

# BIO 475 - Parasitology Spring 2009

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Northern Arizona University

<http://www4.nau.edu/isopod>

## Lecture 22

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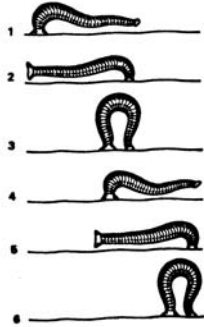
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## Class Hirudinea - Leeches



Leech looping is shown taking 2 steps. Aquatic leeches can swim by undulations of the body.

- a. Predaceous freshwater and terrestrial.
- b. Swallow smaller prey, or blood sucking, with distensible, branching gut.

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## Subclass Hirudinida

- 1. *Hirudo* - medicinal leech.
- 2. Anticoagulant in saliva:  
*hirudin*



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## A Note On Microfilaria

Your book states (p. 447), that *microfilaria* are not as differentiated as normal J1 larvae and hence are not to be considered as such.

The J1 stage does not develop until they are within the insect vector's stomach; after 8 more days, they molt to J2s and after another 4 days molt to slender J3 larvae.

These are the infective *filariiform larvae* that leave the insect and enter the definitive host during a bite.

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## A Note On “Bursate Rhabditidians”

There may have been some confusion over the orders of Secernentea we mentioned in class. Those mentioned were: Rhabditida, Strongylida, Ascarida, Oxyurida and Spirurida.

A slide in Lecture 21 may have given you the impression that what your book calls “bursate rhabditidians” belong within the Order Rhabditida. They DO NOT. They are actually part of the Order Strongylida, which includes the hookworms, Trichostrongylines and Metastrongylines.

The Order Rhabditida include the lungworm *Rhabdiasis*, and the intestinal worm, *Strongyloides*.

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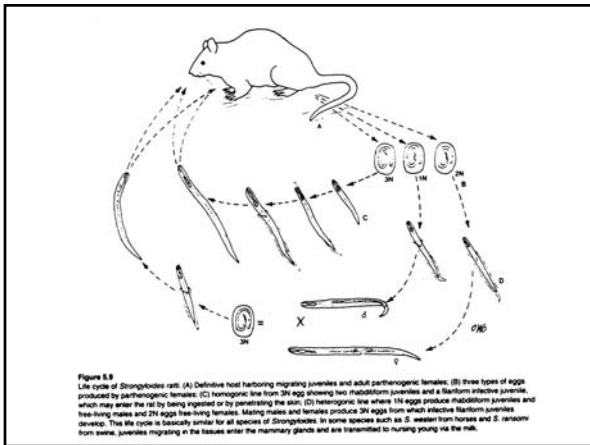
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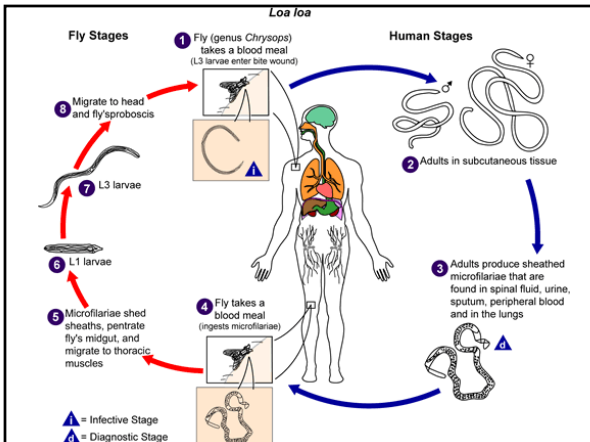
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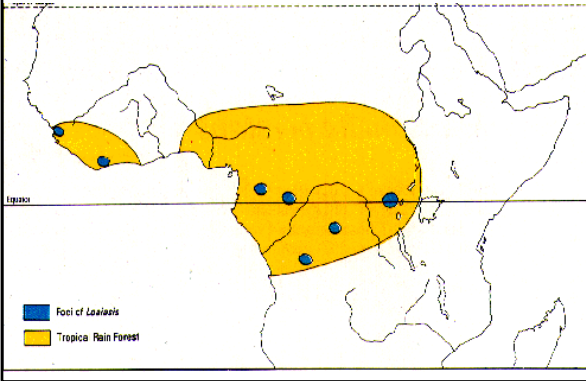
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## Loa loa - Distribution



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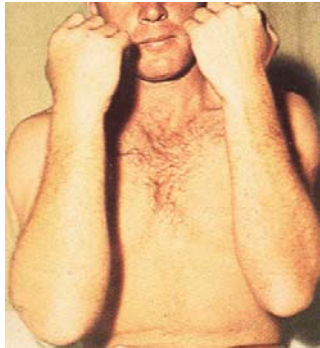
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## Loa loa



### Calabar swellings

Loiasis is prevalent in West and Central Africa. After burrowing into the deeper subcutaneous tissue, the larvae mature to adult worms. Allergic reactions produce localized inflammation in the subcutaneous tissue, particularly in the forearm.

