BIO 475 - Parasitology
Spring 2009

Stephen M. Shuster
Northern Arizona University

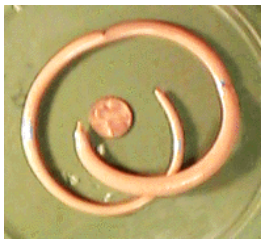
http://www4.nau.edu/isopod

Lecture 17

Acanthocephala: Characteristics

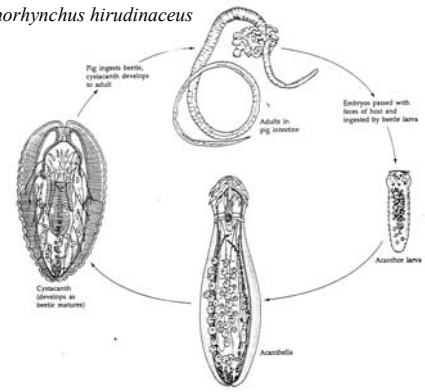
Examples:

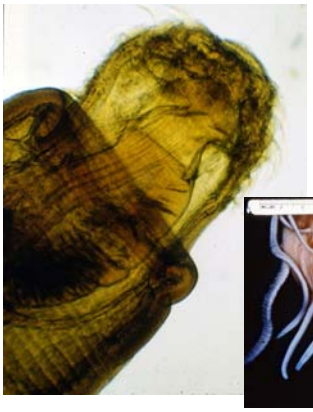
a. *Macracanthorhynchus*.

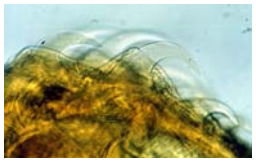


Eggs in pig feces

Macracanthorhynchus hirudinaceus







Macracanthorhynchus hirudinaceus

Acanthocephala: Examples

b. *Plagiorhynchus* - Janice Moore, CSU

1. infected isopods walk on sidewalks, increase transmission to starling chicks.

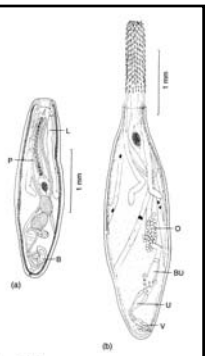


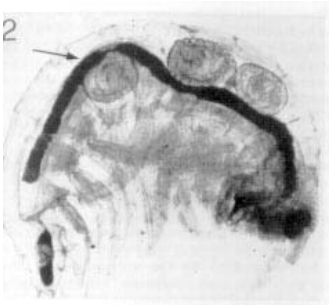
Figure 31.11
Cystacanths of *Plagiorhynchus cylindraceus*. (a) Thirty-seven days after infection of the pillbug intermediate hosts; (b) 60 days after infection; *B*, bursa; *L*, lemniscus; *P*, proboscis; *BU*, uterine bell; *O*, ovarian balls; *U*, uterus; *V*, vagina.
From G. D. Schmidt and O. W. Olsen, "Life cycle and development of *Prosthorynchus formosus* (Van Cleave 1918) Travassos, 1926, an acanthocephalan parasite of birds" in *J. Parasitol.* 50:721–730. Copyright © 1964 Journal of Parasitology. Reprinted by permission.

Acanthocephala: Characteristics

c. An Undescribed species in Montezuma Well.

1. Turns amphipods orange

2. May enhance transmission to final avian host (ducks).



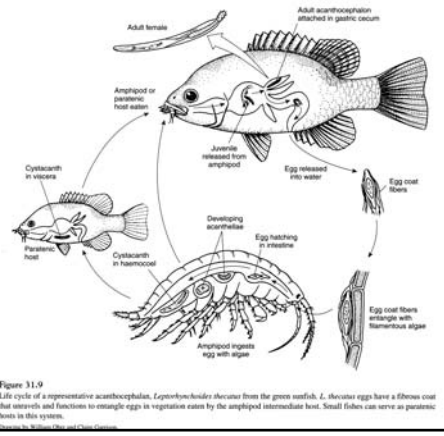
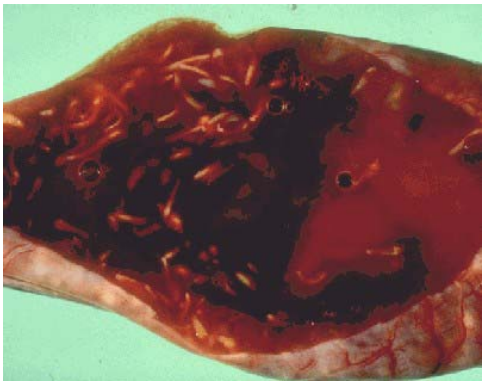


Figure 31.9
Life cycle of a representative acanthocephalan, *Leptorhynchoides thecatus* from the green sunfish. *L. thecatus* eggs have a fibrous coat that unravels and functions to entangle eggs in vegetation eaten by the amphipod intermediate host. Small fishes can serve as paratenic hosts in this system.



