

THE BUG GUIDE

For the Angelo Coast Range Reserve (and beyond)

Order: Coleoptera (Beetles): larvae diverse body shapes: adults oval body with elytra (hard wing covers)

Psephenidae

(Water Pennies): Larvae – very flat, often on stones; adults – terrestrial



Photo credit: S. Pneh

Elmidae

(Riffle Beetles): Larvae: body sclerotized, end of abdomen w/ opening for gills; Adults: small, crawl under water, legs w/o swimming hairs



Photo credit: S. Pneh

larva

Dryopidae

(Long-Toed Water Beetles): Larvae - terrestrial; Adults – look and act like Elmid adults, but much larger (> 2 mm)



Photo credit: S. Pneh



Photo credit: S. Pneh

adult



Photo credit: S. Pneh

Lara sp. larva

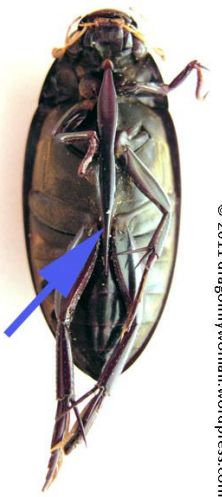
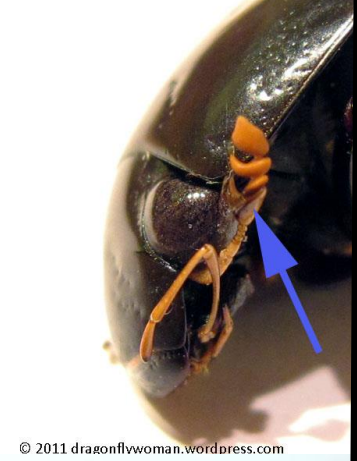
Gyrinidae (Whirligig Beetles): small, adults found swimming on water surface



Halipidae (Crawling Water Beetles): Larvae – diverse body types; Adults- agile swimmers, elytra grooved, use air bubble as scuba tanks



Hydrophilidae (Water Scavenger Beetles): Larvae – legs 4 segments, 1 claw. Adults – body crosssection semicircular, abdomen often w/ keel, antennae clubbed



Dytiscidae (Predaceous Diving Beetles): Larvae – legs 5 segments, 2 claws. Adults – body streamlined “almond” shaped, abdomen w/o keel, antennae long and thin



Order Diptera (True Flies): Larvae: no segmented legs. Adults: have one pair of true wings, and one pair of halteres (little drumstick shaped gyroscopes)

Chironomidae (Midge): Distinct head capsule; Prolegs on thorax and abdomen; Small thin body; May be red or green.

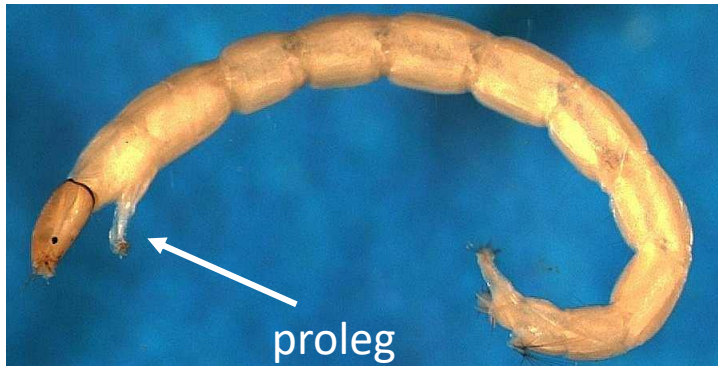
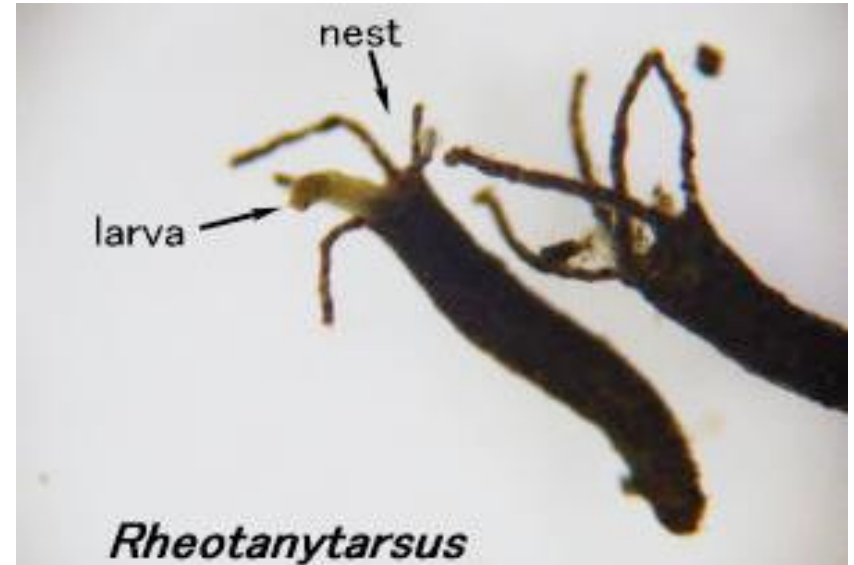


Photo credit: S. Pneh

Rheotanytarsus (tube-dwelling midge): tube has 'horns'



www.cly-net.ne.jp/~reichou/Tanytarsini

Chironomidae (cont'd)

