TIPULIDAE 7

C. P. ALEXANDER AND GEORGE W. BYERS[1]

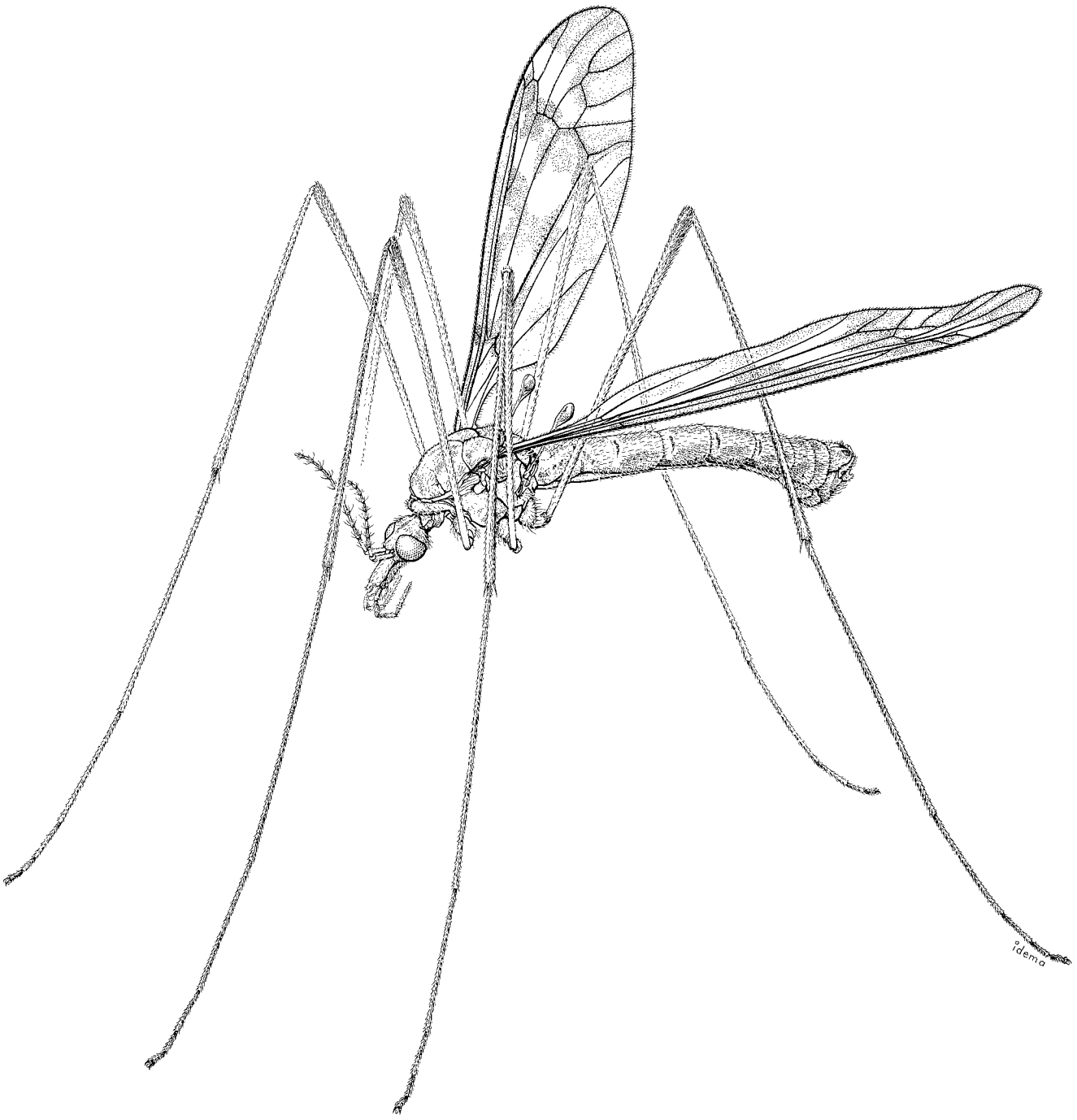


Fig. 7.1. Male of *Tipula trivittata* Say.

[1] Material dealing with adult forms was prepared by C. P. Alexander, and that dealing with immature stages by George W. Byers.

Typically slender-bodied flies (Fig. 1), with V-shaped transverse mesonotal suture. Wing elongate, rather narrow. Legs very long and slender, breaking readily at suture between trochanter and femur. Ocelli absent. Length up to 60 mm; size varying from tiny species of *Tasiocera* Skuse with wing length of about 2 mm, to large species of *Holorusia* Loew with wing often 40 mm long and of *Leptotarsus* Guérin-Méneville (*Longurio* Loew) with body length often 60 mm.

Adult. Head: rostrum small and inconspicuous in Limoniinae, commonly more conspicuous and often extended into a small projection called the ***nasus*** in Tipulinae (Fig. 2), sometimes greatly elongated in *Limonia* (*Geranomyia* Haliday) to about half as long as head and thorax combined and even longer in *Elephantomyia* Osten Sacken and *Toxorhina* Loew; mouthparts usually proportional in size to rostrum; palpus normally four-segmented, but sometimes reduced to a single element; lengthened labrum, hypopharynx, and labella comprising rostrum in *Limonia* (*Geranomyia*); greatly lengthened frons and clypeus comprising rostrum in *Elephantomyia* and *Toxorhina*, with very reduced palpi, labrum, and other mouthparts situated at extreme apex. Antenna varying greatly among groups (Figs. 8–14), usually short or moderate in length, but occasionally extremely long in male of some species, sometimes reaching three or four times body length as in some *Megistocera* Wiedemann, *Leptotarsus*, *Hexatoma* Latreille, and *Rhabdomastix* Skuse; segments numbering between five (some species of *Chionea* Dalman) and 39 (some species of exotic *Gynoplistia* Westwood), but generally numbering 13 in Tipulinae and 14–16 in Limoniinae; flagellomeres usually simple and unmodified, ranging in shape from nearly globular to oval and cylindrical, very elongated in species having long antennae, occasionally branched in male and only rarely branched in both sexes (*Ctenophora* Meigen); scape and pedicel normally similar throughout Tipulidae; one or more flagellomeres occasionally fused together to reduce the number of antennal segments from the usual 16 to as few as five (*Chionea*). Compound eyes large, usually widely separated to display a broad posterior vertex but sometimes holoptic to reduce posterior vertex to a capillary strip or to eliminate it completely (*Limonia* spp.); eyes usually glabrous, but in Pediciini with short erect hairs located between ommatidia; ommatidia numerous; ocelli absent.

Thorax: pronotum usually well-developed, sometimes elongate (*Limonia* spp., *Toxorhina* spp.), jutting anteriorly over prescutum; small paired impressions (tuberculate pits) often present on anterior half of prescutum; other impressed areas or prescutal pits sometimes large and conspicuous, present in postpronotal region. Legs with coxae well-developed; trochanters usually short, but longer in *Atarba* Osten Sacken and *Rhabdomastix*; tibiae with or without two terminal spurs; tarsal claws simple or variously toothed (some species of *Limonia* and *Tipula* Linnaeus).

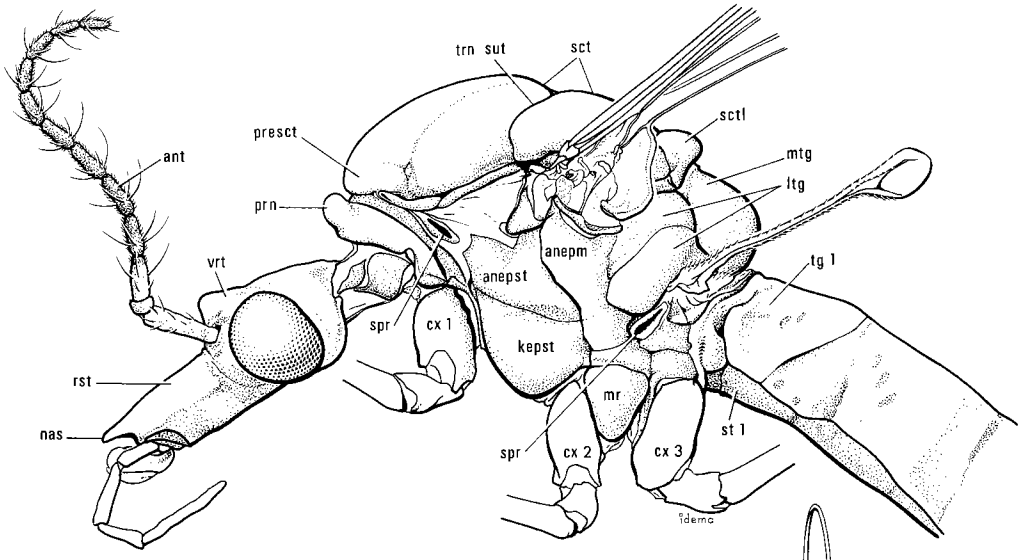
Halter long to very long in all Nearctic species. Wing normally present, but reduced or lost by atrophy in a few groups, sometimes in both sexes (*Chionea*) and sometimes only in female; venation correspondingly modified. Wing venation greatly variable within family and extremely important in taxonomy, generally characterized by two complete anal veins, 9–12 veins reaching wing margin, basal cells at least half length of wing, and a distinctive region near apical third of wing, called the ***cord***, where branching of Rs, M, and CuA frequently occurs in an almost linear transverse line; venational nomenclature of Comstock and Needham as modified by Alexander (1918, 1927, 1929) for the branching of R and Sc used in adult key.[2]

Abdomen: long to very long. Male terminalia (Figs. 3–6) with tergite 9 usually separate but sometimes fused with sternite 9 and gonocoxite to form a continuous ring; gonocoxite variously modified, usually with a ventromedial lobe or extension called the aedeagal guide (adminiculum), and sometimes with a modified structure or ***interbase*** also present medially which is especially characteristic of the Pediciini, primitive Hexatomini, and certain other groups; gonostylus partially to completely divided, variously modified, providing important characters for separating genera and species. Ovipositor of female variously modified, but usually including two pairs of elongate sclerotized valves (Fig. 7); paired cerci situated dorsally, usually lengthened, gently upcurved to the tips; hypogynial valves (hypovalvae) situated ventrally, shorter, obtuse; in Cylindrotominae and eriopterine *Cryptolabis* Osten Sacken, cerci and hypogynial

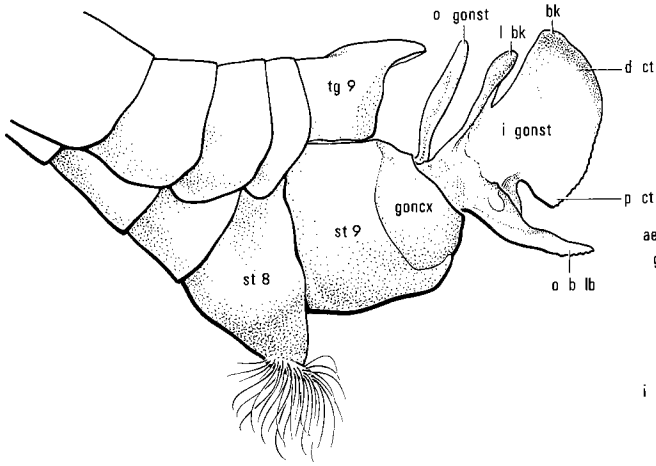
[2] Dr. Alexander's agreement with Tillyard's interpretation of CuA as being unbranched and the vein preceding it therefore being M_4 is not followed here. Instead CuA is interpreted as having two branches, CuA_1 and CuA_2, the former comprising crossvein m-cu and M_4 of Tillyard (see Chapter 2 for a thorough explanation).

Figs. 7.2–6. Head, thorax, and male terminalia: (2) head and thorax of *Tipula trivittata* Say, lateral view; male terminalia of (3) *Tipula* (*Lunatipula*) *monticola* Alexander in lateral view, (4) *Tipula* (*Yamatotipula*) *eluta* Loew in posteroventral view, and (5) *Limonia* (*Rhipidia*) *lecontei* Alexander and (6) *Rhabdomastix subfascigera* Alexander in dorsal view.

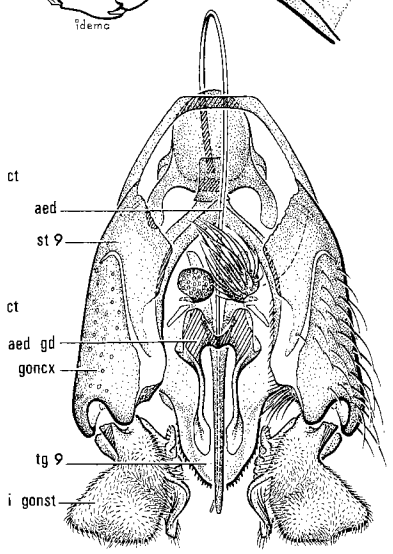
Abbreviations: aed, aedeagus; aed gd, aedeagal guide; anepm, anepimeron; anepst, anepisternum; ant, antenna; bk, beak; cx, coxa; d ct, dorsal crest; goncx, gonocoxite; i gonst, inner gonostylus; interb, interbase; kepst, katepisternum; l bk, lower beak; ltg, laterotergite; mr, meron; mtg, mediotergite; nas, nasus; o b lb, outer basal lobe; o gonst, outer gonostylus; p ct, posterior crest; pm, paramere; presct, prescutum; prn, pronotum; rst, rostrum; rst spn, rostral spine; sct, scutum; sctl, scutellum; spr, spiracle; st, sternite; tg, tergite; trn sut, transverse suture; vrt, vertex.



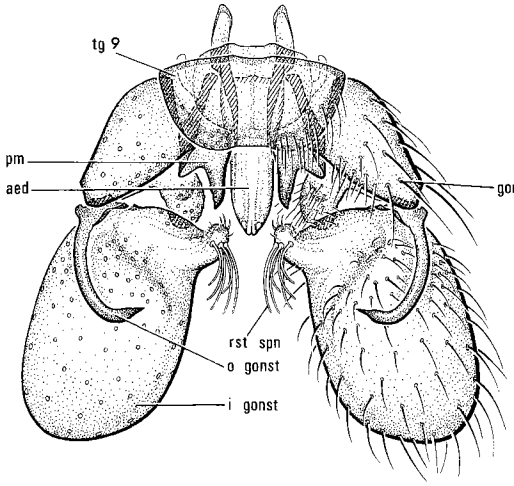
2 Tipula trivittata ♂



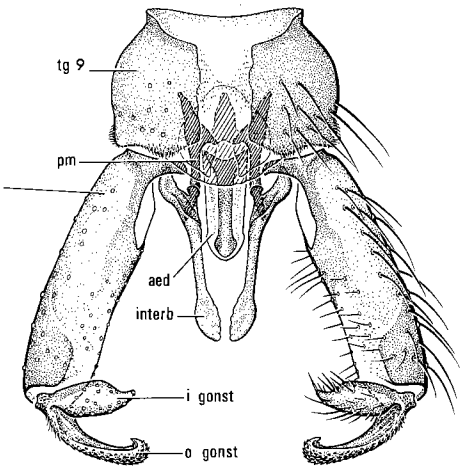
3 Tipula (Lunatipula) monticola ♂



4 Tipula (Yamatotipula) eluta ♂



5 Limonia (Rhipidia) lecontei ♂



6 Rhabdomastix subfascigera ♂

valves reduced and highly modified for a specialized type of oviposition. Detailed descriptions of male and female terminalia found in Byers (1961*b*), Crampton (1941, 1942), Frommer (1963), Rees and Ferris (1939), and Snodgrass (1903, 1904).

Larva. Elongate, usually terete or nearly so, with posterior two-thirds or more of head capsule enclosed within prothoracic segment, usually functionally metapneustic (rarely apneustic), although often with vestigial lateral spiracles. Head capsule distinct, well-sclerotized anteriorly, deeply incised ventrally and often dorsolaterally, retractable within anterior thoracic segments; mandibles opposed or nearly so, moving in horizontal or oblique plane (Figs. 67, 83, 87). Abdominal segments smooth or with transverse rows of fine hairs; transverse creeping welts or, less commonly, fleshy projections sometimes present; terminal segment generally glabrous, often partially sclerotized, bearing posterior spiracles; spiracular disc usually surrounded by lobe-like projections of variable length; anal papillae or membranous anal lobes usually present.

Biology and behavior. The Tipulidae are found from the northernmost lands of the Arctic to lowland equatorial forests, and from the marine intertidal zone to over 5600 m in certain high mountain ranges. Most species are associated with moist, temperate environments; adults are ordinarily found in low, leafy vegetation near streams and lakes in forested areas. However, many species inhabit open meadows, fairly dry rangelands, and even deserts. Because many species of Tipulidae are so abundant, they are extensively preyed upon by birds, mammals, fishes, and other vertebrates, as well as by spiders and predacious insects. The Tipulidae are therefore of tremendous ecological importance. Larvae of a few species that feed on roots of forage crops or on seedling field crops can become economic pests.

