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16. Order MALLOPHAGA — Biting lice

D. I. Blagoveshchenskii

Apterous insects with flattened body, biting mouthparts, 3- to 5-segmented antennae; thorax divided into 2 or 3 segments; legs ambulatory or prehensile; metamorphosis incomplete; permanent parasites of warm-blooded animals, feeding on epidermal products or blood of the host.

Body of varying shape, narrow-oblong to broad-oval, dorsoventrally depressed, 1-11 mm long; male usually smaller than female; body rarely colorless. Head (Figures 155, 1,3,4; 156, 1,2) large, of varying shape, e.g., semilunar, triangular, trapezoidal, pentagonal, square or rectangular, rarely asymmetrical, sometimes with spinelike, denticle-shaped or hook-like processes, often with ventral oral groove (pulvinus) used to bring feathery or hair to the mouth, with sclerotized bands (carinae) in several places. Carina at anterior margin forming border of anterior half of head, often forming processes, interrupted at clypeal suture (Figure 155, 2), and thus divided into frontal and clypeal carinae. Orbital carinae anterior to eyes. Posterodorsal longitudinal carinae (vertical carinae) dividing postgenae from vertex; posteroventral longitudinal carinae (gular carinae) dividing genae from gula. Mouthparts ventral or terminal; pharynx usually with pharyngeal sclerite. Antennae (Figures 155, 1,3; 156, 1,2) short, capitate, clavate or filiform, 3- to 5-segmented, sometimes showing marked sexual dimorphism, in repose often concealed in the lateral or ventral antennal fossae. Lateral appendages (cones, sometimes trabeculae) often present anterior to antennae (Figure 156, 3). Eyes (Figures 155, 1; 156, 1) reduced, with 1 or 2 lenses, with a seta and as a rule with pigment spot; eyes at sides of head, anterior to postgenae or inside them, often in ocular pit; if the eye does not occupy the whole ocular pit, the remaining space is the preocular slit (Figure 156, 4); eyes sometimes absent. Prothorax distinct; meso- and metathorax often fused, forming the pterothorax (Figure 155, 1); no wings; usually one pair of mesothoracic spiracles. Legs ambulatory or prehensile, adapted to cling to the substrate or to grasp feathery or hairs; tarsi 1- or 2-segmented, with 1 or 2 claws. Abdomen consisting of 8-10 visible segments, its shape varying from narrow-oblong to broad-oval, almost always differing in female and male (especially structure of last segment), usually with 6 pairs of spiracles on segments II-VII or III-VIII. Terga and sterna usually with lateral, median or continuous plates or spots. Pleurites often clearly differentiated, with plates or spots and apodemes, sometimes with ventral wedge-shaped processes (Figure 156, 5). Last sternum often with unpaired (median) or paired (lateral) genital plates or spots (Figure 156, 5). Female genital plate rarely with lateral genital appendages (gonapophyses) (Figure 156, 6). Male copulatory apparatus (Figure 156, 7) normally consisting of basal plate, parameres, mesosome and preputial sac; the 3 latter parts are everted during copulation.

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Body sparsely or densely covered with setae, sometimes with setae on pale rounded tubercles (pustules). Hind femora and abdomen often with ventral groups or rows of setae. Nymphs generally resembling imagines, but differing from them in smaller size, chaetotaxy, pattern of abdominal plates or spots, absence of genital pore, gonapophyses or setae replacing them functionally (female) and absence of copulatory apparatus (male) and genital plates or spots. Mallophaga are related to Psocoptera (free-living insects) and to Anoplura (parasites of mammals).

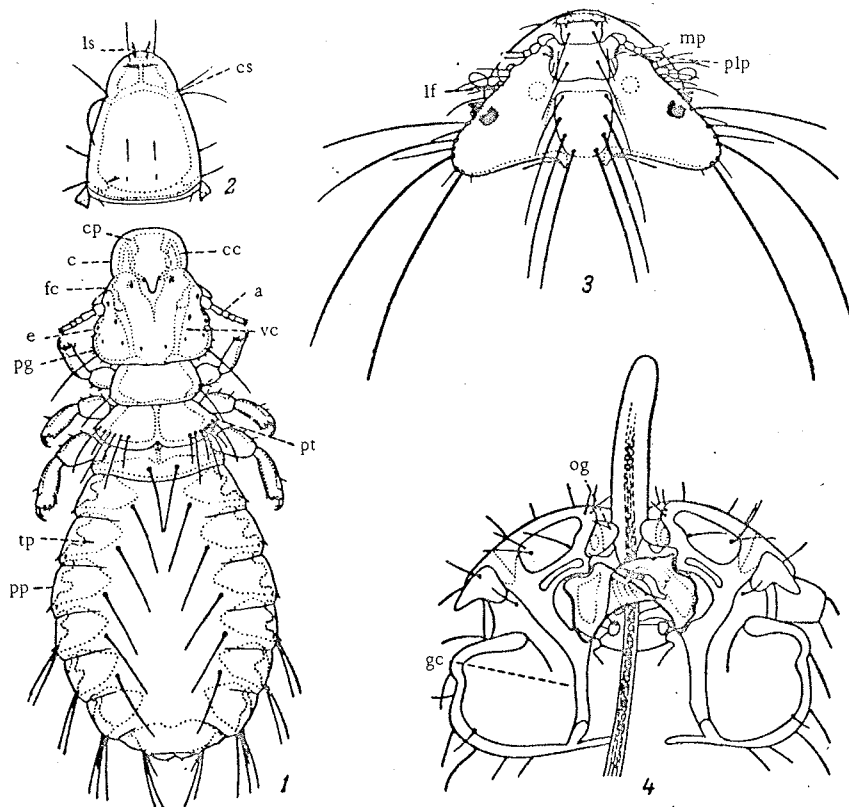


FIGURE 155. Mallophaga (after Blagoveshchenskii and original)

1—*Anotoecus dentatus*, dorsal, female (pg—postgena, e—eye, c—clypeus, cp—clypeal plate, vc, fc, cc—vertical, frontal and clypeal carina respectively, a—antenna, pt—pterothorax, tp, pp—lateral tergal and pleural sclerites of abdomen respectively); 2—anterior part of head of *Columbicola columbae*, male, dorsal (cs—clypeal suture, ls—lanceolate setae); 3—head of *Eomenacanthus stramineus*, female, ventral (lf—lateral antennal fossa, plp—postpalpal process, mp—maxillary palp); 4—head of *Trichodectes canis*, female, ventral (og—oral groove, gc—gular carina).

Mallophaga infest birds and mammals. Some species feed on feathers or hair, others on skin. Some bird parasites occur inside the shaft of feathers and in the oral cavity of the hosts. Mainly feeding on particles of feathers or epidermis, epidermal secretions and blood. Mallophaga

are normally distributed through contact of the hosts, which affords the best conditions for transfer. Reproduction normally bisexual. The eggs are cemented with a sticky secretion to feathers or between them, on the shaft or inside the quill and on hairs, either singly, in rows or in clusters. Eggs more or less oval or cigar-shaped, 0.5-2.5 mm long, with a cap which breaks off at a suture on hatching. The whole development from egg to imago takes 3 to 4 weeks. Metamorphosis incomplete, comprising 3 ecdyses. The geographical distribution of Mallophaga, which are permanent parasites, depends on that of their hosts. The species are specific for a single species or groups of related species. Birds are frequently infested by several species of Mallophaga; mammals are usually infested by one, rarely 2 or 3 species. Heavy infestation of domestic animals is injurious, as the parasites weaken the host, lower its productivity and impair its resistance to diseases. Mallophaga infesting dogs and cats are intermediate hosts of *Dipylidium caninum* which sometimes occurs in man.

