

DICHOTOMOUS KEY TO STREAM MACROINVERTEBRATES

Drawings in this key are from: R.W. Merrit and K.W. Cummins, *An Introduction to the Aquatic Insects of North America*, Kendall/Hunt Publishing Company, ©1987; Izaak Walton League of America (IWL), ©1977; or W.Patrick McCafferty, *Aquatic Entomology*, Boston MA: Jones and Bartlett Publishers, Boston, ©1983. Reprinted with permission.

1. A. Segmented legs.....go to 2
- B. No segmented legs.....go to 14

2. A. 6 legs.....go to 3
- B. More than 6 legs.....go to 23

3. A. No wings, or wings not fully developed and do not cover entire body.....go to 4

- B. Wings cover entire body (but not legs), may appear beetle-like.....go to 26

4. A. Body longer than it is wide.....go to 5

- B. Body oval & flat; head & legs concealed beneath body.....**WATER PENNY**

(a type of beetle larva)

Order Coleoptera, Family Psephenidae

Feeding Group: **SCRAPER**

5. A. 2 or 3 distinct *hairlike* tails; tails not fleshy or hooked, but may be fringed with hairs.....go to 6

- B. Not as above.....go to 7

6. A. 2-3 tails; platelike or hairlike gills along sides of abdomen; one hook on end of each leg.....**MAYFLY**

LARVA

Order Ephemeroptera

Feeding Group: **VARIES***

- B. 2 tails; may have hairy gills under thorax; 2 hooks on end of each leg

.....**STONEFLYLARVA**

Order Plecoptera

Feeding Group: **VARIES***



side

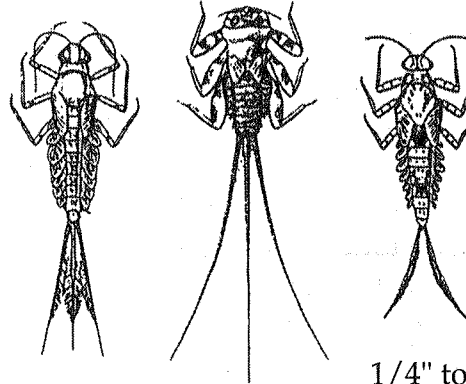


bottom

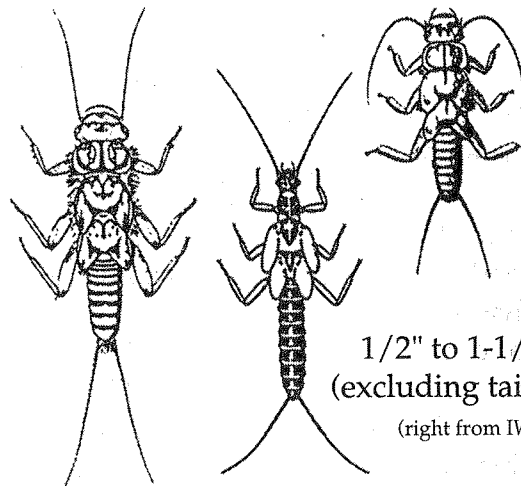


top

1/4"
(all from IWL)



1/4" to 1"
(excluding tails)



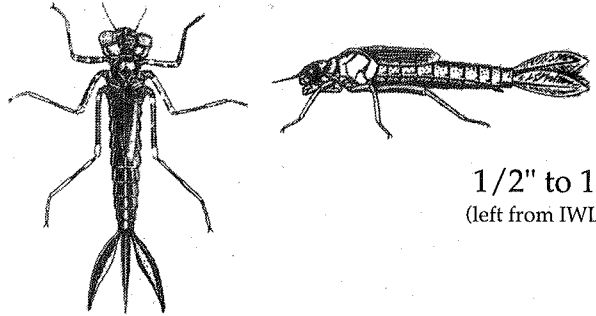
1/2" to 1-1/2"
(excluding tails)
(right from IWL)

* If feeding group varies, see picture key on pages 155-157 for more information.

(All drawings on this page are from W.P. McCafferty, *Aquatic Entomology*, unless otherwise noted.)

