SUCKING LICE (ANOPLURA) FROM IRANIAN MAMMALS[1]

By Ke Chung Kim[2] and K. C. Emerson[3]

Abstract: The Iranian anopluran fauna of rodents, insectivores, a lagomorph, and a carnivore was studied: 4 species of *Hoplopleura*, 9 species of *Polyplax*, and one species for each of *Eulinognathus*, *Haemodipsus*, and *Linognathus*. Adult and nymphal stages of *Hoplopleura merionidis* Ferris and nymphs of *Polyplax kaiseri* Johnson are described and illustrated. *Polyplax calomysci*, new species taken from *Calomyscus baiwardi*, is also described and illustrated.

This paper reports observations on sucking lice associated with mammals, mostly rodents and insectivores, from Iran. Collections were made by H. W. Setzer (HWS) and R. G. Tuck (RGT) of the Division of Mammals, Department of Vertebrate Zoology, U.S. National Museum, Smithsonian Institution, Washington, D.C. The anopluran fauna of Iran and the surrounding region is poorly known. The collections made by Setzer and Tuck have added to the understanding of host relationships and the geographical distribution of many known species and revealed some new information on poorly known species of sucking lice.

The identification and names of the mammalian hosts were provided by Dr H. W. Setzer. Morphological terminology for the Anoplura is that previously published by Kim (1965, 1966a, b). A complete citation of references and synonymies is given for those species which have not been treated in the previous papers by Johnson (1960) and Kim & Emerson (1968, 1970). Most of the material is deposited in the collections of the U.S. National Museum, Washington, D.C.

Family HOPLOPLEURIDAE Ferris
Subfamily HOPLOPLEURINAE Ferris
Genus **HOPLOPLEURA** Enderlein

Hoplopleura acanthopus (Burmeister)

Pediculus acanthopus Burmeister, 1838: No. 5, Pl. 1, f. 2.—Gervais, 1844: 302.—Nitzsch, 1864: 27.

Hoplopleura acanthopus (Burm.): Enderlein, 1904b: 221, f. 1, 2.

A full synonymy and reference citation is found in Ferris (1921, 1951), Johnson (1960), and Beaucournu (1968).

This species is commonly found on *Microtus* and *Clethrionomys*, and occasionally on *Apodemus*, *Mus musculus*, *M. specilegus*, *Pitymys*, *Synaptomys*, and *Lemus*.

Specimens Examined: Ex *Microtus socialis*, FARS PROVINCE: 11 km NW Darab, 12.VII.1965, 1 ♂, 1 ♀ (RGT-1549); KORDESTAN PROVINCE: 66 km NW Sanandaj, 23.V.1965, 1 ♂, 1 ♀ (RGT-1547) and 6 collections (RGT-1532, 1535, 1544, 1546, 1549, 1551); 24.V.1965, 17 collections (RGT-1553-1570); 25.V.1965, 4 coll. (RGT-1577-79, 1587); 46 km N Sanandaj, 28.V.1965, 2 coll. (RGT-1591, 1595); EAST AZARBAIJAN PROVINCE: 5 km SE Meyaneh, 6.VIII.1964, 1 coll. (RGT-1017); 19 km W Sarab, 23.VII.1964, 1 coll. (RGT-954); WEST AZARBAIJAN PROVINCE: 23 km NNE of Khanek, 5.VII.1965, 1 coll. (RGT-1623); 6.VII.1965, 1 coll. (RGT-1654); 32 km NNW Sardasht, 3.VII.1965, 1 coll. (RGT-1610); ex *Microtus nivalis*, KORDESTAN PROVINCE: 11 km ENE of Pasham, 30.V.1965, 1 ♂, 1 ♀ (RGT-1697); 46 km N Sanandaj, 28.V.1965, 1 coll. (RGT-1691); ex *Arvicola terrestris*, LURISTAN PROVINCE: 50 km SW Borujerd, 29.IV.1964, 1 coll. (RGT-699).

Hoplopleura affinis (Burmeister)

Pediculus affinis Burmeister, 1838: No. 10.—Gervais, 1844: 303.—Nitzsch, 1864: 22.

Hoplopleura affinis (Burm.): Ferris, 1921: 75, f. 42, 43.—Anderson, 1924a: 11.—Anderson, 1924b: 6.—Maltback, 1937: 9.—Kloet & Hincks, 1945: 26.—Ferris, 1951: 130.—Gerwell, 1954: 174 (Poland).—Kéler, 1954: 120-125 (redescription).—Scanlon, 1954: 32 (Japan).—Sosnina, 1954: 163-196.—Suyemoto et al. 1954: 636 (Japan).—Kaneko, 1955: 105 (Japan).—Scanlon, 1955: 88 (Korea).—Wegner, 1957: 170.—Wegner, 1959: 35 (Poland).—Kéler, 1961: 937 (mouthparts).—Smetana, 1961: 369-71, figs.—Smetana, 1962: 385-89 (bionomics).—Blagoveshtchensky, 1964: 330 (USSR).—Blagoveshtchensky, 1967: 412 (key; USSR).—Beaucournu, 1968: 232-33 (Occidental Palearctic Reg.).