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## Loa loa



- b. Also corneal irritation when worms cross sclera.
- c. Can cause calcification of sclera and of soft tissues.

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## *Loa loa*

c. Vecteded by  
*Chrysops*.



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## *Dirofilaria immitis*

1. Canine heartworm
2. Vecteded by lots of mosquitoes



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Distributions of two  
vectors of *D. immitis*  
*Aedes* spp.



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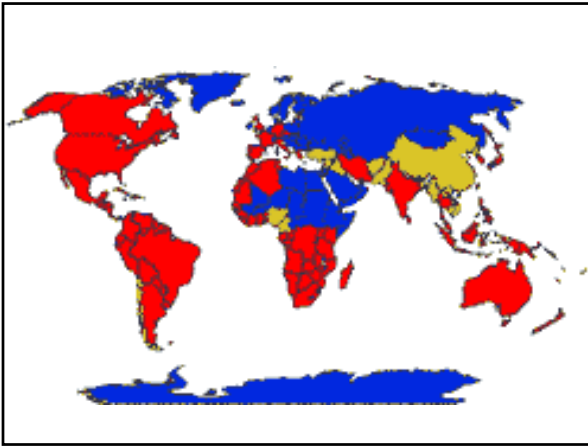
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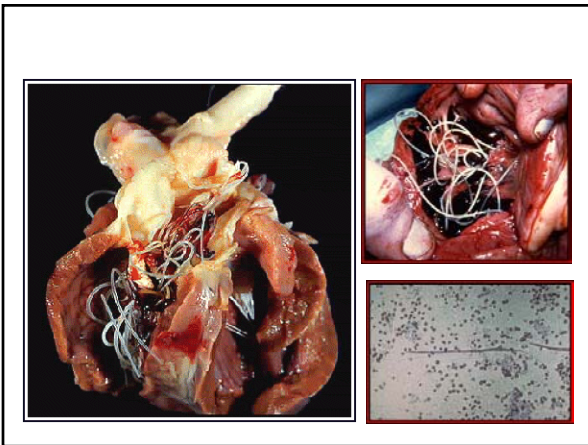
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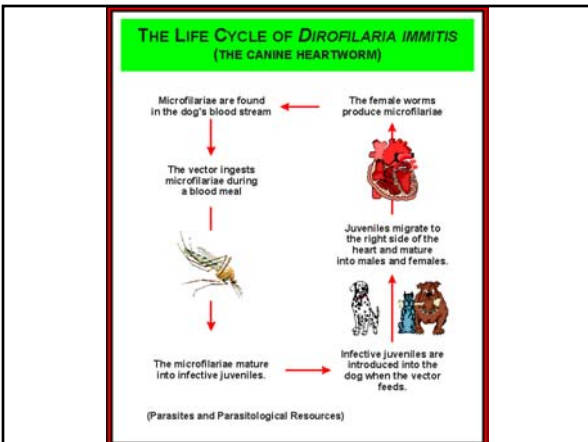
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## *Dirofilaria immitis*



1. 3. Treatment
  1. Ivermectin - effective on microfilariae, not adults.
  2. DEC (diethyl carbamazine) - can cause encephalitis.

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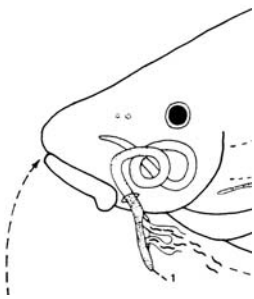
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## Superfamily Camallanina



- Family Philometridae
- a. Tissue parasites of fishes
  - b. Life cycle is similar to those of dracunculids

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## *Philometroides nodulosa*

1. J1s released into water, eaten by copepods
2. leave intestine, enter haemocoel, molt 2x
3. J3s encyst in copepod until eaten by fish
4. migrate through tissues, molt again, mature in cutaneous tissue, mate; females break out and release larvae.