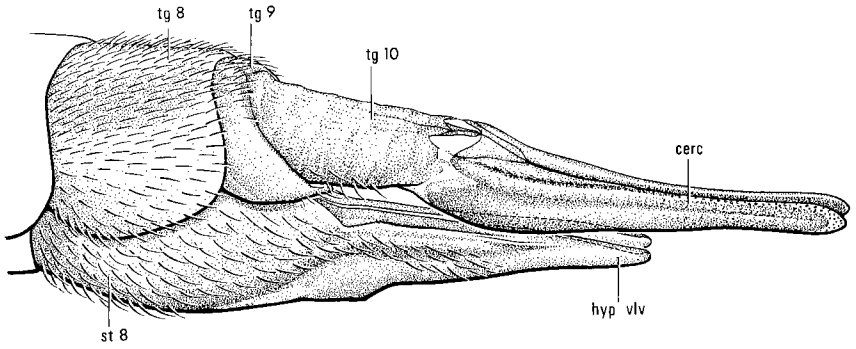
As might be expected in a group of insects as large and varied as the Tipulidae, the immature stages occupy a wide variety of habitats. Habitats ranging from strictly aquatic to completely terrestrial are briefly described here, and examples of the genera that are found in each are given:

- fresh water, especially rapidly flowing streams—*Antocha* Osten Sacken, *Hesperoconopa* Alexander, *Cryptolabis* Osten Sacken
- intertidal zones or brackish water—*Limonia* (*Idioglochina* Alexander) on the Pacific coast, *Limonia* (*Dicranomyia* Stephens) on the Atlantic
- aquatic environment during the larval stage and margins or dryer areas for pupation—*Tipula* Linnaeus, *Limonia* Meigen, *Thaumastoptera* Mik, and many Pediciini, Hexatomini, and Eriopterini
- steep or vertical cliff faces supporting a film or scum of algal growth that is constantly kept wet by slow-flowing or percolating waters or, occasionally, by more rapidly flowing water—some species of *Limonia* Meigen, *Orimarga* Osten Sacken (Vaillant 1950), *Elliptera* Schiner
- moist to wet cushions of mosses or liverworts growing on rocks or earth—Cylindrotominae, various Limoniinae, Tipulinae including *Dolichopeza* Curtis (Byers 1961*b*)
- dry to saturated decaying wood or, occasionally, sodden logs in streams, where larvae commonly feed on fungus mycelia—*Ctenophora* Meigen, *Gnophomyia* Osten Sacken, *Teucholabis* Osten Sacken, *Lipsothrix* Loew
- rich organic earth or mud, as found along margins of streams or lakes or in swamps and marshes; in masses of leaf drift at stream borders; in wet spots in woods where humus is kept saturated—numerous genera and species
- sandy, gravelly, or loamy soils with moderate humus, as found along stream borders—eriopterine groups such as *Gonomyia* Meigen, *Rhabdomastix* Skuse, *Arctoconopa* Alexander, and *Hesperoconopa* Alexander
- decaying plant materials such as masses of leaves, stems, or fruits in various stages of putrefaction—various subgenera and species of *Limonia*
- fungi, both woody and fleshy—*Ula* Haliday, *Limonia* (*Metalimnobia* Matsumura)
- organic matter accumulated in the nests of birds and mammals—chiefly Tipulinae
- leaves of various terrestrial higher plants and mosses—chiefly *Cylindrotoma* Macquart
- dry soil as found in lawns, pastures, or on the ranges of the west—*Nephrotoma* Meigen, *Tipula* Linnaeus, *Dicranoptycha* Osten Sacken.

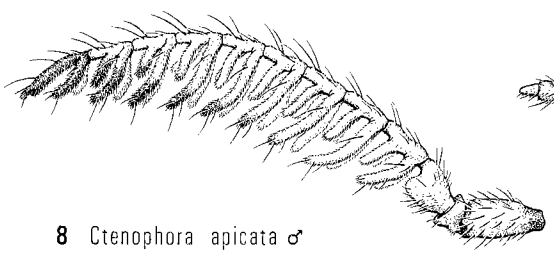
The following papers provide detailed accounts of the immature stages and include bibliographies that may also be consulted for further information: Alexander 1920, 1922, 1931*b*; Bangerter 1928–1934; Brindle 1957–1967; Brodo 1967; Bryce 1956, 1957; Byers 1958–1961*b*; Chiswell 1956; Foote 1963; Hennig 1950; Hynes 1958–1969*c*; Pritchard and Hall 1971; Rogers 1926*a*–1949; Rogers and Byers 1956; Saunders 1928; Savtshenko 1955; Theowald 1957, 1967; Tokunaga 1930; Vaillant 1950.

The life cycle of a crane fly typically consists of a brief egg stage (6–14 days), four larval stages, and a fairly short pupal stage (5–12 days) before emergence of the short-lived adult. Depending on the species and the environmental conditions, especially temperature and humidity, the entire cycle may be as short as 6 wk or as long as 4 yr. Exceptionally long cycles occur in Arctic species. Most species at temperate latitudes or elevations produce one or two generations a year.

Classification and distribution. The family Tipulidae is the single largest family in the Diptera, with approximately 14 000 species; some 1525 of these in 64 genera occur in America north of Mexico. According to

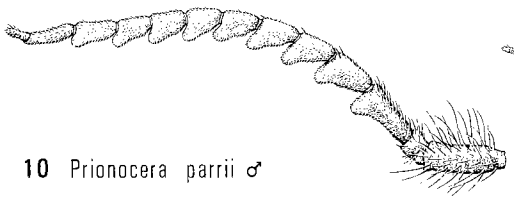


7 Tipula (Yamatotipula) noveboracensis ♀

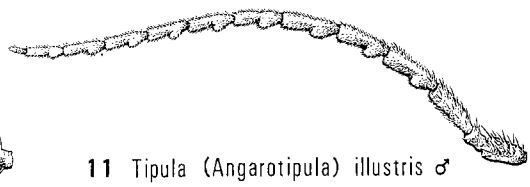


8 Ctenophora apicata ♂

9 Ctenophora apicata ♀

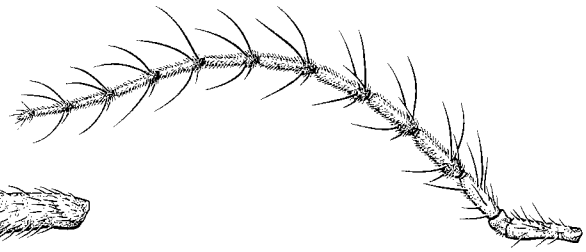


10 Prionocera parrii ♂

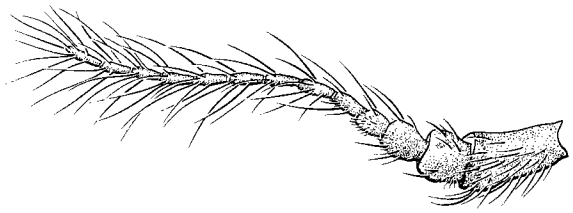


11 Tipula (Angarotipula) illustris ♂

12 Holorusia rubiginosa ♀



13 Tipula (Lunatipula) triplex ♂



14 Leptotarsus testaceus ♂

Figs. 7.7–14. Ovipositor and antennae: (7) ovipositor of *Tipula* (*Yamatotipula*) *noveboracensis* Alexander in lateral view; antennae of (8, 9) *Ctenophora apicata* Osten Sacken, (10) *Prionocera parrii* (Kirby), (11) *Tipula* (*Angarotipula*) *illustris* Doane, (12) *Holorusia rubiginosa* Loew, (13) *Tipula* (*Lunatipula*) *triplex* Walker, and (14) *Leptotarsus testaceus* (Loew).

Abbreviations: cerc, cercus; hyp vlv, hypogynial valve; st, sternite; tg, tergite.

the present interpretation, the family Tipulidae is the sole representative of the superfamily Tipuloidea. Other families that had once been considered members of this superfamily are now assigned to other superfamily groups. The position of these flies in specific superfamilies is still held in question by some students of the order.

Our knowledge of North American tipulid larvae is still fragmentary. The immature forms of probably fewer than 10% of our species have been described. In some genera, even in a few with many species, larvae of only one or a few species are known. Therefore, the limitations of the larval key should be recognized. Some portions of the key are necessarily based on these known but possibly atypical representatives. The genera are not keyed in a phylogenetic sequence because larval characters, particularly the superficial ones utilized in the key, often yield groupings that do not coincide with those based upon adult characteristics. External, more or less readily visible characters are mainly used for identification. All structural details used, however, can be seen with an ordinary dissecting microscope. Diagnostic features include the shape and pigmentation of the spiracular disc on the terminal segment and the characteristics of its peripheral lobes, degree of sclerotization of the dorsal and lateral portions of the head, development of the midventral hypostomal bridge, and presence or absence of raised, often setiferous creeping welts on the abdominal segments. Where possible, the larval habitat is described when each genus is identified. Some genera occasionally appear in two or more places so that generic assignment of species whose larvae are at present unknown might be possible. North American genera for which no larval forms are yet known are *Cheilotrichia* Rossi, *Nasiternella* Wahlgren, *Neocladura* Alexander, *Neolimnophila* Alexander, *Ornithodes* Coquillett, *Phyllolabis* Osten Sacken, *Prolimnophila* Alexander, *Shannonomyia* Alexander, *Tasiocera* Skuse, *Thaumastoptera* Mik, and *Toxorhina* Loew. Although these genera represent 19% of the total, they contain only about 3% of Nearctic tipulid species. The key includes *Cheilotrichia* and *Thaumastoptera* based on characteristics of European species. Probable positions of some other genera are also indicated. The key will undoubtedly need revision as descriptions of newly discovered specimens are published.

The Tipulidae probably evolved from ancestors resembling or perhaps even included in the Architipulidae, a family of primitive Diptera about 140 million years old, known from the Upper Jurassic deposits of Europe. Because fossils of nine families of Nematocera, including one tipulid, have been found in the Cretaceous amber of central Canada (Carpenter 1934), the Tipulidae can be assumed to have become differentiated from related families by middle to late Cretaceous times (about 70 million years ago). Records of Tipulidae from the lower Tertiary period, in contrast, are numerous and are from many parts of the world. Specimens in Baltic amber (Alexander 1931*a*), judged to have been preserved 40–45 million years ago, include representatives of two genera of Tipulinae, both still extant, and 29 genera of Limoniinae, 25 of which are extant. This amber is apparently of upper Eocene or lower Oligocene age. Fossils of approximately equivalent age from Gurnet Bay on the Isle of Wight add a few more genera, especially in the Tipulinae. In North America, the volcanic shales near Florissant, Colo., probably of upper Oligocene or lower Miocene age (perhaps 30 million years old), have yielded representatives of seven genera of Tipulinae, three of which are still extant; one extant genus of Cylindrotominae; and 17 genera of Limoniinae, 10 of which are extant (Scudder 1894). The recently described Chiapas amber from southern Mexico, of approximately the same age as the Florissant beds, includes a few Tipulidae. The older (Eocene) Green River shales of Colorado and various other early to middle Tertiary deposits in North America contain remains of Tipulidae, but these records are generally fragmentary (Scudder 1890, Handlirsch 1910).

The description, classification, and distribution of Nearctic Tipulidae have been dealt with extensively in the literature. Many relevant papers are listed, together with a catalog of species, in the Diptera catalog edited by Stone *et al.* (1965). The papers by Alexander (1966, 1967), Brodo (1967), and Byers (1961*b*) are particularly important because they provide keys to species of major regions of North America. Other useful publications that list species of various political regions and natural areas are those by Alexander, published between 1934 and 1954.

Keys to genera

Adult

1. Fully winged 2
   Subapterous 163
2. Terminal segment of palpus elongate; nasus usually distinct. Flagellum commonly with 11 segments. Sc_1 usually atrophied or incomplete; CuA slightly constricted at branching of CuA_1 and CuA_2 (Figs. 15, 20–25). Size large; wing commonly over 10 mm, usually much larger ..... TIPULINAE....4

Terminal segment of palpus short; nasus absent. Flagellum usually with either 12 or 14 segments, but sometimes with fewer segments. Sc_1 complete; CuA straight, not constricted at branching of CuA_1 and CuA_2 (Figs. 16–19, 26–29). Size small or medium, rarely large; wing commonly under 10 mm, usually much smaller 3

3. Tip of R_{1+2} usually atrophied, with R_1 gradually converging toward and fusing with R_3 well before wing margin; R_{1+2}, if present, arising near this point of fusion; free tip of Sc_2 present (Figs. 26–29) ..... CYLINDROTOMINAE....49

Tip of R_{1+2} present; R_1 not appearing to converge on collision course with R_3; R_2 commonly present and usually in form of a nearly transverse crossvein between R_1 and R_3; free tip of Sc_2, recognizable by its lack of setae and its angular divergence from R_1, preserved in many species in tribe Limoniini, lacking in all other Nearctic tribes ..... LIMONIINAE....53

4. Legs unusually long and slender, filiform. Either R_{1+2} and free ending of Sc_1 atrophied with Sc_2 entering R close to origin of Rs (Fig. 22), or R_{1+2} present with Sc very long and with Sc_1 reaching C very close to free tip of Sc_2 (Figs. 20, 21) 5

Legs long but stouter. R_{1+2} usually preserved, but when atrophied Sc of moderate length and Sc_1 atrophied before fork of Rs with Sc_2 entering R_1 at or near mid length of Rs 9

5. Sc very long; Sc_1 preserved; free tip of Sc_2 at margin close to Sc_1 6

Sc shorter; Sc_1 atrophied ..... ***Dolichopeza*** Curtis....7

6. Crossvein r-m originating in Rs; crossvein m-cu present (Fig. 20) ..... ***Megistocera*** Wiedemann
1 sp., *longipennis* (Macquart); Texas to Florida

Crossvein r-m originating in R_{4+5}; crossvein m-cu absent; CuA_1 fused with lower border of cell dm for short distance (Fig. 21) ..... ***Brachypremna*** Osten Sacken
1 sp., *dispellens* (Walker); southern, eastern

7. Cell dm open by atrophy of basal section of M_3; outer medial field thus appearing pectinate (Fig. 22) ..... ***Dolichopeza*** (***Dolichopeza*** Curtis)
2 spp.; temperate, northern

Cell dm closed 8

8. Wing with cells beyond cord having abundant macrotrichia ..... ***Dolichopeza*** (***Megistomastix*** Alexander)
tropical (Greater Antilles)

Wing without macrotrichia in cells ..... ***Dolichopeza*** (***Oropeza*** Needham)
13 spp.; temperate, lacking in west

9. Antennal flagellum with flagellomeres branched in male and less produced in female of Nearctic species (Figs. 8, 9) ..... ***Ctenophora*** Meigen....10

Antennal flagellum with flagellomeres simple or slightly produced to appear serrate 13

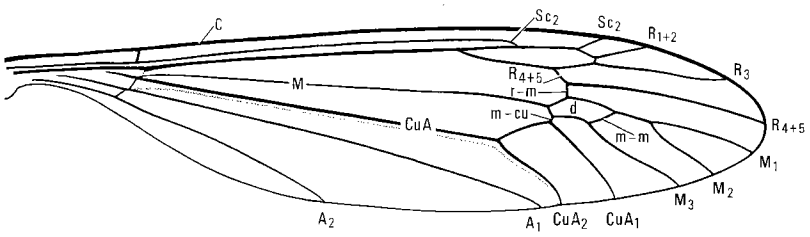
10. Intermediate flagellomeres of male three-branched; flagellomeres 2–10 each with a longer basal pair of branches and a single shorter spur on outer half; each basal branch with a single long seta before mid length; vestiture short; first flagellomere deeply bilobate; terminal flagellomere small, simple. Ovipositor with cerci slender, saber-shaped, much longer than width of head ..... ***Ctenophora*** (***Tanyptera*** Latreille)
1 sp., *dorsalis* Walker; central, eastern

Intermediate flagellomeres of male four-branched. Ovipositor with cerci no longer than width of head 11

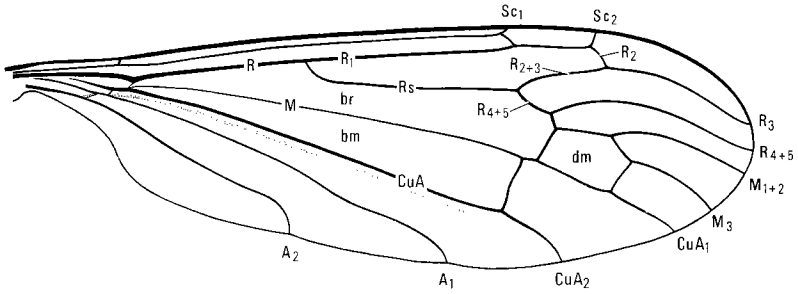
11. First flagellomere of male deeply bilobate and outer lobule weakly emarginate; flagellomeres 2–10 each with four branches arranged in pairs; branches short, subequal in length to flagellomeres; basal pair of branches each with a single strong seta; terminal flagellomere small, simple; flagellar vestiture short ..... ***Ctenophora*** (***Phoroctenia*** Coquillett)
1 sp., *vittata angustipennis* Loew; western temperate

First flagellomere of male simple; flagellomeres 2–10 each with four longer branches 12

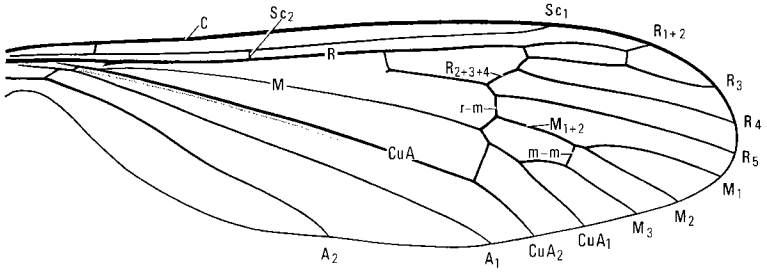
12. Flagellomeres 2–10 each with four moderately long branches; basal pair of branches longer than others; each branch with a long seta before mid length (Fig. 8); flagellar vestiture short and inconspicuous; terminal flagellomere small, simple ..... ***Ctenophora*** (***Ctenophora*** Meigen)
2 spp.; temperate



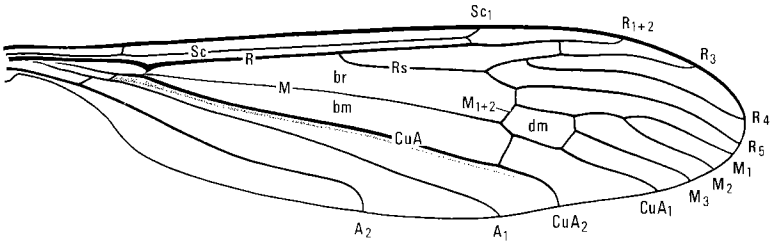
15 Tipula (Yamatotipula) tricolor ♂



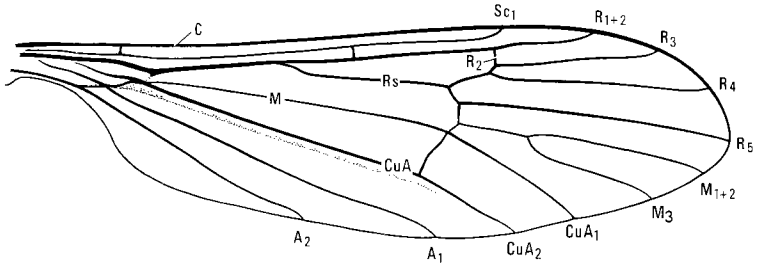
16 Limonia (Metalimnobia) triocellata ♂



17 Dicranota (Eudicranota) pallida ♂



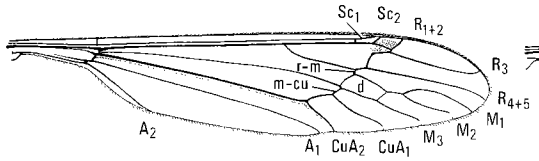
18 Pseudolimnophila inornata ♂



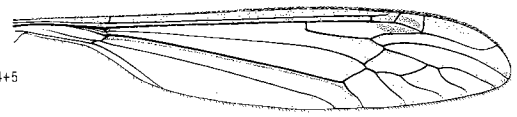
19 Ormosia monticola ♀

Figs. 7.15–19. Wings: (15) *Tipula* (*Yamatotipula*) *tricolor* Fabricius; (16) *Limonia* (*Metalimnobia*) *triocellata* (Osten Sacken); (17) *Dicranota* (*Eudicranota*) *pallida* Alexander; (18) *Pseudolimnophila inornata* (Osten Sacken); (19) *Ormosia monticola* (Osten Sacken) (*continued*).