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[2]The Frost Entomological Museum, Department of Entomology, The Pennsylvania State University, University Park, Pa. 16802, U.S.A.

[3]2701 N. Kensington St., Arlington, Va. and U.S. National Museum, Smithsonian Institution, Washington, D.C. 20560, U.S.A.

Haematopinus affinis (Burm.): Denny, 1842: 36.—Giebel, 1874: 39, pl. 1, f. 9.
Polyplax affiinis (Burm.): Enderlein, 1904a: 142.—Dalla Torre, 1908: 13.
Polyplax affinis (Burm.) (*partim*): Ferris, 1916: 172.
(*non*) *Polyplax affinis* (Burm.): Jancke, 1938: 71, 72.
Haematopinus acanthopus var. *affinis* (Burm.): Piaget, 1880: 639.
Hoplopleura affinis affinis: Eichler, 1960: 8–9.

This species is commonly found on *Apodemus agrarius* and *A. sylvaticus* in Europe and Asia.

Specimens Examined: Ex *Apodemus sylvaticus*, LURISTAN PROVINCE: 50 km SW Borujerd, 26.IV.1964, 1 coll. (RGT-672); KORDESTAN PROVINCE: 4 km W Marivan, 22.V.1965, 1 coll. (RGT-1590); MOZANDERAN PROVINCE: 30

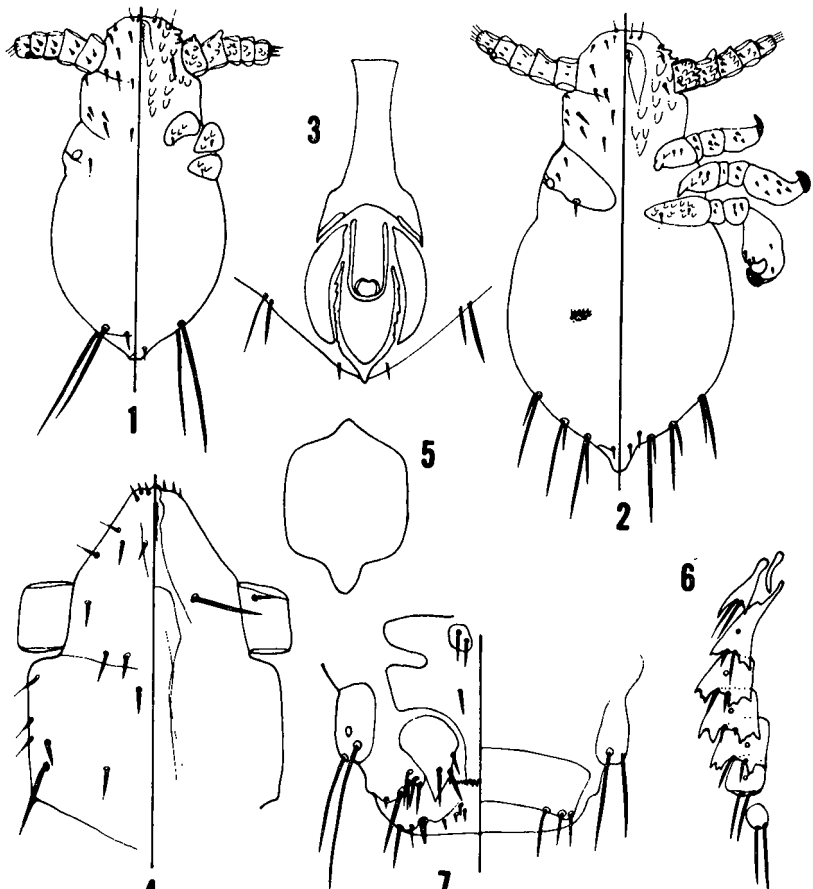

FIG. 1–7. *Hoplopleura merionidis* Ferris. (1) Nymph 1; (2) Nymph 3; (3–6) ♂; (3) Genitalia; (4) Head; (5) Thoracic sternal plate; (6) Paratergites; (7) ♀ terminalia.

km N Sari, 22.VI.1965, 1 coll. (RGT-1675).

Hoplopleura captiosa Johnson

Hoplopleura captiosa Johnson, 1960: 23–28, f. 23c, 24c, 25c, 26, 27, 32, 37a, 37b.—Mohr & Stumpf, 1964: 189.—Kim, 1966: 607.—Wegner, 1966a: 29–33 (nymphs). Wegner, 1966b: 11 (Poland, catalog).—Beaucournu, 1968: 230 (Occidental Palearctic Reg.).

Hoplopleura longula (Neumann) *(partim)*: Zwolski, 1960: 521 (record from *Mus musculus*).

A complete citation of references and synonymies is found in Kim (1965, 1966).

