
Aquatic Beetle Larvae and Adults (*Coleoptera*)

Many families of *Coleoptera* have common names. These names are given in the key immediately before the Latin name. Many beetles are aquatic as adults. The key to adult beetles immediately follows this key to the larvae.

Beetle larvae

- a. Two claws on each tarsus (foot)
..... 2
- 1**
- b. One claw on each tarsus **or** legs absent
..... 4
-

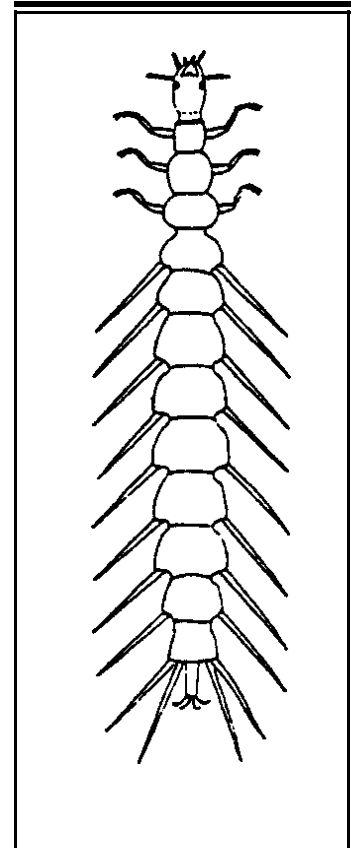
- a. Abdomen with 9-10 segments with feathery lateral gills; 2 pairs of hooks on terminal segment
..... *Whirligig Beetles, Gyrinidae*

2

These beetles are commonly seen swimming in circles on the water's surface. This is not normal behavior, but is an alarm mechanism sometimes triggered by the observers presence. Adults scavenge for floating food while larvae are predaceous. [M/2/2/C]

- b. Abdomen with 8 segments
..... 3
-

Gyrinidae (2a)



- a. Cerci (tail filaments) longer than the first abdominal segment and slender **or** cerci shorter or absent; legs long and adapted for swimming; mandibles sickle-shaped without enlarged molar portion
 *Predaceous Diving Beetles,*
Dytiscidae

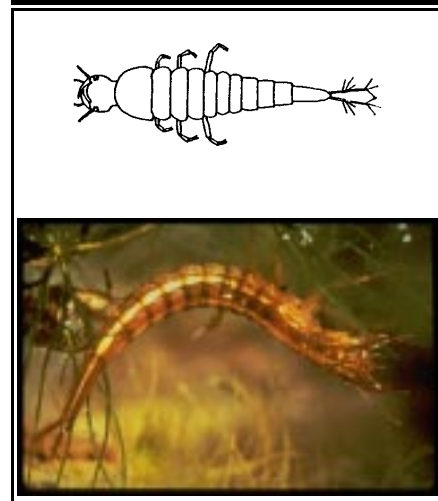
3

These beetles swim well enough to capture macroinvertebrates, tadpoles and fish. Adults fly and can therefore be found in a variety of water types. They trap air for underwater breathing beneath the elytra. [M/6/30/C]

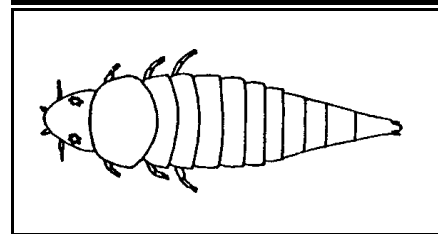
- b. Cerci shorter than abdominal segment 1 or absent; legs short and adapted for digging; mandibles with enlarged molar portion
 ... *Burrowing Water Beetles,* **Noteridae**

These beetles are mostly predators as adults and live in close association with vegetation. Larvae may be more omnivorous. [X/0/3/X]

Dytiscidae (3a)



Noteridae (3b)



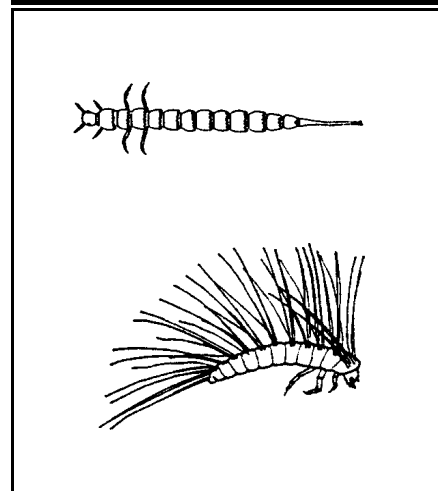
- a. Legs distinctly 5-segmented; abdomen ends in 1 or 2 long filaments; mature larvae have projections from back of thoracic and abdominal segments or 10th segment is very long
 *Crawling Water Beetles,* **Haliplidae**