Acanthocephalans in intestinal mucosa of Great Lakes salmonid fish.

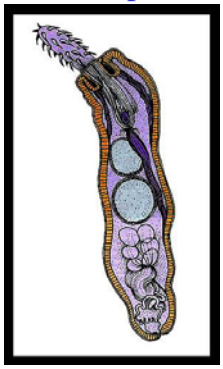
Acanthocephala: Sexual Dimorphism

1.Separate sexes, males < females

2. males compete with each other for access to mates.

a. competition includes cementing other males up

b. may favor early maturation - mature 1st, be cementer.

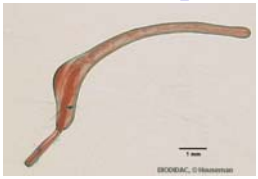


Acanthocephala: Sexual Dimorphism

3. females produce many eggs - dispersed in feces to be picked up by intermediate hosts

a. larger females produce more eggs

b. may favor longer period of growth, larger size at maturity.



Acanthocephala: Sexual Dimorphism

4. Thus, *sexual dimorphism* appears to be a consequence of two factors:

1. Selection favoring rapid maturation in males.

2. Selection favoring large size in females.

b. Result: large females, small males.

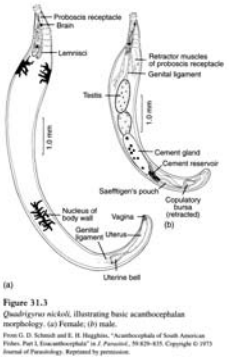


Figure 31.3
Quadrigyrus nicoli, illustrating basic acanthocephalan morphology. (a) Female; (b) male.

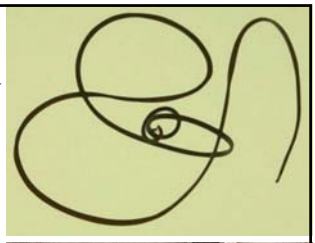
Phylum Nematomorpha

General Characteristics

1. Weird, once thought to represent spontaneous generation.

a. Adults occur in horse troughs.

b. Attempts to revitalize horsehairs failed.



Phylum Nematomorpha

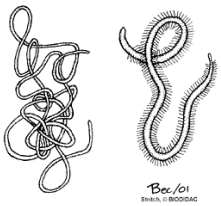
General Characteristics

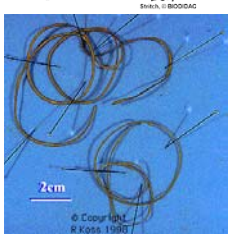
2. Fairly abundant - 230 spp

3. Body form

a. Similar to nematodes

1. thick cuticle must be molted.

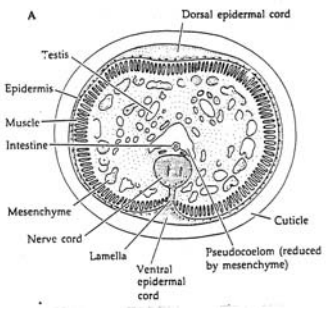




Nematomorpha: Characteristics

2. Longitudinal muscles.

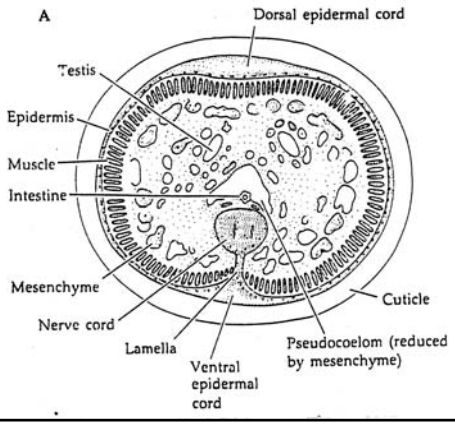
3. No ciliated structures.



Nematomorpha: Characteristics

Dissimilar to Nematodes.

1. Do not show consistency in cell number (eutely).
2. Pseudocoel filled with mesenchyme.
3. Rudimentary digestive system.

