complete synonymy and citations. This species has further been recorded from *Lophuromys sikapusi, L. aquilus laticeps,* and *L. woosnami* (PAULIAN and PAJOT, 1966; KIM and EMERSON, 1968; BENOIT, 1969). No nymphal stages have previously been known, and thus, three nymphal stages are herewith described and illustrated.



Figs 17-19. *Polyplax smallwoodae* Johnson. 17. nymph 1; 18. nymph 2; 19. nymph 3.

Description. - NYMPH 1 (Fig. 17): Total body length 0.80 mm. *Head* longer than wide; with distinct 2 SHS and long DPHS on each side; one distinct accessory seta present anterior to DPHS; CS and OS distinct; MAS and CHS lacking or very poorly developed; VPHS short; antennae 5-segmented, with 2 sensoria contiguous on segments 4 and 5. *Thorax* with distinct mesothoracic spiracle and DPTS; forecoxae close together; no trace of sternal plate present. *Legs* as in adult.

Abdomen with 7 distinct paratergites and 6 spiracles; paratergites of segments 2-6 each with a single apical seta or one long ventral seta and minute dorsal seta; paratergites 7 and 8 each with a pair of long setae; one MAS on each side of segment 9; 2 rows of 9 DCAS and 7 VCAS.

NYMPH 2 (Fig. 18): Total body length 1.05 mm (n = 3). *Head, thorax, legs* and *abdomen* similar to those in nymph 1, unless otherwise mentioned. *Abdomen* with paratergites larger and 6th row of VCAS often with an additional seta.

NYMPH 3 (Fig. 19): Total body length 1.23 mm (n = 4). *Head, thorax,* and *abdomen* same as in nymph 2, unless otherwise mentioned. *Thorax* with distinct DPtS and DMsS. *Abdomen*: 6th row of VCAS with 4 seta; anal segment slightly prolonged.

Specimens examined. - Ex *Lophuromis sikapusi* (Temminck, 1853), DAHOMEY: Eastern Region: Ketou, 8 March 1968, 47 ♂, 61 ♀, and 16 nymphs (JWL-1080, 1074, 1079; CBR-3071, 3070, 3069, 3072, 3066, 3068, 3073); NIGERIA: Federal District: University of Lagos, 2 Nov. 1966, 1 coll. (JCG-315); 7 Nov. 1966, 2 coll. (JCG-414, 415); Midwestern Region: 30 miles West of Benin City, 29 Dec. 1965, 1 coll. (HJH-1688); 1 Jan. 1966, 1 coll. (HJH-1710); Ashaka, 14 Feb. 1966, 2 coll. (HJH-1969, 1973); Sapoba Forest Reserve, 9 Jan. 1966, 2 coll. (HJH-1782, 1783); Western Region: Igbo-Ora, 18-25 Oct. 1966, 15 coll. (CJG-204, 205, 230, 268, 277; HWS-4841, 4846, 4847, 4848, 4849, 4854, 4874, 4876, 4877); TOGO: Ezime, 30 June 1968, 1 ♀ (CBR-4309); 2 July 1968, 1 ♀ and 3 nymphs (JWL-2352).

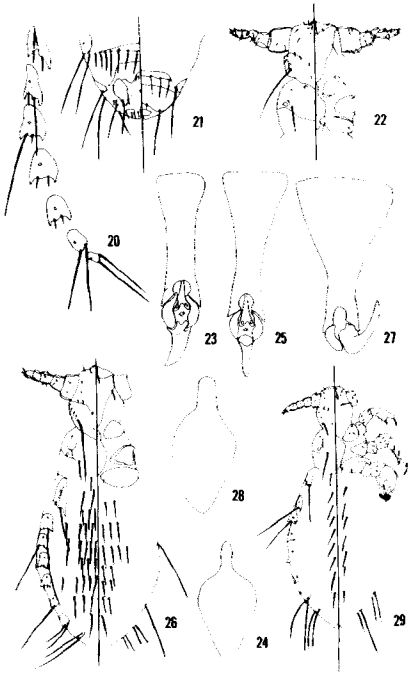
23. **Polyplax spinulosa** (Burmeister, 1839).

This is a common species found on *Rattus rattus, R. norvegicus,* and other species of *Rattus.* In addition to KIM and EMERSON (1968, 1970) several additional records have been published by BENOIT (1964, 1969), and PAULIAN and PAJOT (1966).

Specimens examined. - Ex *Rattus rattus* (Linnaeus, 1758), NIGERIA: Benin City, Mid-western Region, 28, 30 Dec. 1965, 2 coll. (HJH-1694, 2166); Calabar Eastern Region, 9 March 1966 1 coll. (HJH-2089).