4

These beetles are often found in pond weeds or submerged vegetation in streams. They can swim, but usually crawl. They carry air in a pocket under the elytra. Adults are herbivores and larvae are predators. [M/2/2/C]

- b. Legs variable; not with the above combination of projections and filaments
 5

Haliplidae (4a)



- a. Labrum (upper lip) continuous with head capsule (labium [lower lip] may be visible from above)
 6

5

- b. Labrum separated from front of head capsule by a thin, flexible groove (distinct suture)
 10

- a. Maxilla with palpifer appearing as part of stipes (6a); spiracles (openings to the respiratory system on the abdomen) ring-shaped
 *Rove Beetles, Staphylinidae* (in part)

6 *Rove beetles are well represented by non-aquatic species (which are commonly found in carrion or fungal growths, and can be predacious) and the species likely to be collected are usually semi-aquatic.*

- b. Maxilla with palpifer appearing as a segment of palp; spiracles with 2 openings

- a. Abdomen with 10 segments; cerci very short; legs short with 3 segments
 *Minute Mud-loving Beetles, Georyssidae*

7 *These beetles live in sediments on the edge of streams.*

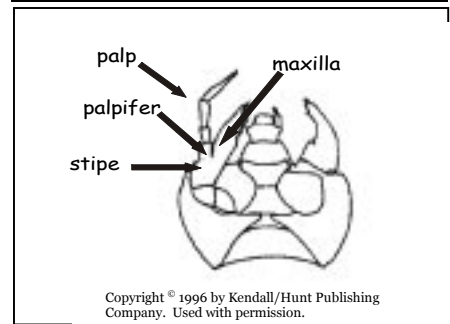
- b. Abdomen with 8 segments **or** abdomen with 10 segments; cerci long with 2-3 segments; legs long with 5 segments
 8

- a. Abdomen with 9 complete segments and the 10th reduced but distinct; hard skinned
 **Helophoridae**

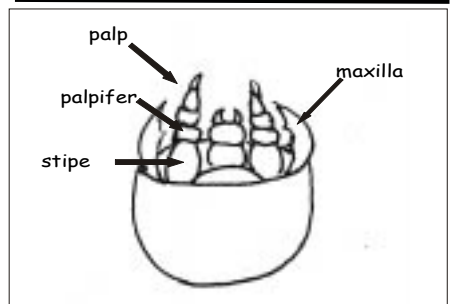
8 *Helophoridae are represented by a single aquatic genus and are closely related to the Hydrophilidae. Adults and larvae are herbivores living on margins of lakes and streams.*

- b. Abdomen with 8 complete segments with the 9th and 10th reduced
 9

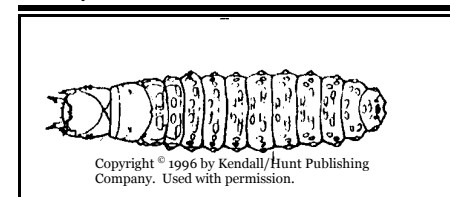
Staphylinidae (6a)



(6b)



Georyssidae (7a)



Helophoridae (8a)

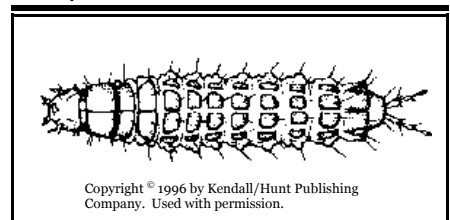


Fig. 6a, 7a, and 8a - From *An Introduction to Aquatic Insects of North America*, Third Edition by R.W. Merritt and K.W. Cummins. Copyright © 1996 by Kendall/Hunt Publishing company. Used with permission.

- a. Base of antennae outside and in front of mandibles; labium and maxillae in a furrow beneath head
 **Hydrochidae**

Hydrochidae are represented by the single aquatic genus Hydrochus and are closely related to the Hydrophilidae. Adults and larvae are herbivores, living on margins of lakes and streams.

