Aquatic Entomology an Introduction

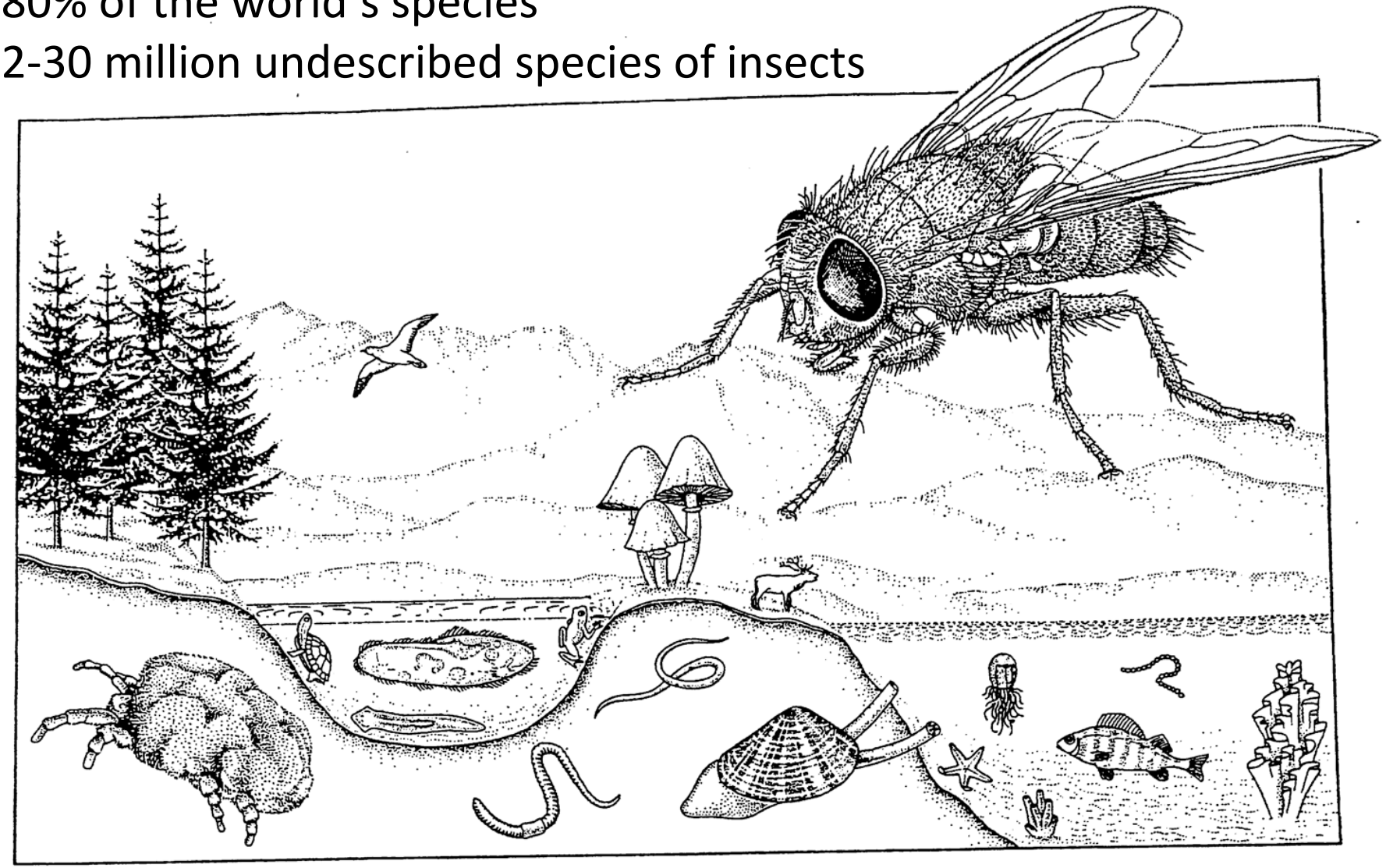
Lecture 1

Spring 2018

- Syllabus

Course Goals

~1 million described insect species
~80% of the world's species
~2-30 million undescribed species of insects



(Wheeler, 1990)

Biomonitoring

- What is it?
  - Evaluation of an ecosystem using living organisms
  - Usually to detect some sort of change
- Kolkwitz and Marsson (1902)
  - They believed that different aquatic taxa were sensitive to various levels of pollutants (Bonada et al., 2006)
  - Saprobien System (1-4 scale)
- Many ecological indicators

