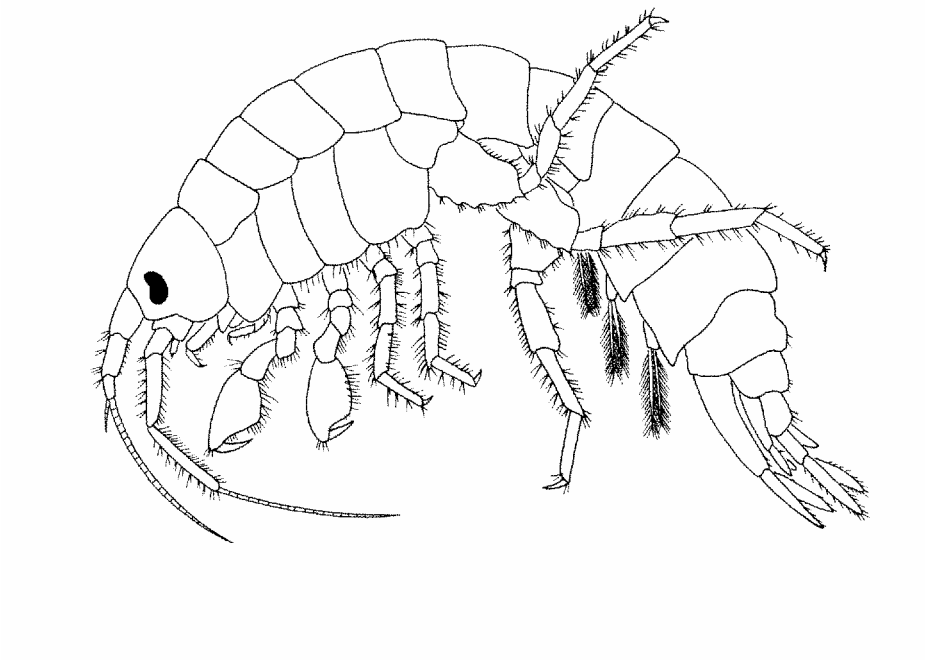
CHAPTER 2

AQUATIC INVERTEBRATES



Citation:

Bouchard, R.W., Jr. 2004. Guide to aquatic macroinvertebrates of the Upper Midwest. Water Resources Center, University of Minnesota, St. Paul, MN. 208 pp.

2 AQUATIC INVERTEBRATES

Aquatic invertebrates can be found in nearly any habitat from small temporary pools to large lakes and small springs to large rivers. Some of the more extreme habitats include highly saline waters (*e.g.*, Great Salt Lake), pools of petroleum, sewage treatment plant lagoons, and hot springs. Within a water body, aquatic invertebrates inhabit a variety of habitats. In lentic, or standing waters, aquatic invertebrates occur at the bottoms of deep lakes, along vegetated margins, and in open water. In lotic, or flowing waters, aquatic organisms occur under stones or woody debris, buried in sand or sediment, and crawling or sprawling on rocks, leaf packs, and snags. The greatest diversity of aquatic invertebrates is found in medium-sized, forested streams with cobble and gravel substrates.

There is great deal of diversity represented by aquatic invertebrates. Despite the abundance and diversity of aquatic invertebrates they are often inconspicuous and few people are aware of their presence, much less their importance. Current knowledge of the life history, ecology, and geographic range of aquatic invertebrates is limited in part by the huge diversity of aquatic invertebrates.

Aquatic invertebrates feed on a variety of food types including tree leaves, algae, wood, detritus, other invertebrates, and even some vertebrates such as small fish and tadpoles. Aquatic invertebrates are an integral part of aquatic food webs, and in some cases are important in terrestrial food webs. They break down material from primary production (*e.g.*, leaves, algae) and consume materials such as fungus, dead animals, and bacteria. By assimilating these materials and breaking large particles into smaller pieces, aquatic invertebrates make energy and nutrients available to other invertebrates and fish.

Aquatic invertebrates are also used to assess the health of streams, lakes, and wetlands because different species have different tolerances to a variety of pollutants. For example, some invertebrates (*e.g.*, stoneflies, caddisflies, and mayflies) are usually intolerant of pollution and are often the first organisms to die or disappear if a water body becomes polluted. This means a water body that lacks these taxa, but supports more tolerant taxa, is likely polluted. However, these kinds of analyses require accurate identification of invertebrates collected in samples. The keys and descriptions in this guide will help with the identification of the more common aquatic invertebrates in the Upper Midwest.

Key to Aquatic Invertebrates

1. Body without segments or shell (Figs. 2.1, 2.2) 2

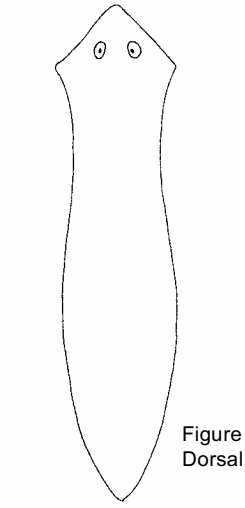


Figure 2.1: Turbellaria, Dorsal View.

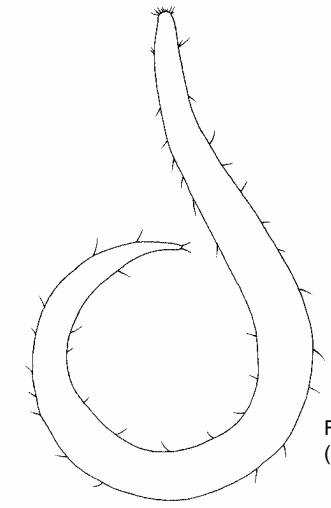


Figure 2.2: *Monhystera* sp. (Nematoda).

1'. Body segmented (Figs. 2.3, 2.5, 2.7) or with a shell (Figs. 2.4, 2.6) 4

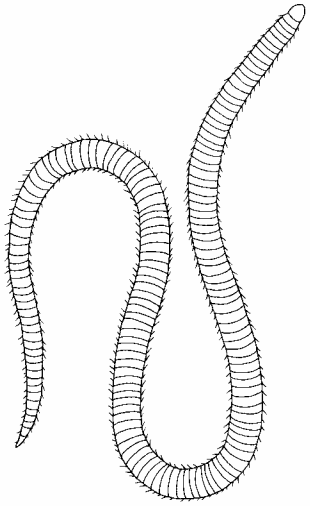


Figure 2.3: Oligochaeta.

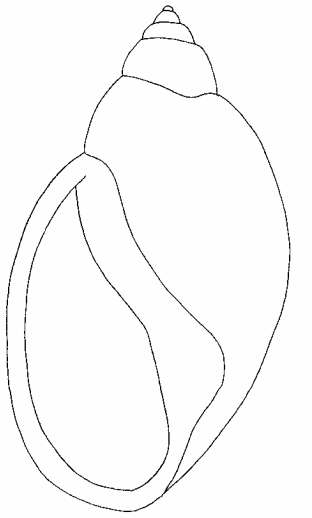


Figure 2.4: *Physella gyrina* (Physidae) Ventral View.

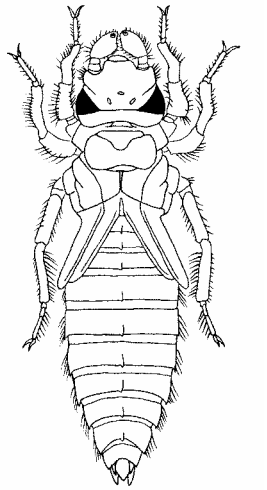


Figure 2.5: *Progomphus serenus* (Gomphidae) larva, Dorsal View.

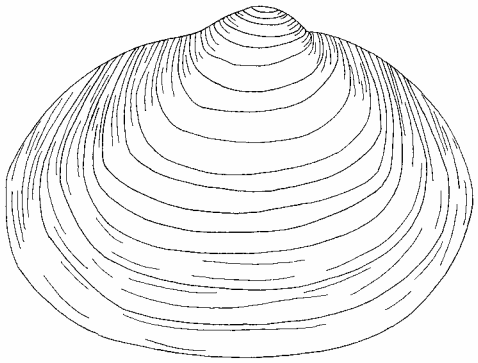


Figure 2.6: *Sphaerium simile* (Sphaeriidae).

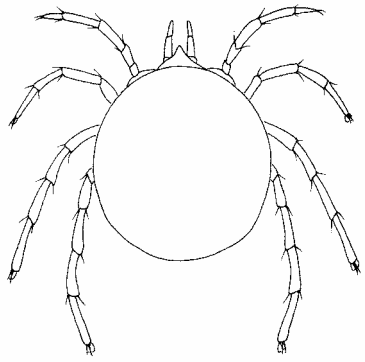


Figure 2.7: Hydracarina, Dorsal View.

2(1). Body flattened (Fig. 2.8) .....**Turbellaria (flatworms, planarians)** ***p. 23***

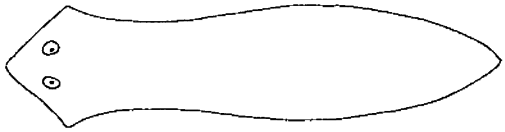


Figure 2.8: Turbellaria, Dorsal View.