Flagellomeres 2–10 each with four very long branches that exceed length of flagellomeres; vestiture dense, erect; terminal flagellomere elongate, appearing trifid with a pair of subequal basal branches ..... ***Ctenophora*** (***Pselliophora*** Osten Sacken)
Neotropical, Mexico



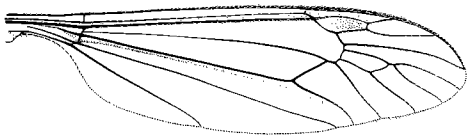
20 Megistocera longipennis ♂



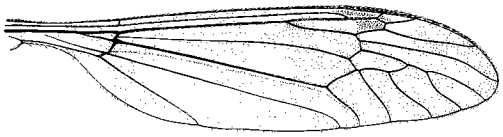
21 Brachypremna dispellens ♀

22 Dolichopeza americana ♀

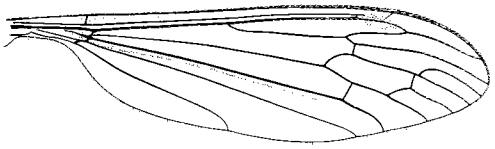
23 Tipula (Yamatotipula) caloptera ♂



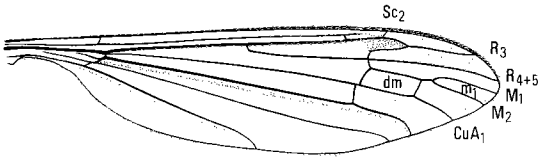
24 Nephrotoma ferruginea ♂



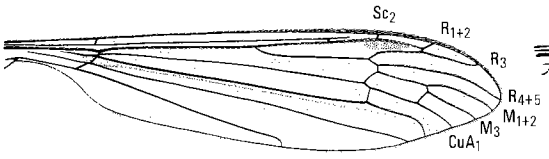
25 Tipula (Lunatipula) dorsimacula ♂



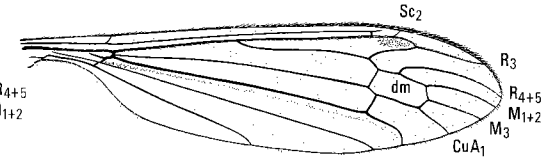
26 Cylindrotoma distinctissima americana ♂



27 Phalacrocera tipulina ♂



28 Phalacrocera replicata ♂



29 Liogma nodicornis ♂

Figs. 7.20–29. Wings (*continued*): (20) *Megistocera longipennis* (Macquart); (21) *Brachypremna dispellens* (Walker); (22) *Dolichopeza americana* Needham; (23) *Tipula* (*Yamatotipula*) *caloptera* Loew; (24) *Nephrotoma ferruginea* (Fabricius); (25) *Tipula* (*Lunatipula*) *dorsimacula* Walker; (26) *Cylindrotoma distinctissima americana* Osten Sacken; (27) *Phalacrocera tipulina* Osten Sacken; (28) *Phalacrocera replicata* (Linnaeus); (29) *Liogma nodicornis* (Osten Sacken) (*continued*).

13. Flagellomeres without conspicuous verticils or elongate setae (Figs. 10, 11) 14
Flagellomeres with distinct verticils or elongate setae (Figs. 12–14) 15

14. Antenna with lower face of flagellomeres slightly produced near outer end, giving organ a serrate appearance (Fig. 10) ..... ***Prionocera*** Loew
16 spp.; northern
Flagellomeres either enlarged on basal half (Fig. 11) or uniformly cylindrical ..... ***Tipula*** (***Angarotipula*** Savtshenko), in part
2 spp.; widespread

15. Size very large; wing commonly over 25 mm, sometimes 40 mm or more. R_3 near mid length bent strongly caudally, narrowing the cell. Antenna with lower faces of intermediate flagellomeres protuberant, without strong setae; upper surfaces with short verticils; terminal three flagellomeres smaller than the rest (Fig. 12) ..... ***Holorusia*** Loew
1 sp., *rubiginosa* Loew, largest in Nearctic region; western
Size smaller; wing less than 30 mm, commonly less than 20 mm. R_3 straight or virtually so. Antenna not as above 16

16. Flagellomeres cylindrical, with short normal setae on proximal ones and long conspicuous setae on outer ones (Fig. 14) ..... ***Leptotarsus*** Guérin-Méneville (***Longurio*** Loew)
4 spp.; eastern U.S.A.
Flagellomeres with bases enlarged and with stout verticils, outwardly without conspicuous setae (Fig. 13) 17

17. Sc ending nearly opposite origin of Rs; basal section of Rs short, oblique; cell m_1 sessile or very short–petiolate; CuA_1 uniting with M for short distance before fork of M (Fig. 24). Body coloration highly polished, often black and yellow ..... ***Nephrotoma*** Meigen
40 spp.; widespread
Sc longer; Sc_2 meeting R_1 beyond origin of Rs; Rs longer, usually exceeding basal section of CuA_1; cell m_1 long–petiolate; CuA_1 or crossvein m-cu meeting M beyond its fork (Figs. 15, 25). Body coloration usually opaque, pruinose ..... ***Tipula*** Linnaeus, in part 18

18. Antennal flagellomeres without verticils (Fig. 11) ..... ***Tipula*** (***Angarotipula*** Savtshenko), in part
1 sp., *illustris* Doane; widespread
Antennal flagellomeres with verticils 19

19. Distal wing cells with macrotrichia 20
No macrotrichia in wing cells 22

20. Thorax polished orange or yellow, sometimes with dark or blackened stripes ..... ***Tipula*** (***Hesperotipula*** Alexander), in part
18 spp.; western
Thorax opaque yellow, brown, or gray, sometimes with darkened opaque stripes 21

21. Calypter without strong setae ..... ***Tipula*** (***Trichotipula*** Alexander), in part
30 spp.; primarily western, 4 spp. eastern
Calypter with setae ..... ***Tipula*** (***Setitipula*** Alexander)
3 spp.; western

22. Tarsi creamy white ..... ***Tipula*** (***Tipulodinodes*** Alexander)
1 sp., *lacteipes* Alexander; western
Tarsi darkened 23

23. Calypter without strong setae 24
Calypter with setae 38

24. Wing of female with two veins, M_1 and M_3, emanating from cell dm; basal section of CuA_1 before fork of M, as in *Nephrotoma* (insufficiently known, perhaps based on abnormal specimens and perhaps belonging in *Yamatotipula* Matsumura) ..... ***Tipula*** (***Nesotipula*** Alexander)
1 sp., *pribilovia* Alexander; Alaska
Wing of female with at least three veins emanating from cell d or dm 25

25. Body coloration polished yellow and black, much as in *Nephrotoma*. Wing veins posterior to R_1 glabrous or virtually so ..... ***Tipula*** (***Nobilotipula*** Alexander)
2 spp.; eastern

Body coloration opaque. Wing veins with microtrichia 26

26. Male terminalia with tergite 9 and sternite 9 fused to form a continuous ring 27

Male terminalia with tergite 9 and sternite 9 separated by a suture 28

27. Wing sometimes unpatterned, but commonly with darkened longitudinal stripes along veins and without a strong transverse darkening in cell bm (Fig. 23); basal section of M_3 short, usually subequal to or less than crossvein r-m; crossvein m-cu or basal section of CuA_1 meeting cell d or dm some distance before its mid length. Male terminalia commonly with tergite 9 produced into a simple or emarginate lobe apically bearing small blackened spines; ventral lobes of aedeagal guide appearing as pale spatulate blades (Fig. 4) ..... ***Tipula*** (***Yamatotipula*** Matsumura)
51 spp.; widespread

Wing variously patterned with white background and darker costal border, or yellow with a brown cloud at end of A_2; basal section of M_3 longer, from two to three times length of crossvein r-m. Male terminalia with tergite 9 large, notched medially; broad pale lobes with margins roughened or with spine-like projections; lobes of aedeagal guide greatly reduced, not blade-like ..... ***Tipula*** (***Platytipula*** Matsumura)
11 spp.; widespread

28. Basal section of Rs short; R_{1+2} present or atrophied. Antenna of male commonly long, one-half length of wing or more. Male terminalia with tergite 9 shallowly to deeply emarginate; lobes covered with coarse setae; gonostylus very irregular in conformation; gonocoxite commonly with a blackened corrugated lobe on median face ..... ***Tipula*** (***Microtipula*** Alexander)
large varied Neotropical group, with some species bordering Nearctic portions of Mexico

Wing, antenna, and terminalia not as above 29

29. Basal section of Rs long; R_{1+2} present, usually with darkened mottled pattern. Antenna commonly long, or very long; extreme bases of flagellomeres each with a knob-like enlargement to present a bead-like appearance. Male terminalia commonly with a variously modified lobe on posterior border of sternite 8 ..... ***Tipula*** (***Eumicrotipula*** Alexander)
widespread in tropics, sparsely represented in southwestern Nearctic

Wing, antenna, and terminalia not as above 30

30. Wing variously patterned with darker coloration 31

Wing without darker markings other than pterostigma 37

31. Wing with white or grayish background, with sparse brown clouds in distal ends of cells bm, cu*p*, and a_1; distal cells having central streaks; cell cua_1 long and narrow ..... ***Tipula*** (***Trichotipula*** Alexander), in part
see couplet 21

Wing with darkened pattern heavier and differently arranged; cell cua_1 broader 32

32. Male terminalia with tergite 9 variously trilobate; posterior margin of sternite 8 variously produced, commonly with a median bispinous plate ..... ***Tipula*** (***Lindneria*** Mannheims)
6 spp.; widespread

Male terminalia with tergite 9 and sternite 8 differently constructed 33

33. Male terminalia with outer basal division of inner gonostylus produced backward as a tail-like extension that bears one or more blackened points, and commonly terminating in a pale membranous blade ..... ***Tipula*** (***Beringotipula*** Savtshenko)
22 spp.; widespread

Male terminalia not as above 34

34. Tergite 9 of male terminalia commonly forming a shallowly concave sclerotized saucer. Female ovipositor with cerci strongly constructed; cercus lying transversely, with outer margin serrate ..... ***Tipula*** (***Vestiplex*** Bezzi)
17 spp.; chiefly northern or alpine

Male terminalia and female ovipositor not as above 35

35. Tergite 9 of male terminalia commonly with a narrow median emargination and broad lobes; sternite 8 usually with lateral lobes that bear modified setae ..... ***Tipula*** (***Pterelachisus*** Rondani), in part
39 spp.; widespread

Tergite 9 of male terminalia not as above; sternite 8 simple, without lateral lobes 36

36. Tergite 9 of male terminalia virtually glabrous, without points or spicules on margin; outer division of gonostylus forming a simple pale fleshy lobe; upper and lower beaks of inner division of gonostylus large, blackened, obtuse; outer basal lobe of inner division of gonostylus large and pale, with abundant strong setae; aedeagus stout ..... ***Tipula*** (***Serratipula*** Alexander), in part
5 spp.; California

Tergite 9 of male terminalia provided with microscopic blackened spinoid setae on margin; outer division of gonostylus with a blackened flange at base of upper margin; lower beak of inner division of gonostylus reduced or obsolete; outer basal lobe of inner division of gonostylus a small sessile cushion with sparse spinoid setae; aedeagus slender ..... ***Tipula*** (***Savtshenkia*** Mannheims)
9 spp.; primarily northeastern with 1 sp. in California

37. Antenna of male longer than thorax. Abdomen of female much longer than that of male. Male with sternite 8 produced caudally into a broad pale fleshy lobe. Female ovipositor with cerci short and strong, modified for deep boring in soil ..... ***Tipula*** (***Odonatisca*** Savtshenko)
5 spp.; northern, western

Antenna of male no longer than thorax. Abdomen of nearly equal length in both sexes. Male sternite 8 without a fleshy lobe. Ovipositor not so modified ..... ***Tipula*** (***Arctotipula*** Alexander), in part
17 spp.; western, northern

38. Outer gonostylus of male terminalia large and broad; outer basal lobe of inner gonostylus bearing two arms, with a slender curved spine on posterior one. Antenna 14-segmented ..... ***Tipula*** (***Tipula*** Linnaeus)
1 sp., *paludosa* Meigen; Holarctic, on east and west coasts

Male terminalia not as above. Antenna 13-segmented 39

39. Rs short, subequal to or shorter than basal section of CuA_1 40

Rs longer than basal section of CuA_1 41

40. Wing with darkened pattern conspicuously mottled, with a marginal whitened spot on outer cells; wing veins unusually glabrous; branches of M without macrotrichia. Size large; wing in Nearctic species about 20 mm. Male with sternite 8 unarmed ..***Tipula*** (***Bellardina*** Edwards)
5 spp.; southwestern

Wing with darkened pattern not mottled, without a white marginal spot on distal cells; wing veins with macrotrichia, including all distal medial veins. Size small or medium; wing less than 15 mm. Male terminalia with sternite 8 variously produced or armed ..... ***Tipula*** (***Schummelia*** Edwards)
7 spp.; widespread

41. Aedeagal guide (adminiculum) of male terminalia distinctive, T-shaped or Y-shaped with a slender stem and two divergent arms near apex..... ***Tipula*** (***Triplicitipula*** Alexander), in part
23 spp.; widespread

Aedeagal guide of male terminalia not as above 42

42. Wing patterned and with characteristic venation; crossvein r-m at or close to fork of Rs; R_{4+5} in direct alignment with Rs; M_3 long; CuA_1 confluent with M_3 for short distance. Size large; wing over 20 mm, commonly 25 mm or more ..... ***Tipula (Nippotipula*** Matsumura)
1 sp., *abdominalis* (Say); eastern

Wing not patterned; venation not as described; crossvein r-m on R_{4+5} some distance beyond base; M_3 short; crossvein m-cu usually present, or if absent, CuA_1 meeting M_3 at a point. Size usually smaller 43

43. Wing with a conspicuous mottled pattern, with alternating dark and pale areas that are more or less zigzag on basal cells; distal veins with a blackish marginal spot ..... ***Tipula*** (***Sinotipula*** Alexander)
17 spp.; western

Wing pattern, when heavy and conspicuous, not mottled or patterned as described above 44

44. Gonocoxite of male terminalia produced into a long strong arm that exceeds gonostylus in length 45

Gonocoxite of male terminalia not produced, or if so only slightly produced and not exceeding gonostylus 46

45. Arm of gonocoxite stout, widened outwardly; apex obtuse or bispinous. Body generally opaque brownish gray .....***Tipula*** (***Labiotipula*** Alexander)
3 spp.; northern

Arm of gonocoxite slender, more or less twisted, narrowed to an acute or subacute tip. Body generally polished orange or yellow .....***Tipula*** (***Hesperotipula*** Alexander), in part
see couplet 20

46. Male terminalia with tergite 9 small and with a median subtergal process situated slightly more ventral than lateral lobes; outer division of gonostylus narrowed outwardly; outer basal lobe of inner division of gonostylus produced backward .....***Tipula*** (***Eremotipula*** Alexander)
25 spp.; western

Male terminalia not as above 47

47. Body usually polished yellow or orange. Ovipositor with cerci short and obtuse .....***Tipula*** (***Hesperotipula*** Alexander), in part
see couplet 20

Body usually not polished yellow or orange. If so, ovipositor with elongate cerci 48

48. Wing veins unusually glabrous; M without macrotrichia. Outer gonostylus of male terminalia large, broad; inner gonostylus unusually simple, without lower beak and outer basal lobe.....***Tipula*** (***Arctotipula*** Alexander), in part
see couplet 37

Wing with macrotrichia on M. Outer gonostylus of male terminalia fairly small; inner gonostylus more complex, with either a lower beak or an outer basal lobe present, usually with both present (Fig. 3) .....***Tipula*** (***Lunatipula*** Edwards)
160 spp.; widespread

49. Head and intervals of mesonotal prescutum with numerous deep punctures; a deep median groove on prescutum .....***Triogma*** Schiner
1 sp., *exsculpta* Osten Sacken; eastern

Head and intervals of mesonotal prescutum smooth; no median prescutal groove 50

50. Three branches of R reaching margin (Fig. 28); R_{1+2} preserved as a distinct element .....***Phalacrocera*** Schiner, in part
4 spp.; 2 spp. eastern, 2 spp. western

Two branches of R reaching margin; R_{1+2} atrophied, giving appearance of a long backward fusion of R_1 and anterior branch of Rs.....51

51. Three branches of M reaching margin (Fig. 26) .....***Cylindrotoma*** Macquart
3 spp.; northern

Two branches of M reaching margin; M_3 in *Phalacrocera occidentalis* Alexander usually present as a short spur, not reaching margin 52

