



Roger D. Price
University of Minnesota

CHEWING LICE

Mallophaga are permanent ectoparasites, primarily on birds, but with a small percentage of species on mammals.

The economic importance of the vast majority of the chewing lice is not known; however, a few species found on poultry and livestock have been reported to cause irritation, loss of weight or production, and to otherwise contribute to an unhealthy condition of the host.

DIAGNOSIS

Small, somewhat flattened individuals, with mandibulate mouthparts. Body divided into distinct head, thorax, and abdomen; head wider than pronotum; three pairs of segmented thoracic legs. Antennae short, of only three to five segments. Tarsi one-segmented, with zero to two claws. Abdomen of eight or nine apparent segments.

Immatures are much like adults except for smaller size, reduced chaetotaxy and sclerotization, and absence of genital features. A progressive increase in size, number of setae, and degree of sclerotization occurs from early to late instars, as shown in figs. 22.11–22.13 and 22.26–22.28.

Most work to date on the Mallophaga has been taxonomic, this being almost exclusively based on adult forms. As a result, immatures have for the most part been disregarded or discarded. Information is limited to occasional descriptions of an immature or part thereof. Nothing is known of the taxonomic characters of immatures and the possibility of species identification in the absence of adults. Workers should be encouraged to collect early instars whenever possible so that collections can gradually be built up. Ultimately, in this manner, a comprehensive treatise may be possible.

BIOLOGY AND ECOLOGY

Biological information is available for a relatively small number of species. From what is known, lice deposit their eggs on the host, attaching them directly to the feather or hair, or in some cases depositing them within the shafts of primary feathers. Development is hemimetabolous. There are three immature instars, with all stages permanently associated with the host; lice can live only a short time away from the host.

Their food consists of bits of feathers or hair, or other particulate matter associated with the skin; some species of Menoponidae and Ricinidae ingest blood as a regular part of their diet.

Although it has often been stated that the chewing lice are highly host specific and that each host taxon has its own unique louse taxa, such a generalization is open to challenge. Work based on morphological evidence suggests that some lice are indeed quite specific, others not so much so, and at least a few may be found on a wide spectrum of hosts. The practice of some workers in describing new louse taxa solely on the fact that they are taken from hosts not previously yielding lice is to be condemned. Lice must be recognized as distinct on the basis of characteristics of the lice and not solely because of their host association.

DESCRIPTION

Head distinct from thorax, as wide or wider than prothorax, with pair of mandibles situated ventrally. Antennae three- to five-segmented, clubbed or filiform. Eyes reduced or absent.

Prothorax usually distinct from mesothorax; meso- and metathorax often closely associated to form pterothorax. Three pairs of distinctly segmented legs; tarsi one-segmented, either with zero, one, or two terminal claws.

Abdomen distinctly segmented, usually with at most only weak sclerotization. With eight or nine apparent segments, these being 2–8 or 1–8, with terminal portion beyond 8 representing fusion of segments 9 and beyond. With six, less often zero to five pairs of spiracles, these associated when present with segments 3–8.

COMMENTS

The classification followed here for the higher taxa is essentially that of Hopkins and Clay (1952), in which the Mallophaga are divided into three suborders, two of which occur in North America: the Amblycera with seven families, six of which are represented in the North American fauna; and the Ischnocera, with two of three families in North America.

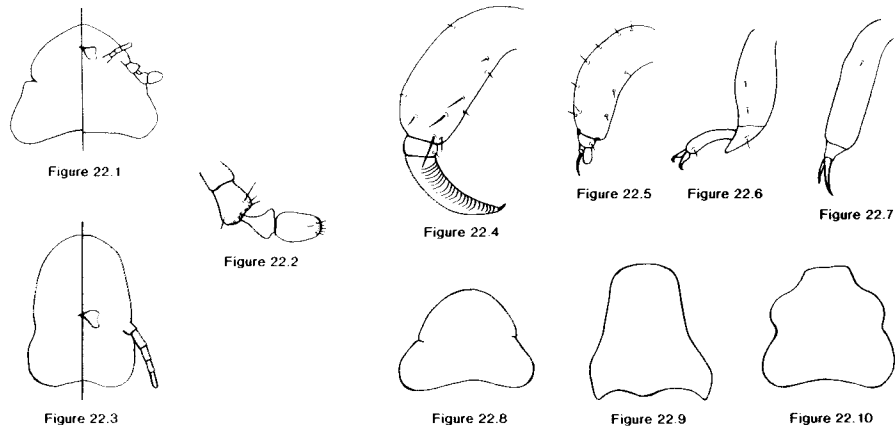
TECHNIQUES

The preparation of chewing lice for microscopic study is essentially the same as for other small soft-bodied insects. Although staining may facilitate character observation, a phase contrast microscope is essential for detailed study.