DICHOTOMOUS KEY TO STREAM MACROINVERTEBRATES

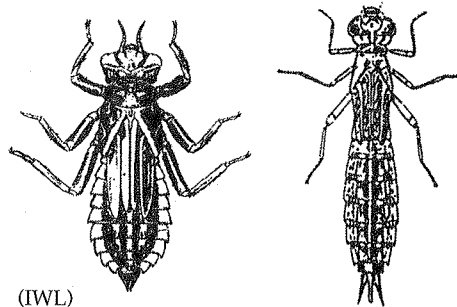
7. A. 3 oar-shaped tails (gills) at *end* of abdomen; no gills along *sides* of abdomen
**DAMSELFLY LARVA**
Order Odonata, Suborder Zygoptera
 Feeding Group: PREDATOR



1/2" to 1"
(left from IWL)

- B. Not as above.....go to 8

8. A. Fat abdomen; large eyes; mask-like lower lip.....**DRAGONFLY LARVA**
Order Odonata, Suborder Anisoptera
 Feeding Group: PREDATOR



1/2" to 2"

(IWL)

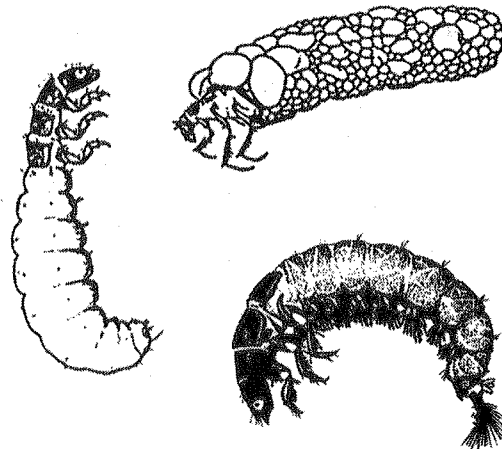
- B. Not as above.....go to 9

9. A. May be hiding in case made of gravel or plant parts; abdomen ends in pair of prolegs which may be hidden by hairs; each proleg has single hook on end, sometimes fused together; if specimen meets this description, but has well-developed lateral filaments, go to 11
**CADDISFLY LARVA**
Order Trichoptera
 Feeding Group: VARIES*



(IWL)

up to 1"

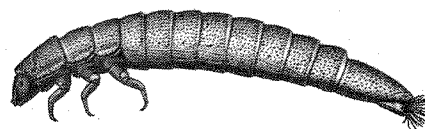


- B. Not as above.....go to 10

10. A. Well developed lateral filaments extend from abdominal segments.....go to 11
 B. No lateral filaments along abdomen; body is hardened & stiff; tip of abdomen has small plate-like opening with hooks and filaments.

1/4" to 1/2"

-**RIFFLE BEETLE LARVA**
Order Coleoptera, Family Elmidae
 Feeding Group: GATHERER COLLECTOR

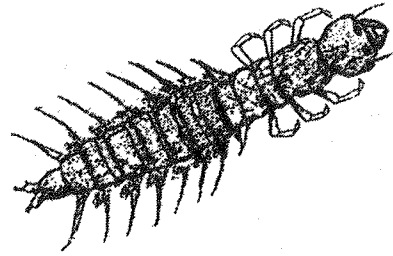


* If feeding group varies, see picture key on pages 155-157 for more information.

(All drawings on this page are from W.P. McCafferty, *Aquatic Entomology*, unless otherwise noted.)

DICHOTOMOUS KEY TO STREAM MACROINVERTEBRATES

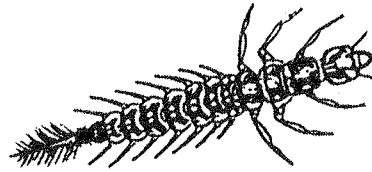
11. A. Fluffy or branched gill tufts under abdomen.....**DOBSONFLY LARVA**
("Hellgrammite")
Order Megaloptera, Family Corydalidae
Feeding Group: PREDATOR



3/4" to 4"
(from IWL)