Specimens Examined: Ex *Mus musculus*, FARS PROVINCE: 4 km NW Darab, 10.VII.1965, 1 coll. (RGT-1750); 11 km NW Darab, 10.VII.1945, 3 coll. (RGT-1763, 1768, 1785); 11.VII.1965, 6 coll. (RGT-1805, 1807, 1816, 1819, 1824, 1842); 12.VII.1965, 3 coll. (RGT-1819, 1851, 1857); 21.VII.1965, 1 coll. (RGT-1951); 27 km N Abadeh, 1.XII.1963, 1 coll. (RGT-279); 2 km SE Mansorabad, 21.VII.1965, 8 coll. (RGT-1932, 1937, 1939, 1945–48, 1950); KHUZISTAN PROVINCE: 30 km S Andimeshk, 28.II.1964, 2 coll. (RGT-472, 476); 6.III.1964, 1 coll. (RGT-536); 7.III.1964, 1 coll. (RGT-547); MAZANDARAN PROVINCE: 30 km N Sari, 21.VII.1965, 2 coll. (RGT-1666, 1668); 22.VII.1965, 1 coll. (RGT-1769); 23.VII. 1965, 2 coll. (RGT-1671, 1673); KERMANSHAHAN PROVINCE: 22.VI.1964, 1 coll. (RGT-820); EAST AZARBAIJAN PROVINCE: 12 km E Ardebil, 22.VII.1964, 1 coll. (RGT-950); 5 km SE Meyauch, 7.VIII.1964 (RGT-1040, 1041). Ex *Meriones libycus*, FARS PROVINCE: 41 km S Easel, 14.VI.1965, 1 ♀ (RGT-1871); 11 km NW Darab, 12.VII.1965, 1 ♀ (RGT-1857); 4 km N Lar, 25.VII. 1965, 2 ♀♀ (RGT-1962); the records from *M. libycus* probably represent contamination.

Hoplopleura merionidis Ferris FIG. 1–7

Hoplopleura merionidis Ferris, 1921: 98–99, f. 60.—Ferris, 1951: 138.

This species was originally described on the basis of 3 ♀♀; ♂ and nymphal stages were not known previously. Thus, description and illustration of the ♂ and 2 nymphal stages is presented herewith for the first time, and the ♀ is redescribed and illustrated. This species is closely related to *H. mulleri* Paterson, but differs from it by having paratergites of the abdominal 7 and 8 with no apical lobe and the first sternal plate of segment 3 with 2 groups of 2 spiniform setae. Males of *H. merionidis* differ from *H. mulleri* and related species by having the head with ACHS and PCHS distinct, and thoracic sternal plate with anterior and posterior prolongations distinct.

♂. Total body length 1.13 mm (X̄). *Head* (FIG. 4) longer than wide and anteriorly elongated; post-antennal angle distinct; posterolateral angle not developed: AS, CS, OS, and PAS distinct; 2 SHS present on each side; 3 MHS short, placed anterior to PDHS; ACHS and PCHS minute; 4 PHS relatively short, reaching the middle of antennal segment 1. Antennae 5-segmented, with sensoria on segments 4 and 5. *Thorax* about as wide as head; coxa 3 with tubercle at base; DPtS minute; DMtS minute, placed anterior to thoracic spiracle; DP1S small; sternal plate (FIG. 5) suboval, with anterior process slightly developed and posterior process short. *Legs* as in the other members of the genus. *Abdomen:* Tergal and sternal plates well developed; 1 tergite per each of segments 3–8; each of tergites 1–6 with 17 setae; first tergal row with 2 large and 2 small setae; each of tergal rows 2 and 7 with 8 or 9 setae; 11 sternite present, 2 sternites per segment; segment 2 with only 1 sternite; sternite of segment 2 and first sternite of segment 3 extended laterally to articulate with corresponding paratergites; first sternite of segment 2 with 2 groups of 2 spiniform setae; each sternite of segments 3–7 with 7 or 8 to 10 setae; sternal rows of segments 5 and 6 with 1 or 2 VLAS; segments 1–8 each with paratergites (FIG. 6); 6 spiracles present, 1 on each of paratergites 3–7; paratergal setae longer than their lobes except for dorsal paratergal setae of segments 4 and 5; paratergal lobes of segments 4–6 slightly divided; paratergal setae of segments 2, 3, 6–8 similar in length; dorsal paratergal setae of segments 4 and 5 minute and usually shorter than their lobes; paratergites of segment 3 anteriorly prolonged and projected; paratergites of segments 7 and 8 with no lobes; anal segment not developed. *Genitalia* (FIG. 3): Basal apodeme distinct; parameres slightly thickened; endomere distinct; pseudopenis with very short distal process.

♀. Total body length 1.23 mm. Head, thorax, legs, and abdomen as in ♂ except for usual sexual dimorphism, unless mentioned otherwise. *Abdomen* much longer than in ♂, with 12–15 tergites and 15 sternites; each of segments 4–8 with 2 tergites; each of tergal rows with 9–12 setae; segments 3–6 each with 3 sternal setal rows; each sternite of segments 4–7 with 1 or 2 VLAS. *Genitalia* (FIG. 7) with gonopods posteriorly pointed, genital lobe not distinct and genital setae short, spiniform.

