Aquatic Insect Identification
Developed by NH Fish & Game Department
Aquatic Resources Education Program

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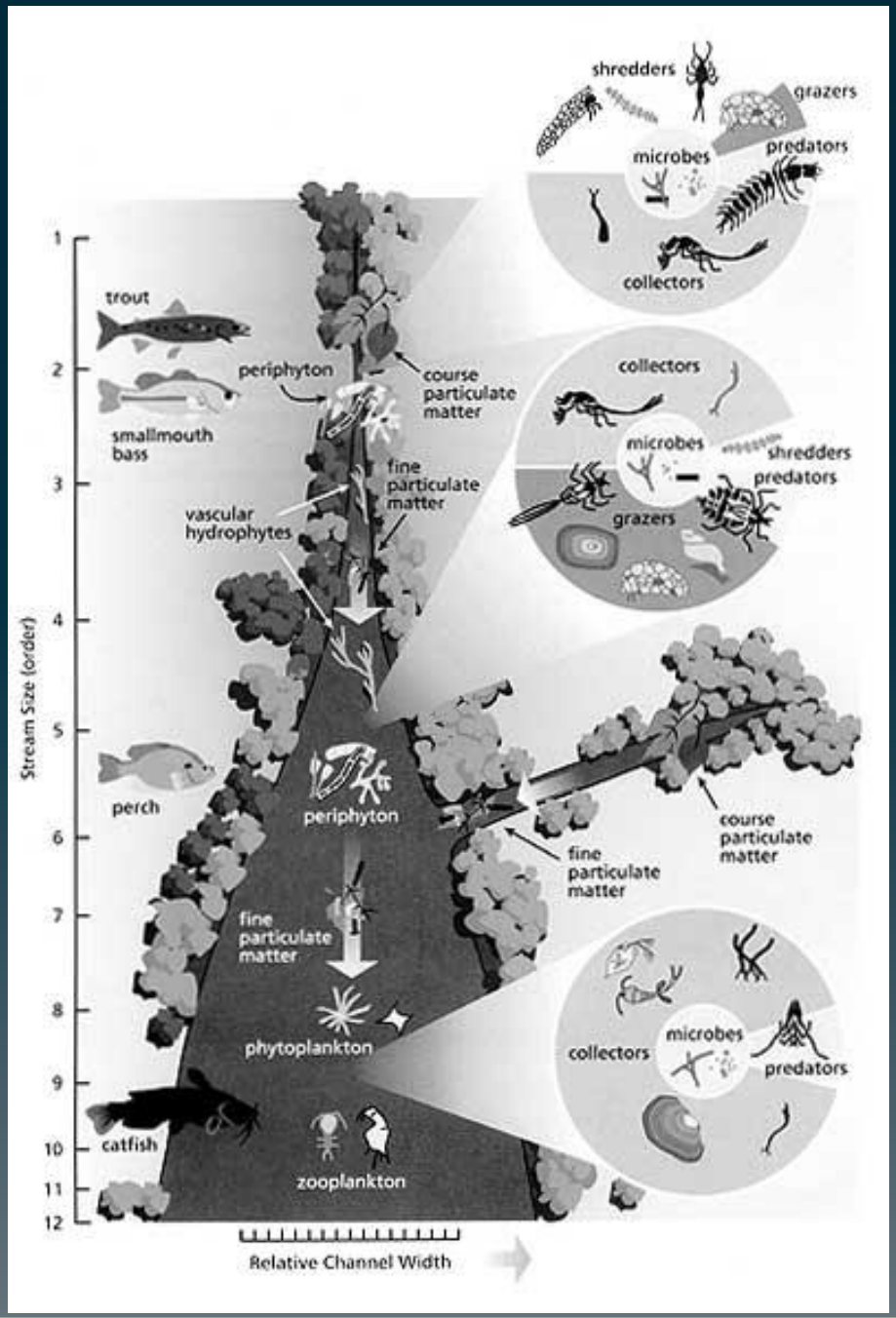
River Continuum Concept (RCC)