Aquatic Macroinvertebrates

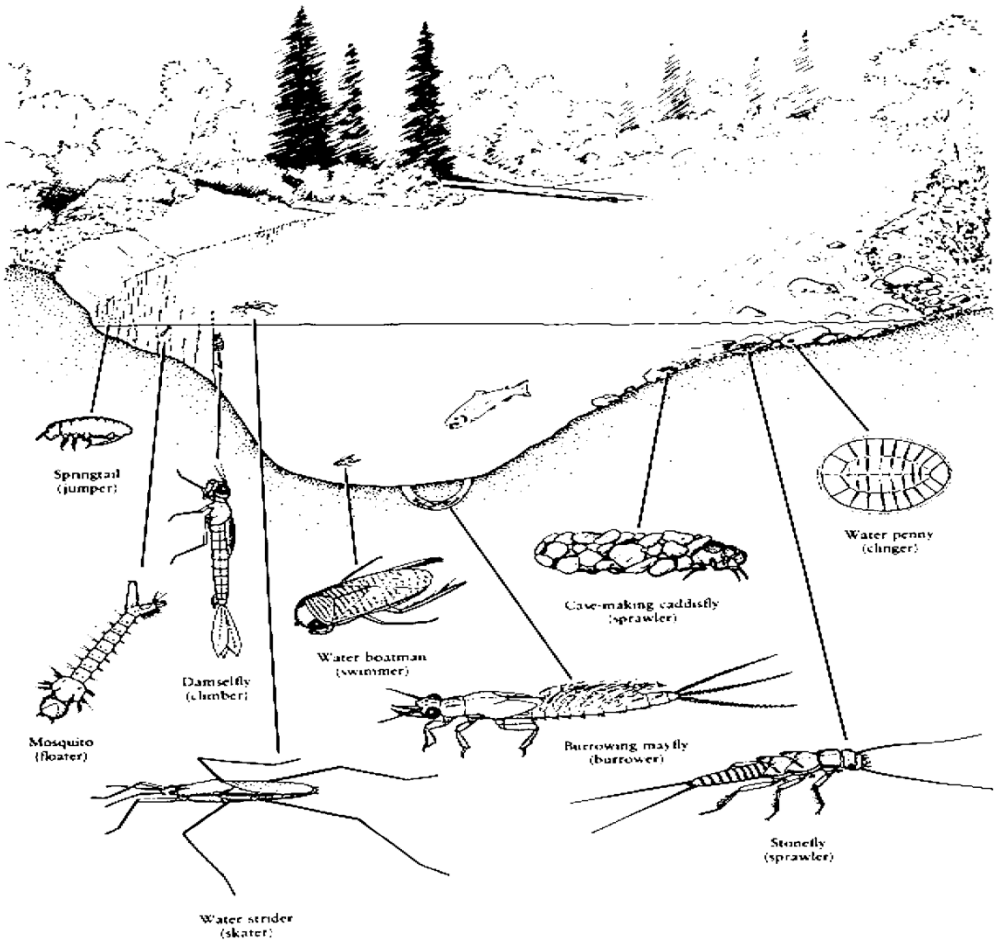
- Aquatic – meaning all or part of lifecycle is in water
- Macro – meaning it can be seen with the unaided eye
- Invertebrate – no backbone; may have exoskeleton
- Includes insects in all life cycle stages (i.e., egg, larvae, pupa, adult)
- Includes some non-insects

Common Names

- mayfly
- stonefly
- dragonfly
- crayfish
- leeches
- aquatic earthworms
- water beetles
- snails
- clams
- sow bugs
- caddisfly
- mites
- scud
- true bugs
- damselfly
- dobsonfly
- true fly

Habitat

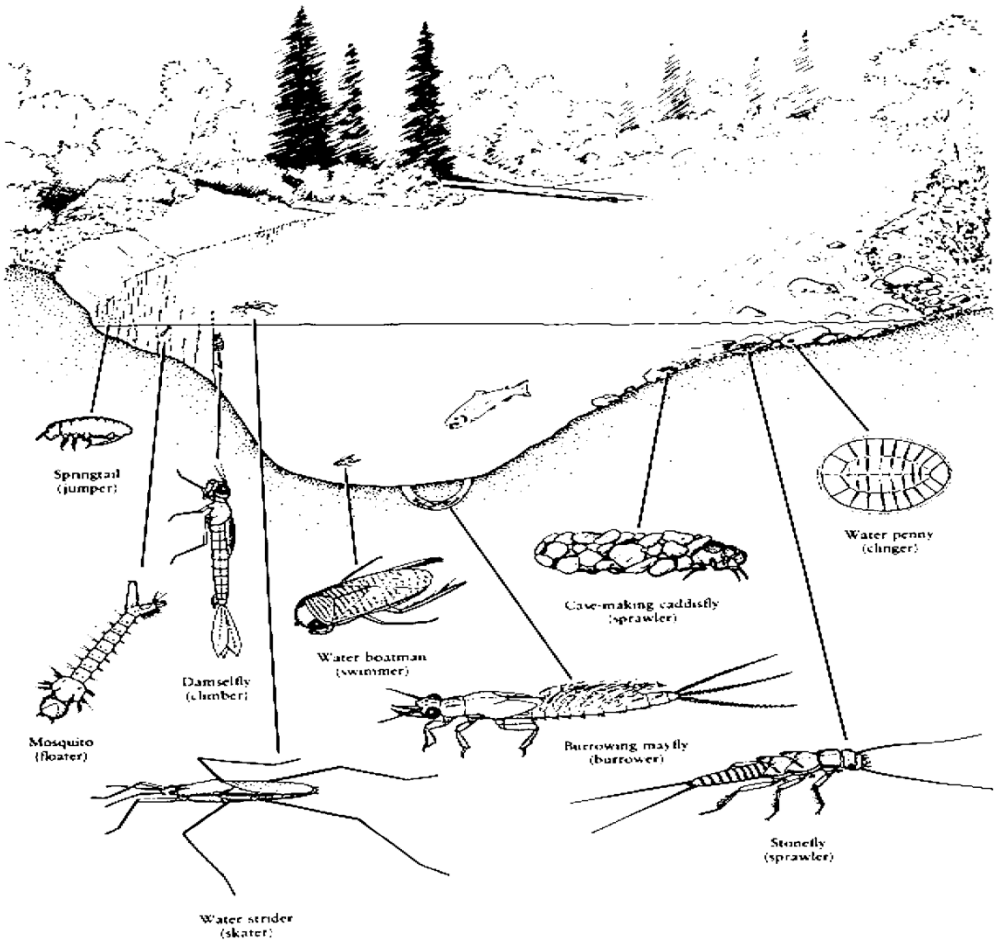
- Lentic Habitat
  - Standing water
  - Lakes ponds
  - Pools, swamps
- Lotic Habitat
  - Flowing water
  - Springs, streams
  - Rivers



(Merritt, Cummins, and Berg)