B. Not as above.....go to 12

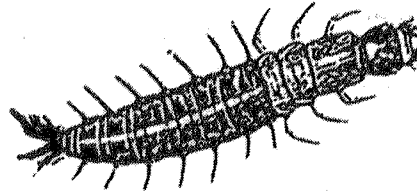
12. A. Abdomen ends in single, unforked, long, hairlike tail....**ALDERFLY LARVA**
Order Megaloptera, Family Sialidae
Feeding Group: PREDATOR



up to 1"

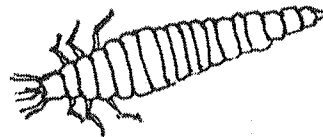
B. Not as above.....go to 13

13. A. Abdomen ends in a pair of prolegs, each with 2 hooks.....**FISHFLY LARVA**
Order Megaloptera, Family Corydalidae
Feeding Group: PREDATOR



up to 1-1/2"

B. Not as above; large, obvious mouthparts**AQUATIC BEETLE LARVA**
Order Coleoptera
Feeding Group: PREDATOR



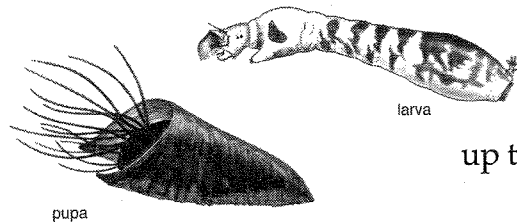
1/4" to 1"
(from IWL)



14. A. Has small but distinct head; body less than 1/2" long.....go to 15

B. Appears not to have a head, although it may be retracted into body.....go to 16

15. A. Body widens at bottom end (bowling pin shaped); may be attached to substrate; dark head....**BLACK FLY LARVA**
Order Diptera, Family Simuliidae
Feeding Group: FILTERER COLLECTOR

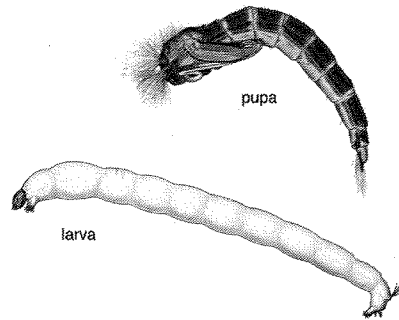


up to 1/2"

(All drawings on this page are from W.P. McCafferty, *Aquatic Entomology*, unless otherwise noted.)

DICHOTOMOUS KEY TO STREAM MACROINVERTEBRATES

15. B. Both ends of body about the same width; tiny pair of prolegs under head & at tip of abdomen.....**MIDGE LARVA**
Order Diptera, Family Chironomidae
 Feeding Group: GATHERER COLLECTOR



up to 1/2"

16. A. Fleshy Caterpillar-like body.....go to 17
 B. Body not caterpillar-like.....go to 18

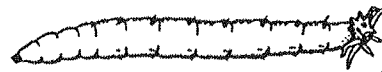
17. A. Two feathered "horns" at back end; caterpillar-like legs
**WATERSNIPE FLY LARVA**
Order Diptera, Family Athericidae
 Feeding Group: PREDATOR



1/4" to 1"

B. Can be up to 4" long; head not apparent because it is retracted into body; may have fleshy, finger-like extensions at one end

.....**CRANEFLY LARVA**
Order Diptera, Family Tipulidae
 Feeding Group: SHREDDER OR PREDATOR



1/3" to 4"
 last segment not swollen
 - SHREDDER



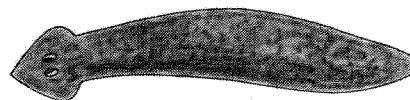
last segment swollen or no fingerlike extensions
 - PREDATOR

(all from Merritt and Cummins)

18. A. Body without hard shell..... go to 19
 B. Body with hard shell.....go to 21



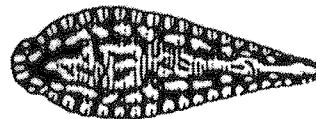
19. A. Flattened, unsegmented, worm-like body; distinct eye spots; gliding movement.....**PLANARIAN**
 (Flatworm)
Class Turbellaria
 Feeding Group: PREDATOR or PARASITE



up to 3/4"

B. Segmented body.....go to 20

20. A. Flattened body with suckers at each end
**LEECH**
Class Hirudinea
 Feeding Group: PREDATOR or PARASITE



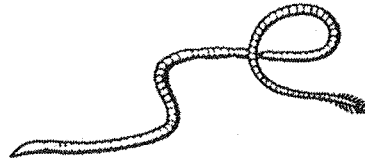
1/4" to 2"
 (bottom figure from IWL)



(All drawings on this page are from W.P. McCafferty, *Aquatic Entomology*, unless otherwise noted.)