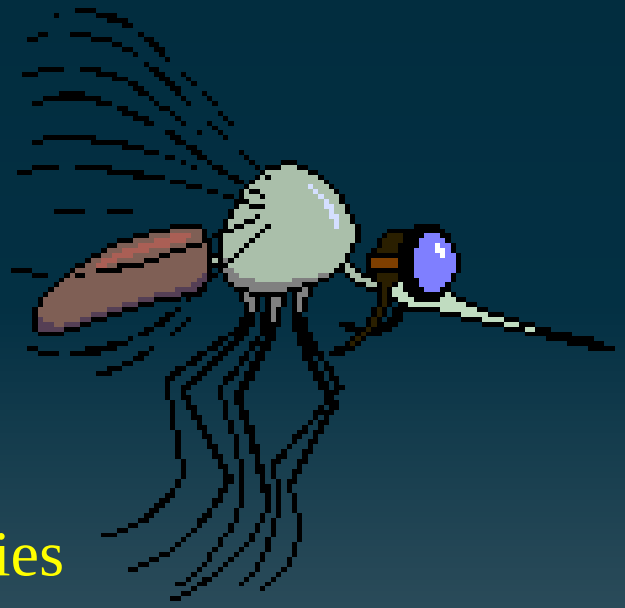
The RCC proposes a progressive shift, from headwaters to mouth, of physical gradients and energy inputs and accompanying shift in trophic organization and biological communities (Vannote et al, 1980, graphic Stream Corridor, FISRWG).


shredders
grazers
microbes
predators
collectors
trout
periphyton
course particulate matter
smallmouth bass
fine particulate matter
vascular hydrophytes
collectors
microbes
shredders
predators
grazers
perch
periphyton
course particulate matter
fine particulate matter
fine particulate matter
phytoplankton
collectors
microbes
predators
catfish
zooplankton
Stream Size (order)
1
2
3
4
5
6
7
8
9
10
11
12
Relative Channel Width

Simplified RCC	Upper reaches	Middle reaches	Lower reaches
Stream order	1 - 3	3 - 6	6 and above
Substrate	coarse	sand, gravel	fine
Current	fast		slow
Oxygen	saturated		periodic deficits
Sunlight	low	high	low
Temperature	max. <20°C, fairly constant	highly variable	max. >20°C, variable
Particulate matter	coarse		fine
Nutrients	low	high	low
Dominant energy source	leaf litter	primary producers	transport detritus
Dominant primary producers	primary producers rare	attached	plankton
Dominant invertebrates	shredders, collectors	grazers (scrapers), collectors	collectors
Fish habitat and food preferences	cool water, swift current insects	fish and insects	slow current plankton, bottom matter
Biological diversity	low	high	low

Identifying Characteristics/Hierarchy

Phylum
Class
Order
Sub-order
Family
Genus
Species



1. Exo-skeleton
2. Six legs at some stage in life cycle (3 pairs)
3. Three body Parts – Head
   Thorax – leg and wing attachment
   Abdomen

Macro-invertebrates

- No Backbone
- Big enough to see with the naked eye

Insects
Crustaceans
Mollusks
Worms

Why Study Insects?

1. Accessible For Study
2. Indicator Species
3. Adaptations
4. Food Webs

Metamorphosis

Transition stage between larva and adult

Complete: **egg --- larva -- pupa -- adult i.e., caddisfly**
Complete change from larva to adult. The pupa is very inactive. Larva are very worm-like.

Simple: **egg – nymph – adult i.e., dragonfly**
Nymph is active and has some adult characteristics. Nymph emerges into an adult. Change is very obvious.

In-complete: **egg – nymph – adult I.e., backswimmer**
Nymph is active and looks like adult. Adult has fully developed wings.

What to look for:

Mouthparts – chewing, piercing-sucking, mandibular

Wing types – 2 pair
1 pair
transparent
wing covers

Body shape – flattened, rounded, long and skinny

Gill location (aquatic) – if gills are present may, they may tell you order

Trichoptera – hair/wing

Caddisfly – 1000 species in North America

Complete Metamorphosis

Larva – Case building - Plant eating
Net spinning - Detritus and plants
Free living – Predacious

Shape is c-curved

Adult – 2 sets of wings held in a tent like fashion over the body.

