Aquatic Insects

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http://sensicology.wordpress.com/20
“Aquatic” Insects

- A polyphyletic, ecological assemblage of taxa. (does not include common ancestor of all members)

- Truly aquatic insects are those that spend some part of their life-cycle closely associated with water, either living beneath the surface or skimming along on top of the water

- The immature stages are truly aquatic while the adult is a winged terrestrial form.
Aquatic Insects: Why do we care?

- **Major component of the aquatic food chain**
  - Nutrient cycle: decomposers and
  - Water quality: filter feeders
  - Food Webs: prey & predators

- **Indicators of aquatic health**
  - pollution tolerant vs. non-tolerant species

- **Affect human health**
  - vectors for disease (malaria, encephalitis, yellow fever)
  - they bite you: mosquitoes, gnats, blackflies, and biting midges (Diptera)

- **People eat them**
Life History & Physiological Aspects
Aquatic vs. Terrestrial Insects

• Development
  Terrestrial: variable rate
  Aquatic: Generally slower (colder temperature under water)

• Respiration
  Terrestrial: open system (siphon, physical gill, etc.)
  Aquatic: closed tracheal system (gills, cutaneous) with exceptions

• Water/Ion Balance
  Terrestrial: conserve water from dehydration
  Aquatic: conserve ions from dilution

• Nitrogen Waste Removal
  Terrestrial: uric acid (conserves water)
  Aquatic: ammonia (conserves energy)
Mayflies are predaceous or detritivores as nymphs. Adults do not feed.

Larva (nymph)
Plecoptera - stoneflies

• Same life cycle as mayflies
• No lamellate gills along abdomen
• Some have filamentous gills
• Adult wings are flat
• Mostly shredders and grazers
• Stoneflies are predators or detritovores as nymphs; adults do not feed.
**ODONATA** - dragonflies & damselflies

All odonates are predators as both nymphs and adults

- Eggs – larva – adult
- Predacious
- No external gills
- Longer body on damselflies (wings up)
- Dragonflies (wings down)
damselflies

dragonflies
Some large dragonfly nymphs may take vertebrate prey!

Dragonfly larva labial mask hydraulic feeding mechanism
Well-known “loop” configuration of mating

Ready for some porno?

http://www.youtube.com/watch?v=BiXOutDEgDM
Some ancient dragonfly relatives ("Griffinflies") measured over two feet in wingspan.
Orthopteroids i.e., cricket- or roach-like.

- Nymphs fully aquatic, prefer highly oxygenated water.
- Thoracic gills.
- Two long cerci in nymphs & adults.

Fig. 8-36. A stonefly Isoperla confusa, nymph and adult. (From Illinois Natural History Survey)
Diptera - midges, mosquitoes, gnats, flies

- Elongate body
- Segmented body
- Adults have one pair of wings
- Very diverse morphology
Hemiptera - true bugs

- Egg – nymph larva – adult
- Predacious “beak”
- Wing pads
- If wings develop they fold over each other
**Coleoptera - beetles**

- Egg – larva – pupa – adult
- Larva very different from adult
- Adults – have hard case on body that does not overlap
- Adults have chewing mouthparts
- Larva – undeveloped eyes, sometimes have tusks
TRICHOPTERA - caddisflies

• Sister order to the Lepidoptera.
• Moth-like.

PRIMITIVE CADDISFLY (p. 214)

- long, thread-like antennae
- wings membranous (~transparent)
- reduced mouthparts
Feature distinguishing adult caddisflies from adult moths.

A true moth
Caddisfly nymphs are predaceous or detritivores; adults do not feed.
Aquatic Insects Inhabit Virtually Every Possible Freshwater Habitat

- What are some of the factors that might explain why insects have been so successful in freshwater?
–Evolutionary history
–Morphology
–Physiology-shape, attachments
–Behavior
–Development
What are some of the advantages and disadvantages of being an aquatic insect?
Advantages:
• No water loss from evaporation
• Less temperature fluctuation
• Less light for predators to see them with
• Avoid competition with terrestrial species

Disadvantages:
• Water uptake from Osmosis
• Less oxygen available
• Moving water
• Different food sources
• Pollution
• How might habitat selection affect the life history of an aquatic insect?
• Substrate for attachment and or shelter
• Food availability (quality and quantity)
• Range of current
• Water temperature and Oxygen
• Presence and relative abundance of other organisms
• Others?
Take home message

• Why aquatic insects are so important:
  I. Important in maintaining biodiversity
  II. Some have been deemed worthy of special protection (dragon-damselflies)
  III. Biocides, larvacides are problematic because indiscriminate.
  IV. Used to determine pollution status or environmental stress- bioindicators
  V. Mostly freshwater-some marine
  VI. Important to food chain
“Mom! Edgar’s making that clicking sound again!”
"Oh no, it's the mosquitoes! Kids, splash around in the pool, they only like stagnant water."
INSECT HEAVEN

I thought that kid just wanted to get a closer look at me.

They warned me not to go into that motel.

Last thing I remember, she came in wearing a sexy negligee...

...so my buddy says, "Dude, check out that crazy zapping blue light!"

What did they expect? I'm a stinkbug - I STINK!
El Hopper Tacos

- 6 Taco Shells
- 1 Cup of Grasshoppers
- 2 cups of water
- 2 onion, peeled, chopped
- Salt and pepper
- 1 bay leaf
- 1 clove garlic, crushed
- 1 tablespoon Worcestershire sauce
- Chopped lettuce
- 1 Tomato, chopped

Making it:
- Bring grasshoppers, water, salt, pepper, 1 chopped onion, and bay leaf to a boil. Reduce heat and simmer for thirty minutes. Drain off liquid. Add garlic, soy sauce, Worcestershire sauce, and tomato sauces and simmer about ten minutes. Practically fill taco shells with some of the grasshopper filling. Top with lettuce, onion, cheese, and tomato.
Infested Fudge

- ¾ cup of butter
- 3 cups of sugar
- 2/3 cup of evaporated milk
- 1 12 oz package of semi-sweets chocolates
- 17 ounces of marshmallow crème
- 1 cup of dry roasted insects
- 1 teaspoon vanilla

Making it:
- Combine butter, sugar, and evaporated milk in a heavy 2 ½ quart saucepan. Bring to a full rolling boil, stirring constantly. Boil for five minutes over medium high. Remove pan from heat source and add chocolate. Stir until the chocolate is melted. Then add marshmallow cream, dry roasted insects, and vanilla. Beat until well-blended. Pour into a buttered nine by twelve inch pan. Let stand at room temperature until firm and then cut into squares.

Best Insects to Use and How to Fix:
- Ants, crickets, and or grasshoppers are best to use. Put into a 200 degree oven for 1 ½ hours until crunchy.
Websites


• The Aquatic Insects of Gunnison County, Colorado- http://www.gunnisoninsects.org/
Cyclops Shark