SUCKING LICE

The sucking lice are obligatory, wingless, hemimetabolous permanent ectoparasites of eutherian mammals. They have adapted successfully to the microenvironment of the host body surface, the far environment, and coevolved with the mammalian hosts. Accordingly, the sucking lice are relatively host specific; often a species of Anoplura is restricted to a single host species. They spend their entire life on the individual host, and they have developed many unique adaptive traits for an ectoparasitic mode of life through a long association with mammals. Their body is dorsiventrally flattened and the head is equipped with a preoral proboscis and sucking mouthparts. They are exclusively blood suckers.

Naturally, sucking lice are closely associated with transmission of certain mammalian diseases. Pediculus humanus is a well-known vector of epidemic relapsing fever caused by Borrelia recurrentis and the sole agent in the transmission among people of typhus fever caused by Rickettsia prowazekii.

The immature stages of the sucking lice are poorly known. Ferris (1951) illustrated several, but until 1959 there was no serious effort to study them. For the first time, Cook and Beer (1959) made an attempt to systematically study Hatchedplura larvae in North America. Following Cook and Beer's pioneering work, the larvae of numerous lice have been studied by Kim (1955, 1965), Smith and Sowick (1965), on mice and sheep (Murray 1960, 1961, 1963a, b). Kim (1971, 1972, 1975) published on population ecology of Anoecophlephrium californiense (Osborna) and Prochemophlephrium flavescens (Ferres) on northern fur seals. Factors influencing the distribution of the sucking lice on the host animal were studied by Murray (1960, 1961, 1963a, b) and by Jensen and Roberts (1966).

BIOLGICAL AND ECOLOGY

Information on biology of the sucking lice is limited to a handful of species, such as Pediculus humanus (Buxton 1956), Haematopinus suis (Hall 1952), and B. cervorum Deeny (Matthes 1944, 1946). Murray and his colleague worked on population biology of the sucking lice on seals (Murray 1958; Murray and Nichols 1963). Murray, Smith and Sowick (1965), on mice and sheep (Murray 1960, 1961, 1963a, b), Kim (1971, 1972, 1975) published on population ecology of Anoecophlephrium californiense (Osborna) and Prochemophlephrium flavescens (Ferres) on northern fur seals. Factors influencing the distribution of the sucking lice on the host animal were studied by Murray (1960, 1961, 1963a, b) and by Jensen and Roberts (1966).

DESCRIPTION

Immature lice are naturally smaller than adults, with a relatively small abdomen. All are quite similar to adults in head, thorax, and abdomen. Body is more or less dorsoventrally flattened, and the mouthparts are modified for sucking blood.

Head generally conical with definite proboscis in which are located peculiar piercing-sucking mouthparts. There is a preoral proboscis. Throat is very short, filiform, usually five-segmented, occasionally reduced to three or four segments. Fourth and fifth segments each bearing a tuft organ and often additional pore and peg organs. No uccel present. Compound eyes usually reduced or absent.

Thorax narrower than abdomen, with a pair of mesothoracic spiracles. Thoracic dorsum mostly composed of subcoaral or pleural components. Ventral genital membranes, but occasionally with a median sternal plate in second and third stages. Legs strongly developed, with a modification of the tibia and tarsus for effective holdfast. Tarsus une-segmented, with a strong claw.

Abdomen of ten segments, of which only nine are easily identified, with terga and sterna usually not sclerotized. Paratergites often developed in the second and third stages. Abdomen normally bearing six pairs of spiracles on lateral sides of segments 3 to 8. In the first instar abdominal spiracles often infundible. Sexual determination can often be made in the third and rarely in the second stage.


MORPHOLOGY AND CHAETOLOGY

The head is of a generalized type usually found in adults (fig. 23.1) but shows several unique characters in some taxa. Larvae of Hatchedplura and Prochemophlephrium have small segmental tubercles on the ventral side of the head, antennae, and even on the coxae (figs. 23.18, 23.19, 23.20, 23.21), whereas those of Prochemophlephrium have numerous heavily sclerotized spiniform setae on the head (figs. 23.10, 23.11, 23.13). The number of antennal segments is usually five or six in the adults except for Leucophlephrum vanhoutti Kim and Emerson, which has three segmented antennae in all stages. In some taxa, however, larvae have fewer segments than the adults. Larvae of Anoecophlephrium californiense (Osborn) have four-segmented antennae, whereas the adults have five.
Thoracic sternal plate usually undeveloped in the larvae and always lacking in the first stage. In some taxa, the sternal plate is already developed in the second stage, for example, *Euderleminella* (figs. 23.30, 23.31).