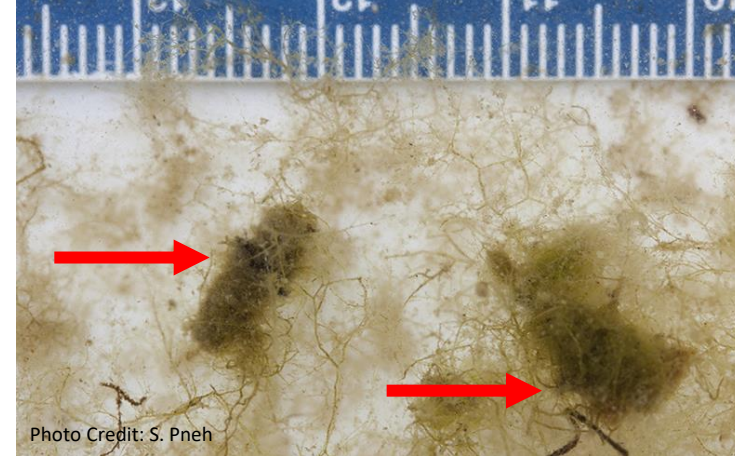
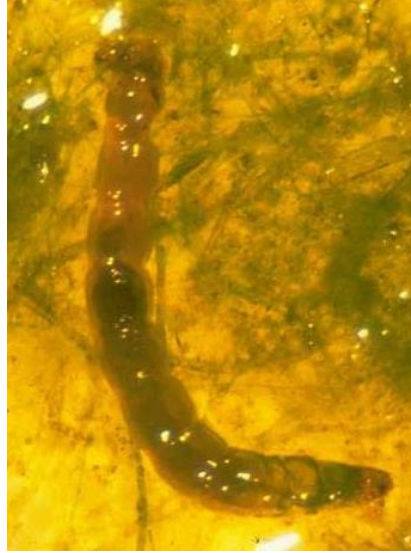
↓ *Cricotopus spp.*: lives in Nostoc (cyanobacterial colony) "ears"



Photo Credit: S. Pneh



→ *Symbiocladius*: Parasitic midge that burrows underneath wingpads of *Ecdyonurus sp.* (Heptageniidae) and consumes hemolymph and associated tissues



←↑ *Pseudochironomus richardsonii* (Tuft midge): often lives in tuft it weaves in Cladophora. Red, but green just before pupation



Culicidae (Mosquitoes): Distinct head capsule. Often covered in hairs. Swollen thorax. Breathing tubes on tip of abdomen. Floats just below water surface



larva



pupa

Simuliidae (Black flies): Distinct head capsule; Fan-shaped mouth-parts; Single proleg on thorax; Swollen base of abdomen; prefer fast flowing water; pupae look like small (3 mm long) "pup tents".



larvae

pupa

**Some sources split this genus into the Family Pediciidae

Tipulidae (Crane Flies): Larvae diverse body shapes. Head sunken into thorax/ underdeveloped. Leathery "skin." Fleshy lobes at tip of abdomen (respiratory organs)

Photo credit: S. Pneh



Photo credit: S. Pneh



*Dicronata sp.***



Photo credit: S. Pneh



Hexatoma sp.

1 mm 8

Dixidae (Meniscus Midges): last ab. seg w/ 2 flat lobes with fine hairs, breathing tube in middle, swims right below water surface.



Photo credit: S. Pneh

Stratiomyidae (Soldier Flies): flattened body, hydrofuge (fan of hairs) on end



Photo credit: S. Pneh

Tabanidae (Horse and Deer Flies): both ends tapered, ring of welts on ab. segs.



Photo credit: S. Pneh

Ceratopogonidae (Biting Midges): minute and thin, head needle shaped, no prolegs



Photo credit: S. Pneh

1 mm

Empididae (Dance Flies): usu. last pair of prolegs larger than the rest, head area “cone-shaped”



Photo Credit: D.H. Funk

Psychodidae (Drain Flies): body flat, usu. < 5mm size



Maruina sp.

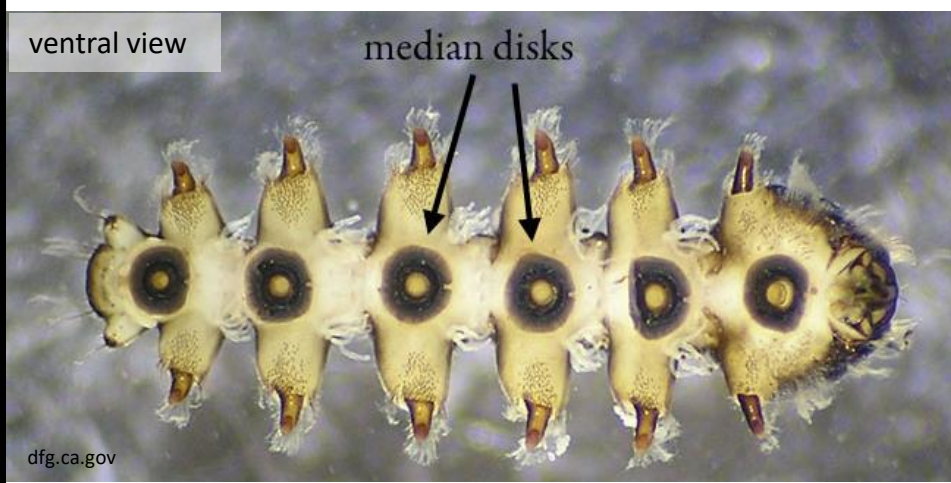
Photo Credit: J. Fortier

Blepharicidae (Netwinged Midges): body flat with lobed segments, ventral side has 6 suckers



dfg.ca.gov

dorsal view



ventral view

median disks

dfg.ca.gov

Order: Ephemeroptera (Mayflies): segmented legs with 1 claw; usually 3, sometimes 2 tails; swim like dolphins

Baetidae (Small Minnow Mayflies): antennae 2-3x longer than head, cylindrical



Heptageniidae (Flatheaded Mayflies): flattened head and body



Isonychiidae (Brushfooted Mayflies): forelegs with brush hairs; very large (2-3 cm long) and abundant in July at Cedar.

