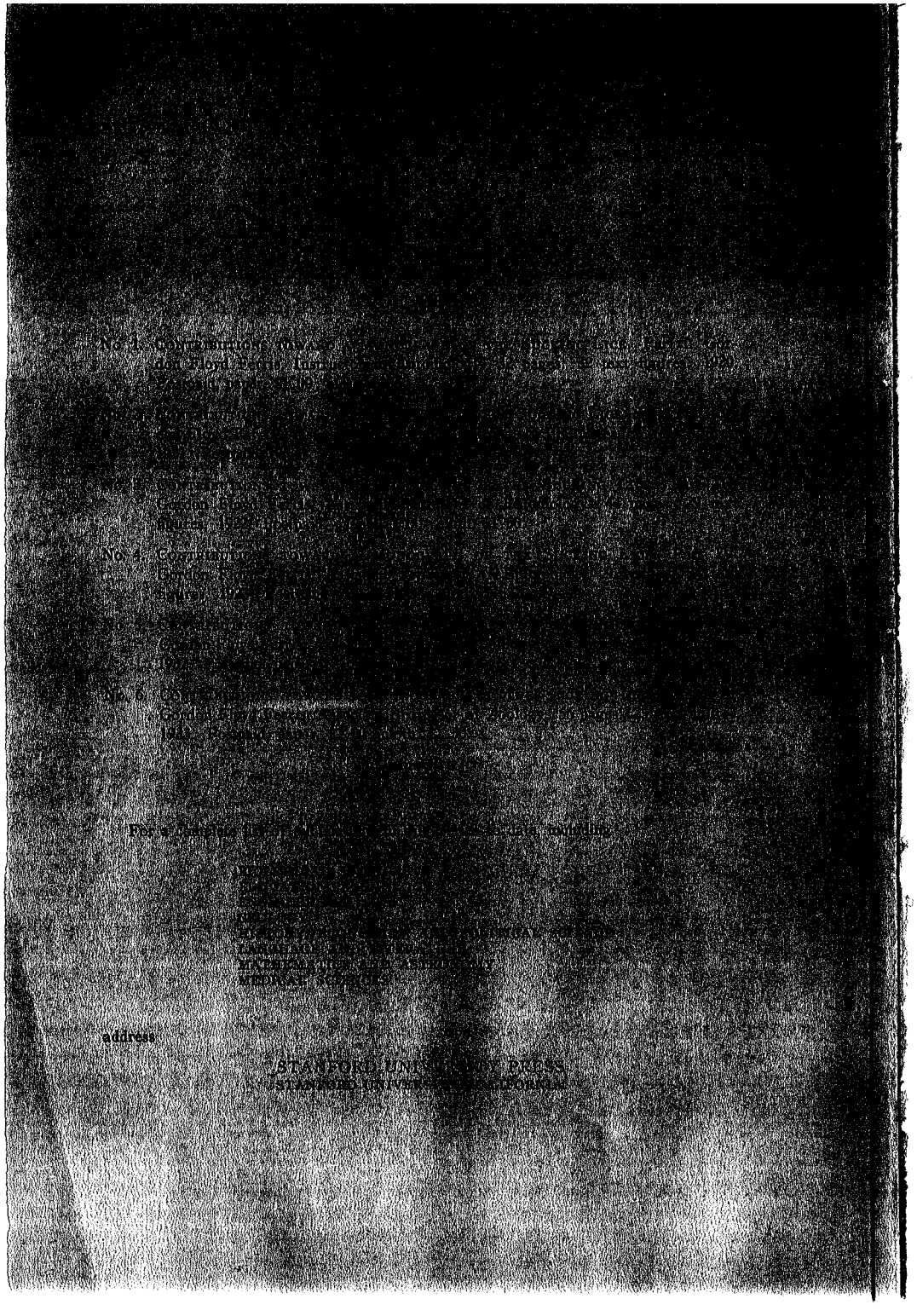

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Contributions Toward a Monograph of the Sucking Lice

PART VI

By

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CONTENTS

SYSTEMATIC TREATMENT (Cont.)

Genus **HAEMATOPINUS** Leach

1815. Leach, *Encyclopaedia Britannica*, Supplement 1, p. 24.
1817. Leach, *The Zoölogical Miscellany*, 3: 64.
1835. Burmeister, *Handbuch der Entomologie*, 2: 58.
1842. Denny, *Monographia Anoplurorum Britanniae*, p. 24.
1844. Gervais, in Walckenaer, *Histoire naturelle des insectes aptères*, 3: 301.
1874. Giebel, *Insecta Epizoa*, p. 33.
1880. Piaget, *Les Pediculines*, p. 633.
1904. Enderlein, *Zoologischer Anzeiger*, 28: 138.
1908. Dalla Torre, "Anoplura," in *Wytsman's Genera Insectorum*, p. 10.
1909. Neumann, *Archives de Parasitologie*, 13: 529.
1913. Patton and Cragg, *Textbook of Medical Entomology*, p. 547.
1915. Kellogg and Ferris, *Anoplura and Mallophaga of North American Mammals*, Stanford University Publications, University Series, No. 20, p. 9.
1916. Ferris, "A Catalogue and Host List of the Anoplura," *Proceedings of the California Academy of Sciences* (4), 6: 142.
1929. Ewing, *Manual of External Parasites*, p. 137.

Anoplura without eyes; with five-segmented antennae which are not sexually dimorphic; with the legs all similar in size and form, with a stout claw and a pad-like sclerite arising from the tibia in the palm of the claw; thorax with the notum reduced to a furrow and a median pit, the sternal plate normally present but without free margins, the dorsum with a free lobe at each posterior angle; paratergal plates of the abdomen present on at least the second to eighth segments but with their margins not free from the body wall; dorsum of the abdomen characteristically more or less sclerotic and marked with irregular furrows and small plates, with the setae inconspicuous and usually somewhat peg-like in form; head with the post-antennal angles acute and directed anteriorly; occiput usually very slightly constricted into a neck, the posterior margin of the head dorsally with a pair of conspicuous internal apophyses; pleural apophysis of the prothorax conspicuous, continuous with the sternal apophysis and sometimes opening into the sternal plate; gonopophyses of the female conspicuous and the abdomen terminating in a pair of small lobes which do not bear a stout spine or seta; genitalia of the male of a characteristic type, the parameres apparently lacking, their place taken by the enlarged pseudopenis, the arms of which articulate with the basal plate and are attached also to the preputial sac, which may assume various forms.

HOSTS. Occurring only on certain families of the two orders, Perissodactyla and Artiodactyla, of "ungulates," these families being the Equidae of the former and the Suidae, Camelidae, Bovidae, and Cervidae of the latter.

TYPE OF THE GENUS. *Pediculus suis* Linnaeus.

Synonymical List of Names Previously Used in the Genus

Note.—Names in italics are synonyms of the names with which they are coupled.

acanthopus (Burmeister).
Hoplopleura acanthopus (Burmeister).
acanthopus var. *affinis* (Burmeister).
Hoplopleura affinis (Burmeister).
aculeatus Neumann.
Eulinognathus aculeatus (Neumann).
albidus Rudow.
Pedicinus albidus (Rudow).
angulatus Piaget.
Linognathus angulatus (Piaget).
annulatus Schilling.
Echinophthirius horridus (Olfers).
antennatus Piaget.
Linognathus tibialis (Piaget).
antennatus Osborn.
Neohaematopinus sciurinus (Mjöberg).
appendiculatus Piaget.
Linognathus tibialis (Piaget).
asini (Linnaeus).
Haematopinus asini var. *coloratus* Piaget.
Haematopinus elegans Fahrenholz.
Haematopinus equi Simmonds.
Haematopinus macrocephalus (Burmeister).
Haematopinus minor Fahrenholz.
Pediculus asini Linnaeus.
Pediculus macrocephalus Burmeister.
aulacodi Neumann.
Scipio aulacodi (Neumann).
bicolor Lucas.
Linognathus setosus (Olfers).
bidentatus Neumann.
Hoplopleura bidentata (Neumann).
breviceps Piaget.
Linognathus breviceps (Piaget).
brevicornis Giebel.
Linognathus brevicornis (Giebel).
bufali (De Geer).
Haematopinus neumanni Fahrenholz.
Haematopinus phthiriopsis (Gervais).
Pediculus bufali De Geer.
Pediculus bufali-capensis Fabricius.
Pediculus phthiriopsis Gervais.
bufali (De Geer) (misidentification).
Haematopinus tuberculatus (Burmeister).
bufali-capensis (Fabricius).
bufali (De Geer).

bufali-europaei (Latreille).
Haematopinus tuberculatus (Burmeister).
bufali-europaei var. *penicillatus* Piaget.
Haematopinus suis (Linnaeus).
bufali var. *punctatus* Rudow.
Haematopinus tuberculatus (Burmeister).
callorhini Osborn.
Antarctophthirus callorhini (Osborn).
cameli (Linnaeus) (part).
Microthoracius cameli (Linnaeus).
cameli (Linnaeus) (misidentification).
Haematopinus tuberculatus (Burmeister).
cervicaprae Lucas.
Linognathus cervicaprae (Lucas).
chinensis Fahrenholz.
Haematopinus suis (Linnaeus).
clavicornis (Nitzsch).
Polyplax (?) clavicornis (Nitzsch).
coloratus Piaget.
Haematopinus asini (Linnaeus).
columbianus Osborn.
Neohaematopinus columbianus (Osborn).
crassicornis (Nitzsch).
Solenopotes burmeisteri Fahrenholz.
echinatus Neumann.
Neohaematopinus echinatus (Neumann).
elegans Fahrenholz.
Haematopinus asini (Linnaeus).
equi Simmonds.
Haematopinus asini (Linnaeus).
erraticus Osborn.
Hoplopleura erratica (Osborn).
eurysternus (Nitzsch).
Haematopinus parviprocursus Fahrenholz.
Haematopinus quadripertusus Fahrenholz.
Pediculus eurysternus Nitzsch.
forficulus Rudow.
Linognathus stenopsis (Burmeister).
germanicus Fahrenholz.
Haematopinus suis (Linnaeus).
germanus Fahrenholz.
Misprint for *germanicus*.
hesperomydis Osborn.
Hoplopleura hesperomydis (Osborn).
hispidus (Grube).
Hoplopleura hispida (Grube).
incisus Harms.
Haematopinus latus Neumann.
irritans Law.
Haematopinus suis (Linnaeus).

laeviusculus (Grube).
Neohaematopinus laeviusculus (Grube).
latus Neumann.
Haematopinus incisus Harms.
Haematopinus peristictus Kellogg and Paine (in part).
leptocephalus (Ehrenberg).
Prolinognathus leptocephalus (Ehrenberg).
leucophaeus Giebel.
Schizophthirus leucophaeus (Giebel).
longulus Neumann.
Hoplopleura longula (Neumann).
longus Neumann.
lyriocephalus (Burmeister).
Haemodipsus lyriocephalus (Burmeister).
macrocephalus (Burmeister).
Haematopinus asini (Linnaeus).
macrocephalus var. *coloratus* Piaget.
Haematopinus asini (Linnaeus).
maniculatus Neumann.
Hoplopleura maniculata (Neumann).
microcephalus Garnett.
Linognathus pedalis (Osborn).
minor Fahrenholz.
Haematopinus asini (Linnaeus).
montanus Osborn.
Neohaematopinus laeviusculus (Grube).
muris Compton.
Polyplax or Hoplopleura sp.
neumanni Fahrenholz.
Haematopinus bufali De Geer.
notophallus Neumann.
Hybophthirus notophallus (Neumann).
obtusus Rudow.
Pedicinus obtusus (Rudow).
oviformis Rudow.
Linognathus oviformis (Rudow).
ovillus Neumann.
Linognathus ovillus (Neumann).
ovis Lugger.
Linognathus pedalis (Osborn).
parviprocursus Fahrenholz.
Haematopinus eurysternus (Nitzsch).
pectinifer Neumann.
Neohaematopinus pectinifer (Neumann).
pedalis Osborn.
Linognathus pedalis (Osborn).
penicillatus Piaget.
Haematopinus suis (Linnaeus).
peristictus Kellogg and Paine.
Haematopinus latus (Neumann) (in part).

Haematopinus phacochoeri Enderlein (in part).
phachochoeri Enderlein.
Misspelling for phacochoeri.
phacochoeri Enderlein.
Haematopinus peristictus Kellogg and Paine.
Haematopinus phachochoeri Enderlein (misprint).
phacochoeri Enderlein (misidentification).
Haematopinus latus Neumann.
phthiriopsis (Gervais).
Haematopinus bufali (De Geer).
piliferus (Burmeister).
Linognathus setosus (Olfers).
praecisus Neumann.
Hoplopleura neumanni Fahrenholz (in part).
Polyplax praecisa (Neumann) (in part).
praelongiceps Neumann.
Microthoracius praelongiceps (Neumann).
punctatus Rudow.
Haematopinus tuberculatus (Burmeister).
quadridentatus Neumann.
Hoplopleura quadridentata (Neumann).
quadripertusus Fahrenholz.
Haematopinus eurysternus (Nitzsch).
quadrumanus Murray.
Pediculus sp.
reclinatus (Nitzsch).
Polyplax reclinata (Nitzsch).
rupicaprae Rudow.
Linognathus stenopsis (Burmeister).
saccatus (Gervais).
Linognathus saccatus (Gervais).
sardiniensis Fahrenholz.
Haematopinus suis (Linnaeus).
sciuropteri Osborn.
Neohaematopinus sciuropteri (Osborn).
serratus (Burmeister).
Polyplax serrata (Burmeister).
setosus Lucas.
Echinophthirius horridus (Olfers).
setosus Piaget.
Neohaematopinus pectinifer (Neumann).
sphaerocephalus (Nitzsch).
Enderleinellus nitzschi Fahrenholz.
sphaerocephalus (Nitzsch) (misidentification).
Neohaematopinus sciurinus (Mjöberg).
spiculifer (Gervais).
An unrecognizable species of *Polyplax* or *Hoplopleura*.
spiniger (Burmeister).
Polyplax spiniger (Burmeister).

spinulosus (Burmeister).
Polyplax spinulosa (Burmeister).
squamulatus Neumann.
Ratemia squamulata (Neumann).
stenopsis (Burmeister).
Linognathus stenopsis (Burmeister).
stephensi Christophers and Newstead.
Polyplax stephensi (Christophers and Newstead).
suis (Linnaeus).
Haematopinus irritans Law.
Haematopinus suis var. *adventicius* Neumann.
Haematopinus suis var. *chinensis* Fahrenholz.
Haematopinus suis var. *germanicus* Fahrenholz.
Haematopinus suis var. *sardiniensis* Fahrenholz.
Haematopinus urius (Nitzsch).
Pediculus suis Linnaeus.
Pediculus urius Nitzsch.
suis (Linnaeus) (part; misidentification).
Haematopinus aperis n. sp.
suis var. *suis* (Linnaeus) (part; misidentification).
Haematopinus aperis n. sp.
suturalis Osborn.
Enderleinellus suturalis (Osborn).
taurotragi Cummings.
tenuirostris Giebel.
Linognathus vituli (Linnaeus).
tibialis Piaget.
Linognathus tibialis (Piaget).
tibialis var. *antennatus* Piaget.
Linognathus tibialis (Piaget).
tibialis var. *appendiculatus* Piaget.
Linognathus tibialis (Piaget).
tibialis var. *cervicaprae* Lucas.
Linognathus cervicaprae (Lucas).
trichechi Bohemann.
Antarctophthirus trichechi (Bohemann).
tuberculatus (Burmeister).
Haematopinus bufali (De Geer) (misidentification).
Haematopinus bufali-europaei (Latreille).
Haematopinus bufali var. *punctatus* (Rudow).
Haematopinus tuberculatus var. *punctatus* Rudow.
Pediculus tuberculatus Burmeister.
tuberculatus var. *penicillatus* Piaget.
Haematopinus suis (Linnaeus).
tumidus Schilling.
Echinophthirius horridus (Olfers).
ungulatus Piaget (misprint).
Linognathus angulatus (Piaget).
urius (Nitzsch).
Haematopinus suis (Linnaeus).

ventricosus Denny.
Haemodipsus ventricosus (Denny).
vituli (Linnaeus).
Linognathus vituli (Linnaeus).