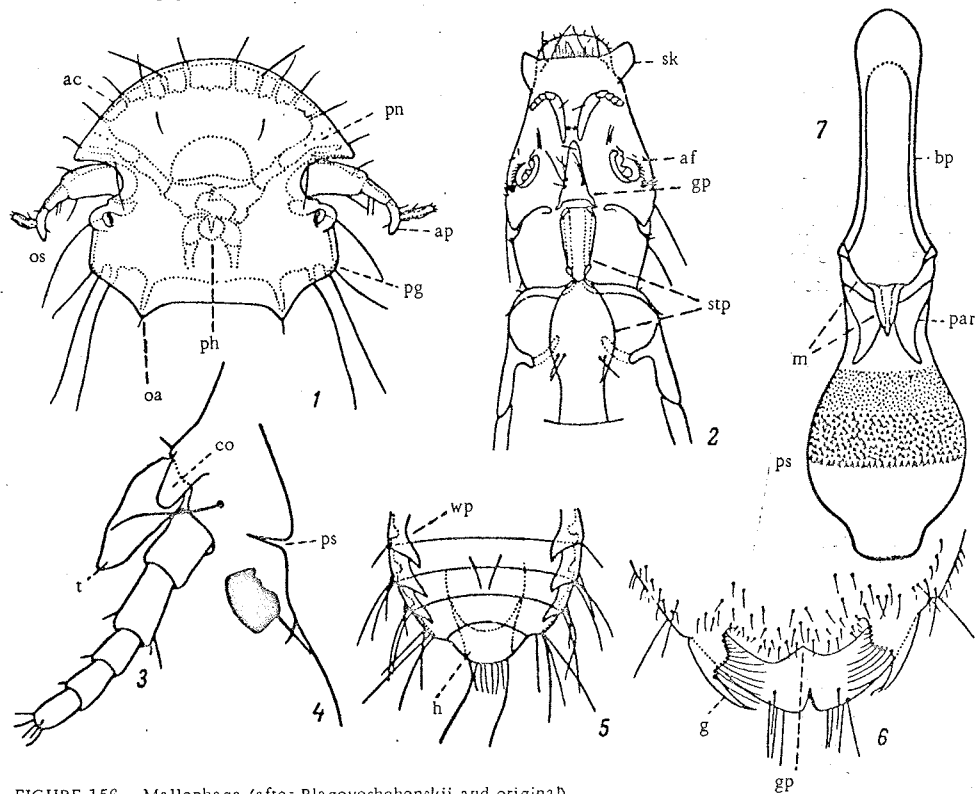


FIGURE 156. Mallophaga (after Blagoveshchenskii and original)

1—head of *Goniodes dissimilis*, male, dorsal (ac—carina on anterior margin, pn—preantennal nodus, pg, oa—postgenal and occipital angles, ap—appendage of 3rd antennal segment, os—ocular seta, ph—pharyngeal sclerite); 2—head and thorax of *Ricinus ivanovi*, female, ventral (sk—sucker-shaped lobe of labrum, af—ventral antennal fossa, gp—gular plate, stp—sternal plates); 3—lateral part of head of *Philopterus ocellatus*, female, ventral (co—cone, t—trabecula); 4—same of *Eomenacanthus stramineus*, female, dorsal (ps—preocular slit); 5—posterior part of abdomen of *Anatococcus dentatus*, male, ventral (wp—wedge-shaped process of pleurite, h—hypandrium); 6—end of abdomen of *Bovicola bovis*, female, ventral (gp—genital plate, g—genapophyses); 7—copulatory apparatus of male *Gyropus ovalis* (bp—basal plate, par—parameres, m—mesosome, ps—eversible preputial sac).

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Mallophaga are collected with a forceps. They are best stored in 70% alcohol. The specimens collected from each host are kept in separate test tubes with labels indicating place and time of collection, name of collector and species of host. Preparations of whole insects and separate 312 organs (treated or not treated with KOH†) are required for the study and identification of Mallophaga.

The world fauna of Mallophaga and their distribution according to hosts is insufficiently known. About 2200 species are known to infest birds and about 300 species to infest mammals. We describe here the genera found in the fauna of the European U.S.S.R. or likely to be found there; we also indicate the species parasitizing domestic animals. — 83 genera (accepted by the author).

LITERATURE. Blagoveshchenskii, D.I. Opredelitel' pukhoedov (Mallophaga) domashnikh zhivotnykh (Key to the Bird Lice (Mallophaga) of Domestic Animals). — Fauna SSSR, Novaya Seriya, Vol. 27, 1940; Blagoveshchenskii, D.I. Stroenie i sistematicheskoe znachenie polovoii sistemy pukhoedov (Mallophaga) (The Structure of the Genitalia of Mallophaga and Their Systematic Importance). — Parazitologicheskii Sbornik Zoologicheskogo Instituta Akademii Nauk SSSR, Vol. 16, 1956; Blagoveshchenskii, D.I. Pukhoedy (Mallophaga). — Fauna SSSR, Novaya Seriya, Vol. 72, 1959; Clay, T. A Preliminary Key to the Genera of the Menoponidae (Mallophaga). — Proc. Zool. Soc. Lond., Vol. 117, 1947; Giebel, C. Insecta Epizoa. Leipzig, 1874; Hopkins, G.H.E. and T. Clay. A Check List of the Genera and Species of Mallophaga. London, 1952; Kéler, S. Bibliographie der Mallophagen. — Mitt. Zool. Mus. Berlin, Bd. 36 (2). 1960; Piaget, E. Les Pédiculines. Leide, 1880, Supplément, 1885.

Key to Suborders

- 1 (2). Maxillary palps (Figure 155, 3) present. Antennae capitate or clavate, 4- or 5-segmented, concealed in antennal fossae at rest. On birds and mammals ..... 1. Amblycera (p. 388).
- 2 (1). Maxillary palps absent. Antennae usually filiform, 3- to 5-segmented, projecting at sides of head. On birds and mammals ..... 2. Ischnocera (p. 395).

1. Suborder *AMBLYCERA*

Maxillary palps 2- to 4-segmented. Antennae capitate or clavate, 4- or 5-segmented, without sexual dimorphism, concealed in lateral or ventral antennal fossae at rest. Meso- and metathorax usually not fused. On birds and mammals.

Key to Families

- 1 (4). All tarsi with 2 claws. Labial palps 1- or 2-segmented.
- 2 (3). Antennae lying in lateral antennal fossae. Meso- and metathorax not fused. Abdomen with lateral intersegmental indentations or processes. On birds and mammals ..... 1. Menoponidae (p. 389).
- 3 (2). Antennae lying in ventral antennal fossae. Meso- and metathorax fused. Lateral contour of pterothorax and abdomen not interrupted. On birds ..... 2. Laemobothriidae (p. 393).
- 4 (1). Tarsi of middle, hind, and usually of forelegs with one claw. Labial palps 1-segmented. On mammals ... 3. Gyropidae (p. 394).

† To make preparations without treatment with KOH, the specimen is passed through alcohols of increasing concentration, xylène, or oil of cloves, and embedded in Canada balsam. For preparations treated with KOH, the specimen is kept in cold or hot 5-10% KOH, washed in water and then treated as above. Chitinous parts of internal organs (e. g., the pharyngeal sclerite, copulatory apparatus, etc.) are often visible in total preparations, particularly in KOH-treated specimens.