Chewing mouth parts

Look similar to moths in flight

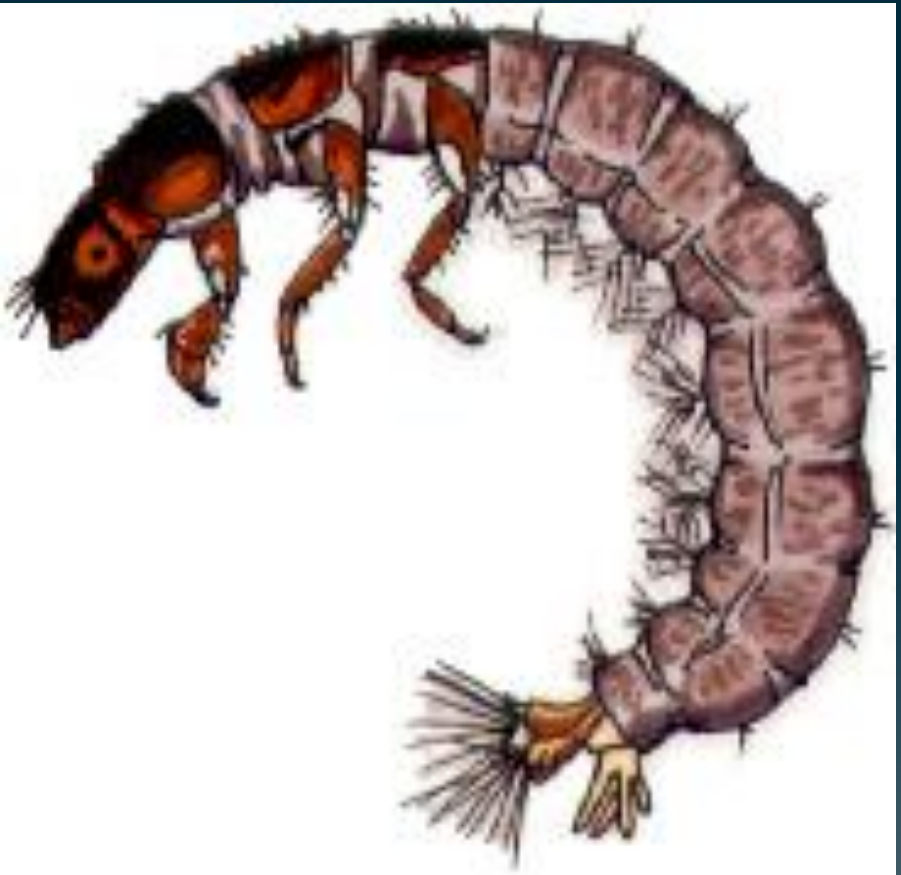
********Very important source of food for fish at all stages of life cycle.

Larva can be identified by case. Cases are built from materials found in substrate (habitat)

