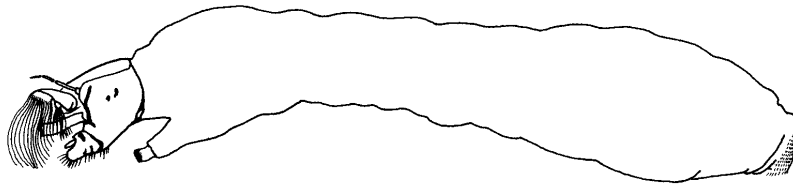


## CHAPTER 13

### DIPTERA (Aquatic & Semiaquatic True Flies)



**Draft**  
**June 17, 2009**

## 13

## ORDER DIPTERA

### Aquatic & Semiaquatic True Flies

There are more species of aquatic Diptera than there are of any other order despite the fact that most of the order is terrestrial. Diptera considered aquatic have aquatic larvae and pupae with terrestrial adults. Many other aquatic insects are also commonly referred to as “flies” (*e.g.*, mayflies, dragonflies, stoneflies, caddisflies, alderflies, fishflies), but these taxa are not true flies as they do not belong to the order Diptera. When referring to true flies or Diptera with their common names, the word “fly” is separate (*e.g.*, crane fly, black fly, moth fly, dance fly, flower fly). In contrast, common names for non-dipteran taxa are one word. The true flies are extremely important in aquatic food webs and often are the most diverse and abundant macroinvertebrate taxon collected in many freshwater habitats. Diptera inhabit a wide range of habitats and some taxa are extremely tolerant and occur in heavily polluted water bodies. Some true flies can be a nuisance due to their blood feeding behaviors. Only a key to the larvae is provided in this guide.

#### Diptera Morphology (Larvae)

Most Diptera larvae are maggot-like or worm-like (Figure 13.1). Some possess an obvious head capsule, but this structure is either reduced or obscured in many other Dipteran taxa. In all dipteran larvae, segmented legs and wing pads are absent from the thorax.

Because of the large diversity of aquatic Diptera and the lack of easily observable and consistent characters in their larvae, the identification of larvae can be difficult. Common diagnostic characters for aquatic Dipteran larvae include the number and location of prolegs, shape of the terminal processes, and head condition (*e.g.*, well-defined or reduced head capsule).

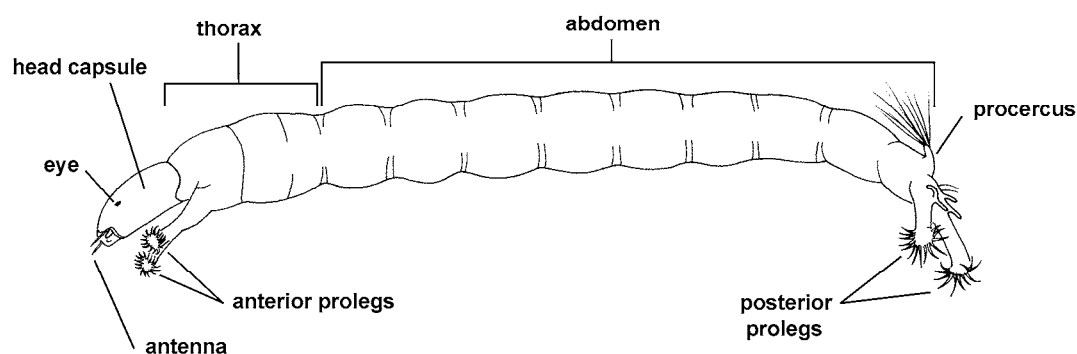


Figure 13.1: Lateral view of dipteran larva.

## Key to Diptera Families (Larvae)

1. Body appears to have 7 segments with deep constrictions between segments (Figure 13.2); segments 1-6 with ventral suckers (Figure 13.2) ..... **Blephariceridae p. 180**

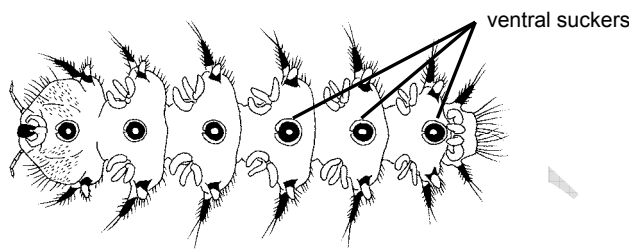


Figure 13.2: *Philorus californicus* (Blephariceridae) larva, Ventral View.

- 1'. Ventral suckers absent from abdominal segments 1-6 ..... 2

- 2(1'). Seven pairs of elongate prolegs present on abdominal segments which project ventrolaterally (Figure 13.3) ..... **Deuterophlebiidae p. 184**

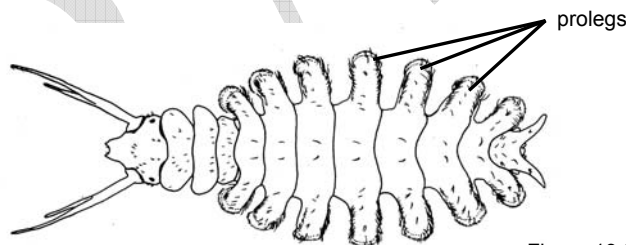


Figure 13.3: *Deuterophlebia nielsoni* (Deuterophlebiidae) larva, Dorsal View.

- 2'. Seven pairs of elongate prolegs usually not present on abdominal segments; if seven pairs of prolegs present then they are projecting ventrally (Figure 13.5, Figure 13.4) ..... 3



Figure 13.5: Athericidae larva, Lateral View.

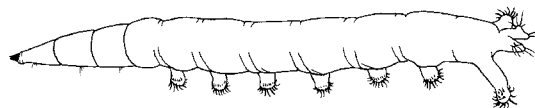


Figure 13.4: *Hemerodromia* sp. (Empididae) larva, Lateral View.

- 3(2'). Body flattened dorsoventrally; integument (skin) leathery; most of head capsule visible (Figure 13.6); long setae usually present along posterior margin (Figure 13.6).....  
 ..... **Stratiomyidae p. 189**

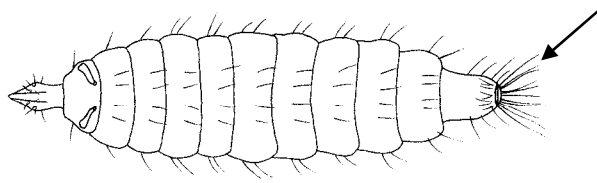


Figure 13.6: *Euparyphus* sp.  
 (Stratiomyidae) larva, Dorsal View.

- 3'. Body cylindrical; integument not leathery; head capsule variable; long setae may or may not be present along posterior margin ..... 4

- 4(3'). Head capsule fully visible and completely separated from thorax (Figure 13.7, Figure 13.8) ..... 5

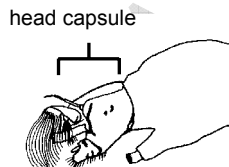


Figure 13.7: Anterior end of *Simulium venustum* (Simuliidae) larva, Lateral View.

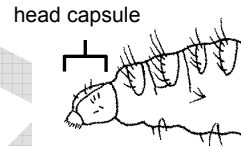


Figure 13.8: Anterior end of *Pericoma* sp. (Psychodidae) larva, Lateral View.

- 4'. Head capsule absent or retracted into thorax (Figure 13.10, Figure 13.9)..... 15

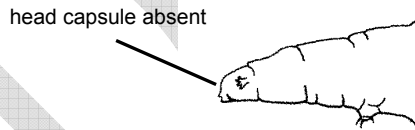


Figure 13.10: Anterior end of *Ephydra* sp. (Ephydriidae) larva, Lateral View.

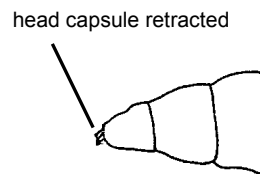


Figure 13.9: Anterior end of *Tipula abdominalis* (Tipulidae) larva, Lateral View.

- 5(4). Prolegs present (either on prothorax, at terminal end of body and prothorax, or on abdomen) (Figure 13.11, Figure 13.12, Figure 13.13, Figure 13.14) ..... 6



Figure 13.11: *Simulium venustum* (Simuliidae) larva, Lateral View.