2'. Body elongate and cylindrical (Figs. 2.9, 2.10) 3

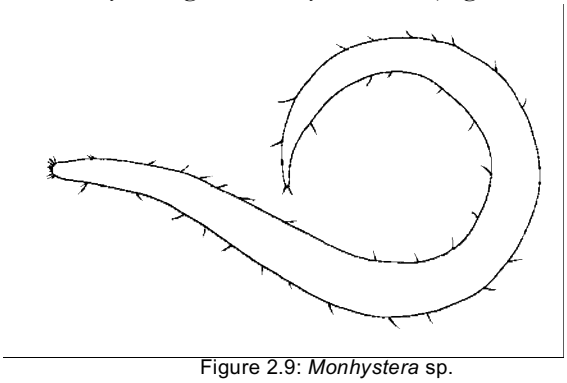


Figure 2.9: *Monhystera* sp. (Nematoda).

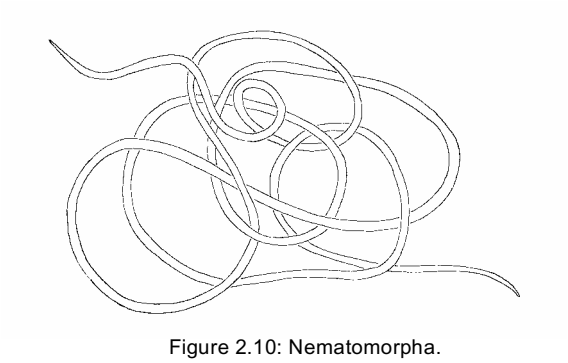


Figure 2.10: Nematomorpha.

3(2') . Large and elongate (greater than 1 cm in length) (Fig. 2.11)..... ....**Nematomorpha (hairworms, horsehair worms)** ***p. 23***

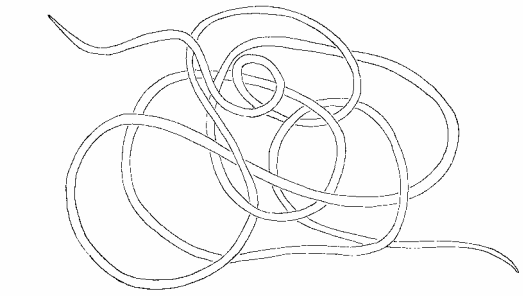


Figure 2.11: Nematomorpha.

3'. Small (less than 1cm in length) (Fig. 2.12).....**Nematoda (roundworms)** ***p. 24***

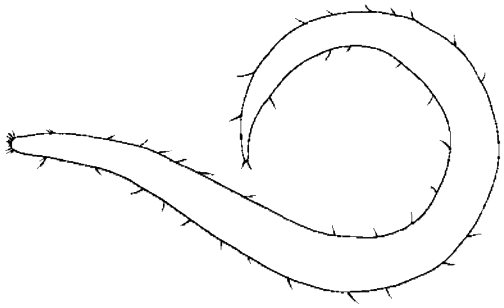


Figure 2.12: *Monhystera* sp. (Nematoda).

4(1'). Shell present (Figs. 2.13 - 2.16) **(Phylum MOLLUSCA – clams & snails)**..... 5

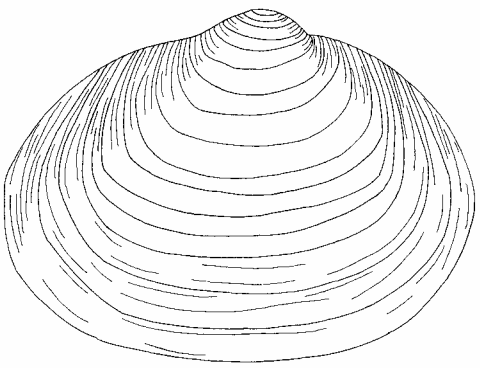


Figure 2.13: *Sphaerium simile* (Sphaeriidae).

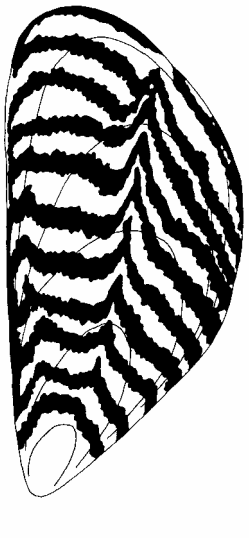


Figure 2.14: *Dreissena polymorpha* (Dreissenidae).

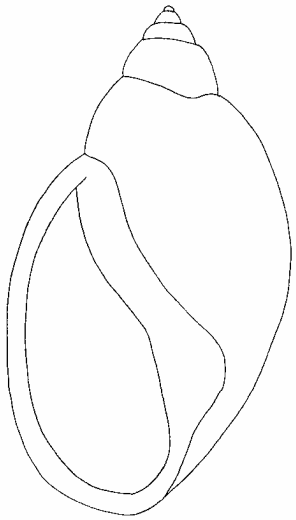


Figure 2.15: *Physella gyrina* (Physidae) Ventral View.

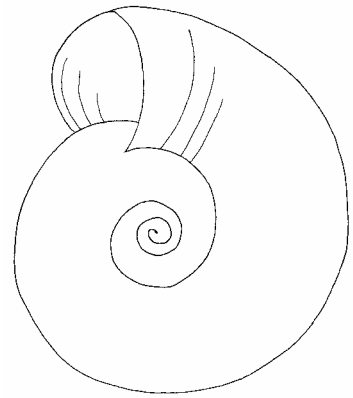


Figure 2.16: *Gyraulus deflectus* (Planorbidae) Ventral View.

4'. Shell absent – *note: be careful with this character because a hardened exoskeleton is often present* (Figs. 2.17 – 2.19) 6

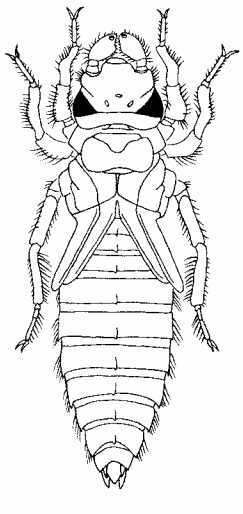


Figure 2.17: *Progomphus serenus* (Gomphidae) larva, Dorsal View.

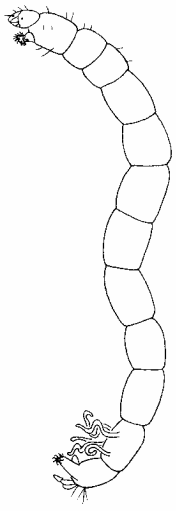


Figure 2.18: *Chironomus tentans* (Chironomidae) larva, Lateral View.

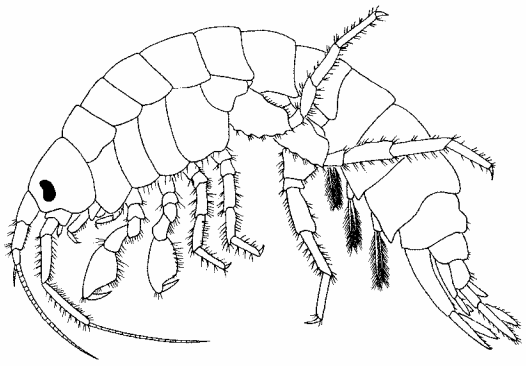


Figure 2.19: *Gammarus fasciatus* (Gammaridae) Lateral View.

5(4). Shell consists of one piece (Figs. 2.20, 2.21) ..... **Gastropoda (snails & limpets)** ***p. 29***

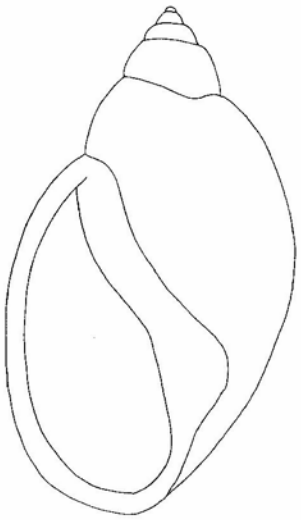


Figure 2.20: *Physella gyrina* (Physidae) Ventral View.

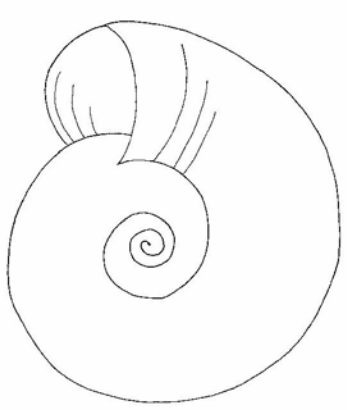


Figure 2.21: *Gyraulus deflectus* (Planorbidae) Ventral View.

5'. Shell consists of two pieces (valves) (Figs. 2.22 - 2.24) ..... **Bivalvia (freshwater mussels & clams)** ***p. 30***

Figure 2.22: *Dreissena polymorpha* (Dreissenidae).

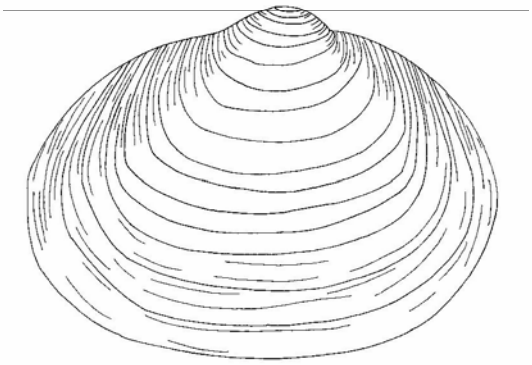


Figure 2.23: *Sphaerium simile* (Sphaeriidae).