52. Crossvein r-m present; distal end of cell dm commonly closed by a single transverse crossvein; cell m_1 present, sessile to short-petiolate; M_3 partially or completely atrophied (Fig. 27). Antennal flagellomeres nearly simple, with lower faces not produced .....***Phalacrocera*** Schiner, in part
see couplet 50

Crossvein r-m usually shortened or obliterated by approximation or fusion of R_{4+5} and M_{1+2}; cell m_1 absent; M_3 complete to margin (Fig. 29). Antennal flagellomeres strongly nodulose, especially in male, with individual flagellomeres subcordate .....***Liogma*** Osten Sacken
1 sp., *nodicornis* (Osten Sacken); eastern to Alberta

53. Eye hairy, with short hairs between ommatidia. Sc_1 very long, exceeding fork of Rs; Sc_2 basal to origin of Rs (Figs. 17, 38, 39) .....PEDICIINI....74

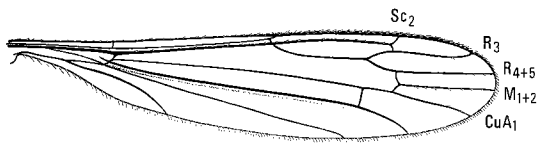
Eye glabrous. Sc_1 short or of moderate length; when Sc_1 longer (some Eriopterini), Sc_2 usually situated distal to origin of Rs; when Sc_2 situated basal to origin of Rs, Sc_1 not exceeding fork of Rs.....54

54. Free tip of Sc_2 often present, nearly transversely oriented; R_4 and R_5 fused to margin; only two branches of Rs (R_3 and R_{4+5}) present (Figs. 30–37). Antenna with 12 or 14 flagellomeres ..... LIMONIINI....56

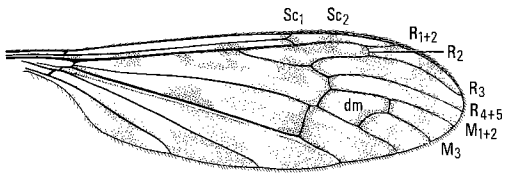
Free tip of Sc_2 lacking; R_4 and R_5 separate; R_4 usually captured by R_{2+3} to form a distinct element R_{2+3+4}; usually three branches of Rs present (exceptions: *Atarba*, *Elephantomyia*, *Teucholabis*, and some *Gonomyia* spp., where R_{2+3} is captured, as above) (Figs. 40–49). Antenna usually with 14 flagellomeres, but with number reduced in *Hexatoma* and a few others 55

55. Tibial spurs present ..... HEXATOMINI.....86

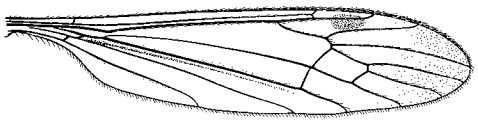
Tibial spurs lacking ..... ERIOPTERINI....118



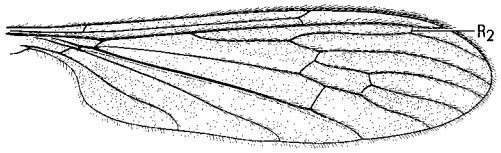
30 Limonia (Alexandriaria) whartoni ♂



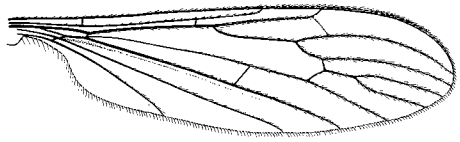
31 Limonia (Metalimnobia) immatura ♀



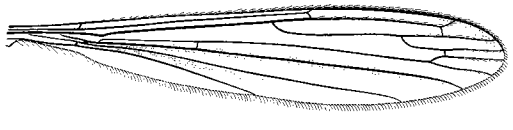
32 Helius flavipes ♂



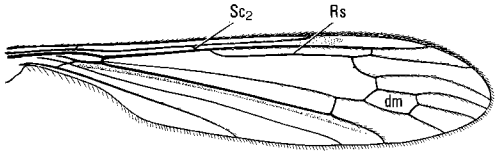
33 Dicranoptycha germana ♀



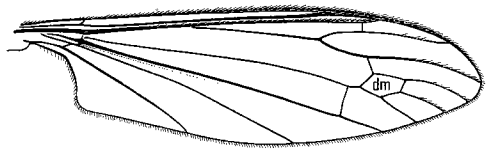
34 Thaumastoptera hynesi ♂



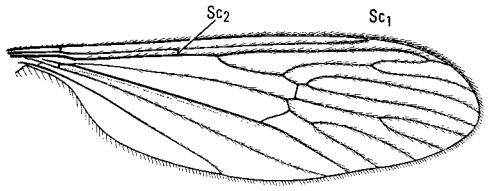
35 Orimarga (Diotrepha) mirabilis ♀



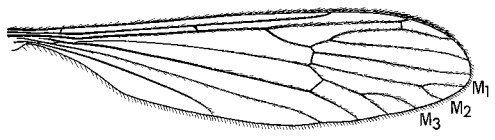
36 Elliptera tennessa ♀



37 Antocha saxicola ♂



38 Pedicia (Tricyphona) protea ♀



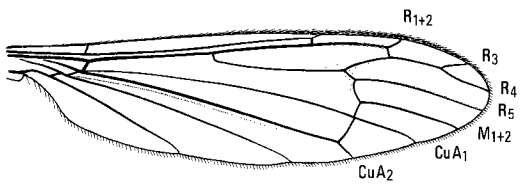
39 Dicranota (Rhaphidolabis) tenuipes ♂

Figs. 7.30–39. Wings (*continued*): (30) *Limonia* (*Alexandriaria*) *whartoni* (Needham); (31) *Limonia* (*Metalimnobia*) *immatura* (Osten Sacken); (32) *Helius flavipes* (Macquart); (33) *Dicranoptycha germana* Osten Sacken; (34) *Thaumastoptera hynesi* Alexander; (35) *Orimarga* (*Diotrepha*) *mirabilis* (Osten Sacken); (36) *Elliptera tennessa* Alexander; (37) *Antocha saxicola* Osten Sacken; (38) *Pedicia* (*Tricyphona*) *protea* (Alexander); (39) *Dicranota* (*Rhaphidolabis*) *tenuipes* (Osten Sacken) (*continued*).

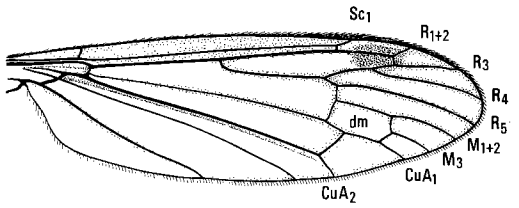
56. Antenna with 12 flagellomeres ..... **Limonia** Meigen....57
Antenna with 14 flagellomeres 67

57. One branch of M reaching margin (Fig. 30) ..... ***Limonia*** (***Alexandriaria*** Garrett), in part
3 spp.; 2 spp. western, 1 sp. northeastern
Two branches of M reaching margin (Figs. 31–37) 58

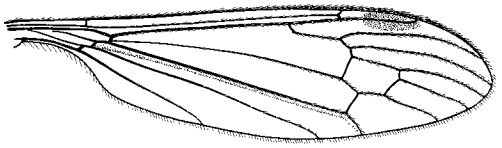
58. Wing with supernumerary crossveins in cells a_1 or r_3 59
Wing without supernumerary crossveins in cells a_1 or r_3, but with a weak vein in cell sc in some species of *Geranomyia* Haliday 60



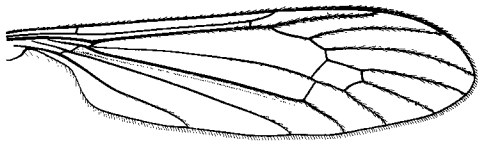
40 Hexatoma megacera ♀



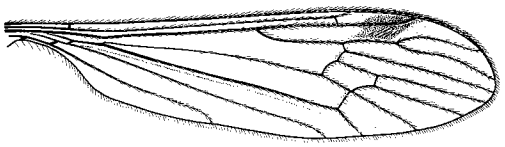
41 Hexatoma (Eriocera) longicornis ♀



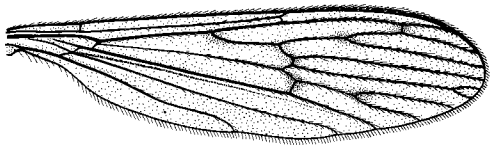
42 Elephantomyia westwoodi ♂



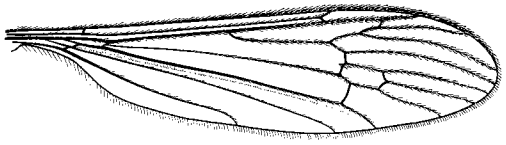
43 Atarba picticornis ♀



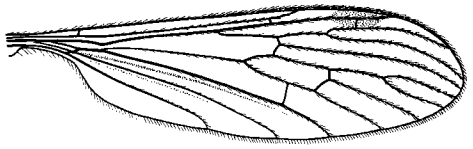
44 Phyllolabis encausta ♀



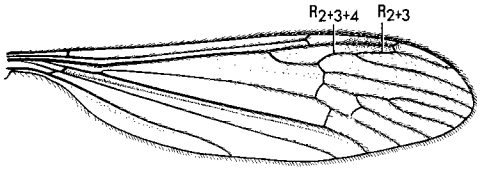
45 Polymera rogersiana ♀



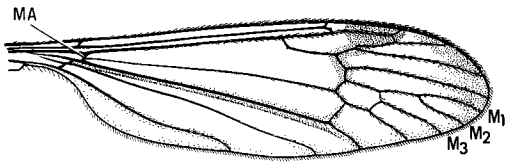
46 Pseudolimnophila noveboracensis ♂



47 Prolimnophila areolata ♂



48 Austrolimnophila toxoneura ♂



49 Limnophila (Phylidorea) adusta ♀

Figs. 7.40–49. Wings (*continued*): (40) *Hexatoma megacera* (Osten Sacken); (41) *Hexatoma* (*Eriocera*) *longicornis* (Walker); (42) *Elephantomyia westwoodi* Osten Sacken; (43) *Atarba picticornis* Osten Sacken; (44) *Phyllolabis encausta* Osten Sacken; (45) *Polymera rogersiana* Alexander; (46) *Pseudolimnophila noveboracensis* (Alexander); (47) *Prolimnophila areolata* (Osten Sacken); (48) *Austrolimnophila toxoneura* (Osten Sacken); (49) *Limnophila* (*Phylidorea*) *adusta* Osten Sacken (*continued*).

59. Supernumerary crossvein in cell a_1 ..... ***Limonia*** (***Discobola*** Osten Sacken)
3 spp.; widespread

Supernumerary crossvein in cell r_3 ..... ***Limonia*** (***Neolimnobia*** Alexander)
tropical (Antilles)

60. Mouthparts, especially labella, elongate; rostrum about equal in length to combined head and thorax ..... ***Limonia*** (***Geranomyia*** Haliday)
14 spp.; widespread

Mouthparts shorter than remainder of head 61

61. Flagellomeres of male antenna more or less produced, bipectinate, unipectinate, or subpectinate; flagellomeres in female less-developed, appearing serrated to nearly simple. Male terminalia often with more than two rostral spines, commonly with three to eight in Nearctic species (Fig. 5) ..... ***Limonia*** (***Rhipidia*** Meigen)
8 spp.; widespread

Flagellomeres of antennae of both sexes ranging from subglobular to oval to elongate, not produced to appear pectinate in male. Male terminalia usually without rostral spines, but sometimes with one or two 62

62. Male terminalia with a simple undivided gonostylus; gonocoxite with simple ventromedial lobe. R_{1+2} longer than R_2 in Nearctic species, shortest in *sociabilis* Osten Sacken ..... ***Limonia*** (***Limonia*** Meigen)
12 spp.; widespread

Male terminalia with divided gonostylus. Venation not as above 63

63. Ventral division of gonostylus without rostral spines in Nearctic species 64

Ventral division of gonostylus commonly with two rostral spines, but sometimes with either one or three 65

64. Sc short, ending close to origin of Rs. Proximal flagellomeres oval, with apices abruptly short–pedunculate, and with verticils shorter than flagellomeres ..... ***Limonia*** (***Idioglochina*** Alexander)
1 sp., *marmorata* (Osten Sacken); marine, Pacific ocean

Sc very long, ending nearly opposite fork of Rs (Fig. 31). Flagellomeres oval, without apical peduncles, and with very long and flexible verticils on proximal flagellomeres. Gonostylus deeply divided, with a third oval lobe at base of ventral division of gonostylus ..... ***Limonia*** (***Metalimnobia*** Matsumura)
9 spp.; widespread

65. Dorsal division of gonostylus of male terminalia in form of a stout club that terminates in several blackened spines; ventral division of gonostylus with two rostral spines placed on a long sinuous prolongation ..... ***Limonia*** (***Hesperolimonia*** Alexander)
1 sp., *infuscata* (Doane); western

Male terminalia not as above 66

66. Male terminalia with a single stout rostral spine. Body commonly polished black. Anterior vertex of head broad and silvery ..... ***Limonia*** (***Melanolimonia*** Alexander)
4 spp.; widespread, boreal

Male terminalia with two rostral spines. Coloration not as above ..... ***Limonia*** (***Dicranomyia*** Stephens), in part
70 spp.; widespread

67. R_2 lacking 68

R_2 present 69

68. Rostrum short and inconspicuous. Sc_2 removed from tip of Sc_1, placed basal to origin of Rs; basal section of Rs long and straight, close to R_1, and in direct alignment with R_{2+3}; crossvein r-m distinct (as in Fig.36) ..... ***Elliptera*** Schiner, in part
6 spp.; widespread

Rostrum of moderate length, subequal to or longer than remainder of head. Sc_2 at tip of Sc_1, and about opposite the fork of Rs; basal section of Rs short and curved, not in alignment with R_{2+3}; crossvein r-m sometimes shortened or obliterated by approximation of adjoining veins (Fig. 32) ..... ***Helius*** Lepeletier & Serville
2 spp.; widespread

69. R_2 situated beyond level of outer end of cell dm; basal section of CuA_1 joining M_3 beyond fork of M; a conspicuous pale fold in outer end of cell cua_2 (Fig. 33) ..... ***Dicranoptycha*** Osten Sacken
23 spp.; widespread

R_2 about opposite crossvein r-m or slightly beyond; basal section of CuA_1 joining M_3 well basal to fork of M; no fold in cell cua_2 70

70. Cell dm absent (Figs. 34, 35) 71

Cell dm present (Figs. 36, 37) 73

71. R_{1+2} equal to or shorter than R_2; R_3 long, decurved, ending at wing tip (Fig. 34) ..... ***Thaumastoptera*** Mik
1 sp., *hynesi* Alexander; western

R_{1+2} longer than R_2; R_3 straight, ending before wing tip ..... ***Orimarga*** Osten Sacken.... 72

72. M with two free branches (M_1 and M_3) reaching margin; basal transverse section of CuA_1 uniting with M about opposite origin of Rs or distal to base of Rs, sometimes at or close to fork of M_{1+2} and distal section of CuA_1, but normally near mid length of wing ..... ***Orimarga*** (***Orimarga*** Osten Sacken)
4 spp.; southwest to Florida

M with one free branch (M_1) reaching margin; basal transverse section of CuA_1 uniting with M far before fork of M_1 and distal section of CuA_1, at or near one-third to one-fourth the wing length (Fig. 35) ..... ***Orimarga*** (***Diotrepha*** Osten Sacken)
1 sp., *mirabilis* (Osten Sacken); southeastern, tropical

73. Anal angle of wing prominent, nearly rectangular; Sc close to R; Sc_2 not evident; basal section of Rs diverging from R_1, in alignment with lengthened R_{4+5}; cell dm present (Fig. 37) ..... ***Antocha*** Osten Sacken
7 spp.; mainly eastern

Anal angle of wing less prominent; Sc and R more separated; Sc_2 present; basal section of Rs long and straight, nearly parallel with R_1, in alignment with R_{2+3}; cell dm present (Fig. 36) or absent ..... ***Elliptera*** Schiner, in part
see couplet 68

74. Wing membrane with abundant macrotrichia ..... ***Ula*** Haliday
3 spp.; eastern

Wing membrane without macrotrichia 75

75. Rostrum produced into a short beak, one-half length of remainder of head or more ..... ***Ornithodes*** Coquillett
2 spp.; western, northern

Rostrum inconspicuously developed, at most one-fourth length of remainder of head 76

76. Supernumerary crossvein present in cell bm. Size large; wing of male approximately 10 mm or more. Female subapterous in Nearctic species. Antenna short, with 11 or 12 flagellomeres .... ***Nasiternella*** Wahlgren, in part
1 sp., *hyperborea* (Osten Sacken); northern

Supernumerary crossvein absent. Other characters not as above 77

77. Antenna with either 12 or 14 flagellomeres. Size large; wing 7 mm or more in fully winged species. Wing of some species patterned with darker marking ..... **Pedicia** Latreille.... 78

Antenna with either 11 or 13 flagellomeres. Size small; wing less than 7 mm, usually smaller. Wing commonly unpatterned except for a pterostigmal darkening ..... ***Dicranota*** Zetterstedt.... 80

78. Size large; wing 20 mm or more. Wing with a darkened pattern that forms a triangle involving broad costal and cubital seams that are interconnected across oblique cord. Palpus with terminal segment elongate. M_1 and M_2 commonly separate, but fused in *bellamyana* Alexander ..... ***Pedicia*** (***Pedicia*** Latreille)
11 spp.; widespread

Size smaller; wing less than 18 mm, commonly not exceeding about 15 mm. Wing, if patterned, without a triangular darkened area as described; cord of wing transverse or only slightly oblique. Palpus with terminal segment shorter. M_1 and M_2 usually fused 79

79. Inner division of gonostylus of male terminalia terminating in five unequal finger-like lobes ..... ***Pedicia*** (***Pentacyphona*** Alexander)
10 spp.; mostly western

Inner division of gonostylus of male terminalia simple, rarely bilobate ..... ***Pedicia*** (***Tricyphona*** Zetterstedt), in part
40 spp.; widespread