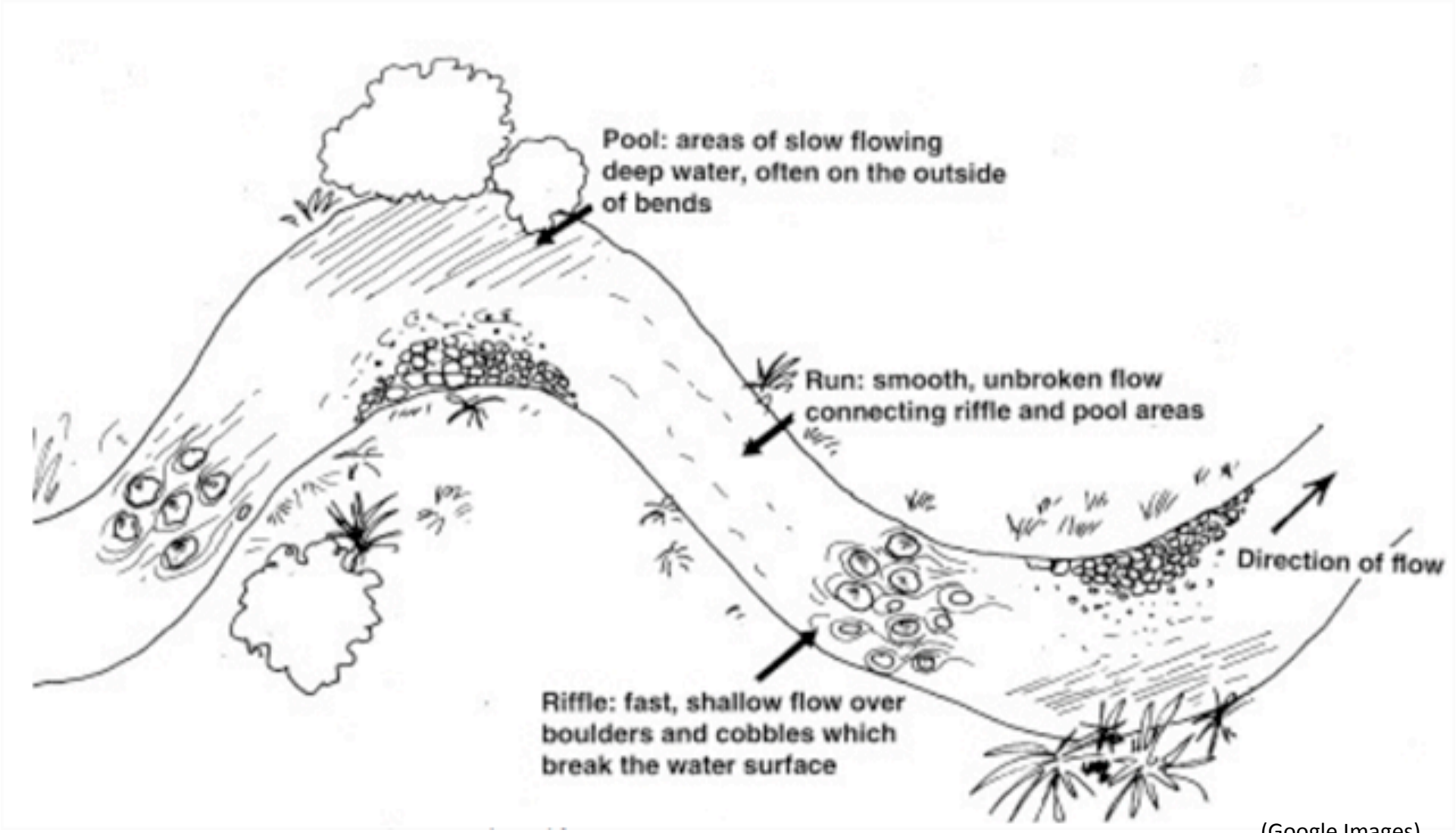
Habitat

- Benthic
  - Live on substrate
  - Live in substrate
- In water column
- On surface



(Merritt, Cummins, and Berg)