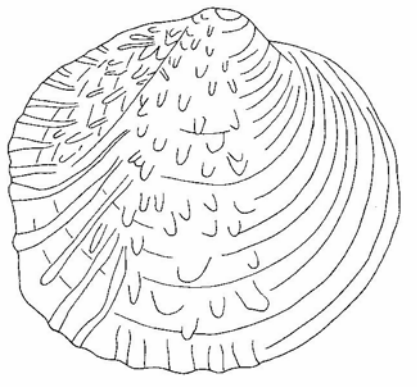


Figure 2.24: Unionidae.

6(4'). Body with 20 or more segments; body shape worm-like (Figs. 2.25, 2.26) **(Phylum ANNELIDA – worms & leeches)**..... 7

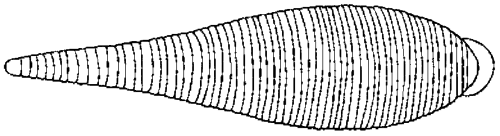


Figure 2.25:
Hirudinea,
Dorsal View.

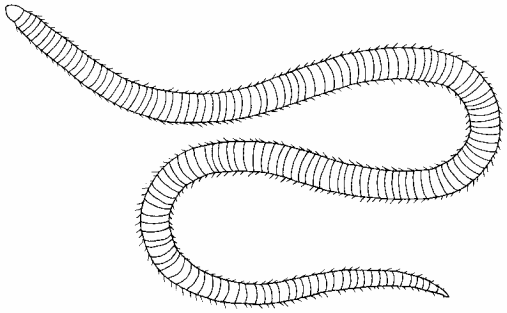


Figure 2.26:
Oligochaeta.

6'. Body with fewer than 20 segments; body shape variable (Figs 2.27 - 2.31) **(Phylum ARTHROPODA – insects, spiders, & crustaceans)**..... 8

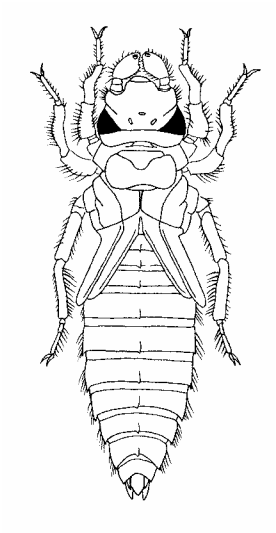


Figure 2.27:
Progomphus serenus
(Gomphidae) larva,
Dorsal View.

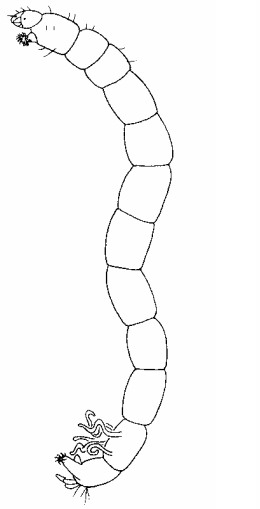


Figure 2.28:
Chironomus tentans
(Chironomidae) larva,
Lateral View.

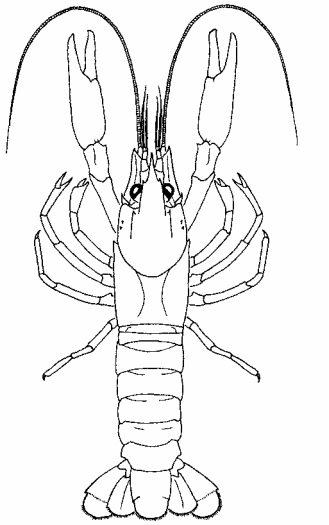


Figure 2.29: Generalized
Cambaridae, Dorsal View.

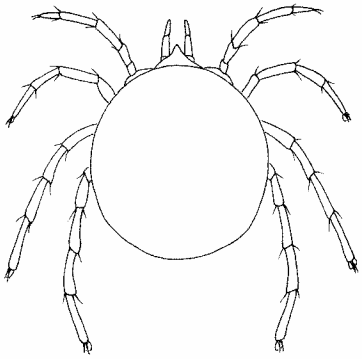


Figure 2.30:
Hydracarina,
Dorsal View.

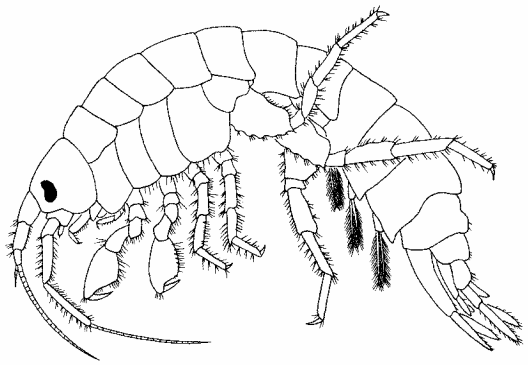


Figure 2.31:
Gammarus fasciatus
(Gammaridae)
Lateral View.

7(6). Suction disk present at one or both ends (Figs 2.32, 2.33) ....**Hirudinea (leeches)** ***p. 24***

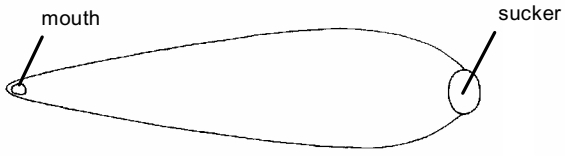


Figure 2.32: Generalized Hirudinea, Ventral View.

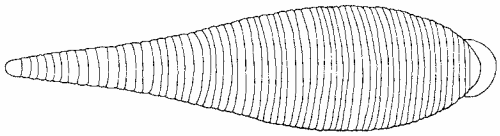


Figure 2.33: Hirudinea, Dorsal View.

7'. Suction disk absent (Fig. 2.34)..... **Oligochaeta (aquatic earthworms)** ***p. 25***

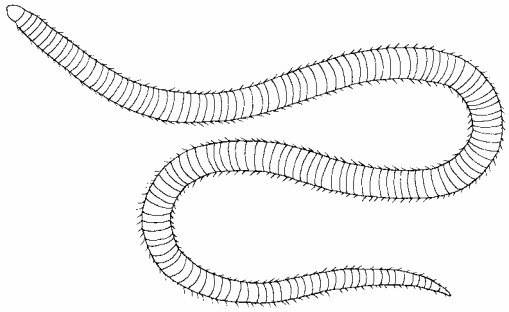


Figure 2.34: Oligochaeta.

8(6') . Four or more pairs of segmented legs (Figs. 2.35- 2.37)..... 9

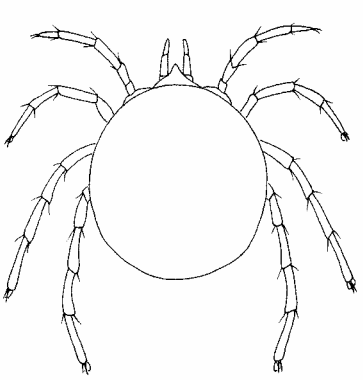


Figure 2.35: Hydracarina, Dorsal View.

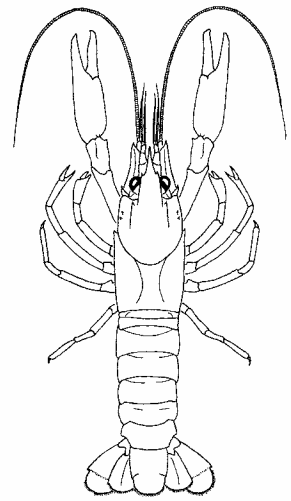


Figure 2.36: Generalized Cambaridae, Dorsal View.

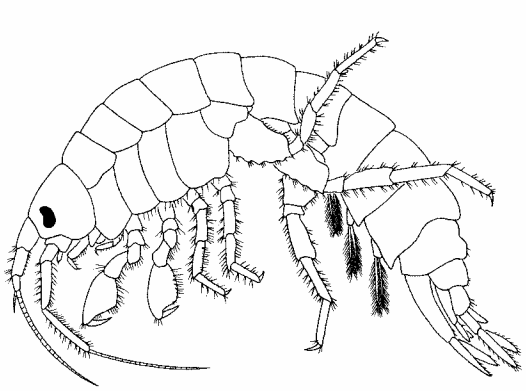


Figure 2.37: *Gammarus fasciatus* (Gammaridae) Lateral View.

8'. Three (Figs. 2.38 - 2.40) or no (Figs. 2.41, 2.42) pairs of segmented legs 15

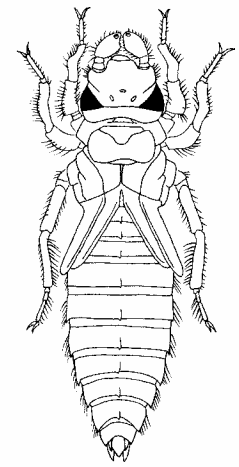


Figure 2.38: *Progomphus serenus* (Gomphidae) larva, Dorsal View.

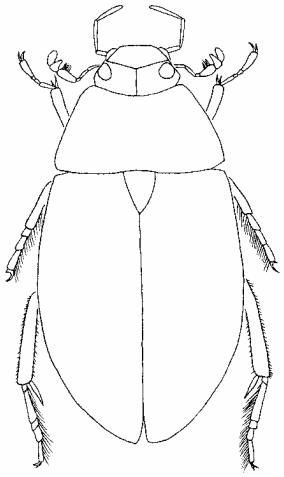


Figure 2.39: *Hydrobiomorpha* sp. (Hydrophilidae) adult, Dorsal View.