NYMPH 1 (FIG. 1). Total body length 0.10 mm. *Head* wider than long; with its ventral surface and antennae covered with variously-sized tubercles; anterior margin rounded; postantennal angle slightly developed and no posterolateral angle developed; OS, CS, AS, PAS, ACHS, PCHS, and 2 SHS distinct on each side; AMHS indistinct and MMHS and PMHS closely placed; PDPHS small, anteriorly with minute ADHS; VPHS short; antennae 5-segmented, with sensoria on segments 1 and 5. *Thorax* short and slightly wider than head; mesothoracic spiracle distinct; no sternal plate; DPtS and DMtS missing or indistinct; DP1S minute, coxal plates with tubercles. *Legs:* front legs smallest, with distinct tarsus and slender claws; middle and hind legs similar in size and shape, each with tibiotarsus and short, blunt claws. *Abdomen* with cuticle scaly; no evidence of segmentation; DCAS and VCAS absent; a pair of long MAS present on each side; AcS present; a pair of AnS present on anal segment posteriorly notched.

NYMPH 2. Unknown.

NYMPH 3. (FIG. 2). Total body length 0.51 mm. Head, thorax, and abdomen similar to those in nymph 1, unless mentioned otherwise. *Head:* ventral surface with much larger tubercles and setae more distinct. *Thorax* with DPtS and DMtS minute. *Legs:* Hind legs largest and tibiotarsal segment enlarged. *Abdomen* with 3 pairs of MAS on each side and 2 pairs of AnS.

Remarks: There are 7 species of *Hoplopleura* known from gerbils: *H. biseriata* Ferris on *Tatera*, *H. capensis* Werneck on *Desmodillus*, *H. cryptica* Ferris on *Tatera*, *H. merionidis* on *Meriones*, *H. mulleri* Paterson on *Gerbillus*, *H. neumanni* Fahrenholz on *Tatera*, and *H. vepreccula* Ferris on *Tatera*. A review of gerbil-infesting Anoplura will be published elsewhere by Kim.

Specimens Examined: Ex *Meriones libycus*, FARS PROVINCE: 4 km N Lar, 29.VII.1965, 3 ♂♂ and 2 ♀♀ (RGT-2011); 25.VII.1965, 12 ♀♀ (RGT-2057); 1-2.VIII.1965, 5 ♀♀, 6 ♂♂, and 2 nymphs (RGT-2067, 2076, 2079, 2088, 2091); 11 km NW Darab, 12.VII.1965, 1 ♀ and 1 nymph (RGT-1857); 41 km S Farsa, 13.VI.1965, 1 ♂ (RGT-1877); ex *Meriones crassus*, KHUZISTAN PROVINCE: 30 km S Andimeshk, 1.III.1964, 1 coll. (RGT-485); 3.III.1964, 1 coll. (RGT-490); 4.III.1964, 7 coll. (RGT-495, 496, 498, 501, 502, 503, 504); 5.III.1964, 1 coll. (RGT-508); 6.III.1964, 1 coll. (RGT-523); 12.III.1964, 1 coll. (RGT-565).

Subfamily Polyplacinae Ferris
Genus **EULINOGNATHUS** Cummings

Eulinognathus aculeatus (Neumann)

Haematopinus (*Polyplax*) *aculeatus* Neumann, 1912: 143, f. 5, 6.

Eulinognathus aculaeatus (Neumann): Ferris, 1916: 168.—Ferris, 1932: 321, f. 196, 197.—Johnson, 1957: 257, f. 1, 2, 7, 11, 13.—Johnson, 1960: 101, f. 169, 171–74.

Specimens Examined: Ex *Jaculus blandfordi*, KERMAN PROVINCE: 20 km SE Anar, 7.XII.1963, 1 coll. (HWS-3978).

Genus **HAEMODIPSUS** Enderlein

Haemodipsus lyriocephalus (Burm.)

Pediculus lyriocephalus Burmeister, 1838: No. 11, Pl. 2, f. 7.—Gervais, 1844: 323.

Haemodipsus lyriocephalus (Burm.): Enderlein, 1901a: 143.—Dalla Torre, 1904: 15.—Mjöberg, 1910: 13, 165.—Evans, 1913: 94.—Kellogg & Ferris, 1915: 28.—Ferris, 1916: 151.—Ewing, 1929: 140.—Bagnall, 1930: 106.—Ferris, 1932a: 330.—Freund, 1935: 20, f. 87–89.—Maltback, 1937: 8.—Jancke, 1938: 64, f. 15.—Thompson, 1939: 8 (Britain).—Kloet & Hincks, 1945: 27.—Brink, 1948: 149 (Sweden).—Brink, 1949: 56 (Sweden).—Girard, 1950: 361–65.—Ferris, 1951: 179–80.—Cooreman, 1952: 3 (Belgium).—Bouvier, 1956: 2 (Switzerland).—Wegner, 1957: 17 (Poland).—Ansari, 1958: 280–81.—Negrobow, 1962: 297–99.—Broeck, 1965: 226 (Netherlands).—Wegner, 1966b: 12 (Poland; catalog). Arzamasov & Trukahn, 1966: 811 (USSR).—Beaucournu, 1968: 235–36 (Occidental Palearctic Reg.).

Haematopinus lyriocephalus (Burm.): Denny, 1842: 27.—Giebel, 1874: 29–10, Pl. 2, f. 2.—Murray, 1877: 386.—Piaget, 1880: 641–42, Pl. 52, f. 5.—Neumann, 1909: 528.

Pediculus lyriceps Nitzsch, 1861: 24.