NOTES.—The genus *Haematopinus* was interpreted for nearly a hundred years (1810–1904) as including by far the greater part of all the species of the sucking lice, and consequently nearly a hundred names have been used in it. It was first broken up by Enderlein (1904), who separated off a number of genera and restricted *Haematopinus* to the limits which are now accepted. As late as 1909, however, Neumann protested against this procedure and placed the genera of Enderlein merely as subgenera. He has been followed in this by even later authors in various textbooks of parasitology.

There can now be no question as to the correctness of Enderlein's action. The genus as restricted by him undoubtedly represents a natural group of closely related forms. They are all species of large size, with their strongly developed claws and legs adapted for clinging to coarse hair and their tough and relatively sclerotic derm apparently adapted in high degree to a greater amount of exposure upon their sometimes thinly haired hosts than is the case with the majority of the species of the order. In the genus as now restricted between twenty-five and thirty specific and subspecific names have been used. These are reduced in the present treatment to ten species, of which one is here named as new. It is probable that at least half, if not more, of the species actually existing are now known.

The genus is exceedingly well defined, and there are no others that can easily be confused with it. It is particularly important from the point of view of comparative morphology, but all discussion of such matters will be relegated to a later portion of these papers. For the present there are presented merely data sufficient to make generic identification definite.

1. **Haematopinus suis** (Linnaeus)

FIGS. 252 *A*; 253 *A*; 254; 255 *E–X*; 256

NOTE.—The bibliography of this species is extremely extensive. However, comparatively few of the references are of any value from the point of view of systematics. An attempt is here made to select those which are of significance in following the nomenclatorial history of the species, in establishing distributional records, or in contributing something to the knowledge of morphology or systematics. Consequently the references in most of the textbooks of parasitology or in the bulletins of agricultural bureaus and departments are omitted. These can be found, if desired, in the reference by Stevenson cited below.

1634. *Pediculus urius* Mouffet, *Insectorum sive minimorum animalium theatrum*, p. 266.
1758. *Pediculus suis* Linnaeus, *Systema Naturae* (ed. 10), p. 611.
1761. *Pediculus suis* Linnaeus, Linnaeus, *Fauna Suecica*, p. 476.
1793. *Pediculus suis* Linnaeus, Panzer, *Faunae insectorum germanicae initia*, pl. 16.
1805. *Pediculus suis* Linnaeus, Fabricius, *Systema Antliatorum*, p. 342.
1810. *Haematopinus suis* (Linnaeus), Leach, *Encyclopaedia Britannica, Supplement*, 1, p. 24.
1815. *Haematopinus suis* (Linnaeus), Leach, *Edinburgh Encyclopedia*, 9:77.

1817. *Haematopinus suis* (Linnaeus), Leach, *Zoölogical Miscellany*, **3**: 65; pl. 46.
1818. *Pediculus urius* Nitzsch, *Germar's Magazin der Entomologie*, **3**: 305.
1835. *Haematopinus suis* (Linnaeus), Burmeister, *Handbuch der Entomologie*, **2**: 58.
1838. *Pediculus suis* Linnaeus, Burmeister, *Genera Insectorum, Rhynchota, Species 19.*
1842. *Haematopinus suis* (Linnaeus), Denny, *Monographia Anoplurorum Britanniae*, p. 34; pl. 25, fig. 2.
1844. *Hoematopinus* [*sic*] (*Pediculus*) *suis* Linnaeus, Gervais, in Walckenaer, *Histoire naturelle des insectes aptères*, **3**: 301.
1874. *Haematopinus urius* (Nitzsch), Giebel, *Insecta Epizoa*, pp. 45–46; pl. 2, fig. 6.
1880. *Haematopinus urius* (Nitzsch), Piaget, *Les Pediculines*, pp. 654–656; pl. 48, fig. 4.
1885. *Haematopinus tuberculatus* var. *penicillatus* Piaget, *ibid.*, Supplement, p. 146; pl. 15, fig. 9.
1891. *Haematopinus urius* (Nitzsch), Osborn, *United States Department of Agriculture, Division of Entomology, Bulletin* (old series), **7**: 18–21; fig. 8.
1896. *Haematopinus urius* (Nitzsch), Osborn, *ibid., Bulletin* (new series), **5**: 178–180; fig. 102.
1903. *Haematopinus irritans* Law, *Textbook of Veterinary Medicine*, **5**: 13.
1904. *Haematopinus suis* (Linnaeus), Enderlein, *Zoologischer Anzeiger*, **28**: 124.
1905. *Haematopinus suis* (Linnaeus), Stevenson, *United States Department of Agriculture, Bureau of Animal Industry, Bulletin*, **69**: 9–16; figs. 1–17.
1908. *Haematopinus suis* (Linnaeus), Dalla Torre, "Anoplura," *Wytsman's Genera Insectorum*, p. 11; fig. 4.
1911. *Haematopinus suis* (Linnaeus), Neumann, *Archives de Parasitologie*, **14**: 406; fig. 8 (part).
1911. *Haematopinus suis* var. *adventicius* Neumann, *ibid.*, **14**: 406; fig. 8.
1913. *Haematopinus suis* var. *adventicus* Neumann, Patton and Cragg, *Textbook of Medical Entomology*, p. 548; pl. 68, fig. 3. (Misprint for *adventicius.*)
1916. *Haematopinus suis* var. *chinensis* Fahrenholz, *Zoologischer Anzeiger*, **48**: 90.
1916. *Haematopinus suis* var. *germanus* Fahrenholz, *ibid.*, **48**: 90. (Misprint for *germanicus.*)
1917. *Haematopinus suis* var. *adventicius* Neumann, Fahrenholz, *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, **34**, Beiheft 2: 10.
1917. *Haematopinus suis* var. *sardiniensis* Fahrenholz, *ibid.*, **34**, Beiheft 2: 10.
1917. *Haematopinus suis* var. *chinensis* Fahrenholz, Fahrenholz, *ibid.*, **34**, Beiheft 2: 10; fig. 2*a*.
1917. *Haematopinus suis* var. *germanicus* Fahrenholz, Fahrenholz, *ibid.*, **34**, Beiheft 2: 11; fig. 2*b*.
1921. *Haematopinus suis* (Linnaeus), Florence, *Cornell University Agricultural Experiment Station Memoir*, **51**: 641–725; pls. 58–66.
1924. *Haematopinus suis* (Linnaeus), Freund, *Prager Tierärztlicher Archiv*, **4**(A): 53; fig. 7.
1927. *Haematopinus suis* (Linnaeus), Freund, *Prager Archiv für Tiermedizin*, **7**(A): 44; fig. 4.
1928. *Haematopinus suis* var. *adventicius* Neumann, Buxton, *Insects of Samoa*, **7**: 3: 85.

PREVIOUS RECORDS. From domestic pigs in all parts of the world. From wild pigs in Asia, including *Sus jubatus*, Pahang, Malaysia, and *Sus*

vittatus, without indication of locality. Records of the species from *Sus scrofa*, the wild boar of Europe, are here regarded as erroneous.

MATERIAL EXAMINED. Owing to the large amount of material which has been available for examination it will be advisable to divide the records into three sections, one including those of specimens from domesticated or presumably domesticated hosts, one including those from wild or presumably wild hosts, and one for abnormal records.

1. FROM DOMESTIC, PRESUMABLY DOMESTIC, OR FERAL SWINE

EUROPE

Germany: vicinity of Hamburg Neugraben, **12**: 6: 1929, *F. Diehl;* Holte bei Cuxhaven, **20**: 7 : 1929; Tübingen, **26**: vii : 1912, *W. Nöller;* Thüringen, 1919, *W. Nöller.* All the foregoing in the Hamburg Museum collection. Switzerland: Kröschenbrunnen, Bern (Molteno Institute). France (?): from the Neumann Collection, "sur *Sus scrofa domestica* Railliet Alfort Juin 98," and "1/3/87." England: Cambridge, *John Clay*, being part of the material included by Neumann in his description of *H. suis adventicius*, together with other lots from the same locality (Molteno Institute); Holmes Chapel, Cheshire (British Museum).

AFRICA

Ilesha, Lagos, *Leishman* (Molteno Institute); Kabete, Kenya Colony (British Museum).

NORTH AND SOUTH AMERICA

California (Stanford University). Mexico: Coyoacan, *Zelia Nuttall*, being part of the material included by Neumann in the original description of his *H. suis adventicius* (Molteno Institute); Mexico City, *Valadez* (Stanford University). Colombia: Bogota and Barranquilla, *L. H. Dunn* (Stanford University). British Guiana: Georgetown, *Cleake* and *Bodkin* (British Museum).

AUSTRALIA

Queensland, *W. A. T. Sommerville* (British Museum).

ASIA

China: the types and other specimens from the type lot of *H. suis chinensis* Fahrenholz, Fokien Province, *Siemssen* (Hamburg Museum); Kwei Chou Fou and Kaihsien, Szchuen, *S. A. Stericker* (Molteno Institute); Shanghai, *Dr. A. Stanley* (Molteno Institute); Weihaiwei, *Dr. W. M. Muat* (British Museum). India: Larpur, Bengal (Indian Museum). Burma: Rangoon, *Dr. H. H. Marshall* (Molteno Institute). Cey-

lon: Hakgala, *H. H. N. Pearson* (Molteno Institute). Malay Peninsula: Bukit Mertajan, *Prof. Wellesley* (British Museum). Philippine Islands: Los Baños, *Woodworth* (Stanford University).

South Sea Islands

Fiji: Tavenni, *T. P. Jepson* (Molteno Institute). New Hebrides: Hog Harbor, *Buxton* and *Hopkins* (British Museum). Samoa: Upolu, "from pigs recently imported from New Zealand," *Buxton* and *Hopkins*. Tahiti: two slides from the Neumann collection labeled, "*H. suis adventicius* Taiti I 05 M. Seural Dr. Trouessart VI–06."

2. From Wild or Presumably Wild Species

From *Sus cristata*, Tanjong Badak, Tenasserim, a single female from a skin in the United States National Museum and a male and female, Bihar, Dinapore, 16: 12 : 4 (British Museum). From "wild pigs," perhaps a wild species, Penang, Federated Malay States, *Dr. A. T. Stanton* (Molteno Institute).

3. Abnormal Records

A single slide from the Piaget Collection (British Museum), labeled as *Haematopinus tuberculatus* var. *penicillatus* Piaget, "sur un *Bos indicus* (zebu.)" A male and female labeled as from "Buffalo, Dinipur Sarar, Bihar," in the British Museum.

A slide from the British Museum labeled simply "the camel."

Female (Fig. 252 *A*). One of the largest of the Anoplura, reaching a maximum observed length of nearly 6 mm., but varying down to an observed minimum (in slide preparation) of 4.5 mm. Typically strongly pigmented and sclerotic. *Head* (Fig. 254) elongate, being from two to three times as long as wide, the fore head and hind head approximately equal in length. *Thorax* quite strongly trapezoidal in form, with the lateral margins convex, normally with its greatest width about equal to the length of the head and with its length considerably shorter; posterior lateral angles with a strongly developed dorsal lobe. *Legs* very large and strong. Sternal plate somewhat variable in form (Fig. 255), the openings of the sternal apophyses included within its limits.

Abdomen broadly ovate, usually strongly pigmented, the more or less quadrate paratergites appearing as a black marginal band, the margins usually quite strongly lobed by intersegmental constrictions, the constriction between the sixth and seventh segments being especially marked.

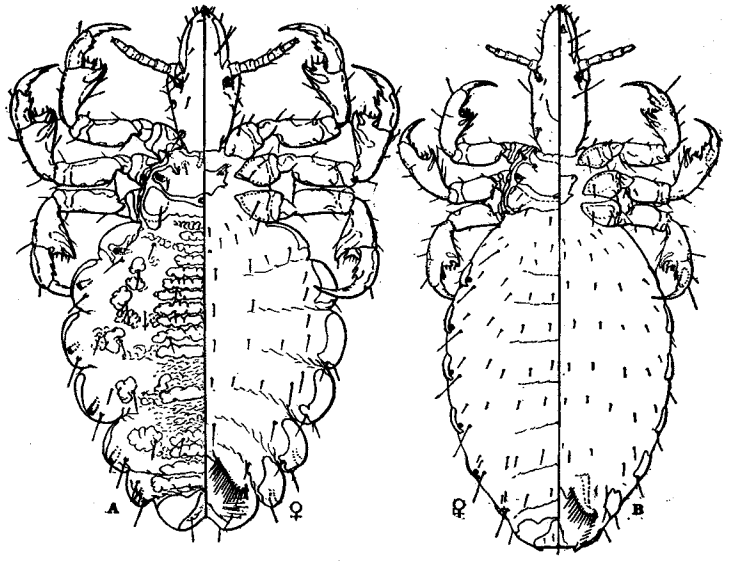

Fig. 252.—Females: *A, Haematopinus suis* (Linnaeus); *B, Haematopinus aperis* n. sp.

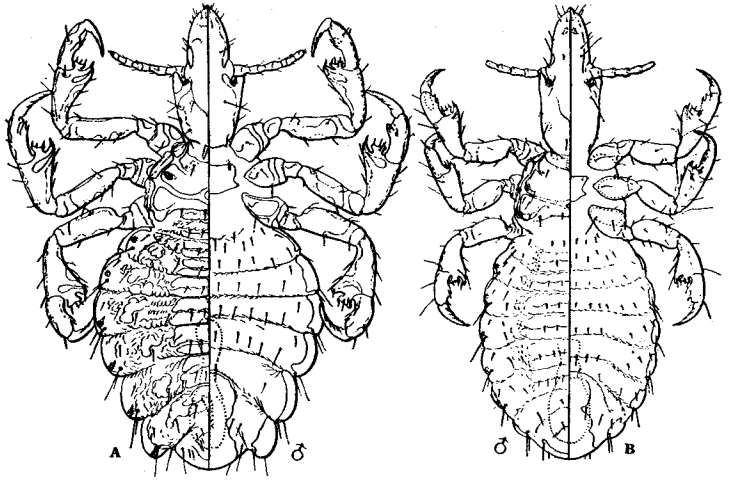

Fig. 253.—Males: *A, Haematopinus suis* (Linnaeus); *B, Haematopinus aperis* n. sp.

Tergites typically quite strongly sclerotic, with small, irregular, submarginal plates and with three pairs of median plates, separated by a slight median line, on the third (first apparent) to fifth segments, there

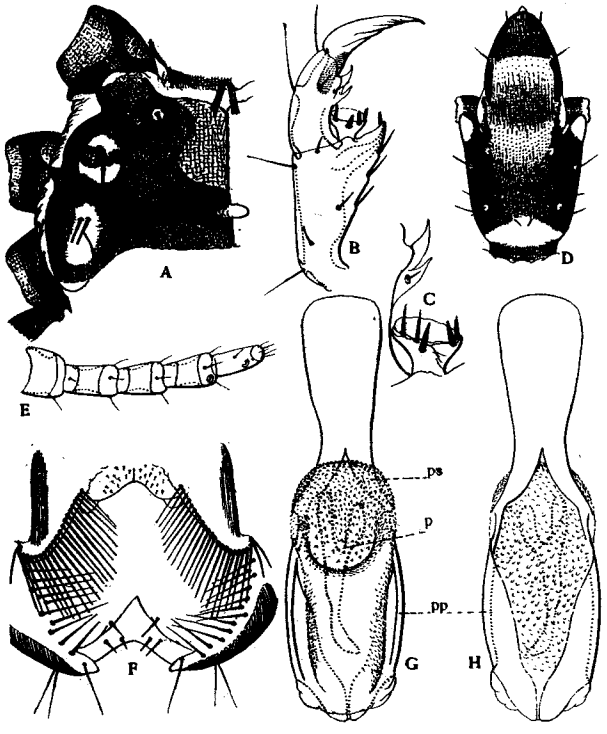

FIG. 254.—*Haematopinus suis* (Linnaeus): *A*, dorsum of thorax; *B*, anterior tibio-tarsus; *C*, pretarsal sclerite detail of tibio-tarsus; *D*, dorsal aspect of head; *E*, antenna of female; *F*, genital region of female; *G*, *H*, genitalia of male.

being then a characteristic break, the sixth segment having but one plate and the seventh and eighth two. Ventral side entirely membranous. Gonopophyses (Fig. 254 *F*) elongate; vulva emarginate and simple.

MALE (Fig. 253 *A*). Length ranging from 3.5 to 4.75 mm. In general characteristics of head and thorax closely resembling the female. *Abdomen* more rounded, with the margins somewhat less deeply lobed, and with but two pairs of median tergal plates on each segment. Genital plate small, but conspicuous. *Genitalia* (Fig. 254 *G, H*) of a type rather distinct from the other members of the genus, the pseudopenis forming a broad, apically truncate piece which supports the entirely membranous preputial sac into the folds of which is withdrawn the slender, funnel-shaped penis.