24. **Polyplax parataterae** sp. nov. (Figs. 20 - 26, 30).

Type-data. - Holotype ♂ and allotype ♀, ex *Tatera kempii* Wroughton, 1906, Kouande, Atacora Region, Dahomey, 28 April 1968 (JWL-1409). Paratypes: Ex *Tatera kempii,* DAHOMEY: Atacora Region: Kou-



Figs 20-26. — *Polyplax parataterae* Kim and Emerson, n. sp.: 20-21. allotype, female; 20-24, holotype, male. 20. paratergites; 21. female genitalia; 22. head and thorax; 23. male genitalia; 24. thoracic sternal plate; 25, 26. paratypes; 25. male genitalia, variant; 26. nymph 3.

Figs. 27-29. — *Polyplax subtaterae* Bedford. 27. male genitalia; 28. thoracic sternal plate, male; 29. nymph 2.

ande, 22 April 1968, 1 ♂ and 1 nymph 3 (CBR-3396); 26-29 April 1968, 8 ♀ and 1 nymph 3 (JWL-1409, 1410, 1394; CBR-3368, 3453); Soubroukou, 22-24 April 1968, 4 ♂, 2 ♀, and 3 nymph 3 (JWL-1327) (CBR-3344, 3294); Eastern Region: Ayitedjou, 18 June 1968, 2 ♀ (CBR-4173); Central Region: Zizonkame, 18 April 1968, 1 ♂ and 2 ♀ (JCL-1220); 15 April 1968, 1 ♂ (CBR-3139); Bimbereke, Borgou Region, 1 Jan. 1968, 1 ♂ and 3 ♀ (JWL-646); 23 Jan. 1968, 1 ♂, 4 ♀, and 1 nymph 3 (CBR-2293); NIGERIA: Northern Region: Kudu, 5 March 1966, 11 ♂ and 11 ♀ (JCG-1769); Shagunu, 1 June 1966, 1 ♀ (HJH-2647); Ugar Jabar, 24 March 1967, 2 ♂ and 2 ♀ (JCG-2226); Western Region: Ilashe, 9 Nov. 1966, 1 ♂, 2 ♀, and 1 nymph 3 (JCG-425, 430); 10 Nov. 1966, 1 ♂, 1 ♀, 8 nymph 3 and 2 nymph 2 (JCG-452); TOGO: Pagala, 27-31 May 1968, 3 ♂, 21 ♀, 13 nymph 3, and 1 nymph 2 (CBR-4092, 4088, 4089, 4037, 4085, 4139, 4055, 4081, 4084; JWL-2085, 2116, 2117, 2089, 2086, 2134, 2083, 2097); Pewa, 22 May 1968, 4 ♂, 3 ♀, and 3 nymph 3 (JWL-1939); Ezime, 1 July 1968, 9 ♀ (CBR-4334).

Diagnosis. - *P. parataterae*, n. sp. is a member of the *praecisa* group, and closely allied to *P. subtaterae* Bedford. This species is separable from *P. praecisa* (Neumann) and *P. taterae* Ferris by having paratergites of abdominal segments 3-4 each with one very long and one short apical setae and segments 5 and 6 each with a pair of short or minute apical setae, from *P. biseriata* Ferris by having single mesothoracic seta immediately anterior to mesothoracic spiracle, from *P. roseinnesi* Paterson and Thompson by lacking large, stout dorsal seta on the basal segment of antennae, and from *P. subtaterae* and *P. gerbilli* Ferris by having apical lobes of paratergites 4-5 distinct but short, dorsal seta of paratergite 3 and ventral seta of paratergite 4 very long, and thoracic sternal plate rounded laterally and gradually tapering toward apex (Figs. 24, 28). In male of *P. subtaterae* the basal apodeme of the aedeagus is very broad basally (Fig. 27), but in *P. parataterae* the basal apodeme is only slightly broadened anteriorly. The male of *P. parataterae* has 26-30 long and short setae on each of abdominal segments 4-7. The nymph 3 of *P. parataterae* has 3 or 4 DLAS on each side, and that of *P. subtaterae* lacks DLAS completely (Fig. 26).