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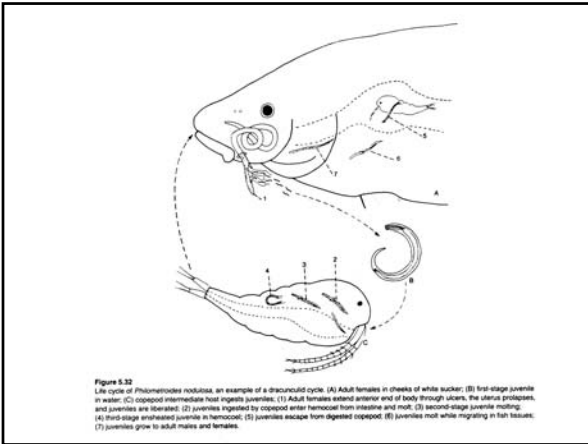
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## Family Dracunculidae

- a. Similar life cycle to philometrids.
- b. Common in many species with access to water.




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## *Dracunculus medinensis*

- a. The “fiery serpent,” also Guinea worm.
- c. Can get very large; up to 8 m long!




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# *Dracunculus medinensis*

## Life Cycle

1. Eggs released by adult
2. Larvae hatch, are eaten by copepods.
3. Copepods swallowed with drinking water.
4. Worms form subcutaneously in host
2. Adult female bursts out when exposed to water; causing much pain and irritation.
- a. Non-emergent worms and bacterial infections are problems.

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## *Dracunculus medinensis* larvae



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### Life Cycle of *Dracunculus medinensis*



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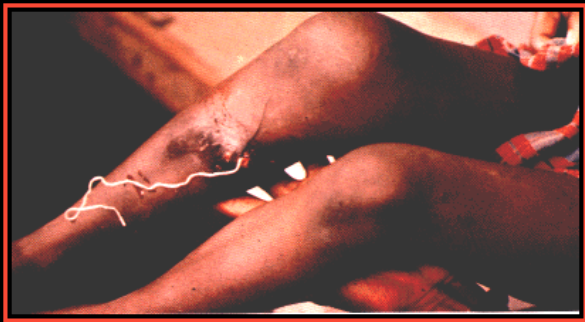
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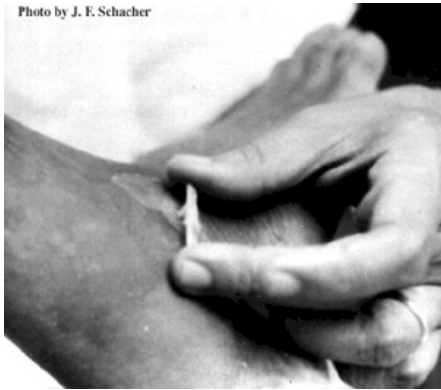
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Photo by J. F. Schacher



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## *Dracunculus medinensis*

### a. The Staff of Asclepius



FIGURE 30.9

Seal of the American Medical Association and the double-serpent caduceus of the military medical profession. Might the serpent on a staff originally have depicted the removal of guinea worm?  
Courtesy of the AMA.

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## Phylum Pentastomida



FIGURE 32.1

Examples of pentastome body types. (a) Anterior end of *Armillifer annulatus*; (b) head of *Leiperia gracilis*; (c) entire specimen of *Raillietiella mulsanti*.

Modified from R. Heymons, Pentastomida. Copyright © 1935. In Bronn's Klass. Ord. Tier. 5-4, book 1, in J. G. Baer, *Ecology of Animal Parasites*. Copyright © 1952 The University of Illinois Press, Urbana, IL.

1. Previously thought to be related to tapeworms, nematodes, annelids

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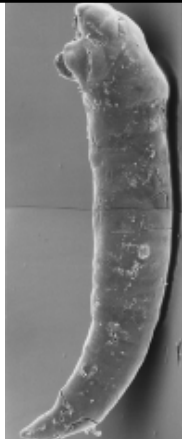
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## Phylum Pentastomida

2. Now known to be most closely related to crustaceans
- a. Abele et al. showed similarity in 18S rRNA
3. Possibly radiated during age of dinosaurs.