Habitat



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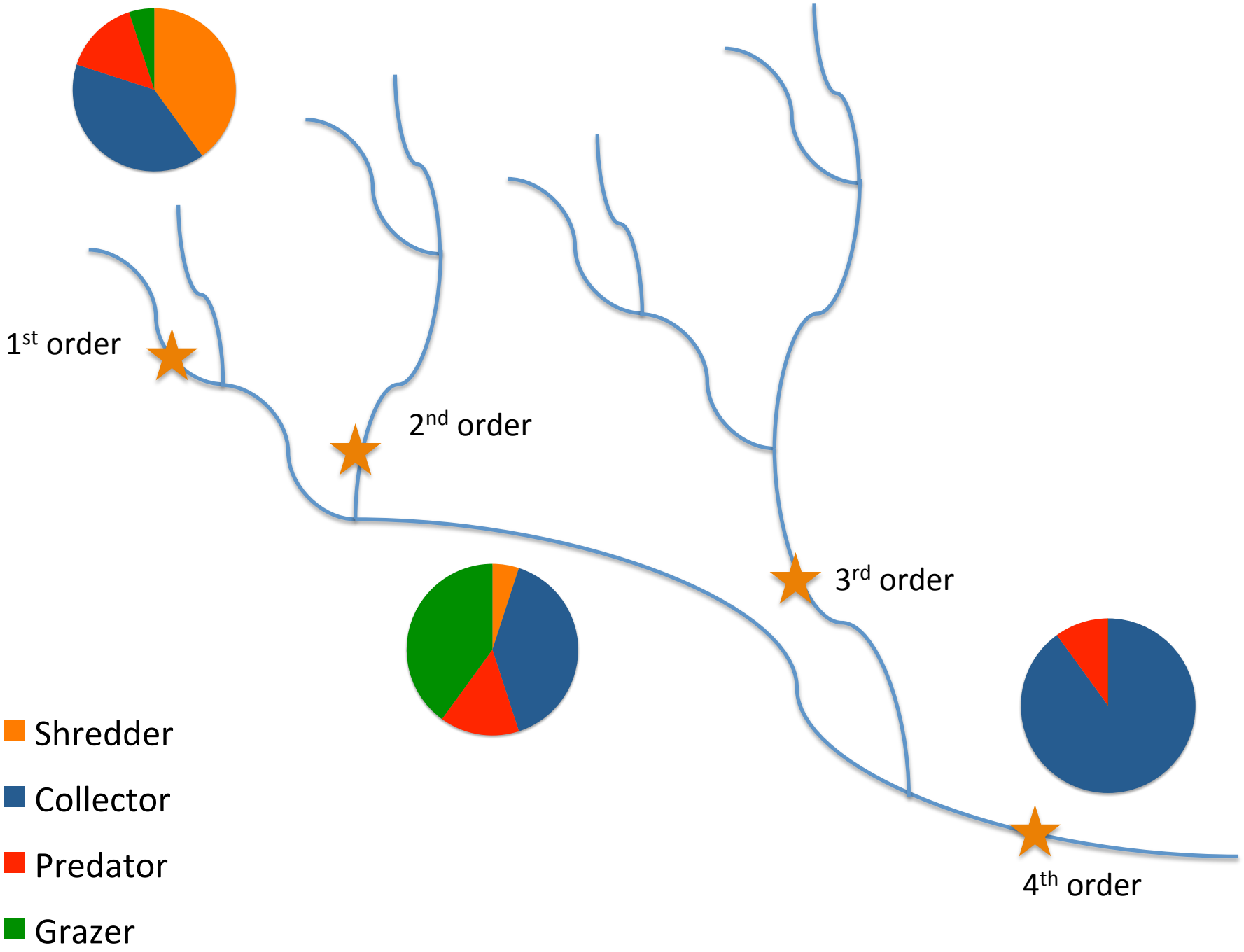
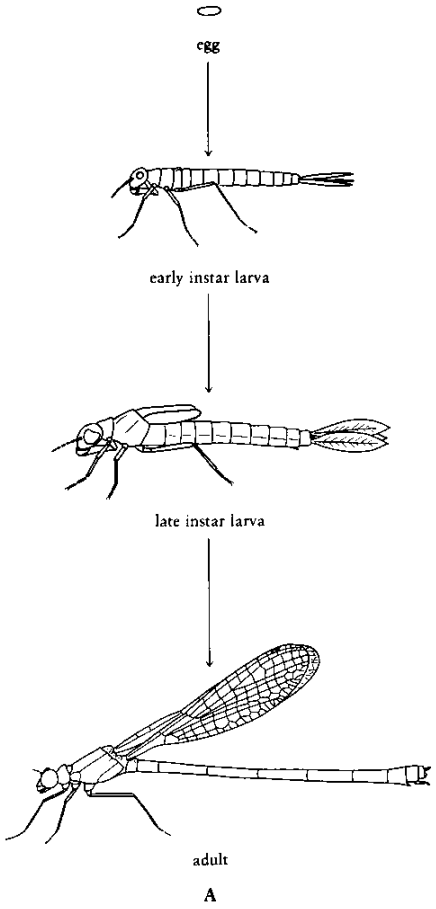
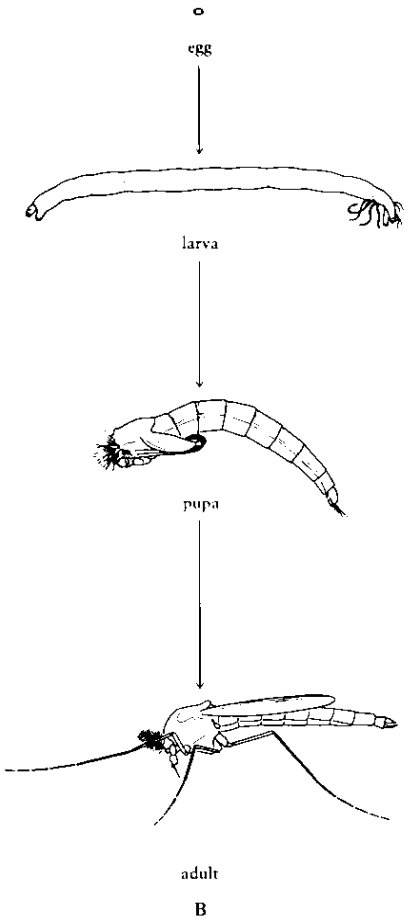

1st order
2nd order
3rd order
4th order
Shredder
Collector
Predator
Grazer

Hemimetabolous Metamorphosis (Incomplete)



Holometabolous Metamorphosis (Complete)