The abdomen is proportionally small and usually composed of ten segments of which the last segment may not be distinct (fig. 23.2). Each segment can be identified by the position of spiracles and setal rows. In *Hoplopleura oncomyctea* Cook and Beer and *H. oncomyctea* Ferris, the abdominal segmentation is evident in the first stage (figs. 23.39a, b). The spiracles are usually evident in the second and third stages but are occasionally seen in the first stage, as in *Hoplopleura arboricula Kellogg* and Ferris and *H. scariola* Ferris. The spiracles are often associated with paratergites, which usually become sclerotized in the second stage, yet are distinctly visible in all stages of some species as in *Hymenopterus quadririparius* Fabrenchitz and *H. cyrtosternum* Denys (figs. 23.34–23.37).

The primary pattern of chaetotaxy on the head, antenae (fig. 23.11), thorax, and legs is already developed in the first stage and does not change throughout postembryonic development. New setae are added to the primary chaetotaxy or each seta becomes longer and larger as it goes through successive stages to the adult. No setae of the primary chaetotaxy are lost during metamorphosis, although some setae in the larval instars are replaced by other types or become greatly reduced in subsequent instars. The most striking difference between larvae and adults is in the abdominal chaetotaxy. In more generalized taxa, such as *Hymenopterus* and *Solenopsis*, the adult chaetotaxy is already mostly developed in the second stage (figs. 23.35, 23.49). In specialized taxa, exemplified by *Hoplopleura* and *Polypatos*, larval lack the extensive chaetotaxy of the adults (figs. 23.38–23.43, 23.57–23.59). In many species larvae I and II simply have one or two rows of central abdominal setae (CAS) for each side (dorsal and ventral) and one to three marginal abdominal setae (MAS) on abdominal segments 7 and 8, and sometimes on segment 9 (fig. 23.2).

**EXPLANATION OF CHAETOTAICAL TERMS**

- **Ac**—accessory setae
- **An**—anterior setae
- **Ap**—apical setae
- **C**—central setae
- **D**—dorsal setae
- **F**—facial setae
- **H**—head setae
- **I**—inter setae
- **M**—marginal setae
- **Md**—median setae
- **O**—outer setae
- **P**—papillae
- **Po**—posterior setae
- **Sp**—supra- setae
- **V**—ventral setae

**Position**

- **A**—abdominal
- **At**—antennal
- **G**—genital
- **H**—head
- **M**—metathoracic
- **O**—occipital
- **Or**—oral
- **P**—parietal
- **P**—pleural
- **S**—setae
- **T**—tegular

**Structure**

- **A**—abdominal
- **At**—antennal
- **G**—genital
- **H**—head
- **M**—metathoracic
- **O**—occipital
- **Or**—oral
- **P**—parietal
- **P**—pleural
- **S**—setae
- **T**—tegular

**COMMENTS**

Sucking lice are widely distributed throughout the world (Hepkins 1949; Ludwig 1968) wherever host animals exist. The anopluran fauna is especially rich in the Ethiopian region. Ludwig (1968) recorded 34.4 percent of the total, or 135 species, from the Ethiopian region, 18.3 percent from the Paleartic, 13.3 percent from the Oriental, 10.2 percent from the Neartic, and 11.0 percent from the Neotropical. Currently, 76 species of sucking lice (19 families, 42 genera) are known from North America (Kim et al. 1986).

The diversity of the Anoplura is not fully known as yet. At present, there are 740 species known from approximately 840 species (241 genera) of mammals (Kim and Ludwig 1978). They are parasitic on diverse groups of mammals but are apparently absent in several major mammalian taxa: Monotremata, Marsupialia, Edentata, Pholidota, Chiroptera, Cetacea, Proboscidea, Sirenia, and most terrestrial Carnivora (Kim 1985).