Specimens Examined: Ex *Lepus europaeus*, KERMANSHAHAN PROVINCE: 20 km S Nahvand, 26.IV.1964, 1 coll. (RGT-682).

Genus **POLYPLAX** Enderlein

Polyplax asiatica Ferris

Polyplax asiatica Ferris, 1923: 233, f. 152D.—Hopkins, 1949: 483.—Ferris, 1951: 206.—Ansari, 1951: 127.—Johnson, 1958: 77 (sinks *P. turkestanica turkestanica* and *turkestanica major*).—Johnson, 1959: 549.—Johnson, 1960: 81.

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

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

Specimens Examined: Ex *Nesokia indica*, KHUZISTAN PROVINCE: 30 km S Andimeshk, 6.III.1964, 1 coll. (RGT-529); 45 km N Ahwaz, 10.III.1964, 1 coll. (RGT-551); 11.III.1964, 1 coll. (RGT-552); 13.III.1964, 2 coll. (RGT-570, 573).

Polyplax brachyrrhyncha Cummings

Polyplax brachyrrhynchus Cummings, 1915: 246, f. 1–3.—Ferris, 1923: 220, f. 142, 143.—Johnson, 1960: 81–82, f. 131, 134, 136, 137, 141, 142.

Symoca brachyrrhyncha (Cummings): Fahrenholz, 1938: 245.—Ferris, 1951: 220, f. 93, 96 (sinks *P. b. minor* Fahrenholz).

Symoca brachyrrhyncha var. *minor* Fahrenholz, 1939: 32.

Specimens Examined: Ex *Acomys dimidiatus*, FARS PROVINCE: 33 km E Fasa, 8.VII.1965, 1 coll. (RGT-738); 4 km N Lar, 25.VII.1965, 2 coll. (RGT-1958, 1959); 26.VII.1965, 2 coll. (RGT-1973, 1974); 27.VII.1965, 2 coll. (RGT-1987, 1988); 28.VII.1965, 1 coll. (RGT-2006).

Polyplax calomysci, n. sp. FIG. 8–13

Type-Data: Holotype ♀, ex *Calomyscus baiwardi*, 1 km N of Persepolis, Fars Province, Iran, 26.XI.1963, collected by R. G. Tuck (RGT-219); allotype ♂, data same as holotype (RGT-258); 6 paratypes (6 ♀♀) data same as the above (RGT-218, 249, 258).

Diagnosis: This species is related to *praecisa* and *spinulosa* groups; male genitalia of *calomysci* n. sp. similar to those of *praecisa* group [e.g., *P. taterae* Ferris and *P. werneri* (Clinkiewicz)] and paratergal

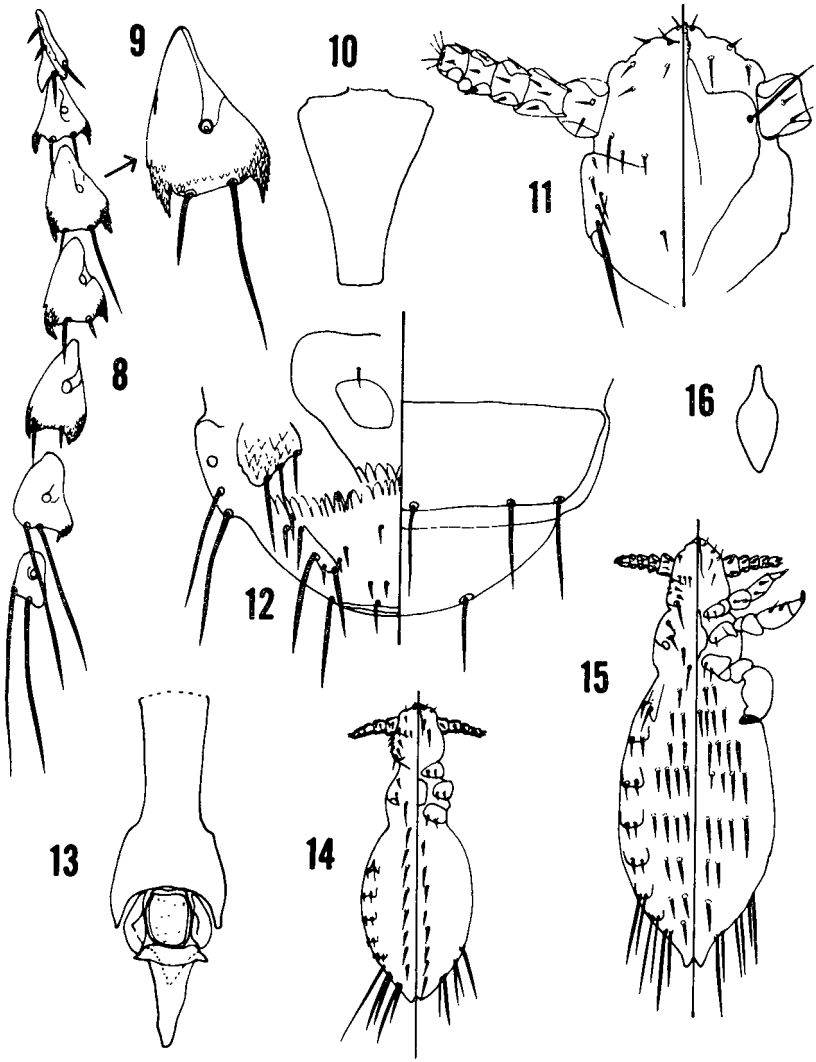

FIG. 8–16. (8–12) *Polyplax columysci* n. sp. ♂; (8) Paratergites; (9) Paratergite of abdominal segment 4; (10) Thoracic sternal plate; (11) Head; (12) Terminalia; (13) ♂ genitalia. (14–16) *Polyplax kaiseri* Johnson. (14) Nymph 2; (15) Nymph 3; (16) Thoracic sternal plate, Nymph 3.