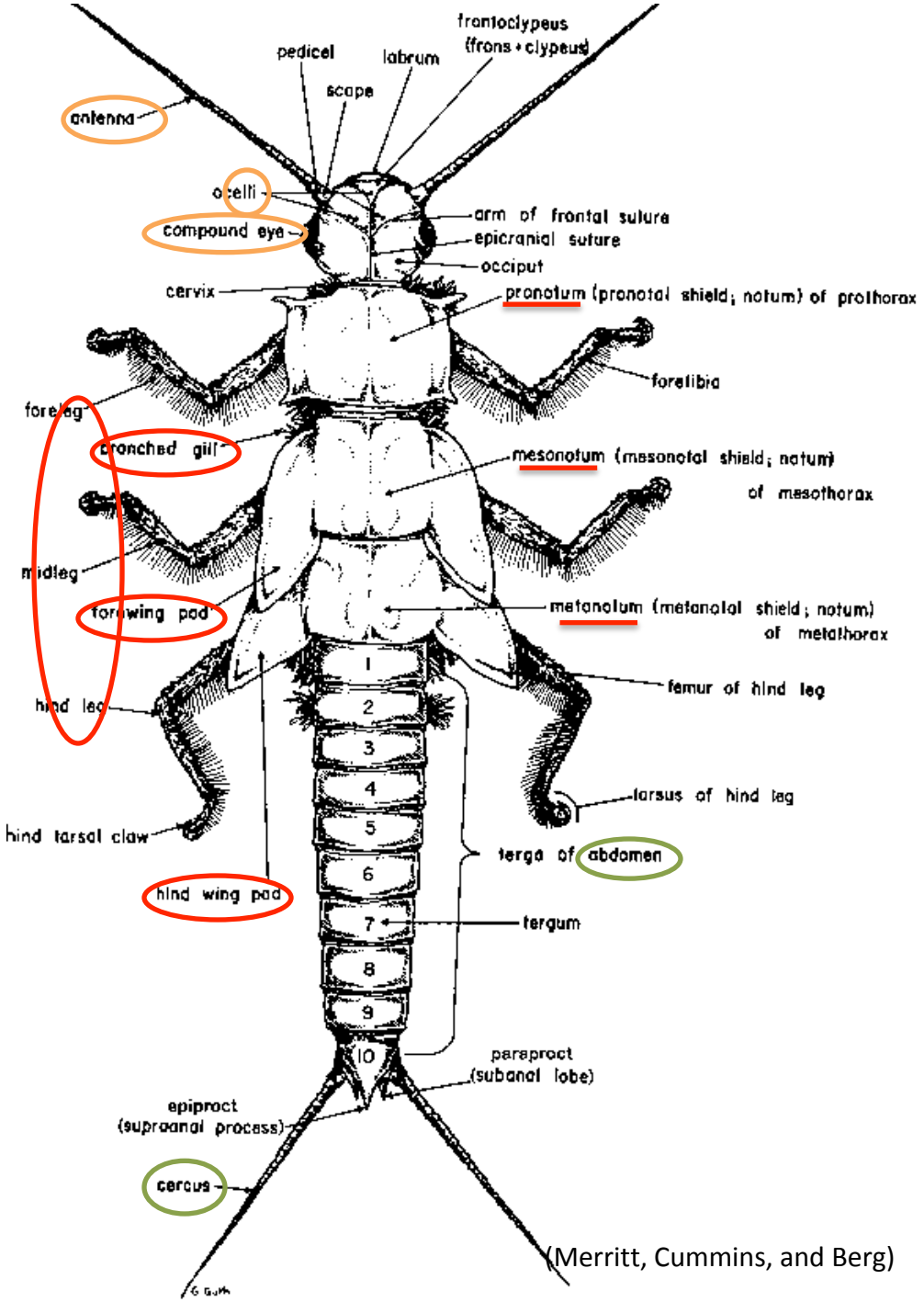


(Merritt, Cummins, and Berg)

Dorsal View

- Stonefly larvae
- Order: Plecoptera

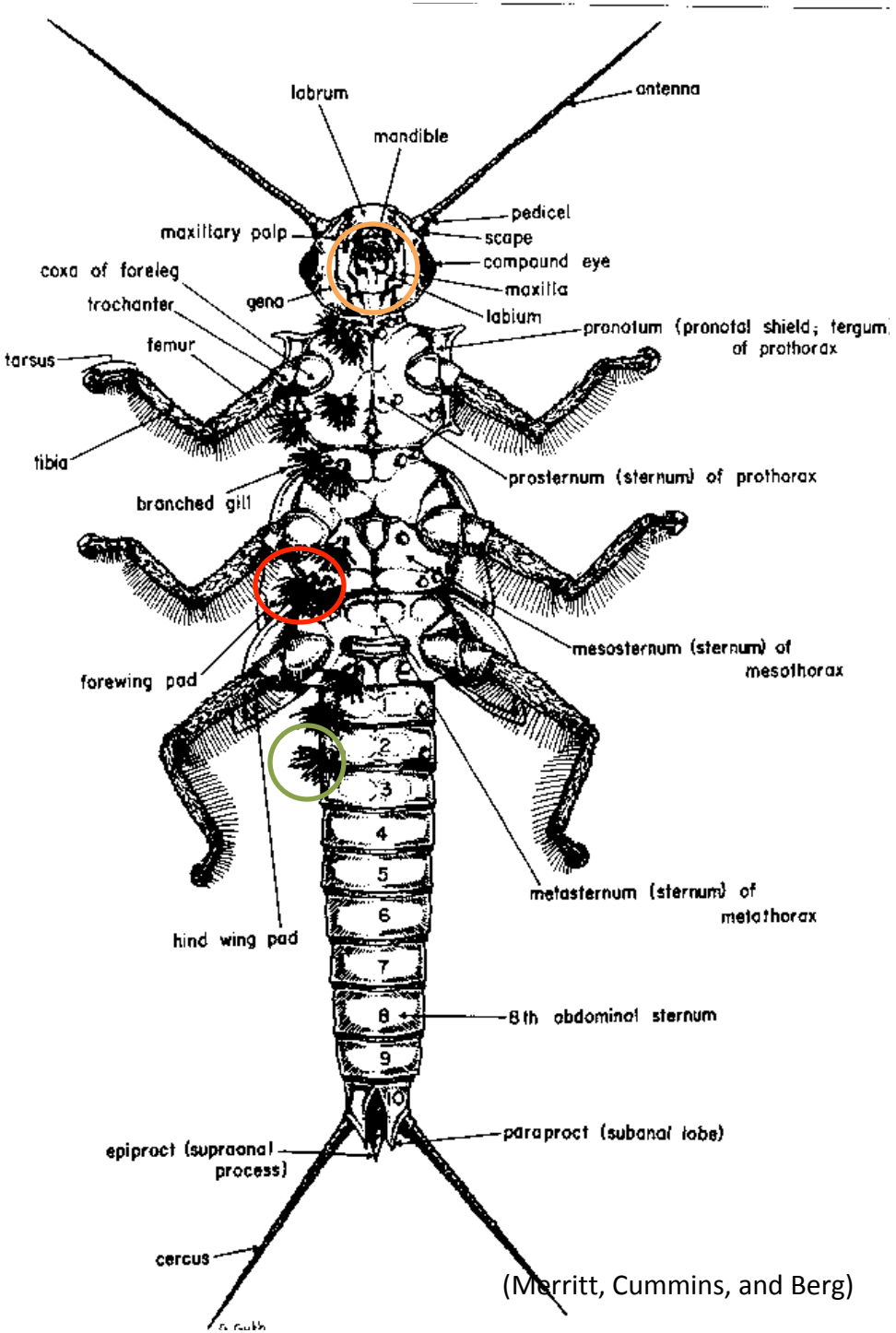
- What are the three major segments?
- Pro-, meso-, meta-



(Merritt, Cummins, and Berg)