9

- b. Base of antennae inside and behind mandibles; labium and maxillae at lower front edge of head
 *Water Scavenger Beetles,*
Hydrophilidae

These beetles live in lakes or streams backwaters and usually in association with vegetation. Larvae are predaceous as are some adults, though others feed on detritus.
 [M/8/20/C]

Hydrophilidae (9b)

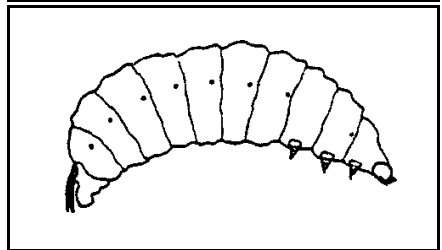


- a. Thorax and abdomen short and plump, without distinct sclerites (hardened plates); legs reduced or absent
 11

10

- b. Thorax and abdomen cylindrical or flattened, not obese; tops of thoracic and abdominal segments clearly defined; legs adapted for walking
 12

Chrysomelidae (11a)



- a. Legs very small but complete; spiracles on top of abdominal segment 8 forming large spines
 *Leaf Beetles, Chrysomelidae*

The aquatic larvae of one genus of leaf beetles (Donacia) feed on submerged vegetation and obtain oxygen by inserting their abdominal spines into plant tissues. Adults are terrestrial or semi-aquatic. [X/X/1/R]

11

- b. Legs entirely absent; spiracles sometimes on tubular extensions, but abdominal segment 8 without spines
 *Weevils, Curculionidae*

This large terrestrial family has a few aquatic species. Most larvae are not aquatic, living in plant tissues. Aquatic adults crawl on submerged vegetation nocturnally. [X/1/X/X]

Curculionidae (11b)

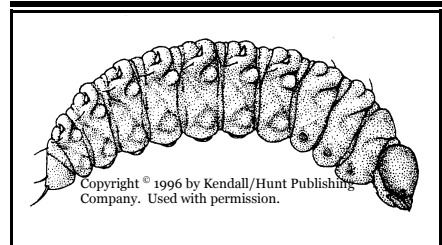


Fig. 11b - From *An Introduction to Aquatic Insects of North America*, Third Edition by R.W. Merritt and K.W. Cummins. Copyright © 1996 by Kendall/Hunt Publishing company. Used with permission.

- a. Abdomen with 10 segments; segment 9 with jointed cerci
..... 13

12

- b. Abdomen with 9 segments; segment 8 or 9 sometimes with immovable appendages, but without jointed cerci
..... 14

- a. Mandibles with large molar lobe
... *Minute Moss Beetles, Hydraenidae*

The Hydraenidae are closely related to the Hydrophilidae but are generally smaller. Larvae are riparian, developing in moist soil, and adults live in shallow water of stream or lake margins. [X/X/4/X]

13

- b. Mandibles sickle-shaped, without molar lobe
..... *Rove Beetles, Staphylinidae*
(in part)

Rove beetles are well represented by non-aquatic species (which are commonly found in carrion or fungal growths, and can be predacious) and the species likely to be collected are usually semi-aquatic.

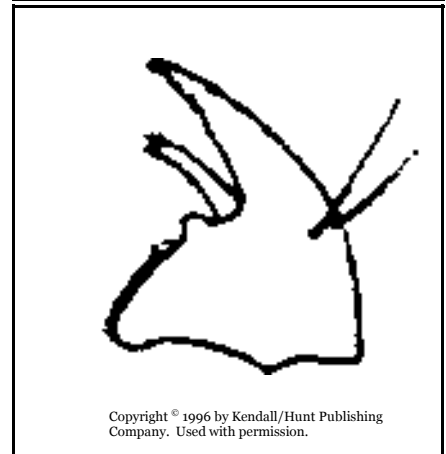
- a. Antennae longer than head and many-jointed
..... *Marsh Beetles, Scirtidae*

14

The larvae of marsh beetles live in the emergent zone, feeding on vascular plants and detritus. Adults are semi-aquatic or terrestrial. [H/1/4/C]

- b. Antennae short, with 2-3 segments
..... 15

Hydraenidae mandible with large molar lobe (13a)



Scirtidae (14a)

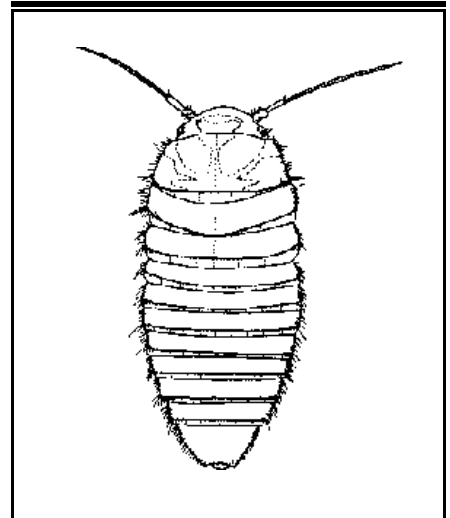


Fig. 13a - From *An Introduction to Aquatic Insects of North America*, Third Edition by R.W. Merritt and K.W. Cummins. Copyright © 1996 by Kendall/Hunt Publishing company. Used with permission.