80. Supernumerary crossveins in one or more of cells r_1, r_3, r_4, and bm 81

Supernumerary crossveins lacking 84

81. Supernumerary crossveins in cells r_1, r_3, r_4, and bm ..... ***Dicranota*** (***Polyangaeus*** Doane), in part
3 spp.; western

Supernumerary crossvein in cell r_1 only 82

82. Cell dm present (Fig. 17) ..... ***Dicranota*** (***Eudicranota*** Alexander)
4 spp.; eastern

Cell dm absent 83

83. M_1 and M_2 fused ..... ***Dicranota*** (***Paradicranota*** Alexander)
3 spp.; eastern

M_1 and M_2 separate ..... ***Dicranota*** (***Dicranota*** Zetterstedt)
11 spp.; widespread

84. Cell dm present ..... ***Dicranota*** (***Rhaphidolabina*** Alexander)
1 sp., *flaveola* (Osten Sacken); eastern

Cell dm absent 85

85. M_1 and M_2 fused ..... ***Dicranota*** (***Plectromyia*** Osten Sacken), in part
9 spp.; widespread

M_1 and M_2 separate (Fig. 39) ..... ***Dicranota*** (***Rhaphidolabis*** Osten Sacken)
28 spp.; widespread

86. Antenna sometimes greatly elongated, with 4–10 flagellomeres ..... ***Hexatoma*** Latreille 87
Antenna with more than 11 flagellomeres 88

87. Cell dm present; two or three branches of M (M_{1+2} and M_3; or M_1, M_2, and M_3) reaching margin (Fig. 41) ..... ***Hexatoma*** (***Eriocera*** Macquart)
33 spp.; widespread

Cell dm absent; one branch of M (M_{1+2}) reaching margin (Fig. 40) ..... ***Hexatoma*** (***Hexatoma*** Latreille)
2 spp.; eastern

88. Rostrum elongate, exceeding one-half length of remainder of body, with mouthparts at extreme tip. Two branches of Rs reaching margin (Fig. 42) ..... ***Elephantomyia*** Osten Sacken
2 spp.; 1 sp. eastern, 1 sp. western

Rostrum short or only of moderate length, not exceeding length of remainder of head. Three branches of Rs present except in *Atarba* 89

89. Two branches of Rs reaching margin (Fig. 43) ..... ***Atarba*** Osten Sacken
4 spp.; widespread

Three branches of Rs reaching margin 90

90. Macrotrichia present in some wing cells 91
No macrotrichia in wing cells except in pterostigmal region when latter present 93

91. Macrotrichia in all cells except near wing base. Cell r_3 sessile or very short–petiolate ..... ***Ulomorpha*** Osten Sacken
8 spp.; widespread

Macrotrichia sparse, present only in apical cells of wing; cell r_3 petiolate 92

92. M_2 separate or fused with M_1; R_2 usually present but faintly indicated. Antenna short in both sexes. Prescutal tuberculate pits present, removed from anterior border ..... ***Paradelphomyia*** Alexander
11 spp.; widespread

M_2 fused with M_1 in Nearctic species; R_2 present. Antenna of male long, subequal to body. Prescutal tuberculate pits lacking ..... ***Shannonomyia*** Alexander, in part
3 spp.; widespread

93. Cell c with a supernumerary crossvein; wing patterned with brown transverse bands or with ring-like markings ..... ***Epiphragma*** Osten Sacken
4 spp.; widespread

Cell c without a supernumerary crossvein; wing, when patterned, without ring-like markings ..94

94. R_2 lacking; CuA_1 having point contact with M_3 (Fig. 44) ..... ***Phyllolabis*** Osten Sacken
12 spp.; chiefly western

R_2 present; CuA_1 fused with M_3 for nearly half its length 95

95. Cell dm absent (Fig. 45). Antenna of male very long; flagellomeres strongly nodulose, appearing bead-like ..... ***Polymera*** Wiedemann
2 spp.; southeastern U.S.A.

Cell dm present. Male antenna short, but if longer, flagellomeres not nodulose 96

96. Wing with MA (anterior branch of medius, arculus) lacking (Figs. 47, 48) 97

Wing with MA present (Figs. 46, 49) 101

97. CuA_1 joining M at or close to fork of M ..... ***Dactylolabis*** Osten Sacken....98

CuA_1 joining M from one-third to one-half the length of cell dm beyond fork of M 99

98. Apex of gonocoxite produced about one-half length of gonostylus; gonostylus subterminal. Cercus of ovipositor lying transversely, broadly flattened, bearing a strong tooth on lateral or ventral margin; hypogynial valve long, fleshy, with abundant setae ..... ***Dactylolabis*** (***Eudactylolabis*** Alexander), in part
2 spp.; western

Gonocoxite not produced; gonostylus terminal. Cercus of ovipositor normally hexatomine, rather slender, without a lateral tooth ..... ***Dactylolabis*** (***Dactylolabis*** Osten Sacken)
17 spp.; widespread

99. Cell dm very large, with its proximal end situated far proximal to other elements of cord (Fig. 47) ..... ***Prolimnophila*** Alexander
1 sp., *areolata* (Osten Sacken); eastern

Cell dm of normal size, with its proximal end located in approximate alignment with other elements of cord (Fig. 48)..... ***Austrolimnophila*** Alexander....100

100. R_{2+3+4} slightly arcuate, short, at most one-half length of anterior branch of Rs (R_{2+3} + R_3) (Fig. 48). Male with one pair of small weak parameres..... ***Austrolimnophila*** (***Austrolimnophila*** Alexander)
3 spp.; widespread

R_{2+3+4} longer, subequal in length to anterior branch of Rs. Male with two pairs of parameres; outer ones in form of heavy black spines..... ***Austrolimnophila*** (***Archilimnophila*** Alexander)
3 spp.; northern

101. Head strongly narrowed and prolonged posteriorly. Pronotum with sides of anterior margin produced forward. Wing with long and sinuous radial and medial veins beyond cord; R_3 and R_4 usually parallel to one another; M_2 usually separate (Fig. 18), sometimes fused with M_1 (Fig. 46)..... ***Pseudolimnophila*** Alexander
5 spp.; widespread

Head broad, not conspicuously narrowed behind. Distal wing veins beyond cord more nearly straight; cell r_3 widened at margin; M_2 separate or fused with M_1 102

102. Antenna with proximal flagellomeres bearing very long conspicuous verticils that much exceed length of flagellomeres. Wing commonly with pterostigmal macrotrichia ..... ***Pilaria*** Sintenis
11 spp.; widespread

Antenna with shorter verticils, not or scarcely exceeding length of flagellomeres. Wing without pterostigmal macrotrichia 103

103. M_2 fused with M_1 in all Nearctic species; R_2 at or close to fork of R_{2+3+4} ..... ***Shannonomyia*** Alexander, in part
see couplet 92

M_2 usually separate; R_2 beyond fork of R_{2+3+4} (Fig. 49) ..... ***Limnophila*** Macquart....104

104. Supernumerary crossveins in cells r_3, r_5, or bm 105

Supernumerary crossveins absent 108

105. Supernumerary crossvein in cell r_3 ..... ***Limnophila*** (***Dicranophragma*** Osten Sacken)
2 spp.; eastern

No supernumerary crossvein in cell r_3 106

106. Supernumerary crossvein in cell r_5. Size large; wing length over 15 mm ..... ***Limnophila*** (***Eutonia*** Wulp), in part
3 spp.; eastern

Supernumerary crossvein in cell bm. Size smaller; wing length commonly less than 10 mm 107

107. Antenna of male elongate. Rs square and sometimes spurred at origin; wing with a more or less complete crossband ..... ***Limnophila*** (***Idioptera*** Macquart)
2 spp.; northern

Antenna short in both sexes. Rs not or only slightly spurred at origin; wing spotted, very rarely unmarked ..... ***Limnophila*** (***Eloeophila*** Rondani)
19 spp.; widespread

108. Distal wing cells with macrotrichia. Antenna of male very long, with abundant erect elongate setae over entire surface ..... ***Limnophila*** (***Lasiomastix*** Osten Sacken)
3 spp.; eastern

Wing without macrotrichia. Antenna of male not as above 109

109. Size very large; wing length about 18 mm or more ..... ***Limnophila*** (***Eutonia*** Wulp), in part
see couplet 106

Size smaller; wing length not exceeding 15 mm, commonly less 110

110. M_2 fused with M_1 111

M_2 separate (Fig. 49) 113

111. Sc_1 ending some distance before fork of Rs; cell r_3 with a short petiole. Tergite 9 of male terminalia narrow, and with apex deeply emarginate forming two slender lobes. Size small. Coloration yellow with white tarsi ..... ***Limnophila*** (***Dendrolimnophila*** Alexander)
1 sp., *albomanicata* (Alexander); western

Sc longer; Sc_1 opposite fork of Rs; cell r_3 sessile, or virtually so. Tergite 9 of male terminalia not as above. Size larger. Coloration dark with dark tarsi 112

112. Outer division of gonostylus of male terminalia deeply bifid with apices forming two long spines ..... ***Limnophila*** (***Idiolimnophila*** Alexander)
1 sp., *emmelina* Alexander; eastern

Outer division of gonostylus of male terminalia compact, trispinous with outer point longest; aedeagus compressed, reniform ..... ***Limnophila*** (***Prionolabis*** Osten Sacken), in part
21 spp.; widespread

113. Cell m_1 small and short, at most one-third as long as its petiole, rarely lacking. Wing unpatterned. Antenna of male with verticils of proximal flagellomeres long; lower faces of flagellomeres glabrous. Outer division of gonostylus of male terminalia in form of a slender rod, with apex unequally bidentate; aedeagus very small, shorter than subtending horn-like apophyses ..... ***Limnophila*** (***Brachylimnophila*** Alexander)
2 spp.; 1 sp. eastern, 1 sp. western

Cell m_1 long, commonly subequal in length to its petiole or longer (Fig. 49). Other combination of characters not as above 114

114. Base of aedeagus flattened, appearing pod-like or reniform ..... ***Limnophila*** (***Prionolabis*** Osten Sacken), in part
see couplet 112

Aedeagus not as above 115

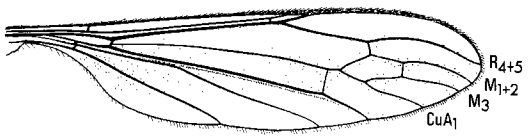
115. Antenna of male elongate, as long as head and thorax; proximal flagellomeres dilated ventrally with both dorsal and ventral verticils; ventral verticils shorter than dorsal ones. Apex of outer division of gonostylus of male terminalia bidentate; aedeagus and parameres elongate; parameres with several spines at apex ..... ***Limnophila*** (***Arctolimnophila*** Alexander)
2 spp.; 1 sp. eastern, 1 sp. western

Antenna and terminalia of male not as above 116

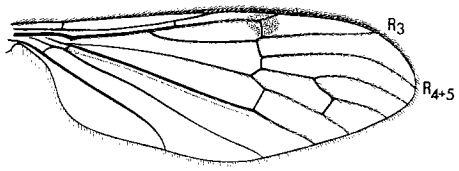
116. Male antenna with normal rather short verticils on both lower and dorsal faces. Aedeagus trifid, sometimes with very long branches ..... ***Limnophila*** (***Phylidorea*** Bigot)
40 spp.; widespread

Male antenna without ventral verticils, with proximal flagellomeres more or less dilated beneath. Aedeagus simple or trifid, with branches short 117

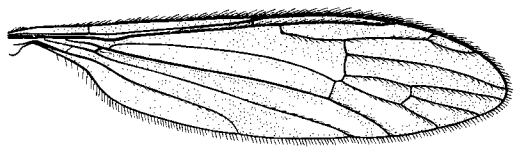
117. Paramere of male terminalia bidentate or tridentate, with tip acute; aedeagus straight, sometimes very short, with apex shallowly notched; outer division of gonostylus in form of a simple glabrous rod with obtuse tip ..... ***Limnophila*** (***Hesperolimnophila*** Alexander)
3 spp.; western



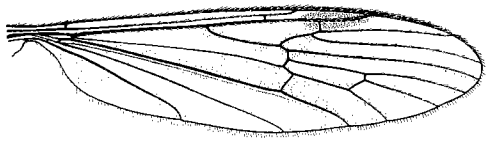
50 Toxorhina magna ♂



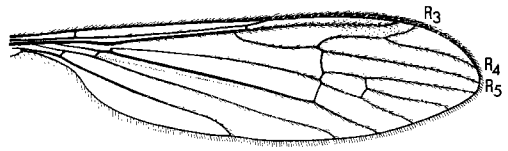
51 Teucholabis complexa ♂



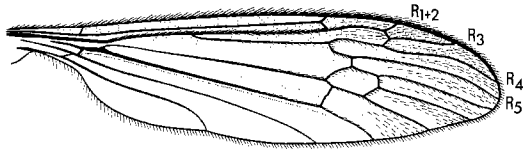
52 Gonomyia (Lipophleps) sulphurella ♀



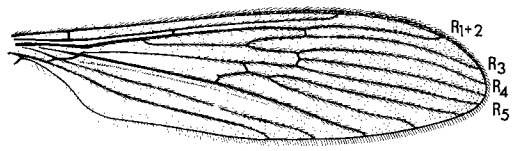
53 Gnophomyia tristissima ♀



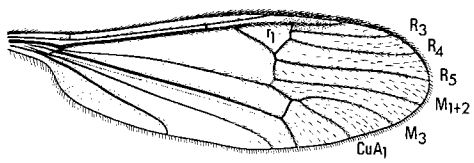
54 Gonomyia (Gonomyia) subcinerea ♀



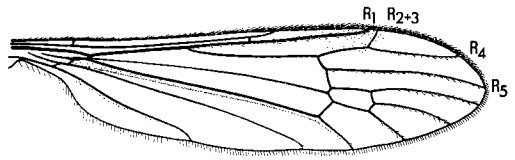
55 Lipsothrix nigrilinea ♀



56 Molophilus (Promolophilus) nitidus ♂



57 Cryptolabis paradoxa ♀



58 Rhabdomastix (Sacandaga) californiensis ♂

Figs. 7.50–58. Wings (*continued*): (50) *Toxorhina magna* Osten Sacken; (51) *Teucholabis complexa* Osten Sacken; (52) *Gonomyia* (*Lipophleps*) *sulphurella* Osten Sacken; (53) *Gnophomyia tristissima* Osten Sacken; (54) *Gonomyia* (*Gonomyia*) *subcinerea* Osten Sacken; (55) *Lipsothrix nigrilinea* (Doane); (56) *Molophilus* (*Promolophilus*) *nitidus* Coquillett; (57) *Cryptolabis paradoxa* Osten Sacken; (58) *Rhabdomastix* (*Sacandaga*) *californiensis* Alexander (*continued*).

Paramere of male terminalia resembling a simple smooth paddle; aedeagus long and slender, gently curved; outer division of gonostylus in form of a simple spine with a small acute point on lower margin before mid length ..... ***Limnophila*** (***Afrolimnophila*** Alexander)
2 spp.; 1 sp. eastern, 1 sp. western

118. M_2 separate 119
M_2 fused with M_1 (Figs. 50–58) 121

119. Cell r_3 short, shorter than its petiole; R_2 at or proximal to fork of R_3 and R_4 ..... ***Neolimnophila*** Alexander
4 spp.; widespread
Cell r_3 long, about three or four times longer than its petiole; R_2 distal to fork of R_{2+3+4} 120

120. Male terminalia with an undivided gonostylus ..... ***Cladura*** Osten Sacken
5 spp.; widespread
Male terminalia with a divided gonostylus. ..... ***Neocladura*** Alexander
2 spp.; 1 sp. eastern, 1 sp. western

121. Rostrum very long and slender, at least subequal to combined length of head and thorax, with reduced mouthparts situated at apex. Setae of legs deeply bifid ..... ***Toxorhina*** Loew
2 spp.; eastern
Rostrum short, not or scarcely exceeding remainder of head. Setae of legs simple 122

122. Coxae of midleg and hindleg only slightly separated by meral region; meron small, not exceeding coxa in diameter 123
Coxae of midleg and hindleg widely separated by a large meron producing a pot-bellied appearance; meron subequal to or larger than coxa 136

123. Two branches of Rs (R_3 and R_{4+5}) reaching margin (Fig. 51) 124
Three branches of Rs (R_3, R_4, and R_5) reaching margin (Figs. 52, 55, 57) 127

124. Sc_1 ending beyond origin of Rs; basal section of CuA_1 joining cell dm beyond fork of M (Fig. 51) ..... ***Teucholabis*** Osten Sacken
7 spp.; predominantly southern
Sc_1 ending before origin of Rs; basal section of CuA_1 joining cell dm at or before fork of M (as in Fig. 52) ..... ***Gonomyia*** Meigen, in part 125

125. Cell dm absent ..... ***Gonomyia*** (***Neolipophleps*** Alexander)
3 spp.; widespread
Cell dm present 126

126. Wing with a conspicuous dark brown pterostigmal spot .... ***Gonomyia*** (***Paralipophleps*** Alexander)
1 sp., *pleuralis* (Williston); southern
Wing with pterostigmal spot lacking or virtually so ..... ***Gonomyia*** (***Lipophleps*** Bergroth), in part
5 spp.; eastern

127. Cell r_3 longer than its petiole (R_{2+3+4}) (Fig. 55) 128
Cell r_3 shorter than its petiole (Fig. 54) ..... ***Gonomyia*** Meigen, in part 132

128. R_{1+2} and R_2 short, subequal (Fig. 55) 129
R_{1+2} longer than R_2 (Fig. 53) 130

129. Sc_1 ending before fork of Rs; R_3 oblique, divergent; distal margin of cell r_3 longer than distal margin of cell r_2; cell dm absent. Size small; wing less than 6 mm ..... ***Gonomyia*** (***Progonomyia*** Alexander)
4 spp.; southern
Sc_1 ending opposite or beyond fork of Rs; R_3 longitudinal, nearly parallel with R_4; distal margins of cells r_2 and r_3 subequal; cell dm present (Fig. 55). Size large; wing over 8 mm ..... ***Lipsothrix*** Loew
6 spp.; western with 1 sp. in east