Rearing methods for some of the few successful attempts to date may be found in Stenram (1956) for *Colymbicola columbae* Linnaeus; Nelson (1971) for *Colpocephalum turbinatum* Denny; Hopkins (1970) for *Bovicola ovis* (Schrank); and Hopkins and Chamberlain (1969, 1972) for *B. crassipes* (Rudow), *B. limbata* (Gervais), and *B. bovis* (Linnaeus). For additional techniques, see the order Anoplura.

KEY TO THE FAMILIES OF IMMATURE NORTH AMERICAN MALLOPHAGA

- 1. Antenna (fig. 22.2) usually 4-segmented, more or less clubbed, with pedunculate 3rd segment, often partially concealed beneath head; maxillary palpus present (fig. 22.1) (Suborder AMBLYCERA) 2
- 1'. Antenna (fig. 22.3) 3- or 5-segmented, filiform, with 3rd segment not pedunculate, and not concealed; maxillary palpus absent (Suborder ISCHNOCERA) 7
- 2(1). Legs 2 and 3 with 0 or 1 tarsal claw (figs. 22.4, 22.5); on mammals *Gyropidae* (p. 219)
- 2'. Legs 2 and 3 with 2 tarsal claws (figs. 22.6, 22.7); usually on birds, less often on mammals 3
- 3(2'). With 5 pairs of abdominal spiracles, those on 8 absent; on guineapigs *Trimenoponidae* (p. 220)
- 3'. With 6 pairs of abdominal spiracles; on dogs or birds 4
- 4(3'). Head broadly triangular, expanded behind eyes (fig. 22.8); antenna often lying in groove on side of head; on dogs or birds 5
- 4'. Head not as above (figs. 22.9, 22.10); antenna lying in cavity opening ventrally; on birds 6



Figures 22.4-22.7. Distal leg 3 of: (22.4) *Gyropus setifer* (Ewing) (Gyropidae); (22.5) *Gliricola echimydis* (Gyropidae); (22.6) *Menopon gallinae* (L.) (Menoponidae); (22.7) *Lipeurus caponis* (L.) (Phloptoridae).

Figures 22.1-22.3. Head: (22.1) Head outline of *Trimenopon hispidum* (Burmeister) (Trimenoponidae); (22.2) Antenna of *Menopon gallinae* (L.) (Menoponidae); (22.3) Head outline of *Lipeurus caponis* (L.) (Phloptoridae).

Figures 22.8-22.10. Head outline of: (22.8) *Menopon gallinae* (L.) (Menoponidae), shaft louse; (22.9) *Ricinus fringillae* De Geer (Ricinidae); (22.10) *Laemobothrion maximum* (Laemobothriidae).

- 5(4). Mesonotum with pair of stout setae each borne on protuberance (fig. 22.18); abdominal tergum 1 fused with metanotum, with 1st abdominal spiracle on apparent 2nd segment; on dogs *Boopiidae* (p. 219)
- 5'. Mesonotum without such stout setae or protuberances; abdominal tergum 1 not fused with metanotum, with 1st abdominal spiracle on apparent 3rd segment; on birds *Menoponidae* (p. 217)
- 6(4'). Side of head with conspicuous swelling in front of eye at base of antenna (fig. 22.10); ventral temple (fig. 22.15) with sculpturing of outer rows of peglike projections; venter of 3rd femur with microtrichial patch (fig. 22.16) *Laemobothriidae* (p. 218)
- 6'. Side of head without such swelling (fig. 22.9); without peglike sculpturing on temple or microtrichial patch on 3rd femur *Ricinidae* (p. 219)
- 7(1'). With 2 tarsal claws; antenna with 5 segments; on birds *Phloptoridae* (p. 220)
- 7'. With only 1 tarsal claw; antenna usually with 3 segments; on mammals *Trichodectidae* (p. 220)