- a. Body extremely flattened, with thoracic and abdominal segments expanded to cover head and legs
 *Water Pennies, Psephenidae*

15

The water penny larvae flatten themselves against rocks and woody debris in streams, where they scrape algae. Adults are non-feeding and inhabit the splash zone. [M/2/3/C]

- b. Body cylindrical or nearly cylindrical; head and legs visible from above
 16

- a. Abdominal segment 9 without an operculum (hinged flap); abdomen with gill clusters on segments 1-7 or in anal region
 .. *Toed-winged Beetle, Ptilodactylidae*

16

These larvae are detritivores, especially of rotting wood and leaf litter in streams, and the adults live in leaf litter in riparian areas. [M/1/1/C]

- b. Abdominal segment 9 with a moveable operculum covering the lower end
 17

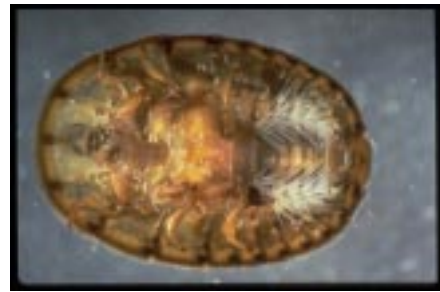
- a. Terminal abdominal segment divided or notched and with lateral ridges; head capsule with 5 groups of eye-spots on the side
 *Riffle Beetles, Elmidae*

17

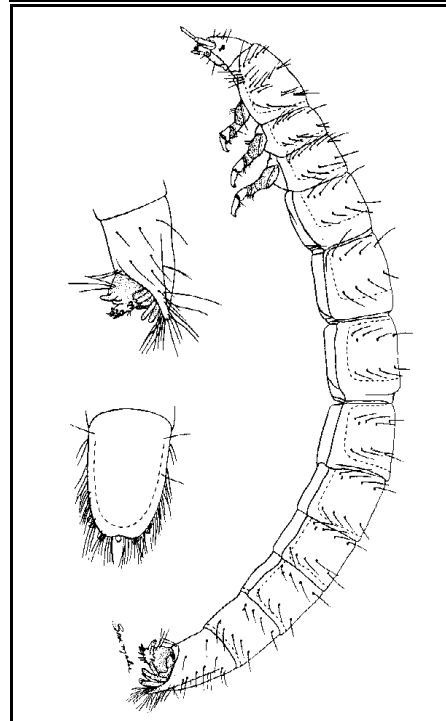
Riffle beetles live in cool, fast running and well oxygenated water. Larvae and adults are herbivores and detritivores. [M/7/8/C]

- b. Terminal abdominal segment rounded posteriorly; head capsule with groups of 6 eye-spots, 5 on the side and 1 below or eyes absent
 18

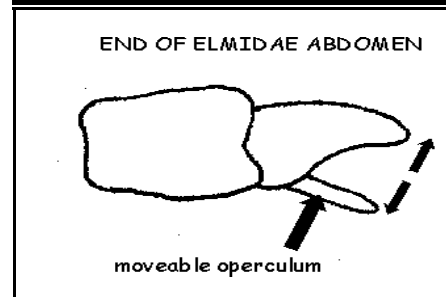
Psephenidae, bottom view showing gills (15a)



Ptilodactylidae (16a)



Elmidae, etc. (16b)



Elmidae (17a)



-
- a. Opercular chamber with 2 retractable hooks and 3 tufts of retractable gills; mandibles with prostheca (accessory feeler)
... *Marsh Loving Beetles, Lutrochidae*

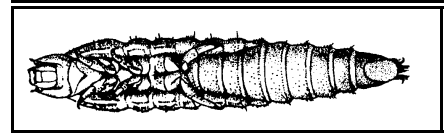
Lutrochidae feed on periphyton and adults live in the splash zone. [X/1/1/C]

18

- b. Opercular chamber without hooks or gills; mandibles without prostheca
.. *Long-toed Water Beetles, Dryopidae*