MENOPONIDAE

1. Family MENOPONIDAE

Labial palps 1- or 2-segmented. Antennae 4- or 5-segmented, lying in lateral antennal fossae at rest. Meso- and metathorax not fused. Tarsi with 2 claws. Abdomen with lateral intersegmental indentations or processes, with 5 or 6 pairs of spiracles. On birds and mammals. — 26 genera.

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Key to Genera

- 1 (50). Abdomen with 6 pairs of spiracles.
- 2 (3). Gular plate trilobed (Figure 157, 1). Head semilunar, with narrow preocular slits. Hind femora and abdominal sterna III-V or VI covered with small groups of setae. Pleura II-VI with ventral wedge-shaped processes. On rails (Ralli), grebes (Colymbi), etc. .... 1. *Pseudomenopon* Mjöb.
- 3 (2). Gular plate of different form or absent.
- 4 (11). Head with ventral processes.
- 5 (10). Head with a pair of postpalpal processes (Figure 155, 3).
- 6 (7). Pharyngeal sclerite flask-shaped. Abdominal pleurites with anterior apodemes. Head trilobed, with narrow preocular slits; antennal fossae partly covered ventrally. Last antennal segment cylindrical. Hind femora and several abdominal sterna covered with small groups of fine setae. On Galliformes (Rasores)..... 2. *Uchida* Ew.  
On domestic fowl *U. pallidulus* Neum.
- 7 (6). Combination of characters different.
- 8 (9). Female genital plate with transverse band divided in the middle. Last abdominal segment of male with dorsal marginal band. Head trilobed, with narrow preocular slits; antennal fossae half covered ventrally. 2nd antennal segment with small appendage; last antennal segment ovoid. Hind femora and abdominal sterna III-V covered with distinct groups of fine setae. On Galliformes ..... 3. *Eomenacanthus* Uch.  
On turkeys and domestic fowls — *E. stramineus* N.
- 9 (8). Different combination of characters. Head semilunar or trilobed, with preocular slits. 2nd antennal segment with well-developed appendage. Hind femora with groups of setae or not. Abdominal sterna with groups of setae or with spinelike setae at posterior margin, or with both forms of setae. Abdominal pleurites sometimes with ventral wedge-shaped processes. Infesting Galliformes, pigeons (Columbae), hoopoes (Upupidae), woodpeckers (Picariae), Passeres, etc. .... 4. *Menacanthus* Neum.  
On domestic fowl — *M. cornutus* Schöm.
- 10 (5). Head with a pair of gular processes. Lateral margins of head (anterior to eyes) with a row of minute setae (Figure 157, 2). Antennal fossae covered ventrally in greater part. Prothorax large, broad, almost as large as head. Hind femora and abdomen without ventral groups of setae. On Procellariiformes (Tubinares) ..... 5. *Ancistrona* Westw.
- 11 (4). Head without ventral processes.

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- 12 (13). First 2 antennal segments with large appendages (Figure 157,3). Eyes with 2 hemispherical lenses. Head triangular, with convex anterolateral margins, antennal fossae half-covered ventrally. All 3 thoracic segments well developed; prothorax with lateral lobes. Hind femora and abdominal sterna IV-V or VI with dense or sparse groups of fine setae. On Anseriformes and flamingos (*Phoenicopterus*) ..... 6. *Trinoton* N. On domestic goose — *T. anserinum* F.; on domestic duck — *T. querquedulae* L.
- 13 (12). Combination of characters different.
- 14 (15). Sides of abdominal sternum II with a group of long, thick or spinelike setae (Figure 157, 4). Head trilobed, anteriorly rounded trapezoidal, without preocular slits. Prosternum with 2 median setae. Hind femora and middle abdominal sterna usually with groups of setae. Anterior abdominal terga (first or more) of female often modified. On woodpeckers and Passeriformes ..... 7. *Myrsidea* Waters
- 15 (14). Abdominal sternum II without lateral groups of setae as in No. 14.
- 16 (21). Prosternum with whole or partly interrupted margin (Figure 157,5). Head without preocular slits. Prosternum with more than 2 median setae.
- 17 (20). Dorsal wall of antennal fossa with median transverse carina (Figure 157, 6). Prothorax with lateral processes. Hind femora and abdominal sterna V-VI or VII with dense groups of fine setae.
- 18 (19). Gular plate horseshoe-shaped (Figure 157, 7). Head much broader than long, with rounded postgenae. On swifts (*Micropodes*) ..... 8. *Eureum* N.
- 19 (18). Gular plate of different shape. Head usually slightly broader than long, with angular postgenae. On swifts ..... 9. *Dennyus* Neum.
- 20 (17). Dorsal wall of antennal fossa without median transverse carina. Prothorax without lateral processes. Hind femora and abdomen without ventral groups of setae. Head much broader than long, with rounded postgenae. On Passeriformes ..... 10. *Machaerilaemus* Har.
- 314 21 (16). Different combination of characters.
- 22 (27). Hind femora (Figure 157, 8) and abdominal segments (first or more) or only abdominal segments with ventral rows of short, thick setae.
- 23 (24). Last antennal segment with incomplete division into 2 parts (Figure 157, 9). Head almost semilunar, with narrow preocular slits. Prosternum with 2 median setae. Abdominal sterna III-IV of female and III-V of male with 2 or more rows of setae. Abdominal tergal plates sometimes with more strongly sclerotized lateral parts. On cuckoos (*Cuculi*) and diurnal birds of prey (*Accipitres*). ..... 11. *Cuculiphilus* Uch.
- 24 (23). Last antennal segment without traces of division.
- 25 (26). Large species (4-6). Prosternum with several median setae. Head almost semilunar, with narrow preocular slits; antennal fossae partly covered ventrally. Hind femora with rows or sparse groups of setae. Male tibiae with distal process. Abdominal

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sternum III with 2 or more rows of setae; abdominal sternum IV with or without rows of setae. Adults and nymphs occur in the oral cavity of hosts in addition to plumage. On Steganopodes . . . . .

- 26 (25). Small species. Prosternum usually with 2 median setae. Head trilobed or almost semilunar, with broad or narrow preocular slits, with angular or rounded postgenae. Abdominal sterna III and partly IV with 1-2 or more rows of setae. On Galliformes, pigeons, Anseriformes, Steganopodes, Ciconiiformes (Gressores), diurnal birds of prey, Strigiformes, woodpeckers, Passeriformes, etc. . . . . 12. *Piagetiella* Neum.
- 315 27 (22). Hind femora and abdomen without rows of setae.
- 28 (29). Head semicircular, with narrow preocular slits; antennal fossae partly covered ventrally. Last antennal segment capitate. Hind femora and abdomen without ventral groups of setae. On diurnal birds of prey . . . . . 14. *Nosopon* Hopk.
- On domestic goose — *C. pectiniventre* Har.