NOTE.—The discussion of this species will follow the description of the next.

2. **Haematopinus aperis** n. sp.

FIGS. 252 *B*; 253 *B*; 255 *A–D*; 256 *F, G, M, N*

1880. *Haematopinus urius* (Nitzsch), Piaget, *Les Pediculines*, pp. 654–656; pl. 48, fig. 4 (the plate and the description in part).
1911. *Haematopinus suis suis* (Linnaeus), Neumann, *Archives de Parasitologie*, **14**: 406–408 (in part).
1917. *Haematopinus suis suis* (Linnaeus), Fahrenholz, *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, **34**, Beiheft 2: 9.

PREVIOUS RECORDS. Recorded by Piaget, Neumann, and Fahrenholz from *Sus scrofa*, the wild boar of Europe.

MATERIAL EXAMINED. Two males and two females from the Piaget Collection, from *Sus scrofa*, now in the British Museum. These include the holotype and allotype. Two males and one female from the same host, central Hungary, in the British Museum. Two males in the Neumann Collection, now at the École Veterinaire de Toulouse, labeled "du Sanglier M. Chevalier 1896."

FEMALE (Fig. 252 *B*). Length, on slide, 5.5 mm. Differing from the preceding species by its pale coloring, its conspicuously more slender form, the relatively more slender head, which has a length of nearly three times its width, the relatively small legs, the extremely small paratergites, which are reduced to widely separated areas, the form of the sternal plate which is typically (Fig. 255 *A–D*) about as long as wide and rather acute posteriorly, and by the absence or great reduction of the lateral lobes of the abdomen.

MALE (Fig. 253 *B*). Length 4.00 to 4.25 mm. Differing from *H. suis* as does the female. Tergal plates of the abdomen at the most but faintly indicated. Genitalia as in *H. suis*.

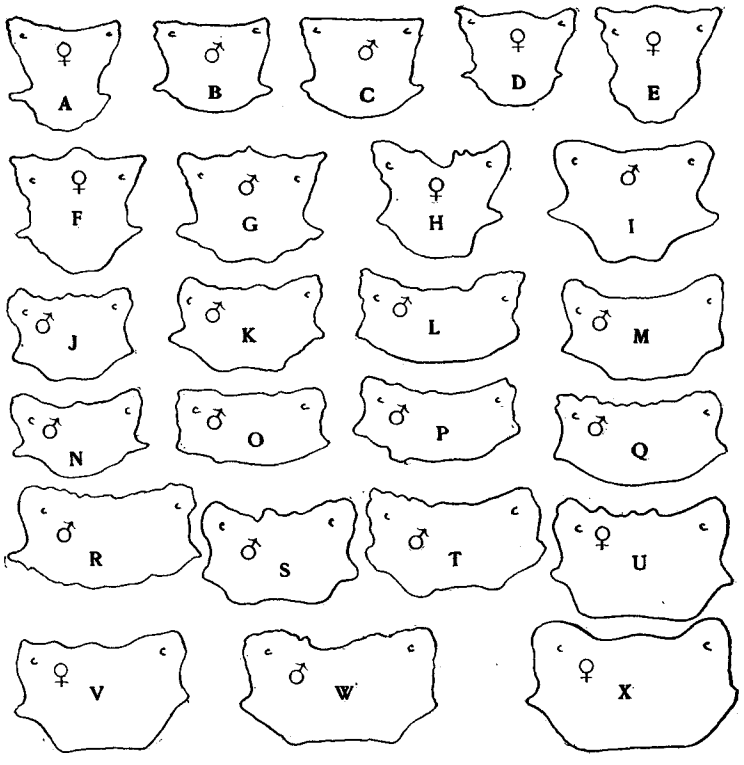

FIG. 255.—Thoracic sternal plates of *Haematopinus aperis* n. sp.: *A, B,* from specimens from the Piaget Collection; *C, D,* from Hungary. *Haematopinus suis* (Linnaeus) from domestic swine: *E, F, G,* from specimens from Switzerland; *H, I, J, K, L,* from China; *M,* Penang; *N,* Mexico; *O,* Ceylon; *P,* California; *Q,* Mexico; *R,* England; *S,* China; *T,* Philippine Islands; *U,* China; *W, X,* Germany; *V,* specimen from *Sus cristata.*

THE LICE OF SWINE

Previous to 1911 authors dealing with the lice of either domestic or wild swine placed the parasites without hesitation under the name *Haematopinus suis* (Linnaeus). Neumann, in that year, was the first to recognize the fact that differences of very considerable degree can be detected among lice from different sources. He therefore divided *Haematopinus suis* into two forms or subspecies, the name *H. suis suis* being retained for the lice

of the wild boar, including that of Sardinia, and the lice of domestic pigs of continental Europe. The name *H. suis adventicius* was proposed for the lice of domestic pigs of other parts of the world and of wild pigs of Asia, including the species *Sus vittatus* and *Sus jubatus.* No type was designated. His record indicates that he had at hand specimens from China, Africa, Mauritius, Australia, England, Tahiti, and Mexico. He assumed that *H. suis adventicius* had originated from the wild pigs of Asia.

Fahrenholz (1916, 1917) carried the process of division still farther. He restricted the name *H. suis suis* to specimens from the wild boar of Europe, *Sus scrofa,* and proposed three more subspecific names, *H. suis sardiniensis* for the louse of the wild pig of Sardinia, *H. suis chinensis* for lice from pigs in China which he assumed to represent the supposed form *Sus leucomystax continentalis,* and *H. suis germanicus* for the lice from some domestic pigs in Germany.

We thus have a total of five supposed subspecies, the status of which is a subject for inquiry. There are two problems involved. One has to do merely with nomenclature. The other is that of the biological facts. It may be well to dispose of the nomenclatorial problem first.

Nomenclature.—It will be noted that the result of the process of division has been to transfer the name *suis* from the lice of domestic swine, for which it has commonly been used, to the lice of the wild boar of Europe. The result cannot but be disturbing to parasitologists, for whose purposes stability of nomenclature is highly desirable, since a very good case can be made out for the recognition of the louse of the wild boar of Europe as a distinct species. Such is the procedure followed by the present writer, and if it be accepted by other workers the name *suis* must be replaced by some other for the lice of domesticated swine. Cannot this change be avoided? It is the opinion here maintained that it can, it having resulted from the failure of Neumann and Fahrenholz to investigate the facts and follow the commonly accepted rules of nomenclature.

The nomenclatorial history of *Haematopinus suis* begins with the tenth edition of the *Systema Naturae* (1758). Here, on page 611, we find merely the following under the genus *Pediculus:*

Suis 5. P. Suis Scrofae.
Habitat in Suibus β.

The symbol β refers unquestionably to a heading under the description of *Sus scrofa,* where we find the following:

Scrofa. 1. S. dorso antice setoso, cauda pilosa. *Fn. suec.* 36. *Syst. nat.* 12.
Aper. *Gesn. quadr.* 146. *Aldr. bisulc.* 1013. *Jonst. quadr.* 74. *Raj. quadr.* 96.
β Sus. *Gesn. quadr.* 872. *Aldr. bisulc.* 937. *Jonst. quadr. t.* 47. *Raj. quadr.* 92.

It needs no searching of the ancient references cited to determine the facts.

Aper is the word for wild boar, and it is because of this that the name *Sus scrofa* is applied to that animal, and not to domestic swine, by mammalogists. The use of this name for domestic swine will be found in the writings of entomologists but is entirely erroneous. The symbol β applies to the domestic form, and consequently we cannot but conclude that these are the habitat of *Pediculus suis*. It would be surprising were it otherwise. This belief is further confirmed by the *Fauna Suecica* (1761), where we find (p. 476) the following:

1942. PEDICULUS *Suis* Suis Scrofa
Habitat in *Suibus* domesticis.

And, as late as 1835, Gervais records the species merely as a parasite of the "cochon domestique."

It is evident, therefore, that the name *suis* must be retained for the lice of domestic swine and that those of the wild boar must be given another name if they are to be nomenclatorially recognized. Apparently no such name is available, and that of *H. aperis* n. sp. is here proposed for them. We are not yet, however, out of our nomenclatorial difficulties.

If the lice of domestic swine be nomenclatorially subdivided, as Fahrenholz would have it and possibly later authors will agree, we are still in doubt as to the exact application of the name *suis suis*. To which of the various forms does it belong? It would appear that the name applies to the lice of domestic swine of Sweden as represented by specimens taken in 1758, and lacking such specimens it may be applied to these lice as they may appear whenever a division of *Haematopinus suis* is attempted. If there has indeed been hybridizing and a mixing of the louse population, as has probably been the case, we have no means of knowing that the lice of today are the same as they were over a hundred years ago. Unfortunately no specimens are at hand from Sweden.

From the writer's point of view the question is not immediately important, since he declines to recognize any such division of the lice from domestic pigs. But as future workers may disagree, it may be well to sum up here the status of the various so-called subspecies and their characters as given by their authors.

HAEMATOPINUS SUIS SUIS (Linnaeus)

This name must be used for lice of the form dominant on domestic swine in Sweden. Its characters are not known.

HAEMATOPINUS SUIS ADVENTICIUS Neumann

Originally described by Neumann without indication of type. Restricted by Fahrenholz and the type designated as from *Sus vittatus* as represented by specimens in the hands of Neumann and recorded without

indication of locality. This is a form with short and broad sternal plate, strongly pigmented and with large paratergal plates. Unfortunately the specimens from *Sus vittatus* are said by Dr. Martin not to be present in the Neumann Collection (1930).

HAEMATOPINUS SUIS SARDINIENSIS Fahrenholz

It is somewhat doubtful that this form is nomenclatorially established. Fahrenholz merely refers to the figure given by Neumann (1901) and said by him to be of *H. suis suis*. Fahrenholz states that this figure probably refers to specimens from *Sus meridionalis* (= *S. scrofa nana*) which in the form of the sternal plate agree with it. The promised description of the supposed form seems never to have appeared. It seems probable that this is the form, to be discussed later, which appears to occur only on pigs of continental Europe and is marked by large size, relatively very long head, somewhat reduced paratergal plates, and a somewhat triangular or quadrate sternal plate. This form approaches that of the wild boar but is here retained with *H. suis*.

HAEMATOPINUS SUIS CHINENSIS Fahrenholz

Based upon specimens in the Hamburg Museum, from Fokien Province, China, col. Siemssen, without indication of host but in all probability from domestic swine. It was supposed by its author to be distinguished primarily by the form of the sternal plate.

HAEMATOPINUS SUIS GERMANICUS Fahrenholz

Described from specimens from "*Sus scrofa domesticus;* englische Rasse.—Provinz Hannover.—Type in Sammlung Fahrenholz." Supposed to be distinguished by the broad and rather regular sternal plate and by its large size, the female reaching a length of as much as 5.18 mm. The value of these characters will be discussed below.

HAEMATOPINUS PENICILLATUS Piaget

From the nomenclatorial point of view this name must here be considered. *H. penicillatus* was described by Piaget as a subspecies of *H. tuberculatus,* from the zebu. The Piaget Collection, now in the British Museum, contains a single specimen bearing the original labels of Piaget but remounted by the present writer. It is a specimen of *H. suis* of the type here regarded as being probably the *H. sardiniensis* of Fahrenholz. It does not agree with the description and figure given by Piaget. It would seem that the best procedure in the future would be simply to disregard the name, although if it be used it must, on the evidence of this specimen, be for the form named by Fahrenholz *H. suis sardiniensis*.

HAEMATOPINUS IRRITANS Law

The volume in which this name appeared is not available to the writer. It appears, however, to have been nomenclatorially established, and in strict accord with nomenclatorial rules must be considered in the course of any attempt to subdivide *H. suis*. It is in all probability quite unidentifiable.

EXAMINATION OF THE DATA

The problem presented by *Haematopinus suis* and its supposed subspecies is worthy of rather extended treatment, not only because of the fact that the species is one of the most familiar of the sucking lice, but because of the opportunity which it presents for a contribution to the methodology of the systematics of the group. It is herein definitely accepted as a principle that no final disposal of the questions here involved can be achieved merely by the examination of preserved specimens. They are questions of genetic relationships and as such should be approached by experimental methods. But no one is likely soon to assemble living specimens from the wild pigs of Europe and Asia in a laboratory where they can be reared and genetically analyzed. The best that can be done is to examine the widest range of material that it is possible to procure, to take into consideration the factor of normal variation, to allow for the existence of local strains fostered by isolation, to consider the possibilities of hybridization, and, finally, to formulate conclusions which it may be hoped will be approximately in accord with the biological facts and which will conform to the demands of a practical system of nomenclature.

It might on purely *a priori* grounds be assumed that a parasite which occurs upon animals of several distinct, even though closely related, species that range naturally from western Europe to the farthest islands of Malaysia will present well-defined local forms of distinct and fixed genetic composition. In this particular case the matter is complicated by the facts that the hosts have in part become domesticated, that the origin of these domestic forms is doubtful, that they have been transported indiscriminately about the world, and that they have in turn at times become feral and possibly bred back with native wild races.

Ideally it would be desirable to examine a large number of the parasites from purely wild hosts from many localities where mixing with domesticated animals probably has not occurred, if such localities exist. Such a series of parasites has not been available to any worker. Nevertheless the material at hand is reasonably extensive. Only three specimens are positively known to be from a naturally wild—not feral—species, although there are others which may possibly be so and some of the material in all probability represents fairly the louse population of the native wild pigs of the region from which it came.

With all of these considerations in mind we may proceed to an examination of the data.

Total length.—The use of this measurement is for the most part impracticable, for it is subject to a wide range of variation correlated with the condition of the specimens. Whether the individual be full-fed or not; whether in the case of the female it be gravid; the effects of the method of preparation; to say nothing of the possible effects, still uninvestigated, of such factors as season or condition or habits of the host—all these things must be considered. The best that can be said is that a specimen is "large" or "small." The length of some hard, fixed part, such as the head, could undoubtedly be used as something of an index to total length.

A comparison of specimens at hand, all prepared in essentially the same way, gives the following results as to total length: A female and a male in the Neumann Collection (Railliet) are, respectively, 6.00 and 4.5 mm., this being the largest female, but not the largest male, seen. Both are longer than the lengths given by Fahrenholz for his *H. germanicus* (5.18 and 4.32 mm. maxima), of which he said, "wir haben es hier mit der gröszten aller bekannten Haematopini zu thun," although in other respects they do not agree with his form. Three females from Switzerland, of a type similar to the preceding specimen, show a length range of 5.75, 5.25, and 4.75 mm., and two males are 4.5 mm. each. Three females from Shanghai, China, are 4.5, 4.75, and 5.00 mm., and a male is 4.00 mm. A male from Rangoon, the smallest seen, is 3.5 mm. A female and a male from Penang, Federated Malay States, are 4.5 and 4.00 mm., respectively, these specimens having the shortest and broadest heads seen. The male and female here figured, from Los Baños, Philippine Islands, are, respectively, 4.25 and 4.75 mm. A female and a male from Fiji are 5.00 and 4.75 mm., respectively.

These data could be extended indefinitely and are merely selections from measurements made. They are sufficient to demonstrate that there is noticeable variation between specimens even from the same lot, that there is relatively little correlation between male and female, and that there are no sharp lines of demarcation.

Head length and form.—Neumann, in naming his subspecies *adventicius*, emphasized the differences in head form having to do with the relative lengths of the fore and hind head. In order to show the range of variation in length as among various specimens and differences in proportions of parts, the accompanying graphs (Figs. 256, 257) are presented. The lengths were taken with the aid of the camera lucida from the base of the rostral tubercle to the base of the occipital apophyses and the percentage of observational error is probably quite low. In the graph the notch indicates the center of the head-length, the cross line indicates the

position of the base of the post-antennal sinus, the upper portion of the graph is the fore head, and the lower portion is the hind head.