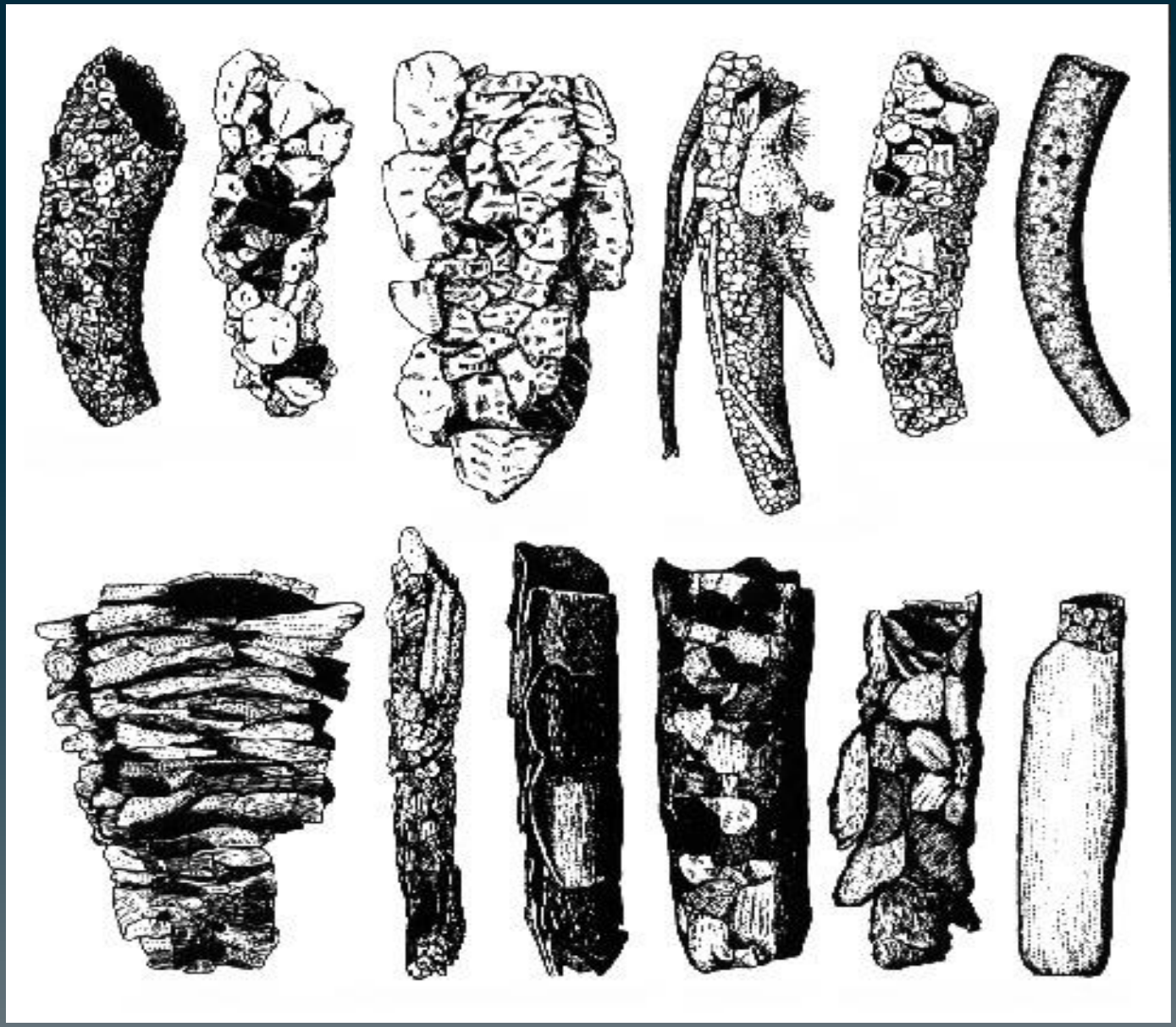
Caddisfly

Larva in case

Adult



CADDISFLY
(Symphitopsyche slossanae, larva)



Examples of River Caddis cases

Coleoptera – Sheeth/wing (beetles)

1000 species of beetles
at least partially aquatic in North America.

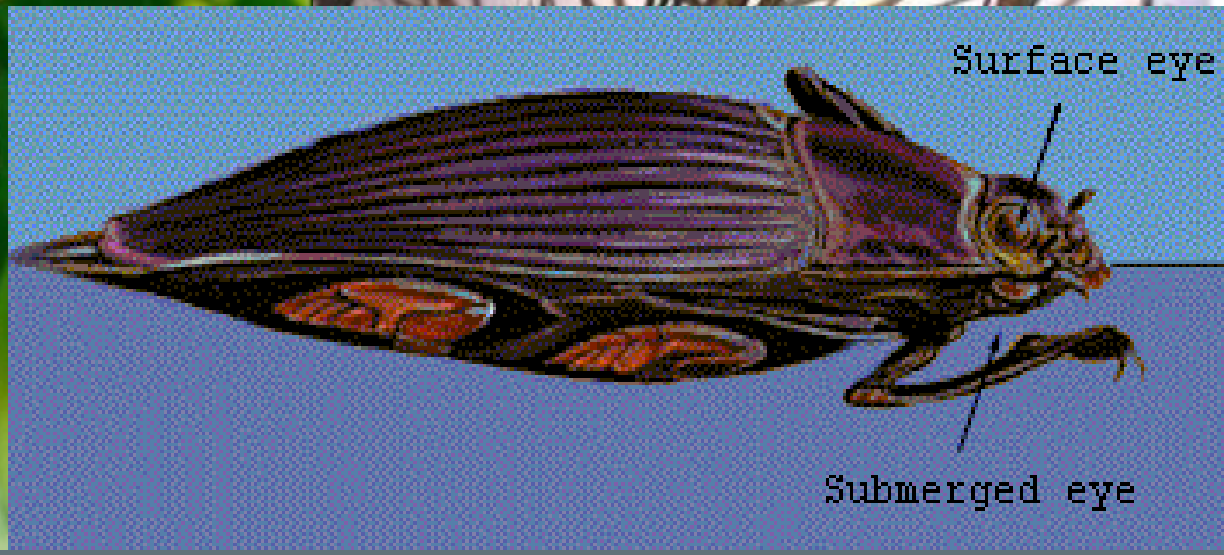
Complete Metamorphosis

Larva - Worm-like with false appendages
Mandibular mouthparts
Gill breathing
Found in variety of aquatic habitats

Adults - Hard wing covers called elytra split down the middle on the back.