CLASSIFICATION

- Order MALLOPHAGA
 - Suborder Amblycera
 - Menoponidae, avian body lice
 - Laemobothriidae, on birds
 - Ricinidae, on birds
 - Boopiidae, on mammals
 - Gyropidae, rodent chewing lice
 - Trimenoponidae, on mammals
 - Suborder Ischnocera
 - Phloptoridae, feather chewing lice
 - Trichodectidae, mammal chewing lice

Suborder AMBLYCERA

Relationships and Diagnosis

An assemblage of six North American families, three of which are restricted to birds and three to mammals. Specimens are readily separated from those of the suborder Ischnocera by having short, four-segmented, clubbed antennae (fig. 22.2) and maxillary palps (fig. 22.1). A discussion of the relationships among the families of Amblycera may be found in Clay (1970).

MENOPONIDAE

The Menoponids, Avian Body Lice

Figures 22.2, 22.6, 22.8, 22.11-22.14

Relationships and Diagnosis: This family of Amblycera contains by far the largest number of species of the suborder, with over 250 North American species distributed in about 35 genera, all restricted to a wide spectrum of bird hosts.

Separable from the other families of amblyceran lice by the broadly triangular head and presence of nine apparent abdominal segments bearing six pairs of spiracles on 3-8.

Biology and Ecology: Members of this family are believed to ingest blood fairly often in the course of their feeding and, by so doing, have the potential to transmit pathogens among their avian hosts.

Description: In size, adults most commonly from 1-3 mm long, but occasionally up to 7-8 mm; generally somewhat ovoid slender specimens, often brownish or gray. Head roughly triangular, with temple variably wider than anterior head; each tarsus with two claws; abdomen with nine apparent segments, with six pairs of spiracles laterally on 3-8.

Comments: Clay (1969) has applied numbers to most of the head and pronotal setae and has otherwise discussed in detail the morphology of adult menoponids. At least some of this will be pertinent to immature descriptions following study to establish appropriate homologies.

HOST LISTS

Since so much Mallophaga identification is based on host lists rather than on formal keying of the lice themselves, a set of four publications by Emerson (1972a, b, c, d) is indispensable for anyone attempting to affix a specific name to a North American chewing louse. The first two works list the species of lice by family and genus for each suborder, giving known hosts for each species. The last two works present a mammal and bird host list, giving the lice known from each host.

Selected Bibliography

- General**
- Hopkins and Clay 1952.
- Keter 1960 (adults only).
- Rearing**
- Stenram 1956.
- Nelson 1971.
- Hopkins 1970.
- Hopkins and Chamberlain 1969, 1972.

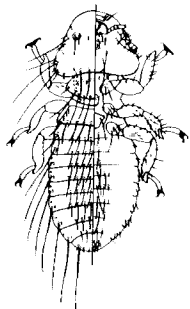


Figure 22.11

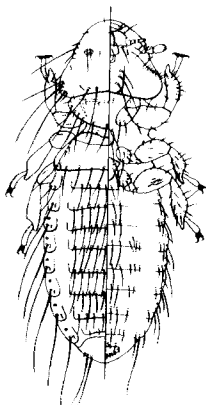


Figure 22.12

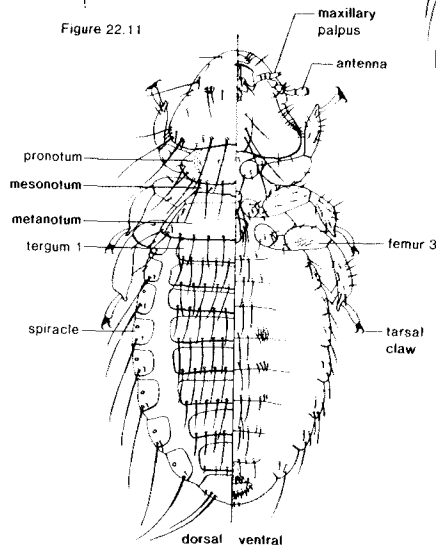


Figure 22.13

Figures 22.11–22.13. *Menopon gallinae* (L.) (Menoponidae): (22.11) first instar; (22.12) second instar; (22.13) third instar.