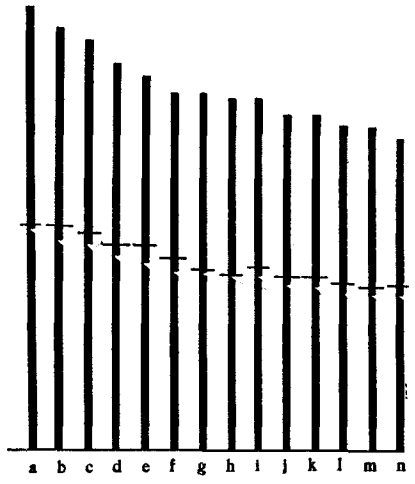

FIG. 256.—Graph to show variation of length of head and component parts of females of *Haematopinus aperis* n. sp., based upon specimens from: *b*, Piaget Collection, and *c*, Hungary; and of *Haematopinus suis* (Linnaeus) based upon specimens from: *a*, France; *b* and *d*, Switzerland; *e*, England; *f*, Lagos, Africa, and Homes Chapel, England; *g*, Kwei Chou Fu, China; *h*, Philippine Islands; *i*, Shanghai, *k*, Colombia; *l*, Mexico; *m*, specimen from *Sus cristata*, Tenasserim; *n*, from "wild pig," Federated Malay States.

It will be evident from these graphs that attempts to separate forms on total head-length alone are hopeless, the intergradation being complete between the longest and the shortest heads. Nor, it is evident, is anything to be inferred from differences in relative length of fore and hind head, the observational error alone probably being greater than those differences which actually exist.

The greatest head-lengths, however, are correlated with other characters to at least a certain extent.

The ratio of head-length to head-breadth can hardly be used with any degree of satisfaction. It is evident that the longer heads are also more narrow, but precise measurement is out of the question because of the difficulty of obtaining fixed points for determining width. In Fig. 258 *H, I, J* are shown the superposed heads of three forms, two of which

are extremes and one intermediate. The smallest head is slightly less than twice as long as wide (1.8), while the largest is slightly more than twice as long as wide (2.03). There is nothing especially significant here, and a completely intergrading series exists.

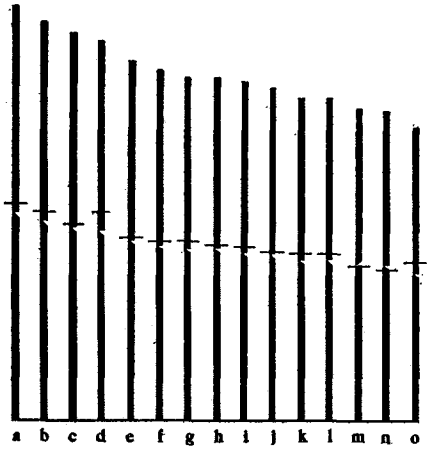

FIG. 257.—Graph to show variation of length of head and component parts of males of *Haematopinus aperis* n. sp., based upon specimens from: *c*, Piaget Collection, and *d*, Hungary; and of *Haematopinus suis* (Linnaeus) from: *a*, France; *b*, Switzerland; *e*, Ceylon; *f*, England; *g*, Kwei Chou Fu, China; *h*, Philippine Islands; *i*, England; *j*, Mexico; *k*, California; *l*, Ceylon; *m*, England; *n*, Rangoon; *o*, specimens from "wild pigs," Federated Malay States.

Relation of head-length to thoracic breadth.—The use of the relation of head-length to thoracic breadth is rendered difficult and unreliable by the high degree of observational error which is inevitable. The thorax is convex and in addition offers no sufficiently fixed points for the taking of measurements. However, the accompanying graph (Fig. 259) has been prepared, the measurements of the thoracic width being taken between the apices of the middle coxal condyles, which mark approximately the greatest breadth and which are as nearly fixed as any points that can be found.

There are certain significant things revealed by the graph. It will be noted that in the majority of specimens the head is very slightly longer than the thoracic breadth, the variations being no greater than might be expected as the result of observational error. But in the two individuals from the wild boar and in the specimen from Switzerland the head-length is significantly greater than the thoracic breadth. This correlates with the

greater actual head-length, the large size, the small paratergal plates, and the tendency toward weak pigmentation which is shown by these same specimens.

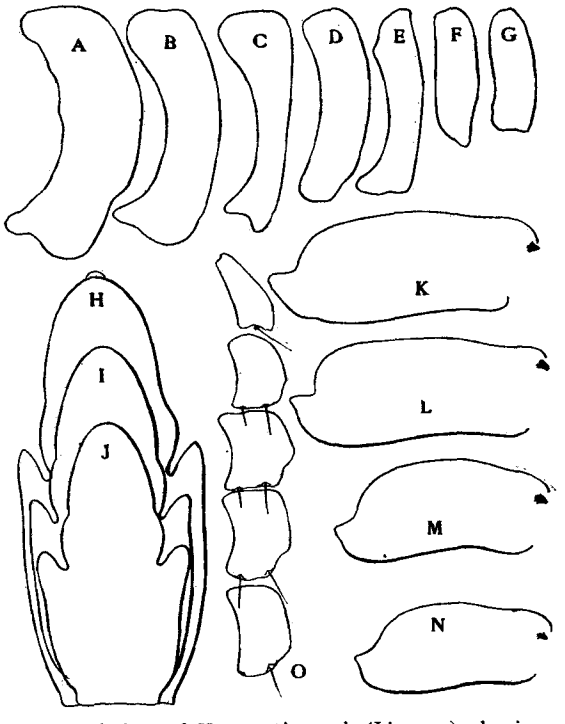

FIG. 258.—Paratergal plates of *Haematopinus suis* (Linnaeus), showing variation in size, based upon specimens from: *A*, England; *B*, Philippine Islands; *C*, Mexico; *D*, China; *E*, Switzerland; and of *H. aperis* n. sp., based upon specimens from: *F*, Piaget Collection; *G*, Hungary. *H*, *I*, *J*, heads of *Haematopinus suis* (Linnaeus), showing variation in size and form, including the greatest observed extremes and an intermediate. Posterior femora of *H. suis*, showing variation in size, based upon specimens from: *K*, Switzerland, and *L*, Philippine Islands; and of *H. aperis* n. sp., based upon *M*, specimen from Piaget Collection, and *N*, specimen from Hungary. *O*, normal paratergal plates of *H. suis*.

The specimen from Coyoacan, Mexico, is part of a lot included by Neumann in his *H. suis adventicius* and said by him to have the thorax wider than the length of the head.

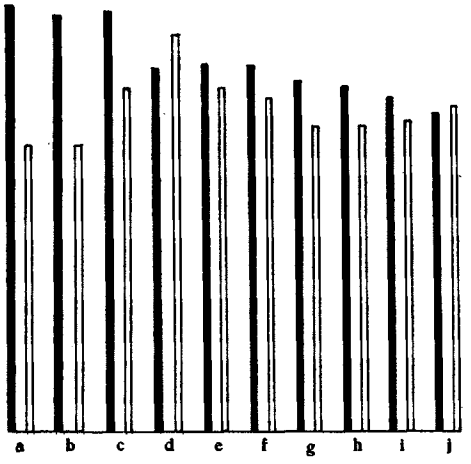

FIG. 259.—Graph showing variation in relative length of head and width of thorax in *Haematopinus aperis* n. sp., based upon specimens from: *a*, Piaget Collection, and *b*, Hungary; and in *H. suis* (Linnaeus) based upon specimens from: *c*, Switzerland; *d*, Larpur, India; *e*, Cambridge, England; *f*, Kwei Chou Fu, China; *g*, Ceylon; *h*, Philippine Islands; *i*, Coyoacan, Mexico; *j*, Penang, Federated Malay States. In this graph the solid bar represents head length, the light bar thoracic breadth.

Form of the sternal plate.—Both Fahrenholz and Neumann have utilized the form of the sternal plate in the separation of their supposed subspecies. The accompanying series of figures (Fig. 255), all drawn to the same scale with the aid of the camera lucida, includes all the forms figured by these authors. They have been arranged to show the transition from one extreme to the other. Figures *A* to *D* are from specimens of *H. aperis*. Figures *E* to *G* are from specimens from Switzerland of the form of *H. suis sardiniensis*, showing the degree of variation in three specimens from the same lot. Figure *H* is from a specimen from Weihaiwei, China, and forms a definite transition to Figure 255 *I*, which is from a specimen from the type lot of *H. suis chinensis*. Figures 255 *I*, *S*, and *U* are from this same lot and indicate something of the degree of variation to be seen. Figure 255 *L* duplicates almost exactly the figure given by Neumann for his *H. suis adventicius* and Figures 255 *Q* and *R* are from specimens belonging to lots which were referred by him to this form. Figure 255 *X*, from a specimen from Thüringen, Germany, duplicates the figure given by Fahrenholz for his *H. suis germanicus*.

It is evident that, while the differences between the extremes shown are notable, there is a completely graded series between them. It would be entirely impracticable to attempt a division upon the basis of such characters, for while a particular type may recur or may even be associated with a particular locality, we should be forced to the recognition of an almost endless series of forms which could not be definitely separated.

It may be noted, however, that the rather distinctive form shown by the specimens from wild boar and from the material from Switzerland is associated with other characters which serve to set these specimens apart.

Form and extent of paratergal plates.—In Fig. 258 are presented figures showing a small series of isolated paratergal plates, these being in each case the plate of the sixth segment of a male. It is impossible to get an exact comparison, owing to the fact that the plates may assume various positions, but the results are sufficiently close for comparison. Had we but the extremes of the series, a separation would be simple, but the series is well graded and such gaps as exist could be filled up if desired. Again, however, it will be noted that the specimens from wild boar occupy an extreme position. In this form, as may be seen by reference to Figs. 252 *B* and 253 *B*, the plates tend to be widely separated, while in typical *H. suis* they form an almost continuous border on the abdomen.

Sclerotization and pigmentation.—Both *H. suis adventicius* and *H. suis chinensis* were characterized by their authors as "strongly chitinized." In the majority of the specimens at hand the dorsum of both males and females is strongly sclerotic and pigmented, and the markings of head and thorax are very dark. The pattern formed by the tergal plates of the abdomen is constant throughout, differences being merely of degree of sclerotization and pigmentation. There is evidently some variation which may be ascribed to differences in preparation and there is probably some normal variation in the insects, but there exist differences which may not be assigned to such causes. In all of the few available specimens from the wild boar the pigmentation is extremely weak or entirely lacking on the dorsum of the abdomen, and the specimens are elsewhere pale. In the single female from Penang, Malaysia, the dorsum of the abdomen is almost membranous. In the single female from Larpur, India, only certain plates are developed. In the specimens from Tübingen, Germany, the dorsum is exceedingly pale, the plates being scarcely or not at all discernible. The various specimens (Switzerland, France) which belong to the *sardiniensis* type are moderately pigmented.

Again, there is a correlation of this character with others in the specimens from the wild boar and from continental Europe, although it appears in other specimens as well.

Legs.—There are very obvious differences in the size of the legs. The

short series of drawings here given (Fig. 258 *K–N*), all of which represent the second femur of males, will serve to illustrate the point. But there are curious discrepancies. The specimens from Switzerland, which in some respects approach most closely those from the wild boar, have the largest femora, while those from the wild boar have the smallest. Those from Los Baños, Philippine Islands, which represent something of an extreme in coloration and sclerotization, are intermediate.

Again there is a correlation in the specimens from the wild boar of this character with others. In other specimens it apparently does not correlate with other characters.

Combinations of characters.—It is evident that no single character which has been considered will suffice for any satisfactory separation of forms. Considered in combinations, however, there are some fairly clear results.

The specimens from wild boar, few, but taken at different times and in different places, agree in the combination of long head, comparatively small legs, small thorax, weak pigmentation, small paratergal plates, and narrow and rather pointed sternal plate.

The specimens from presumably domestic pigs from Switzerland, from domestic pigs from France(?), from "zebu" (Piaget Collection), and from "camel" (British Museum) constitute a fairly well-defined type, the paratergal plates being larger than in specimens from the wild boar, the size tending to be greater, the pigmentation darker, the legs larger, and the sternal plate essentially the same.

Other specimens are difficult to place in particular combinations, the characters being rather indiscriminately mixed, but in general the head tends to be shorter, the pigmentation more pronounced, the paratergites larger, the sternal plate broader.

Conclusions

From a consideration of the data here presented, together with the facts of the primitive distribution of the wild pigs, the writer has been led to certain conclusions. In forming them and translating them into nomenclatorial symbolism he has endeavored on the one hand to be practical and on the other to recognize the probable biological situation. The conclusions are as follows:

1. In all probability there were originally two well-marked forms of lice occurring on wild pigs, with possibly minor local forms. Of these two forms, one occurred on the wild boar of Europe, the other on the pigs of eastern Asia. There is unfortunately an enormous area in between concerning which we have no data.

2. The majority of the lice on domestic pigs resemble most closely the Asiatic type, which is consistent with the known fact that our domestic pigs, as they exist today, have come in large part from Asiatic swine.

3. In continental Europe, however, there exists a type which in many respects approaches more closely the type from the wild boar. This may possibly be a hybrid or it may possibly represent a third primitive type.

4. As matters stand it seems practical to recognize nomenclatorially but two forms and to regard these as species, one including only the lice of *Sus scrofa,* the wild boar of Europe, the other including all lice on domestic swine. Such action does some slight violence to the facts in the case of the third type from continental Europe but is in accord with practical considerations.

5. There apparently being no name available for the species from *Sus scrofa,* it is here named *Haematopinus aperis.*

3. **Haematopinus phacochoeri** Enderlein

FIGS. 260, 261

1908. *Haematopinus phacochoeri* Enderlein, *Wissenschaftliche Ergebnisse der Schwedische Expedition nach dem Kilimandjaro, dem Meru, und den umgebenden Massaische Steppen,* **11**: 7–9; fig.

1911. *Haematopinus peristictus* Kellogg and Paine, *Bulletin of Entomological Research,* **2**: 145–146; pl. 4, figs. 3–6 (part).

1912. *Haematopinus phacochoeri* Enderlein, Paine, *Entomological News,* **23**: 468 (part).

1916. *Haematopinus phachochoeri* Enderlein, Ferris, *Annals of the Durban Museum,* **1**: 238 (part; specific name misspelled).

1916. *Haematopinus phachochoeri* Enderlein, Ferris, "Catalogue and Host List of the Anoplura," *Proceedings of the California Academy of Sciences* (4), **6**: 145 (part; specific name misspelled).

1919. *Haematopinus phachochoeri* Enderlein, Bedford, *Director Veterinary Education and Research, Department of Agriculture, Union of South Africa, Report,* **5–6**: 713 (part; name misspelled).

1927. *Haematopinus phacochoeri* Enderlein, Bedford, *ibid.,* **11–12**: 737 (part).

PREVIOUS RECORDS. There is confusion in the published records of this species, owing to the failure of certain authors—notably Kellogg and Paine and the present writer—to recognize the fact that two distinct species of lice occur upon the African bush pigs and wart hogs. As nearly as may be determined, *H. phacochoeri* occurs normally only on the genus *Phacochoerus.* On this basis records may be allocated as follows:

Originally described by Enderlein from the region of Mount Kilimanjaro, from *Phacochoerus aeliani massaicus.* Recorded by Kellogg and Paine from *Phacochoerus aethiopicus,* Akamanga, North Nyasa; by Harms from *Phacochoerus* sp., German East Africa; by Bedford from *Phacochoerus sundevalli* in Zululand and *P. aethiopicus* in the Transvaal. Other records of the species from *Potamochoerus* refer to *H. latus* Neumann.

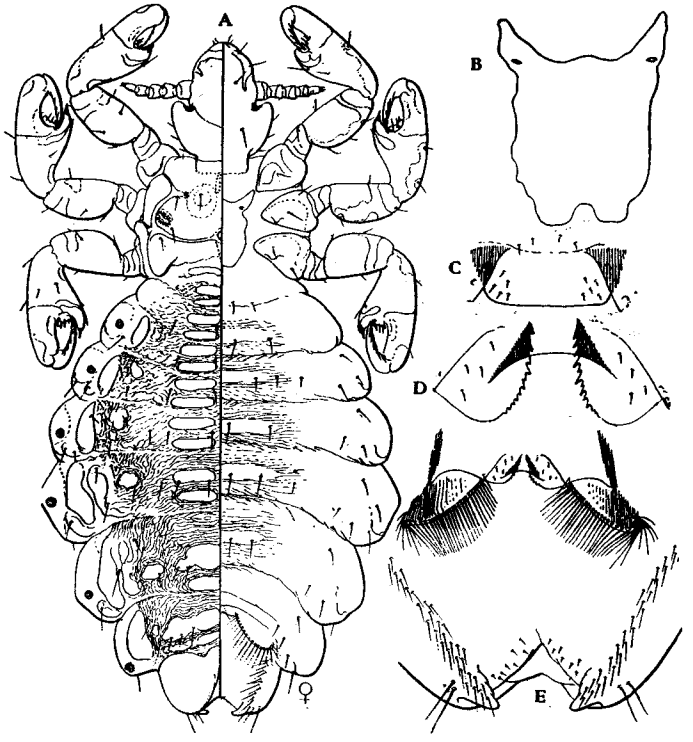

FIG. 260.—*Haematopinus phacochoeri* Enderlein: *A,* female; *B,* sternal plate of male; *D,* detail of vulva; *E,* genital region of female. *Haematopinus latus* Neumann: *C,* detail of vulva.

