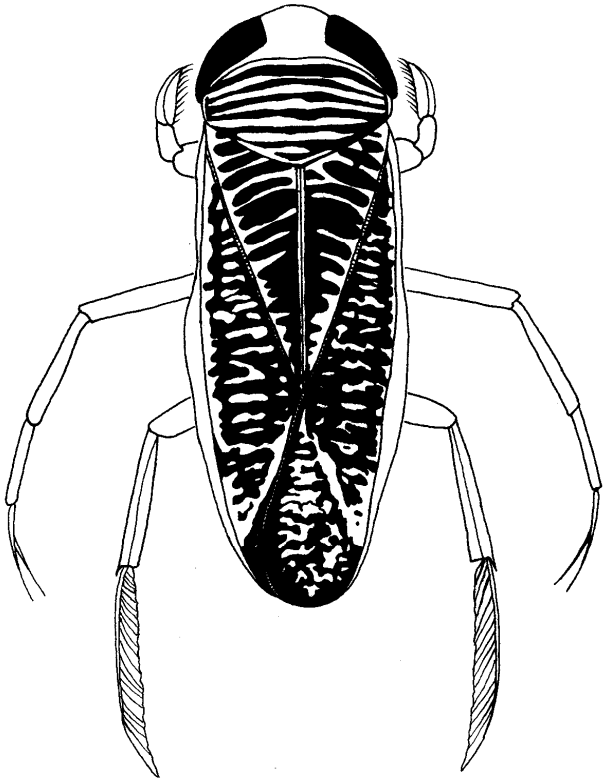
CHAPTER 7

HEMIPTERA
(Aquatic & Semiaquatic True Bugs)



Draft
June 17, 2009

7 ORDER HEMIPTERA
Aquatic & Semiaquatic True Bugs

The majority of Hemiptera are not associated with aquatic habitats. Aquatic hemipterans are unlike most aquatic taxa in that the adults and larvae occupy the same habitat. Aquatic and semiaquatic Hemiptera can be separated into two groups based on their antennal morphology and the habitat in which they are generally found. Some Hemiptera are primarily aquatic and can be recognized by the possession of antennae that are shorter than the head and concealed below the eye (see Figure 7.2). One exception is the Gelastocoridae, which are riparian and possess short antennae. The truly aquatic species are usually found under water, but many possess wings, which allow movement between water bodies. In contrast, most semiaquatic species of Hemiptera have antennae longer than their heads (see Figure 7.3) and can be found on the water's surface or at the water's margin.

Although some taxa are primarily aquatic, most Hemiptera do not rely heavily on dissolved oxygen in the water, but instead obtain oxygen from the atmosphere. Due to their ability to utilize atmospheric oxygen, Hemiptera are often able to exist in water bodies with low levels of dissolved oxygen.

Most aquatic and semiaquatic Hemiptera are predatory. After grasping a prey item, these predatory hemipterans inject enzymes into the prey with their beak or rostrum, first to poison and then to digest the insides of their prey. The softened internal structures of the prey are then sucked up through the beak. Some species of these Hemiptera can inflict a painful bite in self-defense when handled (*e.g.*, Belostomatidae, Naucoridae, Nepidae).

There are many families and genera that likely occur in Mongolia, but their presence needs to be confirmed. The following key includes known families as well as number of families that likely occur in Mongolia, but this remains to be confirmed.

Hemiptera Morphology

The most distinctive characteristic of both immature and adult Hemiptera is the presence of mouthparts that are modified into an elongate, sucking beak. Most hemipteran adults possess "hemelytra", which are modified fore wings with a leathery base and membranous distal half (Figure 7. 1). Some adults and all larvae lack wings, but most mature larvae possess wing pads. Both adults and larvae have three pairs of segmented legs and there are two tarsal claws present on at least some of the legs.

The shape and length of the antennae, legs, and beak (*i.e.*, rostrum) can be important for separating Hemiptera families. Body shape and the presence or absence of veins in the wing membrane are also diagnostic for some taxa.