**DICHOTOMOUS KEY
TO STREAM MACROINVERTEBRATES**

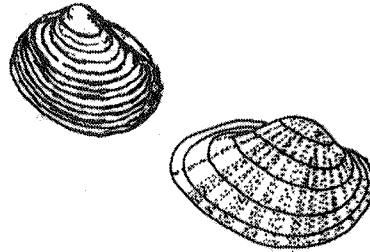
20. B. Segmented, earthworm-like body
.....**AQUATIC EARTHWORM**
 Class Oligochaeta
Feeding Group: GATHERER COLLECTOR



1/4" to 2"

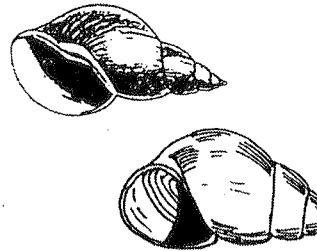
21. A. Snail-like.....go to 22

B. Body enclosed within two hinged shells
.....**FRESHWATER CLAM or MUSSEL**
 Class Pelecypoda
Feeding Group: FILTERER COLLECTOR



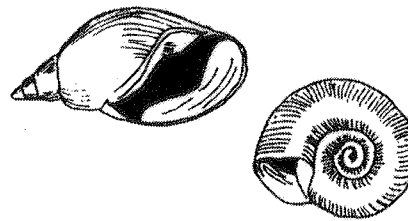
(both from IWL)

22. A. Has operculum (hard covering used to close the opening).....**GILLED SNAIL**
 Class Gastropoda, Order Prosobranchia
Feeding Group: SCRAPER



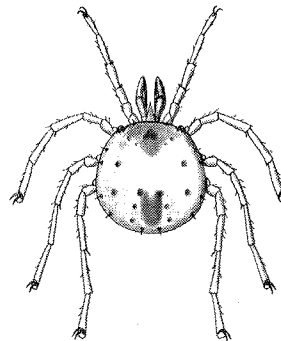
(right from IWL)

B. No operculum; may be spiral-shaped, limpet-like, or coiled in one plane
.....**LUNG-BREATHING SNAIL**
 Class Gastropoda, Order Pulmonata
Feeding Group: SCRAPER



(both from IWL)

23. A. Looks like spider; may be very tiny; has 8 legs.....**AQUATIC MITE**
 Class Arachnida, Order Hydracarina
Feeding Group: PREDATOR

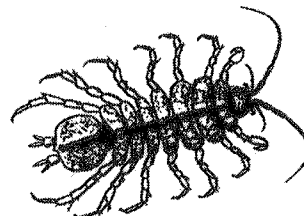


up to 1/8"

B. Not as above.....go to 24

24. A. Lobster or shrimp-like.....go to 25

B. Armadillo shaped body, wider than high; crawls slowly on bottom
.....**AQUATIC SOWBUG**
 Subphylum Crustacea, Order Isopoda
Feeding Group: SHREDDER

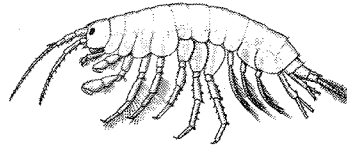


1/4" to 3/4"

(All drawings on this page are from W.P. McCafferty, *Aquatic Entomology*, unless otherwise noted.)