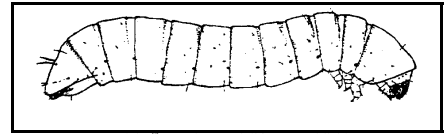
These beetles are covered with hairs that repel water and retain air for breathing under water. They crawl on the bottom of streams and are herbivores. [M/1/1/C]

Lutrochidae (18a)



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Dryopidae (18b)



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Beetle adults

- a. Eyes divided into upper and lower parts (4 eyes) either completely separate or with a dividing ridge; antennae short and clubbed

..... Whirligig Beetles, **Gyrinidae**

1

These beetles are commonly seen swimming in circles on the water's surface. This is not normal behavior, but is an alarm mechanism sometimes triggered by the observer's presence. Adults scavenge for floating food while larvae are predaceous. [M/2/3/C]

- b. Eyes not divided (2 eyes); antennae not short and clubbed

..... 2

- a. Head extended forward like a snout

..... Weevils, **Curculionidae**

2

This large terrestrial family has a few aquatic species. Most larvae are not aquatic, living in plant tissues. Aquatic adults crawl on submerged vegetation nocturnally. [X/1/X/X]

- b. Head not extended like a snout

..... 3

- a. Elytra (hard wing covers) short, with at least 2 abdominal segments exposed

..... Rove Beetles, **Staphylinidae**

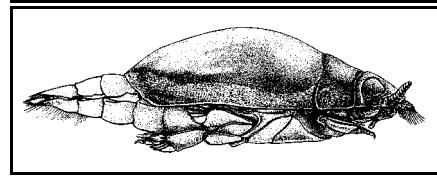
Rove beetles are well represented by non-aquatic species (which are commonly found in carrion) and the species likely to be collected in streams are usually only semi-aquatic.

- b. Elytra covering entire abdomen with at most 1 abdominal segment exposed

3

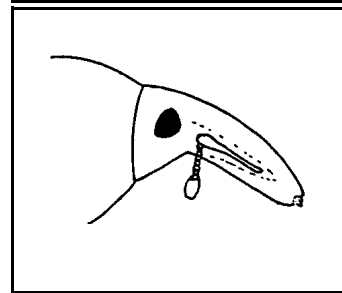
..... 4

Gyrinidae adult, side view (1a)

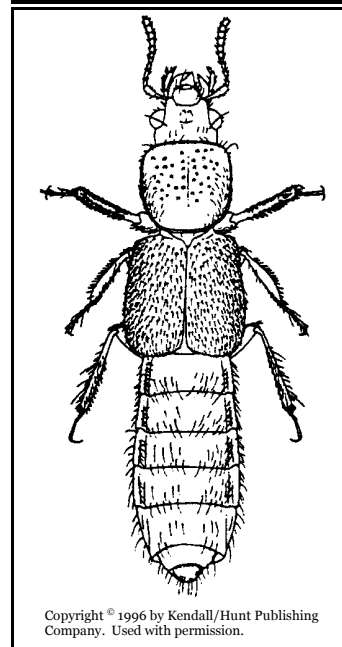


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Side view of adult Curculionidae head, extended forward into a snout (2a)



Staphylinidae adult (3a)



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Fig. 1a and 3a - From *An Introduction to Aquatic Insects of North America*, Third Edition by R.W. Merritt and K.W. Cummins. Copyright © 1996 by Kendall/Hunt Publishing company. Used with permission.

- a. Hind coxae (bases of legs) broad, flattened and covering front 1-3 abdominal segments and base of hind femur
 ... *Crawling Water Beetles, Haliplidae*

4

These beetles are often found in pond weeds or submerged vegetation in streams. They can swim, but usually crawl. They carry air in a pocket under the elytra. Adults are herbivores and larvae are predators. [M/2/2/C]

- b. Hind coxae not broadened or covering abdominal segments
 5

5

- a. Hind coxae extended back along midline, dividing first abdominal segment into 2 separate plates
 6
- b. Hind coxae not extending to divide first abdominal segment
 7

- a. Fore and middle tarsi (feet) with 5 segments (segment 4 similar in size to segment 3) **and** hind tarsi with 2 equal, slender curved claws **and** scutellum (nob or triangular plate between elytra) concealed
 *Burrowing Water Beetles, Noteridae*

These beetles are mostly predators as adults and live in close association with vegetation. Larvae may be more omnivorous. [X/o/3/X]