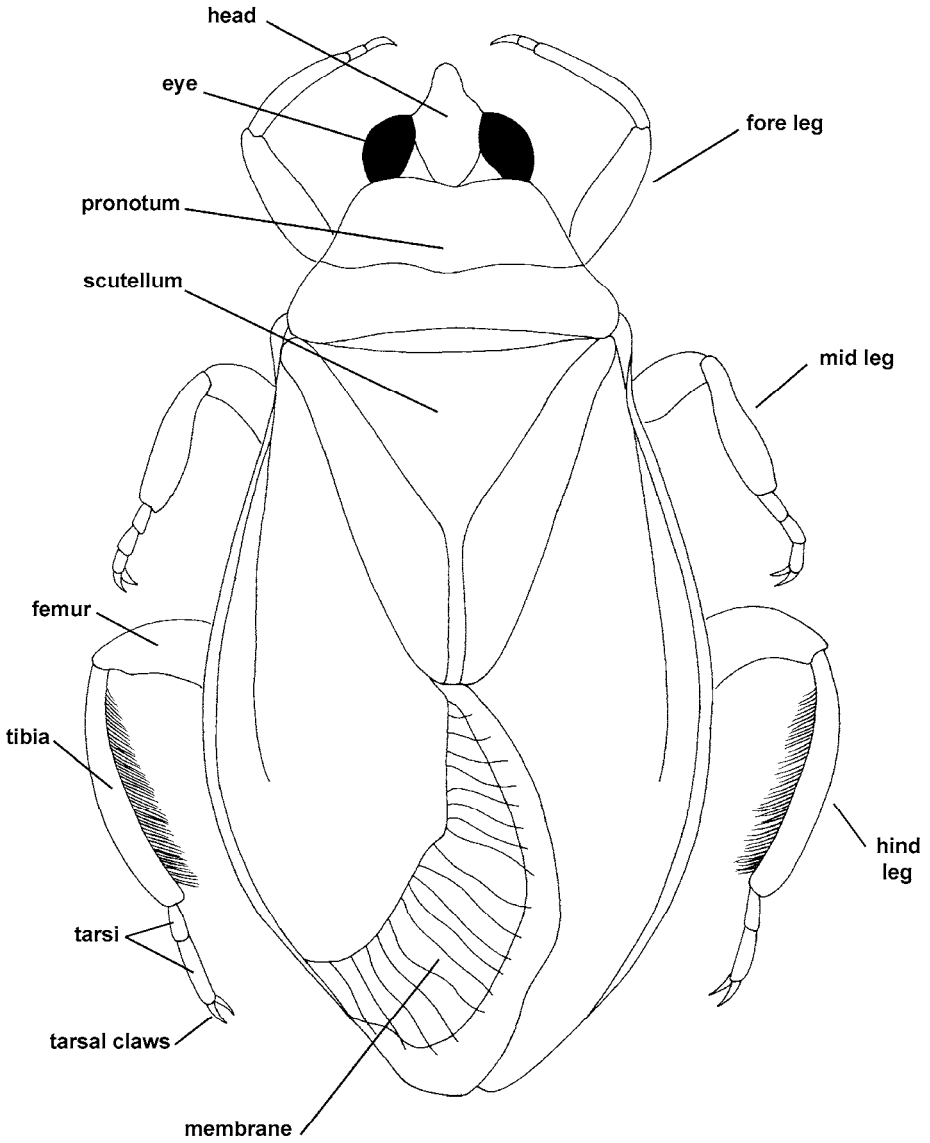


Figure 7. 1: Dorsal view of hemipteran adult.

Key to Hemiptera Families (Adults)

1. Antennae shorter than head and concealed below eye (Figure 7.2) 2

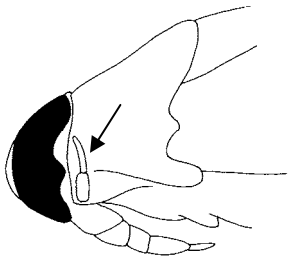


Figure 7.2: Head of Notonectidae, adult, Lateral View.

1'. Antennae longer than head and usually conspicuous (Figure 7.3) 8

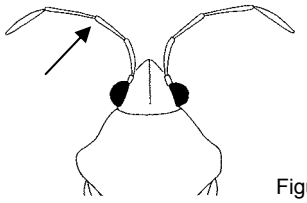


Figure 7.3: Head of *Microvelia beamri* (Veliidae) adult, Dorsal View.

2(1). Beak broad and triangular without distinct segments (Figure 7.5); fore tarsus scoop-like and edged with setae (Figure 7.4) ..... **Corixidae *p. 96***

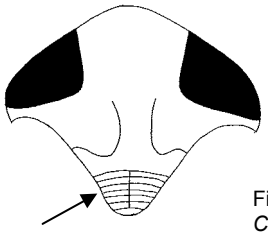


Figure 7.5: Head of *Corisella* sp. (Corixidae) adult, Ventral View.

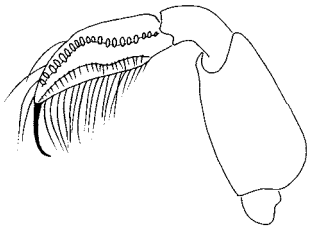


Figure 7.4: Fore leg of *Sigara scabra* (Corixidae) adult, Ventral View.

2'. Beak cylindrical with 3-4 distinct segments (Figure 7.6); fore tarsus not as above 3

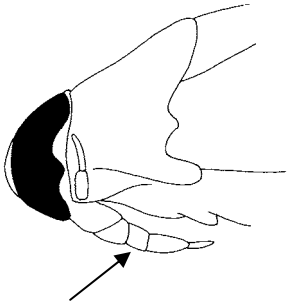


Figure 7.6: Head of Notonectidae, adult, Lateral View.

3(2'). Abdomen terminating in an elongate breathing tube (Figure 7.7); **Not known from Mongolia** ..... **Nepidae *p. 100***

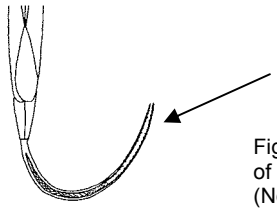


Figure 7.7: Apex of abdomen of *Ranatra brevicollis* (Nepidae) adult, Dorsal View.