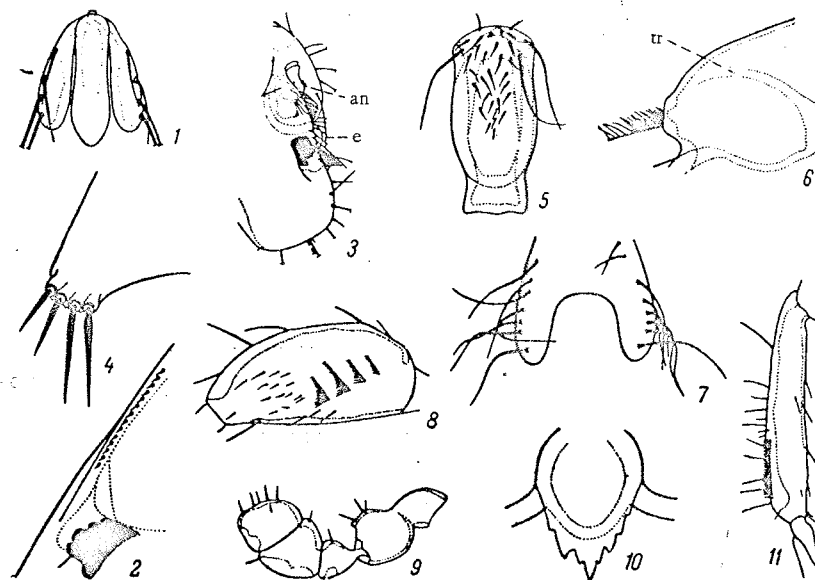


FIGURE 157. Mallophaga. Family Menoponidae (after Blagoveshchenskii and original)

1—*Pseudomenopon tridens*, gular plate of female; 2—*Ancistrona vagelli*, preocular lateral row of setae of female; 3—*Trinoton querquedulae*, lateral part of head, male (e—two-lensed eye, an—antenna); 4—*Myrsidea aegithali*, group of lateral spinelike setae on abdominal sternum II of female; 5, 7—*Eureum cimicoides*, female: 5—prosternum; 6—lateral part of head (tr—transverse carina of dorsal wall of antennal fossa); 7—gular plate; 8, 9—*Cuculiphilus fasciatus*, female: 8—ventral rows of setae on hind femur; 9—antenna; 10—*Holomenopon tadornae*, prosternum of female; 11—*Heleonomus macilentus*, female, chaetotaxy of hind tibia.

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- 29 (28). Combination of characters different.
- 30 (31). Posterior margin of prosternum serrated (Figure 157, 10). Head semilunar, without preocular slits; antennal fossae half-covered ventrally. Prosternum with 2 median setae. Hind femora and abdominal sterna IV-V, partly also III and VI with more or less distinct groups of setae. On Anseriformes . . . . 15. *Holomenopon* Eichl.
- 31 (30). Posterior margin of prosternum not serrated.
- 32 (35). Last antennal segment with traces of division into 2 or more parts.
- 33 (34). Prosternum with 2 median setae. Head semilunar with narrow or wide preocular slits. Hind femora and abdominal sterna IV-V or VI with sparse groups of setae. Pleurites of several abdominal segments with ventral wedge-shaped processes. On Ciconiiformes . . . . . 16. *Plegadiphilus* Bedf.
- 34 (33). Prosternum with more than 2 setae. Head semilunar, with narrow preocular slits. Hind femora and abdominal sterna IV-V with sparse groups of setae. On Ciconiiformes . . . . . 17. *Eucolpocephalum* Bedf.
- 35 (32). Last antennal segment without traces of division.
- 36 (37). Head trilobed. Prosternum with 2 median setae; mesosternum with more than 2 median setae. Middle and hind tibiae with outer marginal and submarginal setae arranged in groups, not in rows (Figure 157, 11). Hind femora and abdominal sternum IV with dense groups of fine setae. On cranes (Gruidae) . . . . . 18. *Gruimenopon* Cl. et M.
- 37 (36). Different combination of characters.
- 38 (41). Head semilunar.
- 39 (40). With narrow preocular slits. Prosternum with denticle-shaped posterior process. Antennal fossae half-covered ventrally. Prosternum with 2 median setae. Hind femora and abdominal sterna IV-VI with groups of setae. On Steganopodes . . . . . 19. *Eidmanniella* Kél.
- 40 (39). Without preocular slits. Prosternum without denticle-shaped posterior process. Antennal fossae ventrally half-covered. Prosternum with 2 median setae. Hind femora and middle abdominal segments with or without ventral groups of setae. Infesting Charadriiformes (Limicolae), gulls (Lari), auks (Alcae), Procellariiformes, etc. . . . . 20. *Austromenopon* Bedf.
- 41 (38). Head trilobed.
- 42 (45). Eye occupying almost the whole ocular pit. Postgenae rounded.
- 43 (44). Pleura very narrow, without setae at posterior margin. Head with or without narrow preocular slits. Antennae distinctly clavate; antennal fossae partly covered ventrally. Hind femora and abdominal sternum IV with dense groups of fine setae; sterna V-VI sometimes with sparse groups of 3-6 setae. Pleurites with apodemes. On Galliformes . . . . . 21. *Menopon* N. On domestic fowl — *M. gallinae* L.
- 44 (43). Pleurites well developed, with a row of setae at posterior margin. Head with narrow or broad preocular slits; antennae markedly clavate; antennal fossae half-covered ventrally. Hind femora and usually some of abdominal sterna III-VII with dense or sparse groups of setae. Pleurites with or without apodemes. On Galliformes . . . . . 22. *Amyrsidea* Ew.



LAEMOBOTHRIDAE

- 45 (42). Eye not occupying the whole ocular pit. Postgenae angular.
- 46 (47). Fore, middle and hind tibiae with a row of fine setae at outer margin (Figure 157, 11). Head with wide preocular slits. Last antennal segment oblong, cylindrical. Prosternum with 2 median setae. Hind femora and abdominal sternum IV with dense groups of setae; abdominal sterna II-III, V-VIII with sparse groups of setae. On Gruiformes ..... 23. *Heleonomus* Ferris.
- 47 (46). Tibiae without row of setae.
- 48 (49). Prosternum with median perforation. Mesothorax with 4 anterodorsal setae close together in the middle. Head with narrow preocular slits, square or rounded postgenae; antennal fossae partly covered ventrally. Prosternum with 2 median setae. Hind femora and abdominal sterna IV-V (also III in part) with dense or sparse groups of fine setae. Abdominal pleurites II-IV sometimes with ventral wedge-shaped processes.  
316 On bee-eaters (Meropidae) and rollers (Coraciidae) ..... 24. *Meromenopon* Cl. et M.
- 49 (48). Different combination of characters. Head with wide preocular slits, square or rounded postgenae; antennal fossae partly covered ventrally. Prosternum with 2-4 median setae. Hind femora and abdominal sternum IV (also III and V in part) with dense or sparse groups of setae. On Charadriiformes, gulls, Procellariiformes ..... 25. *Actornithophilus* Ferris.
- 50 (1). Abdomen with 5 pairs of spiracles. Head with distinct clypeal suture; antennal fossae partly covered ventrally. Head without lateral hooklike processes or ventral spines. 1st tarsal segment with distinct pulvilli. On rodents (*Cavia*, etc.) ..... 26. *Trimenopon* Cum.  
On the common guinea pig — *T. hispidum* Burm.

2. Family LAEMOBOTHRIDAE

Antennae lying in ventral antennal fossae. Meso- and metathorax fused. Tarsi with 2 claws. Lateral contours of pterothorax and abdomen not interrupted. On birds. — 3 genera.

Key to Genera

- 1 (4). Head with anterolateral bulges. Labrum without sucker-shaped lobes.
- 2 (3). Anterior margin of head truncate or convex, without rodlike setae. Copulatory apparatus without parameres. On birds of prey ..... 1. *Laemobothrion* N.
- 317 3 (2). Anterior margin of head concave, with several rodlike setae (Figure 158, 1). Copulatory apparatus with free parameres. On aquatic birds ..... 2. *Eulaemobothrion* Ew.
- 4 (1). Head without anterolateral bulges. Labrum with 2 sucker-shaped lobes (Figure 156, 2) which usually project beyond lateral margins of head. Head without deep lateral notches. Body oblong. On Passeriformes, etc. .... 3. *Ricinus* Deg.