6

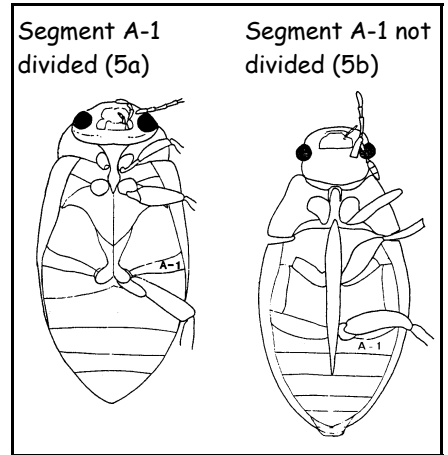
- b. Fore and middle tarsi with 4 segments **or** fore and middle tarsi with 5 segments with segment 4 very small and concealed between lobes of segment 3 **or** fore and middle tarsi with 5 segments and hind tarsi with a single claw **or** fore and middle tarsi with 5 segments, hind tarsi with 2 claws and scutellum large and exposed
 *Predaceous Diving Beetles, Dytiscidae*

These beetles swim well enough to capture macroinvertebrates, tadpoles and fish. Adults fly and can therefore be found in a variety of water types. They trap air for underwater breathing beneath the hardened hind wing covers (elytra). [M/6/3o/C]

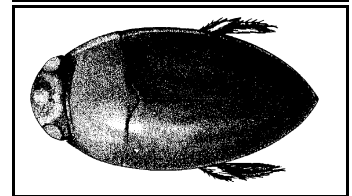
Haliplidae adult (4a)



Hind coxae and first abdominal segments (A-1) (5a/5b)

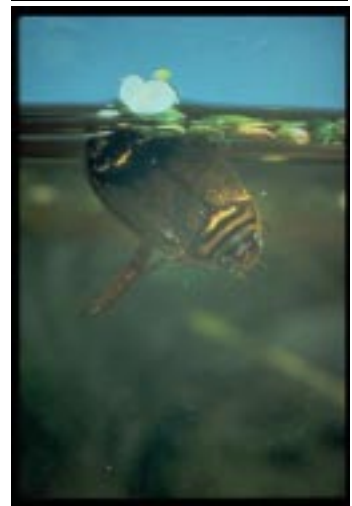


Noteridae adult (6a)



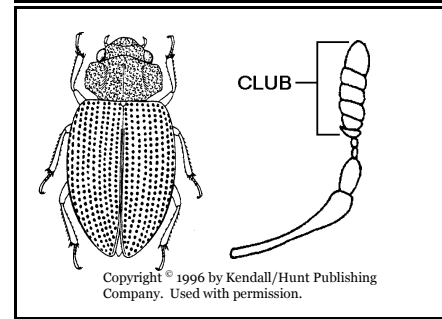
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Dytiscidae adult (6b)



- a. Antennae ending in a 3-5 segmented club 8
- 7 b. Antennae long and slender **or** short and thick with basal segment enlarged 12

Hydraenidae adult with antennae ending in 5 segmented club (8a)

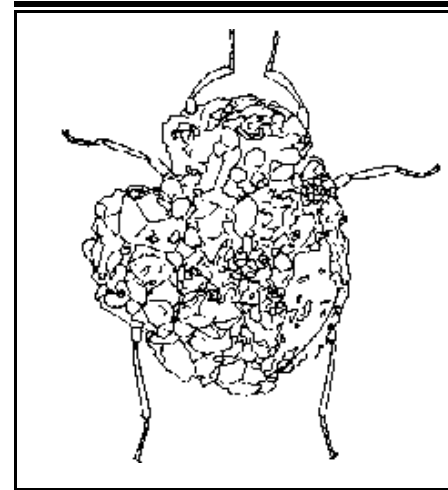


- a. Abdomen with 6-7 visible segments; antennae ending in a 5 segmented club
... *Minute Moss Beetles, Hydraenidae*

8 *The Hydraenidae are closely related to the Hydrophilidae but are generally smaller. Larvae are riparian, developing in moist soil, and adults live in shallow water of stream or lake margins. [X/X/4/X]*

- b. Abdomen with 5 visible segments; antennae ending in a 3 segmented club (not including segment 6) 9

Georyssidae adult (9a)



- a. Fore tarsi with 4 segments; hind coxae widely separated; may be camouflaged with grains of sand glued to its back
..... *Minute Mud-loving Beetles, Georyssidae*

9 *These beetles live in sediments on the edge of streams.*

- b. Fore tarsi with 5 segments; hind coxae close together 10

- a. Pronotum (back plate, just behind head) with 5 grooves running lengthwise
..... **Helophoridae**

10 *Helophoridae are represented by a single aquatic genus and are closely related to the Hydrophilidae. Adults and larvae are herbivores living on margins of lakes and streams.*