3'. Abdomen not terminating in an elongate breathing tube (Figure 7.9); if terminal respiratory appendages are present they are short (Figure 7.8) 4

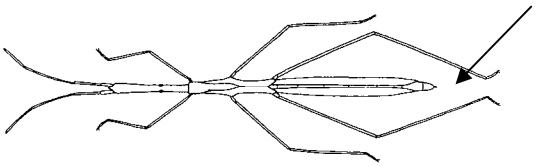


Figure 7.9: *Hydrometra martini* (Hydrometridae) adult, Dorsal View.

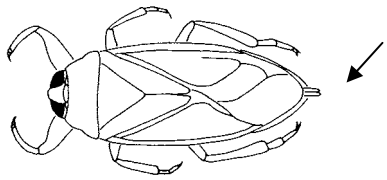


Figure 7.8: *Lethocerus americanus* (Belostomatidae), adult, Dorsal View.

4(3'). Eyes protuberant or bulging (Figure 7.10); legs lacking a fringe of swimming hairs; ocelli present (Figure 7.11); toad-like in appearance; **Not known from Mongolia** ..... **Gelastocoridae *p. 97***

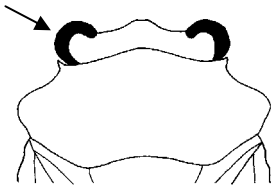


Figure 7.10: Head of *Gelastocoris oculatus* (Gelastocoridae) adult, Dorsal View.

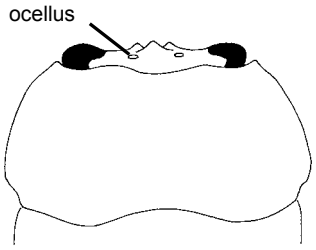


Figure 7.11: Head of *Nerthra* sp. (Gelastocoridae) adult, Dorsal View.

4'. Eyes not protuberant (Figure 7.12); legs with swimming hairs; ocelli absent (Figure 7.12)... 5

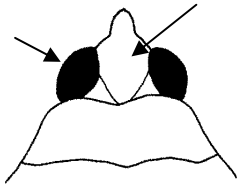


Figure 7.12: Head of *Belostoma flumineum* (Belostomatidae) adult, Dorsal View.

5(4'). Body convex (Figure 7.13); small (2.0-2.5 mm); **Not known from Mongolia**..... ..... **Pleidae *p. 101***

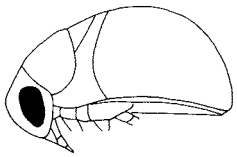


Figure 7.13: Body of *Neoplea striola* (Pleidae) adult, Lateral View.

5'. Body flattened (Figure 7.14) or elongate (Figure 7.15); > 5 mm long 6

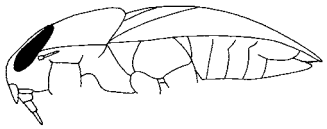


Figure 7.14: Body of Naucoridae, adult, Lateral View.

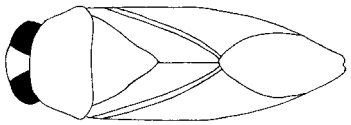


Figure 7.15: Body of *Notonecta unifasciata* (Notonectidae) adult, Dorsal View.

6(5'). Body elongate; hind legs oar-like (Figure 7.16); hind tarsal claws inconspicuous (Fig. 7.16); **Not known from Mongolia**.....**Notonectidae *p. 100***

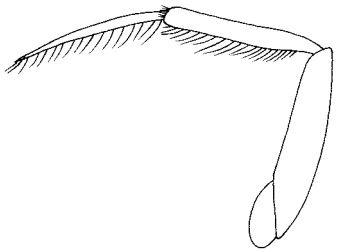


Figure 7.16: Leg of *Notonecta undulata*, (Notonectidae) larva.

6'. Body flattened; tarsal claws conspicuous..... 7

7(6'). Fore wing membrane with veins (Figure 7.17); apex of abdomen with a pair of flat respiratory appendages (air straps) (Figure 7.18) – *note: in preserved specimens the air straps are often retracted*; >18 mm; **Not known from Mongolia**.....**Belostomatidae *p. 96***

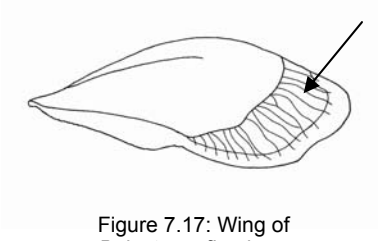


Figure 7.17: Wing of *Belostoma flumineum* (Belostomatidae) adult, Dorsal View.

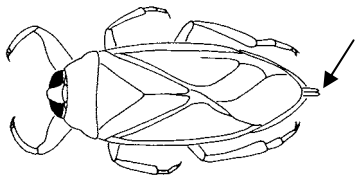


Figure 7.18: *Lethocerus americanus* (Belostomatidae) adult, Dorsal View.

7'. Fore wing membrane without veins (Figure 7.19); apex of abdomen lacking respiratory appendages; <18 mm; **Not known from Mongolia**.....**Naucoridae *p. 99***

Figure 7.19: Wing of Pelocoris shoshone (Naucoridae) adult, Dorsal View.