SPECIMENS EXAMINED. The types of *H. peristictus* Kellogg and Paine, from *Phacochoerus aethiopicus,* Akamanga, North Nyasa, and from "wart hog," northeastern Rhodesia (Stanford University and British Museum); "wart hog," East Africa, *E. J. Baxter,* and Gatdoma District, southern Rhodesia, *H. S. Lesson* (British Museum); "buffalo," Nakaru, Kenya Colony, *T. J. Anderson* (British Museum).

FEMALE (Fig. 260 *A*). Length, on the slide, attaining 6.5 mm. A strikingly marked and heavy-bodied species. Head relatively very small,

short, being very little longer than broad, with very prominent post-antennal angles and with a pronounced occipital constriction which gives it a short "neck." *Thorax* about as long as the head and somewhat wider, being somewhat quadrilateral in form; sternal plate (Fig. 260 *B*) somewhat longer than broad, with the anterior angles produced and inclosing the openings of the sternal apophyses. Legs of the type common to the genus, strongly marked with bands of color.

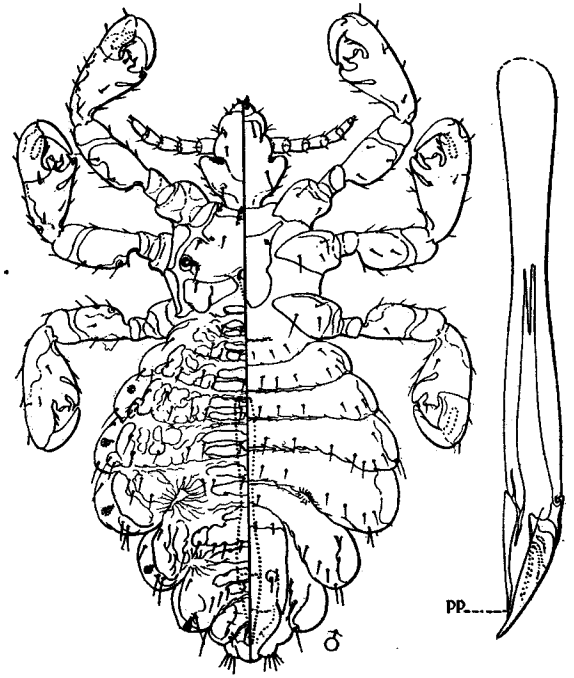

FIG. 261.—*Haematopinus phacochoeri* Enderlein, male and genitalia.

Abdomen broadly and regularly oval, with the margins strongly lobed by inter-segmental constrictions, especially between the sixth and seventh and seventh and eighth segments. Paratergal areas strongly sclerotic, but without well-defined plates. All tergites from the first to the eighth with two pairs of small median plates and those of the third to eighth segments with strongly defined, irregular, submarginal sclerotic areas. *Gonophyses* (Fig. 260 *E*) small, the vulva with a pair of serrate median lobes (Fig. 260 *D*), which are a distinctive characteristic of the species.

MALE (Fig. 261). In general closely resembling the female except for the smaller abdomen. Length, on slide, attaining 5.00 mm. Abdominal margin between sixth and seventh ventral segments more deeply incised than in female. Genitalia (Fig. 261) with the basal plate very long and slender, the apical parts small and obscure, presenting the usual V-shaped pseudopenis, but without any marked developments of the preputial sac.

NOTE.—The discussion of this species will follow the description of the next, which has been confused with it.

4. **Haematopinus latus** Neumann

FIGS. 260 *C*, 262

1909. *Haematopinus latus* Neumann, *Archives de Parasitologie*, **13**: 505; figs. 6–9.
1911. *Haematopinus peristictus* Kellogg and Paine, *Bulletin of Entomological Research*, **2**: 145–146 (part).
1912. *Haematopinus incisus* Harms, *Zoologischer Anzeiger*, **40**: 293.
1912. *Haematopinus phacochoeri* Enderlein, Paine, *Entomological News*, **23**: 468 (part).
1916. *Haematopinus phachochoeri* Enderlein, Ferris, *Annals of the Durban Museum*, **1**: 238 (misidentification; specific name misspelled).
1916. *Haematopinus phachochoeri* Enderlein, Ferris, "Catalogue and Host List of the Anoplura," *Proceedings of the California Academy of Sciences* (4), **6**: 145 (part; specific name misspelled).
1919. *Haematopinus phachochoeri* Enderlein, Bedford, *Director of Veterinary Education and Research, Department of Agriculture, Union of South Africa, Report*, **5–6**: 713 (part; specific name misspelled).
1927. *Haematopinus phacochoeri* Enderlein, Bedford, *ibid.*, **11–12**: 737 (part).

PREVIOUS RECORDS. Originally described by Neumann from *Potamochoerus africanus*, Kaporo, Nyasaland. Recorded by Kellogg and Paine (as *H. peristictus* K. and P., in part) from *Potamochoerus choeropotamus*, Fort Hill, North Nyasa; by Ferris (as *H. phacochoeri* Enderlein) from the same host, Ngxwala Hill, Ubombo, Zululand; by Harms (as *H. incisus* Harms) from *Potamochoerus affinis nyassae*, Msumwialager, German East Africa.

SPECIMENS EXAMINED. Those upon which the foregoing records by Kellogg and Paine and by Ferris were based and others from *Potamochoerus choeropotamus*, Luangwa Valley, Northeastern Rhodesia, *S. A. Neave* (British Museum).

FEMALE (Fig. 262). Length, on slide, attaining 5.00 mm. In all respects closely resembling the preceding species except in the form and certain other details of the abdomen. In this species the abdomen, instead of being broadly oval, is characteristically angular, widening to the sixth

segment, the lateral lobes of which are very prominent, and then sharply narrowing again. Instead of two pairs of median tergal plates, as in *H. phacochoeri*, each segment bears but one pair. Correlated with these characters, the vulva (Fig. 260 *C*) presents a single median lobe instead of the two serrate lobes of *H. phacochoeri*.

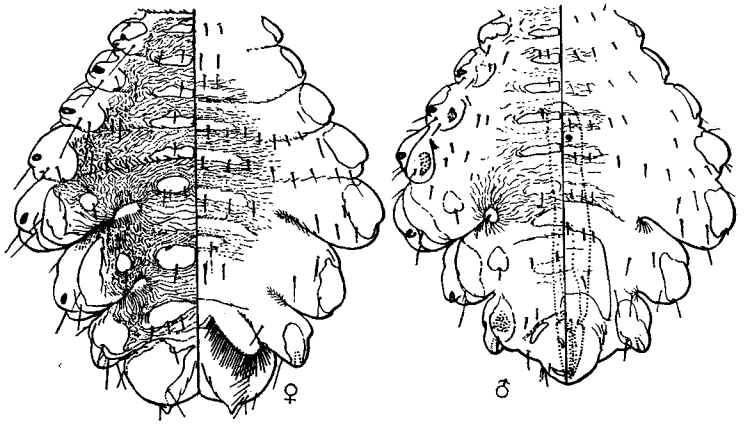

FIG. 262.—*Haematopinus latus* Neumann, abdomens of male and female.

MALE (Fig. 262). Length, on slide, 4.00 mm. Practically identical with the male of *H. phacochoeri* except in the angular form of the abdomen and the presence of but a single pair of median tergal plates on each abdominal segment.

NOTES.—The figures and descriptions given by Neumann and Harms are sufficiently clear to make the identity of their species certain. There can, I think, be no reasonable doubt that the two species, *H. latus* and *H. incisus*, are identical and that this species is distinct from *H. phacochoeri*. The characters which have been given permit the positive identification and separation of the two species.

Apparently *H. phacochoeri* is confined to species of the genus *Phacochoerus*, while *H. latus* occurs only on *Choeropotamus*. The two species show no very close resemblance to *H. suis* and *H. aperis*, which infest the species of the related host genus *Sus*.

5. Haematopinus eurysternus (Nitzsch)

FIGS. 263, 264

NOTE.—This species being a parasite of a domestic animal, there are numerous references to it in the literature of parasitology, few of which are of any significance from the point of view of this paper. No attempt is here made to list such references unless they add something to the records of distribution, the biology, or the systematics of the species.

1818. *Pediculus eurysternus* Nitzsch, *Germar's Magazin der Entomologie*, 3: 305.
1829. *Haematopinus eurysternus* (Nitzsch), Stephens, *Catalogue of British Insects*, 2: 329.
1838. *Pediculus eurysternus* Nitzsch, Burmeister, *Genera Insectorum, Rhynchota, Species 14.*
1842. *Haematopinus eurysternus* (Nitzsch), Denny, *Monographia Anoplurorum Britanniae*, p. 29; pl. 25, fig. 5.
1874. *Haematopinus eurysternus* (Nitzsch), Giebel, *Insecta Epizoa*, p. 41; pl. 2, fig. 8.
1880. *Haematopinus eurysternus* (Nitzsch), Piaget, *Les Pediculines*, p. 648; pl. 53, fig. 1.
1891. *Haematopinus eurysternus* (Nitzsch), Osborn, *United States Department of Agriculture, Division of Entomology, Bulletin* (old series), 7: 13; fig. 6.
1896. *Haematopinus eurysternus* (Nitzsch), Osborn, *ibid., Bulletin* (new series), 5: 172; fig. 100.
1908. *Haematopinus eurysternus* (Nitzsch), Dalla Torre, "Anoplura," *Wytsman's Genera Insectorum*, p. 11.
1909. *Haematopinus eurysternus* (Nitzsch), Neumann, *Archives de Parasitologie*, 13: 498–500.
1913. *Haematopinus eurysternus* (Nitzsch), Patton and Cragg, *Textbook of Medical Entomology*, p. 549.
1916. *Haematopinus quadripertusus* Fahrenholz, *Archiv für Naturgeschichte*, 81 (Abt. A): Fasc. 11: 19; figs. 15–17 (August).
1916. *Haematopinus parviprocursus* Fahrenholz, *ibid.*, 81 (Abt. A): Fasc. 11: 21.
1916. *Haematopinus quadripertusus* Fahrenholz, *Zoologischer Anzeiger*, 48: 91 (October).
1916. *Haematopinus parviprocursus* Fahrenholz, *ibid.*, 48: 91.
1917. *Haematopinus eurysternus* (Nitzsch), Lamson, *Journal of Economic Entomology*, 10: 446.
1927. *Haematopinus eurysternus* (Nitzsch), Freund, *Prager Archiv für Tiermedizin*, 7(A): 43; fig. 2.

PREVIOUS RECORDS. From almost all parts of the world on domestic cattle.

SPECIMENS EXAMINED. Europe: four females and two males in the Piaget Collection (British Museum), "sur Bos taurus," these used as the basis for the accompanying figures. Africa: "off cows," Bathurst, Gambia, *Dr. Hood* (Molteno Institute); "off ox," Zululand, *H. H. Curson*, and Uganda, *A. W. N. Pillers* (British Museum). Asia: "tail of bullock," Ross Island, Andamans, and from *Cyon dukhensis*, Calcutta (Indian Museum); "off bullocks," Seychelles Islands, *P. R. Dupont*, and from "cattle," Kandy District, Ceylon, *J. C. Hutson* (British Museum); "off bullock," Rangoon, Burma, *Montant*, and "off bull," and "off calf," Khota Baru, Kelantan, Malay Peninsula, *G. D. Gimlette* (Molteno Institute); "off cow," Central Fukien, China, *Dr. J. P. Maxwell* (Molteno Institute). Australia: "tail of cow," Mackay, Queensland (British Museum). Pacific Islands: British Solomon Islands (British Museum); from dog, Honolulu, Hawaii, *E. M. Ehrhorn* (Molteno Institute and British Mu-

seum). North America: "from cow," New Brunswick, New Jersey, Bishop, and Corozal, Panama Canal Zone, *L. H. Dunn* (Stanford University).

In addition to these a male labeled as "type" of *Haematopinus parviprocursus* Fahrenholz and a female labeled as "type" of *H. quadripertusus* Fahrenholz, received as a loan through the kindness of the Berlin Museum, have been examined.

FEMALE (Fig. 263). Length, on slide, from 3.5 to 4.75 mm. *Head* short and broad, strongly pigmented, with conspicuous pustulations about the bases of the dorsal setae; length only slightly greater than breadth; post-antennal angles very prominent; occipital region constricted into a

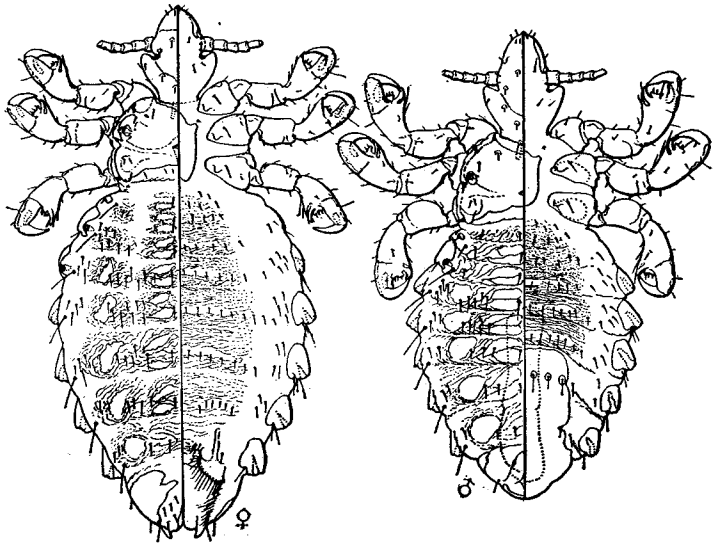

FIG. 263.—*Haematopinus eurysternus* (Nitzsch), male and female. From specimens in the Piaget Collection.

"neck." *Thorax* with the dorsum strongly and quite uniformly pigmented, the transverse, mesothoracic thickening but little darker than the remainder. *Sternal* plate (Fig. 264 *A–E*) somewhat variable in form but in general slightly longer than broad, quadrate and frequently with the anterior angles and the median point of the anterior margin produced. Sternal apophyses not included within the sternal plate. *Legs* strongly and uniformly pigmented, the tibial pad (pretarsal sclerite) very small.

Abdomen elongate oval, usually rather membranous and pale except for the definitely sclerotic areas. Paratergites for the most part forming conspicuous, conical tubercles, those of the first apparent segment present

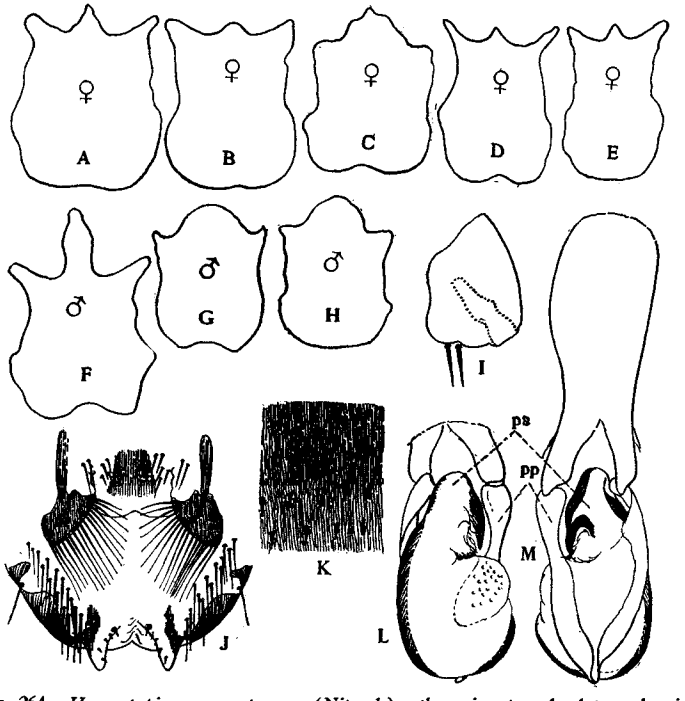

FIG. 264.—*Haematopinus eurysternus* (Nitzsch): thoracic sternal plates, showing variation in form, based upon specimens from: *A*, Panama Canal Zone; *B*, Rangoon; *C*, United States of America; *D*, Gambia; *E*, Khota Baru, India; *F*, Panama Canal Zone; *G*, specimen in Piaget Collection; *H*, from dog, Honolulu. *I*, paratergal plate, from specimen in Piaget Collection; *J*, genital region of female from specimen in Piaget Collection; *K*, ornamentation of derm; *L*, *M*, genitalia of male.

as minute plates. Tergites with two pairs of small, median plates on each segment and with a single, somewhat irregular submarginal plate. Dorsal setae rather numerous and conspicuous, forming something of a cluster between the median and submarginal and just outside of the marginal plates. Paratergites never with more than two or three setae along their posterior, ventral border. Furrowing of the derm somewhat variable,

depending upon the degree of distention of the abdomen. Ventral side faintly sclerotic and furrowed. *Gonopophyses* (Fig. 264 *J*) rather small, blunt; wall of vagina with a median, quadrate, sclerotic area. Tracheal trunks unusually large and conspicuous.