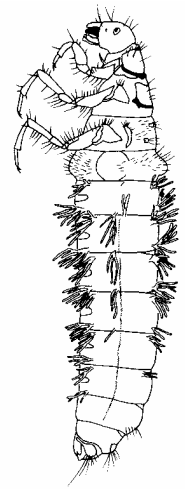


Figure 2.40: *Hesperophylax designatus* (Limnephilidae) larva, Lateral View.

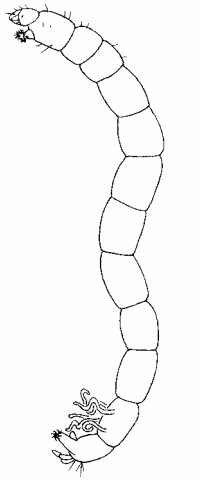


Figure 2.41: *Chironomus tentans* (Chironomidae) larva, Lateral View.

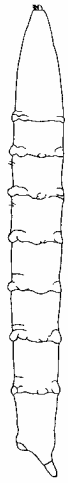


Figure 2.42: *Tabanus reinwardtii* (Tabanidae) larva, Lateral View.

9(8). Fours pairs of segmented legs; antennae absent (Figs. 2.43, 2.44) **(Class ARACHNIDA – spiders & mites)** 10

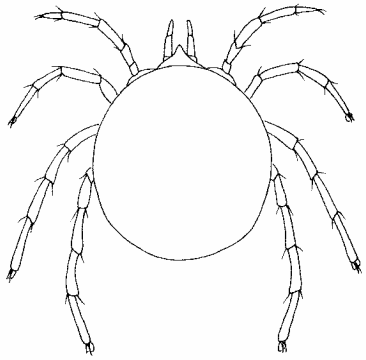


Figure 2.43: Hydracarina, Dorsal View.

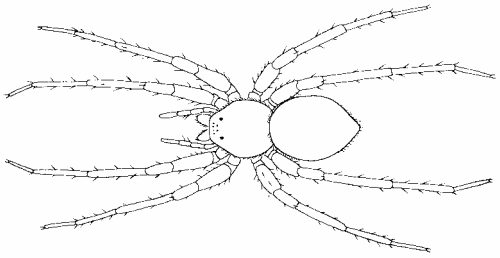


Figure 2.44: *Dolomedes* sp. (Pisauridae) Dorsal View.

9'. Five or more pairs of segmented legs; antennae present (Figs. 2.45 -2.47) **(Subphylum CRUSTACEA – shrimps, crayfishes, sow bugs, scuds, water fleas, etc.)**..... 11

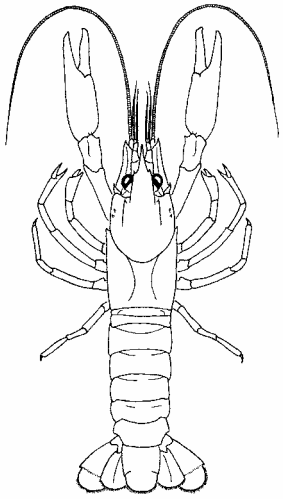


Figure 2.45: Generalized Cambaridae, Dorsal View.

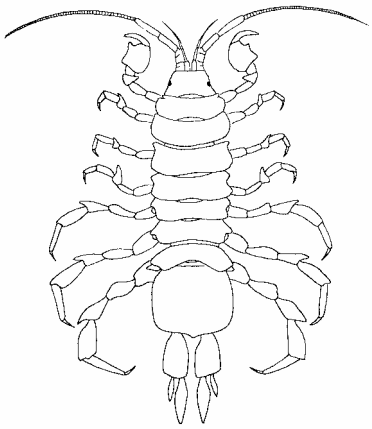


Figure 2.46: *Asellus* sp. (Asellidae) Dorsal View.

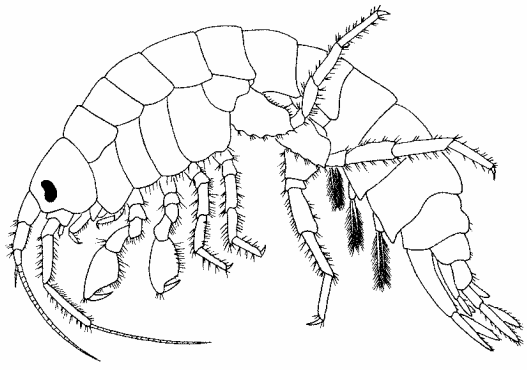


Figure 2.47: *Gammarus fasciatus* (Gammaridae) Lateral View.

10(9). Body consists of 2 segments (cephalothorax and abdomen) (Fig. 2.48) ....**Araneae (spiders)** ***p. 25***

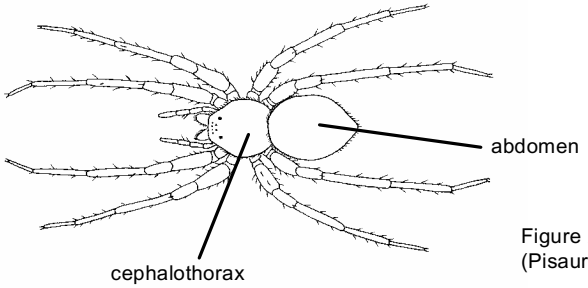


Figure 2.48: *Dolomedes* sp. (Pisauridae) Dorsal View.

10. Body apparently unsegmented (Fig. 2.49).....**Hydracarina (water mites)** ***p. 26***

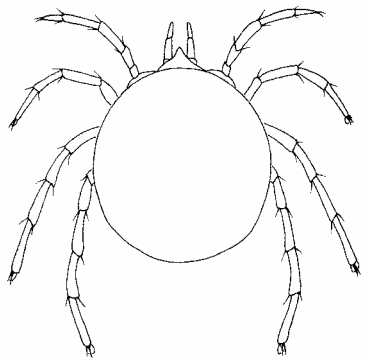


Figure 2.49: Hydracarina, Dorsal View.

11(9'). Five pairs of segmented legs (Figs. 2.50, 2.51) **(Order DECAPODA – shrimps & crayfishes)** 12

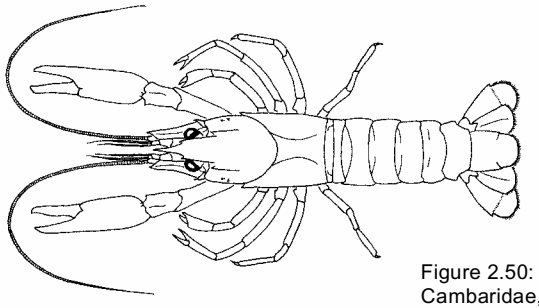


Figure 2.50: Generalized Cambaridae, Dorsal View.

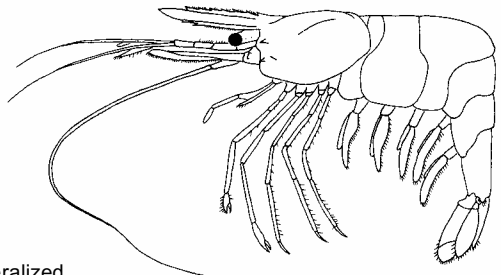


Figure 2.51: *Palaemonetes paludosus* (Palaemonidae) Lateral View.

11'. Seven pairs of segmented legs (Figs. 2.52, 2.53).....13

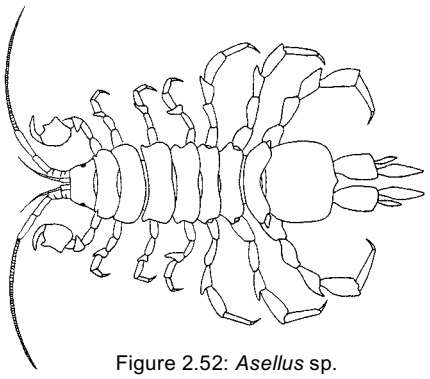


Figure 2.52: *Asellus* sp. (Asellidae) Dorsal View.

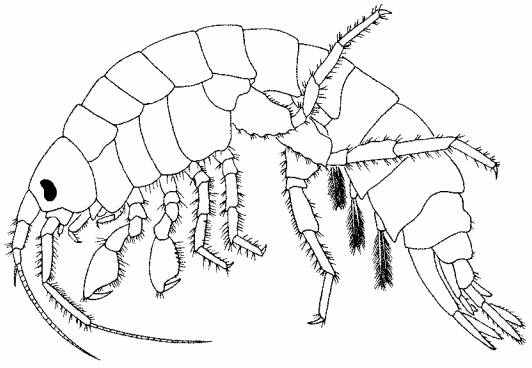


Figure 2.53: *Gammarus fasciatus* (Gammaridae) Lateral View.

12(11). Hinged claws on the first three legs (first pair usually greatly enlarged) (Fig. 2.54)..... .....**Cambaridae (crayfishes)** ***p. 26***

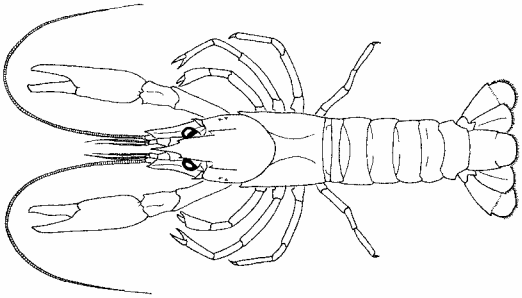


Figure 2.54: Generalized Cambaridae, Dorsal View.