8(1'). Claws of fore legs inserted before apex (Figure 7.20).....9

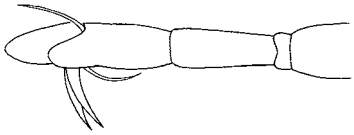


Figure 7.20: Tarsi of *Rhagovelia* sp. (Veliidae) adult, Lateral View.

8'. Claws of fore legs inserted at apex (Figure 7.21).....10

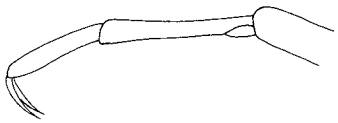


Figure 7.21: Tarsi of Teloleuca sp. (Saldidae) adult, Lateral View.

9(8). Metafemur long and extending well beyond apex of abdomen (Figure 7.23, Figure 7.22).... ..... **Gerridae *p. 97***

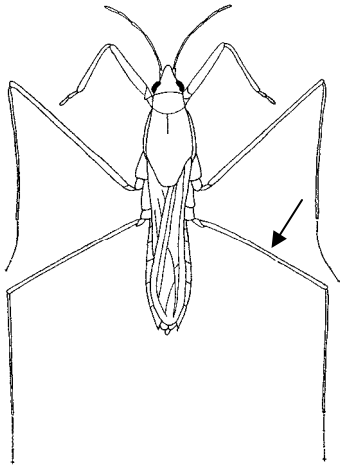


Figure 7.23: *Aquarius remigis* (Gerridae) adult, Dorsal View.

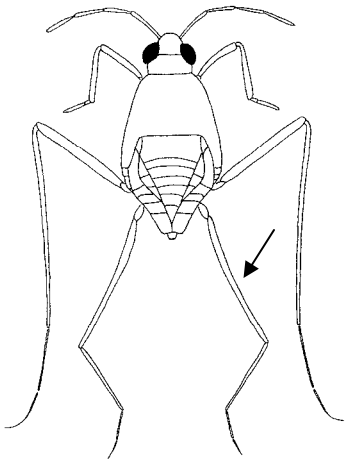


Figure 7.22: *Trepobates becki* (Gerridae) adult, Dorsal View.

9'. Metafemur short and not or only slightly extending beyond apex of abdomen (Figure 7.25, Figure 7.24); **Not known from Mongolia** ..... **Veliidae *p. 102***

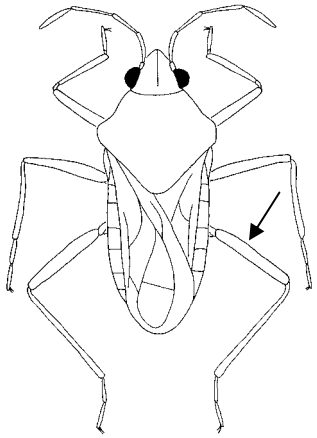


Figure 7.25: *Microvelia beamri* (Veliidae) adult, Dorsal View.

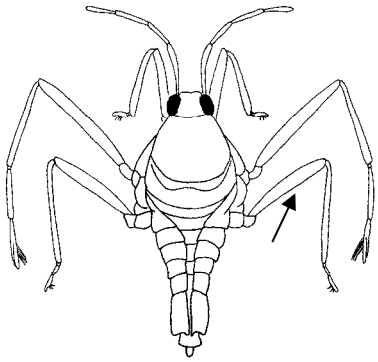


Figure 7.24: *Rhagovelia obesa* (Veliidae) adult, Dorsal View.

10(8'). Body slender and elongate; head as long as thorax (Figure 7.26); **Not known from Mongolia** ..... **Hydrometridae *p. 98***

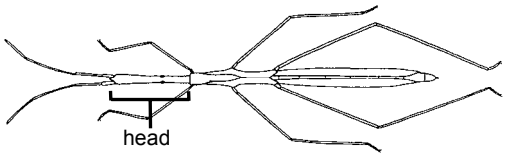


Figure 7.26: *Hydrometra martini* (Hydrometridae) adult, Dorsal View.

10'. Body not slender and elongate; head shorter than thorax 11

11(10'). Wings present with veins in membrane of fore wing (Figure 7.27).....**Saldidae *p. 101***

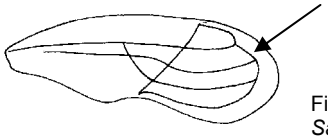


Figure 7.27: Wing of *Saldula* sp. (Saldidae) adult, Dorsal View.

11'. Wings absent or if present lacking veins in membrane (Figure 7.28).....12

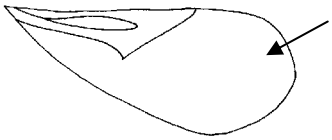


Figure 7.28: Wing of *Hebrus sobrinus* (Hebridae) adult, Dorsal View.

12(11'). Legs with dark spines or bristles (Figure 7.29); **Not known from Mongolia**..... .....**Mesoveliidae *p. 99***

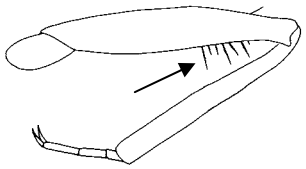


Figure 7.29: Leg of Mesoveliidae, adult, Lateral View.