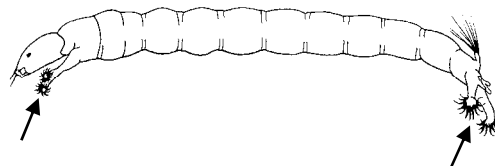


Figure 13.12: *Ablabesmyia* sp. (Chironomidae) larva, Lateral View.

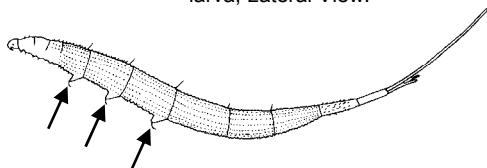


Figure 13.13: *Bittacomorpha clavipes* (Ptychopteridae) larva, Lateral View.

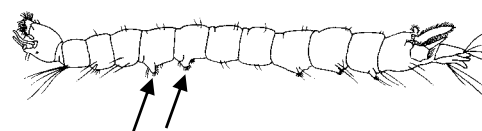


Figure 13.14: *Dixella* sp. (Dixidae) larva, Lateral View.

- 5'. Prolegs absent (Figure 13.16, Figure 13.15) ..... 11

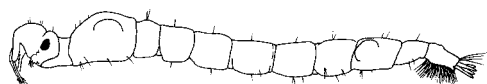


Figure 13.16: *Chaoborus* sp. (Chaoboridae) larva, Lateral View.



Figure 13.15: *Pericoma* sp. (Psychodidae) larva, Lateral View.

- 6(5). Prolegs present on prothorax (Figure 13.17), at terminal end of body, or both (Figure 13.18) ..... 7



Figure 13.17: *Simulium venustum* (Simuliidae) larva, Lateral View.

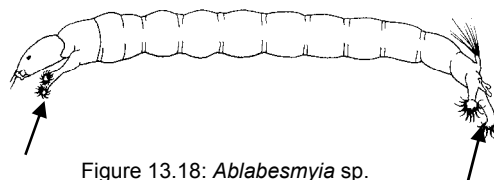


Figure 13.18: *Ablabesmyia* sp. (Chironomidae) larva, Lateral View.

- 6'. Prolegs absent from prothorax and terminal end of body; prolegs only present on abdomen (Figure 13.20, Figure 13.19) ..... 10

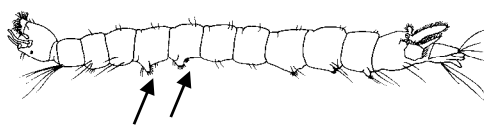


Figure 13.20: *Dixella* sp. (Dixidae) larva, Lateral View.

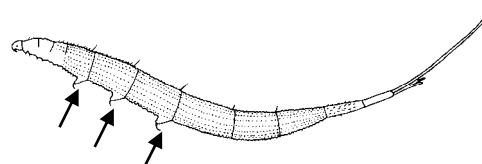


Figure 13.19: *Bittacomorpha clavipes* (Ptychopteridae) larva, Lateral View.

- 7(6). Prolegs only at terminal end of body (absent from prothorax) (Figure 13.21) .....  
 ..... **Ceratopogonidae (in part) p. 181**

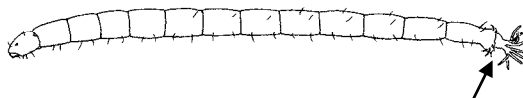


Figure 13.21: *Dasyhelea* sp.  
 (Ceratopogonidae) larva, Lateral View.

- 7'. Prolegs either present only on prothorax (Figure 13.22) or on both prothorax and terminal end of body (Figure 13.23) ..... 8



Figure 13.22: *Simulium venustum*  
 (Simuliidae) larva, Lateral View.

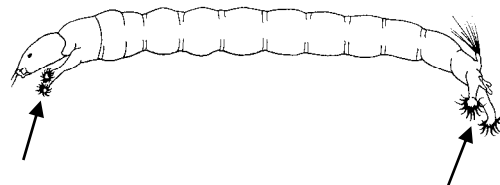


Figure 13.23: *Ablabesmyia* sp.  
 (Chironomidae) larva, Lateral View.

- 8(7'). Prolegs only on prothorax (Figure 13.24); posterior third of abdomen swollen (Figure 13.24); abdomen terminates in a single ring of hooks ..... **Simuliidae p. 189**

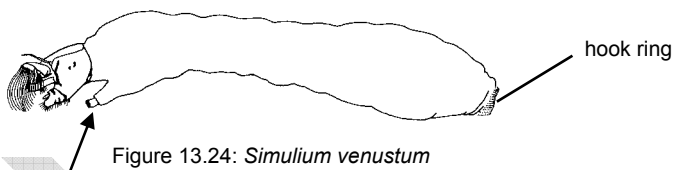


Figure 13.24: *Simulium venustum*  
 (Simuliidae) larva, Lateral View.

- 8'. Prolegs present on both prothorax and terminal end of body (Figure 13.25, Figure 13.26); posterior third of abdomen not swollen (Figs. 13.22, 13.23); abdomen not terminating in a single ring of hooks although rings of hooks may be present at the end of prolegs ..... 9

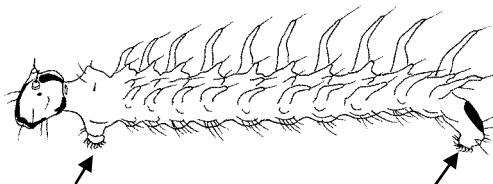


Figure 13.25: *Atrichopogon* sp.  
 (Ceratopogonidae) larva, Lateral View.

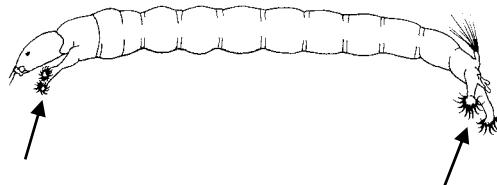


Figure 13.26: *Ablabesmyia* sp.  
 (Chironomidae) larva, Lateral View.

- 9(8'). Segments with fleshy protuberances or long setae (Figure 13.27) .....  
 ..... **Ceratopogonidae (in part) p. 181**

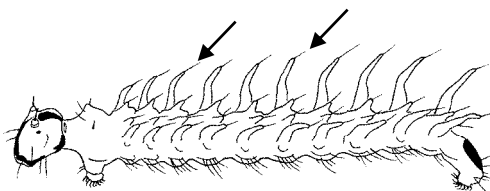


Figure 13.27: *Atrichopogon* sp.  
 (Ceratopogonidae) larva, Lateral View.

- 9'. Segments lacking fleshy protuberances and long setae although short setae may be present (Figure 13.29, Figure 13.28) ..... **Chironomidae p. 182**

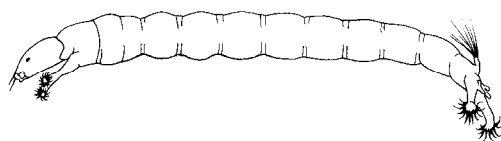


Figure 13.29: *Ablabesmyia* sp.  
 (Chironomidae) larva, Lateral View.

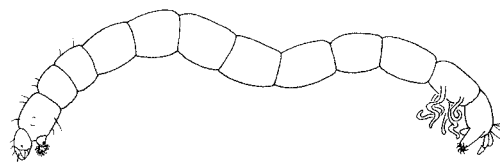


Figure 13.28: *Chironomus tentans*  
 (Chironomidae) larva, Lateral View.

- 10(6'). Prolegs on abdominal segments 1-2 (Figure 13.30); abdomen terminating in two lobes fringed with setae (Figure 13.31) ..... **Dixidae p. 184**

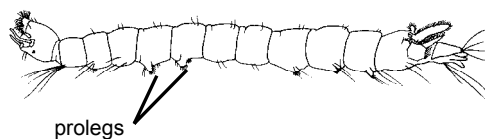


Figure 13.30: *Dixella* sp.  
 (Dixidae) larva, Lateral View.

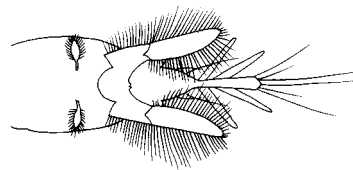


Figure 13.31: Apex of  
 abdomen of *Dixia* sp.  
 (Dixidae) larva, Lateral View.