**COLLECTION AND PRESERVATION TECHNIQUES**

Sucking lice are small and often difficult to find on the host animals. Most immature lice are very small and usually escape visual examination of the host skin, unless special care is taken. When sucking lice are found on freshly killed animals, all specimens should be preserved in 75–90 percent ethyl alcohol. They can be collected from museum skins by combing; these specimens should be relaxed in Barber's fixative for preservation in alcohol (but the specimen in Barber's is a known carcinogen, so use proper precautions or another relaxing technique).

To collect all stages, the host animal may be trapped in the field and skinned. Each skin or hide is placed in a separate plastic bag in order to prevent contamination and keep frozen for future study. To extract lice, the entire skin or a small piece of a large hide is placed in a beaker with 1 percent trypsin (certified 1:250) buffered to pH 8.3 + with sodium phosphate and kept at ambient temperature for 10 to 24 hours. After the initial digestion period, an equal amount of 10 percent KOH solution is added to the beaker containing the digested skin. This mixture is then boiled for several minutes or until hair and tissues are completely dissolved. The cleared specimens are then stained out of the resulting solution through an 80-mesh screen. This process recovers the entire loose population including eggs (Cook and Beer 1950; Kim 1972). The concentration of KOH and the length of the digestion period may vary with the size and thickness of skin and the amount of blood and fat material.
HOST LIST OF NORTH AMERICAN ANOPLURA

Order Anoplura, insects

Family Talydae, males

Haematopinidae

Order Lagomorpha, lagomorphs

Family Leporidae, hares and rabbits

Hemocombidae

Family Rodentia, rodents

Order Sciuridae, squirrels

Enderleinellidae

Order Heteromyidae, heteromyids

Fahreriidae

Family Cricetidae, New World rats

and mice

Hepilopidae

Order Muridae, Old World rats

and mice

Neohematopinidae

Polyplax

Family Carnivora, carnivores

Order Canidae, canids

Linognathus

Family Mustelidae, mustelids

Latagophthirus

Order Pilliptidae, pipipes

Family Otaridae, eared seals

Proechimiphthirus

Family Odobenidae, walrus

Antarctophthirus

Family Phocidae, hair seal

Antarctophthirus

Order Antarticidae, even-toed ungulates

Family Tayassuidae, peccaries

Pecaroecus

Family Cervidae, cervids

Solenops
gidae

Family Hovidae, bovines

Linognathus

Family Suinae, pigs

Haematopinidae

Order Perissodactyla, odd-toed ungulates

Family Equidae, horses

Haematopinidae

Order Primates, primates

Family Homoidea, humans

Pediculidae

Phthirus

KEY TO THE FAMILIES OF NORTH AMERICAN IMMATURE ANOPLURA

1. Head with distinct eyes (fig. 23.3) or suboculate ocellar points (fig. 23.4) on lateral margins posterior to antennae ........................................................................................................ 2

2.1. Head without external eyes or prominent ocellar points (fig. 23.5) ........................................................................................................ 5

2.2. Head with prominent ocellar points but without eyes (fig. 23.4); on bovines, pigs and horses ........................................................................................................ 5

3. Head with eyes having a distinct lobe but without ocellar points (fig. 23.3); on other hosts ........................................................................................................ 3

3.2. Head long and slender, much longer than thorax (fig. 23.6); large loose with narrowly elliptical abdomen; on peccary Pecaroecidae (p. 238)

3.3. Head about as long as thorax (figs. 23.7, 23.8); small lice with oval or elliptical abdomen; on humans ........................................................................................................ 4

4.3. Compact, with body less than 2X as long as wide (fig. 23.7); thorax very wide; fore legs slender, mid and hind legs very stout, each with stout claw; on humans Puphides (p. 241)

4.4. Slender, with body more than 2X as long as wide (fig. 23.8); abdomen long, wider than thorax, all legs slender, each with an acuminate claw; on humans Pediculidae (p. 239)
ORDER ANOPLURA

51'. Head and thorax thickly covered with various setae (fig. 23.19) or with strong spiniform setae (fig. 23.19); spiracular atrium tubular (fig. 23.11a); on sea lions, walrus, and river otter ... Echinophthiridae (p. 230)

5'. Head and thorax with only a few setae (fig. 23.11a); spiracular atrium bulbous (fig. 23.11b); on terrestrial mammals ......................................................... 6

6(5'). Fore legs subequal to mid legs in size and shape, both more slender and smaller than hind legs, each with acuminated claw (fig. 23.12); on squirrels ................................ Endophterididae (p. 233)