Description. - MALE (Fig. 30a): Total body length 1.21 mm (n = 3). *Head* (Fig. 22) about as long as wide; postantennal and posterolateral angles well developed; AS, CS, OS, PAS, ACHS and PCHS distinct; 2 SHS distinct on each side; 3 MHS arranged irregularly; ADHS placed anterior to DPHS; DPHS very long, placed on lobe; VPHS short, reaching slightly beyond basal one-half of antennal segment 1; antennae 5-segmented, with basal segment enlarged, segment 3 modified, bearing a short thorn-like seta on an apical projection, and segments 4 and 5 each bearing a sensorium. *Thorax* (Fig. 22) slightly wider than head; sternal plate (Fig. 24) with anterolateral angles rounded, lateral margins gradually sloping, obtuse at posterior end, and anterior process narrow; forecoxae separated; DPtS and DMsS (DMtS of KIM, 1966) distinct; DPTS long; 2 minute setae present immediately behind occiput on each side. *Legs* as other members of *Polyplax*. *Abdomen* with 7 tergites and 6 sternites narrow and short, each occupying less than one-half of the width of abdomen; tergites present on segments 2-7, with mixture of long and short setae; segment 1 with one row of 2 setae; segment 2 with 2 rows of setae, 0-4-4-0 and 3-6-3; segment 3 with setae of 0-22-0 on tergite; segments 4 and 5 each with 30 setae on tergites; segments 6 and 7 each with 28 and 26 setae on tergite respectively; segment 8 with setae of 0-6-5-0; segments 1 and 2, each with 18 and setae on sternites respectively; segments 3-7, each with 1 VLAS, 21, 19, 15, 12, and 6 VCAS respectively on each sternite; segment 8 with 2 DCAS; paratergites present on segments 2-8; paratergites 2-5, each with apical lobes short; paratergite 2 divided, with 2 apical setae longer than apical lobes; paratergite 3 with very long dorsal apical seta and one short ventral seta, and with distinct apical lobes; paratergite 4 with short dorsal and very long ventral setae; paratergites 5-6, each with small dorsal seta and minute ventral seta; paratergites 6-8 without apical lobes; paratergites 7-8 each with a pair of very long setae; spiracles present on paratergites of segments 3-8; genital area sclerotized; anal segment bifurcate, each lobe with 6-8 minute setae. *Genitalia* (Fig. 23, 25): Basal apodeme much longer than aedeagus proper, slightly or moderately widened anteriorly; parameres shorter than pseudopenis, thickened posteriorly; endomeres distinct, inverted Y-shaped; pseudopenis large, thickened anteriorly, wedge-shaped, articulating with parameres.

FEMALE (Fig. 30b): Total body length 1.40 mm (n = 3). Similar to male, unless otherwise mentioned below. *Head* with basal segment of antennae not unusually enlarged; segment 3 unmodified. *Abdomen* with 11 tergites, 11 sternites, and usual genitalic sclerotization; segments 2 with one tergite and 2 rows of setae, 0-3-3-0 and