Photo credit: S. Pneh



Isonychia velma

Photo credit: S. Pneh



Isonychia velma

Leptophlebiidae (Prong-gilled Mayflies): forked gills; 3 tails that are thin and splayed out

Paraleptophlebia spp

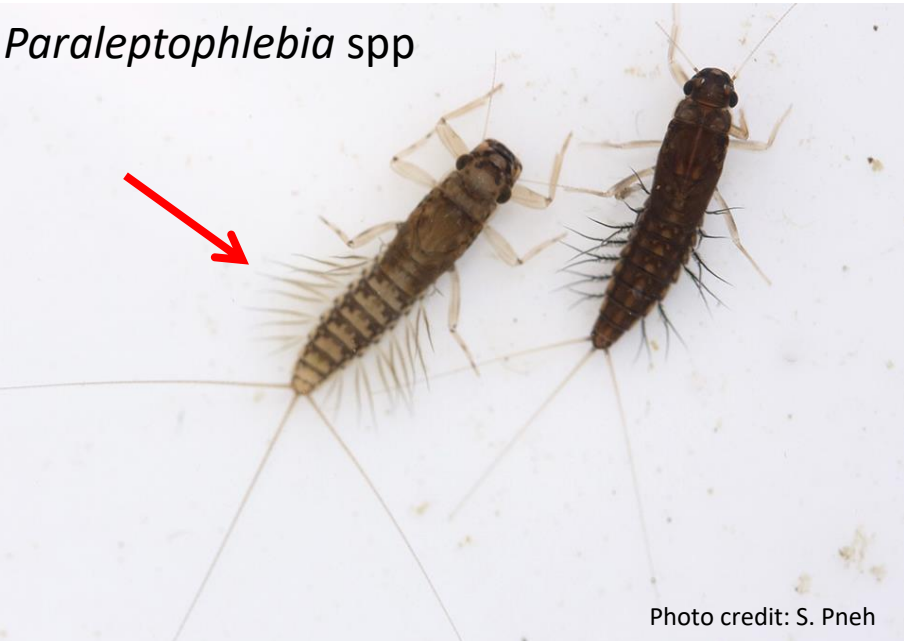


Photo credit: S. Pneh

Siphonuridae (Primitive Minnow Mayflies): last two abdominal segments with lateral spines; underside w/ distinctive "U" pattern, swims really fast

Photo credit: S. Pneh



Siphonurus sp.

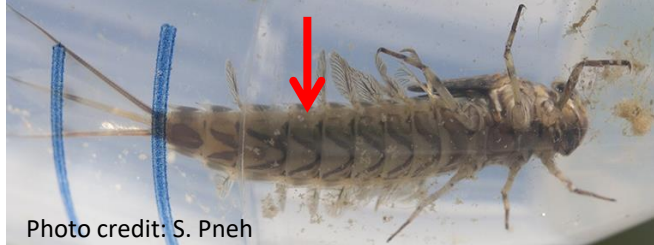


Photo credit: S. Pneh

Ephemerellidae (Spiny Crawler Mayflies): robust body, 3 tails, 3-4 pairs of gills, defensive scorpion posture behavior when threatened (tail arches over back), come in many colors

Ephemerellids with 4 pairs of gills



Photo credit: S. Pneh



Drunella doddsi

Photo credit: S. Pneh



Serratella sp.

Photo credit: S. Pneh



Drunella flavilinea

Photo credit: S. Pneh



Ephemerella dorothea infrequens

Photo credit: S. Pneh



Photo credit: S. Pneh



Caudatella sp.



Ephemerella maculata

Ephemerellidae cont'd (Spiny Crawler Mayflies)

Ephemerellids with only 3 pairs of gills



Photo credit: S. Pneh

Eurylophella sp.



Photo credit: S. Pneh

Attenella sp.



Photo credit: S. Pneh

Timpanoga hecuba pacifica

Leptohiphidae: (Little Stout Crawler Mayflies):
small; one pair of triangular abdominal gills; live in
sandy substrate

Ameletidae: (Combmouthed
Minnow Mayflies): antennae shorter
than head; large eyes; maxillae with
comb-like spines; look like Baetids (but
w/o long antennae) and Siphonurids
(but last two abdominal segments w/o
lateral spines)

Photo credit: S. Pneh



Tricorythodes sp.

Tricorythodes sp.



Photo credit: S. Pneh

Photo credit: S. Pneh



Ameletus sp.

Order Hemiptera: True Bugs: piercing beaks

Nepidae (Water Scorpions)

Photo credit: S. Pneh



Belostomatidae (Giant Water Bug)

Photo credit: S. Pneh



Corixidae (Water Boatman)



Photo credit: S. Pneh

Notonectidae (Backswimmer)



Photo credit: S. Pneh

Naucoridae (Toe Biters)



Photo credit: S. Pneh

Gerridae (Water Strider)



Gelastocoridae (Toad Bugs) – found along stream margins



Order: Megaloptera (Hellgrammites, Dobsonflies, and Alderflies)

Corydalidae (Hellgrammites)



Sialidae (Alderflies)



Order: Lepidoptera (moths and butterflies)

Crambidae: *Petrophila* (most common *P. confusalis*)—Aquatic caterpillar, build transparent silk webs, then condense these into smaller, white cocoons for pupation. Found on med-large boulders in well-oxygenated fast-flowing water.