6'. Fore legs smaller of the 3 pairs (fig. 23.13, 23.14); mid legs usually subequal to hind legs in size and shape or at least somewhat larger than fore legs, each with larger and stouter claws ................................................. 7

7(6'). Abdomen without any evidence of paratergites in all stages (fig. 23.15); first instar with 4 rows of VCAS (ventral central abdominal setae) (figs. 23.14, 23.15); on even-toed ungulates and camels ................................. Linognathidae (p. 237)

7'. Abdomen usually with paratergites in second or third larval stage (fig. 23.16); first instar with no, or at most, 2 rows of VCAS (fig. 23.17); on small mammals ............................................. 8

8(7'). Hind legs largest of three pairs, stout, each with a stout, blunted claw (fig. 23.13); small unsegmented tubercles densely distributed on ventral surface of head, first antennal segment and coxae (fig. 23.18); parasitic on rodents (Hoplopleuridae), or if absent, abdomen with 4 rows of CAS (central abdominal setae) in third stage (fig. 23.43); parasitic on moles (Haematopinicipodes) ... Hoplopleuridae (p. 233)

8'. Hind legs usually subequal to mid legs in shape and size (fig. 23.14); head, basal antennal segment and coxae usually without such tubercles (fig. 23.19); all instars usually with more than 4 rows of CAS; on rodents .................................. Polyplacidae (p. 241)

The figures show only half the rows since the left half of each figure is a dorsal and the right half is a ventral view.

ECHINOPHTHRIDAE

The Echinophthiridae

Figures 23.20–23.27

Relationships and Diagnosis: The echinophthirids are rather unique lice, exclusively parasitic upon aquatic carnivores, namely Pinnipedia and aquatic Mustelidae. They are somewhat related to the Haematopinicipodes. All the echinophthirids are easily recognized by the presence of unique spines of a tubular atrium (Key fig. 23.11a) and variously shaped setae on the head and thorax; tuberculoform and setaceros setae of various sizes (Antarctophthirius, Echinophthirius, and Latophthirius) or strong spiniform setae (Proechinophthirius). The echinophthirids are well developed; meso- and metathorax spiracles small, with specialized closing apparatus; no sternal plate. Abdomen oval, with six small spiracles, each with specialized closing apparatus; no tergal, sternal, or paratergal sclerites developed; with numerous spiniform setae, scales and regular setae in Antarctophthirius (figs. 23.25, 23.26) and Latophthirius; or with numerous spiniform and regular setae in Echinophthirius and Proechinophthirius (figs. 23.21–23.23) and in the first instars of Antarctophthirius (fig. 23.25).

Comments: Five genera are presently recognized, Proechinophthirius, Echinophthirius, Lepadophthirius, and Antarctophthirius on Pinnipedia, and Latophthirius on river otters (Mustelidae, Carnivores). All genera except Lepadophthirius occur in North America.

Selected Bibliography


Kim and Emerson 1974.


ENDERLEINELLIDAE

The Enderleinellidae

Figures 23.28–23.33

Relationships and Diagnostic: Very small lice, related to the hoplopleurids, but easily distinguished from other lice by having the fore legs subequal to the mid legs in size and shape, both small and slender. DHFS are very small but VHFS are distinct and large in all larval stages.

Biology and Ecology: The Enderleinellidae are exclusively parasitic on squirrels (Sciuridae).

Description: Third-stage larvae about 0.5 mm in length. Head with anterior margin rounded or truncate; antennae five-segmented; dyscostral suture distinct; DHFS very small but VHFS distinct and long. Thorax with comparatively large DPTS, thoracic sternal plate generally absent. Abdomen with two central rows of DCAS and VCAS and three visible pairs of spiracles in larva III.

Differences between species and between the early stages are striking in abdominal morphology (figs. 23.29–23.31). The first stage has only two pairs of MAS. The second stage has four pairs of MAS and five to seven or more pairs of DCAS and VCAS, and usually three or more paratergites on each side. The third stage has six pairs of MAS and numerous LAS in addition to CAS. On the anterior half of the abdomen there are four or more paratergal plates on each side. In E. longipes Kellogg and Ferris there is no evidence of paratergites but the thoracic sternal plate is developed in the second and third stages (figs. 23.30, 23.31).