12'. Hinged claws on first two legs (first pair not enlarged) (Fig. 2.55)..... .....**Palaemonidae (shrimp)** ***p .27***

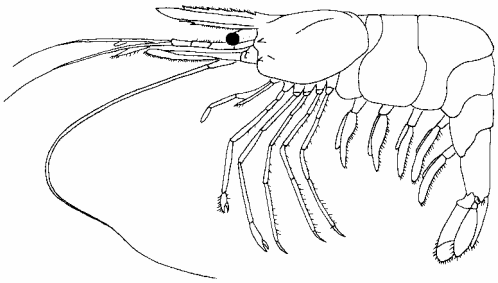


Figure 2.55: *Palaemonetes paludosus* (Palaemonidae) Lateral View.

13(11'). One antennal pair much longer than the other; body dorso-ventrally flattened (Fig. 2.56).. ..... **Isopoda – Asellidae (aquatic sow bugs)** ***p. 27***

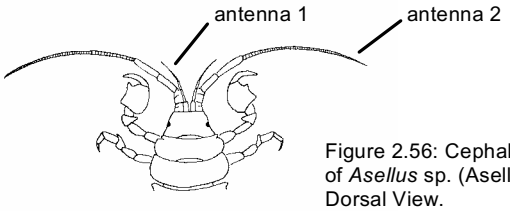


Figure 2.56: Cephalothorax of *Asellus* sp. (Asellidae) Dorsal View.

13'. Antennae of equal length; body laterally flattened (Fig. 2.57) **(Order AMPHIPODA – scuds, sideswimmers)** 14

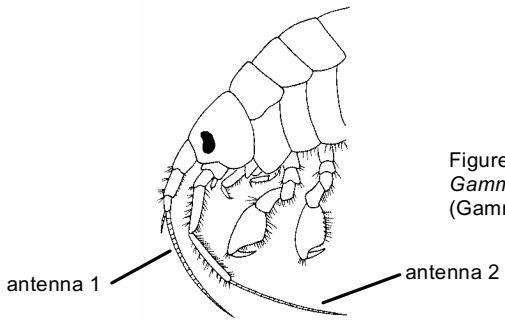


Figure 2.57: Cephalothorax *of Gammarus fasciatus* (Gammaridae) Lateral View.

14(13'). Segmented flagellum arising from distal end of 3rd antennal segment (Fig. 2.58)..... .....**Gammaridae *p. 28***

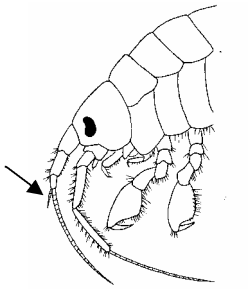


Figure 2.58: Cephalothorax *of Gammarus fasciatus* (Gammaridae) Lateral View *– accessory flagellum indicated by arrow*.

14'. Segmented flagellum absent from distal end of 3rd antennal segment (Fig. 2.59)..... .....**Hyalellidae *p .28***

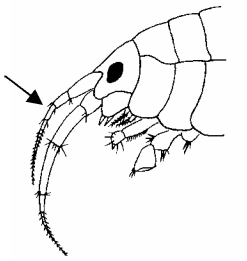


Figure 2.59: Cephalothorax *of Hyalella azteca* (Hyalellidae) Lateral View – *lack of accessory flagellum indicated by arrow*.

15(8'). Abdomen with 6 or fewer segments; wingless; small (usually less than 3mm) (Fig. 2.60).... .....**Collembola (springtails) *p. 31***

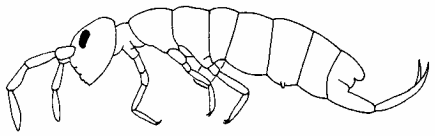


Figure 2.60: *Agrenia bidenticulata* (Collembola) Lateral View.

15'. Abdomen with more than 6 segments; wings present or absent; size variable (Figs. 2.61 - 2.65)..... **Insecta (insects) *Chapter 3 - p. 35***

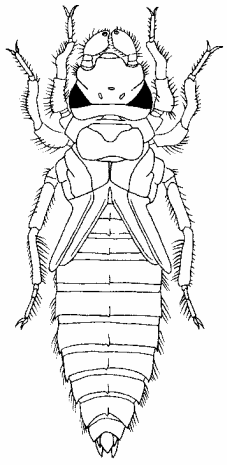


Figure 2.61: *Progomphus serenus* (Gomphidae) larva, Dorsal View.

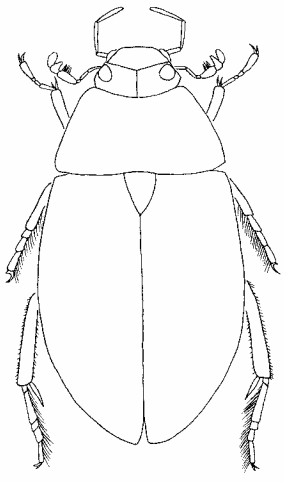


Figure 2.62: *Hydrobiomorpha* sp. (Hydrophilidae) adult, Dorsal View.

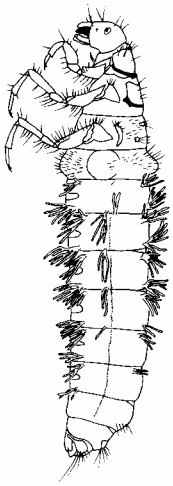


Figure 2.63: *Hesperophylax designatus* (Limnephilidae) larva, Lateral View.

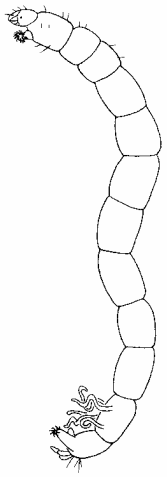


Figure 2.64: *Chironomus tentans* (Chironomidae) larva, Lateral View.

Figure 2.65: *Tabanus reinwardtii* (Tabanidae) larva, Lateral View.

Non-Insect Invertebrate Descriptions

Turbellaria* (Class)

Common Name: Flatworms and Planarians
Feeding Group: Collector/Gatherers
Tolerance Value: 4 (Moderate)
Habitat: Flatworms can be found in nearly any habitat. They are most commonly encountered on rocks in slowly flowing water, but they can be found in lakes, ponds, streams, springs, and temporary water bodies.
Size: Small to large (1-30 mm)
Characteristics: Body flattened dorsally; no segments; two eyespots usually present.
Notes: Most Turbellaria are smaller than 1 mm with a rounded body, but these types are not commonly encountered. The triclads are the most commonly encountered Turbellaria. When preserved they are often curled or shriveled and more closely resemble small, shriveled, unsegmented leech. Planarians exhibit a variety of tolerances, but in situations where a large number of planarians are present there is often organic pollution.

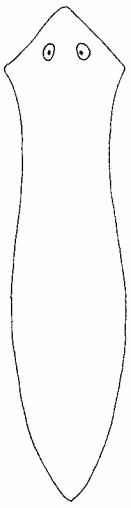


Figure 2.66: Turbellaria, Dorsal View.

* The description for Turbellaria includes only the more commonly encountered Tricladida flatworms.

Nematomorpha (Class)

Common Name: Hairworms and Horsehair Worms
Feeding Group: Parasites
Tolerance Value: Undetermined
Habitat: Adults occur in puddles and in shallow areas of ponds, marshes, and streams. The larvae are internal parasites of grasshoppers, crickets, terrestrial beetles, and occasionally aquatic insects.
Size: Large (100-700 mm)
Characteristics: Body long and slender; no segmentation.
Notes: Nematomorpha have an interesting life history. It is believed that after hatching the larvae encyst on streamside vegetation where they are consumed by potential hosts. If the larval cyst is consumed by an appropriate host, the larva burrows through the intestinal wall into the body of the host. It feeds on its host's tissues until the worm matures. If the host falls into water, the worm breaks through its host's body wall and becomes a free-living adult. There also appears to be evidence that if the host is not near water when the worm is ready to emerge, the host will seek out water. This suggests a potential mechanism the worm uses to bring its host to an appropriate habitat.

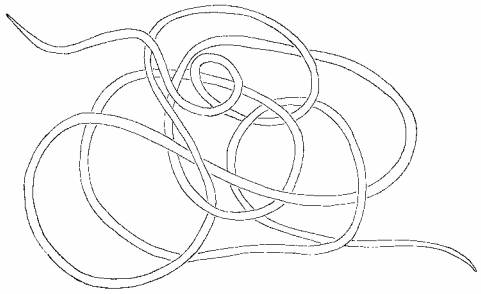


Figure 2.67: Nematomorpha.

Nematoda (Phylum)

Common Name: Roundworms
Feeding Group: Parasites, Piercers, Shredders
Tolerance Value: 5 (Moderate)
Habitat: Nematodes are found in and on the substrate in just about any aquatic habitat.
Size: Small (1-10 mm)
Characteristics: Worm-like in appearance; no segmentation; body pale and usually translucent.
Notes: Roundworms are extremely abundant, however due to their small size they are rarely collected in standard aquatic samples. Some are free living, but many of the nematodes collected in stream samples are parasites and can be seen curled up inside some aquatic invertebrates.