The most common economically important lice are those associated with poultry: *Menacanthus stramineus* (Nitzsch), the chicken body louse, and *Menopon gallinae* (L.), the shaft louse (figs. 22.11–22.13). Several of the largest members of the family (*Trinoton querquedulae* (L.), the large duck louse (fig. 22.14), and *T. anserinum* (J. C. Fabricius), the goose body louse) are associated with ducks and geese and are often encountered by hunters handling freshly killed game.

Selected Bibliography

Clay 1969.
Emerson 1956, 1962 (adults only).

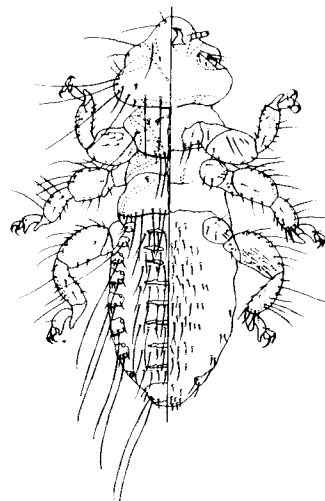


Figure 22.14

Figure 22.14. *Trinoton querquedulae* (L.), large duck louse (Menoponidae).

LAEMOBOTHRIDAE

The Laemobothriids

Figures 22.10, 22.15, 22.16

Relationships and Diagnosis: The largest of all Mallophaga (adults to 12 mm long), but with only eight North American species, four of these found on various falconiform hosts and the others on gallinules, limpkins, coots, and grebes.

The large size and unique head shape (fig. 22.15), with the swelling at the side in front of the eye at the antennal base, separate laemobothriids from the other amblyceran bird lice.

Description: Adults up to 12 mm long, with moderately heavy ovoid bodies, usually tan to dark brown. Head angular (fig. 22.15), with conspicuous swelling at side in front of eye near antennal base; antennae mostly concealed in ventral concavity; ventral temple with sculpturing of rows of peglike projections; prothorax as for ricinids; each tarsus with two claws; venter of femur 3 (fig. 22.16) with patch of microtrichia; abdomen with nine apparent segments; six pairs of spiracles laterally on 3–8.

Comments: Essentially nothing has been done on the immatures of this family or on the adults of the nonfalconiform hosts. Nelson and Price (1965) have discussed the adult taxonomy of the four species found on the Falconiformes.

Selected Bibliography

Nelson and Price 1965 (adults only).

RICINIDAE

The Ricinids

Figures 22.9, 22.17

Relationships and Diagnosis: Only about 30 species in three genera that are restricted in distribution to the songbirds and hummingbirds. Readily distinguished from both the Menoponidae and Laemobothriidae by the head shaped much as in figure 22.17 and by lacking a conspicuous swelling at side in front of the eye near antennal base, and from the Menoponidae by the clubbed antennae lying in a cavity opening ventrally.

Biology and Ecology: Although little is known other than the generalizations given earlier, an excellent summary of available information is given by Nelson (1972). He compiles details of life cycle, sex ratio, intensity of infestation, rate of incidence, seasonal abundance, oviposition sites, dispersion on the host, and blood feeding. In this last regard, it should be noted that ricinids apparently regularly feed on blood and serum and, by so doing, have the potential for transmitting avian infectious agents.

Description: Adults from 2–6 mm long, rather elongate specimens with parallel sides, and pale colored. Head uniquely shaped (fig. 22.17), lacking conspicuous swelling at side in front of eye near antennal base; antennae concealed in concavity opening ventrally; mandibles reduced and inconspicuous; prothorax rectangular; each tarsus with two claws; abdomen with only eight apparent segments, segment 1 absent; six pairs of spiracles laterally on 3–8.

Comments: No members of this family are considered of economic importance, since they all occur on nondomestic hosts.

Selected Bibliography

Nelson 1972.
Rheinwald 1968 (adults only).

BOOPIIDAE

The Boopiids

Figure 22.18

Relationships and Diagnosis: With a number of features in common with, and possibly closely related to, the Menoponidae. Found only on mammals, with only one North American species.

Separated from other amblycerans by the presence of a seta on a prominent protuberance on each side of mesonotum (fig. 22.18) in combination with the head shape, presence of two tarsal claws, and only eight apparent abdominal segments.

Description: Adults about 2.5 mm long, generally ovoid and brownish. Head roughly triangular; with ventral post-palpal spinous process; mesonotum with seta-bearing protuberance on each side; quadrate metathorax; each tarsus with two claws; abdomen with only eight apparent segments bearing six pairs of spiracles laterally on 3–8.