130. Sc_2 situated near origin of Rs; Sc_1 nearly as long as Rs. Legs with linear scales. Gonostylus of male terminalia terminal; outer division of gonostylus elongate, with a brush of long setae at apex; gonocoxite with a dense brush of setae on median face ..... ***Idiognophomyia*** Alexander
2 spp.; western; Byers 1975

Sc_2 situated more distally (Fig. 53); Sc_1 much shorter than Rs. Legs with setae. Male terminalia not as above 131

131. Distal wing cells with macrotrichia; Sc_1 and Sc_2 subequal; cord of wing at near two-thirds length of wing; branches of R rather short and straight. Apex of gonocoxite of male terminalia strongly produced; gonostylus subterminal ..... ***Eugnophomyia*** Alexander
2 spp.; southeast to Arizona

Distal wing cells without macrotrichia; Sc_1 longer than Sc_2; cord of wing more basal, shortly beyond mid length; branches of R longer and slightly more curved (Fig. 53). Gonocoxite of male terminalia small, not produced; gonostylus terminal ..... ***Gnophomyia*** Osten Sacken
3 spp.; widespread

132. Supernumerary crossvein in cell r_4 ..... ***Gonomyia*** (***Euptilostena*** Alexander)
2 spp.; western

Supernumerary crossvein absent in cell r_4 133

133. Sc_1 ending some distance beyond origin of Rs; cell dm absent; basal section of CuA_1 joining M about its own length before fork of M ..... ***Gonomyia*** (***Idiocera*** Dale)
17 spp.; widespread

Sc_1 ending opposite or before origin of Rs; cell dm present or absent; basal section of CuA_1 joining M less than its length before fork of M (Fig. 52) 134

134. Cell r_3 very small; R_4 about two-thirds length of R_{2+3+4} ..... ***Gonomyia*** (***Lipophleps*** Bergroth), in part
see couplet 126

Cell r_3 larger; R_4 longer than R_{2+3+4} (Fig. 54) 135

135. Antenna with proximal two or three flagellomeres fused. Gonostylus of male terminalia with three simple divisions; gonocoxite not produced at apex; aedeagus very large and complex in structure ..... ***Gonomyia*** (***Teuchogonomyia*** Alexander)
4 spp.; western

Antenna with flagellomeres distinct. Gonostylus of male terminalia with two divisions; gonocoxite at apex produced into a small fleshy lobe; aedeagus not greatly modified ..... ***Gonomyia*** (***Gonomyia*** Meigen)
25 spp.; widespread

136. Cell r_3 sessile; Rs forking into R_{2+3} and R_{4+5} (Fig. 56) 137

Cell r_3 petiolate; Rs forking into R_{2+3+4} and R_5 (Figs. 57, 58) 139

137. Cell a_2 short and narrow; CuA_1 fusing with M basal to fork of M_3. Gonostylus of male terminalia undivided. Size very small; wing about 2.5 mm or less ..... ***Tasiocera*** Skuse (***Dasymolophilus*** Goetghebuer)
5 spp.; widespread

Cell a_2 long and broad; CuA_1 fused with M_3 for short distance distal to fork of M (Fig. 56). Gonostylus of male terminalia with two divisions. Size larger ..... ***Molophilus*** Curtis 138

138. Male terminalia with a black tergal plate; parameres fused to form an entire black plate or divided into two blades ..... ***Molophilus*** (***Promolophilus*** Alexander)
5 spp.; western

Male terminalia without a black tergal plate; parameres forming a simple flattened pale plate ..... ***Molophilus*** (***Molophilus*** Curtis)
40 spp.; widespread

139. Gonostylus of male terminalia undivided. Cell dm absent 140

Combination of characters not as above 141

140. Basal section of Rs short; R_{2+3+4} at a right angle to Rs; cell r_1 small and triangular in outline (Fig. 57). Aedeagus of male terminalia stout to massive, darkened, terminating in a single filament. Female with cercus and hypogynial valves of ovipositor short and fleshy ..... ***Cryptolabis*** Osten Sacken
11 spp.; mainly western

Basal section of Rs long, arcuate, in longitudinal alignment with R_{2+3+4}; cell r_1 elongate. Gonocoxite of male terminalia bearing a needle-like interbase (as in Fig. 6); aedeagus narrow, divided into three long slender branches. Female terminalia not as above ..... ***Phantolabis*** Alexander
1 sp., *lacustris* (Alexander); eastern

141. Cell r_3 shorter than its petiole (R_{2+3+4}) (Fig. 58) 142
Cell r_3 at least as long as its petiole (Figs. 59, 60) 149

142. R_2 lacking. R_3 short, suberect, close to R_1 at margin, longer and more oblique in *neolurida* Alexander; R_3 commonly about one-third length of R_4 or less (Fig. 58). Gonostylus of male terminalia terminal; outer division of gonostylus simple, densely spinose outwardly; interbase long and slender (Fig. 6) ..... ***Rhabdomastix*** Skuse.... 143
R_2 present. Other combination of characters not as above 144

143. Antenna of male greatly lengthened, more than three times length of wing ..... ***Rhabdomastix*** (***Rhabdomastix*** Skuse)
1 sp., *nuttingi* Alexander; southwestern
Antenna short in both sexes, not exceeding one-half length of wing ..... ***Rhabdomastix*** (***Sacandaga*** Alexander), in part
24 spp.; widespread

144. Cell r_3 small; R_4 short, gently curved; Sc_2 absent ..... ***Rhabdomastix*** (***Sacandaga*** Alexander), in part
1 sp., *monticola* Alexander; western
Cell r_3 larger; R_4 long, straight; Sc_2 present 145

145. Gonostylus of male terminalia with three divisions ..... ***Gonomyodes*** Alexander
4 spp.; western
Gonostylus of male terminalia with either one or two divisions 146

146. Gonostylus of male terminalia undivided ..... ***Gonomyopsis*** Alexander
1 sp., *doaneiana* Alexander; western
Gonostylus of male terminalia with two divisions 147

147. Gonostylus of male terminalia subterminal; gonocoxite produced beyond its insertion into a long narrow blade. R_3 oblique, straight ..... ***Gonempeda*** Alexander
3 spp.; widespread
Gonostylus of male terminalia terminal; outer division bifurcate except in *exilistyla* (Alexander) where it is simple. R_3 more longitudinal in position ..... ***Cheilotrichia*** Rossi.... 148

148. Cell dm present ..... ***Cheilotrichia*** (***Cheilotrichia*** Rossi)
1 sp., *alicia* (Alexander); western
Cell dm absent ..... ***Cheilotrichia*** (***Empeda*** Osten Sacken)
11 spp.; predominantly western, 1 sp. eastern

149. Wing with abundant macrotrichia in all cells ..... ***Ormosia*** Rondani.... 150
Wing usually without such macrotrichia, but when present, restricted to just a few in distal cells or in region of pterostigma 154

150. Cell dm present 151
Cell dm absent 153

151. A_1 and A_2 slightly convergent. Outer division of gonostylus of male terminalia outwardly dilated or slightly bifid; apex of aedeagus divided into two long filaments ..... ***Ormosia*** (***Rhypholophus*** Kolenati)
10 spp.; western
A_1 and A_2 divergent. Outer division of gonostylus not dilated outwardly; apex of aedeagus simple 152

152. Outer division of gonostylus of male terminalia oval, with strong spinules on surface; aedeagus very large. Cell dm small; posterior border of cell dm equal to or shorter than following distal section of CuA_1 ..... ***Ormosia*** (***Scleroprocta*** Edwards)
3 spp.; 2 spp. eastern, 1 sp. western
Outer division of gonostylus of male terminalia bifid, with strong spines; aedeagus small, slender, with narrow subtending basal plates. Venation not as above ..... ***Ormosia*** (***Parormosia*** Alexander)
7 spp.; widespread

153. Medial field comprising M_1 and M_3; M_3 branching from a basal fusion with CuA_1 (as in Fig. 61). Outer division of gonostylus of male terminalia forming a simple curved horn that

narrows to an acute spine; inner division of gonostylus forming a simple yellow blade; paramere simple, rounded, plate-like ..... ***Ormosia*** (***Oreophila*** Lackschewitz)
6 spp.; western

Medial field comprising M_1 and M_2; M_3 absent (Fig. 59). Gonostylus of male terminalia variously constructed but not as above; paramere spine-like..... ***Ormosia*** (***Ormosia*** Rondani)
75 spp.; widespread

154. Wing with pterostigmal region dilated and with abundant macrotrichia (Fig. 60). Gonostylus of male terminalia terminal; outer division of gonostylus with an acute spine beyond mid length; aedeagus bilobate ..... ***Empedomorpha*** Alexander
1 sp., *empedoides* (Alexander); western

Wing with pterostigmal region normal, without macrotrichia. Male terminalia not as above..155

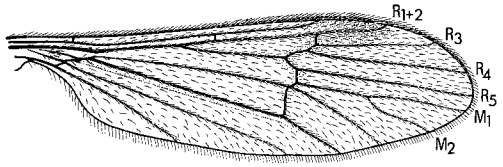
155. Sc_2 usually absent but sometimes preserved; apical section of Sc_1 short, subequal to basal section of CuA_1; distal cells sometimes with sparse macrotrichia (Fig. 61). Outer division of gonostylus of male terminalia gently curved, with a finger-like lobe near mid length..... ***Hesperoconopa*** Alexander
5 spp.; western

Sc_2 always present; apical section of Sc_1 long, approximately three times length of basal section of CuA_1; wing cells without macrotrichia (Fig. 62). Male terminalia not as above 156

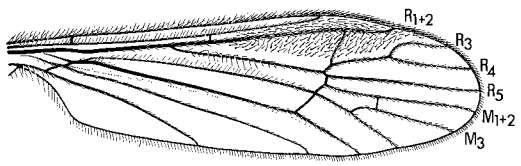
156. Inner division of gonostylus of male terminalia angulate near mid length, with apex slender and bearing small spines; aedeagus forming a slender rod..... ***Arctoconopa*** Alexander
9 spp.; western

Male terminalia not as above ..... ***Erioptera*** Meigen....157

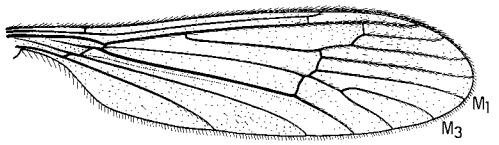
157. Antenna with terminal three flagellomeres smaller than others. Cell dm present. Apical branches of aedeagus of male terminalia short; paramere in form of a simple slender spine; divisions of gonostylus subequal in length, narrow; outer division of gonostylus terminating in a black spine; inner division of gonostylus with tip obtuse ..... ***Erioptera*** (***Trimicra*** Osten Sacken)
1 sp., *pilipes* (Fabricius); eastern to Texas



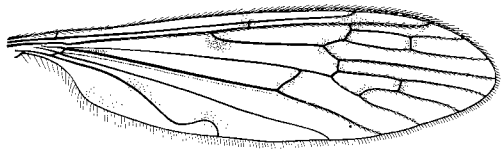
59 Ormosia (Ormosia) manicata ♂



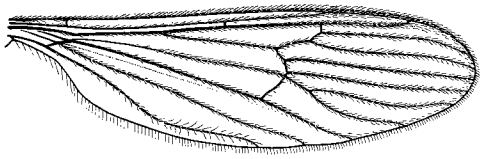
60 Empedomorpha empedoides ♂



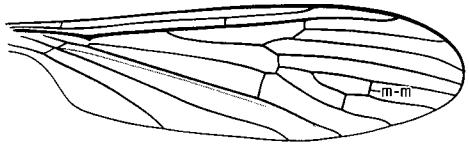
61 Hesperoconopa melanderi ♂



62 Erioptera (Symplecta) cana ♀



63 Erioptera (Erioptera) septemtrionis ♀



64 Erioptera (Hoplolabis) armata ♀

Figs. 7.59–64. Wings (*concluded*): (59) *Ormosia* (*Ormosia*) *manicata* (Doane); (60) *Empedomorpha empedoides* (Alexander); (61) *Hesperoconopa melanderi* (Alexander); (62) *Erioptera* (*Symplecta*) *cana* (Walker); (63) *Erioptera* (*Erioptera*) *septemtrionis* Osten Sacken; (64) *Erioptera* (*Hoplolabis*) *armata* Osten Sacken.

Antenna with outer flagellomeres gradually and progressively smaller. Other combination of characters not as above 158

158. Supernumerary crossvein in cell r_3 usually present (Fig. 62), but lacking in *stictica* Meigen; A_1 and A_2 strongly convergent; A_2 sinuous distally. Gonostylus of male terminalia terminal to slightly subterminal; outer division of gonostylus expanded outwardly, sometimes variously spined; apex of aedeagus deeply forked ..... ***Erioptera*** (***Symplecta*** Meigen)
4 spp.; widespread

Supernumerary crossvein lacking in cell r_3. Gonostylus and aedeagus of male terminalia not as above 159

159. Cell dm present (Fig. 64) 160

Cell dm absent (Fig. 63) 162

160. Cell dm divided by a spur running proximally into the cell from basal section of M_3 to M_{1+2} (Fig. 64) ..... ***Erioptera*** (***Hoplolabis*** Osten Sacken)
4 spp.; widespread

Cell dm undivided 161

161. Cell dm small, much shorter than veins issuing from it. Male terminalia not as below ..... ***Erioptera*** (***Psiloconopa*** Zetterstedt)
30 spp.; widespread

Cell dm large, longer than the veins emanating from it. Male terminalia inverted 180°; outer division of gonostylus unusually large ..... ***Erioptera*** (***Ilisia*** Osten Sacken)
5 spp.; eastern

162. Cell dm lost by atrophy of basal section of M_3 (present in *melanderiana* Alexander); A_1 and A_2 divergent; A_2 nearly straight. Gonostylus of male terminalia terminal; outer division of gonostylus deeply divided into two spines; inner division of gonostylus forming a long simple spine ..... ***Erioptera*** (***Mesocyphona*** Osten Sacken)
15 spp.; widespread

Cell dm lost by atrophy of crossvein m-m; A_1 and A_2 convergent; A_2 sinuous distally (Fig. 63). Gonostylus of male terminalia not as above ..... ***Erioptera*** (***Erioptera*** Meigen)
29 spp.; widespread

163. Body length commonly more than 8–10 mm. Wing usually reduced in female only to about 10 mm, but virtually absent in both sexes of *quaylii* Doane. Head with distinct tubercle on frons, commonly with a nasus; terminal palpal segment long ..... TIPULINAE ..... ***Tipula*** (***Pterelachisus*** Rondani), in part
see couplets 35, 36, and 41 ***Tipula*** (***Serratipula*** Alexander), in part
Tipula (***Triplicitipula*** Alexander), in part

Body length commonly less than 5 mm, but sometimes larger. Head without tubercle on frons, and without a nasus; terminal palpal segment short ..... LIMONIINAE 164

164. Eye with hairs between ommatidia ..... PEDICIINI 165

Eye without hairs ..... LIMONIINI, HEXATOMINI, ERIOPTERINI 166

165. Body length up to about 10 mm, commonly smaller; wing length up to about 6 mm, but usually smaller ..... ***Nasiternella*** Wahlgren, in part
female only, see couplet 76
..... ***Pedicia*** (***Tricyphona*** Zetterstedt), in part
4 spp.; western, northern

Body length up to about 5 mm ..... ***Dicranota*** (***Polyangaeus*** Doane), in part
1 sp., *subapterogyne* Alexander, female only; western
..... ***Dicranota*** (***Plectromyia*** Osten Sacken), in part
1 sp., *reducta tehamicola* Alexander, both sexes; western

166. Antenna with 12 flagellomeres ..... LIMONIINI ..... ***Limonia*** (***Alexandriaria*** Garrett), in part
1 sp., *phalangioides* Alexander, both sexes, wing to about 1 mm; western
..... ***Limonia*** (***Dicranomyia*** Stephens), in part
2 spp.; northwestern, Asiatic

Antenna with 14 flagellomeres, except in *Chionea* with 2–9 flagellomeres 167

167. Legs with tibial spurs. Wing present as a short stub to virtually lacking ..... HEXATOMINI....***Dactylolabis*** (***Eudactylolabis*** Alexander), in part
1 sp., *vestigipennis* Alexander, both sexes; southwestern
.....***Limnophila*** (***Prionolabis*** Osten Sacken), in part
1 sp., *rudimentis* Alexander, female only; eastern

Legs without tibial spurs. Wing present only as a microscopic vestige in both sexes. Small brown hairy insects, superficially resembling spiders, usually found on snow in winter ..... ERIOPTERINI....***Chionea*** Dalman
8 spp.; northern

Larva

1. Thoracic and abdominal segments with dorsal and lateral longitudinal rows of conspicuous usually elongate fleshy projections (Fig. 65) .....CYLINDROTOMINAE....2

Thoracic and abdominal segments without dorsal longitudinal rows of conspicuous projections; lateral projections, if present, occurring on abdomen only, and blunt, shorter than their basal diameter.....5

2. Dorsal projections mostly long, slender, simple on thoracic segments; posterior projections on most abdominal segments either deeply bifurcate or, if simple, approximately 10 times as long as basal diameter. Larva found in aquatic or semiaquatic mosses .....***Phalacrocera***

Dorsal projections shorter, with length one to three times basal diameter; those of posterior annulus of most abdominal segments longest on that segment, not deeply divided 3

3. Dorsal projections simple, without serrations on anterior surface. Posterior spiracles much farther apart than diameter of a spiracle. Larva feeding on leaves of certain flowering plants .....***Cylindrotoma***

Dorsal projections serrate on anterior convex surface. Posterior spiracles set close together, separated by about width of a spiracle 4

4. Posterior pair of dorsal projections on abdominal segments 1–7 with three or four serrations. Body color brownish. Larva found in semiaquatic mosses ..... ***Triogma***

Posterior pair of dorsal projections on abdominal segments 1–7 with two or only one serration (Fig. 65). Body color greenish with dark brown maculation. Larva found in terrestrial mosses.....***Liogma***