**DICHOTOMOUS KEY
TO STREAM MACROINVERTEBRATES**

25. A. Looks like tiny shrimp; swims quickly on its side.....**SCUD**
Subphylum Crustacea, Order Amphipoda
Feeding Group: SHREDDER



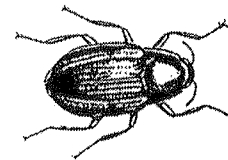
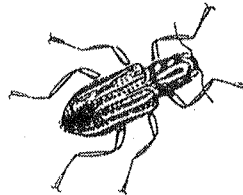
1/4" to 1/2"

B. Looks like small lobster; has 2 large front claws (10 legs total).....**CRAYFISH**
Subphylum Crustacea, Order Decapoda
Feeding Group: GATHERER COLLECTOR



up to 6"

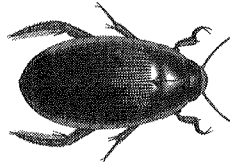
26. A. Beetle-like, crawls slowly on bottom**RIFFLE BEETLE ADULT**
Order Coleoptera, Family Elmidae
Feeding Group.: SCRAPER or GATHERER COLLECTOR



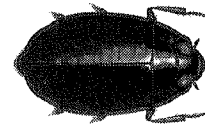
1/4"

B. Beetle-like, swims quickly.....go to 27

27. A. Wings meet along the midline of back side of body, they do not overlap**BEETLE ADULT**
Order Coleoptera
Feeding Group: MOST ARE PREDATORS



Predaceous Diving Beetle

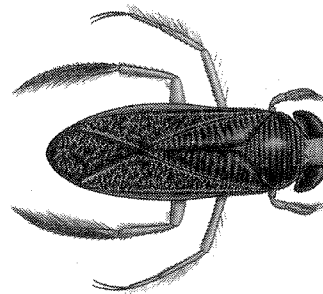


Whirligig Beetle (swims in circular motion on water surface)

up to 1"

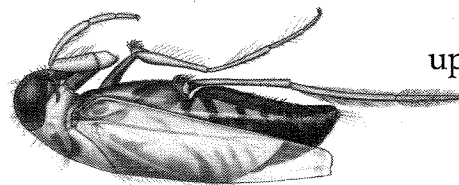
27. B. Wings overlap on backside, usually form a visible triangular pattern just below head.....go to 28

28. A. Front legs are shorter than mid and hind legs; propels itself with oar-like strokes,**WATER BOATMAN**
Order Hemiptera, Family Corixidae
Feeding Group: VARIES



up to 3/4"

B. Similar to water boatman but swims upside down, on its back**BACKSWIMMER**
Order Hemiptera, Family Notonectidae



up to 3/4"

Feeding Group: PREDATOR

(All drawings on this page are from W.P. McCafferty, *Aquatic Entomology*, unless otherwise noted.)

POLLUTION TOLERANCE VALUES FOR FAMILIES OF STREAM MACROINVERTEBRATES

Order (or Class)	Common Name	Tolerance Value
True Flies (Order Diptera)	Aquatic Dance Flies.....	(Empididae).....6
	Aquatic Longlegged Flies.....	(Dolichopodidae).....4
	Aquatic Muscids.....	(Muscidae).....6
	Biting Midges.....	(Ceratopogonidae).....6
	Black Flies.....	(Simuliidae).....6
	Craneflies.....	(Tipulidae).....3
	Horse & Deer Flies.....	(Tabanidae).....6
	Moth Flies.....	(Psychodidae).....10
	Netwinged Midges.....	(Blephariceridae).....0
	Rattailed Maggots.....	(Syrphidae).....10
	Shore Flies.....	(Ephydridea).....6
	True Midges (blood red).....	(Chironomidae).....8
	True Midges (others, including pink)	(Chironomidae).....6
	Watersnipe Flies.....	(Anthericidae).....2
Beetles (Order Coleoptera)	Water Pennies.....	(Psephenidae).....4
	Longtoed Water Beetles.....	(Dryopidae).....5
	Riffle Beetles.....	(Elmidae).....4
Damselflies & Dragonflies (Order Odonata)	Broadwinged Damselflies.....	(Calopterygidae).....5
	Narrowwinged Damselflies.....	(Coenagrionidae).....9
	Spreadwinged Damselflies.....	(Lestidae).....9
	Belted & River Skimmers.....	(Macromiidae).....3
	Biddies.....	(Cordulegastridae).....3
	Clubtails.....	(Gomphidae).....1
	Common Skimmers.....	(Libellulidae).....9
	Darners.....	(Aeshnidae).....3
Greeneyed Skimmers.....	(Corduliidae).....5	
Crustaceans (Class Crustacea)	Aquatic Sowbugs (Order Isopoda)8
	Crayfish (Order Decapoda).....6
	Scuds (Order Amphipoda).....	(Gammaridae).....4 (Talitridae).....8
Snails (Class Gastropoda)6-8*	
Aquatic Earthworms (Class Oligochaeta).....6-10*	
Leeches (Class Hirudinea).....10	
Planarians (Class Turbellaria).....4	

* Depending on the genus, tolerance values for snails vary from 6-8. For aquatic worms, they vary from 6-10. See U.S. EPA publication and local aquatic entomologists for more information.