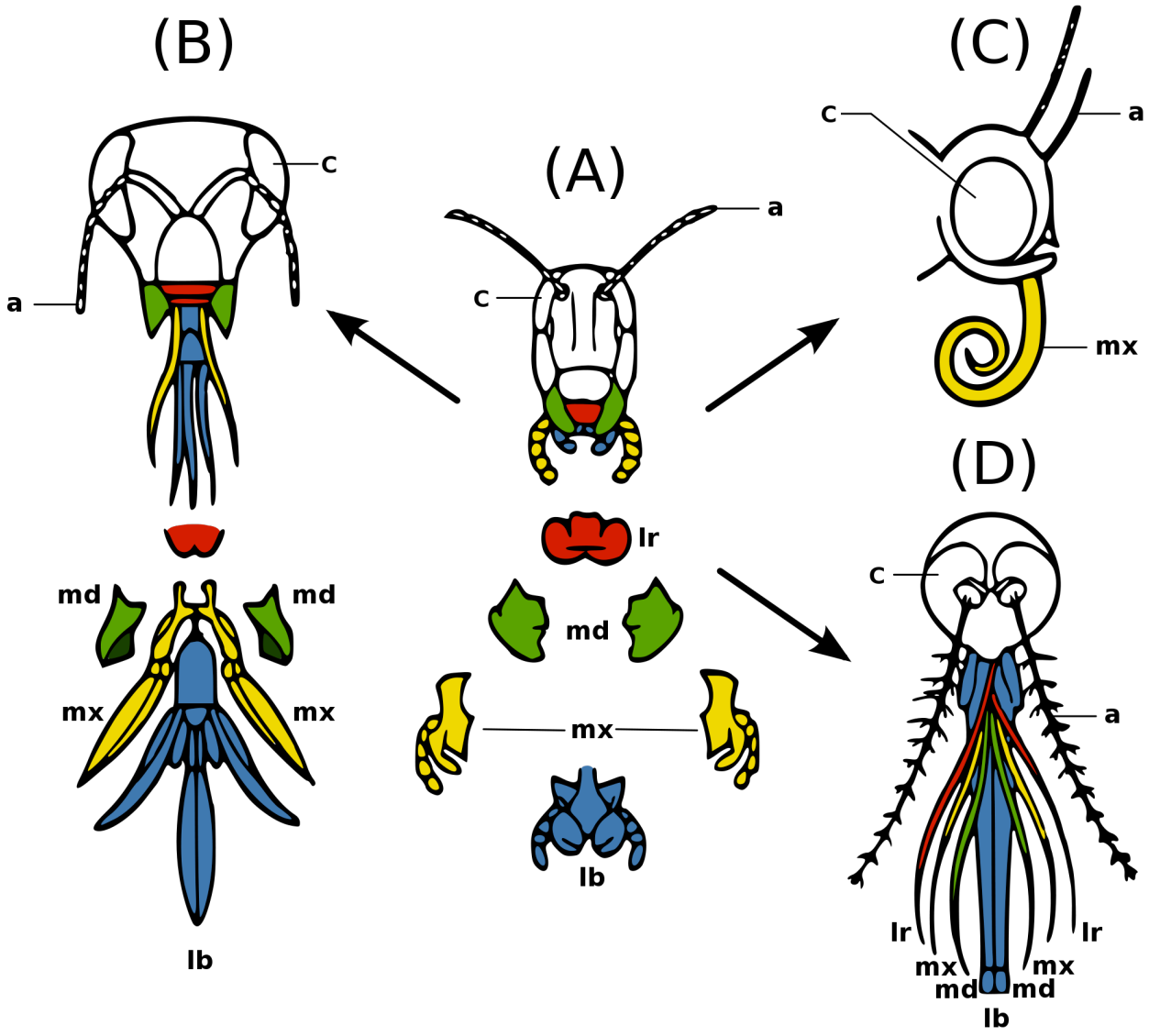
Ventral View

- Stonefly larvae
- Order: Plecoptera



(Merritt, Cummins, and Berg)