Comments: Only one species, *Heterodoxus spiniger* (Enderlein) (fig. 22.18), is known in North America; it has been found on the domestic dog, coyote, and wolf.

Selected Bibliography

Emerson and Price 1975, 1981 (adults only).
Hopkins 1949 (adults only).
Keler 1971 (adults only).
Werneck 1948 (adults only).

GYROPIDAE

The Rodent Chewing Lice

Figures 22.4, 22.5, 22.19

Relationships and Diagnosis: Clay (1970) finds this family having the fewest characters in common with the Menoponidae of all Amblycera; the diversity within the Gyropidae even suggests it may be polyphyletic. There are four North American species, each placed in a separate genus.

The gyropids are the only Amblycera having only zero to one tarsal claws on legs 2 and 3, and this claw often is extremely modified and large (fig. 22.4) or quite small (fig. 22.5).

Description: Small, slender lice, only 1.0–1.5 mm long, and whitish. Head rather broad, angular; legs often disproportionately long, with no or single claw on 2 and 3, either very large (fig. 22.4) or inconspicuously small (fig. 22.5); abdomen with eight to nine apparent segments, with five to six pairs of spiracles.

Comments: Found only on mammals, the most likely species of this family to be found in North America are associated with guineapigs in laboratories—*Gliricola porcelli* (Schrank), the slender guineapig louse, and *Gyropus ovalis* Burmeister, the oval guineapig louse. In addition to these, a louse from the nutria and one from the collared peccary are the only other ones likely to be found.

Selected Bibliography

Clay (1970).
Emerson and Price 1975, 1981 (adults only).
Hopkins 1949 (adults only).
Werneck 1948 (adults only).

TRIMENOPONIDAE

The Trimenoponids

Figures 22.1, 22.20

Relationships and Diagnosis: Close to the Menoponiidae and Boopiidae in some respects, but with distinctive features. Found on mammals, with only one possible North American species.

Separated from other amblyceran lice by having a broadly triangular head, abdominal tergite 1 reduced, and with nine apparent abdominal segments, but with only five pairs of spiracles, those on 8 absent.

Description: Head roughly triangular, ovoid prothorax; each tarsus with two small claws; abdomen with nine apparent segments, with first reduced and much shorter than others; with only five pairs of spiracles, those on 8 being absent.

Comments: Only one species, *Trimenopon hispidum* (Burmeister) (fig. 22.20), may be found in North America; it occurs on guineapigs, but has not been reported to date north of Panama.

Selected Bibliography

Emerson and Price, 1975, 1981 (adults only).
Hopkins 1949 (adults only).
Werneck 1948 (adults only).

Suborder ISCHNOCERA

Relationships and Diagnosis

There are only two North American families in this suborder, with one of these restricted to birds and the other to mammals. Specimens are easily separated from those in the Amblycera by having short three- or five-segmented filiform antennae (fig. 22.3) and lacking maxillary palpi.

PHILOPTERIDAE

The Feather Chewing Lice

Figures 22.3, 22.7, 22.21-22.25

Relationships and Diagnosis: This family has the largest number of species of any in the Mallophaga, with over 450 North American species distributed in about 60 genera, all found on birds. It and the Trichodectidae represent the only North American families of Ischnocera and thus are presumably closely related.

The Philopteridae are distinguished by having an antenna of five segments and two tarsal claws on each leg.

Description: A wide variety of sizes and shapes, with adults usually from 2-4 mm long, and broad (fig. 22.22) to slender (fig. 22.21) individuals. Head from narrowly rounded to broadly tapered anteriorly; antenna five-segmented; tarsi with two claws; abdomen with eight apparent segments; with six pairs of spiracles laterally on 3-8.

Comments: Found only on birds. As would be expected, a family of this size includes a number of parasites of poultry and other domestic birds. Commonly occurring on chickens are *Cuclotogaster heterographus* (Nitzsch), the chicken head louse (fig. 22.23); *Goniodes dissimilis* Denny, the brown chicken louse; *G. gigas* (Taschenberg), the large chicken louse; *Gonicotes gallinae* (De Geer), the fluff louse (fig. 22.24); and *Lipeurus caponis* (L.), the wing louse (fig. 22.21). Several species from turkeys are *Chelospistes meleagridis* (L.), the large turkey louse (fig. 22.25); and *Oxylipurus polytrapezius* (Burmeister), the slender turkey louse.