12'. Legs without spines or bristles (Figure 7.30); **Not known from Mongolia**..... .....**Hebridae *p. 98***

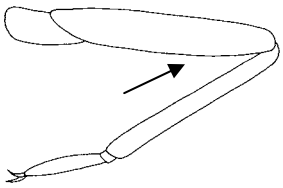


Figure 7.30: Leg of Hebridae, adult, Lateral View.

Hemiptera Family Descriptions

Belostomatidae

Common Name: Giant Water Bugs
Feeding Group: Predators
Tolerance Value: 10 (High)
Habitat: Belostomatids most commonly occur in lakes, ponds, and marshes and less commonly in pools and backwaters in streams and rivers. Belostomatids can also be found in temporary pools and ditches. They are usually associated with aquatic vegetation.
Size: Large (25-45 mm)
Characteristics: Body flattened and oval; antennae shorter than head, concealed below eye; beak cylindrical; fore legs raptorial; mid and hind legs fringed with swimming hairs; fore wing membrane with veins; a pair of strap-like appendages present at apex of abdomen.

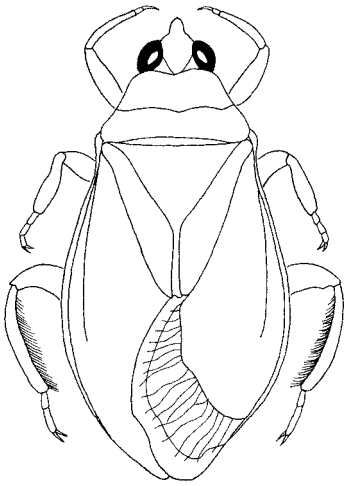


Figure 7.31: *Belostoma flumineum* (Belostomatidae) adult, Dorsal View.

Notes: **Not known from Mongolia.** Belostomatids are superficially very similar to naucorids, especially as larvae. Belostomatids are voracious predators and have been observed attacking fish up to 9 cm long. They are sometimes called "toe biters" because when handled carelessly or stepped on, belostomatids can inflict a painful bite with their beak or rostrum.

Corixidae

Common Name: Water Boatmen
Feeding Group: Collector/Gatherers
Tolerance Value: 9 (High)
Habitat: Corixids are found in areas of standing or slow flowing water in ponds, lakes, marshes, streams, and rivers.
Size: Small (3-11 mm)
Characteristics: Antennae shorter than head, concealed below eye; beak broad and triangular without distinct segments; fore tarsus scoop-like and edged with setae.
Notes: Corixids feed differently than most other hemipterans. Most corixids feed by disturbing soft sediments and detritus with their scoop-like fore legs and consuming organisms stirred up from the sediment. These bugs breathe by using an air bubble held under their wings, which must be renewed periodically by breaking the surface of the water.

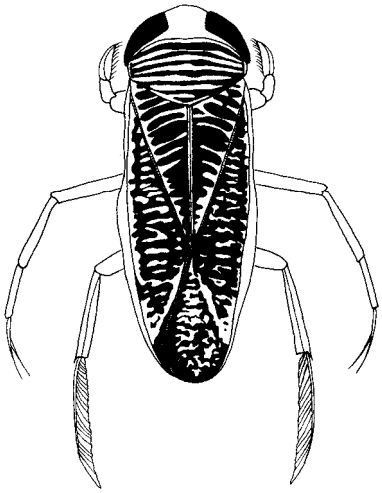


Figure 7.32: *Sigara mckinstryi* (Corixidae) adult, Dorsal View.

Gelastocoridae

Common Name: Toad Bugs
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Gelastocorids occur on sandy beaches or mud flats at the margins of lakes, ponds, wetlands, and streams.
Size: Small (5-9 mm)
Characteristics: Similar to miniature toads; body warty; eyes protuberant; antennae short and concealed; fore legs raptorial; all tarsi have two claws.
Notes: **Not known from Mongolia.** Gelastocorids look remarkably like small toads. They can be observed hopping at stream and lake margins, but when disturbed they sometimes remain motionless. They are predators of other invertebrates inhabiting the same habitat.

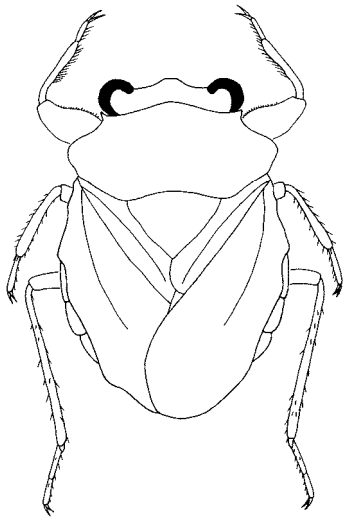


Figure 7.33: *Gelastocoris oculatus* (Gelastocoridae) adult, Dorsal View.

Gerridae

Common Name: Water Striders
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Gerrids are generally found on the surface of the water in ponds, lakes, marshes, streams, and rivers.
Size: Small to medium (3-18 mm)
Characteristics: Body shape variable; antennae longer than head; beak cylindrical; claws of protarsus inserted before apex; metafemur extends well beyond tip of abdomen.
Notes: Gerrids are commonly observed skating on the water's surface using their mid and hind legs. The fore legs are held above the water and are used for grasping prey. Gerrids often feed on insects trapped in the surface film and use disturbances on the water to detect prey much like a spider uses a web. Gerrids breathe air through spiracles like most terrestrial insects. When they dive underwater, air is trapped by non-wetting hairs along the body, providing a store of oxygen. Some of the smaller species resemble veliids, but they can be separated by the length of the femur. Some species are wingless, making it difficult to separate adults from larvae.