- a. Pronotum without 5 grooves 11

Helophoridae adult (10a)

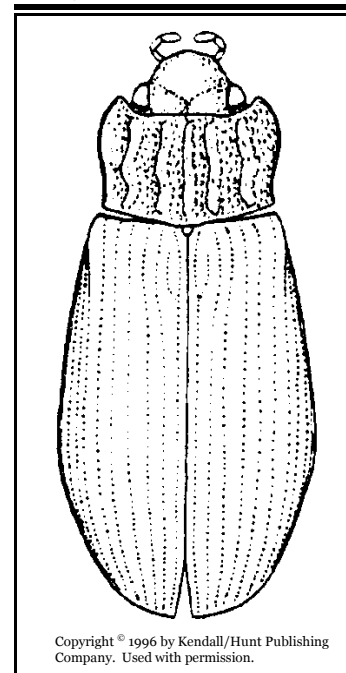


Fig. 8a, 9a, and 10a - From *An Introduction to Aquatic Insects of North America*, Third Edition by R.W. Merritt and K.W. Cummins. Copyright © 1996 by Kendall/Hunt Publishing company. Used with permission.

- a. Eyes protruding; pronotum narrower than base of adjoining elytra; scutellum small; antennae with 3 or fewer segments before cupule (base of terminal club)
 - **Hydrochidae**

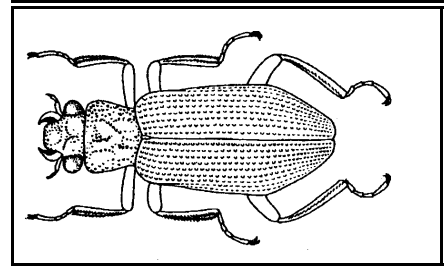
Hydrochidae are represented by the single aquatic genus Hydrochus and are closely related to the Hydrophilidae. Adults and larvae are herbivores, living on margins of lakes and streams.

11

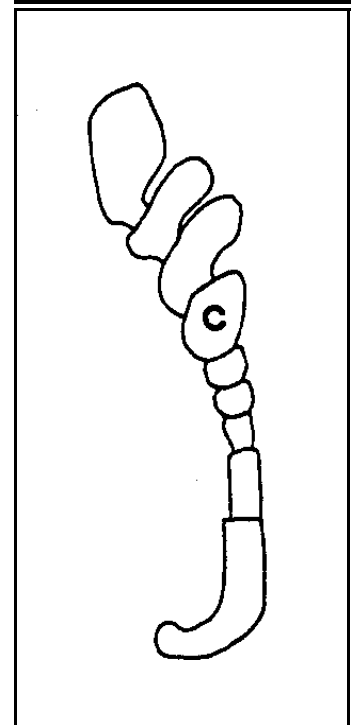
- b. Eyes usually not protruding; pronotum not distinctly narrower than elytra (if narrower then scutellum is large); antennae often have 5 segments before cupule
 - *Water Scavenger Beetles, Hydrophilidae*

These beetles live in lakes or streams backwaters and usually in association with vegetation. Larvae are predaceous as are some adults, though others feed on detritus.
[M/8/20/C]

Hydrochidae adult (11a)



Hydrophilidae adult antennae with 5 segments before cupule (C) (11b)



- a. Tarsal formula (number of segments in the fore, middle and hind tarsi, respectively) 4-4-4
 - *Leaf Beetles, Chrysomelidae*

12

The aquatic larvae of one genus of leaf beetles (Donacia) feed on submerged vegetation and obtain oxygen by inserting their abdominal spines into plant tissues. Adults are terrestrial or semi-aquatic. [X/X/1/R]

- b. Tarsal formula 5-5-5
 - 13

- a. Prosternum (chest plate) expanded forward under head; head usually contracted into thorax concealing antennae and eyes
 - 14

13

- b. Prosternum not expanded forward, antennae clearly visible
 - 16

Chrysomelidae adult (12a)

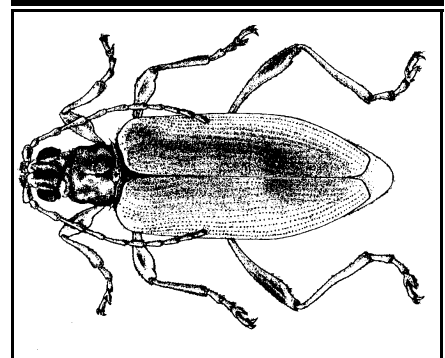


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- a. Body oval; 2-2.5 mm; antennae with 10 or 11 segments; hind coxae contiguous
 ... *Marsh Loving Beetles*, **Lutrochidae**