Photo credit: S. Pneh

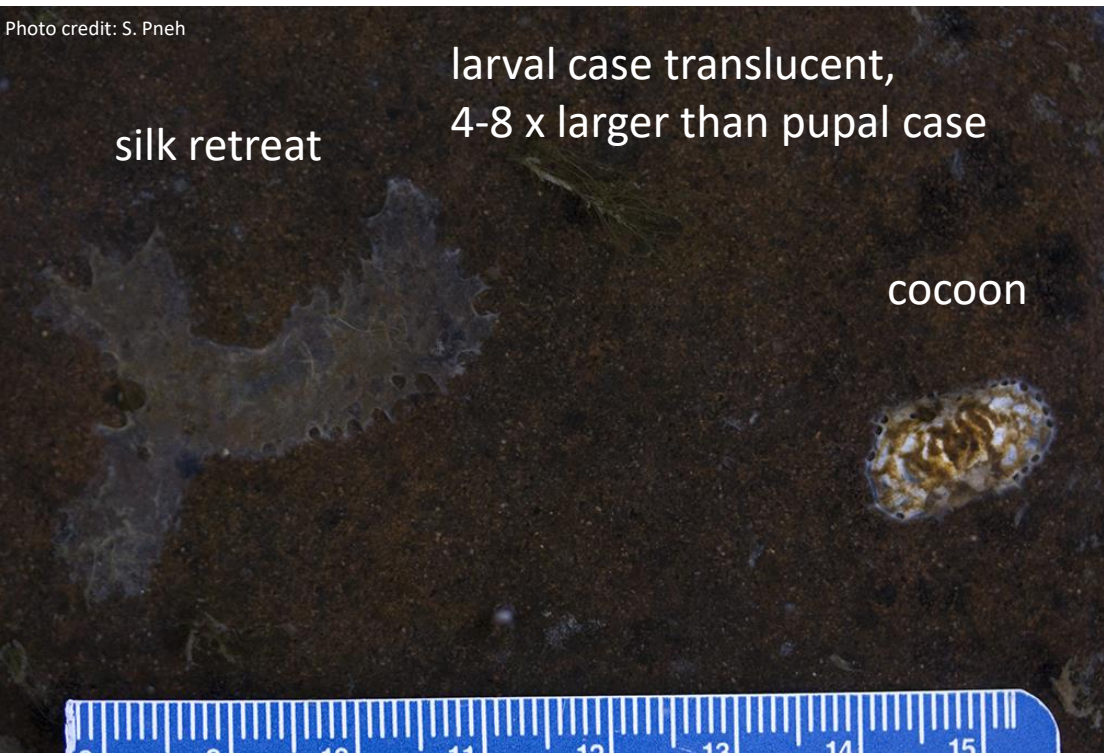


Photo credit: S. Pneh



Order: Odonata: labial mask (over face) extends to capture prey

Suborder Anisoptera (Dragonflies)	Suborder Zygoptera (Damselflies)
No "tails"; abdomen ends with spikes	Abdomen with 3 gills, although frequently damaged
Generally more robust	Generally slender

Suborder Zygoptera (Damselflies)

Calopterygidae:

(Broadwinged Damselflies): 1st antennal seg. very long



Hetaerina americana

Lestidae (Spreadwing Damselflies): long, narrow body; labial mask long, narrow, like wine glass; flat gills; usually in stagnant, warm water



Coenagrionidae (Narrow-winged/Pond Damselflies): antennal segments all same length, flat trapezoidal labium, gills look inflated, with pointy tips, common along edges



Suborder: Anisoptera (Dragonflies)

Aeshnidae:

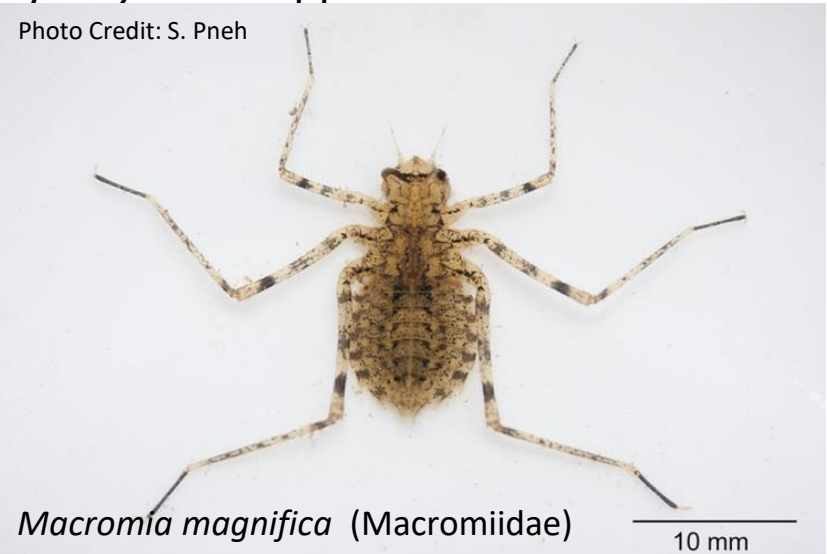
(Darners), elongated body, likely just one species (@ Angelo), *Aeshna walkeri*. dark to black

Photo Credit: S. Pneh



Macromiidae: (Cruisers): very long legs, body very flat: 1 spp in CA

Photo Credit: S. Pneh



Gomphidae:

(Clubtails)
antennae clubbed,
stout abdomen,
often buried in silt
or sand

Photo Credit: S. Pneh



Photo Credit: S. Pneh



Photo Credit: M. Melton



Suborder Anisoptera, cont. (Dragonflies)

Cordulegastridae (Spiketails) labial mask spoon-like (covering most of head) with large irregular teeth; 1 sp. in CA

Photo Credit: S. Pneh

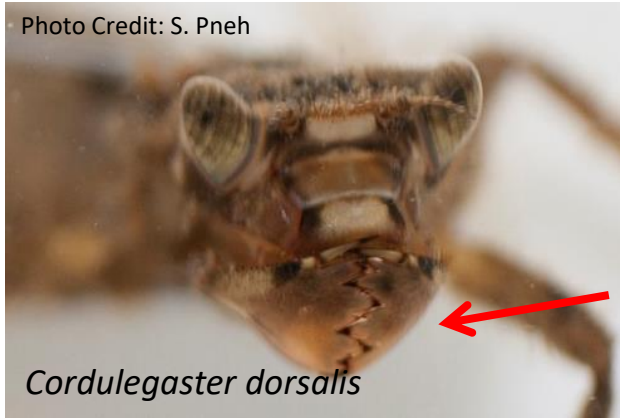


Photo Credit: S. Pneh



Libellulidae (Skimmers) labial mask spoon-like (covering most of head) with small uniform teeth

Photo Credit: S. Pneh

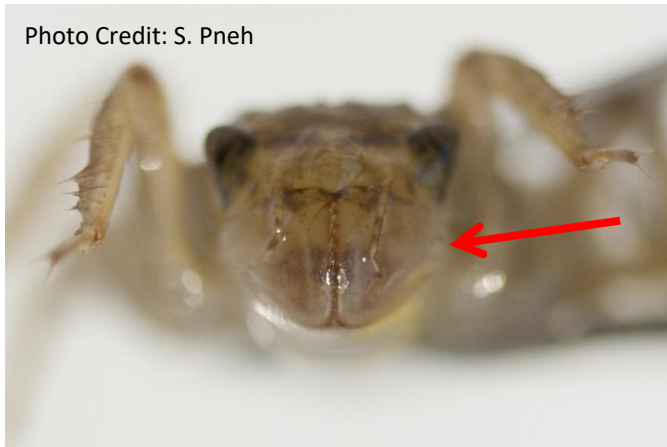


Photo Credit: S. Pneh



Order: Plecoptera (Stoneflies): segmented legs ending with two claws; long antennae; 2 tails; 2 pairs of wing pads on mature larvae; wiggles side-to-side

Peltoperlidae (roachflies): small, compact



Photo Credit: S. Pneh



Leuctridae (Rolled-wing Stoneflies): tiny, very thin, no gills, abdominal sterna with longitudinal lateral folds not extending beyond 7 segments

Chloroperlidae (Green Stoneflies): no gills tail shorter than abdomen



Nemouridae (Spring Stoneflies): small, cervical gills below mouthparts, tarsal seg 2 shorter than 1. They always seem to be covered in “dirt”

Zapada sp.

Photo credit: S. Pneh

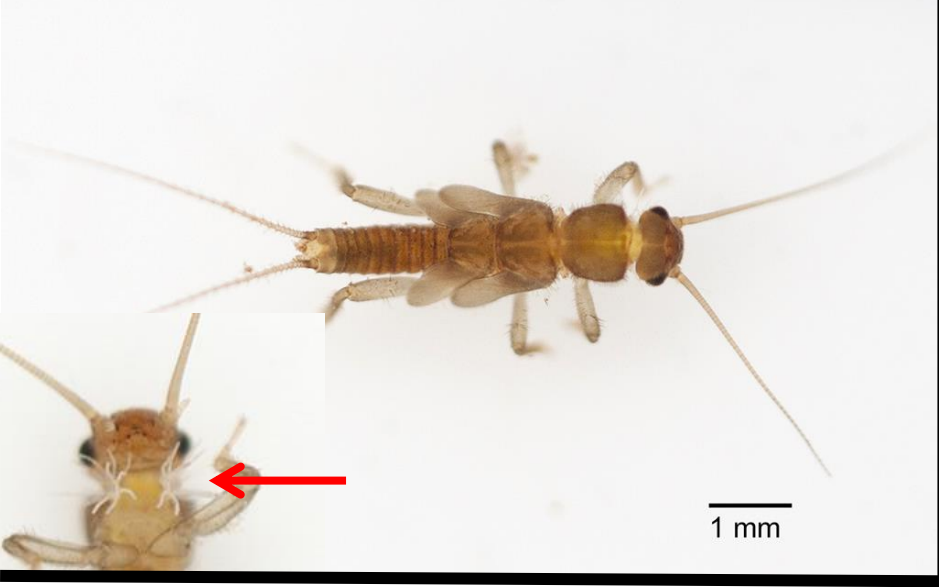
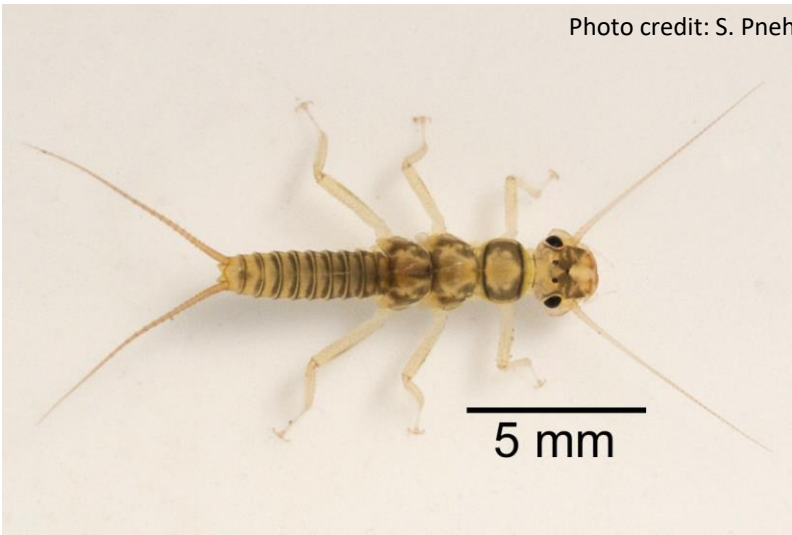