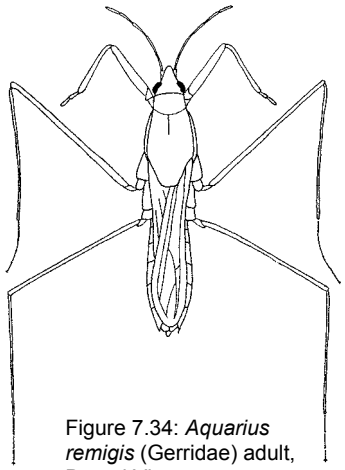


Figure 7.34: *Aquarius remigis* (Gerridae) adult, Dorsal View.

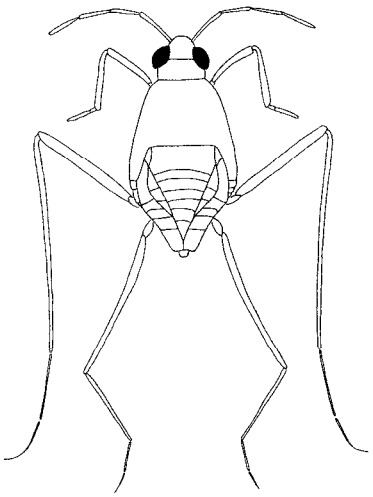


Figure 7.35: *Trepobates becki* (Gerridae) adult, Dorsal View.

Hebridae

Common Name: Velvet Water Bugs
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Hebrids occur at the margins of ponds, marshes, and streams or on the surface of floating mats of vegetation in these habitats.
Size: Small (1-2.5 mm)
Characteristics: Body short and stout and covered in fine hairs; antennae longer than head; beak cylindrical; membrane not veined (in winged forms); 2 tarsal segments (first segment short and second segment long); claws inserted at apex.
Notes: **Not known from Mongolia.** Hebrids have a similar appearance to some veliids, but hebrids can be recognized by possessing tarsal claws, which are inserted at the apex of the leg. These stocky insects are often overlooked because of their small size. When disturbed, hebrids often crawl beneath the water surface.

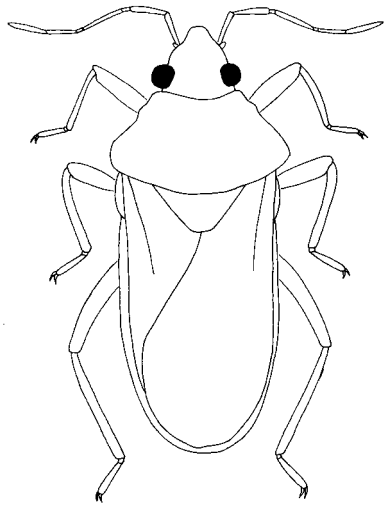


Figure 7.36: *Hebrus* sp. (Hebridae) adult, Dorsal View.

Hydrometridae

Common Name: Marsh Treaders, Water Measurers
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Hydrometrids are most commonly collected from marshes and bogs, but they also occur at the margins of ponds and streams. They are generally associated with emergent vegetation and floating mats of vegetation or detritus.
Size: Small (7-10 mm)
Characteristics: Body slender and elongate; head as long as thorax with eyes situated midway up head; antennae longer than head; beak cylindrical; legs thin and thread-like with two claws at terminal end; claws inserted at apex.
Notes: **Not known from Mongolia.** Hydrometrids generally walk slowly over the surface of the water or on mats of vegetation. Although they walk on the water, they are not as agile as gerrids and veliids because their tarsal claws are located at the apex of the tarsi. These insects feed on dead and dying insects that fall onto the water surface or onto the mats they inhabit.

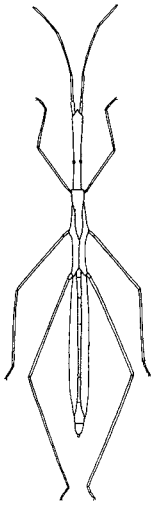


Figure 7.37: *Hydrometra martini* (Hydrometridae) adult, Dorsal View.

Mesoveliidae

Common Name: Water Treaders
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Mesoveliids are generally found associated with floating mats of detritus and vegetation or at the margins of ponds, marshes, and streams.
Size: Small (2-4 mm)
Characteristics: Body slender and somewhat boat-shaped; antennae longer than head; membrane not veined (in winged forms); beak cylindrical; legs with dark spines or bristles; all legs of similar length and with 3 tarsal segments; claws inserted at apex.
Notes: **Not known from Mongolia.** Mesoveliids prey on invertebrates along the shore or those caught in the water surface. Some adults in this family are wingless. When disturbed, mesoveliids will skate across the water with surprising speed and agility.