Comments: Five genera are presently recognized: Enderleinellus (43 species), Wurmseria (3 species), Microphthirius (1 species), Phthirunculus (1 species), and Atopophthirius (1 species) (Kim and Ludwig 1978). Enderleinellus (figs. 23.28–23.31) and Microphthirius (figs. 23.32, 23.33) occur in North America.

Selected Bibliography

Ferris 1951.
Kuhn and Ludwig 1965.

HAEMATOPIIDAE

Haematopinids, Wrinkled Sucking Lice

Figures 23.34–23.37

Relationships and Diagnostic: The haematopinids are among the most devastating ectoparasites of domesticated animals. They are easily distinguished from other lice by their large size, the presence of prominent ocular points posterior to the antennae, all legs subequal in size and shape, and abdominal cuticular leathery and minutely wrinkled.

Biology and Ecology: The life cycle takes three to five weeks from eggs to adults. The incubation period for eggs takes 10–17 days and each stage requires three to seven days before molting (Matthysse 1946). However, the total period for the life cycle varies by season and host species.

Each species prefers specific parts of the host body by season. During August and September Haematopinus euxenus Denny is found in the ears near the tips but the main area of infestation is the tip of the neck in the winter in New York state (Matthysse 1946). H. suis L. frequents the folds of skin on the neck and the jowl, the inside and the base of the ears, the inside of the legs, flanks, and, in smaller numbers, the back (Florence 1921). This distribution pattern may be altered by seasonal temperature changes.

H. suis feeds readily on humans and other hosts and is well adapted for experimental work. Hosts of Haematopinus are Susidae, some Bovidae, Cervidae (Artiodactyla), and Equidae (Perissodactyla).

Description: Third instar 2–3.8 mm long. Head with distinct ocular points; antennae five-segmented; primary chaetotaxy distinct. Thorax much wider than head, heavily pigmented, with distinct notal pit and large mesothoracic spiracles; no evidence of sternal plate. All legs subequal in size and shape, each leg with strong acuminate claw. Abdomen membranous, leathery and wrinkled, with distinct paratergites and spiracles on segments 3–5; with numerous sclerotic plates, with 9 DCAS, 2–6 Dinas, 3–7 VMAS on segments 1–7, 1–3 VMAS on each side (fig. 23.37).

Larva II (fig. 23.35) is very similar to larva III in general appearance, but smaller. Larva I (fig. 23.34) is naturally smaller, with a reduction in chaetotaxy and fusion of sclerotic plates, and with no mesothoracic seta.

Comments: This monotypic family, with 22 known species, is widely distributed throughout the world. Haematopinus euxenus Denny, H. quadridentatus Fausto e Holz, and H. tuberculatus (Burmeister) are important cattle lice (Meloney and Kim 1974). H. suis and H. suis canalis are lice of swine; H. suis (L.) is an important parasite of horses.

Selected Bibliography

Bruce 1947.
Craufurd-Benson 1941.
Florence 1921.
Matthysse 1946.
Roberts 1953.
Stimic and van der Merwe 1958.

HOPLOPLEURIDAE

The Hoplopleurids

Figures 23.38–23.43

Relationships and Diagnostic: The hoplopleurids are specialized lice somewhat similar to Linognathidae and Polyplacidae. Larvae of Hoplopleuridae can be distinguished from the Linognathidae by having the hind legs stout and usually larger than the mid and fore legs, and each leg with a stout and blunt claw. Larvae of the subfamily Hoplopleurinae have numerous tubercles on the ventral side of the head and antennae, whereas the Haematopinidae larvae lack ventral tubercles on the head and usually have distinct paratergites.
Figures 23.34–23.37. *Hematopinus*. *Hematopinus eurysternus* Diney. (23.34) larva I; (23.35) larva II male; (23.36) larva III male; (23.37) larva III female.


**Biology and Ecology**: Hoplopleurinae are parasitic on rodents and pikas (Ochotonidae, Lagomorpha), and Haematopinioidea are parasites of moles and shrews (Taeniiidae and Soricidae; Insectivora) and myomorph rodents (Gliridae and Zapodidae).