Selected Bibliography

Emerson 1956, 1962 (adults only).

TRICHODECTIDAE

The Mammal Chewing Lice

Figures 22.26-22.30

Relationships and Diagnosis: The only family of Ischnocera containing mammal-infesting lice; closely related to the Philopteridae. There are somewhat more than 50 North American species occurring in ten genera.

Recognized by having an exposed antenna, usually of three segments, and only one tarsal claw on each leg.

Description: A variety of sizes and shapes, much as for the Philopteridae. Antenna usually three-segmented; tarsi each with one claw; abdomen with nine apparent segments; with variable number of spiracles, from zero to six pairs.

Comments: Restricted to mammals. The genus *Bovicola* contains a number of important livestock pests, including *B. bovis* (L.), the cattle biting louse (figs. 22.26-22.28); *B. caprae* (Gurlt), the goat biting louse; *B. equi* (Denny), the horse biting louse; *B. limbata* (Gervais), the Angora goat biting louse; and *B. ovis* (Schrank), the sheep biting louse. Lice found on domestic pets around the home include *Felicola subrostratus* (Burmeister), the cat louse (fig. 22.30); and *Trichodectes canis* (De Geer), the dog biting louse (fig. 22.29).

Selected Bibliography

Emerson and Price 1975, 1981 (adults only).
Hopkins 1949 (adults only).
Werneck 1948, 1950 (adults only).

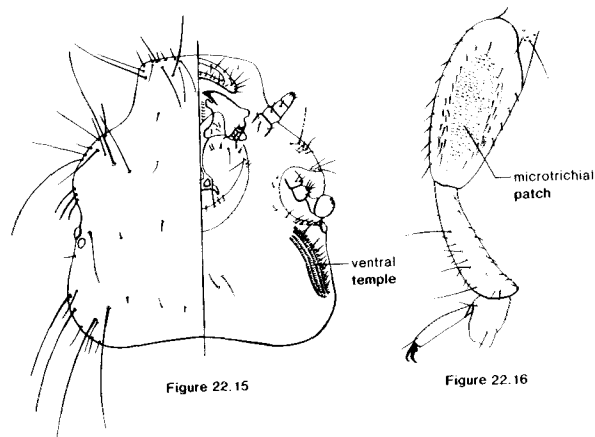


Figure 22.15

Figure 22.16

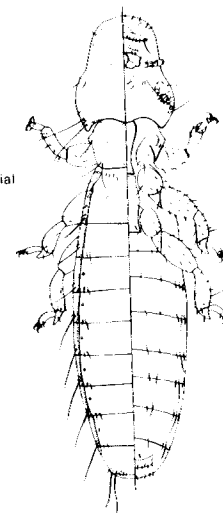


Figure 22.17

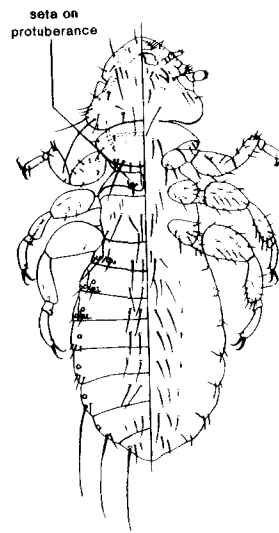


Figure 22.18

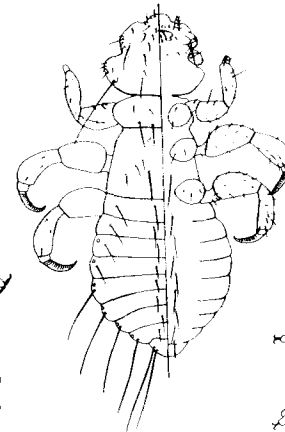


Figure 22.19

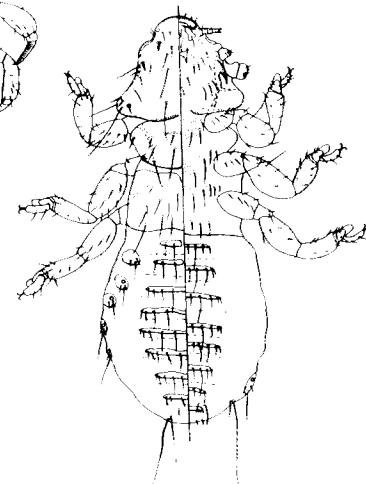


Figure 22.20

Figures 22.15-22.16. *Laemobothrion maximum* (Scopoli) (Laemobothridae): (22.15) head; (22.16) ventral leg 3.
Figure 22.17. *Ricinus fringillae* De Geer (Ricinidae).