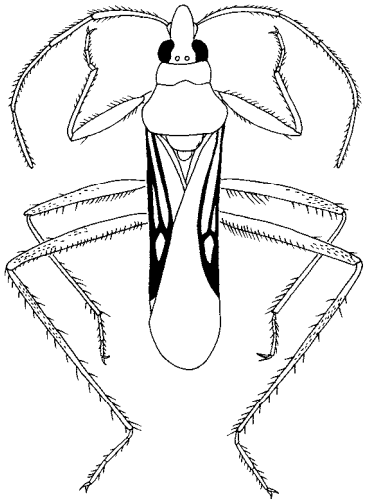


Figure 7.38: *Mesovelia mulsanti* (Mesoveliidae) adult, Dorsal View.

Naucoridae

Common Name: Creeping Water Bugs
Feeding Group: Predators
Tolerance Value: 5 (Moderate)
Habitat: Naucorids most commonly occur along vegetated margins of lakes, ponds, marshes, and in the pools and backwater in streams.
Size: Small to medium (5-15 mm)
Characteristics: Body flattened and oval; antennae shorter than head, concealed below eye; beak cylindrical; fore legs raptorial; mid and hind legs fringed with swimming hairs; fore wing membrane without veins; respiratory appendages absent from terminal end of abdomen.
Notes: **Not known from Mongolia.** As their name implies, they are commonly observed creeping along the substrate or on vegetation in search of prey. Like belostomatids, naucorids can give a painful bite when handled.

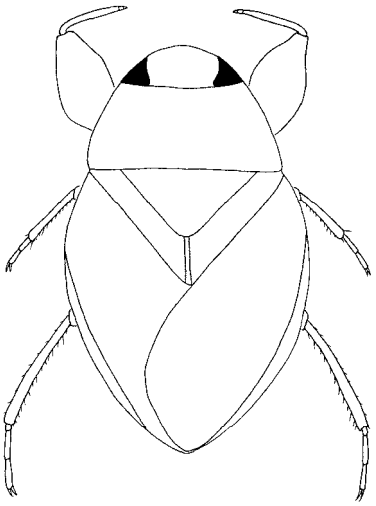


Figure 7.39: *Pelocoris femoratus* (Naucoridae) adult, Dorsal View.

Nepidae

Common Name: Water Scorpions
Feeding Group: Predators
Tolerance Value: 8 (High)
Habitat: Nepids can be collected in ponds, marshes, and streams in areas of calm water. They are usually found at the vegetated margins of these water bodies.
Size: Medium to large (15-45 mm) – not including respiratory tube.
Characteristics: Body usually cylindrical (sometimes oval and flattened); antennae shorter than head, concealed below eye; beak cylindrical; fore legs raptorial; mid and hind legs long and slender; abdomen terminating in an elongate breathing appendage.
Notes: **Not known from Mongolia.** Nepids are sit-and-wait or stalking predators. They grasp their prey with raptorial fore legs that are similar to those of a praying mantis. The long respiratory appendage is used to maintain contact with the atmosphere in order to obtain oxygen. These insects can be observed hanging with their head facing downward and the respiratory appendage in contact with the water surface as they wait for prey.

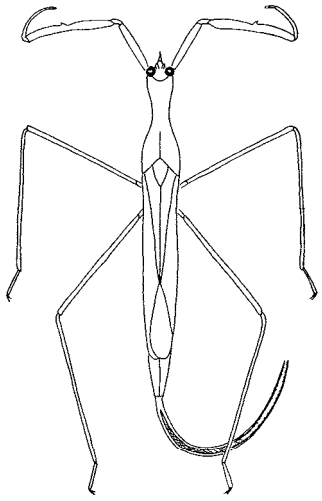


Figure 7.40: *Ranatra brevicollis* (Nepidae) adult, Dorsal View.

Notonectidae

Common Name: Backswimmers
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Notonectids most commonly occur along vegetated margins of lakes and ponds and in marshes. They are also sometimes found in the pools and backwaters in streams and rivers. Notonectids can also be found in temporary pools and ditches.
Size: Small to medium (5-15 mm)
Characteristics: Body cylindrical; antennae shorter than head, concealed below eye; beak cylindrical; hind legs oar-like; hind tarsal claws inconspicuous.
Notes: **Not known from Mongolia.** Like pleids, notonectids swim on their backs using their oar-like legs to propel them. Notonectids spend most of their time hanging from the water surface at an angle with the tip of their abdomens in contact with the surface film. These bugs store air on the ventral side of their abdomens and under their wings. The coloration of notonectids is reversed compared to many other aquatic organisms. They are generally dark ventrally and light dorsally because they swim on their backs.

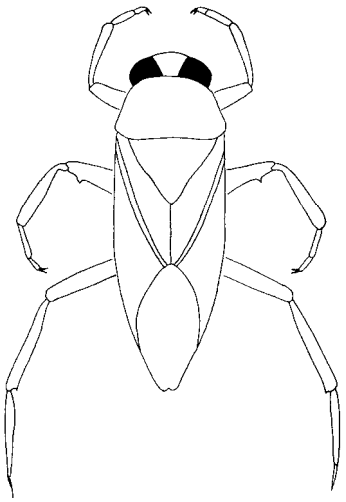


Figure 7.41: *Notonecta unifasciata* (Notonectidae) adult, Dorsal View.