plates similar to those of *spinulosa* group [e.g., *P. waterstoni* Bedford and *P. serrata* (Burmeister)]. *P. calomysci* n. sp. differs from other related species by having the thoracic sternal plate posteriorly truncate with anterior process indistinct (FIG. 10), paratergites with lateral lobes short, pointed and scaly, and dorsal paratergal seta of segment 4 as long as or longer than paratergites and at least 2 × as long as its ventral setae, and ♂ further separable from other species by having basal apodeme apically enlarged and pseudopenis basally articulated to apex of paramere (FIG. 13).

♀. Total body length 1.175 (X̄). *Head* (FIG. 11) longer than wide, more or less rounded anteriorly, and sides posteriorly converging; postantennal angle developed; posterolateral angle not developed; OS, CS, PAS, and AS distinct; 3 SHS on each side; 3 MHS minute, in irregular row, placed off the margin, with PMHS placed immediately anterior to ADHS; DPHS long, with 1 large ADHS anteriorly; ACHS absent; PCHS present; VPHS long, reaching beyond the base of antennal segment 2; antennae 5-segmented, with sensoria on segments 4 and 5 and segments 2 and 3 unmodified. *Thorax* slightly wider than head; sternal plate (FIG. 10) posteriorly elongated and truncate, with anterior process obscure and anterolateral angles slightly notched; DPtS and DMtS distinct; DPTS long; ADTS missing. *Legs* as in other members of the genus. *Abdomen* with 12 tergites, 12 sternites, 7 paratergites and 6 spiracles; segments 2, 3, 8 and 9, each with 1 tergite and segments 4–7, each with 2 tergites; tergites of segments 3–7 each with about 6–9 setae; segments 2–7 each with 2 sternites and each sternite with 5–7 setae; no LAS present; paratergites of segments 3–6 each triangular, with 2 lateral lobes short, pointed at apex and scaly; segment 7 with only dorsal paratergal lobe; paratergal setae of segments 2, 3, 5 and 6 shorter than their paratergites but longer than lateral lobes; dorsal paratergal seta of segment 4 longer than its paratergite and more than 2 × longer than ventral seta; dorsal paratergal setae of segments 5 and 6 shorter than its ventral setae; paratergites of segment 8 with no lateral lobe; anal segment rounded. *Genitalia* (FIG. 12) with slightly thickened genital seta; vulvar fimbriae distinct; gonopods scaly, with 3 long setae; genital plate small; spermatheca indistinct.

♂. Total body length 0.88 mm. Head, thorax, legs and abdomen as in ♀ except for usual sexual dimorphism, unless mentioned otherwise. *Abdomen* with 7 tergites and 8 sternites; segments 2–8 each with 1 tergite; segments 2 and 3 each with 2 sternites and segments 4–7 each with 1 sternite. *Genitalia* (FIG. 13) with basal apodeme apically enlarged; paramere short but thick, apically articulated with the base of pseudopenis; pseudopenis broad, wedge-shaped.

Remarks: There are 2 species of *Polyplax* previously known from true hamsters (Tribe Cricetini, Cricetinae, Cricetidae): *Polyplax dentaticornis* Ewing from *Cricetulus andersoni* in China and *P. plesia* Johnson off *Mystromys albicaudatus* in Lesotho (Basutoland), South Africa.

Specimens Examined: Type specimens (see type-data). Ex *Tatera indica*, Ahwaz, KHUZISTAN PROVINCE, 17.III.1964, 2 ♂♂ (RGT-600); these records probably represent contaminations.

Polyplax gerbilli Ferris

Polyplax gerbilli Ferris, 1923: 203, f. 128, 129.—Hopkins, 1949: 477.—Ferris, 1951: 208.—Paterson & Thompson, 1953: 200.—Werneck, 1953: 59.—Briscoe, 1956: 403.—Johnson, 1960: 65–67, f. 72, 76, 80, 85, 87, and 88.

Eremophthirius gerbilli (Ferris): Fahrenholz, 1938: 243.

Specimens Examined: Ex *Meriones libycus*, KHORASAN PROVINCE: 30 km NE Sabzavar, 13.XI.1965, 1 coll. (RGT-115).

Polyplax kaiseri Johnson FIG. 14–16

Polyplax kaiseri Johnson, 1960: 93–95, f. 156–58, 161, 162.—Benoit, 1962a: 478.

This species was described on the basis of a long series of ♂ and ♀ specimens taken from several species of *Gerbillus* in Egypt and Morocco. However, no nymphal stage has been known. Thus, nymphs 2 and 3 are herewith described and illustrated.