**Description**: Small lice; larva I 0.30–0.50 mm long, larva II 0.35–0.70 mm, and larva III 0.60–0.90 mm. Head with anterior margin irregularly rounded or truncated and without external eyes or ocellar points; antennae usually five-segmented or rarely four-segmented (*Ancyroplax* and *Hematopinioidea*, both on Insectivora); numerous tubercles usually present on the ventral head (*Hoplolaelisurus* and *Hieronymus*). Thorax gradually larger than head; thoracic sternal plate usually lacking except *Schizophractus*; mesothoracic spiracles small; no notal pit. Fore legs always small, each with an acuminate claw; mid legs usually larger than fore legs, although similar in shape; hind legs usually largest, each with a stout claw and highly developed tibial thumbs. **Abdomen** usually with one or more pairs of MAS and two central rows of DCAS and VCAS.
Figures 23.48–23.50. Linognathidae. Solopsgotes farandi (Møbjerg). (23.48) larva I. (23.49) larva II. (23.50) larva III.

Comments: Two subfamilies and five genera are recognized: Hoplopleurinae—Hoplopleura (117 species) (figs. 23.38–23.42) and Petropzbollah (5 species), and Haematopininae—Haematopinoides (1 species) (fig. 23.43), Ancistruplax (2 species), and Schizophthirus (7 species). Of these Hoplopleura and Haematopinoides occur in North America.

Selected Bibliography
Cook and Beer 1959.
Ferris 1951.
Johnson 1972.
Kim 1965.
Pratt and Karp 1953.

LINOGNATHIDAE

Linognathids, Smooth Sucking Lice
Figures 23.44–23.50

Relationships and Diagnosis: The linognathids are a rather homogeneous group, closely related to the Rataeidae (Old World zebra and ass lice) and the Polyphagidae. Linognathids can be distinguished by having four rows of VCA (D. L. AS in larva I), the mid legs and head legs subequal and larger than the fore legs, and no paratergites in larvae II and III.

Biology and Ecology: The life cycle usually takes 21–30 days from eggs to eggs. Each species infects particular parts of the host animal. Linognathus vituli (L.) is abundant on the dewlap and shoulders, although it is also found on the sides of the neck, the rump, sides of the body, and oed,
petrimeum, and belly. *Solemus capitatus* Enderlein is usually found on the neck and head of infested animals (Matthysse 1986). Seasonal fluctuations in the *Solemus capitatus* population are caused by air temperature changes in the host's habitat and hair shedding (Jensen and Roberts 1986). As the temperature moves above or below the optimum (31.7°C), less favorable environmental conditions are available for reproduction and population maintenance. *Linognathus* is primarily parasitic on Bovidae and Giraffidae (Artiodactyla) and has expanded its distribution to Cervidae (Carnivora). *Solemus* is parasitic on Bovidae and Cervidae (Artiodactyla), and *Prolinognathus* is found exclusively on Procaviidae (Hyracoidea).

**Description:** Medium lice; larva 1.00–1.25 mm, larva H 1.10–1.80 mm, larva H 1.70–2.10 mm. The abdominal chaetotaxy develops gradually in size and number from the first to the third stage. Head usually cone-shaped, without external eyes or ocular points; antennae usually five-segmented or rarely four-segmented (*Prolinognathus*); DPINS and DPTE distinct. Thorax without sternal plate; DPIS and DPTE distinct, mesothoracic spiracles usually large (or small in *Prolinognathus*). Legs relatively short, fore legs smallest, mid legs much larger, and hind legs largest; fore coxae separated widely from each other. Abdomen elliptical, without any indication of parategites, sternites or tergites; spiracles usually visible; abdominal chaetotaxy with mostly minute **DeMAD** and **VMAD** between larger LAS and CAS.

**Comments:** Three genera are recognized: *Linognathus* (51 species), *Solemus* (10 species), and *Prolinognathus* (6 species). Some species of *Linognathus* (figs. 23.41–23.47) and *Solemus* (figs. 23.48–23.50) are found in North America. *Linognathus* and *Solemus capitatus* are important cattle lice.

**Selected Bibliography**

Jensen and Roberts 1986.

Kim and Weiser 1974.

Matthysse 1986.


**PECAROECIDAE**

**The Pecaroeids**

**Figures 23.51, 23.52**

**Relationships and Diagnosis:** Pecaroeids are superficially similar to *Haematopinus* and are distinguishable from other lice by the long slender head and distinct eyes.