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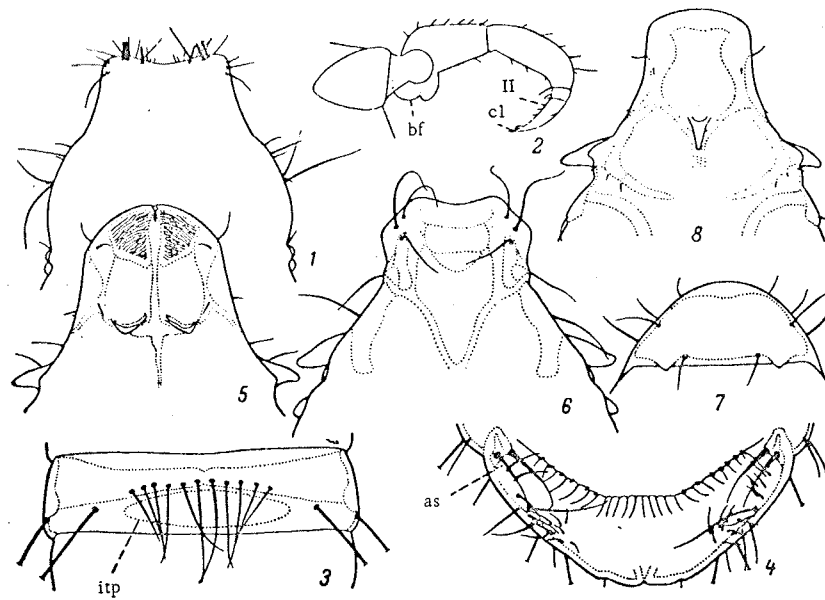


FIGURE 158. Mallophaga (after Blagoveshchenskii and original)

1—*Eulaemobothrion atrum*, female, anterior part of head; 2—*Gyropus ovalis*, female, hind leg (bf—basal bifurcation of femur, II—2nd tarsal segment, cl—claw); 3—*Otidoeucus heterographus*, male, abdominal segment IV (itp—intertergal plate); 4—*Rallicola fulicae*, anterolateral setae (as) of abdominal sternum VIII; 5—*Iridoecus bisignatus*, female, clypeus; 6—*Craspedorrhynchus macrocephalus*, same; 7—*Neophilopterus tricolor*, same, male; 8—*Saemundssonina sterna*, male, anterior part of head.

3. Family GYROPIDAE

Mouthparts terminal. Maxillary palps 2- to 4-segmented; labial palps 1-segmented. Antennae 4-segmented. Antennal fossae lateral. Eyes rudimentary or absent. Postgenae horn-shaped. Tarsi with 1 claw; fore tarsi rarely with 2 claws. Middle and, usually, hind legs adapted to cling to hair. Abdomen with 5 or 6 pairs of spiracles. On rodents, Artiodactyla and primates. — 3 genera.

Key to Genera

- 1 (2). Middle and, usually, hind femora with basal bifurcation; 2nd tarsal segment oblong (Figure 158, 2). Abdomen with 6 pairs of spiracles. Maxillary palps 4-segmented. All tarsi with one claw. Body broad. On rodents (Caviidae, etc.) and primates (Cebidae) . . . . . 1. *Gyropus* N.  
On the common guinea pig.— *G. ovalis* N.
- 2 (1). Middle and hind femora without basal bifurcation; tarsi with well-developed sucker-shaped pulvillus on 2nd segment and reduced

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- claw. Abdomen with 5 pairs of spiracles. Maxillary palps 2-segmented.
- 3 (4). Prothorax without ventral processes. Middle and hind tibiae similar. Body narrow, covered with fine setae. On rodents (Caviidae, etc.) ..... 2. *Gliricola* Mjöb. On the common guinea pig — *G. porcelli* Schr.
- 4 (3). Prothorax with a pair of spinelike ventral processes. Middle and hind tibiae dissimilar. Body broad, covered with long setae. On nutria (*Myocastor coypus*) ..... 3. *Pitrufquenina* Mar.

2. Suborder ISCHNOCERA

Maxillary palps absent. Antennae usually filiform, 3- or 5-segmented, often with distinct sexual dimorphism, markedly projecting at sides. Mesothorax and metathorax usually fused. On birds and mammals.

Key to Families

- 1 (2). Tarsi with 2 claws. Antennae 5-segmented. On birds and mammals ..... 1. Philopteridae (p. 395).
- 2 (1). Tarsi with 1 claw. Antennae 3- (?-5) segmented. On mammals .. ..... 2. Trichodectidae (p. 403).

1. Family PHILOPTERIDAE

Antennae 5-segmented, filiform or rarely slightly clavate, often showing strong sexual dimorphism. On birds and mammals (lemurs). — 47 genera.

Key to Genera

- 1 (6). Head rounded anteriorly, with sclerotized band at anterior margin, angular posteriorly, with well-marked postgenal and occipital angles, usually broad (Figure 156, 1). Abdomen oval or almost rounded, with normally developed 1st segment. In body plumage.
- 2 (3). Antennae without sexual dimorphism. Eyes slightly convex or flat. Female genital plate laterally with submarginal or marginal spinules and thick setae. Pleurites of abdominal segment VIII of female without setose pulvilliform processes. On Galliformes and pigeons ..... 1. *Goniocotes* Burm. On domestic fowl — *G. gallinae* Deg.; on domestic fowl and turkeys — *G. maculatus* Tasch.; on domestic pigeon. — *G. compar* N.
- 3 (2). Different combination of characters.
- 318 4 (5). Abdominal segment I larger than II. Cones without marked sexual dimorphism. Male abdomen without ventral appendage. Antennae usually showing marked sexual dimorphism; in male: 1st antennal segment enlarged, sometimes both 1st and 2nd segments with process, 3rd segment often with process, sometimes 4th and 5th segments markedly reduced or 3rd to 5th segments modified, so that the anterior part of the antennae seems curved-clavate. Abdominal sternum VII of female often with lateral denticle-shaped appendages; pleurites of abdominal segment VIII of female ventrally with

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- well-developed pulvilliform setose processes. Female genital plate usually without lateral spines at angles. End of male abdomen rounded; end of female abdomen bilobed. Galliformes, pigeons . . . . . 2. *Goniodes* N. On domestic fowl — *G. dissimilis* N., *G. gigas* Tasch., *G. truncatus* Gb. On domestic pigeon — *G. piageti* John. et Har.
- 5 (4). Abdominal segment I smaller than II. Cones showing sharp sexual dimorphism, with thin transparent appendage in male. Abdominal segment VII of male with ventral fingerlike appendage. 1st antennal segment of male enlarged; 1st and 3rd antennal segments of male with appendage. End of male and female abdomen bilobed. On Galliformes . . . . . 3. *Chelopistes* Kél. On turkeys — *Ch. meleagridis* L.
- 6 (1). Combination of characters different.
- 7 (66). Pterothorax pentagonal or trapezoidal, with markedly diverging lateral margins.
- 8 (33). Body more or less slender, short or oblong, with narrow head and usually narrow abdomen. Legs short, moderately massive. Antennae often without sexual dimorphism. Mainly body plumage, sometimes on neck and head.
- 9 (10). No spermatheca (its chitinous ring is not found in preparations of females). Male abdomen with intertergal plates between segments II-VII (Figure 158, 3); ejaculatory duct with appendage. Head with continuous carina at anterior margin, sometimes with distinct clypeal and postantennal sutures. 1st antennal segment of male enlarged, usually without appendage; 3rd segment with appendage. Abdominal tergal plates of female divided, lateral or continuous. Abdomen sometimes broad; last abdominal segment bilobed. On bustards (*Otides*), *Charadriidae* and Galliformes . . . . . 4. *Otideoecus* Bedf. On domestic fowl — *O. heterographus* N.
- 10 (9). Different combination of characters.
- 11 (22). Carina at anterior margin entire dorsally, sometimes light and expanded on oral groove or narrowed in region of clypeal suture.
- 12 (17). Head without clypeal suture.
- 13 (14). Postgenae with one long seta. Head with distinct oral groove; carina at anterior margin of head weakly developed and often widened. First antennal segment male sometimes enlarged. Abdomen with lateral tergal plates and median sternal plates. On Passeriformes, woodpeckers, bee-eaters, etc. . . . . 5. *Brüelia* Kél.
- 14 (13). Postgenae with not less than 2 long setae.
- 15 (16). Abdominal pleurites with perforation anteriorly ("eyelet"). Head without sutures. 1st antennal segment of male sometimes enlarged; 3rd antennal segment with appendage. Abdominal segments usually with lateral tergal plates; male without intertergal plates. On sandgrouse (*Pterocletes*) . . . 6. *Syrrhptoecus* Waters
- 16 (15). Abdominal pleurites without perforation. Head rounded anteriorly, truncate or pointed, sometimes with transparent margin, rarely with postantennal suture. Antennae usually without sexual dimorphism. Abdomen sometimes broad, with continuous tergal plates