Lutrochidae feed on periphyton and adults live in the splash zone. [X/1/1/C]

14

- b. Body more elongate; 1-8 mm; antennae variable
 15

- a. Antennae longer than head and slender, usually visible when viewed from above; anterior coxae round
 *Riffle Beetles*, **Elmidae** (in part)

Riffle beetles live in cool, fast running and well oxygenated water. Larvae and adults are herbivores and detritivores. [M/7/8/C]

15

- b. Antennae shorter with most segments broader than long and not visible from above; elytra with many tiny hairs
 ... *Long-toed Water Beetles*, **Dryopidae**

These beetles are covered with hairs that repel water and retain air for breathing under water. They crawl on the bottom of streams and are herbivores. [M/1/1/C]

- a. Tarsi with 4th segment bilobed
 *Marsh Beetles*, **Scirtidae**

The larvae of marsh beetles live in the emergent zone, feeding on vascular plants and detritus. Adults are semi-aquatic or terrestrial. [H/1/4/C]

16

- b. 4th segment of tarsi not bilobed
 17

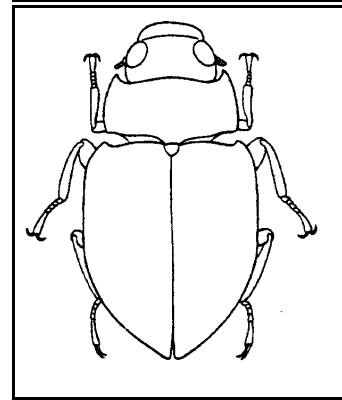
- a. Antennae thread-like, club-shaped or concealed by prothorax; typically hard-bodied
 *Riffle Beetles*, **Elmidae** (in part)

Riffle beetles live in cool, fast running and well oxygenated water. Larvae and adults are herbivores and detritivores. [M/7/8/C]

17

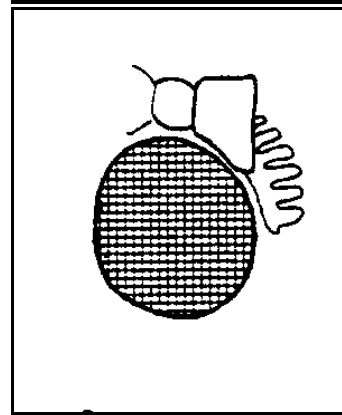
- b. Antennae saw-toothed or comb-like, never concealed; typically soft-bodied
 18

Lutrochidae adult (14a)



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Dryopidae adult, showing antenna near eye (15b)



Elmidae adult (17a)



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- a. Abdomen with 6-7 segments; maxillary palp with 2nd segment longer than next 2 combined **or** abdomen with 5 segments; maxillary palp with 2nd segment much shorter than next 2 combined **and** antennae bases close together between eyes, significantly constricting front of head capsule
 *Water Pennies, Psephenidae*

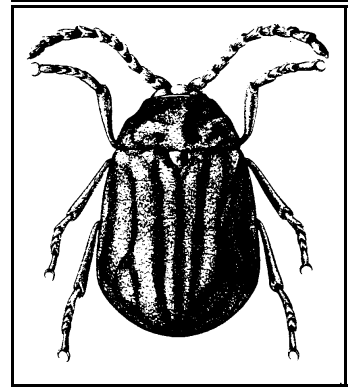
The water penny larvae flatten themselves against rocks and woody debris in streams, where they scrape algae. Adults are non-feeding and inhabit the splash zone. [M/2/3/C]

18

- b. Abdomen with 5 segments; maxillary palp with 2nd segment much shorter than next 2 combined; bases of antennae below eyes, only slightly constricting head capsule
 . . *Toed-winged Beetle, Ptilodactylidae*

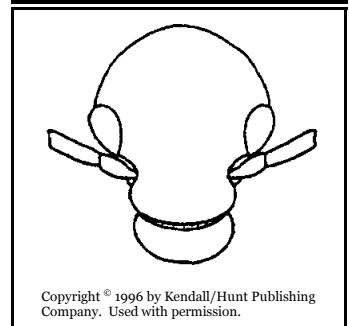
These larvae are detritivores, especially of rotting wood and leaf litter in streams, and the adults live in leaf litter in riparian areas. [M/1/1/C]

Psephenidae adult (18a)



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Head of Ptilodactylidae adult showing slight constriction of head capsule at bases of antennae (18b)



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