**Biological and Ecological Characteristics:** Pecaroeids are parasites of the pecary (Tayassuidae).

**Description:** Large lice with long, slender body. Head long and slender, with clearly evident eyes represented by a lens; antennae five-segmented. Thorax relatively short and heavily sclerotized, with distinct notal pit; no sternal plate; mesothoracic spiracles distinct. All legs subequal in size and shape but fore legs with enlarged tibial thumb. Abdomen long and narrowly elliptical; dorsum wrinkled; segmental setae short and arranged in transverse rows.

**Comments:** The single known species, *Pecaroeus javali* Babcock and Ewing (1938), is distributed in the southwestern United States.

**Selected Bibliography**

Babcock and Ewing 1938.

Ferro 1951.

**Figures 23.53–23.56. Pediculidae. Pediculus humanus humanus L. (23.53) larva I, (23.54) larva II, (23.55) larva III, (23.56) egg.**

**Figures 23.51–23.52. Pecaroeididae. Pecaroeus javali Babcock & Ewing, (23.51) egg (23.52) larva II.**

**Pediculidae**

**Pediculids, Human Lice**

**Figures 23.53–23.56**

**Relationships and Diagnosis:** The pediculids, although highly specialized as are the Pecaroeidae and the Haematopinidae, retain many primitive characters. Larvae of the pediculids can be distinguished from other lice by the presence of external eyes, distinct notal pit and all legs subequal in size and shape.

**Biological and Ecological Characteristics:** *Pediculus* is parasitic upon New World monkeys (Cebidae), gibbons and great apes (Pongidae), and humans (Hominidae). The human louse, *Pediculus humanus* L., has two subspecies, *P. h. humanus* L., and *P. h. capitis* De Geer. The life cycle takes 18–20 days from eggs to eggs. The eggs (fig. 23.56) take 8–9 days at 30°C to hatch, and larval stages last 12–21 days. *Pediculus h. capitis* (head louse) is able to feed at any time, but *P. h. humanus* (body louse) can only feed undisturbed when the host is at rest (Buxton 1946). The eggs of head lice are cemented to hairs whereas body louse eggs are glued to fibers of the clothing.

**Description:** Medium lice, often translucent; larva 0.90–1.30 mm long (fig. 23.53); larva H 1.15–1.58 mm long (fig. 23.54); larva H 2.00–2.70 mm long (fig. 23.55). Head relatively short, abruptly constricted posteriorly into a short neck, with eyes externally represented by pair of distinct lenses and pigmentation on the lateral lobes; antennae five-segmented (terminal segments often fused). Thorax with well-developed phragmata and notal pit; no sternal plate; mesothoracic spiracles distinct. All legs subequal in shape and size and each with a long ovisacum claw; tibial thumbs developed. Abdomen membranous, with lateral margins more or less lobed and six pairs of spiracles, segmental setae distinct, arranged in transverse fields.

**Comments:** Many species had formerly been recognized for *Pediculus*. Currently only two species are accepted as distinct and others as subspecies or infraspecific variants: *Pediculus humanus* on humans and New World monkeys (Cebidae), and *P. schaeffi* Fabricius on gibbons and great apes (Pongidae).
Selected Bibliography
Buston 1946.
Ferris 1951.
Kim and Emerson 1968a.

Selected Bibliography
Ewing 1927.
Ferris 1951.
Johnson 1969.
Kim and Adler 1982.
Pratt and Karp 1953.

POLYPLACIDAE

Relationships and Diagnosis: The polyplacids are a rather heterogeneous group and somewhat related to the Linognathiidae and the Hoplopleuridae. They can be distinguished from other lice by having no or two rows of VCAs and no D.M.A. in larva I and mid legs usually subequal to the hind legs in size and shape, and paragnathia in larva II and III.

Larvae are superficially similar among Polyplax (figs. 23.57, 23.60), Neoharmonopterinae (figs. 23.64, 23.67), Priaenopterinae, Linognathiidae (figs. 23.61, 23.63), Fabroharmonoptera (figs. 23.64, 23.70), and Haemodipsidae (figs. 23.71, 23.73), but larvae are quite different among Lemuriphotidae, Lemurophilidae, Phthiriphotidae, Ctenophyidae, Scutia, Surtia, Johnthropotidae, and Do- rephoridae. However, the larvae are very similar to their adults in general morphology and primary chaetotaxy.