Photo credit: S. Pneh



Perlodidae: looks like Perlid but no gills, looks like Chloroperlid BUT tail longer ~ same length as abdomen

Photo credit: S. Pneh



Perlidae (Common Stoneflies): 3 pairs of branching thoracic gills; 2 spp: *Calineuria californica* -no anal gill; *Hesperoperla pacifica* -tufted anal gill

Photo credit: S. Pneh



Calineuria californica

Photo credit: S. Pneh



Hesperoperla pacifica

Pteronarcyidae (Giant Stoneflies):

tufted gills on thorax AND abdomen, one common sp. – *Pteronarcys californica*

Photo credit: S. Pneh



Pteronarcys californica

5 mm

Photo credit: S. Pneh



Pteronarcys californica, ventral gills

5 mm

Order: Trichoptera (Caddisflies): Larvae: caterpillar-like, can live in a case, a retreat, or be free-living; abdomen ending with two claws Adults: look moth-like with “hairy” wings

Limnephilidae (Northern Caddisflies): Large caddisflies, dorsal and lateral humps present, cases made of plant or stone. Larvae with prosternal horn (found right below the underside of head), usu. Front legs much shorter than other two pairs

Dicosmoecus gilvipes - Different instars can use different case materials:



Early instar



Final instar

Limnephilidae (cont'd)

Photo credit: S. Pneh



Onocosmoecus sp.

10 mm

Psychoglypha sp.: Very common Limnephilid, makes case out of almost anything, linearly arranged and a little disorganized

Photo credit: S. Pneh



Psychoglypha sp.

Photo credit: S. Pneh



Photo credit: S. Pneh

Psychoglypha sp.

Hydatophylax hesperus

Photo credit: S. Pneh



12 13 14 15

Photo credit: S. Pneh



Psychoglypha sp.

Photo credit: S. Pneh



5 mm

Namamyia plutonis

Odontoceridae: med/lrg.
Case made of uniform sized sand/pebbles w/ slight taper

Photo credit: S. Pneh



1 mm

**Helicopsyche sp.*

Helicopsychidae: very small, case spiraled

Photo credit: S. Pneh



**Lepidostoma sp.*

Photo credit: M. Melton



Lepidostomatidae:
med. size, case 4-sided plant matter or sand, larva w/ only lateral humps; common



**Gumaga sp.*

Sericostomatidae: fine-grained, very skinny curving cylindrical case. Egg mass "U" shaped

*CA only has one genera
**CA has only one species

Photo credit: M. Melton



***Heteroplectron californicum*

Calamoceratidae: case is a single twig, HOWEVER early instars case from leaves; mesonotum long and narrow

Photo credit: S. Pneh



Micrasema sp.

Brachycentridae: tiny, case of coiled filamentous algae or fine sand grains, larvae w/o humps; common

Photo credit: S. Pneh



Photo credit: S. Pneh



Neophylax sp.

Photo credit: S. Pneh

Leptoceridae

1 mm

Leptoceridae

1 mm

Hydroptilidae: tiny, only final instar makes case. Commonly found on filamentous algae. Find pupae attached to rocks ("rice grains")

Photo credit: S. Pneh



Hydroptila sp.

Photo credit: S. Pneh



Pupae attached to rocks

Leptoceridae: Long antenna (for a caddisfly), legs usu. very slender, rear legs much longer than others

Thremmatidae: medium sized looks like limnephilid but anterior edge of mesonotum will be notched, case w/ 1 opening

Photo credit: M. Melton



Glossosoma sp.

Photo credit: S. Pneh



1 mm

Glossosomatidae: dome of pebbles (loosely constructed) w/ 2 openings, case frequently abandoned²⁹

Hydropsychidae: larva abdomen with tufts of gills, all three thoracic segments sclerotized.