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- and median sternal plates. Pleurites often with hooklike, re-entrant head. On diurnal birds of prey, Coraciiformes, woodpeckers, etc. .... 7. *Degeeriella* Neum.
- 17 (12). Head with clypeal suture.
- 18 (21). Most abdominal segments with lateral tergal plates.
- 19 (20). Abdomen broad. Clypeal suture transverse; postantennal suture curved, often indistinct. 1st antennal segment of male enlarged; 3rd antennal segment with process. Male without intertergal plates. Pleurites with curved re-entrant head. On Galliformes ... 8. *Lagopoecus* Waters
- 20 (19). Abdomen narrow. Clypeal suture transverse, concave. Carina at anterior margin narrow near clypeal suture. Abdominal sternal plates median. Pleurites with hooklike re-entrant head. On Cuculiformes ..... 9. *Cuculicola* Cl. et M.
- 21 (18). Abdominal segments with continuous tergal plates. Clypeal suture forked. Carina at anterior margin narrow in region of clypeal suture. Abdominal sternal plates median. Pleurites with hooklike re-entrant head. On hoopoes ..... 10. *Upupicola* Cl. et M.
- 22 (11). Carina at anterior margin of head interrupted.
- 23 (26). Postgenae with one long seta.
- 319 24 (25). Postgenal carinae distinct. Abdominal segment VIII of female ventrally without thick anterolateral setae. Head with forked clypeal suture. Clypeus rounded, with transparent anterior margin reaching carinae and with plate projecting beyond them. 1st antennal segment of male enlarged. Abdominal segments III-VI of female with lateral tergal and sternal plates; sternal plates median in male. On grebes ..... 11. *Aquanirmus* Cl. et M.
- 25 (24). Different combination of characters. Head often with distinct clypeal suture. Clypeus usually with plate, often with narrow or broad transparent anterior margin. Antennae similar in both sexes, or in male 1st antennal segment enlarged, sometimes with appendage, and 3rd segment with appendage. Female genital plate with slender setae and spinules at the margin; abdominal segment VIII ventrally with 1-3 thick anterolateral setae (Figure 158, 4). On rails, etc. .... 12. *Rallicola* John et Har.
- 26 (23). Postgenae with not less than 2 long setae.
- 27 (28). Pleurites of abdominal segment I connected with lateral margins of 1st sternal plate. Segment VIII with laterodorsal groups of setae. Head with forked clypeal suture. Clypeus with plate, Antennae without sexual dimorphism. Abdominal segments I-VII of female, like segment I, I-II or I-III and VII, or VI-VII of male, with lateral tergal plates. On the avocet (*Recurvirostra*) ..... 13. *Cirroptirius* Tim.
- 28 (27). Combination of characters different.
- 29 (30). Clypeus with transparent anterior margin reaching carinae. Head with usually forked clypeal suture. Clypeus rounded, truncate or concave. Antennae without sexual dimorphism. Abdomen sometimes broad; tergal plates entire over greater part of segment, often longitudinally divided in middle or lateral. On Charadriiformes, auks, etc. .... 14. *Quadriceps* Cl. et M.

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- 30 (29). Clypeus with transparent anterior margin reaching clypeal suture.
- 31 (32). Frontal carina with posterior transverse part. Most tergal plates with posterior transverse, more heavily pigmented carina. Head with clypeal suture distinct at sides, with distinct vertical and gular carinae. Clypeus rounded, with large plate and characteristic carinae. Antennae without sexual dimorphism. Tergal plates of abdomen usually entire. On Charadriiformes ..... 15. *Carduceps* Cl. et M.
- 32 (31). Different combination of characters. Head with transverse clypeal suture, without distinct vertical carinae. Clypeus rounded, with small plate. Antennae without sexual dimorphism. Tergal plates of abdomen usually entire. On Charadriiformes ..... 16. *Luniceps* Cl. et M.
- 33 (8). Body broad, short, with broad head and oval or rounded abdomen. Legs relatively short and massive. Antennae usually without sexual dimorphism. Mainly on feathers of head and neck.
- 34 (35). Trabeculae present. Head with clypeal suture, with well-developed trabeculae and short cones (Figure 156, 3). Clypeus with transparent anterior part reaching carinae. Antennae without sexual dimorphism. Most tergal plates of abdomen lateral, with pustules at posterior margin. On Passeriformes, woodpeckers, etc. .... 17. *Philopterus* N.
- 35 (34). Trabeculae absent.
- 36 (37). Head with clypeal suture and curved postantennal suture, without distinct vertical carinae. Clypeus not modified, narrowed, with straight transparent anterior margin which reaches carinae, with pentagonal plate without processes. Antennae without sexual dimorphism. Tergal plates of abdomen usually distinct, lateral or continuous. Pleurites with re-entrant head. On Passeriformes and woodpeckers ..... 18. *Penenirmus* Cl. et M.
- 37 (36). Different combination of characters.
- 38 (39). Abdominal pleurites with ventral wedge-shaped processes (Figure 156, 5). Clypeal suture forked. Clypeus (Figure 155, 1) rounded, with transparent free lobe and with characteristic carinae; plate with posterior process. Most abdominal segments with lateral tergal plates; chitinous rod between first tergal plates reaching middle of abdomen. On Lamellirostres and flamingos ... 19. *Anatoecus* Cum.  
On domestic goose — *A. adustus* N.; on domestic duck — *A. dentatus* Scop.
- 39 (38). Abdominal pleurites without ventral processes.
- 40 (41). Clypeus with 2 plates (Figure 158, 5). Clypeal suture forked. Clypeus anteriorly straight or notched, sometimes forming closed forceps, with transparent free lobe; plate usually with denticle-shaped posterior process. Abdominal segments usually with lateral tergal plates and one row of tergal setae. On ibises (*Plegadidae*), etc. .... 20. *Ibidoecus* Cum.
- 41 (40). Clypeus with one plate.
- 42 (47). Abdominal segments with continuous tergal plates.