- 10'. Prolegs on abdominal segments 1-3 (Figure 13.32); abdomen terminating in a long respiratory tube (Figure 13.32) ..... **Ptychopteridae (in part) p. 188**

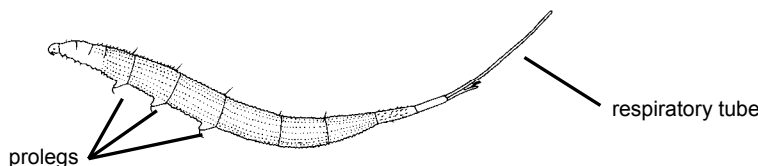


Figure 13.32: *Bittacomorpha clavipes*  
 (Ptychopteridae) larva, Lateral View.

- 11(5'). Thoracic segments fused and swollen (thicker than abdomen) (Figure 13.34, Figure 13.33) .....12

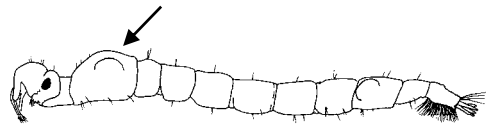


Figure 13.34: *Chaoborus* sp.  
(Chaoboridae) larva, Lateral View.

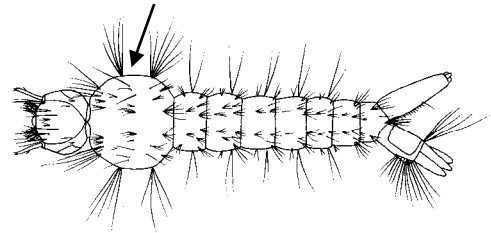


Figure 13.33: Culicidae larva,  
Dorsal View.

- 11'. Thoracic segments not fused and not swollen .....13

- 12(11). Antennae terminating in long setae (Figure 13.35) ..... **Chaoboridae p. 181**

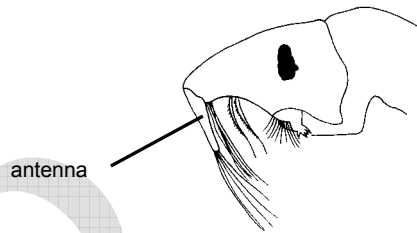


Figure 13.35: Head of *Chaoborus punctipennis* (Chaoboridae) larva,  
Lateral View.

- 12'. Antennae not terminating in long setae (only short setae present) (Figure 13. 36) ..... **Culicidae p. 183**

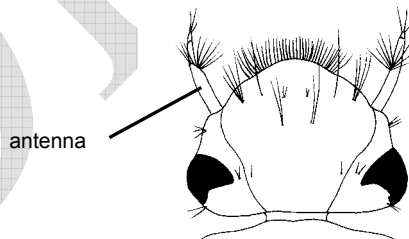


Figure 13. 36: Head of *Aedes stimulans* (Culicidae) larva,  
Dorsal View.



- 13(11'). Abdomen terminating in a long respiratory tube (Figure 13.37).....  
 .....**Ptychopteridae (in part) p. 188**



Figure 13.37: *Ptychoptera* sp.  
 (Ptychopteridae) larva, Lateral View.

- 13'. Abdomen not terminating in a long respiratory tube (Figure 13.39, Figure 13.38).....14

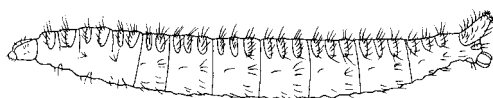


Figure 13.39: *Pericoma* sp.  
 (Psychodidae) larva, Lateral View.

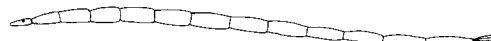


Figure 13.38: *Bezzia* sp.  
 (Ceratopogonidae) larva, Lateral View.

- 14(13'). Body segments with 2-3 secondary divisions (annuli) (Figure 13.40); body grey or brown...  
 .....**Psychodidae p. 187**



Figure 13.40: Psychodidae  
 larva, Lateral View.

- 14'. Body segments not secondarily divided (Figure 13.41); body white or off-white .....  
 .....**Ceratopogonidae (in part) p. 181**



Figure 13.41: *Bezzia* sp.  
 (Ceratopogonidae) larva, Lateral View.

- 15(4'). Much of rounded head capsule present (sometimes reduced to only a few rods) (Fig. 13.39); mandibles moving against each other on a horizontal plane (Figure 13.42) – *note: to see head the sides of the thorax must often be cut to reveal retracted head* (**Tipuloidea**).....16



Figure 13.42: Head capsule of *Dicanota* sp. (Tipulidae) larva, Ventral View.

- 15'. Head capsule lacking or much reduced (Figure 13.43); mandibles moving parallel to each other on a vertical plane (Figure 13.43) .....18

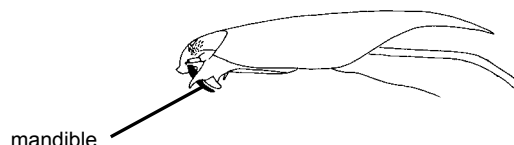


Figure 13.43: Head capsule of *Tabanus reinwardtii* (Tabanidae) larva, Lateral View.

- 16(15). Spiracular disc at posterior end of abdomen with 6 lobes that are variously developed, sometimes reduced (Figure 13.45, Figure 13.46, Figure 13.44) ..... **Tipulidae p. 191**

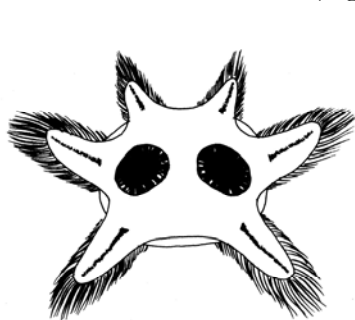


Figure 13.45: Spiracular disk of *Holorusia hespera* (Tipulidae) larva.

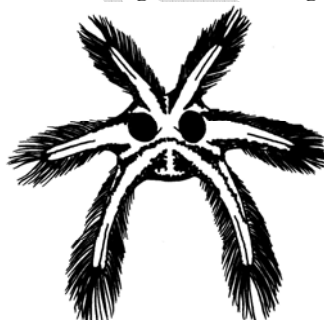


Figure 13.46: Spiracular disk of *Prionocera* sp. (Tipulidae) larva.



Figure 13.44: Spiracular disk of *Tipula abdominalis* (Tipulidae) larva.

- 16'. Spiracular disc at posterior end of abdomen with 5 or fewer lobes (Figure 13.48, Figure 13.47).....17



Figure 13.48: Spiracular disk of *Palaria* sp. (Limoniidae) larva.



Figure 13.47: Spiracular disk of *Molophilus hirtipennis* (Limoniidae) larva.

- 17(16'). Body with long projections at least half as long as the body width and arranged in longitudinal rows along the body (Figure 13.49) ..... **Cylindrotomidae p. 183**

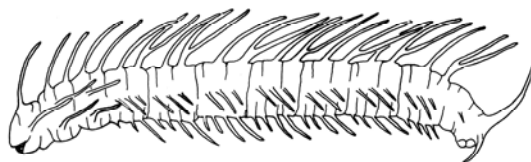


Figure 13.49: *Phalacrocera replicata* (Cylindrotomidae) larva, Ventral View.

- 17'. Body without long projections although tubercles may be present but never half as long the body width (Figure 13.51, Figure 13.50) ..... **Limoniidae and Pediciidae p. 186**



Figure 13.51: *Pedicia albivitta* (Pediciidae) larva, Ventral View.



Figure 13.50: *Limonia* sp. (Limoniidae) larva, Ventral View.

- 18(15'). Abdomen terminating in a long respiratory tube that is at least half as long as body (Figure 13.52, Figure 13.53) ..... 19

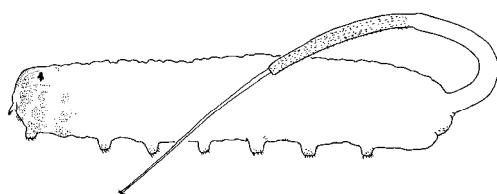


Figure 13.52: *Eristalis tenax* (Syrphidae) larva, Lateral View.

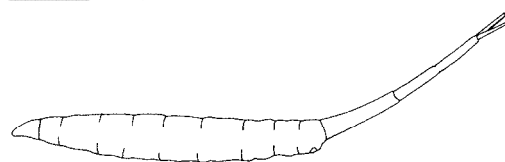


Figure 13.53: *Paracoenia bisetosa* (Ephydriidae) larva, Lateral View.