Clumsy flyers

Coleoptera - Beetles



Water beetle Larva

Whirligig beetle

Plecoptera – braid/wing (Stonefly)

425 species of Stoneflys on North America

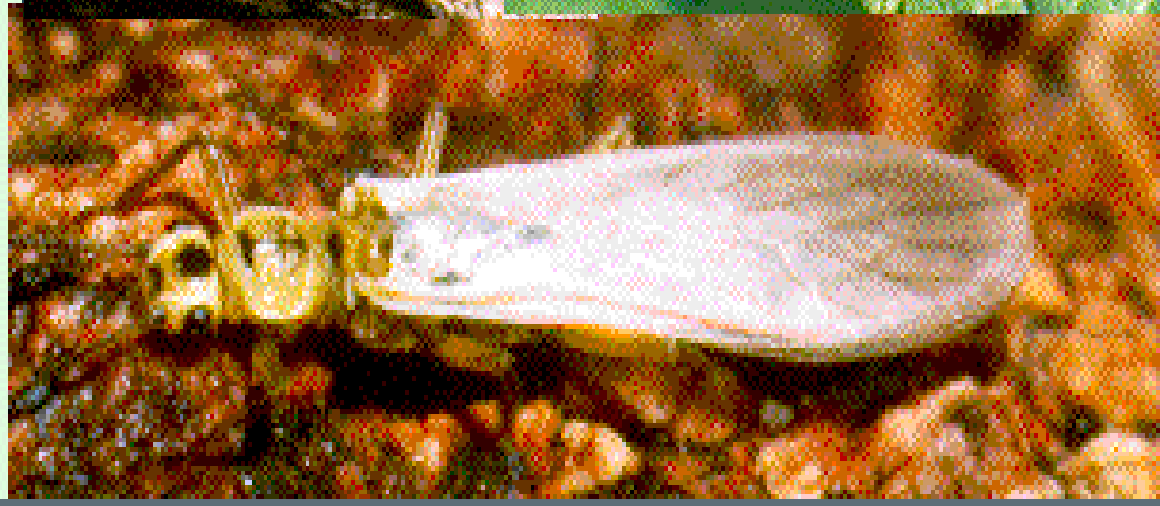
Metamorphosis is simple

Nymph –Gills located at the base of the legs
(The Mayfly looks similar)
Flattened bodies
Predacious or herbivore

Adults - Similar body shape slender and flat
Wings held flat over the body
Short lived as adults
Nymphs crawl out of water and emerge on rocks, bridges or vegetation

The stonefly is associated with clean, cold oxygen rich water habitat. The water will be moving (stream or river). Typically found on rocks in riffle areas.

Plecoptera – Stoneflies



Diptera – two/wings (true flies)

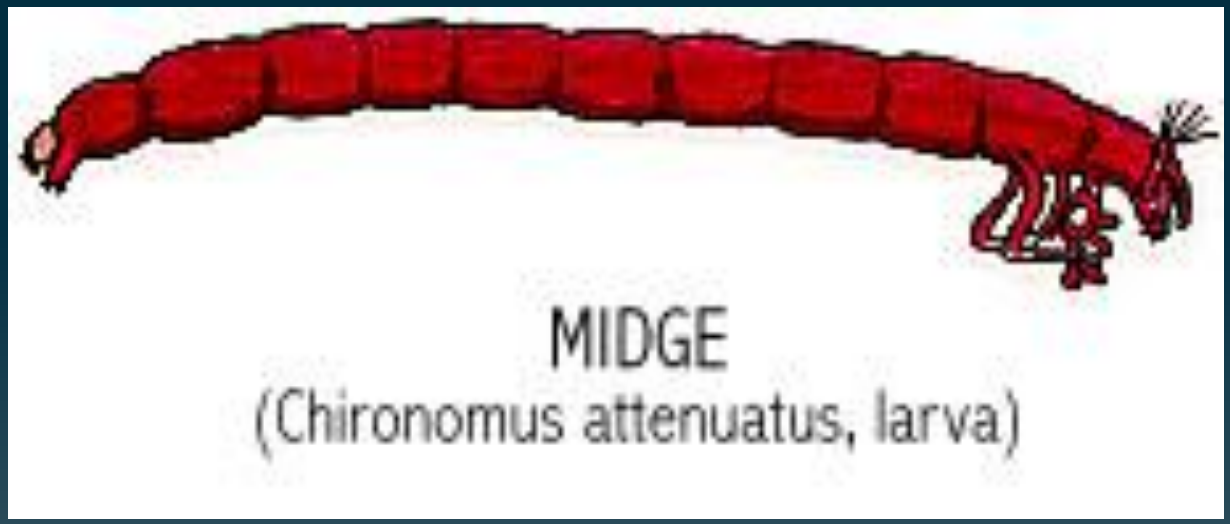
Only group of insects with 1 pair of wings as adults. All other orders have 2 pair of wings.

Metamorphosis is complete.

Larva – Wormlike
- Mosquito's
- Midges
- Crane flies
- Black flies

Habitat requirements vary i.e.. mosquito's can live in low oxygen stagnant conditions. Black flies require fast moving well oxygenated water.