5. Spiracular disc bordered by six (rarely eight) usually subconical lobes usually arranged with two dorsally, two dorsolaterally, and two below spiracles; these lobes sometimes short and blunt or sclerotized and hook-like (Figs. 66, 68, 70–73) .....TIPULINAE....6

Spiracular disc bordered by five (rarely seven) or fewer lobes; lobes variable in shape, often arranged with one dorsomedially, two laterally, and two below spiracles or spiracles absent (Figs. 74, 75, 78–81) .....LIMONIINAE....15

6. Anal papillae pinnately branched. Dorsal lobes of spiracular disc short, bluntly rounded; lower lobes more than twice as long as their basal diameter. Larva aquatic or semiaquatic.....
.....***Leptotarsus*** (***Longurio***)

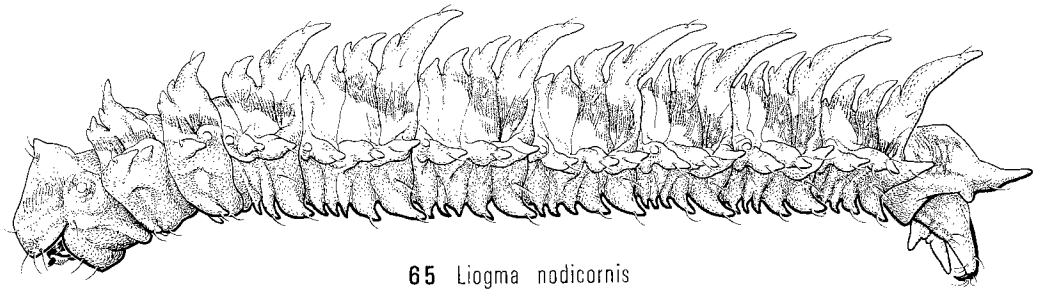
Anal papillae not pinnately branched. Lobes of spiracular disc variable 7

7. Dorsal lobes of spiracular disc closely appressed to one another (subgenus *Dolichopeza*) or abdominal segment 8 bearing a subconical lobe at each side below and before dorsolateral lobe of spiracular disc (subgenus *Oropeza*, Fig. 68). Larva found in terrestrial mosses and liverworts .....***Dolichopeza***

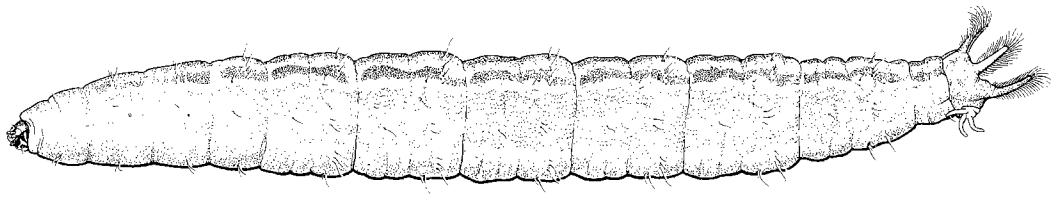
Dorsal lobes of spiracular disc not appressed; abdominal segment 8 without lateral subconical lobes 8

8. All lobes of spiracular disc elongate; lateral and ventral lobes three or four times as long as their basal width, with numerous long hairs bordering each lobe; outer hairs two or three times as long as width of lobe at point of attachment (Fig. 66) 9

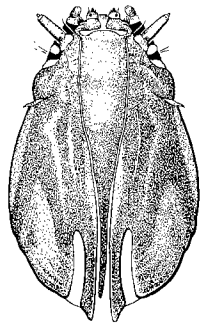
Some lobes of spiracular disc not elongate; longest ones rarely more than twice their basal width, except when in form of densely sclerotized hooks; bordering hairs usually sparse, but if numerous not long.....10



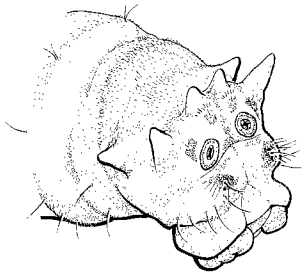
65 Liogma nodicornis



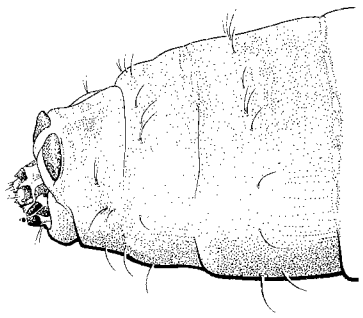
66 Prionocera sp.



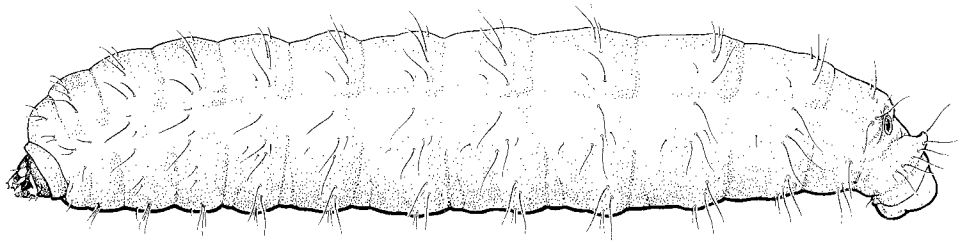
67 Prionocera dimidiata



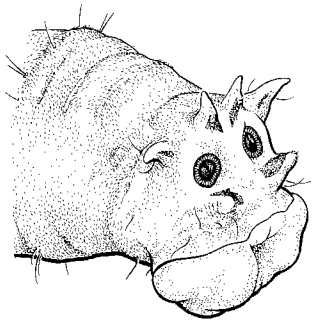
68 Dolichopeza (Oropeza) sp.



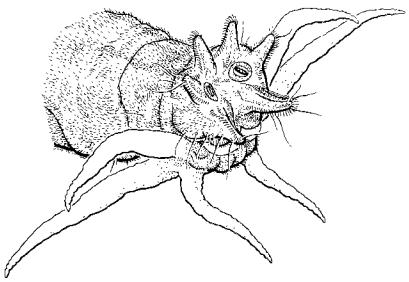
69 Nephrotoma sp.



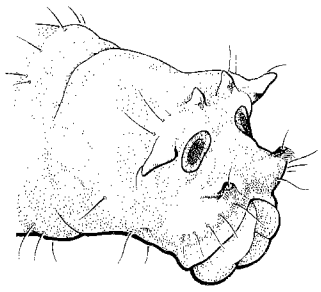
70 Ctenophora dorsalis



71 Tipula trivittata



72 Tipula (Yamatotipula) strepens

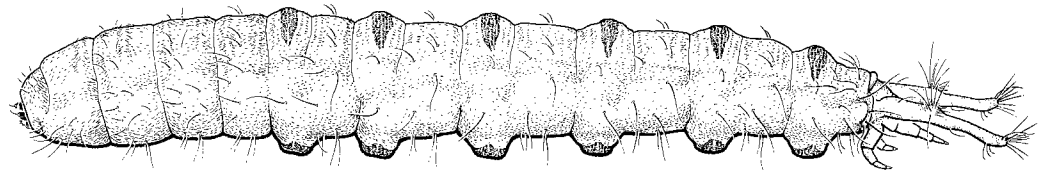


73 Ctenophora angustipennis

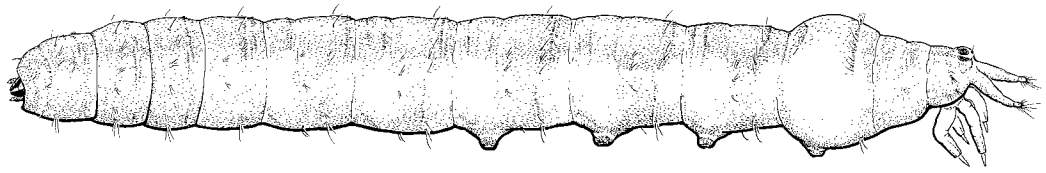
Figs. 7.65–73. Larvae: (65) *Liogma nodicornis* (Osten Sacken), lateral view; (66) *Prionocera* sp., lateral view; (67) *Prionocera dimidiata* (Loew), dorsal view of head capsule; (68) *Dolichopeza* (*Oropeza*) sp., oblique posterior view of terminal segments; (69) *Nephrotoma* sp., dorsolateral view of head capsule and thoracic segments; (70) *Ctenophora dorsalis* Walker, lateral view; (71) *Tipula trivittata* Say, oblique posterior view of terminal segments; (72) *Tipula* (*Yamatotipula*) *strepens* Loew, oblique posterior view of terminal segments; (73) *Ctenophora angustipennis* Loew, oblique posterior view of terminal segments (*continued*).

9. Two pairs of elongate retractile anal papillae present. Lobes of spiracular disc darkened along margins, pale medially. Larva found in open-ended tube of floating vegetation....***Megistocera***

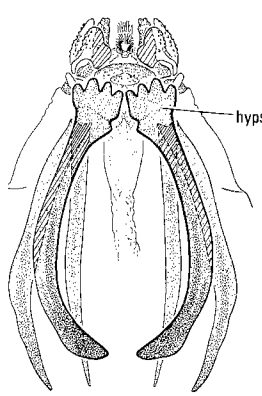
Three pairs of elongate anal papillae (Fig. 66) present. Lobes of spiracular disc darkened along margins but each with a thin submedian dark line. Larva not found in tubes of vegetation [included here are larvae of species of *Tipula* (*Angarotipula*), formerly assigned on basis of adult structures to *Prionocera*] .....***Prionocera***



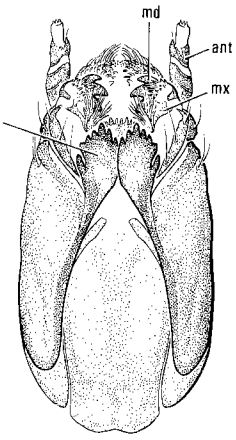
74 Antocha sp.

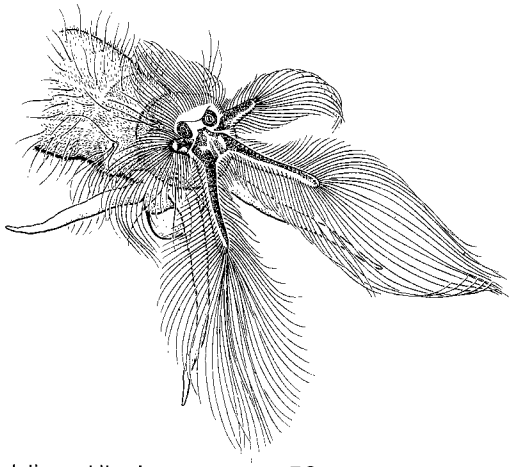


75 Pedicia sp.

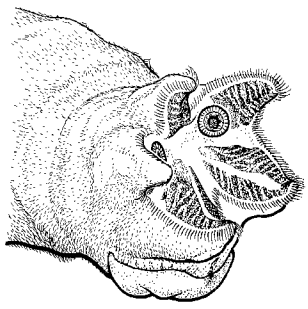


76 Molophilus sp.

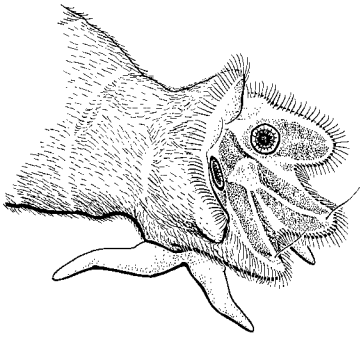




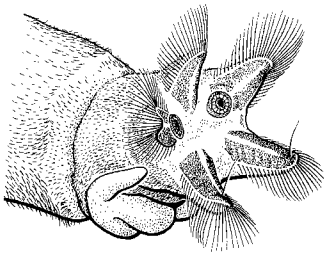
77 Pseudolimnophila inornata **78**



79 Gnophomyia toschiae



80 Gonomyia sp.



81 Ormosia sp.

Figs. 7.74–81. Larvae (*continued*): (74) *Antocha* sp., dorsolateral view; (75) *Pedicia* sp., dorsolateral view; (76) *Molophilus* sp., ventral view of head capsule; (77) ventral view of head capsule and (78) oblique posterior view of terminal segments of *Pseudolimnophila inornata* (Osten Sacken); (79) *Gnophomyia toschiae* Alexander, oblique posterior view of terminal segments; (80) *Gonomyia* sp., oblique posterior view of terminal segments; (81) *Ormosia* sp., oblique posterior view of terminal segments (*continued*).

Abbreviations: ant, antenna; hyps plt, hypostomal plate; md, mandible; mx, maxilla.

10. Pilosity on abdominal segments and posterior ring of metathorax uniformly dense giving larva a woolly appearance; thoracic segments otherwise with only short pubescence (microsetae), nearly bare by contrast. Spiracular disc rather small, only about half as wide as abdominal segment 8; dorsal lobes of disc low, inconspicuous, with their darkened posterior faces continued ventrally as wedge-shaped spots with apices between spiracles; lateral lobes of disc only about as long as diameter of spiracle, with bluntly rounded apices; ventral lobes darkened on discal face, narrowed near mid length, expanded apically. Larva found in dark thin organic mud by small streams, seepage areas, and other similar habitats ..***Brachypremna***

Pilosity not dense on abdomen, contrastingly absent on entire thorax. Spiracular disc of normal size; ventral lobes of disc not constricted near mid length 11

11. Prothoracic dorsum with two transverse somewhat roughened and elevated welts slightly behind line of attachment to head capsule, readily visible only when head extended (Fig. 69). Lobes of spiracular disc elongate–conical. Larva found in soil, usually near surface, in woodlands or less often in grasslands, pastures, and lawns ..... ***Nephrotoma***

Prothoracic dorsum without transverse welts. Lobes of spiracular disc variable 12

12. Dorsal and lateral lobes of spiracular disc not well-developed, low, bluntly rounded; ventral lobes small (Fig. 70); strong setae (macrosetae), longer than diameter of a spiracle, on each lateral lobe; three or four such setae below and beside each ventral lobe. Larva pale, thin-skinned, feeding in dead but still fairly sound wood ..... ***Ctenophora* (*Tanyptera*)**

Dorsal and lateral lobes of spiracular disc moderately to strongly developed. Larva usually grayish or brownish, but if pale, not thin-skinned 13

13. Central smooth area of spiracular disc surrounded by fringe of short hairs, with dorsal and dorsolateral lobes outside this fringe. Larva found in decaying hardwood stumps and logs ..... ***Ctenophora***, in part

Smooth area of disc continued onto posterior faces of lobes; fringing hairs usually confined to margins of lobes 14

14. Posterior spiracles large, separated by less than diameter of a spiracle; lobes of spiracular disc less than twice as long as basal width, fringed with long hairs; a thin black median line present on discal face of each lobe. Body length more than 50 mm in fourth instar. Larva found in moist soil, in Pacific drainage area ..... ***Holorusia***

Posterior spiracles usually separated by more than diameter of a spiracle; lobes of spiracular disc highly variable, from short and rounded to elongate, subconical to densely sclerotized, hook-like; ventral pair rarely divided. Larva found in various terrestrial and aquatic habitats (Figs. 71, 72) ..... ***Tipula***

15. Posterior spiracles absent; tracheal system closed; dorsal and lateral lobes of abdominal segment 9 absent or extremely reduced 16

Posterior spiracles present, usually conspicuous, but sometimes concealed when lobes of spiracular disc are infolded; dorsal and lateral lobes of abdominal segment 9 usually present, but absent in some species 17

16. Ventral lobes of abdominal segment 9 elongate, deeply separated, slightly divergent, with a few tufts of hairs (Fig. 74). Anal papillae elongate. Dorsal and ventral creeping welts conspicuous on abdominal segments 2–7. Larva in silken tube found on stones in swift well-oxygenated water ..... ***Antocha***

Abdominal segments 8 and 9 covered with dense long pilosity; segment 9 elongate, tapering, shallowly bifurcate at apex. Anal papillae short, not extending beneath segment 9. No conspicuous creeping welts. Larva found in sandy bottoms of cold clear rapid streams of Pacific drainage ..... ***Hesperoconopa***

17. Dorsal and lateral lobes of spiracular disc absent or extremely reduced; ventral lobes elongate (Fig. 75). Larva aquatic or semiaquatic (larvae of *Ornithodes* and *Nasiternella*, at present unknown, may key out here) 18

Dorsomedial lobes of spiracular disc or lateral lobes, or both, well-developed if ventral lobes elongate; ventral lobes usually short, less often absent 20

18. Paired prolegs with sclerotized apical crochets present on venter of abdominal segments 3–7. Creeping welts absent ..... ***Dicranota***, in part

Prolegs with apical crochets absent. Roughened creeping welts or broad tubercles present on basal rings of abdominal segments 4–7 19

19. Creeping welts on both dorsum and venter, bearing microscopic spicules ..... ***Dicranota*** (***Rhaphidolabina***)

Creeping welts or broad tubercles on venter only, without spicules but with microscopically roughened surface (Fig. 75) ..... ***Pedicia***

20. Spiracular disc surrounded by seven lobes, situated one dorsomedially and one each dorsolaterally, laterally, and ventrally on each side; spiracles small, widely separated, at bases of lateral lobes of spiracular disc. Larva found in organic silt in small streams of Pacific drainage ..... ***Gonomyodes***

Spiracular disc with five or fewer peripheral lobes, or without distinct lobes 21

21. Spiracular disc with four or five peripheral lobes 22

Spiracular disc with only three lobes, or without distinct lobes 58

22. Internal portion of head extensively sclerotized dorsally and laterally, with shallow posterior incisions (Figs. 77, 87) (determined by cutting prothoracic skin at one side, or often visible through skin) 23

Internal portion of head divided by deep posterior incisions into elongate slender rod-like to spatulate sclerites (Figs. 76, 83, 88), or if sclerites plate-like, darkly sclerotized only along margins giving appearance of separate rods 51

23. Hypostomal bridge divided medially by membranous area (hypostomal plates in contact though not fused in *Pseudolimnophila*, Fig. 77). Abdominal segments without creeping welts 24

Hypostomal bridge undivided (Fig. 87), though sometimes deeply incised posteriorly. Creeping welts present on basal rings of abdominal segments (Fig. 82), or abdominal segments with transverse bands or patches of dense pilosity on both basal and apical rings 39