Pupa case long, oval, somewhat fragile, attached to rock

Photo credit: M. Melton



Hydropsyche sp. pupa

Hydropsychid

Photo credit: S. Pneh



2 mm

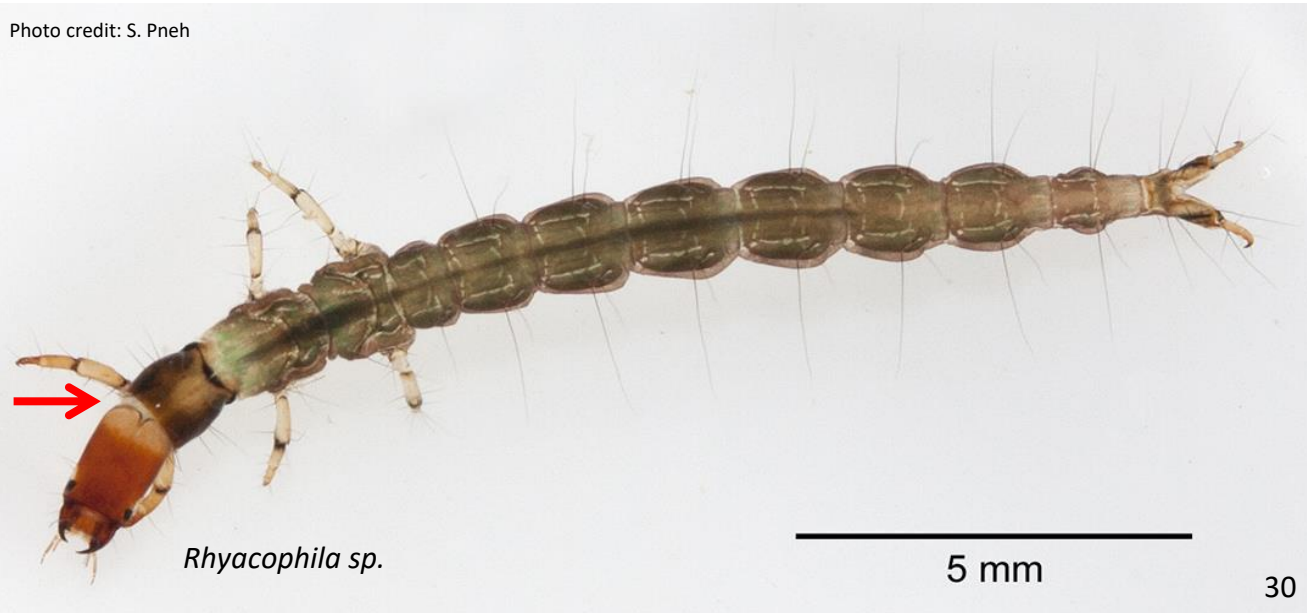
Photo credit: S. Pneh



Hydropsychid retreat

Rhyacophilidae: very aggressive, will bite. Larvae: free living, back of the head is notched, coloration varies, builds case for pupation

Photo credit: S. Pneh



Rhyacophila sp.

5 mm

Philopotamidae:

larva head with translucent T-shaped labrum, bright orange-pink body



Philopotamid retreat

Photo credit: S. Pneh



Photo credit: S. Pneh

Chimarra sp.

Psychomyiidae:

larvae head not speckled, no black line on posterior edge of pronotum, foretrochantin hatchet shaped



Psychomyiid retreat

Photo credit: S. Pneh



Tinodes sp.

Polycentropodidae:

larvae head speckled, will have thin black line on posterior edge of pronotum, foretrochantin pointed

Photo credit: S. Pneh



**Polycentropus sp.*

*CA only has one genera

Planorbidae: Ramshorn snails and freshwater limpets

Photo Credit: S. Pneh



Helisoma sp.

5 mm

Semisulcospiridae: large (>10mm) thick shell, operculum whorled

Photo Credit: S. Pneh



Juga sp.*

3 mm



Ferrissia sp.

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www.lifeinfreshwater.net

Thiaridae (Malaysian trumpet snail): looks like *Juga*, but shell sculpted; invasive spp

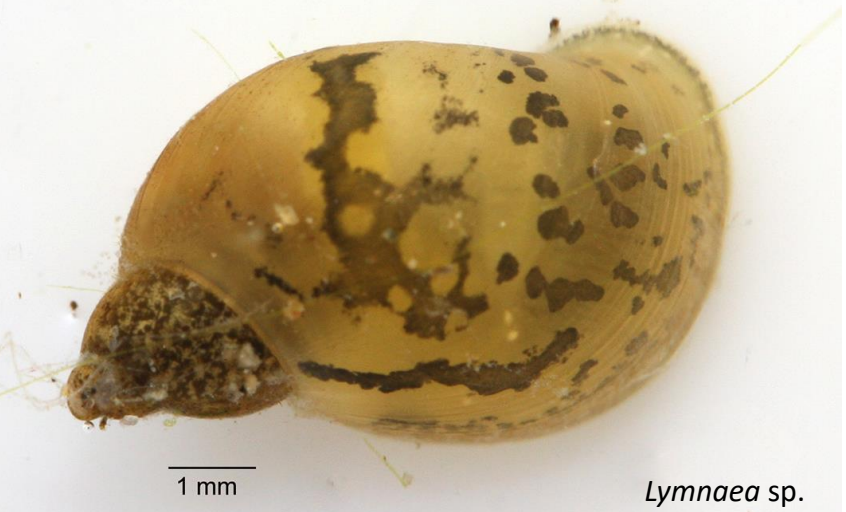


Melanoides sp.

Source: dfg.ca.gov

Lymnaeidae: no operculum, family also contains freshwater limpets

Photo Credit: S. Pneh



Source: wikipedia.org

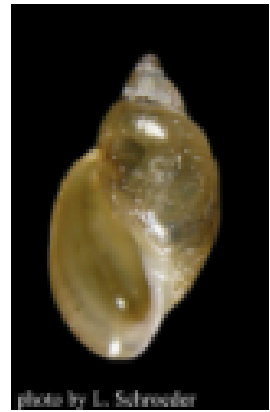


*non-native, invasive
**Only one species

Margaritiferidae: freshwater mussel, 100+ year lifespan. *M. falcata* is IUCN Red Listed species categorized as near threatened