MALE (Fig. 263). Length, on slide, ranging from 2.00 to 3.5 mm. In general form and characters closely resembling the female, but usually with the abdomen appearing much more strongly pigmented, owing perhaps to its lack of distention. Genital plate very large and conspicuous. *Genitalia* (Fig. 263 *L, M*) with the basal plate short and broad, the pseudopenis with the **V**-shape common to the genus, the preputial sac strongly sclerotic and forming basally a relatively huge hook.

NOTES.—Neumann (1909) called attention to the large size and the stronger pigmentation of specimens from Africa which he referred to this species. Fahrenholz (1916) considered such specimens to represent a distinct species, *H. parviprocursus*, the types of which, from "zweifellos eine Rinderart," were from Rehoboth, German Southwest Africa.

The material at hand presents a very wide range of size, the largest specimen (a female from Panama Canal Zone) being 1.5 times as large as the smallest of the same sex (Piaget Collection). There are also marked differences in pigmentation, some specimens being very much darker than others. Structurally they appear all to be identical. In general it is those specimens from the tropical regions which tend to be the larger: Canal Zone, female 4.75, male 3.25; Rangoon, females 4.75 and 4.5 mm.; Malay Peninsula, females 4.5 and 4.25, male 3.25 mm.; Gambia, females 4.5 mm.; Seychelles Islands, female 4.00, male 3.5 mm.; New Jersey, female, 3.5, male 2.5 mm.; Europe (Piaget material), female 3.00, male 2.00 mm. The specimens from the Seychelles and Ceylon are extraordinarily dark in color, but are structurally not different from the others.

Without some structural basis for a separation these forms can hardly merit recognition as distinct species. The species *H. quadripertusus* Fahrenholz was described from males only, from cattle, Banjo, Kamerun. The characters presented by it are duplicated in specimens at hand and it appears to be merely the male of the form described as *H. parviprocursus* Fahrenholz, which was based solely upon females. It will therefore also fall into synonymy.

The separation of *H. eurysternus* from *H. tuberculatus* (Burmeister) is a simple matter in spite of their close general similarity and their overlapping in size. A glance at the margin of the abdomen suffices; *H. eurysternus* never has more than two or three setae along the posterior margin of each paratergal plate, while *H. tuberculatus* has in the same place a row of at least five or six setae. This is correlated with other differences but is in itself precise as a "key character."

It will be noted that in the list of specimens examined there are included two anomalous records, one from dog at Honolulu and another from *Cyon dukhensis*, the "dingo," in India. There is nothing to do but accept these records at their face value and assume that occasionally this species may transfer to other animals.

Haematopinus sp.

One lot of material at hand, labeled as from "cow," Rangoon, Burma, VI: 1912, *Dr. H. H. Marshall* (Molteno Institute No. 131) is extremely puzzling. It represents an exceedingly small species, length of female 2.5 and male 2.00 mm. It is in general similar to *H. eurysternus*, but the female especially differs in the weak development or even complete absence of the median tergal plates and the strong development of the submarginal tergal plates on the sixth to eighth segments. The material is not satisfactory and it seems best to leave it for some future student who may be better able to deal with it.

6. Haematopinus taurotragi Cummings

FIGS. 265, 266

1914. *Haematopinus taurotragi* Cummings, *Bulletin of Entomological Research*, 5: 155–159; 2 figs.

1916. *Haematopinus taurotragi* Cummings, Ferris, "Catalogue and Host List of the Anoplura," *Proceedings of the California Academy of Sciences* (4), 6: 146.

1927. *Haematopinus taurotragi* Cummings, Bedford, *Director of Veterinary Education and Research, Department of Agriculture, Union of South Africa, Report*, 11–12: 737.

PREVIOUS RECORDS. Originally described from specimens taken from *Taurotragus oryx* (*Boselaphus oreas*) in a menagerie in England. Recorded by Bedford from the same host, Drakensberg, Natal.

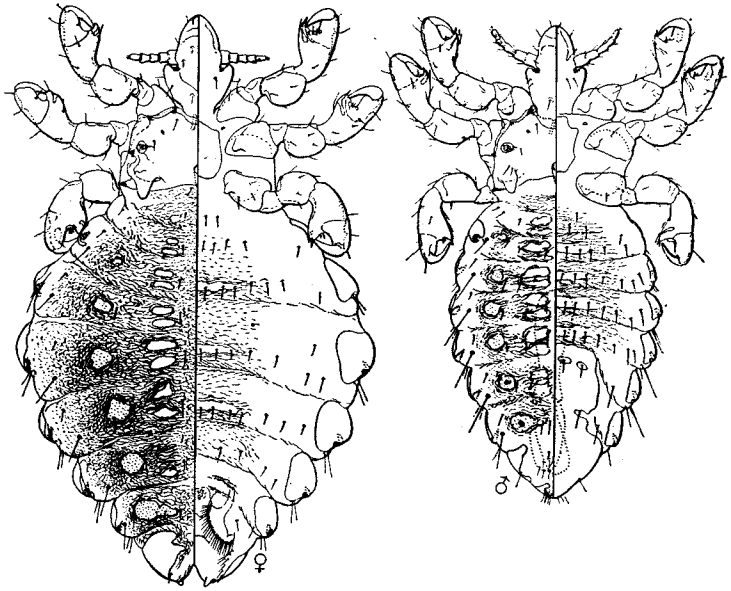

FIG. 265.—*Haematopinus taurotragi* Cummings, male and female.

SPECIMENS EXAMINED. The types (British Museum) and other specimens from the same host, Natal, South Africa, *Lawrence Hill,* and Drakensberg, Natal, and zoölogical garden, Pretoria, *Bedford;* from "kudu," presumably *Strepsiceros kudu,* Grahamstown, South Africa, *Bedford.*

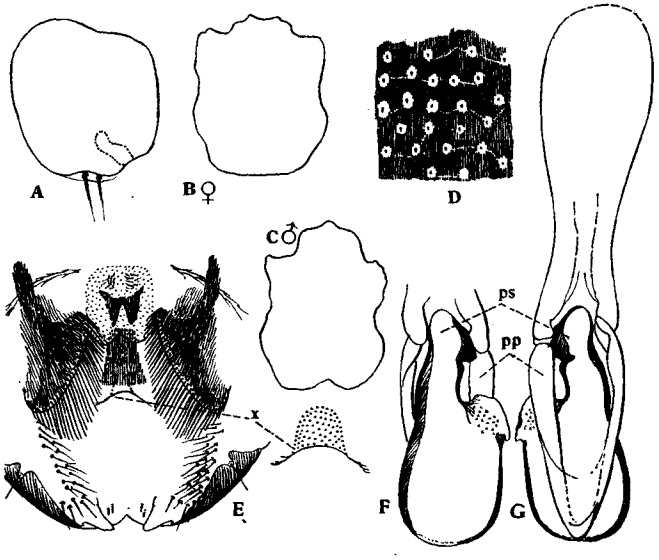

FIG. 266.—*Haematopinus taurotragi* Cummings: *A,* paratergal plate; *B,* thoracic sternal plate of female; *C,* thoracic sternal plate of male; *D,* ornamentation of derm; *E,* genital region of female; *F, G,* genitalia of male.

FEMALE (Fig. 265). Length, on slide, 3.5 to 4.00 mm. A stout-bodied species very closely resembling *H. eurysternus* (Nitzsch). It is in fact so very similar to the latter species that only the points of difference may be mentioned. Aside from somewhat intangible differences, such as the broader abdomen and the stouter and heavier legs, it presents the following precise differences: Second (apparent first) abdominal segment entirely without a paratergal plate. Gonopophyses (Fig. 266 *E*) somewhat halberd-shaped; the wall of the vagina with a very conspicuous sclerotic plate within the limits of which appears a more heavily sclerotic, somewhat **W**-shaped area; between the apices of the gonopophyses a crescent-shaped mark (Fig. 266 *Ex*) which is formed by the opening of a pit of unknown function that seems to be peculiar to this species; slightly anterior to this pit is a pigmented spot which seems sometimes to

be lacking. Submarginal tergal plates marked almost throughout by small, pore-like openings (Fig. 266 *D*). Tracheal trunks much more slender than in *H. eurysternus.*

MALE (Fig. 265). Length, on slide, 3.00 to 3.5 mm. In general closely resembling the female, except for the narrower abdomen and the darker pigmentation due to the body not being distended. *Genitalia* (Fig. 266 *F, G*) similar to those of *H. eurysternus.*

NOTES.—While this species is certainly close to *H. eurysternus,* the differences which have been pointed out are constant and precise. The specimens from "kudu" are slightly smaller than those from *Taurotragus,* having the smaller measurements cited, but otherwise there are no differences.

7. Haematopinus tuberculatus (Burmeister)

FIGS. 267, 268, 269

1800. ? *Pediculus bufali-europaei* Latreille, *Histoire naturelle générale et particulière des Crustaces et des Insectes,* **8**: 96.
1839. *Pediculus tuberculatus* Burmeister, *Genera Insectorum, Rhynchota, Species 20.*
1852. *Haematopinus tuberculatus* (Burmeister), Lucas, *Annales de la Société Entomologique de France* (2), **10**: 529–533; pl. 11, No. 2.
1864. *Pediculus tuberculatus* Burmeister, Nitzsch, *Zeitschrift für die gesamten Naturwissenschaften,* **23**: 32.
1867. *Haematopinus tuberculatus* (Burmeister), Nitzsch and Giebel, *ibid.,* **28**: 397.
1869. *Pediculus punctatus* Rudow, *ibid.,* **34**: 167.
1874. *Haematopinus tuberculatus* (Burmeister), Giebel, *Insecta Epizoa,* p. 46.
1874. *Haematopinus punctatus* (Rudow), Giebel, *ibid.,* p. 47.
1880. *Haematopinus tuberculatus* (Burmeister), Piaget, *Les Pediculines,* p. 650: pl. 53, fig. 2.
1904. *Haematopinus tuberculatus* (Burmeister), Enderlein, *Zoologischer Anzeiger,* **28**: 140.
1908. *Pediculus ? punctatus* Rudow, Dalla Torre, "Anoplura," *Wytsman's Genera Insectorum,* p. 9.
1908. *Haematopinus tuberculatus* (Burmeister), Dalla Torre, *op. cit.,* p. 11.
1909. *Haematopinus tuberculatus* (Burmeister), Neumann, *Archives de Parasitologie,* **13**: 497–500; fig. 1.
1910. *Haematopinus punctatus* (Rudow), Mjöberg, *Arkiv för Zoologi,* **6**: 166.
1910. *Haematopinus phthiriopsis* (Gervais), Mjöberg, *ibid.,* **6**: 166; fig. 84 (misidentification).
1910. *Haematopinus tuberculatus* (Burmeister), Mjöberg, *ibid.,* **6**: 167.
1911. *Haematopinus tuberculatus* (Burmeister), Neumann, *Archives de Parasitologie,* **14**: 413.
1913. *Haematopinus tuberculatus* (Burmeister), Patton and Cragg, *Textbook of Medical Entomology,* p. 549; pl. 68, figs. 2, 7.
1913. *Haematopinus tuberculatus* (Burmeister), Johnston and Harrison, *Proceedings of the Royal Society of Queensland,* **24**: 106.
1916. *Haematopinus bufali* (De Geer), Fahrenholz, *Archiv für Naturgeschichte,* **81** (Abt. A): Fasc. **11**: 7; pl. fig. 3 (misidentification).
1916. *Haematopinus punctatus* (Rudow), Fahrenholz, *ibid.,* **81** (Abt. A): Fasc. 11: 33.

1916. *Haematopinus tuberculatus* (Nitzsch) [*sic*], Bodkin and Cleare, *Bulletin of Entomological Research*, **7**: 188.
1916. *Haematopinus tuberculatus* Grib. [*sic*], Roubaud and Van Saceghem, *Bulletin de la Société de Pathologie Exotique*, **9**.
1917. *Haematopinus bufali bufali* (De Geer), Fahrenholz, *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, **34**, Beiheft 2: 4 (misidentification).
1917. *Haematopinus bufali punctatus* (Rudow), Fahrenholz, *ibid.*, **34**, Beiheft 2: 4, 13.
1919. *Haematopinus bufali-europaei* (Latreille), Fahrenholz, *Zeitschrift für Angewandte Entomologie*, **6**: 154–155.
1919. *Haematopinus tuberculatus* (Nitzsch) [*sic*], Banks, *Philippine Journal of Science*, **14**: 171.

PREVIOUS RECORDS. The description of *Pediculus bufali-europaei* Latreille was based upon specimens from "les buffles venus d'Italie," and that of *Pediculus tuberculatus* Burmeister upon specimens from "common buffalo or buffalo of India," this in each case being presumably *Bos bubalus* (*Bubalus buffelus, Bos buffelus*). It has many times been recorded from this host in Asia and in other localities (Africa, South America) into which it has been introduced. Also recorded, as *H. punctatus* (Rudow), from the yak (*Bos grunniens, Bos tibetanus*) and from camels.

SPECIMENS EXAMINED. Variously indicated as from "buffalo," "carabao," *"Bos bubalus."* Piaget Collection, without indication of locality, but without doubt part of the material recorded by him as from the zoölogical garden of Rotterdam. India: Rawalpindi, Punjab, *R. C. Cochrane* (Molteno Institute); Kasauli (Stanford University); Pandacan, *F. M. Howlett* (Molteno Institute); Kotang Factory (Indian Museum). Burma: Rangoon, *Dr. H. H. Marshall* (Molteno Institute). British North Borneo: Sekong River, *Dr. H. F. Conyngham* (Molteno Institute). Sumatra, *Dr. J. S. Koningsberg* (Molteno Institute). Malay Peninsula: Kota Baru, Kelantan, *Dr. G. D. Gimlette* (Molteno Institute). Java, *W. Grosshoff* (British Museum). China: Hongkong, *Adam Gibson* (British Museum); Kaihsien, Szchuen, *S. S. Stericker* (Molteno Institute). Philippine Islands: Central Mindanao and Los Baños, *Woodworth* (Stanford University); Alabang, *Mitzmain* (British Museum). Guam (Stanford University).

From camels: Punjab, India (Indian Museum); "camels imported from India, Perth, W. Australia, *Dr. J. B. Cleland*" (Molteno Institute), being part of the material recorded by Neumann (1911); without indication of locality (British Museum); Burao, British Somaliland, *Dr. R. E. Drake-Brockman* (British Museum).

Four specimens from the Hyslop Collection, now in the possession of the Faculté de Medecin of Paris, received as a loan through the kindness of Dr. E. Brumpt, labeled as from "Bison americanus," without further data, these being the specimens recorded by Neumann (1909) and which

have served as the basis for the published records of Anoplura from this host.

Two slides, including a male and a female, from the Hamburg Museum collection, labeled *"Haematopinus punctatus* Rudow, Type, von *Bos Grunniens*, alte sammlung, **2.9.1868**, H. Sch., H. Fahrenholz det., praep. 1914/16."

Four slides, including two females, a male, and a nymph, in the Hamburg Museum collection, labeled *"Haematopinus bufali* (De Geer), von *Bubalus caffer* Sparr. *alba*, Zool. Garten, Hambg., Zool. Gesellsch. ded. **11.11.1892**, H. Fahrenholz det., praep. 1914/16."