- 18'. Abdomen not terminating in a long respiratory tube that is at least half as long as body, although shorter tubes and projections may be present ..... 20

- 19(18). Anterior end blunt; tail not forked posteriorly (Figure 13.54)..... **Syrphidae p. 190**

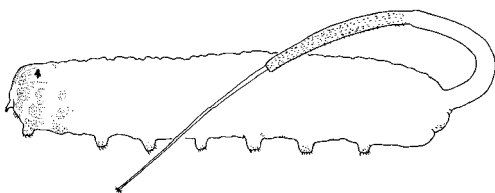


Figure 13.54: *Eristalis tenax*  
(Syrphidae) larva, Lateral View.

- 19'. Anterior end tapering; tail sometimes forked posteriorly (Figure 13.55).....  
..... **Ephydriidae (in part) p. 186**

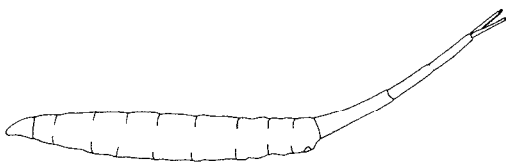


Figure 13.55: *Paracoenia bisetosa* (Ephydriidae) larva,  
Lateral View.

- 20(18'). Body wrinkled; many segments with rings of tubercles (Figure 13.57); posterior segment with spiracles surrounded by lobes (Figure 13.56) ..... **Sciomyzidae p. 188**

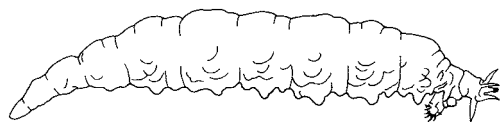


Figure 13.57: *Hedria* sp.  
(Sciomyzidae) larva, Lateral View.

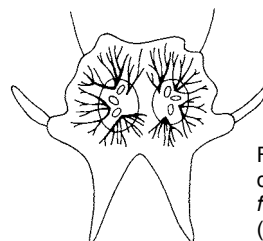


Figure 13.56: Spiracular  
disc of *Sepedon f. fuscipennis*  
(Sciomyzidae) larva,  
Dorsal View.

- 20'. Not as above ..... 18

- 21(20'). Distinct prolegs present and terminating in rows or clusters of hooks or spines (Figure 13.59, Figure 13.58).....22

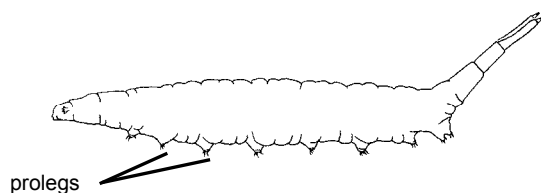


Figure 13.59: *Ephydra* sp.  
(Ephyridae) larva, Lateral View.

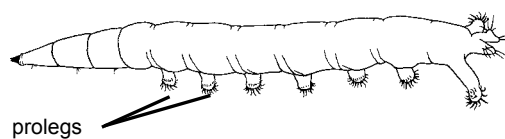


Figure 13.58: *Hemerodromia* sp.  
(Empididae) larva, Lateral View.

- 21'. Distinct prolegs absent (welts covered in setae sometimes present) (Figure 13.61, Figure 13.60).....25

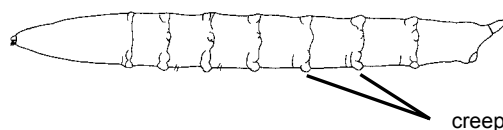


Figure 13.61: *Tabanus reinwardtii*  
(Tabanidae) larva, Lateral View.

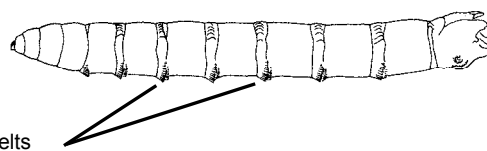


Figure 13.60: *Rhaphium campestre*  
(Dolichopodidae) larva, Lateral View.

- 22(21). Abdomen terminating in 2 lobes fringed with setae (Figure 13.62); terminal processes longer than prolegs (Figure 13.62); **Not known from Mongolia....Athericidae p. 180**



Figure 13.62: Athericidae larva,  
Lateral View.

- 22'. Terminal processes not as above although scattered setae may be present on terminal processes; terminal processes usually longer than prolegs .....23

- 23(22'). Head discernible with visible antennae and palpi; body usually terminating in 1-4 lobes bearing setae and with abdominal prolegs present (Figure 13.63) - *note: in some cases posterior end bulbous with inconspicuous terminal processes and only welts present* ..... **Empididae and Hybotidae p. 185**

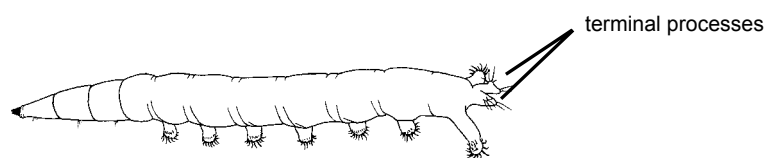


Figure 13.63: *Hemerodromia* sp.  
(Empididae) larva, Lateral View.

- 23'. Head not discernible; terminal processes absent or variously shaped.....24

- 24(23'). Abdomen terminating in a pair of short respiratory tubes (shorter than posterior prolegs) (Figure 13.64) ..... **Muscidae p. 187**

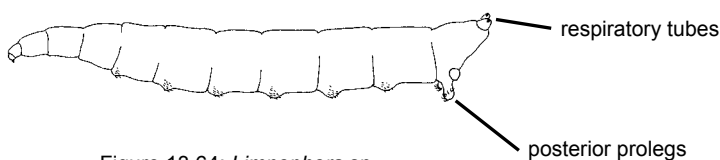


Figure 13.64: *Limnophora* sp.  
(Muscidae) larva, Lateral View.

- 24'. Abdomen terminating in a variety of lobes or processes; posterior prolegs absent or prolegs shorter than respiratory tubes (Figure 13.65) ..... **Ephydriidae (in part) p. 186**

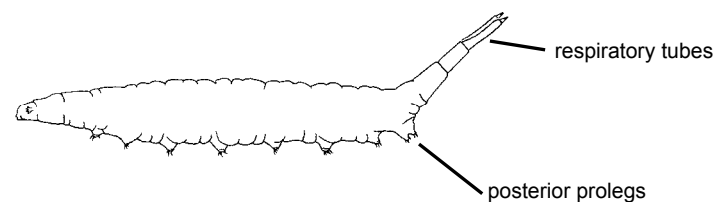


Figure 13.65: *Ephydra* sp.  
(Ephydriidae) larva, Lateral View.

- 25(21'). Both ends tapering (Figure 13.66); terminal processes absent; segments ringed by welts (fleshy lumps covered in setae) (Figure 13.66).....**Tabanidae p. 190**



Figure 13.66: *Tabanus reinwardtii*  
(Tabanidae) larva, Lateral View.

- 25'. Terminal processes present; welts present or absent, if present only ventrally .....26

- 26(25'). Abdomen terminating in 4 lobes (Figure 13.67); posterior segments bare.....**Dolichopodidae p. 185**



Figure 13.67: *Rhabdium campestre*  
(Dolichopodidae) larva, Lateral View.

- 26'. Abdomen not terminating 4 lobes (Figure 13.68); posterior segments covered in fine setae, spines, or tubercles bearing setae ..... **Ephydriidae (in part) p. 186**

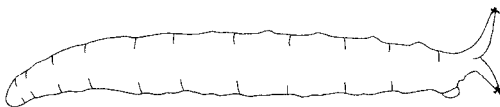


Figure 13.68: *Scatella hawaiiensis*  
(Ephydriidae) larva, Lateral View.

## Diptera (Pupae)

Some examples of aquatic Diptera pupae:

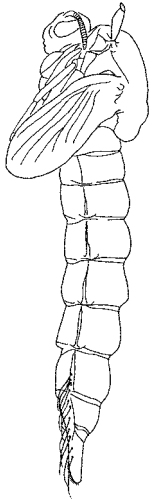


Figure 13.69: *Procladius* sp. (Chironomidae) pupa, Lateral View.