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- 43 (44). Head with transparent lateral lobes of pulvinus projecting beyond margins, with 3 pairs of dorsal pin-shaped spines. Clypeus with transparent anterior margin reaching carinae. Vertical carinae directed towards ocular carinae. Antennae similar in both sexes or in male 3rd antennal segment (or 1st and 3rd) with appendage. On Procellariiformes ..... 21. *Trabeculus* Rud.
- 44 (43). Combination of characters different.
- 45 (46). No postantennal suture. Clypeal suture forked. Clypeus with transparent anterior margin reaching carinae; plate without posterior process. Vertical carinae directed towards preantennal nodes. Antennae without sexual dimorphism. On Charadriidae ... 22. *Cummingsiella* Ew.
- 46 (45). Postantennal suture present, transverse. Clypeal suture well marked at sides. Vertical carinae directed towards ocular carinae. Clypeus with transparent margin reaching suture. Antennae without sexual dimorphism. On loons (Gaviae) ..... 23. *Craspedonirmus* Thomp.
- 47 (42). Abdominal segments with lateral tergal plates.
- 48 (49). Head large, triangular, broader than long, with forked clypeal suture and little-projecting cones. Clypeus anteriorly narrow, truncate or slightly concave, with transparent free lobe. Antennae without sexual dimorphism. On diurnal birds of prey ..... 24. *Aegypocus* Cl. et M.
- 49 (48). Different combination of characters.
- 50 (55). Clypeus anteriorly expanded in form of wing (Figure 158, 6).
- 51 (54). Frontal and clypeal carinae separate.
- 52 (53). Vertical carinae fused with preantennal nodes. Abdominal tergal plates without pustules or with one half-open pustule. Head with forked clypeal suture and markedly projecting cones. Clypeus anteriorly concave or truncate, with 2 lateral setae, with transparent margin which almost reaches suture. Antennae without sexual dimorphism. On diurnal birds of prey ..... 25. *Craspedorrhynchus* Kél.
- 53 (52). Combination of characters different. Head with forked clypeal suture and well-developed cones. Clypeus anteriorly concave, with 1-3 (or more) lateral setae, with transparent margin reaching suture. Antennae without sexual dimorphism. On Cuculiformes ..... 26. *Cuculoecus* Ew.
- 54 (51). Frontal and clypeal stripes fused. Head with markedly projecting cones. Clypeus anteriorly concave, with transparent margin and 2 spinelike anterolateral setae. Antennae without sexual dimorphism. On bee-eaters ..... 27. *Meropocus* Eichl.
- 55 (50). Clypeus of different form.
- 56 (57). Clypeal plate posteriorly with 2 lateral denticle-shaped processes (Figure 158, 7). Clypeal suture transverse. Abdominal segments usually with 2 tergal rows of setae. On Ciconiidae ..... 28. *Neophilopterus* Cum.
- 57 (56). Clypeal plate with or without posterior median process.
- 58 (59). Frontal carinae posteriorly with transverse branch (Figure 158, 8). Clypeal suture forked. Clypeus with transparent anterior margin

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- reaching carinae; plate with posterior process. Postantennal suture distinct at sides. Vertical carinae directed towards ocular carinae. Antennae without sexual dimorphism. On gulls, Charadriiformes, auks, Procellariiformes, Gruiformes, Steganopodes . . . . . 29. *Saemundssonina* Tim.
- 59 (58). Frontal carinae without transverse branch.
- 60 (61). Head with indistinct clypeal suture, with well-developed cones and one long postgenal seta. Clypeus anteriorly concave or almost truncate. Antennae without sexual dimorphism. Abdominal tergal plates tongue-shaped, without pustules at posterior margin. Female genital plate triangular. On Passeriformes . . . . . 30. *Sturnidoecus* Eichl.
- 61 (60). Different combination of characters.
- 62 (65). Abdominal sternal plates present except genital plate.
- 63 (64). Clypeal plate with posterior process. Head with forked clypeal suture, with markedly projecting cones and distinct vertical carinae. Clypeus forceps-shaped, with median notch anteriorly and with lateral transparent lobes which are usually joined, delimiting opening. Antennae without sexual dimorphism. On rails . . . . . 31. *Incidifrons* Ew.
- 64 (63). Clypeal plate without posterior process. Clypeal suture forked. Clypeus anteriorly narrowed, with transparent lobe and median notch (lateral parts joined around opening), or concave. Antennae without sexual dimorphism. On kingfishers (Halcyones) . . . . . 32. *Alcedoffula* Cl. et M.
- 65 (62). Abdominal sternal plates absent. Head with distinct clypeal suture and well-developed cones. Clypeus narrow anteriorly, shallowly convex or truncate, with transparent margin which reaches carinae; plate sometimes with well-developed posterior process. 1st antennal segment of male rarely enlarged, 3rd segment with process. Abdominal tergal plates with pustules at posterior margin. On owls . . . . . 33. *Strigiphilus* Mjög.
- 66 (7). Pterothorax longitudinally or transversely rectangular, with straight, concave or weakly diverging lateral margins, sometimes with notches anteriorly, or pentagonal with angular-convex lateral margins. Antennae usually showing sexual dimorphism. Body oblong; legs relatively long, slender. Mainly on wing feathers.
- 67 (68). Anterior part of head forceps-shaped, with connected or unconnected lateral lobes (Figure 159, 1). Posterior half of head markedly longer than anterior half; antennae therefore seem displaced anteriorly. Abdominal pleurites with 2 longitudinal carinae, which form a frame. On Anseriformes . . . . . 34. *Ornithobius* D.
- 68 (67). Anterior part of head different.
- 69 (74). Head with continuous carina at anterior margin.
- 70 (71). Anterior part of head with cuticular sculpture in form of processes or transverse line (Figure 159, 2). Head usually with transverse clypeal suture and indistinct postantennal sutures. 1st antennal segment of male enlarged, sometimes with appendage; 3rd segment with process. Male abdomen without intertergal plates, with ventral terminal process. On Galliformes . . . . . 35. *Oxylipeurus* Mjög.



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- On turkeys — *O. polytrapezius* N.  
 71 (70). Anterior part of head without such cuticular sculpture.  
 72 (73). Carina at anterior margin with a pair of preantennal nodes. Head without sutures, its anterior part often broader in male. 1st antennal segment of male enlarged, usually with appendage; 3rd segment with appendage. Abdominal terga II-VII of female usually with median X-shaped pigmented pattern. Tergal plates of male usually continuous; intertergal plates absent. On Galliformes . . . . .  
 . . . . . 36. *Lipeurus* N.  
 On domestic fowl — *L. caponis* L.

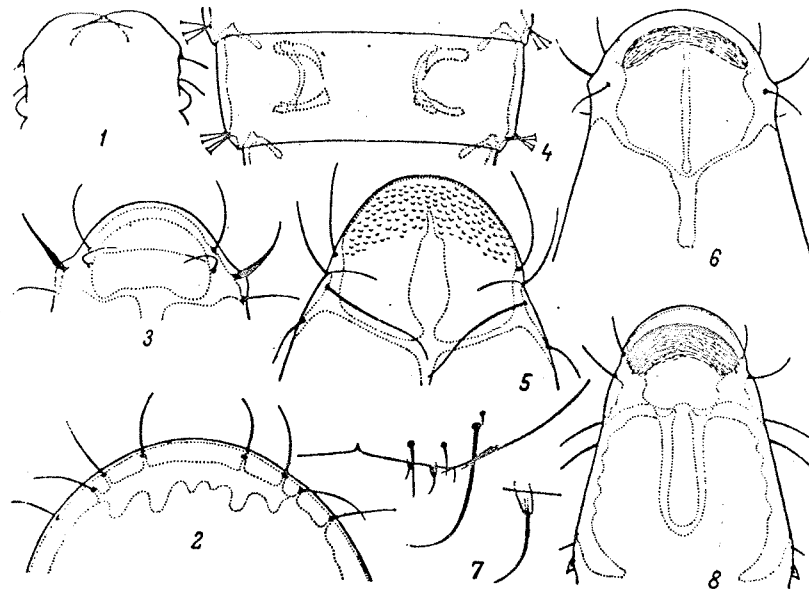


FIGURE 159. Mallophaga. Family Philopteridae (after Blagoveshchenskii and original)

- 1—*Ornithobius cygni*, anterior part of head, male; 2—*Oxylipeurus tetraonis*, sculpture of head, female; 3—*Anaticola crassicornis*, clypeus, female;  
 4—*Esthiopterum gruis*, tergal and sternal plates, dotted lines of abdominal segment V, female; 5—*Ardeicola ardeae*, female, clypeus; 6—*Fulicoffula lurida*, same;  
 7—*Pectinopygus excornis*, female, seta with well-developed articulated tubercle;  
 8—*Halipeurus diversus*, anterior part of head, female.