Two slides, including male and female, in the British Museum, labeled "wild boar, Jogidia, Hazanibagh, **24 : iii : 13**, *O. A. Smith.*"

FEMALE (Fig. 267). Varying in length from 3.5 to 5.5 mm., on the slide, the average being about 4.5 mm. A robust and typically deeply pigmented species that in general closely resembles *H. eurysternus*, having the same head form and the same distribution of the abdominal tergal plates. It can be separated from *H. eurysternus* by the one precise character of the number of setae at the margin of the abdominal segments caudad of the paratergal plates (Fig. 269 *D*), there being here a series of at least five or six—and usually eight or more—setae in *H. tuberculatus*, while there are but two or three in *H. eurysternus*. Correlated with this are other characters: the generally larger size; the form of the sternal plate (Fig. 269 *C*), which has the lateral margins emarginate in a characteristic manner, with the anterior angles produced laterally; the rather characteristic form of the submarginal tergal plates of the abdomen, which ordinarily have a small, appendage-like, posterior, mesal prolongation; the form of the gonopophyses (Fig. 269 *F*), which are more tapering, with their mesal margins sinuate; and the presence of a quite conspicuous, somewhat variably formed, sclerotic area between the apices of the gonopophyses. The submarginal tergal plates are beset in large part with minute squamate markings (Fig. 269 *E*).

MALE (Fig. 268). Length, on slide, varying from 2.5 to 4.00 mm. In general resembling the female and definitely distinguishable in the same manner. *Genitalia* (Fig. 269 *A, B*) essentially the same as in *H. eurysternus*.

NOTES.—The specimens in the collection of the Hamburg Museum which are supposed to be the types of *Pediculus punctatus* Rudow offer no basis for the separation of this species from *H. tuberculatus*. The specimens are pale, but it may here be noted that the same condition appears in other material in the Hamburg Museum collection. Apparently long immersion in the particular preserving fluid employed by that institution has tended to decolorize the specimens, for even such parts as the claws and the genitalia of the males are extremely pale. This condition is especially

marked in *Haematopinus minor* Fahrenholz, which will be discussed later, and in the specimens from *Bubalus caffer* which Fahrenholz has identified as *Haematopinus bufali* (De Geer).

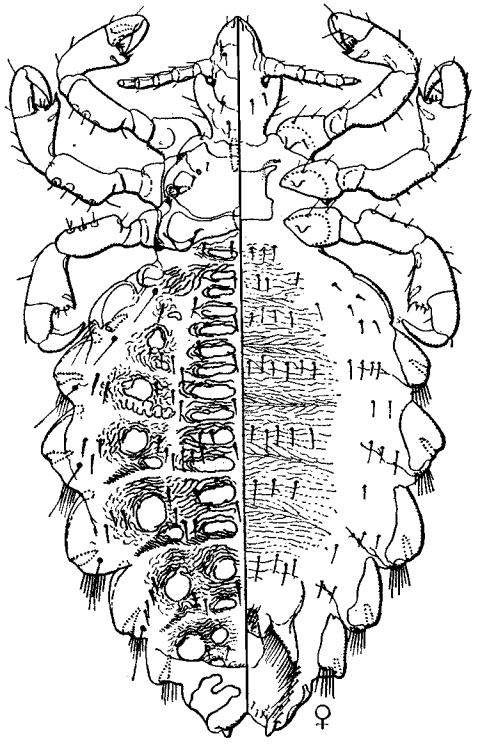

FIG. 267.—*Haematopinus tuberculatus* (Burmeister), female. From specimen in the Piaget Collection.

The question of the identity of *H. bufali* will be discussed more fully in connection with that species, but it may here be noted that in the writer's opinion the specimens in the Hamburg Collection identified by Fahrenholz as *H. bufali* are in reality *H. tuberculatus*.

It has previously been pointed out in connection with *H. suis* that the one specimen remaining in the Piaget Collection as a representative of his *H. tuberculatus* var. *penicillatus* is *H. suis*. Unfortunately this specimen does not agree with the description, which apparently refers to *H. tuberculatus*. Under the circumstances it seems best merely to allow the name *penicillatus* to lapse into oblivion.

There remains one more disturbing nomenclatorial question, that having to do with *Pediculus bufali-europaei* Latreille. This species was described from "buffaloes from Italy," which were presumably *Bos bubalus*, and obviously is a species of *Haematopinus*. The inference is inescapable that this is the same as *H. tuberculatus*, for *H. eurysternus*—in all the material before me—is not represented by specimens from the buffalo. But, aside from its replacement of *H. tuberculatus* in a host-list published by Fahrenholz and one reference in an early list, the name *bufali-europaei* seems to have appeared in literature only in connection with the original description. On the other hand, a very considerable body of literature has been built up under the name of *H. tuberculatus*.

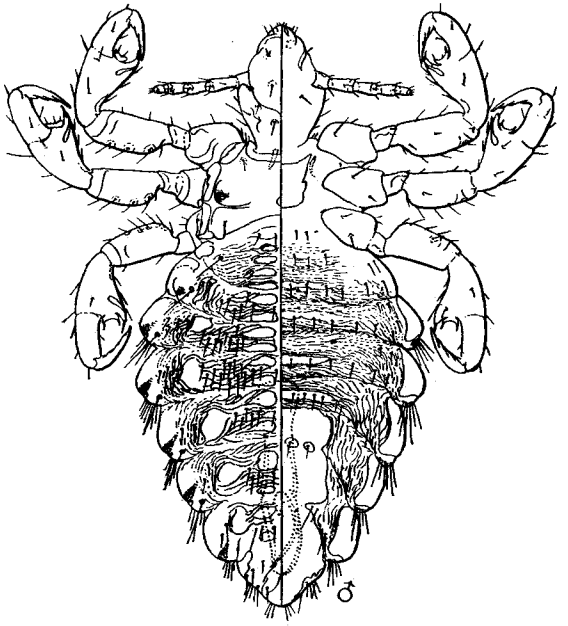

FIG. 268.—*Haematopinus tuberculatus* (Burmeister), male. From specimen in the Piaget Collection.

Under the circumstances, in spite of the fact that there is every reason to suppose that *H. tuberculatus* is a synonym of *H. bufali-europaei*, the writer refuses to displace the former name. He would hold that the case should be presented to the International Commission on Zoölogical Nomenclature with a request that the claims of priority be set aside in the interest of nomenclatorial stability.

No hesitation is here felt in placing all the specimens above recorded under a single species. Two lots from camel, including those from Australia and from the Punjab, India, differ from the typical form in being somewhat paler and smaller, being the smallest recorded above. In all other respects they are perfectly typical, and

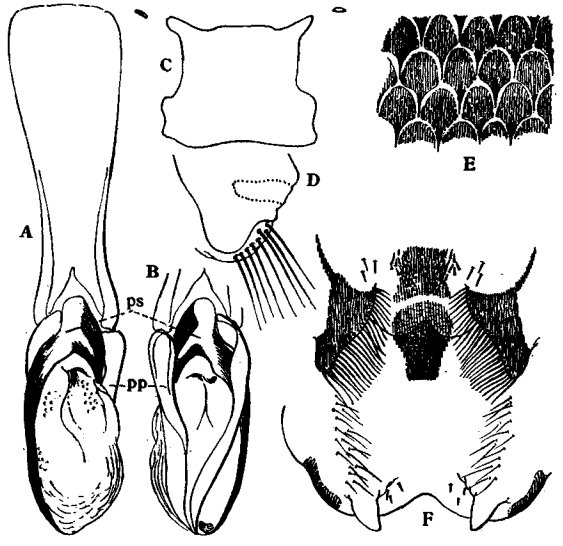

FIG. 269.—*Haematopinus tuberculatus* (Burmeister): *A*, *B*, genitalia of male; *C*, sternal plate of female; *D*, paratergal plate; *E*, ornamentation of derm; *F*, genital region of female.

the other specimens from camel are normal in all respects. The identification of this species with *Pediculus cameli* Linnaeus is utterly erroneous. *P. cameli* was based upon a figure given by Redi and is readily identifiable. It will stand as *Microthoracius cameli* (Linnaeus) and has been discussed elsewhere in this series.

8. Haematopinus bufali (De Geer)

FIGS. 270, 271, 272

1778. *Pediculus bufali* De Geer, *Memoires pour servir a l'histoire des Insectes*, **7**: 68; pl. 1, figs. 11–12.
1781. *Pediculus bufali-capensis* Fabricius, *Species Insectorum*, 2.
1844. *Pediculus phthiriopsis* Gervais, in Walckenaer, *Histoire naturelle des insectes aptères*, **3**: 306.
1874. *Haematopinus phthiriopsis* (Gervais), Giebel, *Insecta Epizoa*, p. 47.
1904. *Haematopinus phthiriopsis* (Gervais), Enderlein, *Zoologischer Anzeiger*, **28**: 141.
1908. *Haematopinus phthiriopsis* (Gervais), Dalla Torre, "Anoplura," *Wytsman's Genera Insectorum*, p. 11.
1909. *Haematopinus bufali* (De Geer), Neumann, *Archives de Parasitologie*, **13**: 500–505; figs. 2–5.
1915. *Haematopinus neumanni* Fahrenholz, *Archiv für Naturgeschichte*, **81** (Abt. A); Fasc. 11: 8.

PREVIOUS RECORDS. Originally described by De Geer from Cape of Good Hope, "sur le Buffle d'Afrique." Recorded by Neumann from "buffalo," Katanga, Congo Free State, and Nyasaland (Nuttall Collection).

SPECIMENS EXAMINED. From *"Buffelus caffer,"* Nyasaland (British Museum); from "buffalo," Ruwenzori District, Nyasaland, *G. A. H. Bedford* (Stanford University); and part of both the lots recorded by Neumann (Molteno Institute).

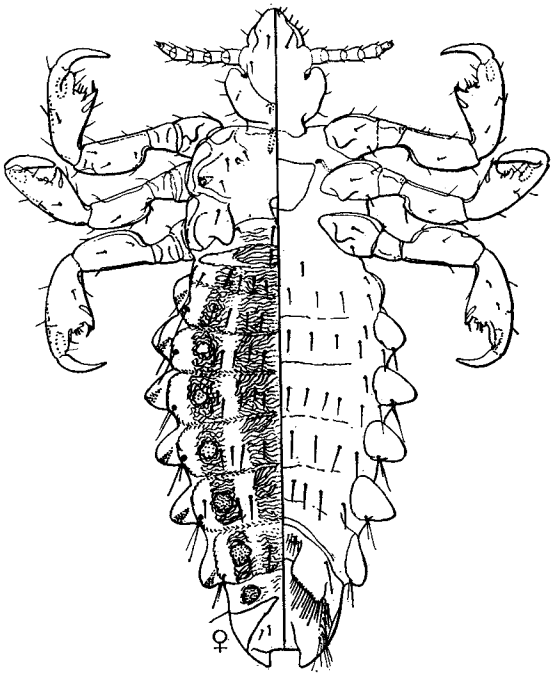

FIG. 270.—*Haematopinus bufali* (De Geer), female.

FEMALE (Fig. 270). Length, on slide, 4.00 to 4.5 mm. A very distinctive species because of its slender body, relatively enormous, sprawling legs, and very prominent abdominal paratergites. *Head* short and broad, the length only slightly exceeding the width, the post-antennal angles very prominent and rounded laterally, the occipital region constricted into a distinct "neck."

Thorax distinctly quadrate, heavily pigmented; sternal plate (Fig. 272 *C*) somewhat trapezoidal, not inclosing the openings of the sternal apophyses. *Legs* relatively very large and long, not marked with bands and spots of deeper color.

Abdomen elongate and slender. Paratergites of the second (apparent first) segment entirely lacking; those of the third to eighth segments forming prominent, acute conical projections, the posterior margin of each plate bearing one or two small setae. Dorsum marked by four longitudinal, pigmented bands in which the furrowing of the derm is strongly developed; the mesal bands develop no distinct plates, but in the lateral bands small, circular, deeply pigmented plates appear. Ventral side membranous throughout. Gonopophyses (Fig. 272 *D*) pale and fringed irregularly with small setae.

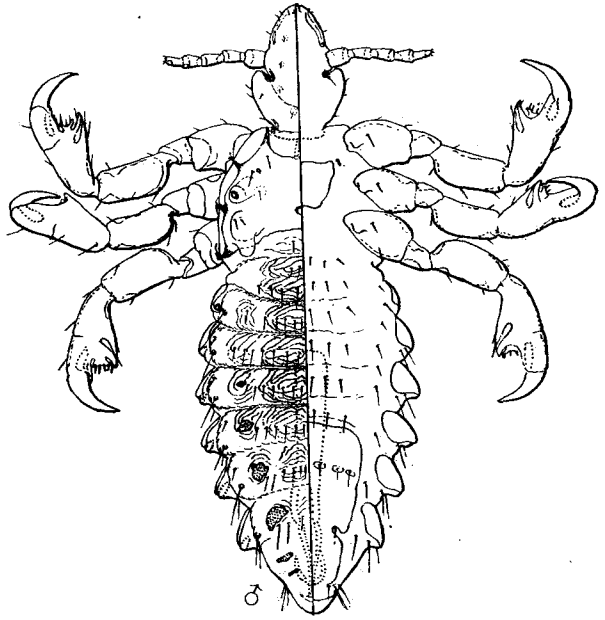

FIG. 271.—*Haematopinus bufali* (De Geer), male.

MALE (Fig. 271). Length, on slide, 3.5 to 4.00 mm. In general form and characters very similar to the female. Genital plate very large. *Genitalia* (Fig. 272 *A, B*) with the V-shaped pseudopenis common to the genus, this elongate and slender; with the sclerotic portions of the preputial sac forming a narrow, irregular, hook-like rim and with a very small, strongly curved penis (*p*).

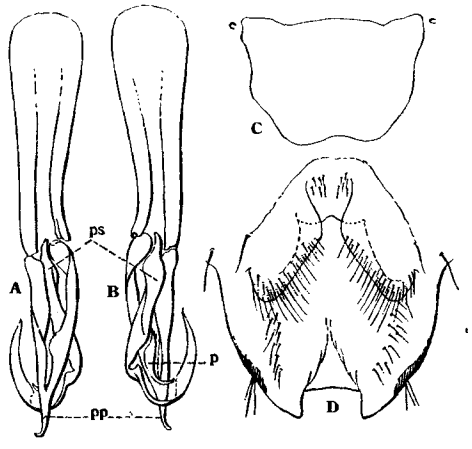

FIG. 272.—*Haematopinus bufali* (De Geer): *A, B*, genitalia of male; *C*, sternal plate of male; *D*, genital region of female.

NOTES.—An examination of the original description of ***Pediculus bufali*** has convinced the writer that Neumann was correct in his identification of the species. The description itself contains little information, but the characteristics of the species are striking and are indicated in De Geer's figures. He refers especially to the five pairs of lateral tubercles and his figure of the entire insect indicates these as they are in the specimens at hand. The size is stated to be "un peu plus petits que les Poux ordinaire des hommes," and the specimens at hand are in fact about as large as good-sized ***Pediculus humanus***. The name ***phthiriopsis*** Gervais was merely a substitute for *bufali* and need not be considered further.

The writer, therefore, refuses to follow Fahrenholz in considering that Neumann misidentified this species. The name *H. neumanni* Fahrenholz is here placed as a synonym of *H. bufali*. The opinion is here maintained—based upon an examination of the specimens identified by Fahrenholz—that the *H. bufali* of Fahrenholz is merely *H. tuberculatus*. These specimens were taken in a zoölogical garden. It is unfortunate that the specific identity of the host has not in each case been positively established, it not being possible to say definitely that the specimens at hand from African buffaloes are from ***Buffelus caffer***.