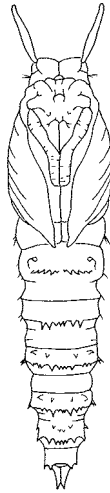


Figure 13.70: *Psychoda alternata* (Psychodidae) pupa, Ventral View.



Figure 13.71: *Tipula* sp. (Tipulidae) pupa, Ventral View.

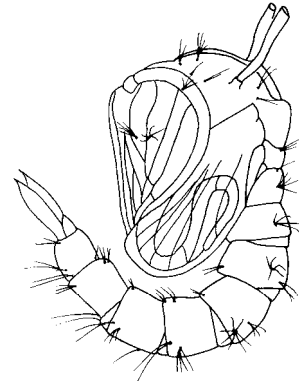


Figure 13.72: Culicidae pupa, Lateral View.

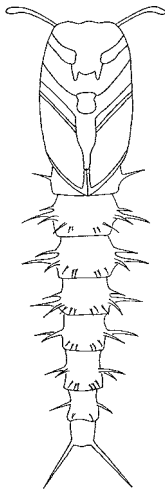


Figure 13.76: *Probezzia* sp. (Ceratopogonidae) pupa, Ventral View.

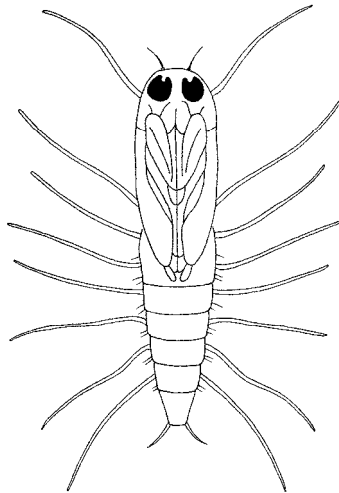


Figure 13.74: Empididae pupa, Ventral View.

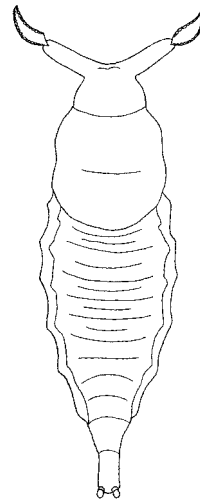


Figure 13.75: *Brachydeutera* prob. *argentata* (Ephydriidae) pupa, Ventral View.

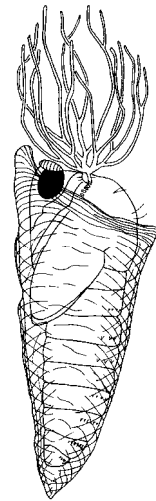


Figure 13.73: *Simulium vittatum* (Simuliidae) pupa within cocoon. Lateral View.



## Diptera Family Descriptions (Larvae)

### Athericidae

**Common Name:** Aquatic Snipe Flies  
**Feeding Group:** Predators  
**Tolerance Value:** 2 (Low)  
**Habitat:** Athericid larvae are most commonly found under rocks in the riffles of streams.

**Size:** Medium (10-18 mm)

**Characteristics:** **Not known from Mongolia.** Body elongate; head reduced and withdrawn into the thorax although some parts may be visible; mandibles moving parallel to each other on a vertical plane; a pair of prolegs present on abdominal segments 1-7 and a single proleg on abdominal segment 8; abdomen terminates in two pointed tails fringed with hairs.

**Notes:** Athericid larvae are piercer predators that prey on aquatic insects such as chironomids and Ephemeroptera. Egg-laying in this family is curious. The female finds a twig over-hanging a stream and lays an egg mass. She then stays with the eggs until she dies. Other females are attracted to the same spot and a clump of dead flies and egg masses eventually accumulates. When the larvae hatch they must crawl through the mass of fly carcasses in order to drop into the stream below.



Figure 13.77: Athericidae larva, Lateral View.

### Blephariceridae

**Common Name:** Net-Winged Midges  
**Feeding Group:** Scrapers  
**Tolerance Value:** 0 (Low)  
**Habitat:** Blepharicerid larvae are restricted to cool, fast-flowing streams and waterfalls. They are found attached to rocks in areas of fast flow.

**Size:** Small to medium (5-12 mm)

**Characteristics:** Head fused with thorax and first abdominal segment; mandibles moving against each other on a horizontal plane; 6 abdominal segments with deep constrictions between segments; ventral suckers on first 6 segments; gill tufts present ventrally.

**Notes:** The 6 ventral suckers and the flattened body shape allow these larvae to remain attached to the substrate in swiftly flowing waters. They “inchworm” slowly across rocks grazing on diatoms, microbes, and other detritus attached to the rocks.

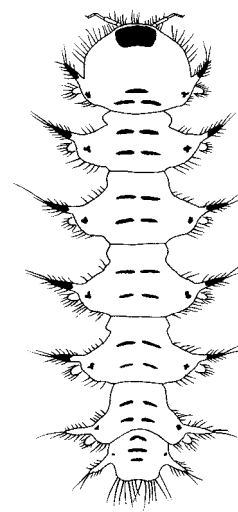
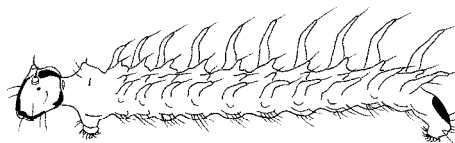
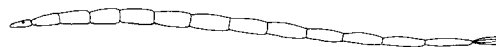
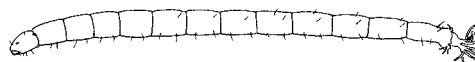
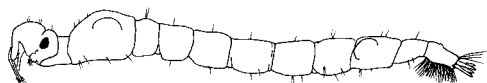


Figure 13.78: *Philorus californicus* (Blephariceridae) larva, Ventral View.

**Ceratopogonidae****Common Name:** Biting Midges, No-See-Ums, Punkies**Feeding Group:** Predators**Tolerance Value:** 6 (Moderate)**Habitat:** Ceratopogonid larvae are generally found in standing or slow moving waters in lakes, ponds, marshes, and streams. They usually occur in soft sediments or in algal growths.**Size:** Small (2-15 mm)**Characteristics:** Superficial characteristics vary considerably within this group. Distinct sclerotized head capsule present; mandibles moving against each other on a horizontal plane; prolegs present or absent.**Notes:** Some ceratopogonid larvae inhabit semiaquatic areas such as moist sand or mud. Common species are snake-like and are similar to chironomids except that most ceratopogonids lack prolegs. The adults of these flies are often considered pests because the females of some species feed on the blood of mammals, birds, reptiles, and amphibians. Some species feed on the blood of other insects, while others are predators that capture insects and suck fluids from their prey. They are particularly troublesome to humans because of their small size which allows them to pass through window screens and because their bites are much more painful than their size would suggest.Figure 13.79: *Atrichopogon* sp.  
(Ceratopogonidae) larva, Lateral View.Figure 13.80: *Bezzia* sp.  
(Ceratopogonidae) larva, Lateral View.Figure 13.81: *Dasyhelea* sp.  
(Ceratopogonidae) larva, Lateral View.**Chaoboridae****Common Name:** Phantom Midges**Feeding Group:** Predators**Tolerance Value:** 8 (High)**Habitat:** Chaoborid larvae most commonly occur in standing water in lakes, ponds, and marshes. They are rarely found in the calm water of streams.**Size:** Small to medium (6-12 mm)**Characteristics:** Head sclerotized, rounded, and clearly separate from the thorax; mandibles moving against each other on a horizontal plane; thoracic segments fused and swollen, wider than abdomen; prolegs absent; antennae terminating in long setae; terminal segment with ventral brush of setae.**Notes:** Chaoborid larvae resemble mosquito larvae. The most common forms of chaoborids are found in the water columns of lakes and ponds and are known for their vertical migrations. They migrate in order to follow their prey and to obtain air. These larvae have two air sacs that provide buoyancy and an air source as they move through the water column.Figure 13.82: *Chaoborus* sp.  
(Chaoboridae) larva, Lateral View.