NYMPH 1. Unknown.

NYMPH 2. (FIG. 14). Total body length 0.72 mm (X̄). *Head* about as long as wide; postantennal and posterolateral angles not developed; anterior margin slightly pointed; OS, CS, AS, and PAS distinct; 3 SHS on each side; 3 MHS minute, placed near the side margin; 2 ADHS distinct, placed anterior to PDPHS; no ACHS and PCHS present; VPHS distinct; antennae 5-segmented, with 2 sensoria on segments 4 and 5; ventral surface not covered with tubercles. *Thorax* slightly wider than head; DPtS and DMtS distinct; DPTS long; sternal plate present but irregular in shape. *Legs:* Front and middle legs similar in shape; hind legs with enlarged tibiotarsal segment. *Abdomen* with indications of 5 paratergites, 8 DCAS, 8 VCAS, and 5 MAS on each side; paratergites each with 2 minute setae; AMAS single and MMAS and PMAS paired; cuticle scaly; anal segment slightly notched.

NYMPH 3 (FIG. 15). Total body length 0.84 mm (X̄). Head, thorax, legs, and abdomen as in nymph 2, unless stated otherwise. *Thorax* wider than head; sternal plate with anterior process elongated (FIG. 16). *Abdomen* with 9 rows of dorsal setae, 7 rows of ventral setae, 7 paratergites; DCAS and DLAS as follows, first row 2,2,4,4,8,8,4, and last row 2; VCAS and VLAS as follows, first row 4,8,8,8,8,4, and last row 2; first paratergite divided; paratergites of segments 2–6 each with a pair of short setae; paratergites of segments 7 and 8 each with a pair of long setae; segment 9 with a pair of long setae; anal segment slightly elongated and notched at apex.

Specimens Examined: Ex *Gerbillus cheesmani*, KERMAN PROVINCE: 60 km W Kerman, 8.VII.1965, 5 ♀♀, 2 ♂♂, 2 nymph 3 and 2 nymph 2 (RGT-1220); 1 ♀ (RGT-1221); BALUCHESTAN PROVINCE: 60 km SW Iranshahr, 28.XI.1964, 1 ♀, 1 ♂, 2 nymph 3, and 1 nymph 1 (RGT-1137); ex *Gerbillus nanus*, BALUCHESTAN PROVINCE: 60 km SW Iranshahr, 28.XI.1964, 2 ♂♂ and 2♀♀ (RGT-1173); KERMAN PROVINCE: 20 km SE Anar, 8.XII.1963, 3 coll. (RGT-313, 315; HWS-3998); 10.XII.1963, 1 coll. (HWS-4032); KHUZISTAN PROVINCE: 45 km N Ahwaz, 11.III.1964, 2 coll. (RGT-558–559); 13.III.1961, 1 coll. (RGT-572); 15.III.1964, 1 coll. (RGT-580); 16.III.1964,

2 coll. (RGT-596, 598); 17.III.1961, 1 coll. (RGT-603).

Polyplax paradoxa Johnson

Polyplax paradoxa Johnson, 1960: 72-74, f. 97, 101, 109, 119.

Specimens Examined: Ex *Meriones persicus*, KHUZISTAN PROVINCE: 93 km ESE of Behbehan, 9.II.1964, 1 coll. (RGT-438); 5 km NW Dorud, 17.V.1965, 1 coll. (RGT-1510); EAST AZARBAIJAN PROVINCE: 5 km SE Mayarneh, 6.VIII. 1964, 1 coll. (RGT-1009); TEHRAN PROVINCE: Qazvin, 2.VII.1964, 1 coll. (RGT-901); KERMANSHAHAN PROVINCE: 40 km SW of Asadabad, 22.VI.1964, 1 coll. (RGT-825); ex *Meriones crassus*, KHUZISTAN PROVINCE: 30 km S Audimeshk, 1.III.1964, 1 coll. (RGT-485); 3.III.1964, 1 coll. (RGT-490); 4.III.1964, 7 coll. (RGT-495, 496, 498, 501-504); 5.III.1964, 1 coll. (RGT-508); 6.III.1964, 1 coll. (RGT-523); 12.III. 1964, 1 coll. (RGT-565).

Polyplax reclinata (Nitzsch)

Pediculus reclinatus Nitzsch, 1861: 23.

Polyplax reclinata (Nitzsch): Freund, 1935: 14-15.—Jancke, 1938: 70-71, f. 21.—Werneck, 1959: 33.- Paulian & Pajot, 1966: 40. - Beaucournu & Houin, 1967: 67. Beaucournu, 1968: 210-212.- Kim & Emerson, 1968: 37.

A full citation of reference and synonymy is found in Kim & Emerson (1968).

Specimens Examined: Ex *Crocidura russual*, EAST AZARBAIJAN PROVINCE: 5 km SE Meyaneh, 6.VIII.1964, 1 coll. (RGT-1013).

Polyplax serrata (Burmeister)

Pediculus serratus Burmeister, 1838: No. 6. Gervais, 1844: 302. Nitzsch, 1861: 27.