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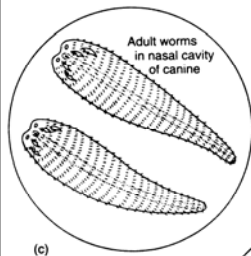
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## Pentastomida: Characteristics



1. Parasites of respiratory organs of carnivores; especially reptiles.
2. Eggs - have a distinctive cleft.
3. Larvae hatch when eggs are ingested by intermediate hosts.
  - a. Usually rodents or small animals

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## Pentastomida: Characteristics

- b. Larvae are distinctive:
- a. Have legs
- b. Anterior penetration organ
- c. Forked tail

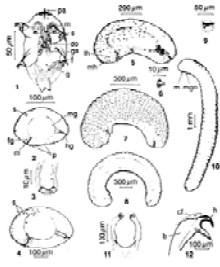


FIGURE 32.6  
Developmental stages of *Porocephalus erassi* in experimental intermediate hosts (anatomical drawings made from living specimens). 1, Primary larva (ventral view) after release from egg; 2, first nymphal stage (nymph I) in left lateral view (all succeeding nymphs similarly oriented); 3, second stage of nymph I (not fed, seen with anterior mouth everted); 4, nymph II; 5, nymph III; 6, lateral mouth hook of nymph III; 7, nymph IV; 8, nymph V (anteriorly everted mouth not shown); 9, lateral mouth hook of nymph V; 10, nymph VI (collective nymph, male, ventral view emerging from mouth of nymph V); 11, second stage of nymph VI; 12, lateral mouth hook of nymph VI; 13, view of mouth hook (d, collecting field or auxiliary hook); 14, dorsal region; 15, ventral region; 16, pen. (penetration); 17, lateral mouth hook; 18, mouth (m); 19, midgut; 20, male genital opening; 21, genital mouth hook; 22, papilla; 23, penetration apparatus; 24, vagina.

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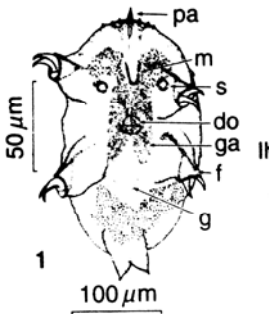
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## Pentastomida: Larvae



1. Are called nymphs.
2. Wander in 1st host until they molt (6 nymphal stages)
1. then lose legs and encyst (6th stage is infective) in liver or viscera.

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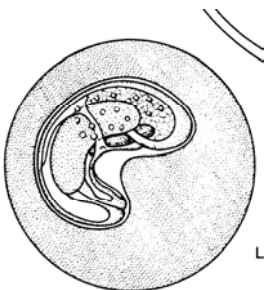
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## Pentastomida: Larvae

4. When 1st host is eaten, the larvae hatch out,
- a. Penetrate gut wall, move to respiratory structures,
- b. Attach and feed on blood and cells.




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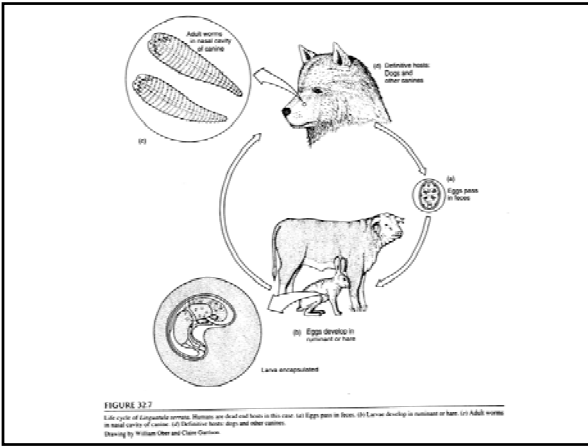
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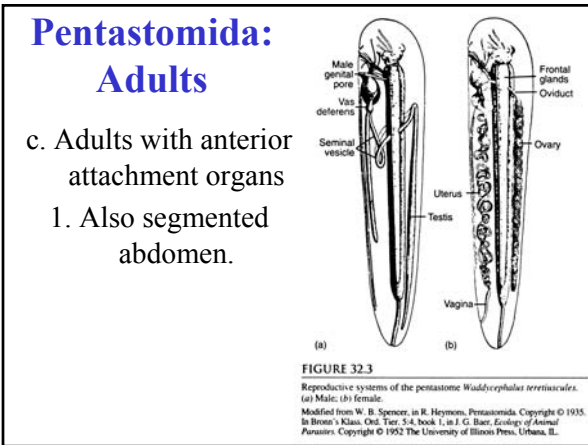
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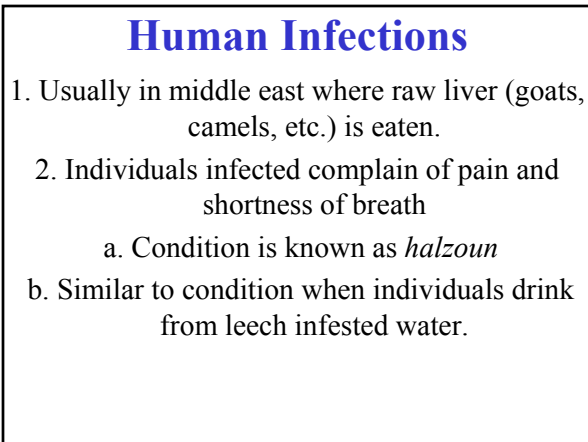
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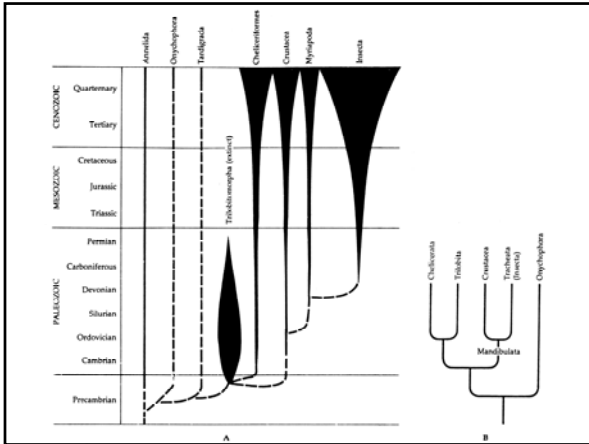
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## Crustacea: Characteristics