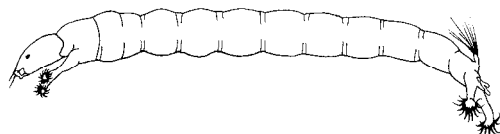
**Chironomidae****Common Name:** Non-Biting Midges**Feeding Group:** Collector/Gatherers (also Scrapers, Filter/Collectors, Predators)**Tolerance Value:** 6 (Moderate) - pale forms; 8 (High) - blood red**Habitat:** Chironomids are found in every aquatic habitat from small seeps to large rivers and from temporary pools to deep lakes. They occur in soft sediment, on rocks, in and around vegetation, in snags, and just about any other habitat.**Size:** Small to large (2-30 mm)**Characteristics:** Head sclerotized, rounded, and clearly separate from the thorax; body elongate and worm-like; mandibles moving against each other on a horizontal plane; two pairs of ventral prolegs (one on prothorax and one at the terminal end); prolegs terminate in a series of hooks.**Notes:** Chironomids are the most abundant and diverse group of aquatic insects. They are found in almost any water body and it is common for chironomids to comprise more than 50% of the species richness. Some kinds of chironomids are blood red (this color is lost when the specimen is preserved). The red coloration comes from hemoglobin that allows the larvae to store oxygen and survive in situations with low dissolved oxygen. Chironomids are an important food source for insects, fishes, and birds.

Figure 13.84:  
*Ablabesmyia* sp.  
(Chironomidae) larva,  
Lateral View.

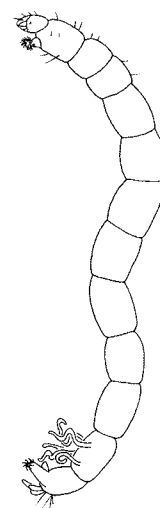


Figure 13.83:  
*Chironomus tentans*  
(Chironomidae) larva,  
Lateral View.

**Culicidae**

**Common Name:** Mosquitoes  
**Feeding Group:** Collector/Filterers, Collector/Gatherers  
**Tolerance Value:** 8 (High)

**Habitat:** Mosquito larvae occur in standing or still water of lakes, ponds, marshes, temporary pools, and streams. The larvae are planktonic.

**Size:** Small to medium (4-18 mm)

**Characteristics:** Head sclerotized, rounded, and clearly separate from the thorax; labrum with brushes of setae; mandibles moving against each other on a horizontal plane; thoracic segments fused and swollen, wider than abdomen; prolegs absent; eighth segment usually bearing a respiratory siphon.

**Notes:** Most mosquito larvae breathe atmospheric oxygen by using their respiratory siphon. Female mosquitoes require a blood meal for egg development, which makes them a nuisance. The short life cycle (7-10 days for many species) and the ability of some species to utilize temporary pools, puddles, and other sources of standing water make mosquitoes particularly problematic.

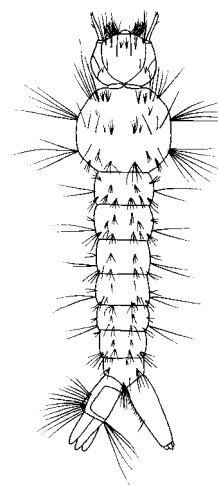


Figure 13.85:  
Culicidae larva,  
Dorsal View.

**Cylindrotomidae**

**Common Name:** Crane Flies  
**Feeding Group:** Shredders-herbivores  
**Tolerance Value:** Unknown

**Habitat:** Cylindrotomid larvae are found in lentic or slowly flowing lotic habitats and are typically associated with aquatic plants such as mosses.

**Size:** Medium to large (15-25 mm)

**Characteristics:** Much of rounded head capsule present; head capsule completely or partially retracted into thorax; mandibles moving against each other on a horizontal plane; terminal segment with two spiracles; spiracular disc usually surrounded by six anal lobes or projections; body with long projections at least half as long as the body width and arranged in longitudinal rows along the body.

**Notes:** The plants these crane flies are associated with, usually mosses, serve as both attachment sites and food sources. Presumably the long extensions on the abdomen serve as gills to obtain oxygen from the water for some species. In other species, the spiracles are used to obtain oxygen from the atmosphere. Some species in this family are terrestrial and are associated with wetland plants or terrestrial mosses.

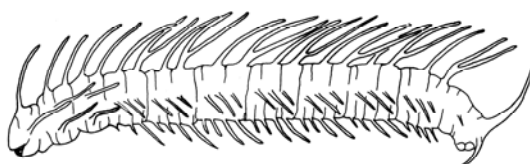
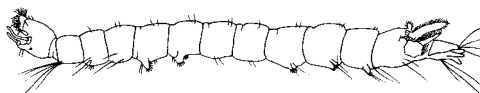
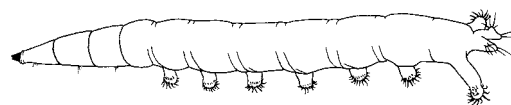
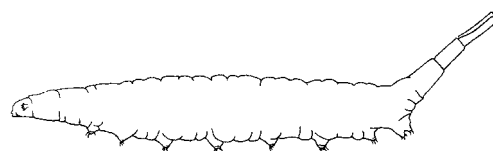
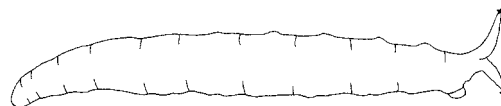


Figure 13.86: *Phalacrocer replicata* (Cylindrotomidae) larva, Ventral View

**Deuterophlebiidae****Common Name:** Mountain Midges**Feeding Group:** Scrapers**Tolerance Value:** 0 (Low)**Habitat:** Mountain midges are only found in swift flowing streams attached to large rocks, boulders, or bedrock.**Size:** Small (3-6 mm)**Characteristics:** Body dorsoventrally flattened; head sclerotized, rounded, and clearly separate from the thorax; head with elongated branched antennae; mandibles moving against each other on a horizontal plane; seven pairs of elongate prolegs present on abdominal segments which project ventrolaterally.**Notes:** Deuterophlebiidae larvae do not commonly occur in invertebrate samples because of the restricted habitat in which they occur. They are usually found in the swiftest portions of streams, often in cascades attached to large boulders. However, they are usually found less than 30 cm deep in the water. The prolegs on the abdominal segments allow them to cling to smooth rock surfaces where they presumably graze on periphyton.Figure 13.87: *Deuterophlebia nielsoni* (Deuterophlebiidae) larva, Dorsal View.**Dixidae****Common Name:** Dixid Midges, Meniscus Midges**Feeding Group:** Collector/Gatherers**Tolerance Value:** 1 (Low)**Habitat:** Dixid larvae occur in the calm waters of marshes, ponds, and streams. They are usually found in vegetated margins.**Size:** Small to large (3-25 mm)**Characteristics:** Head sclerotized, rounded, and clearly separate from the thorax; mandibles moving against each other on a horizontal plane; prolegs terminating in hooks on abdominal segments 1-2; abdomen terminating in two lobes fringed with setae.**Notes:** Dixid midges can be observed at the surface of the water in a U shape with their head and terminal end of their abdomens in the water (or terminal end on the surface) and the middle of the body protruding from the water. Dixids are generally restricted to clean waters and in some cases they can become very abundant.Figure 13.88: *Dixella* sp. (Dixidae) larva, Lateral View.

**Dolichopodidae****Common Name:** Long-Legged Flies**Feeding Group:** Predators**Tolerance Value:** 4 (Moderate)**Habitat:** Dolichopodid larvae occur in standing or slow moving water in streams, ponds, and marshes. They are usually found at the margins in mud or decaying vegetable matter or in submerged soft sediments.**Size:** Small to Medium (6-22 mm)**Characteristics:** Body cylindrical with anterior end tapering and posterior end blunt; head reduced and withdrawn into the thorax; mandibles moving parallel to each other on a vertical plane; abdominal segments 1-7 with ventral creeping welts; abdomen terminating in 4 lobes (dorsal lobes bearing spiracles).**Notes:** Adult dolichopodids have interesting courtship rituals involving complicated dance patterns. The adults, often observed on vegetation near water bodies, are metallic green or blue.Figure 13.89: *Raphium campestre* (Dolichopodidae) larva, Lateral View.**Empididae and Hybotidae****Common Name:** Dance Flies**Feeding Group:** Predators**Tolerance Value:** 6 (Moderate)**Habitat:** Dance fly larvae are found in a variety of habitats such as streams, ponds, and marshes. They can be found in the swift or slow-moving sections of streams or at the margins of ponds and marshes.**Size:** Small to medium (3-20 mm)**Characteristics:** Body elongate; head reduced and withdrawn into the thorax although some parts are usually visible; mandibles moving parallel to each other on a vertical plane. In the most common species: prolegs present on abdominal segments 1-8 or 2-8 with the prolegs on abdominal segment 8 longer than the others; prolegs bearing hooks; abdomen terminating in 1-4 lobes usually bearing setae. In the less common species: prolegs absent but welts present on abdominal segments; terminal end blunt.**Notes:** The larvae of this group are not very well studied. The adults get their common name from their twisting and turning movements while swarming. Many species have interesting mating rituals where the male will present a dead insect to a female in order to entice her to mate. Adults and larvae are predators, often feeding on insects such as mosquitoes and black flies, making them a beneficial group.Figure 13.90: *Hemerodromia* sp. (Empididae) larva, Lateral View.