Physidae: left handed snails (shell w/ opening to the left), no operculum



Oligochaeta (Aquatic segmented worms): segmented, looks like an earthworm



Jason Neuswanger
www.troutnut.com

Photo credit: E.C. Maxwell



Turbellaria (Flatworms): Flattened cross-section; have triangular head w/ eye spots



Source: breatheasyproject.weebly.com

Photo credit: S. Pneh



Nematomorpha

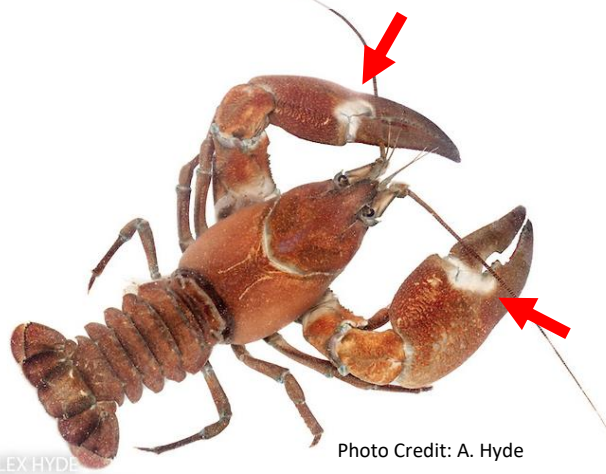
(Horsehair Worms): large, parasites of terrestrial insects (e.g. grasshoppers), unsegmented, wire-y

Nematoda (Round Worms): small, parasitic, unsegmented, thin, pale colored, writhe

Decapoda (Crayfish)



Pacifastacus leniusculus Signal Crayfish



Spongilla (freshwater sponge)

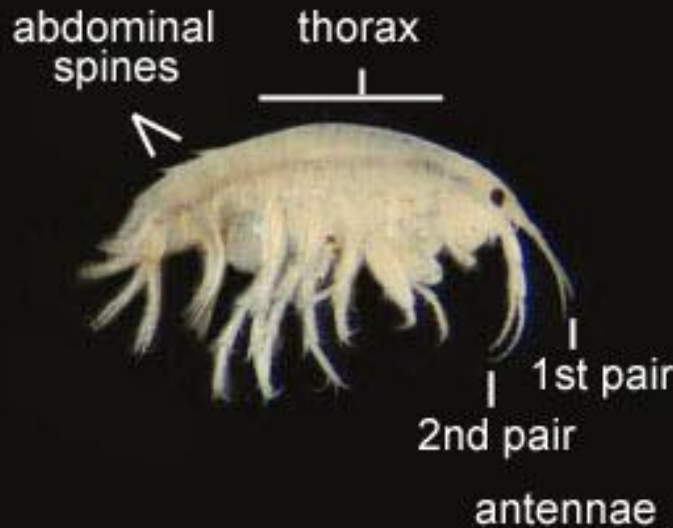


Acari (water mites): 8 legged, $\leq 1\text{mm}$

Photo Credit: J. Hamrsky



Amphipoda (Scuds)



Ostracoda (Seed Shrimp): $\leq 1\text{mm}$

Photo Credit: J. Hamrsky



Got Eggs?



Photo credit: S. Pneh

E. maculata black, sticky clumped, carpet creek bottom, found only in tribis



Purcell et al 2008

1 cm

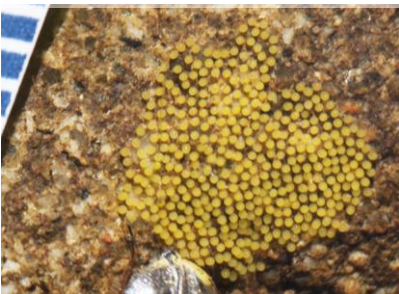
Neophylax egg mass gelatinous, donut shaped, attached to rock



Photo credit: S. Pneh

5 mm

Hydropsychidae eggs oval, arranged in single layered arch-like rows, color varies



← **Psephenidae** yellow and circular, eggs slightly spaced out, less "organized" than hydropsychid eggs



Photo Credit: N. Dixon

→ ***Gumaga*** free floating "U" shaped OR green ball

← **Planoboridae** flat oval mass



1 mm

Photo credit: S. Pneh



Photo credit: S. Pneh

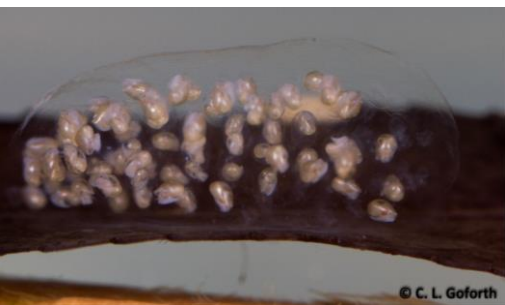
1 mm

↔ **Chironomidae** diverse, shapes vary



Photo credit: S. Pneh

2 mm



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← **Physidae** long gelatinous mass, usu a side attached on side

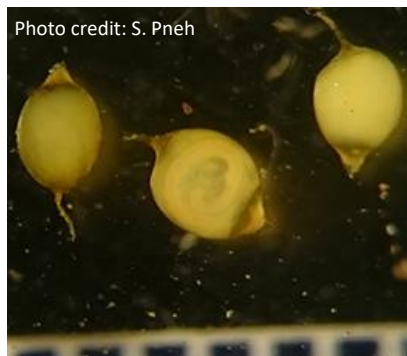


Photo credit: S. Pneh

← **Oligochaeta** yellow, acorn-shaped

→ ***Lepidostoma***: lrg gelatinous ball, covered in debris, usu attached to smtg at single point



Photo credit: S. Pneh