Biological and Ecological: Polyplacidae parasitize on Rodents, Lagomorphs, Insectivora, and Primates. Polyplax (16 species) and Neoharmonopterinae (18 species) are the two largest genera, primarily parasitic on rodents and occasionally infesting Insectivora, Surtia (1 species) and Proctopera (1 species) are found in Tupaia (Primates), and three genera are parasitic on Primates: Lemurophilidae (2 species) on Lemuridae, Lemurophilidae (2 species) on Lemuridae, and Phthiriphotidae (1 species) on Insectivora. Haemodipsidae (6 species) are parasites of rabbits (Leporidae, Lagomorpha).

Description: Small lice, body size variable. Head with antennae five-segmented; head short as long as wide; VPHS long; DPHS, MHS, DAPCHS, DAPCHS distinct; some species with sclerotized ventral tubercles (e.g., Fabroharmonoptera minimus). Thorax wider than head; DPHS and DAPCHS distinct. Sternal plate usually lacking in the first stage but frequently present in the second and third stages. Fore legs always small and slender, each with an acuminate claw; mid legs subequal to hind legs in size and shape, or hind legs larger than mid legs. Abdomens oral or elliptical, with six pairs of small spiracles; paragnathia often present in larva II and III. M.A.S. and CAS distinct: usual larva I with two rows of CAS and two pairs of MAS, larva III with two or four rows of CAS and four or more pairs of MAS, and larva III with four or more rows of CAS as usually six pairs of CAS.

Comments: Polyplax, Neoharmonopterinae, Linognathiidae, Fabroharmonoptera, and Haemodipsidae are commonly found in North America.

PHTHRIDAE

Pithriids, Crab Lice, Public Lice
Figures 23.57—23.60

Relationships and Diagnosis: The pithriids are unique lice with a compact body, wide thorax, and short abdomen. Because of the host relationships, Pithrius and Pithrus have been considered closely related and have been grouped into the family Pithriidae by some workers (Ewing 1951), but they basically represent two different lineages with numerous morphological differences (Kim and Ludwig 1978).

Larvae are very similar to the adults except for size and setal density.

Biological and Ecological: The entire life cycle of Pithrus pubis I takes 13—17 days from eggs to eggs at skin temperature. Eggs hatch 7—8 days after oviposition (Buston 1946). Pithrus pubis infests the pubic regions particularly, but also the armpits and more rarely the mammary, beard, eyelashes, and eyebrows.

Description: Medium lice with compact body; larva I 0.63—0.85 mm long, larva II 0.9—1.2 mm, and larva III 1.80—2.00 mm. Head short, much narrower than thorax, with distinct eyes, antennae five-segmented. Thorax short and wide, without natal pit or sternal plate; mesothoracic spiracles distinct. Fore legs slender, with pointed, acuminate claws; mid legs subequal to hind legs in size and shape, or hind legs larger than mid legs. Abdomen oral or elliptical, with six pairs of small spiracles; paragnathia often present in larva II and III. M.A.S. and CAS distinct: usual larva I with two rows of CAS and two pairs of MAS, larva III with two or four rows of CAS, and four or more pairs of MAS, and larva III with four or more rows of CAS as usually six pairs of CAS.

Comments: Two species of Pithrus are so far known. Pithrus pubis (crab louse) on humans and P. gorillae Ewing on the gorilla. Pithrus pubis is distributed worldwide. Crab lice are usually transmitted from one person to another during sexual activity. They may also spread on loose hairs transferred by infested persons to such items as towels and bedding.

Selected Bibliography
Buston 1946.
Ewing 1927.
Kim and Emerson 1968a.
Potowski 1947.
Figures 23.64-23.67. Polyplacidae. Neorhagopus: (23.64-66) N. scroptifer (Osborn); (23.64) larva I; (23.65) larva II; (23.66) larva III; legs removed; (23.67) N. scorni Jancsek, egg.

Figures 23.68-23.70. Polyplacidae. Fahrenholzia fairchildi Johnson; (23.68) larva I; (23.69) larva II; (23.70) larva III.

Figures 23.71-23.73. Polyplacidae. Hermodora seloni Ewing; (23.71) larva I; (23.72) larva II; (23.73) larva III.

Figures 23.74-23.77. Pithinidae. Pithius pubis (I.); (23.74) egg; (23.75) larva I; (23.76) larva II, legs removed; (23.77) larva III, legs removed.
BIBLIOGRAPHY