**Ephydriidae****Common Name:** Shore Flies, Brine Flies**Feeding Group:** Collector/Gatherers (also Shredders, Scrapers, Predators)**Tolerance Value:** 6 (Moderate)**Habitat:** Ephydrid larvae occur at the margins of ponds, marshes, and streams. They are usually found in detrital mats, algal mats, and mud.**Size:** Small to medium (1-14 mm)**Characteristics:** The superficial characteristics of the larvae of this family are variable; head reduced and withdrawn into the thorax; mandibles moving parallel to each other on a vertical plane; prolegs present or absent; posterior end variable – sometimes terminating in long respiratory tube or a forked respiratory tube.**Notes:** Some species are extremely tolerant and exist in situations such as highly saline lakes and petroleum pools.Figure 13.91: *Ephydra* sp.  
(Ephydriidae) larva, Lateral View.Figure 13.92: *Scatella hawaiiensis*  
(Ephydriidae) larva, Lateral View.Figure 13.93: *Paracoenia bisetosa*  
(Ephydriidae) larva, Lateral View.**Limoniidae and Pediciidae****Common Name:** Short-palped Crane Flies**Feeding Group:** Shredders (also Predators and Collector/Gatherers)**Tolerance Value:** 3 (Low)**Habitat:** This is a large group that occurs in a variety of habitats, but they are most commonly found in wet soils or decaying vegetation along the edge of streams, lakes, and marshes.**Size:** Medium**Characteristics:** Body elongate; head capsule retracted into thorax; much of rounded head capsule present; although it may be reduced to a few bars; mandibles moving against each other on a horizontal plane; body without long projections although tubercles may be present but never half as long the body width; terminal segment with spiracles; spiracular disc at posterior end of abdomen with 5 or fewer lobes of variable length.**Notes:** Together these two families are one of the largest groups of flies with approximately 11,000 species. There are not set of characters that can be used to separate Limoniidae and Pediciidae larvae. To determine family they need to be identified to genus. Some species are very abundant and are important food sources for vertebrates and invertebrate predators.Figure 13.95: *Limonia* sp.  
(Limoniidae) larva, Ventral View.Figure 13.94: *Pedicia albivitta*  
(Pediciidae) larva, Ventral View.

**Muscidae**

**Common Name:** House Flies, Stable Flies, Green Bottle Flies

**Feeding Group:** Predators

**Tolerance Value:** 6 (Moderate)

**Habitat:** Larvae of aquatic muscid

species can be found in running and standing waters in streams, ponds, and marshes. They are generally collected in decaying organic matter and algal mats, presumably where they find their prey.

**Size:** Small to medium (6-20 mm)

**Characteristics:** Body shape peg-like - anterior end tapering and posterior end blunt; head reduced and withdrawn into the thorax; mandibles moving parallel to each other on a vertical plane; welts bearing spinules present on abdominal segments; prolegs present ventrally on terminal segment; abdomen terminating in a pair of short respiratory tubes.

**Notes:** The vast majority of muscid larvae are found in terrestrial situations such as dung, carrion, fungi, and rotting vegetable matter. However, a few species of Muscidae are truly aquatic and prey primarily on other Diptera. The aquatic larvae of this group are not well studied.

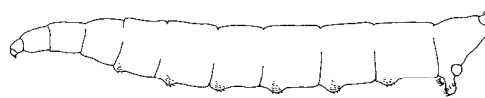


Figure 13.96: *Limnophora* sp.  
(Muscidae) larva, Lateral View.

**Psychodidae**

**Common Name:** Moth Flies

**Feeding Group:** Collector/Gatherers

**Tolerance Value:** 10 (High)

**Habitat:** Psychodid larvae occur in moist sediments and detritus at the edge of streams, ponds, and marshes. Some species are truly aquatic and are found in streams.

**Size:** Small (3-6 mm)

**Characteristics:** Head sclerotized, rounded, and clearly separate from the thorax; mandibles moving against each other on a horizontal plane; body cylindrical; body segments with 2-3 secondary divisions (annuli) often bearing dorsal sclerotized plates; prolegs absent.

**Notes:** Some species of moth flies are associated with sewage treatment facilities and heavily enriched streams. The adults of some psychodid species are commonly seen in bathrooms because the larvae occur in household drains feeding on organic matter.

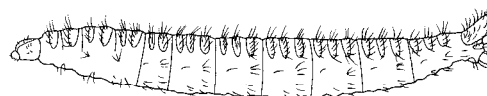
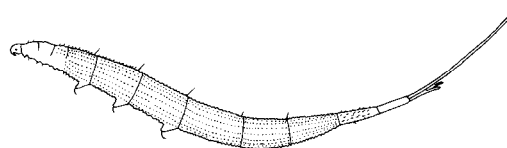
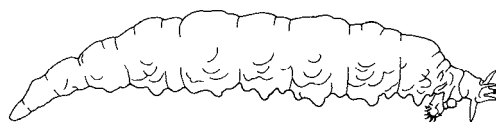
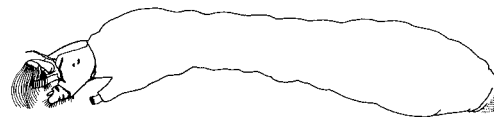
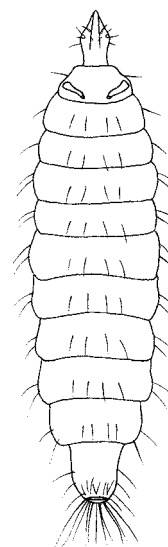
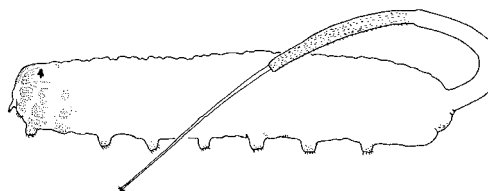


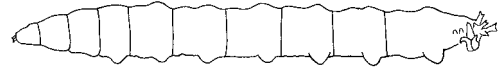
Figure 13.97: *Pericoma* sp.  
(Psychodidae) larva, Lateral View.



**Ptychopteridae****Common Name:** Phantom Crane Flies**Feeding Group:** Collector/Gatherers**Tolerance Value:** 7 (High)**Habitat:** Ptychopterid larvae are found in muddy areas of marshes, seeps, and streams where a lot of organic matter is present.**Size:** Medium to large (10-25 mm) – not including extended breathing tube**Characteristics:** Head sclerotized, rounded, and clearly separate from the thorax; mandibles moving against each other on a horizontal plane; prolegs on abdominal segments 1-3; prolegs terminate in slender claw; usually with numerous warts bearing hairs on segments; abdomen terminating in a long respiratory tube.**Notes:** Ptychopterid larvae burrow into soft sediments and breathe either through their integument or by connecting to the atmosphere using their long breathing tubes. The adults get their name from their habit of flying with very little movement of their wings.Figure 13.98: *Ptychoptera* sp. (Ptychopteridae) larva, Lateral View.Figure 13.99: *Bittacomorpha clavipes* (Ptychopteridae) larva, Lateral View.**Sciomyzidae****Common Name:** Snail-Killing Flies, Marsh Flies**Feeding Group:** Predators (or snail parasites)**Tolerance Value:** 6 (Moderate)**Habitat:** Sciomyzids most commonly occur in ponds, marshes, and streams where their prey are found.**Size:** Small to medium (3-15 mm)**Characteristics:** Body wrinkled; head reduced and withdrawn into the thorax; mandibles moving parallel to each other on a vertical plane; many segments with rings of tubercles; posterior segment with spiracles surrounded by lobes.**Notes:** Sciomyzid larvae most commonly parasitize pulmonate snails.Figure 13.100: *Hedria* sp. (Sciomyzidae) larva, Lateral View.