1. Aquatic “equivalent” of insects - very diverse
2. Body form highly variable usually due to appendage modification.
  - a. Variable in number, ***biramous***.
  - b. Body with 16-20 somites (segments)
  - c. Two pairs of antennae - very olfactorily oriented.

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## Crustacea: Characteristics

- d. Respire with gills – often with a carapace.
  1. Cuticle with  $\text{CaCO}_3$
  2. Growth often indeterminate - continues throughout life.
  3. Molting is an important time.
    - a. Extreme vulnerability.
    - b. Frequently associated with mating.
    - c. With compound eyes, ocelli.

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# Crustacea: 5 Major Classes

1. Remipedia - look like centipedes
2. Cephalocarida - well developed head shield
3. Branchiopoda - water fleas, etc.
4. Maxillopoda - copepods and barnacles
5. Malacostraca - higher crustacea

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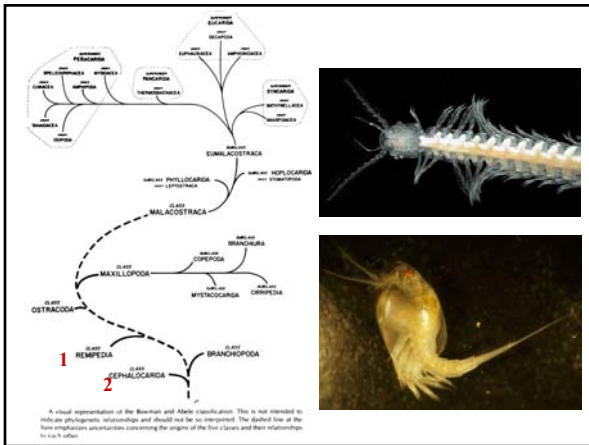
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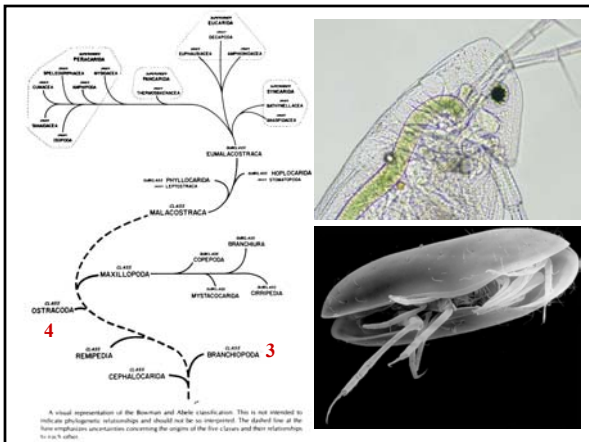
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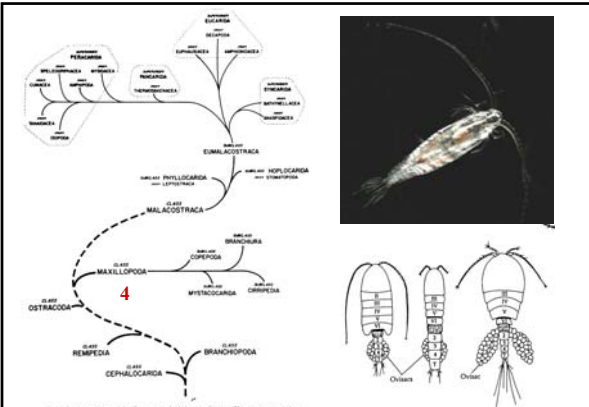
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A visual representation of the Beumer and Ahele classification. This is not intended to indicate phylogenetic relationships and should not be so interpreted. The dashed line at the base emphasizes uncertainties concerning the origin of the tree classes and their relationships to each other.