Figure 22.18. *Heterodoxus spiniger* (Enderlein) (Boopiidae).
Figure 22.19. *Gyropus setifer* (Ewing) (Gyropidae).
Figure 22.20. *Trimenopon hispidum* (Burmeister) (Trimenoponidae).

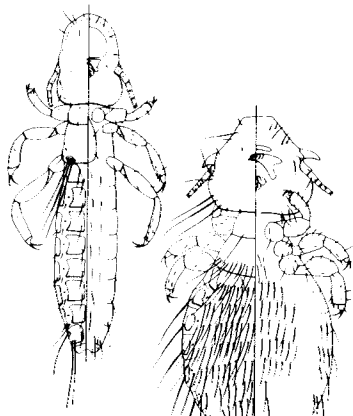


Figure 22.21

Figure 22.22

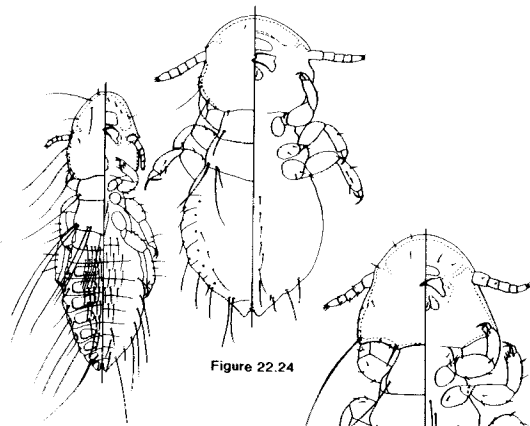


Figure 22.23

Figure 22.24

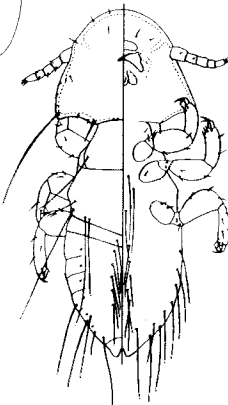


Figure 22.25

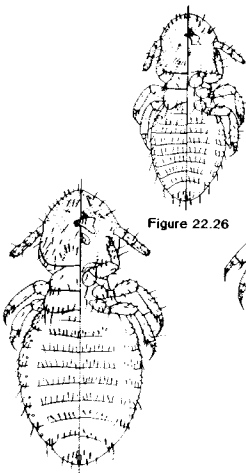


Figure 22.26

Figure 22.27

Figure 22.28

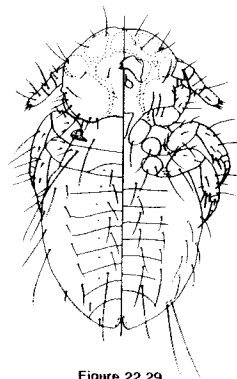


Figure 22.29

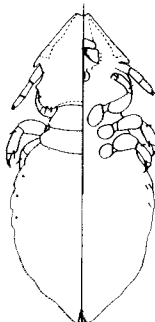


Figure 22.30

Figures 22.21–22.22. (22.21) *Lipeurus caponis* (L.), wing louse (Phlopterae); (22.22) *Philopterus ocellatus* (Scopoli) (Phlopterae).

Figures 22.23–22.25. (22.23) *Cuculotogaster heterographus* (Nitzsch), chicken head louse (Phlopterae); (22.24) *Gonioptes gallinae* (De Geer), fluff louse (Phlopterae); (22.25) *Chelopistes meleagridis* (L.), large turkey louse (Phlopterae).

Figures 22.26–22.28. *Bovicola bovis* (L.), cattle biting louse (Trichodectidae): (22.26) first instar; (22.27) second instar; (22.28) third instar.

Figures 22.29–22.30. (22.29) *Trichodectes canis* (De Geer), dog biting louse (Trichodectidae); (22.30) *Felicola subrostratus* (Burmeister), cat louse (Trichodectidae).