- 322 73 (72). Carina at anterior margin with three pairs of nodes. Clypeal suture wanting. 1st antennal segment of male enlarged, sometimes with appendage; 3rd segment with appendage. Many abdominal segments, or only some, with lateral tergal plates, which are fused with median plate. On diurnal birds of prey . . . . .  
 . . . . . 37. *Falcolipeurus* Bedf.  
 74 (69). Head with interrupted carina at anterior margin.  
 75 (84). Clypeus anteriorly without cuticular sculpture.

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- 76 (77). Pterothorax with posterolateral processes. Abdominal segments IV-V of male short. Clypeal suture forked. Clypeus with broad transparent anterior lobe. 1st antennal segment of male enlarged; 3rd segment with process. On Procellariiformes . . . . . 38. *Philoceanus* Kell.
- 77 (76). Combination of characters different.
- 78 (79). Sternal plates of pterothorax and abdominal segment I connected by a chitinous rod. Chaetotaxy of anterior half of head characteristic; one lateral seta on clypeus usually thick (Figure 159, 3). Clypeus narrowly rounded; plate of female usually semilunar. 1st antennal segment of male enlarged; 3rd segment with appendage. On Lamellirostres and flamingos . . . . . 39. *Anaticola* Cl. On the common goose — *A. anseris* L.
- 79 (78). Different combination of characters.
- 80 (81). Frontal carina posteriorly with transverse part (Figure 155, 2). Clypeus with a pair of anterior, often lanceolate setae, usually also a pair of posterior spines or setae. Clypeal suture transverse. Clypeus anteriorly rounded or concave, sometimes without plate. 1st antennal segment of male usually enlarged; 3rd segment with appendage. On pigeons . . . . . 40. *Columbicola* Ew. On the common pigeon — *C. columbae* L.
- 81 (80). Different combination of characters.
- 82 (83). Head with forked clypeal suture, with distinct vertical carinae. Antennae without sexual dimorphism. Clypeus slightly convex anteriorly, with transparent anterior margin reaching carinae, with plate. Body dark. On Caprimulgi . . . 41. *Mulcticola* Cl. et M.
- 83 (82). Head with transverse clypeal suture, without distinct vertical carinae. Antennae showing sexual dimorphism. Clypeus shallowly rounded or truncate. Body light, sometimes with characteristic abdominal plates (Figure 159, 4). On cranes . . . . . 42. *Esthiopterum* Har.
- 84 (75). Clypeus anteriorly with scalelike, reticular or longitudinally striated sculpture.
- 85 (86). Part of clypeus with scalelike sculpture (Figure 159, 5). Clypeal suture forked. Clypeus anteriorly rounded, with typical plate, divided by suture. 1st antennal segment of male enlarged; 3rd segment with appendage. On Ciconiiformes . . . . 43. *Ardeicola* Cl.
- 86 (85). Part of clypeus with reticular (Figure 159, 6) or longitudinally striated sculpture.
- 87 (88). Clypeal plate longitudinally divided (Figure 159, 6). Clypeal suture forked. Clypeus rounded anteriorly. 1st antennal segment of male enlarged; 3rd segment with appendage. Last abdominal segment bilobed, in female partly covered by lateral, pointed lobes of segment VIII. On rails, etc. . . . . 44. *Fulicoffula* Cl. et M.
- 88 (87). Clypeal plate entire or not distinct.
- 89 (90). Genital region of female with anterior and lateral rows of setae. Terminal segment of abdomen (in one or both sexes) also with setae on distinct articulated tubercle (Figure 159, 7). Clypeal suture and plate distinct. Antennae showing sexual dimorphism. Most abdominal pleurites with anterior apodemes. On Steganopodes . . . . . 45. *Pectinopygus* Mj6b.

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- 90 (89). Different combination of characters.  
 91 (92). Frontal carinae markedly curved posteriorly, reaching level of mandibles (Figure 159, 8). Anteroventral longitudinal carinae well developed. Clypeal suture forked. Clypeus with transparent anterior margin reaching stripes, with distinct plate. 1st antennal segment of male enlarged; 3rd segment with appendage. Male abdomen with separated shortened segments (V†, III and IV or IV and V). On Procellariiformes ..... 46. *Halipeurus* Har.  
 92 (91). Frontal carinae not curved posteriorly. Anteroventral longitudinal carinae not marked. Clypeal suture and plate not always distinct. Clypeus with light anterior margin. 1st antennal segment of male enlarged, sometimes with appendage; 3rd segment with appendage. On Procellariiformes and Stercorariidae ..... 47. *Harrisoniella* Bedf.

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2. Family TRICHODECTIDAE

Antennae 3-segmented in male, 3 (?-5)-segmented in female; 1st antennal segment of male often markedly enlarged, 3rd segment with apical spines. Eyes normal, sometimes weakly developed. Tarsi with 1 claw; claws smooth, rarely serrated. Gonapophyses (Figure 156, 6) well developed. On mammals. — 4 genera.

Key to Genera

- 1 (4). Abdominal segments usually with row of setae divided into groups.  
 2 (3). Head almost square, with straight or concave anterior margin. Carina at anterior margin narrowly interrupted in the middle. On dogs (*Canidae*), bears (*Ursidae*), *Mustelidae*, etc. .... 1. *Trichodectes* N.  
 On dogs — *T. canis* Deg.  
 3 (2). Head pentagonal, triangular anteriorly, usually with narrow apical notch. Carina at anterior margin interrupted by notch, On cats (*Felidae*), etc. .... 2. *Felicola* Ew.  
 On rats — *F. subrostratus* N.  
 4 (1). Abdominal segments usually with a regular row of setae which is often preceded by one or several irregular rows of setae.  
 5 (6). Abdominal segments with one regular row of fine, slender setae and usually 1-3 irregular rows of such setae. Head regularly rounded anteriorly, truncate or concave, with entire carina or carina narrowly interrupted in the middle. On *Bovidae*, *Cervidae*, *Equidae*, etc. .... 3. *Bovicola* Ew.  
 On cattle — *B. bovis* L.; on goats — *B. caprae* Gurlt.; on sheep — *B. ovis* Schr.; on horses — *B. equi* D.  
 6 (5). Abdominal segments with a regular row of long setae and 2 or several irregular rows of short thick setae. Anterior part of head slightly convex, with entire carina at anterior margin. Anterior part of head shorter than posterior part, so that the antennae appear displaced anteriorly. On *Bovidae* ..... 4. *Holakartikos* Kél.

† [Probably a misprint for II.]