Pleidae

Common Name: Pygmy Backswimmers
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Pleids are found in shallow standing or slow moving waters of ponds, marshes, and streams. They are generally found associated with emergent vegetation.
Size: Small (2-2.5 mm)
Characteristics: Body convex; antennae shorter than head and concealed below eye; beak cylindrical; legs of similar length although hind legs slightly longer and fringed with swimming hairs; two well developed claws at the end of each leg.
Notes: **Not known from Mongolia.** Pleids feed on small invertebrates such as ostracods, cladocerans, and mosquito larvae. As their name indicates, they swim on their backs using their hind legs to propel them. Pleids carry air under their wings and on their undersides when they submerge.

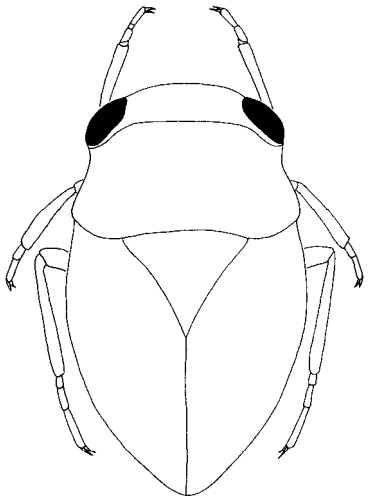


Figure 7.42: *Neoplea striola* (Pleidae) adult, Dorsal View.

Saldidae

Common Name: Shore Bugs
Feeding Group: Predators
Tolerance Value: Undetermined
Habitat: Saldids are found along the wetted margins of lakes, ponds, marshes, and streams.
Size: Small (2-8 mm)
Characteristics: Body oval; antennae longer than head; beak cylindrical; wings present with veins in membrane of fore wing; 4-5 closed cells in membrane; all legs of similar length and with 3 tarsal segments; claws inserted at apex.
Notes: Saldids feed on invertebrates found along the water body margins they inhabit. They can usually be seen flying and jumping in these habitats.

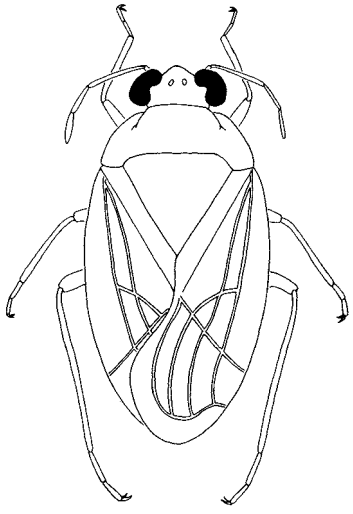


Figure 7.43: *Saldula* sp. (Saldidae) adult, Dorsal View.

Veliidae

Common Name: Broad-Shouldered Water Striders
Feeding Group: Predators
Tolerance Value: 6 (Moderate)
Habitat: Veliids most commonly occur on the surface of standing or slow moving water in lakes, ponds, marshes, and streams. They are usually observed at the margins of these habitats. However, they are also found in stream riffles behind rock or logs.
Size: Small (2-6 mm)
Characteristics: Body usually short and stocky; antennae longer than head; beak cylindrical; claws of protarsus inserted before apex; metafemur does not or only barely extends beyond tip of abdomen.
Notes: **Not known from Mongolia.** Veliids are found in the same habitats gerrids generally occupy, but veliids usually inhabit more protected areas. One genus is found primarily in riffles in streams. Veliids are commonly wingless (apterous) although some species are winged. Gerrids and veliids in general have similar feeding and breathing habits. Similarly, veliids and gerrids both have tarsal claws inserted before the apex of the leg. This morphological trait prevents their legs from penetrating the water's surface and allows them to skate on the waters surface.

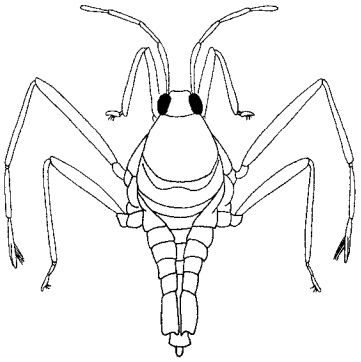


Figure 7.44: *Rhagovelia obesa* (Veliidae) adult, Dorsal View.

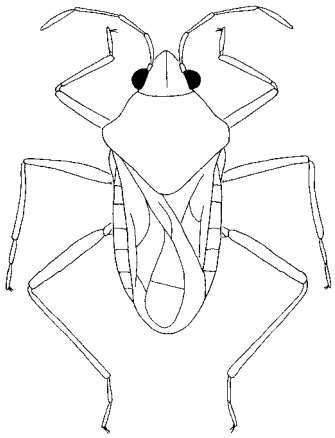


Figure 7.45: *Microvelia beameri* (Veliidae) adult, Dorsal View.

Families and Genera of Hemiptera Known from Mongolia

Belostomatidae	Hydrometridae*	Notonectidae*
Corixidae	Mesoveliidae*	Pleidae
Gelastocoridae*	Naucoridae*	Saldidae
Gerridae	Nepidae*	Veliidae*
Hebridae*		

* Occurrence in Mongolia needs to be confirmed.