BIBLIOGRAPHY

- Clay, T. 1969. A key to the genera of the Menoponidae (Amblycera: Mallophaga: Insecta). *Bull. Brit. Mus. (Nat. Hist.) Ent.* 24:1–26.
- Clay, T. 1970. The Amblycera (Phthiraptera: Insecta). *Bull. Brit. Mus. (Nat. Hist.) Ent.* 25:73–98.
- Emerson, K. C. 1956. Mallophaga (chewing lice) occurring on the domestic chicken. *J. Kansas Ent. Soc.* 29:63–79 (adults only).
- Emerson, K. C. 1962. Mallophaga (chewing lice) occurring on the turkey. *J. Kansas Ent. Soc.* 35:196–201 (adults only).
- Emerson, K. C. 1972a. Checklist of the Mallophaga of North America (north of Mexico). Part I. Suborder Ischnocera. Desert Test Center, Dugway, Utah. 200 pp.
- Emerson, K. C. 1972b. *Ibid.* Part II. Suborder Amblycera. 118 pp.
- Emerson, K. C. 1972c. *Ibid.* Part III. Mammal host list. 28 pp.
- Emerson, K. C. 1972d. *Ibid.* Part IV. Bird host list. 216 pp.
- Emerson, K. C., and R. D. Price. 1975. Mallophaga of Venezuelan mammals. *Brigham Young Univ. Sci. Bull. Biol. Series* 20(3):1–77 (adults only).
- Emerson, K. C., and R. D. Price. 1981. A host-parasite list of the Mallophaga on mammals. *Misc. Publ. Ent. Soc. Amer.* 12(1):1–72 (adults only).
- Hopkins, D. E. 1970. *In vitro* colonization of the sheep biting louse, *Bovicola ovis*. *Ann. Ent. Soc. Amer.* 63:196–97.
- Hopkins, D. E., and W. F. Chamberlain. 1969. *In vitro* colonization of the goat biting louse, *Bovicola crassipes* and *B. limbata*. *Ann. Ent. Soc. Amer.* 62:826–28.
- Hopkins, D. E., and W. F. Chamberlain. 1972. *In vitro* colonization of the cattle biting louse, *Bovicola bovis*. *Ibid.* 65:771–72.
- Hopkins, G. H. E. 1949. The host-associations of the lice of mammals. *Proc. Zool. Soc. London* 119:387–604 (adults only).
- Hopkins, G. H. E., and T. Clay. 1952. A check list of the genera and species of Mallophaga. London. British Museum. 362 pp.
- Keler, S. von. 1960. Bibliographie der Mallophagen. *Mitteilungen aus dem Zoologischen Museum in Berlin* 36:145–403 (adults only).
- Keler, S. von. 1971. A revision of the Australasian Boopidae (Insecta: Phthiraptera), with notes on the Trimenoponidae. *Australian J. Zool., Suppl. Series, Suppl. No.* 6:1–126 (adults only).
- Nelson, B. C. 1971. Successful rearing of *Colpocephalum turbinatum* (Phthiraptera). *Nature New Biology* 232:255.
- Nelson, B. C. 1972. A revision of the New World species of *Ricinus* (Mallophaga) occurring on Passeriformes (Aves). *Univ. Calif. Publ. in Entomol.* 68. 180 pp.
- Nelson, R. C., and R. D. Price. 1965. The *Laemobothrion* (Mallophaga: Laemobothriidae) of the Falconiformes. *J. Med. Ent.* 2:249–57.
- Rheinwald, G. 1968. Die Mallophagengattung *Ricinus* De Geer, 1778. Revision der ausseramerikanischen Arten. *Mitteilungen aus dem Zoologischen Staatsinstitut und Zoologischen Museum in Hamburg* 65:181–326 (adults only).
- Stenram, H. 1956. The ecology of *Columbicola columbae* L. (Mallophaga). *Opusc. Ent.* 21:170–90.
- Werneck, F. L. 1948. Os malofagos de mamiferos. Parte I: Amblycera e Ischnocera (Phlopterae e parte de Trichodectidae). *Revista Brasileira de Biologia, Rio de Janeiro.* 243 pp. (adults only).
- Werneck, F. L. 1950. Os malofagos de mamiferos. Parte II: Ischnocera (continuaçao de Trichodectidae) e Rhynchophthirina. *Instituto Oswaldo Cruz, Rio de Janeiro.* 207 pp. (adults only).