**Simuliidae****Common Name:** Black Flies, Buffalo Gnats**Feeding Group:** Collector/Filterers**Tolerance Value:** 6 (Moderate)**Habitat:** Black fly larvae occur in streams and rivers in areas of moderate to fast current. They are found attached to rocks, logs, vegetation, or any other solid substrate in the current.Figure 13.101: *Simulium venustum* (Simuliidae) larva, Lateral View.**Size:** Small to medium (3-15 mm)**Characteristics:** Head sclerotized, rounded, and clearly separate from thorax; pair of labral fans ("mouthbrushes") usually present; mandibles moving against each other on a horizontal plane; proleg present ventrally on prothorax; posterior 1/3 of abdomen swollen; abdomen terminates in a ring of hooks.**Notes:** Black flies have a ring of hooks at the terminal end of the abdomen, which enables them to adhere to the substrate and avoid being swept away in the current. At a glance these hooks resemble a suction disc. The hooks are used to cling to a patch of silk, which the larva attaches to the substrate. Black flies use a brush-like structure to filter fine organic matter from the water. These larvae can be common in streams and in some situations can reach huge numbers, covering rocks and other substrate in flowing waters. Most adult females are blood feeders on mammals and can be a nuisance in regions where they are extremely abundant.**Stratiomyidae****Common Name:** Soldier Flies**Feeding Group:** Collector/Gatherers**Tolerance Value:** 8 (High)**Habitat:** The larvae of stratiomyids commonly occur at the water surface, in algal mats, and on the surface of mud or detritus at the edges of ponds, marshes, and streams.**Size:** Small to large (5-35 mm)**Characteristics:** Body flattened dorsally; integument leathery; most of reduced head capsule visible; mandibles moving parallel to each other on a vertical plane; thorax broader than head; prolegs absent.**Notes:** Soldier flies have spiracles at the end of the abdomen that are used for breathing. Many species have a fringe of water-repelling hairs surrounding the spiracles that allow the larva to maintain contact with the atmosphere when the body is submerged.Figure 13.102: *Euparyphus* sp. (Stratiomyidae) larva, Dorsal View.

**Syrphidae****Common Name:** Rat-Tailed Maggots, Flower Flies**Feeding Group:** Collector/Gatherers**Tolerance Value:** 10 (High)**Habitat:** Syrphid larvae can be found in shallow water at the margins of ponds, marshes, and streams in areas where there is a lot of decaying organic matter. They are tolerant of low levels of dissolved oxygen so they are sometimes associated with sewage discharge and heavily enriched waters.**Size:** Small to medium (4-16 mm) – not including extended breathing tube**Characteristics:** Head blunt; head reduced and withdrawn into the thorax; mandibles moving parallel to each other on a vertical plane; 7 prolegs present (1 proleg on thorax and prolegs on abdominal segments 1-6); abdomen terminating in a long respiratory tube that is at least half as long as body.**Notes:** The majority of species in this family have terrestrial larvae. The larvae are sometimes called rat-tailed maggots because of their long respiratory tube. This tube allows them to exist in water with low levels of dissolved oxygen by giving them direct access to atmospheric oxygen. Because of this tolerance they are often a good indication of organic pollution.Figure 13.103: *Eristalis tenax* (Syrphidae) larva, Lateral View.**Tabanidae****Common Name:** Horse Flies, Deer Flies**Feeding Group:** Predators**Tolerance Value:** 6 (Moderate)**Habitat:** Tabanid larvae commonly occur in ponds, marshes, and streams. They are usually found burrowing in sediment in areas of standing or slow flow, but some species occur in sand or gravel in the swift portions of streams.**Size:** Medium to large (15-60 mm)**Characteristics:** Body spindle-shaped with both ends tapering; integument is tough with longitudinal striations; head reduced and withdrawn into the thorax; mandibles moving parallel to each other on a vertical plane; prolegs absent; creeping welts with small hooks present on abdominal segments 1-7 (3-4 welts present on each segment).**Notes:** Adult female tabanids are blood sucking and can be a nuisance to humans because of their painful bite. The larvae attack their prey using their hook-like mandibles. Tabanid larvae can give a painful bite when handled carelessly.Figure 13.104: *Tabanus reinwardtii* (Tabanidae) larva, Lateral View.

**Tipulidae****Common Name:** Crane Flies**Feeding Group:** Shredders (also Predators and Collector/Gatherers)**Tolerance Value:** 3 (Low)**Habitat:** Tipulid larvae can be found in a variety of habitats such as streams, ponds, and marshes. They can be found under rocks, in sand, snags, leaf packs, and algal mats.**Size:** Small to large (3-60 mm)**Characteristics:** Much of rounded head capsule present or reduced to only a few rods; head capsule completely or partially retracted into thorax; mandibles moving against each other on a horizontal plane; usually with ventral welts; terminal segment usually with two spiracles; spiracular disc usually surrounded by lobes or projections of varying numbers or shapes.**Notes:** Some of the large larvae are very common in leaf packs and are sometimes called “leatherjackets” because of their thick integument. These larvae are very important contributors to stream ecosystems because they break leaves into smaller pieces and make them accessible to other organisms. Adult crane flies look like large mosquitoes, but these insects do not bite.Figure 13.105: *Tipula abdominalis* (Tipulidae) larva, Lateral View.

## Families and Genera of Diptera Known from Mongolia

**Nematocera:**

## Blephariceridae

*Agathon**Blepharicera**Neobapalothrix*

## Ceratopogonidae

## Chaoboridae

## Chironomidae

## Podonominae

## Boreochlini

*Paraboreochlus**Trichotanypus*

## Tanypodinae

## Macropelopiini

*Macropelopia**Procladius**Psectrotanypus*

## Pentaneurini

*Ablabesmyia**Conchapelopia**Larsia**Thienemannimyia*

## Tanypodini

*Tanypus*

## Diamesinae

## Diamesini

*Diamesa**Potthastia**Pseudodiamesa*

## Protanypini

*Protanypus*

## Prodiamesinae

*Monodiamesa*

## Orthocladiinae

*Corynoneura**Thienemanniella**Acricotopus**Chaetocladius**Cricotopus**Diplocladius**Eukiefferiella**Heterotrissocladius**Krenosmittia**Lapposmittia**Limnophyes**Metriocnemus**Mongolcladius**Mongolyusurica**Orthocladius**Paracladius**Parakiefferiella**Parametriocnemus**Paratrithocladius**Psectrocladius**Pseudorthocladius**Pseudosmittia**Rheosmittia**Trissocladius**Zalutschia*

## Chironominae

## Chironomini

*Chironomus**Cladopelma**Cryptochironomus**Cryptotendipes**Cyphomella**Demicryptochironomus**Dicrotendipes**Einfeldia**Endochironomus**Glyptotendipes**Microchironomus**Mongolchironomus**Neozavrelia**Parachironomus**Paracladopelma**Paratendipes**Phaenopsectra**Polypedilum**Saetheria**Sergentia**Stictochironomus*

## Tanytarsini

*Cladotanytarsus**Constempellina**Corynocera**Microsectra**Paratanytarsus**Rheotanytarsus**Stempellinella**Tanytarsus*

## Culicidae

## Deuterophlebiidae

## Simuliidae

*Gymnopaia**Helodon**Metacnephia**Prosimulium**Simulium*

## Cylindrotomidae

*Cylindrotoma**Diogma**Phalacropera*

## Tipulidae

*Ctenophora**Dictenidia**Dolichopeza**Nephrotoma**Nigrotipula**Phorocenia**Prionocera**Tanyptera**Tipula*

## Limoniidae

## Chioneinae

*Arctoconopa**Cheilotrichia**Eriocnopa**Erioptera**Gnophomyia**Gonomyia**Gonomyodes**Hoplolabis**Idiocera**Molophilus**Neolimnophila**Ormosia**Scleroprocta**Symplecta*

## Dactylolabidinae

*Dactylolabis*

## Limoniinae

*Achyrolimonia**Antocha*

*Ula*

**achycera-**  
**thorrhapha:**  
lichopodidae