24. Spiracular disc surrounded by five lobes, each in form of a black spatulate plate with finely toothed margins. Larva found in marshy soil ..... ***Ormosia*** (***Scleroprocta***)

Spiracular disc surrounded by four or five lobes of rounded or subconical form 25

25. Plane of spiracular disc approximately perpendicular to long axis of body; disc surrounded by five lobes 26

Plane of spiracular disc diagonal to long axis of body; disc with four peripheral lobes 37

26. Hypostomal prolongations each expanded into a sclerotized plate with anterior margin toothed (Fig. 76) 27

Hypostomal prolongations, if expanded, not sclerotized or not toothed anteriorly 28

27. Hypostomal plates each with four teeth (Fig. 76). Spiracular disc extensively blackened; black spots on dorsolateral and ventral lobes divided medially by pale line; spot on dorsal lobe nearly always undivided. Larva found in wet humous soil (larva of *Tasiocera*, at present unknown, may key out here) ..... ***Molophilus***

Hypostomal plates each with five to eight teeth. Spiracular disc small, without extensive blackened areas. Larva found in organic mud ..... ***Erioptera***, in part

28. Posterior faces of all five lobes of spiracular disc each bearing solidly blackened spot 29

Spots on some or all lobes of spiracular disc divided medially by pale line or wider pale zone 30

29. Blackened areas of dorsolateral lobes of spiracular disc continued between spiracles. Larva found in organic mud near water ..... ***Ormosia***, in part

No blackened areas between spiracles. Larva found in muddy stream banks ..... ***Erioptera*** (***Trimicra***)

30. Dorsomedial lobe of spiracular disc bearing densely sclerotized horn-like projection with apex bent downward over disc; black wedge-shaped spots present at periphery of disc between ventral lobes, between ventral and lateral lobes, and between lateral and dorsomedial lobes. Larva found in fine sand, silt, and organic debris at margins of clear streams of Pacific and Arctic drainages ..... ***Arctoconopa***

Dorsomedial lobe of spiracular disc without sclerotized horn-like projection; no wedges of black pigmentation between lobes of disc 31

31. Dorsolateral lobes of spiracular disc with solidly blackened spots; spots on ventral lobes divided (Figs. 79, 80) 32

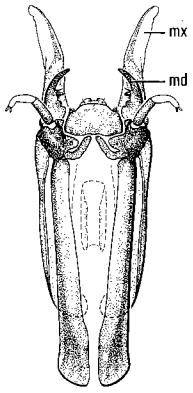
    Dorsolateral lobes of spiracular disc and ventral lobes with spots divided (Fig. 81), but if spots of dorsolateral lobes more completely darkened, four to six small dark spots present on central disc 33

32. Blackened areas of dorsolateral lobes of spiracular disc continuous around spiracles and extending to midline or nearly so. Larva found in moist earth or sand, usually near water ..... ***Gonomyia***, in part

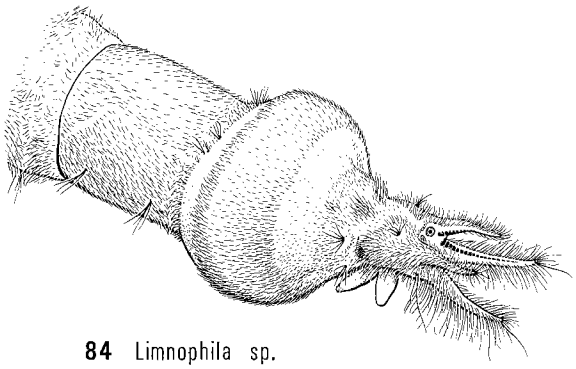
    Blackened areas of dorsolateral lobes of spiracular disc not continuous around spiracles (Fig. 79), but if dark area present between spiracles, this joined to pigmented areas of ventral lobes. Larva dark yellowish to amber, living beneath bark of dead somewhat decayed hardwood logs or in decaying inner parts of living hardwoods (larva of one *Idiognophomyia* species keys out here, found in decaying *Yucca* in southern California) ..... ***Gnophomyia***

33. Peripheral lobes of spiracular disc short, blunt; blackened areas of dorsolateral lobes continuous around spiracles, fading toward midline ..... ***Gonomyia***, in part

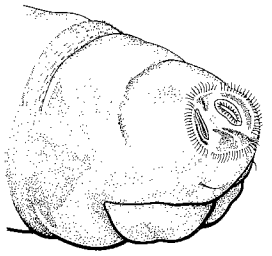
82 Limonia sp.



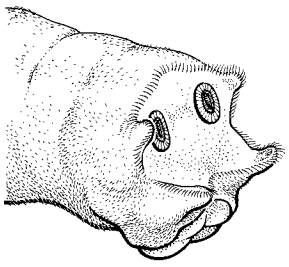
83 Limnophila sp.



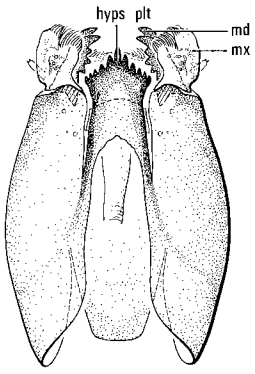
84 Limnophila sp.



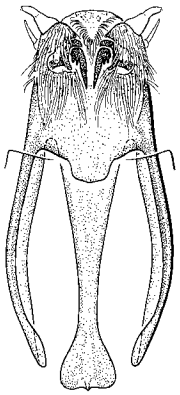
85 Limonia sp.



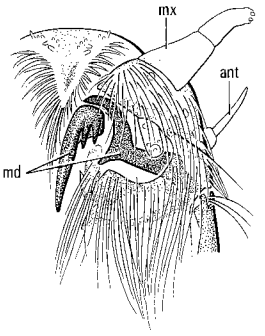
86 Epiphragma fascipennis



87 Limonia sp.



88 Pilaria recondita



89 Pilaria recondita

Figs. 7.82–89. Larvae (*concluded*): (82) *Limonia* sp., lateral view of larva; (83) *Limnophila* sp., dorsal view of head capsule; (84) *Limnophila* sp., oblique posterior view of terminal segment; (85) *Limonia* sp., oblique posterior view of terminal segment; (86) *Epiphragma fascipennis* (Say), oblique posterior view of terminal segment; (87) *Limonia* sp., ventral view of head capsule; (88) ventral view and (89) enlarged view of left mandibular region of head capsule of *Pilaria recondita* (Osten Sacken).

Abbreviations: ant, antenna; hyps plt, hypostomal plate; md, mandible; mx, maxilla.

Peripheral lobes of spiracular disc nearly as long as their width at base, or longer; blackened areas of dorsolateral lobes not continuous around spiracles 34

34. Blackened area of dorsomedial lobe of spiracular disc not divided. Larva found in organic mud ..... ***Ormosia***, in part

Blackened area of dorsomedial lobe (and all others) of spiracular disc divided medially by pale line 35

35. Area between spiracles generally unpigmented, not blackened. Larva found in organic mud ..... ***Ormosia***, in part

Area between spiracles with some darkly pigmented spots 36

36. Two round spots between spiracles; spiracular disc small compared with body size. Larva found in organic mud ..... ***Erioptera***, in part

Four to six small spots (as two or three pairs) between and below spiracles; spiracular disc not small compared with body size. Larva found in moist earth ..... ***Erioptera*** (***Symplecta***)

37. Ventral lobes of spiracular disc not darkly pigmented on upper surface, not fringed with long hairs; spiracles pale. Hypostoma reduced to small longitudinal rod below maxilla on each side. Larva found in sandy bottoms of clear cold streams ..... ***Cryptolabis***

Ventral lobes of spiracular disc darkly pigmented on upper surface (Fig. 78), fringed with long hairs that are longer than lobes; spiracles dark. Hypostoma in form of a toothed plate at each side 38

38. Hypostomal plates each bearing four anterior teeth. Larva found in organic mud in wet woodlands ..... ***Paradelphomyia***

Hypostomal plates each bearing seven or eight anterior teeth (Fig. 77). Larva found in thin organic mud in swampy woods, pond margins, and similar habitats ..... ***Pseudolimnophila***

39. Spiracular disc with five peripheral lobes 40

Spiracular disc usually with four peripheral lobes, but if vestigial dorsomedial lobe present, it is unpigmented 45

40. Posterior faces of all five lobes of spiracular disc bearing a solidly blackened spot; central disc generally unpigmented. Scape about as thick as long. Larva found in fungi ..... ***Ula***

Posterior faces of all lobes not solidly blackened, unpigmented to only partially darkened. Scape much longer than its diameter 41

41. Creeping welts on abdominal segments only slightly raised, pale, without microscopic hairs or with hairs indistinct except at high magnifications 42

Creeping welts on abdominal segments distinct, conspicuous 43

42. Hypostomal bridge with seven teeth. Ventral lobes of spiracular disc with single linear dark brown spot. Larva found in pieces of damp to saturated much decayed hardwood ..... ***Atarba***

Hypostomal bridge with three teeth. Ventral lobes of disc short, broadly rounded, with triangular dark spot enclosing pale setal base. Larva found in damp punky wood ..... ***Austrolimnophila***, in part

43. Abdominal segments 2–7 with both dorsal and ventral creeping welts on basal rings (Fig. 82). Lobes of spiracular disc wider than long, broadly rounded, unpigmented or with only limited darkened spots (Fig. 85). Larva found in numerous terrestrial and aquatic habitats ..... ***Limonia***, in part

Abdominal segments 2–7 with ventral creeping welts only. Ventral lobes of spiracular disc as long as their width at base, or longer 44

44. Ventral lobes of spiracular disc longer than their width at base, darkened at margins with a broad median pale zone on each. Hypostomal bridge with five teeth. Larva brownish with long appressed pubescence, found in marsh borders in decomposing aquatic vegetation or in marshy areas in woods ..... ***Helius***

Ventral lobes of spiracular disc only about as long as basal width, almost uniformly brownish posteriorly (Fig. 86). Hypostomal bridge with three teeth. Larva pale, with short appressed pubescence, found in decayed wood of deciduous trees ..... ***Epiphragma***, in part

45. Abdominal segments 2–7 without distinct creeping welts; all segments with transverse bands or patches of dense pilosity. Lateral lobes of spiracular disc broadly pigmented from spiracles outward; broadly pigmented faces of ventral lobes narrowly connected across lower disc. Larva found in thin mosses and algal mats on wet rocky cliffs, rarely in soil ..... ***Dactylolabis***

Abdominal segments 2–7 with distinct creeping welts, without transverse bands of dense pilosity 46

46. Abdominal segments 2–7 with ventral creeping welts only. Hypostomal bridge with three teeth 47

Abdominal segments 2–7 with both dorsal and ventral creeping welts on basal rings. Hypostomal bridge with more than three teeth 48

47. Body smooth-skinned, shiny, nearly transparent, long, slender; length about 18–20 times diameter. Hypostomal bridge with three subequal blunt-tipped teeth, sometimes with a smaller lateral tooth at each side. Larva terrestrial, found in humous forest soil ..... ***Dicranoptycha***

Body opaque whitish, more robust; length about 12 times diameter. Hypostomal bridge with three unequal teeth; outer ones broader and more narrowly tipped than median one. Larva found in decayed wood of deciduous trees ..... ***Epiphragma***, in part

48. Ventral lobes of spiracular disc longer than their width at base, tapering to subacute apex, fringed with long hairs 49

Ventral lobes of disc shorter than width at base, broadly rounded, without long marginal hairs 50

49. Body wide, flattened. Ventral creeping welts without minute spines. Spiracles dorsoventrally elongate. Larva semiaquatic, found in indistinct tunnels beneath algal mats on wet cliffs, beside waterfalls, and in other similar locations ..... ***Elliptera***

Body nearly cylindrical, only slightly flattened. Ventral creeping welts with numerous rows of minute spines. Spiracles transversely elliptical; lobes of spiracular disc narrowly darkened at margins. Larva found in sodden decayed wood, at or just below water level ..... ***Lipsothrix***

50. Nearly entire spiracular disc except spiracles and outer margins of lobes dark reddish brown; spiracles horizontally elongate. Larva found in wet extremely decayed pulpy wood ..... ***Orimarga*** (***Diotrepha***)

Spiracular disc with only isolated spots of dark pigmentation, generally pale; spiracles oval, inclined together dorsally. Larva found in various habitats ..... ***Limonia***, in part

51. Maxilla not prolonged forward, inconspicuous in dorsal aspect 52

Maxilla prolonged forward as a dorsoventrally flattened tapering (less often subconical) blade; maxillae appearing as divergently curved tusks (Fig. 83) with apices visible even when head is withdrawn into thoracic segments 53

52. Plane of spiracular disc roughly perpendicular to long axis of body; disc surrounded by five lobes ..... ERIOPTERINI 26

Plane of spiracular disc diagonal to long axis of body; disc concave, with four peripheral lobes; lateral lobes bluntly rounded at apex; ventral lobes longer, without dark pigmentation, each with a single long terminal seta. Larva slender, tapering toward head, yellowish, found in moist to wet decayed logs of deciduous trees ..... ***Elephantomyia***

53. Mandible complex, jointed near mid length (Figs. 88, 89); maxilla and labrum-epipharynx densely fringed with long yellowish to golden hairs. Dorsal plates of head fused into spatulate plate widest posteriorly. Spiracular disc small, with its upper lobes often infolded to conceal spiracles; marginal hairs protruding from cavity formed by infolding 54

Mandible not jointed near mid length; maxilla and labrum-epipharynx with mostly short pilosity. Dorsal plates of head not fused, although each may be widest posteriorly 55

54. Pigmentation of ventral lobes of spiracular disc discontinuous, either as transverse striations near base of lobe, more continuous coloration toward apex, or reduced to short darkened median line; all four lobes (lateral pair sometimes reduced) fringed with long golden hairs. Basal tooth or teeth of apical portion of mandible much less than half as long as main outer tooth. Larva found in moist to wet humous soil or decomposing vegetation in swampy woodlands ..... ***Pilaria***

Pigmentation of ventral lobes of disc more evenly distributed, but more intense toward apex of lobe; all four lobes fringed with long hairs. Basal tooth of apical portion of mandible about half as long as main outer tooth. Larva found in organic mud in swampy woodlands ..... ***Ulomorpha***

55. Spiracular disc surrounded by five short bluntly rounded lobes; ventral lobes not fringed with long hairs; dorsomedial and lateral lobes sometimes with a densely sclerotized horn-like projection near apex. Larva found in sandy bottoms and margins of clear streams ..... ***Rhabdomastix***, in part

Lobes of spiracular disc (usually four) not all short and bluntly rounded; ventral ones usually elongate; ventral lobes fringed with long hairs; upper lobes without sclerotized horn-like projections 56

56. Midventral region of head before line of attachment of thorax entirely membranous, without darkened transverse bar just beneath surface. Larva found in sand or gravel near margins of clear cool brooks and streams. *Note:* in this genus especially, but also in some others in similar habitats, larva sometimes with abdominal segment 7 much swollen (Fig. 84), possibly as an aid in locomotion or anchorage; swelling sometimes persisting in preserved specimens ..... ***Hexatoma***

Midventral region of head before line of attachment of thorax membranous, with darkened narrow transverse bar (part of hypopharynx) visible just beneath surface 57

57. Lateral lobes of spiracular disc unpigmented on posterior face. Mandible with long outer tooth and two smaller teeth of similar size and shape near mid length of inner margin; maxillary projections subconical. Larva found in wet organic debris ..... ***Polymera***

Lateral lobes of spiracular disc pigmented at least along one margin, usually much more extensively (Fig. 84). Mandible without two small similar teeth near mid length of inner margin (with more or fewer dissimilar teeth); maxillary projections flattened. Larva carnivorous, aquatic, found usually in organic mud in swampy woods and pond margins, less often in mud or sand at bottom of small streams ..... ***Limnophila***

58. Spiracular disc broadly emarginate dorsally. Larva found in a hardened flattened elliptical case, in marshy soil near small streams or springs of Pacific drainage (description based on a European species) ..... ***Thaumastoptera***

Spiracular disc not broadly emarginate dorsally. Larva not in a hardened case 59

59. Internal portion of head divided by deep posterior incisions into elongate slender or spatulate sclerites (determined by cutting prothoracic skin at one side, or often visible through skin) 60

Internal portion of head extensively sclerotized dorsally and laterally; sclerites plate-like, with shallow posterior incisions (Fig. 87) 61

60. Spiracular disc lightly pigmented, vertically subrectangular, with two claw-like projections at ventral margin; posterior spiracles minute, pale, separated by about three times diameter of a spiracle. Larva yellowish, aquatic, found in bottoms and margins of clear streams ..... ***Rhabdomastix***, in part

A single broadly rounded ventral protuberance below posterior spiracles; spiracular disc without pigmented spots; spiracles darkly pigmented, separated by less than twice diameter of a spiracle. Larva pale yellowish white, found beneath bark of moist to wet decayed hardwood trees ..... ***Teucholabis***

61. Hypostomal bridge well-developed, toothed anteriorly (Fig. 87). Ventral creeping welts distinct 62

Hypostomal bridge not complete; hypostomal plates sometimes present and toothed anteriorly, but clearly separated medially by membranous region. Ventral creeping welts distinct or not 63

62. Abdominal segments 2–7 with both dorsal and ventral creeping welts (of differing structure in some species) on basal rings. Posterior spiracular disc roughly circular or broadly oval to transversely subrectangular; spiracles often large, oval, inclined together dorsally (Figs. 82, 85). Larva found in various terrestrial and aquatic habitats ..... ***Limonia***, in part

Abdominal segments 2–7 with ventral creeping welts only; welts pale, without microscopic setae. Spiracles subcircular. Larva found in damp punky wood ..... ***Austrolimnophila***, in part

63. A broad thick transverse lobe present beneath posterior spiracular disc; lobe bearing dense short pale hairs. Larva found in humous forest soil (larva of *Neocladura*, at present unknown, may key out here) ..... ***Cladura***

No such pilose transverse lobe beneath posterior spiracular disc. Larva found in organic debris, often associated with mouse burrows ..... ***Chionea***

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