Note: The common names used in this chart, e.g., "flatheaded mayfly," "green stonefly," or "common netspinner" are taken from W.P. McCafferty, *Aquatic Entomology*, Boston MA: Jones and Bartlett Publishers, © 1983. Reprinted by permission. Be aware that common names for aquatic BMIs may vary from region to region, and even from person to person. The scientific names, which do not vary, appear next to the common names.

POLLUTION TOLERANCE VALUES FOR FAMILIES OF STREAM MACROINVERTEBRATES

Values are based on a family's tolerance to organic pollution. The scale ranges from 0 (least tolerant) to 10 (most tolerant). This chart is adapted from U.S. Environmental Protection Agency, *Rapid Bioassessment Protocols for Use in Streams and Rivers, Benthic Macroinvertebrates and Fish*, May 1989. Values were developed for benthic macroinvertebrate families in the Great Lakes and New York State. Before using this chart, check with your local biologist to determine if values have been developed for your specific region.

Order	Common Name	Family	Tolerance Value
Stoneflies (Plecoptera)	Common Stoneflies	(Perlidae)	1
	Green Stoneflies	(Chloroperlidae)	1
	Giant Stoneflies	(Pteronarcyidae)	0
	Nemourid Broadbacks	(Nemouridae).....	2
	Perlodid Stoneflies	(Perlodidae)	2
	Rolledwinged Stoneflies	(Leuctridae)	0
	Slender Winter Stoneflies	(Capniidae)	1
	Taeniopterygid Broadbacks	(Taeniopterygidae).....	2
Mayflies (Ephemeroptera)	Armored Mayflies	(Baetiscidae)	3
	Brushlegged Mayflies	(Oligoneuriidae)	2
	Cleftfooted Minnow Mayflies.....	(Metretopodidae)	2
	Common Burrowers	(Ephemeridae).....	4
	Flatheaded Mayflies	(Heptageniidae)	4
	Hacklegills	(Potamanthidae)	4
	Little Stout Crawlers	(Tricorythidae)	4
	Pale Burrowers	(Polymitarcyidae)	2
	Primitive Minnow Mayflies.....	(Siphonuridae)	7
	Pronggills	(Leptophlebiidae)	2
	Small Minnow Mayflies	(Baetidae)	4
	Small Squaregills	(Caenidae)	7
	Spiny Crawlers	(Ephemerellidae)	1
Caddisflies (Trichoptera)	Bushtailed Case Makers	(Sericostomatidae).....	3
	Common Netspinners	(Hydropsychidae).....	4
	Fingernet Caddisflies	(Philopotamidae).....	3
	Freeliving Caddisflies	(Rhyacophilidae).....	0
	Giant Case Makers	(Phryganeidae).....	4
	Hoodcase Makers	(Molannidae).....	6
	Humpless Case Makers	(Brachycentridae).....	1
	Lepidostomatid Case Makers	(Lepidostomatidae).....	1
	Longhorned Case Makers	(Leptoceridae).....	4
	Micro Caddisflies	(Hydroptilidae).....	4
	Nettube Caddisflies	(Psychomyiidae).....	2
	Northern Case Makers	(Limnephilidae).....	4
	Saddlecase Makers	(Glossosomatidae).....	0
	Snailcase Makers	(Helicopsychidae).....	3
	Strongcase Makers	(Odontoceridae).....	0
	Trumpetnet & Tubemaking Caddisflies	(Polycentropodidae).....	6
Dobsonflies, Alderflies, & Fishflies (Megaloptera)	Dobsonflies & Fishflies	(Corydalidae).....	0
	Alderflies	(Sialidae).....	4