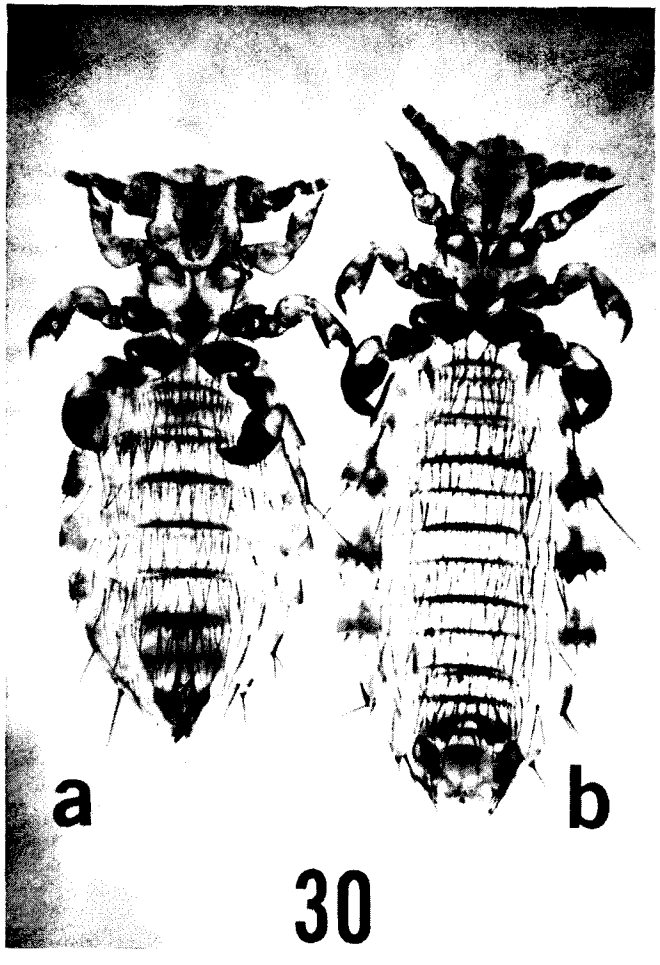


Fig. 30. *Polyplax parataterae* Kim and Emerson, n. sp. a. male, b. female

0-10-0; segment 3 with one row of setae on tergite, 0-13-0; segments 4-7 each with 2 tergites and 2 rows of setae, usually 0-19-0 or 0-20-0; segment 8 with one row of setae on tergites 0-6-0; segment 2 with one row of setae on sternite 0-12-0; segment 3-6 each with 2 sternites and 2 rows of setae, usually 16 or 17 VCAS; 506 VLAS present on each side; segment 7 with 2 sternites and 2 rows of setae, 1-12-1 and 1-10-1; paratergites 5 and 6 each with both apical setae short, similar in size; paratergite 6 with distinct apical lobes (Fig. 20). *Genitalia* (Fig. 21): Genital plate wide and short; gonopods irregularly ovate, with 2 short and one long apical seta; genital lobe poorly developed, with genital seta not spiniform; anal segment with several small setae.

NYMPH 3 (Fig. 26): Total body length 1.07 mm (n = 5). *Head* and *thorax* essentially same as in adult; head setae smaller; postantennal and posterolateral angles not developed; thorax without minute setae posterior to occiput. *Abdomen* with 6 spiracles and 7 paratergites; paratergites of segments 2-4 each with one very long and one small apical setae; paratergites 5 and 6 each with a pair of short setae; paratergite 7 with a single long apical seta; paratergite 8 with a pair of very long setae; with 9 rows of DCAS 2, 4, 6, 6, 8, 6, 8, 6 and 2 respectivey; 3 DLAS present on each side; with 7 rows of VCAS, 4, 6, 8, 4, 4, and 2 respectively.

NYMPH 2: Total body length 0.91 mm (n = 2). Same as in nymph 3, unless otherwise mentioned below. *Head* setae minute. *Thorax* with sternal plate small and less distinct; DPtS and DMsS minute. *Abdomen* with small paratergites on segments 2-7; paratergite 7 without setae; with 9 rows of DCAS as 2, 4, 5, 5, 5, 5, 4, 4, and 2 respectively; 2 DLAS present on each side; with 8 rows of VCAS as 4, 5, 5, 6, 6, 6, 4, and 2 respectively.

NYMPH 1: Unknown.

Specimens examined. - Type series and the following possible contaminations; NIGERIA: Ex *Steatomys caurinus* Thomas, 1912, Mada, River, Northern Region, 14 March 1967, 1 ♀ (JCG-2020); ex *Mus musculoides* Temminck, 1853, Afon, Northern Region, 8 May 1967, 2 ♂ and 1 ♀ (JCG-2960); TOGO: Ex *Mastomys natalensis* (Smith, 1834), Pagala, 7 May 1968, 1 nymph 2 (CBR-4030); ex *Arvicanthis niloticus* (Desmarest, 1822), Padori, 18 May 1968, 1 ♂ (JWL-1912).

25. **Polyplax subtaterae** Bedford, 1936 (Figs. 27-29)

JOHNSON (1960) listed a complete synonymy and provided diagnosis for *P. subtaterae*. This species has been recorded from *Tatera liodon smithi, T. emini, Aethomys kaiseri,* and *Arvicanthis abyssinicus*. JOHNSON (1960) considered the records from *Aethomys, Arvicanthis,* and *T. emini* erroneous. This species has also been recorded from *Tatera dichrura* (BENOIT, 1961) and *T. liodon* (BENOIT, 1969a) from Central Africa. Nymphal stages have not been previously described. Thus, nymphs 2 and 3 are herewith described.

Description. - NYMPH 1: Unknown.

NYMPH 2 (Fig. 29): Total body length 0.85 mm (n = 2). *Head* about as long as wide; antennae 5-segmented, with segments 4 and 5 each bearing minute sensorium; postantennal angle not developed; OS, PAS, AS, and PCHS present; 2 SHS and 3 MHS present on each side; DPHS long; VPHS reaching the base of antennal segment 2. *Thorax* slightly wider than head; DPtS and DMsS (DMtS of KIM, 1966) distinct; DPTS long; sternal plate suboval. *Legs*: Fore and midlegs similar in shape, with acuminate claws; midlegs larger than forelegs; hindlegs larger than midlegs with blunt claw. *Abdomen* with 9 pairs of DCAS and 7 pairs of VCAS; no LAS present; 7 paratergites and 6 spiracles present; paratergites of segments 2-4 each with one very long apical seta and one small seta; paratergite 5 with one minute seta; paratergites 6 and 7 without visible apical setae; segments 8 and 9 each with a pair of MAS on each side; anal segment bifurcate.