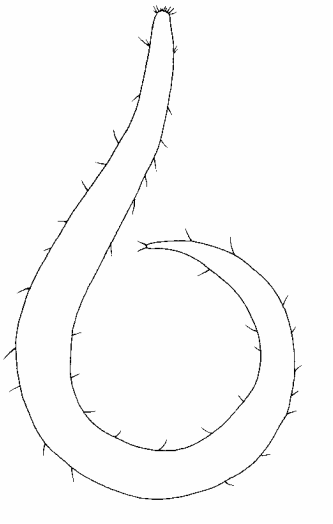


Figure 2.68: *Monhystera* sp. (Nematoda).

Hirudinea (Class)

Common Name: Leeches
Feeding Group: Parasites, Predators
Tolerance Value: 10 (High)
Habitat: Leeches primarily live in standing waters such as marshes, pond and lake margins, and in the pools of streams and rivers. Some kinds occur in fast flowing waters. They are usually located on vegetation, attached to prey, or on other solid substrates.
Size: Small to very large (4-450 mm)
Characteristics: Body flattened with 34 segments (segments secondarily divided so there appears to be many more); eyespots usually present dorsally at anterior end (sometimes hard to see in preserved specimens); suction disk present at one or both ends; no bundles of hairs present.
Notes: Although leeches are best known as bloodsuckers, most leeches collected by aquatic biologists feed on small invertebrates. However, even the predatory kinds feed only on the fluids of invertebrates by crushing the prey in the mouth and then expelling the exoskeleton from the mouth or anus. Some leeches are scavengers. The few external parasitic leeches feed on the blood of a host organism (*e.g.*, fish, frogs, turtles, birds, and mammals) by using a rasping tongue to penetrate the skin. To keep the blood from clotting while a leech is feeding, an anticoagulant (hirudin) is injected into the opening.

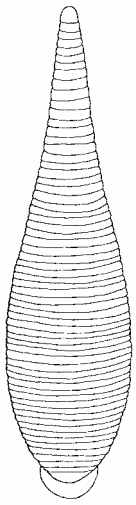


Figure 2.69: Hirudinea, Dorsal View.

Oligochaeta (Class)

Common Name: Aquatic Earthworms
Feeding Group: Collector/Gatherers
Tolerance Value: 8 (High)
Habitat: Oligochaeta most commonly live in lakes, ponds, marshes, and in stream pools. Some small kinds are found in the swift areas of streams. They are most commonly found in soft sediments, but some can be found in coarse detritus, on vegetation, and in coarse substrates.

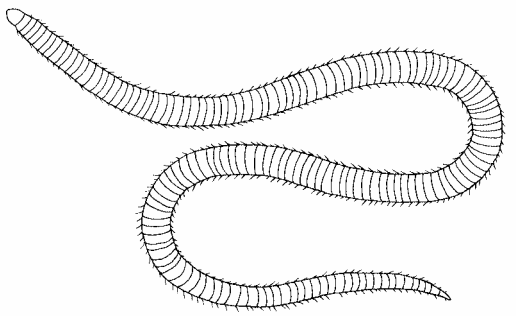


Figure 2.70: Oligochaeta.

Size: Small to Large (1-30 mm; up to 150 mm)
Characteristics: Body elongate and worm-like; body divided into many segments; most segments have bundles of hairs; no eyespots or suckers present.
Notes: Oligochaetes are closely related to and look very similar to the earthworms that you can find in your garden. Oligochaetes, especially *Tubifex* worms, can live in extremely polluted waters with very low dissolved oxygen levels. Severely organically enriched habitats, (*e.g.*, below waste water treatment plants) often have large populations of these worms. Some kinds also live at the bottom of lakes where dissolved oxygen levels are low. However, there is a diversity of tolerances to a wide variety of impacts represented in this group.

Araneae (Order)

Common Name: Spiders
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Semiaquatic spiders live along the margins of lakes, ponds, streams, and marshes. They are found on vegetation, on the shore, and on the water surface.

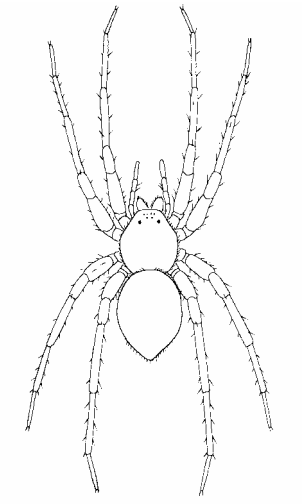


Figure 2.71: *Dolomedes* sp. (Pisauridae) Dorsal View.

Size: Medium to large (up to 50 mm)
Characteristics: Body consists of cephalothorax (fused head and thorax) and an abdomen; four pairs of segmented legs.
Notes: There are two types of spiders commonly found along streams. The long-jawed spider is a slender spider with long legs that builds a web in the vegetation or on man-made structures alongside and over streams in order to capture recently hatched aquatic insects. The second type of spider is more robust and lives along the margins of streams and skates across the water on the surface tension. These fishing and wolf spiders feed on emerging insects or insects trapped on the surface of the water. In some cases, the spiders use the water surface like a web and can sense the disturbance caused from an invertebrate trapped on the water surface. Some of the fishing spiders will dive under the water surface either to escape predators or to catch prey.

Hydracarina (Suborder Trombidiformes)

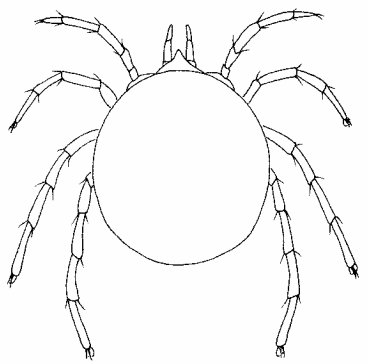


Figure 2.72: Hydracarina, Dorsal View.

Common Name: Water Mites
Feeding Group: Predators
Tolerance Value: 4 (Moderate)
Habitat: Hydracarina most commonly live in the shallow waters of lakes, ponds, and marshes. They can also be found in streams and rivers of all sizes. They usually occur amongst vegetation.
Size: Small (1-7 mm)
Characteristics: No antennae present; pair of pedipalps extending from front; four pairs of segmented legs; body appears to consist of only the abdomen with no segments.
Notes: As larvae, water mites are parasitic on aquatic insects. Sometimes when aquatic insects are collected, water mite larvae can be seen attached to thoracic, abdominal, and leg joints. Some adults are bright red, orange, or green. Water mite adults are primarily predators. Much like their close relatives, the spiders, water mites catch invertebrates, pierce the cuticle of their prey, and inject digestive juices. After some of the digestive enzymes have softened the tissues, water mites suck out the fluids and discard the remaining exoskeleton. Hydracarina is not a formal taxonomic term, but is rather an informal term used to describe a group of families in the suborder Trombidiformes.

Cambaridae (Family)

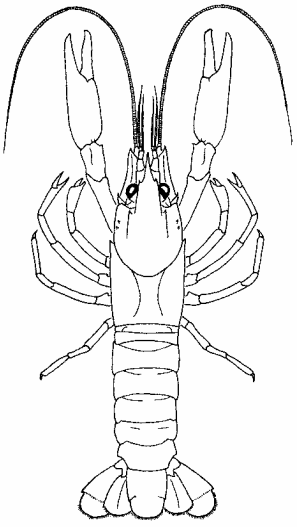


Figure 2.73: Cambaridae, Dorsal View.

Common Name: Crayfishes
Feeding Group: Collector/Gatherers
Tolerance Value: 6 (Moderate)
Habitat: Crayfishes live in a variety of habitats from small streams to large rivers, in lakes, ponds, marshes, swamps, and ditches. They can be found under rocks and logs, in snags and detritus, or burrowed into the substrate.
Size: Medium to large (10-150 mm)
Characteristics: Cephalothorax (fused head and thorax) cylindrical and abdomen dorsally flattened; one pair of compound eyes present; one pair of antennae longer than other pairs; 5 pairs of walking legs (first 3 pairs with hinged claws and first pair usually greatly enlarged); 6 abdominal segments; 5 pairs of appendages on first 5 abdominal segments; abdomen terminating in flipper-like structure.
Notes: Crayfishes are probably the best-known freshwater crustaceans. The most commonly encountered crayfishes are found under cover in streams (*e.g.*, under rocks or in snags). The less commonly encountered kinds are burrowers that spend most of their lives underground. The burrowing species are most commonly collected as juveniles in streams, marshes, swamps, and ditches or they can be observed crawling about on warm rainy nights searching for mates.

Palaemonidae (Family)

Common Name: Shrimps
Feeding Group: Scrapers
Tolerance Value: 4 (Moderate)
Habitat: Shrimps are found in areas of slow to no flow in lakes, ponds, streams, and rivers. They are usually collected in areas of aquatic vegetation.
Size: Medium to large (25-240 mm)
Characteristics: Cephalothorax (fused head and thorax) and abdomen cylindrical with some side to side flattening; one pair of compound eyes present; one pair of antennae longer than other pairs; 5 pairs of walking legs (first 2 pairs with hinged claws; 5 pairs of appendages on first 5 abdominal segments; first pair not greatly enlarged); abdomen terminating in flipper-like structure.
Notes: Shrimps are not as important aquatic ecosystem components as crayfishes due to their rather restricted habitat and feeding habits. They are most common in the back waters of larger rivers.