Adults – One set of wings.
The mosquito's body type occurs frequently among the aquatic Diptera.



MIDGE
(Chironomus attenuatus, larva)

The True Flies (Diptera)

crane fly larva


crane fly


mosquito


mosquito

Simulidae – black fly

Ephemeroptera – temporary/wings

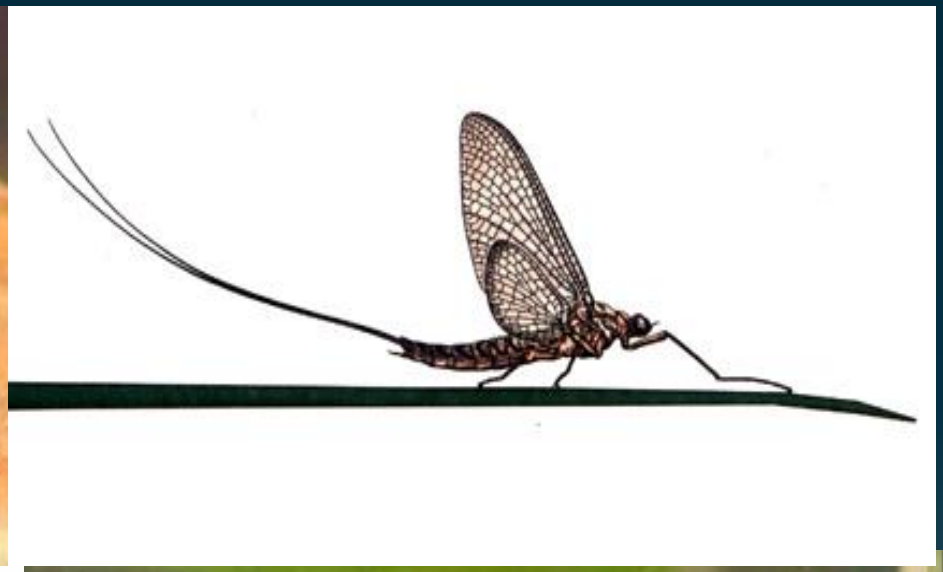
Mayfly: 625 species in North America
Simple metamorphosis with 1 additional stage called the subimago.

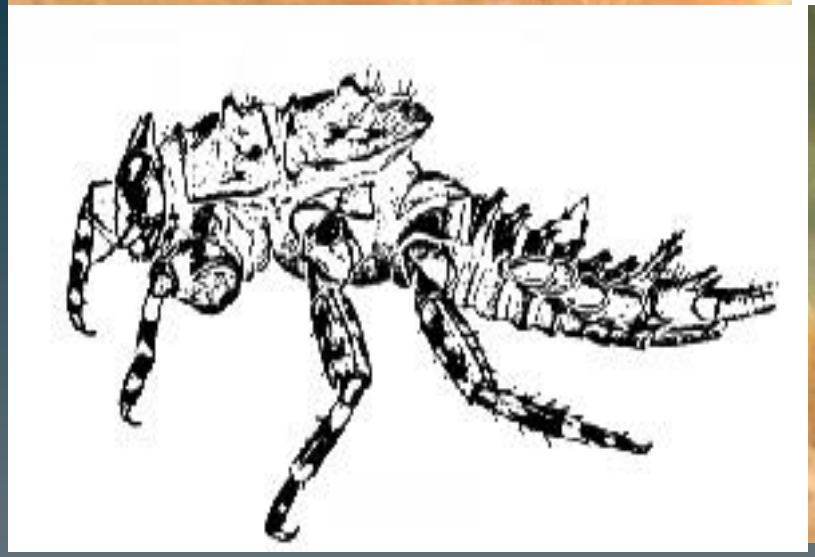
egg-nymph-**subimago**-adult or egg-emerger-dun-spinner
(temporary)

Nymphs: Emerge en-mass
Similar to stonefly nymph, but gills are located on the sides of the abdomen.

Adults: No mouthparts
Very distinct shape
Important source of food for trout
Short live (in some cases as short as 24 hours)
Important fly to imitate in fly-fishing

Ephemeroptera - mayflies





Hemiptera – half/winged (true bug)
400 species in North America

In-complete metamorphosis (5 in-stars)

Adults and nymphs look alike

Adults have fully developed wings

- Water scorpions
- Water boatmen
- Backswimmers
- Giant water bugs

All have piercing sucking mouthparts

Clumsy flyers as adults

Most are predators

Half of the wings are covered with an outer sheath giving the appearance of an X on the back