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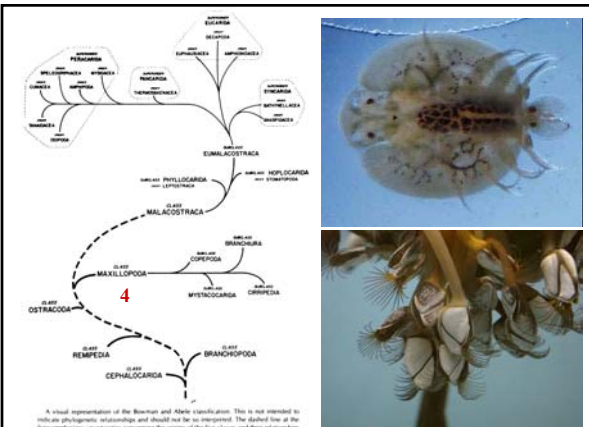
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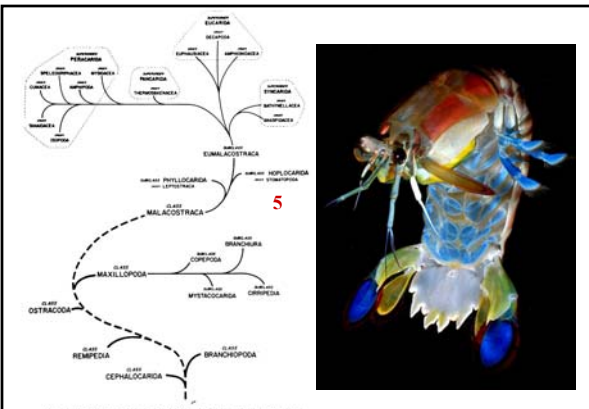
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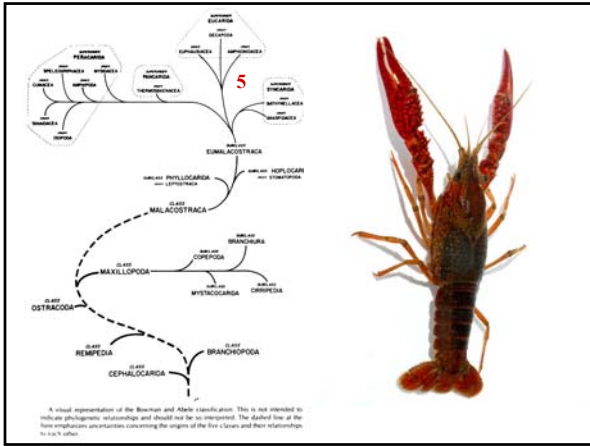
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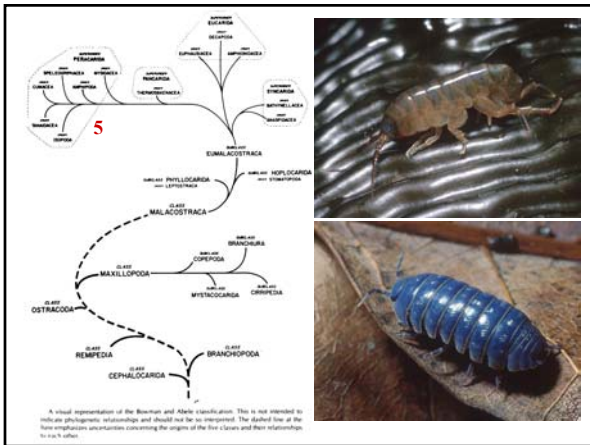
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