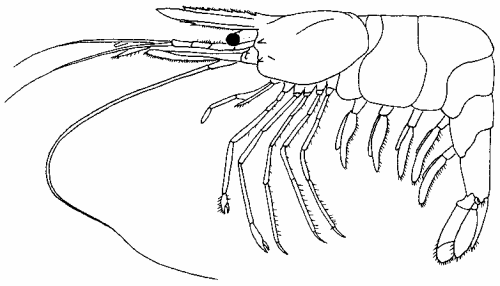


Figure 2.74: *Palaemonetes paludosus* (Palaemonidae) Lateral View.

Isopoda (Order)

Common Name: Aquatic Sow Bugs
Feeding Group: Collector/Gatherers
Tolerance Value: 8 (High)
Habitat: Isopods are found in a variety of locations including streams, springs, ponds, and marshes, but they most commonly occur in small streams and springs. They are generally found in snags, overhanging vegetation, root mats, and around cobble.
Size: Small to large (5-20 mm)
Characteristics: Body dorsally flattened; 2 pairs of antennae with one pair much longer than the other; 7 pairs of walking legs (first pair claw-like; remaining pairs simple with pointed claw); 6 pairs of appendages on ventral side of abdomen (only last pair visible from top).
Notes: Aquatic sow bugs are closely related to terrestrial sow bugs that are found amongst decomposing leaves and logs. There is only one family of aquatic sow bugs commonly collected in North America (Asellidae). Isopods are an important food source for fish and invertebrate predators. Aquatic sow bugs are usually grey when preserved.

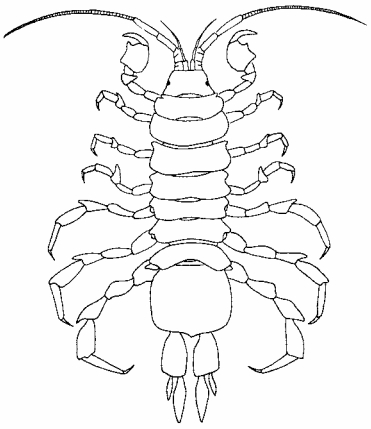


Figure 2.75: *Lirceus* sp. (Asellidae) Dorsal View.

Amphipoda (Order) - Families Gammaridae & Hyalellidae

Common Name: Scuds and Side-Swimmers
Feeding Group: Collector/Gatherers
Tolerance Value: Gammaridae = 4 (Moderate); Hyalellidae = 8 (High)
Habitat: Amphipods most commonly occur in the shallow regions of streams, springs, lakes, ponds, and marshes. They are generally found in snags, overhanging vegetation, root mats, and around cobble.
Size: Small to medium (5-20 mm)
Characteristics: Body flattened from side to side; two pairs of antennae of nearly equal length on cephalothorax; 7 pairs of walking legs (first two pairs claw-like; remaining pairs simple with pointed claw); 6 pairs of appendages on ventral side of abdomen.
Notes: Amphipods are also crustaceans. The family Hyalellidae was formerly called Talitridae so some publications may refer to this group by its old name, but they are the same organisms. Scuds can swim rapidly on their sides when disturbed, hence the name side-swimmer. Amphipods are important food sources for fish and invertebrate predators. They can be extremely abundant in water bodies without fish and are important in the breakdown of organic matter. Amphipods are generally white when preserved. The two common families can be separated by the presence or absence of a segmented flagellum arising from distal end of the third antennal segment. However, the flagellum is sometimes difficult to discriminate from setae so caution must be exercised when looking for this character.

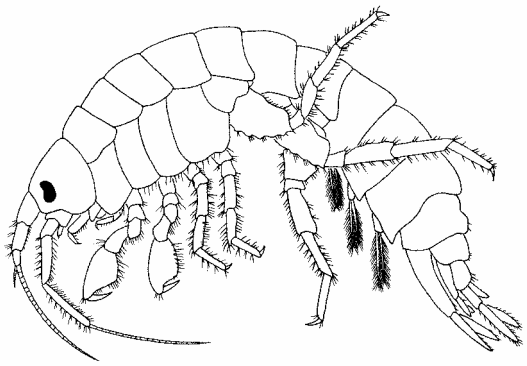


Figure 2.76: *Gammarus fasciatus* (Gammaridae) Lateral View.

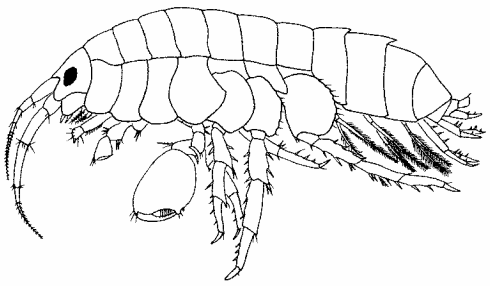


Figure 2.77: *Hyalella azteca* (Hyalellidae) Lateral View.

Gastropoda (Class)

Common Name: Snails and Limpets
Feeding Group: Scrapers
Tolerance Value: 7 (High)
Habitat: Gastropods are found in a variety of habitats including streams, rivers, ponds, lakes, marshes, and swamps. They occur on rocks, vegetation, silt, detritus, and sand.
Size: Small to large (2-70 mm)
Characteristics: Single shell; shell is usually coiled (not coiled in the limpets[Fig. 2.82]).
Notes: Snails can be divided into two groups based on how they breathe. One group uses gills to obtain dissolved oxygen from the water (Prosobranchia) while the other group breathes air using a structure that functions like a lung (Pulmonata). Generally the presence of gilled snails is a sign of better water quality (higher dissolved oxygen). Although the presence of a few lunged snails does not necessarily indicate pollution, a large number of these snails is often indicative of impacted waters since they can survive in low dissolved oxygen conditions.

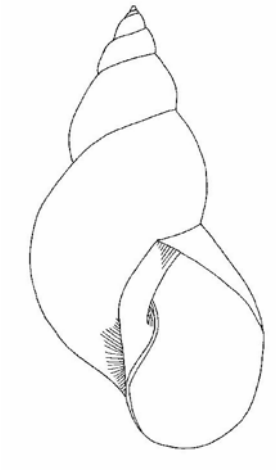


Figure 2.78: Lymnaeidae, Ventral View.

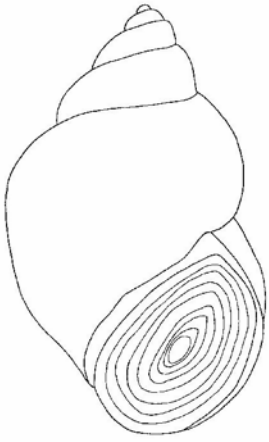


Figure 2.79: Bithyniidae, Ventral View.

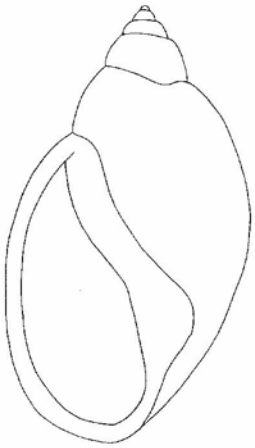


Figure 2.80: *Physella gyrina* (Physidae) Ventral View.

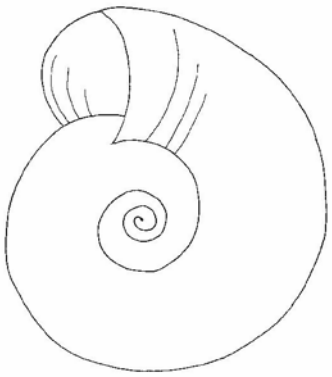


Figure 2.81: *Gyraulus deflectus* (Planorbidae) Ventral View.

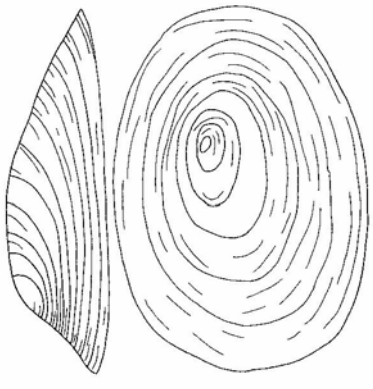


Figure 2.82: *Ferrissia* sp. (Ancylidae) Ventral View.

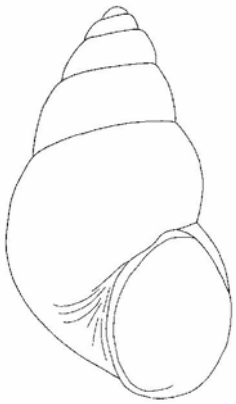


Figure 2.83: *Littoridinops tenuipes* (Hydrobiidae) Ventral View.

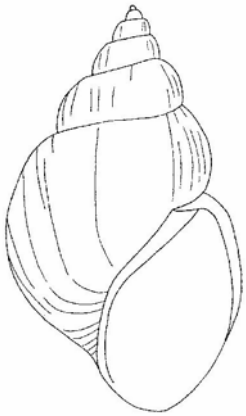


Figure 2.84: *Lioplax subcarinata* (Viviparidae) Ventral View.

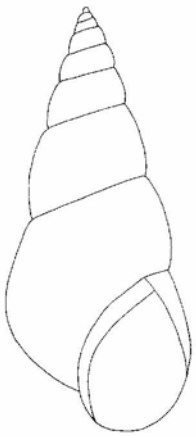


Figure 2.85: *Goniobasis livescens* (Pleuroceridae) Ventral View.