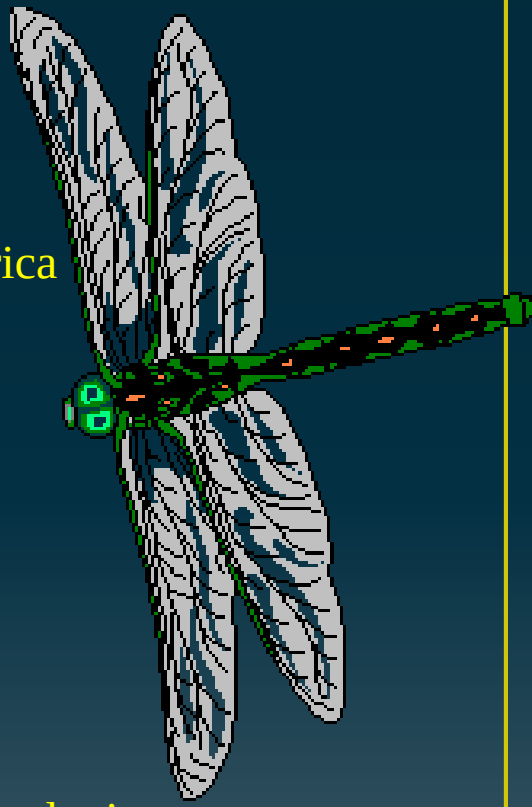
Hemiptera – True Bugs

Odonata – toothed

Dragonfly and Damselfly

Most primitive insects still around today

Simple Metamorphosis/425 species in North America



Nymphs – gill breathing predators

Dragonfly – short and stocky
gills internal

Damselfly – Long and slender bodies
Gills external on abdomen

Adult –

Dragonfly - great flyers hold wings flat and away from body important predators of mosquito and blackflys, mosquito hawks, chewing mouthparts, huge compound eyes

Damselfly – hold wings vertical and above the
Nickname – Darning Needles

Odonada

Damselfly

Dragonfly

Dragonflies

Megaloptera (Large Wings)

Complete Metamorphosis/40 Species in North America

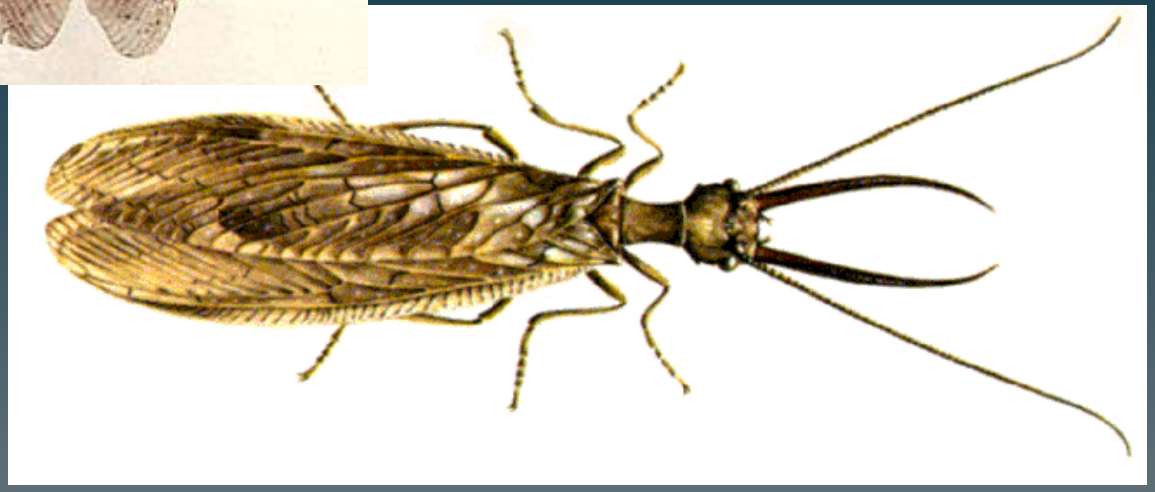
Three families of aquatic Megaloptera in North America.