NYMPH 3: Total body length 1.04 mm (n = 4). *Head, thorax,* and *legs* same as in nymph 2. *Abdomen* with 9 rows of DCAS, usually 4-6 setae per row, except for segments 1 and 8 each with 2 DCAS; with 7 rows of VCAS, 4, 7, 5, 7, 4 and 2 respectively.

Specimens examined. - Ex *Taterillus nigeriae* Thomas, 1911, DAHOMEY: Atacora Region: Kouande, 29-30 April 1968, 3 ♀ (JWL-1391, 1470); Souhroukou, 20-23 April 1968, 7 ♀ and 7 nymphs (JWL-1310, 1258; CBR-3292, 3241, 3317); Central Region: Zizonkame, 18 April 1968, 2 ♀ (CBR-3203); NIGERIA: Northern Region: Dada, 29 May 1967, 1 ♀ (SBA-199); ex *Taterillus gracilis* (Thomas, 1892), DAHOMEY: Borgou Region: Guewe, 28 Jan. 1968, 2 ♀ (CBR-2327); ex *Crocidura* sp., DAHOMEY: Central Region: Zizonkame, 18 April 1968, 1 ♀ (CBR-3220) (stragglers ?).

26. **Polyplax taterae** Ferris, 1923

KIM and EMERSON (1970) presented a complete synonymy and description of nymphal stages.

Specimen examined. - Ex *Lemniscomys striatus* (Linnaeus, 1758), NIGERIA: Panyam, Northern Region, 11 April 1967, 1 ♂ (JCG-2537).

Genus **Proenderleinellus** Ewing

27. **Proenderleinellus calvus** (Waterston)

KIM and EMERSON (1968) recorded this species from *Cricetomys gambianus emini* in addition to previous records from *C. gambianus, C. ansorgei viator,* and *Thryonomys gregorianus*. This species has been further known from *C. dissimilis, C. ansorgei,* and *C. gambianus* (BENOIT, 1969; PAULIAN and PAJOT, 1966).

Specimens examined. - Ex *Cricetomys gambianus* Waterhouse, 1840, DAHOMEY: Central Region: Diho, 16 Jan. 1968, 2 nymphs (CBR-2177); Zizonkame, 17 April 1968, 1 ♀ (CBR-3175); NIGERIA: Eastern Region: Azulerii, 24 Feb. 1966, 1 coll. (HJH-2043); Calabar, 12 March 1966, 1 coll. (HJH-2114); Northern Region: Karaduwa, 15 Jan. 1967, 1 coll. (JCG-1200); Kudu, 7 March 1967, 1 coll. (JCG-1825); Mada River, 12 March 1967, 1 coll. (JCG-1905); Panisan, 24-25 Jan. 1967, 2 coll. (JCG-1456, 1466); Zaria, 23 April 1966, 1 coll. (HJH-2281); Western Region: Upper Ozum Ranch, 15 Dec. 1966, 1 coll. (JCG-869); TOGO: Pewa, 24 May 1968, 5 ♂, 10 ♀, and 3 nymphs (JWL-1972; CBR-3973, 3974).

Subfamily **HYBOPHTHIRINAE**

Genus **Scipio** Cummings

28. **Scipio aulacodi** (Neumann)

This species has been known from *Thryonomys swinderianus, T. gregorianus,* and *T.* (*Choeromys*) *harrisoni* in Africa (KIM and EMERSON, 1970). This species has been further recorded from *Thryonomys harrisoni* by BENOIT (1969) and *Thryonomys* sp. by PAULIAN and PAJOT (1966) from Africa.

Specimens examined. - Ex *Thryonomys swinderianus* Temminck, 1827, NIGERIA: Eastern Region: Calabar, 22 Feb. 1966, 1 coll. (HJH-2116).

Family LINOGNATHIDAE

Genus **Prolinognathus** Ewing

29. **Prolinognathus foleyi** Fahrenholz

Prolinognathus foleyi Fahrenholz, 1939 : 1 : 9, Figs. 5, 7, 8; Ferris, 1951 : 251.

This species was originally described from specimens taken off *Procavia rufescens bouhioli* from Algeria. Fahrenholz (1939) described all stages. The present record is the first since the species was described.

Specimens examined. - Ex *Procavia ruficeps* (Hemprich and Ehrenberg, 1832), Nigeria : Northern Region : Zaria, 25 April 1966, 4 ♂, 2 ♀, and 2 nymphs (HJH-2307).

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