H. bufali is a very distinct form, having little in common with the other bovid-infesting species.

9. Haematopinus asini (Linnaeus)

FIGS. 273, 274, 275 C

1674. *Pediculus asini* Redi, *Experimenta circa generationem insectorum*, pl. 21.
1758. *Pediculus asini* Linnaeus, *Systema Naturae* (ed. 10), p. 612.
1781. *Pediculus asini* Linnaeus, Fabricius, *Species Insectorum*, p. 476.
1787. *Pediculus asini* Linnaeus, Fabricius, *Mantissa Insectorum*, p. 368.
1804. *Pediculus asini* Linnaeus, Latreille, *Histoire naturelle générale et particulière des Crustaces et des Insectes*, **8**: 99.
1805. *Pediculus asini* Linnaeus, Fabricius, *Systema Antliatorum*, p. 342.
1829. *Haematopinus asini* (Linnaeus), Stephens, *Catalogue of British Insects*, **2**: 329.
1838. *Pediculus macrocephalus* Burmeister, *Genera Insectorum, Rhynchota, Species 18.*
1842. *Haematopinus asini* (Linnaeus), Denny, *Monographia Anoplurorum Britanniae*, p. 32; pl. 25, fig. 1.
1865. *Haematopinus equi* Simmonds, *Journal of the Royal Agricultural Society of England* (2), **1**: 60.
1874. *Haematopinus macrocephalus* (Burmeister), Giebel, *Insecta Epizoa*, p. 44; pl. 2, fig. 5.
1880. *Haematopinus macrocephalus* (Burmeister), Piaget, *Les Pediculines*, p. 652; pl. 53, fig. 3.
1880. *Haematopinus macrocephalus* var. *colorata* Piaget, *ibid.*, p. 654.
1891. *Haematopinus asini* (Linnaeus), Osborn, *United States Department of Agriculture, Division of Entomology, Bulletin* (old series), **7**: 21; fig. 9.
1896. *Haematopinus asini* (Linnaeus), Osborn, *ibid., Bulletin* (new series), **5**: 180; fig. 103.
1904. *Haematopinus asini* (Linnaeus), Enderlein, *Zoologischer Anzeiger*, **28**: 141.
1908. *Haematopinus asini* (Linnaeus), Dalla Torre, "Anoplura," *Wytsman's Genera Insectorum*, p. 10.
1910. *Haematopinus asini* (Linnaeus), Mjöberg, *Arkiv för Zoologi*, **6**: 167.
1916. *Haematopinus asini* (Linnaeus), Fahrenholz, *ibid.*, **47**: 271.
1916. *Haematopinus elegans* Fahrenholz, *Archiv für Naturgeschichte*, **81** (Abt. A): Fasc. 11: 22; fig. 8 (August).
1916. *Haematopinus elegans* Fahrenholz, *Zoologischer Anzeiger*, **48**: 90.
1916. *Haematopinus macrocephalus* (Burmeister), Fahrenholz, *Zoologischer Anzeiger*, **47**: 271 (July).
1916. *Haematopinus minor* Fahrenholz, *ibid.*, **48**: 90 (October).
1924. *Haematopinus macrocephalus* (Burmeister), Freund, *Prager Tierärztlicher Archiv*, **4**(A): 52; fig. 6.

PREVIOUS RECORDS. From domestic horses in many parts of the world. From the zebra, *Equus burchelli*, Hamburg Zoölogical Garden.

SPECIMENS EXAMINED. The material in the Piaget Collection (British Museum), including five females, one male, and one immature specimen labeled "*Haematopinus macrocephalus*, sur un cheval," and three females and one male labeled "*Haematopinus macrocephalus* var. *coloratus*, sur un *Equus asinus*." North and South America: domestic horses, Florence, Montana, and San Jose, California (Stanford University); burro (donkey), Barranquilla, Colombia, *L. H. Dunn* (Stanford University). Africa:

Equus caballus, Egyptian Sudan, and horse, Borao, British Somaliland, *Dr. R. E. Drake-Brockman* (British Museum). Australia: domestic horse, Sydney, New South Wales, *H. F. Clinton* (Stanford University). Burma: mules, N. Chin Hills (British Museum). Specimens in the British Museum labeled as "*H. eurysternus*, pres. by *J. E. Gray*," without host or locality.

Also the types of *Haematopinus minor* Fahrenholz, "von *Equus burchelli* Gray. Zool. Garten Hamb. Zool. Gesellsch. ded. 26.5.1893. H. Fahrenholz det., praep. 1914/16," received as a loan through the kindness of Dr. Titschack of the Hamburg Museum.

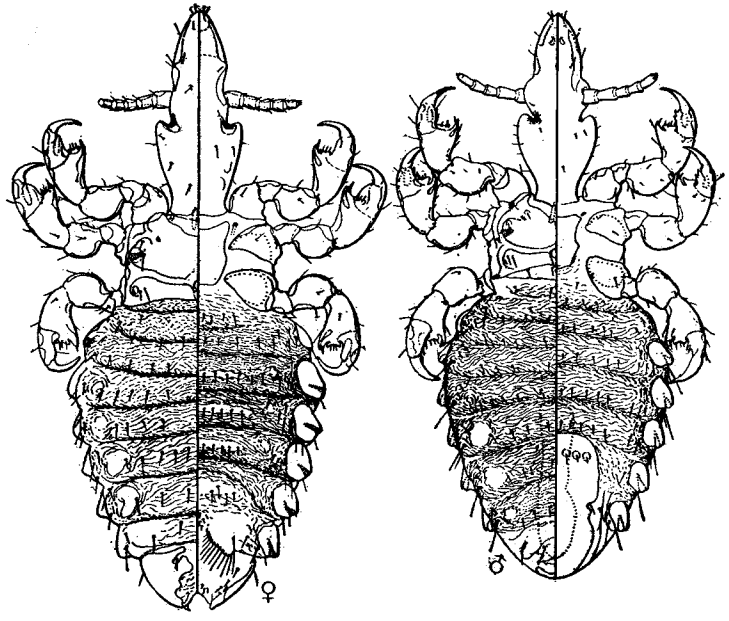

FIG. 273.—*Haematopinus asini* (Linnaeus), male and female.

FEMALE (Fig. 273). Length, on slide, from 2.5 to 3.5 mm. A very distinctive species by reason of the extraordinarily large and long head and comparatively small legs and body. *Head* nearly two and a half times as long as broad, the portion anterior to the post-antennal sinus somewhat longer than the remainder; post-antennal angles quite prominent; hind

head with the lateral margins gracefully curved and sinuate, the head constricting into a "neck." Entire head quite strongly pigmented.

Thorax scarcely more than half as long as the head, quadrate, the dorsum strongly pigmented; sternal plate (Fig. 274 *H*) of quite constant form, quadrate, somewhat longer than wide, the lateral margins slightly convex, the anterior margin slightly emarginate; openings of ventral apophyses not inclosed within it. *Legs* short and stout, quite uniformly pigmented, the tibial pad (praetarsal sclerite) very small.

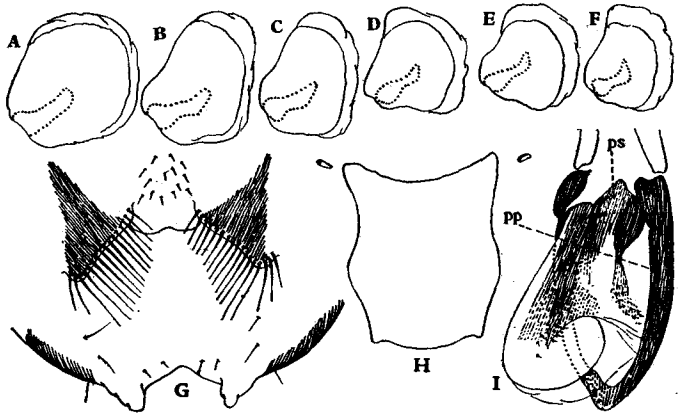

FIG. 274.—*Haematopinus asini* (Linnaeus): Paratergal plates, showing variation in size, based upon specimens from: *A*, horse in Piaget Collection; *B*, horse, California; *C*, horse, Montana; *D*, ass, Colombia; *E*, type of *H. asini coloratus* Piaget; *F*, ass, Colombia. *G*, genital region of female; *H*, sternal plate; *I*, genitalia of male.

Abdomen relatively small, quite deeply pigmented in typical examples that have not become greatly expanded; pleurites of the second (apparent first) segment lacking, those of the third to eighth segments forming small conical protuberances; tergal plates entirely lacking except for small submarginal areas developed on the fourth to eighth segments, these becoming progressively stronger posteriorly; derm thickly beset with small folds and wrinkles which are less conspicuous in more expanded specimens. Ventral side faintly sclerotic, likewise finely wrinkled; gonopophyses (Fig. 274 *G*) small and inconspicuous.

MALE (Fig. 273). Length 2 to 2.5 mm. In general very closely resembling the female. Genital plate large. *Genitalia* (Fig. 274 *I*) of the type characteristic of the genus, the pseudopenis bluntly V-shaped, the

preputial sac with a heavy, slightly hooked knob which articulates with the basal plate.

NOTES.—This species is very distinct from the others of the genus, although in character of the genitalia of the male it approaches the bovid-infesting forms.

There is a certain amount of variation in size and coloration of the specimens at hand, but not enough to support any attempt at a division of the species. In Fig. 274 *A–F* are shown comparable paratergites from specimens of the same sex. While there is a noticeable difference in size, the intergradation is such as to make a separation impossible. Specimens at hand from donkeys (Colombia and Piaget Collection) tend to be slightly smaller and paler than those from horses, but there are no structural differences.

The specimens of *Haematopinus minor* are the smallest seen (female 2.5, male 2.00 mm.), but they are only slightly smaller than those from donkey and in addition are somewhat shrunken. In naming this species, Fahrenholz emphasized especially the paleness of color. As has previously been noted, there is a marked tendency toward paleness in specimens from the Hamburg Museum collection, apparently because of the particular preserving fluid there employed. In the specimens of *H. minor* even such normally dark regions as the claws are pale. There is no adequate basis for the separation of this species from *H. asini*.

Specimens of *H. elegans* Fahrenholz have not been available. This species was described from Gobabis, Southwest Africa, without indication of host other than the assumption that it would be some species of *Equus*. In the original description it is compared with *H. eurysternus* rather than *H. asini* and no basis is given for its separation from the latter. On the evidence of the figures it is very obviously nothing but *H. asini*.

10. Haematopinus acuticeps n. sp.

FIG. 275

SPECIMENS EXAMINED. Two females, type and paratype, from *Hippotigris* (= *Equus*) *burchelli*, Mpwapwa, Tanganyika Territory, received through the kindness of Mr. G. A. H. Bedford.

FEMALE (Fig. 275 *A*). Length, on slide, 5.5 to 5.75 mm. A species of form very similar to *H. asini*. *Head* (Fig. 275 *B*) of the same form as in *H. asini* (Fig. 275 *C*) and of the same length, but slightly more pointed anteriorly and apparently without the occipital apophyses of the latter. *Thorax* and legs essentially as in *H. asini*, but the sternal plate (Fig. 275 *D*) small and narrow. *Abdomen* relatively very large and swollen, the derm membranous and but weakly pigmented, setae few and minute. Ninth tergite with the usual sclerotic areas and the fifth to sixth tergites each with a small, faintly sclerotic submarginal area on each side. Paratergal plates strongly sclerotic, relatively small, the spiracles also small. Venter entirely membranous except for the conspicuous and strongly sclerotic gonopophyses, which are slender, tapering, and somewhat sickle-shaped. Ventral wall of the vagina with a pair of small, sclerotic areas.

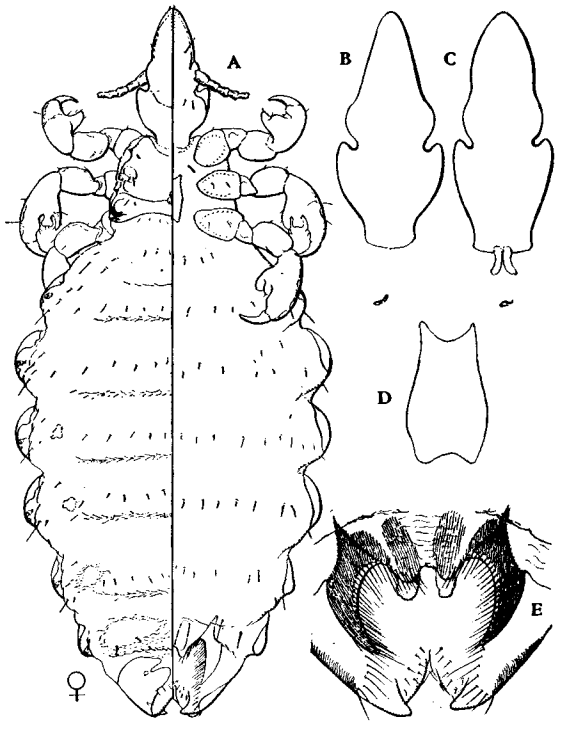

FIG. 275.—*Haematopinus acuticeps* n. sp.: *A*, female; *B*, outline of head; *D*, thoracic sternal plate; *E*, genital region. *Haematopinus asini* (Linnaeus): *C*, outline of head of female to same scale as *B*.

NOTES.—*Haematopinus minor* Fahrenholz is definitely ascribed to the same host as is *H. acuticeps*, and *H. elegans* Fahrenholz is also a presumably equid-infesting species and is recorded from Africa. But in spite of any presumption as to identity which might be suggested, it is evident that *H. acuticeps* is neither of these species, both being—in the opinion here adopted—clearly synonyms of *H. asini*, while *H. acuticeps* is equally clearly distinct. The difference in size is perhaps not significant, although the two specimens of *acuticeps* are nearly double the length of average *asini*, since practically all of this difference is in the abdomen, but the form of the sternal plate and, above all, that of the gonopophyses leave no room for question.

It is not probable that two distinct species of *Haematopinus* occur upon zebras. The types of *H. minor* Fahrenholz were taken in a zoölogical garden and may possibly have been stragglers from horses or asses. In any case there is no question of the distinctness of *H. acuticeps*.

11. Haematopinus longus Neumann

FIG. 276

1912. *Haematopinus longus* Neumann, *Bulletin de la Société Zoölogique de France*, 37: 141; fig. 1.

1916. *Haematopinus longus* Neumann, Ferris, "Catalogue and Host List of the Anoplura," *Proceedings of the California Academy of Sciences* (4), 6: 144.

PREVIOUS RECORDS. Known only from the original description, from *Cervus unicolor*, Kota, Nepaul, India.

SPECIMENS EXAMINED. A single female, with the data of the types, received through the kindness of the Indian Museum.

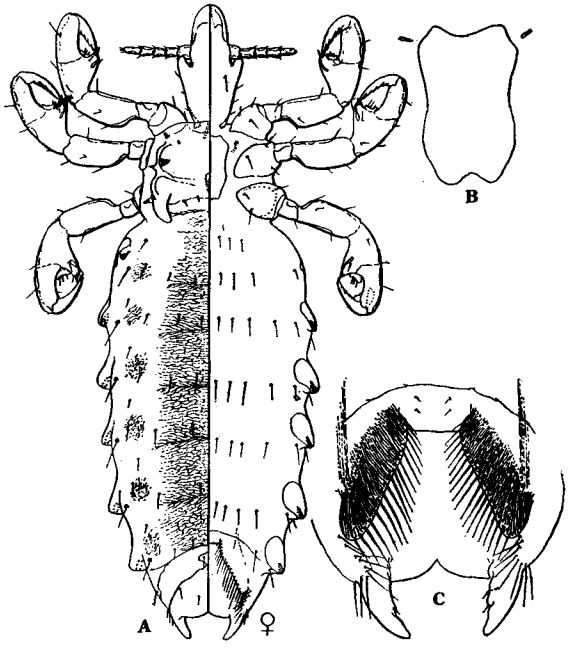

FIG. 276.—*Haematopinus longus* Neumann: *A*, female; *B*, thoracic sternal plate; *C*, genital region.

FEMALE (Fig. 276 *A*). Length, on slide, 4.5 mm. A very slender, pale species. Head rather slender, about twice as long as wide, the postantennal angles acute and forward-pointing, the hind head tapering regu-

larly to the occipital margin. *Thorax* about as long as the head and about three times as wide, quadrate, the lobes at the posterior lateral angles unusually long. *Sternal plate* (Fig. 276 *B*) elongate, not inclosing the openings of the ventral apophyses. *Legs* normal.

Abdomen elongate and slender, with the paratergites forming small, widely separated, conical protuberances, those of the second (apparent first) segment lacking. Dorsum membranous, except for the usual areas on the ninth tergite, the derm showing only faintly pigmented and reticulated median longitudinal bands and still fainter submarginal spots. Venter entirely membranous; gonopophyses (Fig. 276 *C*) elongate, fringed with a single marginal row of setae.

MALE. The male is described by Neumann as essentially like the female, but with the abdomen shorter and relatively wider. The details of the genitalia are not described.

NOTE.—This is the only species of *Haematopinus* as yet recorded from members of the family Cervidae. It is a very distinct form and cannot be confused with any other of the known species.