Anatomy of the Mouth



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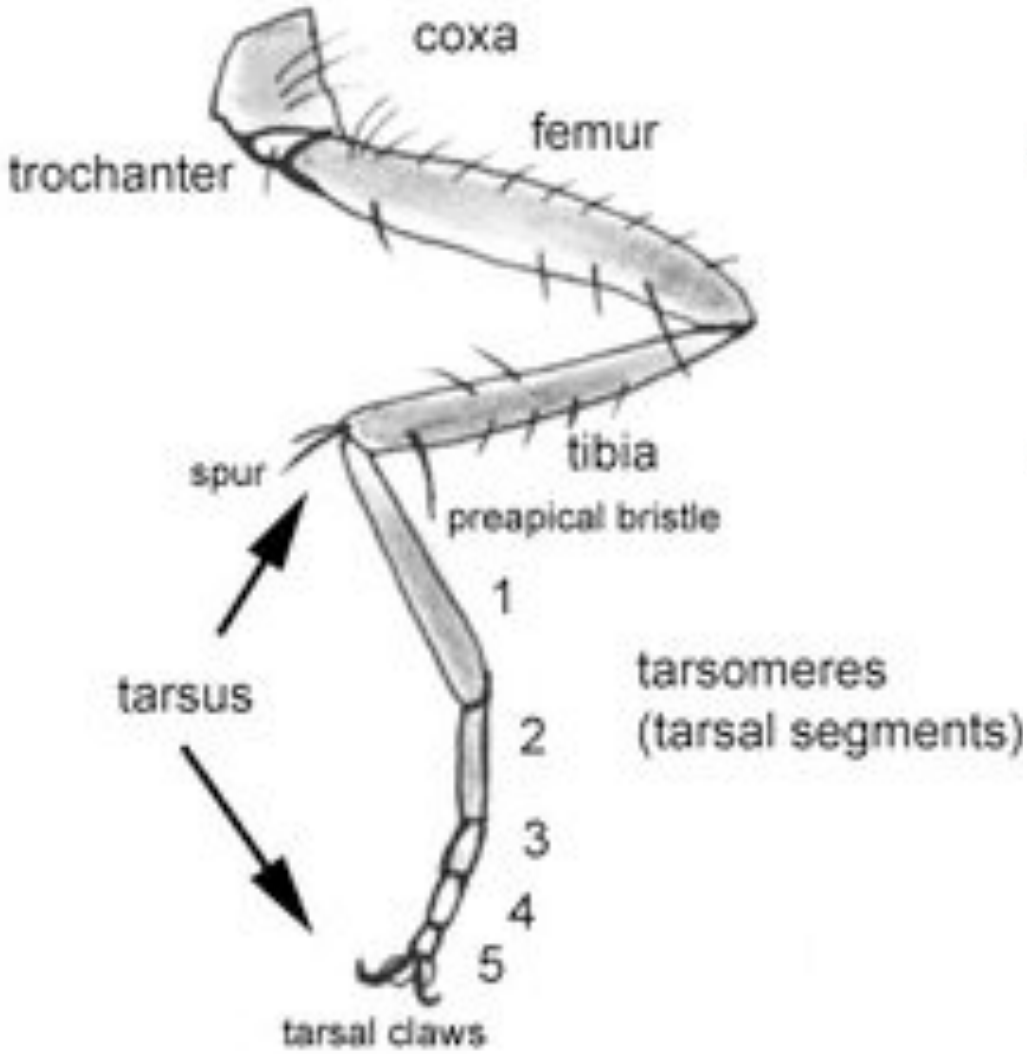
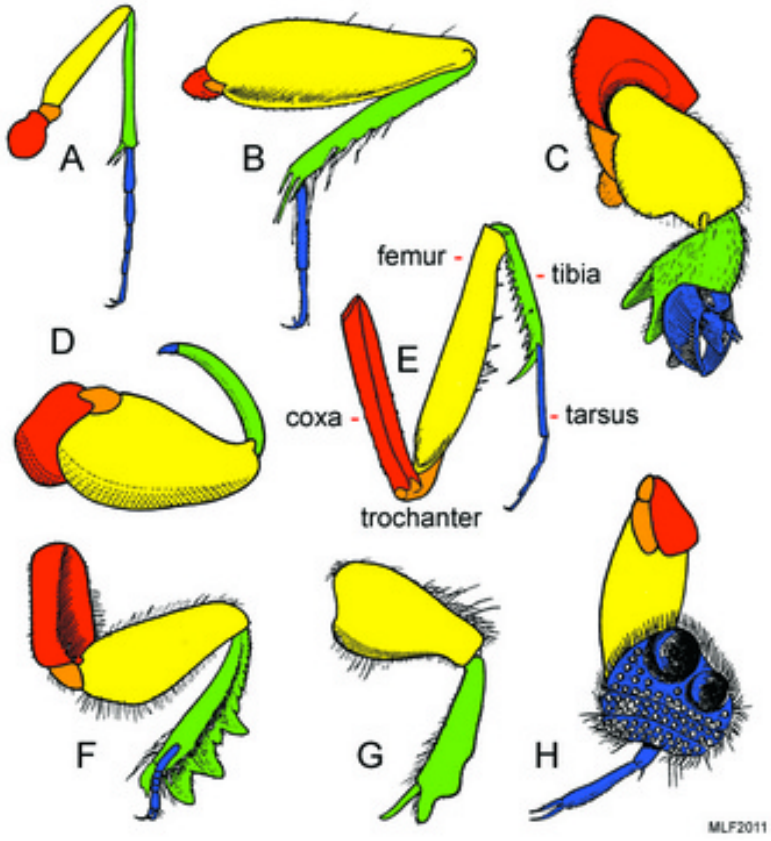
Anatomy of the Leg





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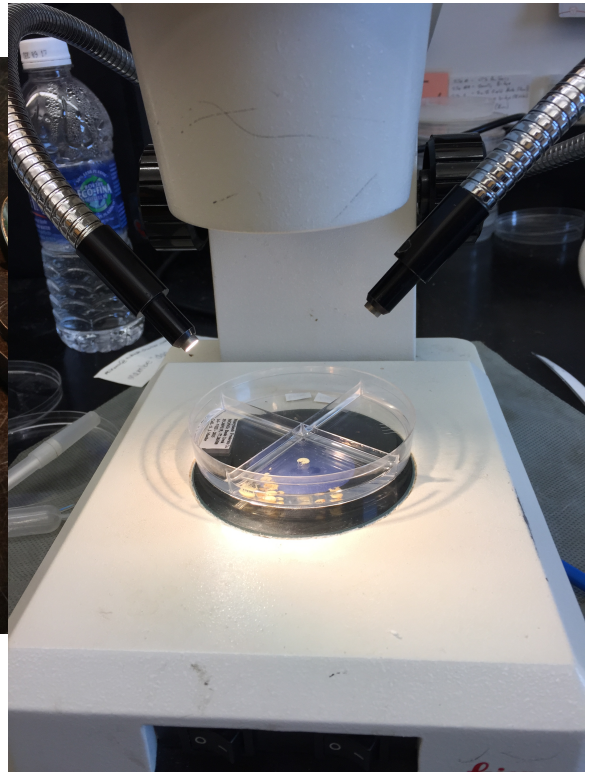
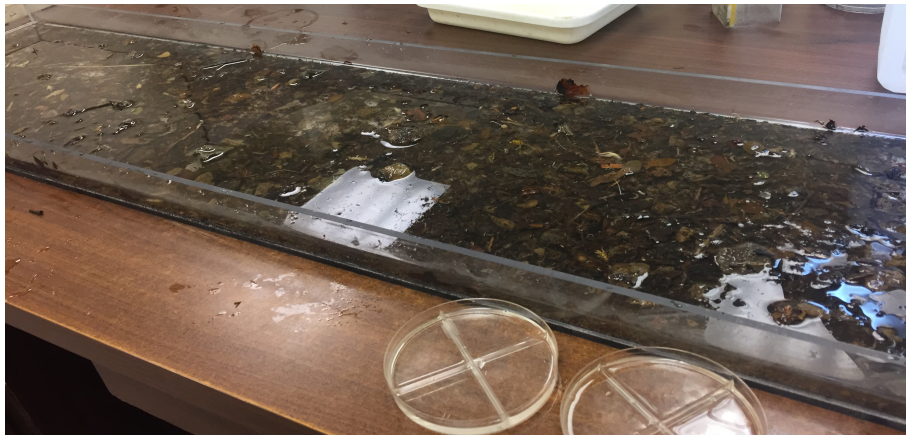
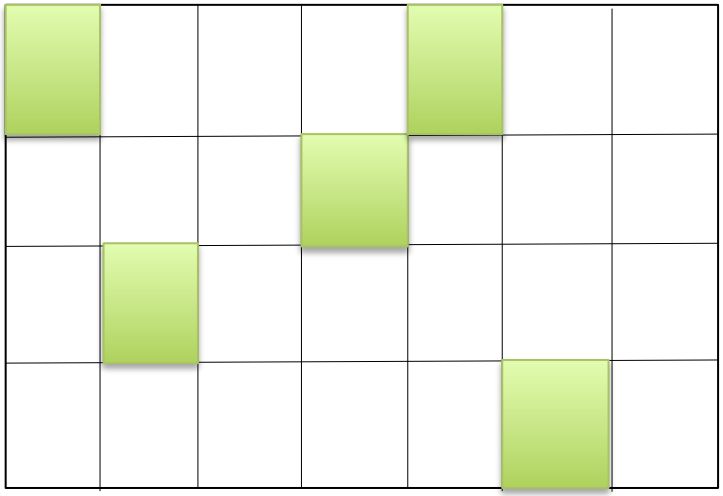
The Collection Process