Polyplax serrata (Burm.): Enderlein, 1904a: 142.—Dalla Torre, 1908: 14.—Evans, 1913: 94.—Ferris, 1916: 175.—Ferris, 1923: 191, f. 120B, E.—Bagnall, 1930: 105.—Jancke, 1932: 252.- Freund, 1935: 13-14, f. — Eliot, 1936: 397.—Heston, 1941: 370-71. Kloet & Hincks, 1945: 26.—Brink, 1948: 149.—Brink, 1949: 56.—Menzies, 1949: 435 (Texas).—Sasa, 1950: 715 (Japan).—Ferris, 1951: 210. Menzies et al., 1951: 152 (Texas). —Cooreman, 1952: 1 (Belgium). Joyce, 1953: 263.—Paterson & Thompson, 1953: 201.—Gerwell, 1954: 175 (Poland). - Scanlon, 1954: 34 (Japan).- Suyemoto et al., 1954: 636 (Japan). —Kaneko, 1955: 105 (Japan). —Flynn, 1955: 75—77, Tab. 88, 89.—Ono & Hasegawa, 1955: 76-77, f. 2b. (Japan). - Scanlon, 1955: 90 (Korea).- Ignoffo, 1956: 9-17 (Utah). Race, 1956: 178.—Wegner, 1957: 172. Bezuklandnikova, 1957: 289.—Tuleshkov, 1957: 189. Ansari, 1958: 281. Cerny, 1959: 162. Wegner, 1959: 35 (Poland).- Kaneko, 1959: 259 (Japan).—Eichler, 1960: 9-13.—Johnson, 1960: 55 (Africa). Smetana, 1960: 213.- Murray, 1961: 1-13 (ecology).—Smetana, 1961: 374-75.—Smetana, 1962: 389-95 (bionomics). Zarubina, 1963: 198 (infestation). —Mohr & Stumpf, 1964: 189. -Wegner, 1966: 15 (Poland; catalog).—Paulian & Pajot, 1966: 40 (Angola). Beaucournu, 1968: 207-10 (Occidental Palearctic Reg.).

Haematopinus serratus (Burm.): Denny, 1842: 36.—Giebel, 1874: 36, pl. 1, f. 6.- Piaget, 1880: 639.

Polyplax affinis (Burm.): Fahrenholz, 1912: 39-42, f. 13-15. Jancke, 1938: 71-72, f. 22 (Misidentification).

Polyplax affinis (Burm.) *partim*: Ferris, 1916: 172.

Polyplax serrata affinis Fahrenholz, 1938: 261.—Wegner, 1966: 15.

Polyplax serrata paxi Eichler, 1952: 206, f. 62. Eichler, 1960: 15-16.—Wegner, 1966: 15.

Specimens Examined: Ex *Mus musculus*, MAZANDERAN PROVINCE: 150 km W Bojnurd, 10.VI. 1964, 2 coll. (RGT-779, 780).

Polyplax stephensi (Christophers & Newstead)

Haematopinus stephensi Christophers & Newstead, 1906: 3, pl.

Polyplax stephensi (Christophers & Newstead): Ferris, 1923: 206.- Ansari, 1951: 127.—Ferris, 1951: 214.

Eremophthirius stephensi (Christophers & Newstead): Fahrenholz, 1938: 243.

Specimens Examined: Ex *Tatera indica*, FARS PROVINCE: 4 km N Lar, 27.VII.1965, 2 ♂♂ and 1 ♀ (6 coll., RGT-1979-1984); 28.VII.1965, 2 coll. (RGT-2002, 2009); 30.VII.1965, 1 coll. (RGT-2027); 2 km SE Mansorabad, 23.VII.1965, 1 ♀ (RGT-1923); 23-24.VII.1965, 11 coll. (RGT-1921-1930, 1933, 56); 19 km S Mansorabad, 31.VII. 1965, 4 coll. (RGT-2042, 2044, 2045, 2048); 2.VIII. 1965, 1 coll. (RGT-2075); 2 km NW Darab, 10.VII. 1965, 9 coll. (RGT-1793, 1795 1902); 11.VII.1965, 3 coll. (RGT-1829, 1830, 1833); KHUZISTAN PROVINCE: 93 km ESE Behbehan, 8-10.II.1964, 5 coll. (RGT-430-432, 411, 413); 30 km S Andimeshk, 28.II-7.III.1964, 21 coll. (RGT-478, 481-484, 488, 489, 491-494, 499, 500, 507, 518-522, 521, 537); 45 km N Ahwaz, 12-17.III.1964, 12 coll. (RGT-571, 577, 578, 587-593, 600, 601); 37 km NW Banch, 31.V.1965, 1 coll. (RGT-1602).

Family LINOGNATHIDAE Webb
Genus **LINOGNATHUS** Enderlein

Linognathus vulpis Werneck

Linognathus vulpis Werneck, 1952: 77-78, f. 10–13.

This species was originally described on the basis of ♂ and ♀ specimens taken from *Vulpes rüppellii bengalensis*, in Karachi, Pakistan. This record is the first since this species was described.

Specimens Examined: Ex *Vulpes vulpes*, KHUZISTAN PROVINCE: Behbehan, 10.II.1964, 10 ♂♂ and 10 ♀♀ (1 coll., RGT-447).

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