Bivalvia (Class)

Common Name: Freshwater Mussels and Clams
Feeding Group: Collector/Filterers
Tolerance Value: 7 (High)
Habitat: Bivalves can be found in nearly any habitat. They generally occur buried in the substrate although some taxa such as zebra mussels occur attached to solid substrates.
Size: Small to Very Large (2-250 mm)
Characteristics: Two shells opposite of each other connected by hinge; shape of shells highly variable.
Notes: Some species in this group can be very large (up to 250 mm) as in the Unionidae, while others, such as the Sphaeriidae, can be very small (2-20 mm). One particular species of mussel has been getting a lot of attention. The introduced zebra mussel (Fig. 2.89) can have a major impact on aquatic ecosystems through competition for resources and by smothering some species of native bivalves. The Asian clam (*Corbicula fluminea*) is also an introduced species.

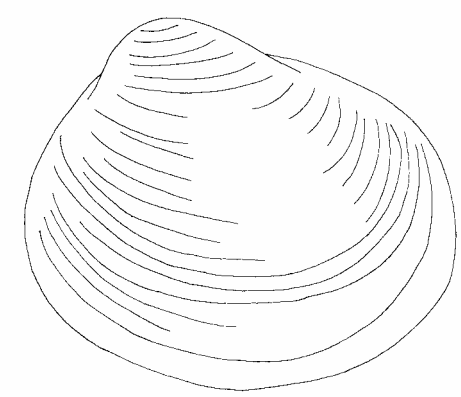


Figure 2.86: Corbiculidae.

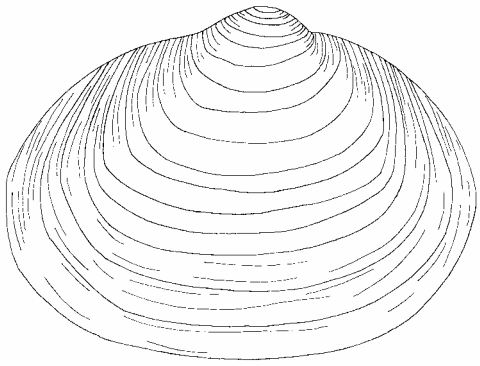


Figure 2.87: *Sphaerium simile* (Sphaeriidae).

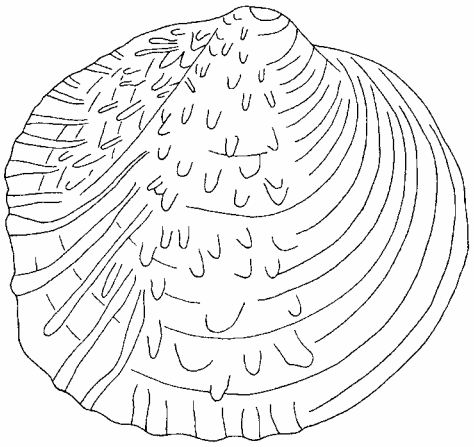


Figure 2.88: Unionidae.

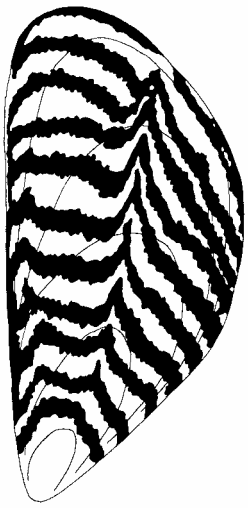


Figure 2.89: *Dreissena polymorpha* (Dreissenidae).

Collembola (Order)

Common Name: Springtails
Feeding Group: Collector/Gatherers
Tolerance Value: 10 (High)
Habitat: Springtails occur on water surfaces in calm waters or water body margins in nearly any type of water body.

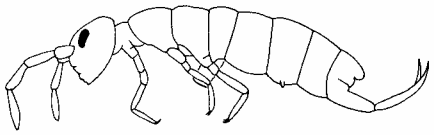


Figure 2.90: *Agrenia bidenticulata* (Collembola) Lateral View.

Size: Small (<2 mm)
Characteristics: Wings absent; abdomen with only six segments; tubule (collophore) on ventral surface of first abdominal segment; abdomen terminates in a forked appendage (furcula).
Notes: These are small invertebrates are closely related to the insects. In fact some publications include Collembola with the class Insecta. Most species of this order are not associated with water bodies. Those species that are semiaquatic do not enter the water and are found on the surface or margins of water bodies. When disturbed, Collembola jump by using their furcula. The furcula is held under the abdomen by a catch on the third abdominal segment. When the furcula is released, the organism is propelled into the air.

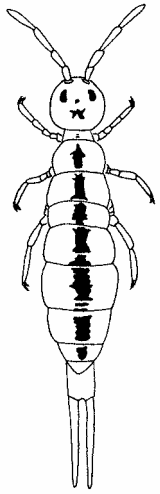


Figure 2.91: *Isotomurus tricolor* (Collembola) Dorsal View.

Other Commonly Encountered Invertebrates Not Included in the Key

Cladocera (Suborder)

Common Name: Water Fleas
Feeding Group: Collector/Filterers
Tolerance Value: Undetermined
Habitat: Planktonic cladocerans from lakes and ponds are probably the best known, but these small crustaceans also occur in marshes, bogs, streams, and rivers. Most are associated with the water column, but some live among the gravel in riffles. They are very abundant in most lakes, ponds, and wetlands, but tend to be much less common in fast flowing streams.
Size: Small (<3 mm)
Characteristics: Body shape usually round or oval and appearing to consist of two valves as in a clam; large eye on head; first pair of antennae inconspicuous; second pair of antennae large and used for swimming; legs and postabdomen concealed.

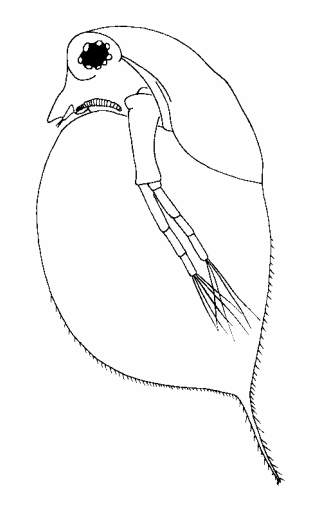


Figure 2.92: *Daphnia pulex* (Daphniidae) Lateral View

Notes: Cladocerans are very well studied and important aquatic organisms. They are an important link in the food webs of lakes and ponds as they are a food source for a variety of fish and invertebrates. In some cases they are responsible for helping to clarify water in lakes and ponds by consuming large amounts of algae. They are also very sensitive to a variety of man-made chemicals so they are commonly used to test the toxicity of these compounds.

Copepoda (Subclass)

Common Name: Copepods
Feeding Group: Collector/Gatherers, Collector/Filters
Tolerance Value: Undetermined
Habitat: Copepods are found in nearly every type of water body in the water column or in the benthos. They are most abundant in lakes, ponds, and wetlands and tend to be much less common in fast flowing streams.
Size: Small (<4.5 mm – usually <2 mm)
Characteristics: Body shape is generally cylindrical; single simple eye is generally present; first antennae long; second antennae generally small; abdomen and some of the thoracic segments are usually articulated to form a tail-like structure; a pair of rami extend from last abdominal segment.
Notes: Copepods are an important segment of many aquatic food webs because they consume algae and other microorganisms and are in turn fed on by fish and invertebrates.

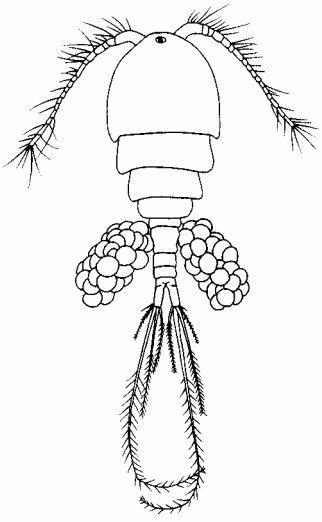


Figure 2.93: Macrocyclops ater (Cyclopidae) Dorsal View

Ostracoda (Class)

Common Name: Seed Shrimps
Feeding Group: Collector/Filterers, Collector/Gatherers
Tolerance Value: Undetermined
Habitat: Ostracods can be found in a variety of habitats including streams, lakes, ponds, and marshes. They sometimes occur in flowing waters, but they most commonly occur in standing waters.

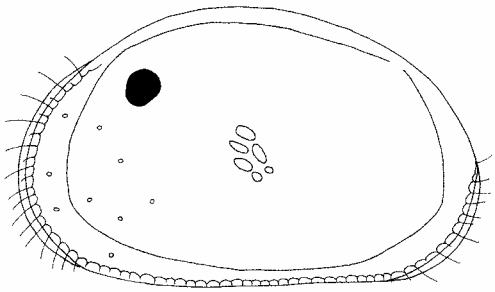


Figure 2.94: *Cypria obesa* (Ostracoda) Lateral View.

Size: Small (<3 mm)
Characteristics: Body covered by a shell giving the organism a bivalve-like or seed-like appearance; appendages (*e.g.*, legs, maxillae, mandibles, and antennae) are concealed within the shell although some appendages may protrude in preserved specimens.
Notes: Although sometimes abundant, ostracods are not a large part of aquatic food webs and they are not a large food source for fish. Due to the presence of a shell, there is a great deal of sub-fossil information on ostracods. They have been used in some studies to reconstruct the chemical and physical habitat of water bodies by looking at ostracods in sediment core samples.