Rapid Bioassessment Protocol

- 9 kicks/jabs with a D-frame kicknet
- Preserve sample
- Spread into 28 grid tray
- Randomly select squares until:
  - Limestone = 200 ±10% individuals
  - Freestone = 100 ±10% individuals





Sampling Devices – D-frame Kicknet

- Pros
  - Versatile
  - Sample a variety of habitats

- Cons
  - Difficult to standardize

(Google Images)

Sampling Devices – Drift Net

- Pros
  - Measure insect drift
  - Calculate volume of water

- Cons
  - Single purpose
  - Large time commitment

(Google Images)

Sampling Devices – Hess Sampler

- Pros
  - Defined area

- Cons
  - Heavy
  - Depth of water
  - Substrate size dependent

(Google Images)

Sampling Devices – Surber Sampler

- Pros
  - Defined area
  - Easy to carry

- Cons
  - Depth of water
  - Substrate size dependent

(Google Images)

Sampling Devices – Eckman Dredge

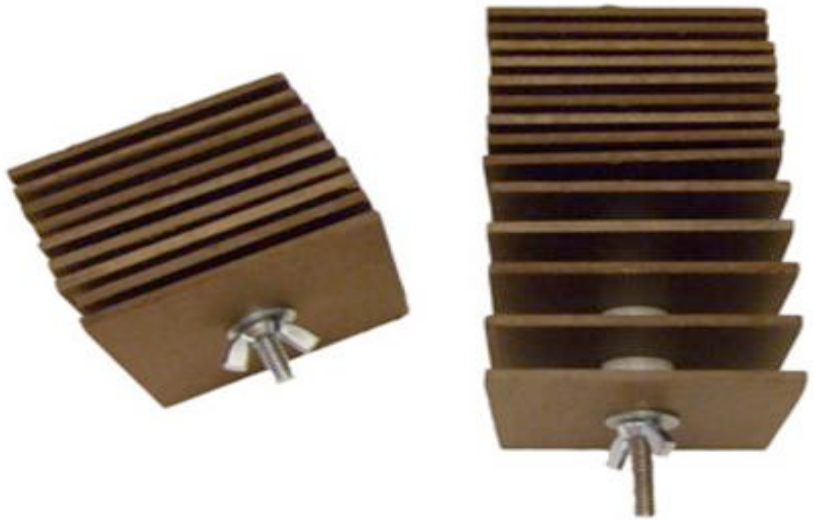
- Pros
  - Defined area
  - Can sample deep water

- Cons
  - Heavy
  - Substrate size dependent
  - May take multiple tries

(Google Images)

Sampling Devices – Hester-Dendy

- Pros
  - Defined area
  - Light
- Cons
  - Takes time to colonize
  - Prey may be eaten



(Google Images)

Locality Label

State: County.
Stream Name/site description
GPS Coordinates
Day - Month (roman numerals)- Year
Coll.: Collector's name

Maryland: Washington Co.
ANTI: Sharpsburg Creek
39.454971, -77.737793
20 - VIII - 2015
Coll.: S. J. Mueller

Identification Label

Order: Family

Genus species

Day - Month (roman numerals)- Year

Det. Identifier's name

Coleoptera: Elmidae

Stenelmis

12 - VII - 2015

Det. S. J. Mueller

Identification – Dichotomous keys

A tool consisting of a series of paired, mutually exclusive statements to reveal the identity of a “thing”

1a. Thorax without segmented legs (except for pupae).....2

1b. Thorax with 3 pairs of segmented legs……3

2a. Not in case, mobile larvae, mostly with prolegs or psuedopods on 1 or more segments……Diptera

2b. Mummylike, often in case that has plant or mineral particles cemented with silk……Pupae (not keyed further)

(Google Images)

3a. With large functional wings……4

3b. Wingless, or with developing wingpads……6

4a. All wings completely membranous, with may veins……Non-aquatic

4b. Mesothoracic wings hardened and shell-like, or leather like basally……5

(Google Images)

5a. Mesothoracic winds hardened protecting membranous metathoracic wings, mesothoracic winds meet along midline of abdomen, mouthparts chewing……Coleoptera (adult)

5b. Mesothoracic wings leathery in basal hald, overlapping along the midline of the abdomen, mouthparts formed into a tubular beak……Hemiptera

(Google Images)

6a. Body small to minute, thoracic legs 4 segmented, abdomen only has 6 segments, furcula usually present on tip of abdomen……Collembola

6b. Body usually not minute, thoracic legs 5 segmented, abdomen always with more than 6 segments, furcula absent……7

(Google Images)

7a. Abdomen with 2 or 3 long (>10 segments) terminal filaments……8

7b. Abdominal terminal filaments absent or present, but with <10 segments……9

(Google Images)

8a. Abdominal segments with lamellate, featherlike, or forked gills; last abdominal segment with usually 3 distinctive terminal filaments, ocassionally with only 2 distinctive filaments; tarsal claws are all singular……Ephemeroptera

8b. Gills absent from middle adominal segments, but occassionally occur on ventral side of segments 1 and 2; last abdominal segment with only 2 distinctive filaments; tarsal claws double……Plecoptera

(Google Images)

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