Dobsonfly – nymphs are known as hellgrammites
Alderfly
Fishfly

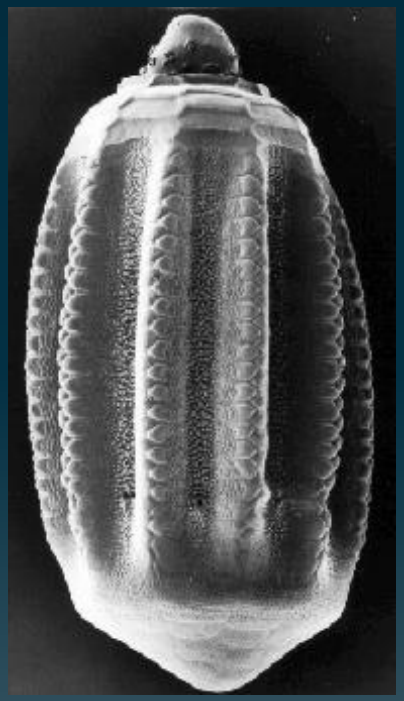
Larva – Very predacious, life spans vary – 1-5 yrs
Similar to some beetle larva with false appendages
Chewing mouth parts
Long, flattened, narrow bodies

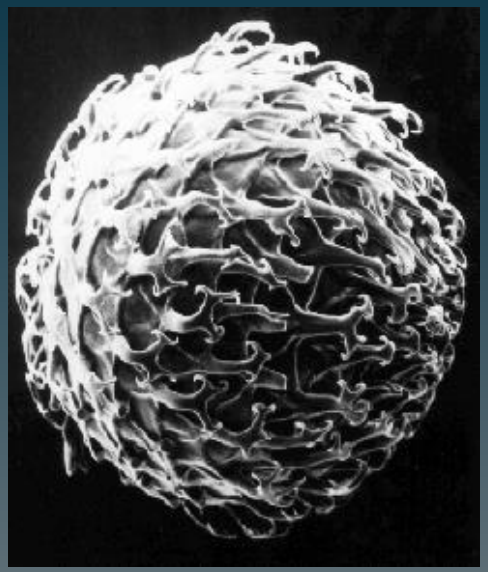
Adults – Very large in size
Large wings (2 sets) held tent like over the body
Dobsonfly males have huge extended mandibles (very distinct!)
Short lived and generally do not feed

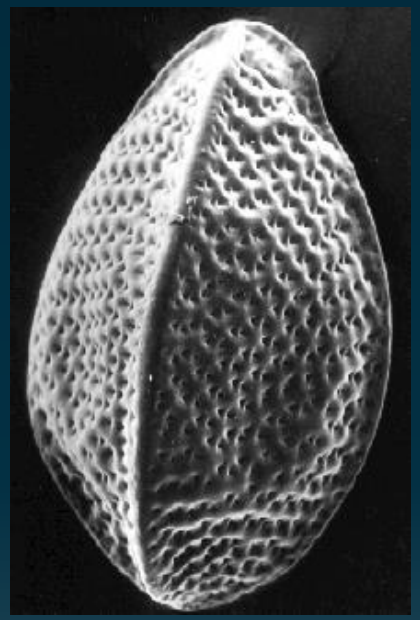
Megaloptera

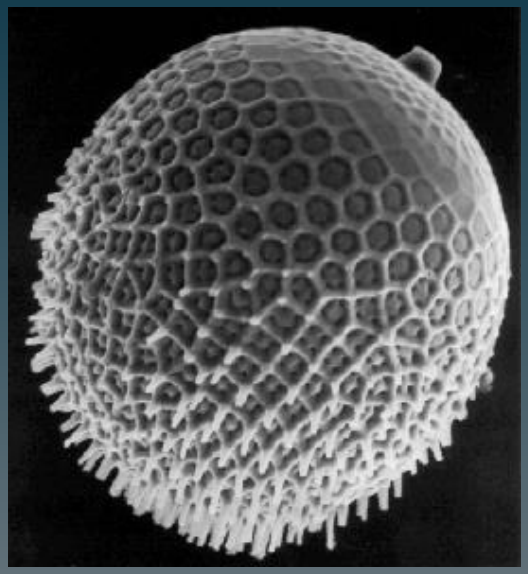


Insect eggs









RIFFLE BEETLE
(Stenelmis sp., larva)

CRANE FLY
(Tipula abdominalis, larva)

Water Penny

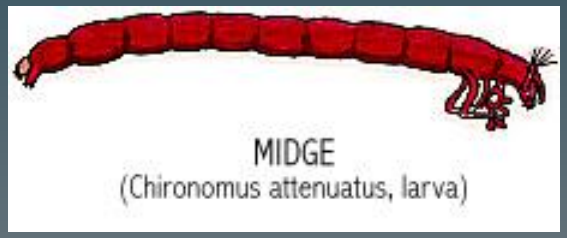
SPREADWINGED DAMSELFLY
(Lestes congener, larva)

CADDISFLY
(Symphitopsyche slossanae, larva)

RIFFLE BEETLE
(Stenelmis sexlineata, adult)

FLATHEADED MAYFLY
(Stenacron interpunctatum, larva)

Predacious Diving Beetle



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