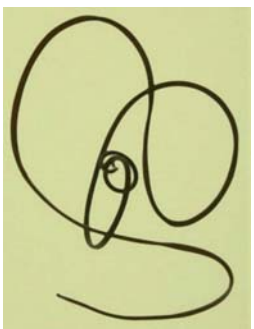


Phylum Nematomorpha

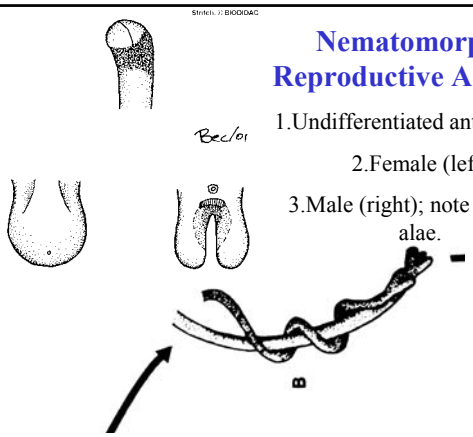
Dissimilar to Nematodes.

a. nutrients absorbed from body of insect host.

3. No excretory system
4. No specialized genital system - cloacas in both sexes.



Nematomorpha: Reproductive Anatomy



1.Undifferentiated anterior end.

2.Female (left)

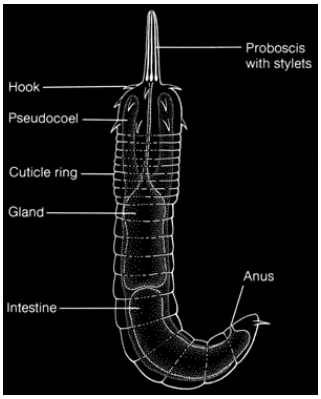
3.Male (right); note clasping alae.

Nematomorpha: Life Cycle

a. Adults develop in bodies of insects.

1. Cause hosts to seek water, once entering, they explode.

2. Separate sexes mate in water.

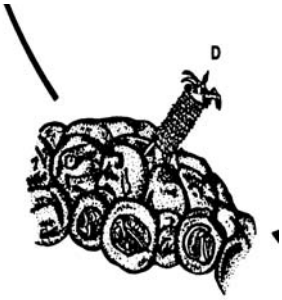


Nematomorpha: Life Cycle

a. Females lay eggs that wrap around aquatic vegetation.

3. Eggs hatch, larvae remain free living for only a few days.

Nematomorpha: Life Cycle



4. Larvae ingested by host- when insects feed or drink near water.

a. Use hooked proboscis to imbed in tissues

Nematomorpha: Life Cycle

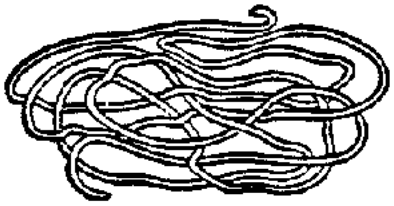
b. If unsuitable host ingests, will encyst and wait for intermediate host to be ingested by suitable host.

1. Beetle -> mantid

Nematomorpha: Other Hosts

2. Can also inhabit annelids, molluscs, crustceans, humans

5. Mature worm develops beneath skin.



Horsehair (Gordian) Worm

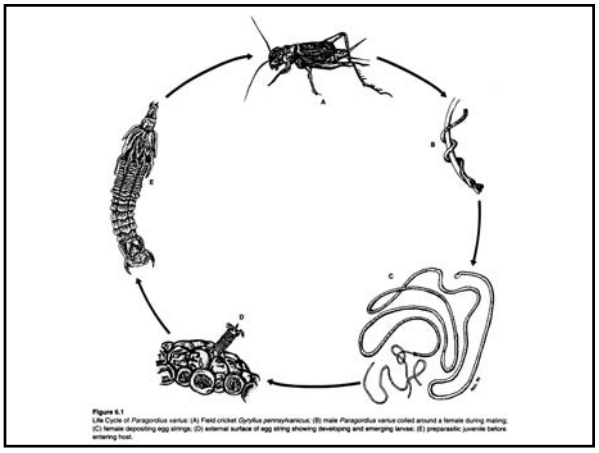


Figure 6.1
Life Cycle of *Paragordius varius*: (A) Field cricket *Gryllus pennsylvanicus*; (B) male *Paragordius varius* coiled around a female during mating; (C) female depositing egg strings; (D) external surface of egg string showing developing and emerging larvae; (E) preparasitic juvenile before entering host.

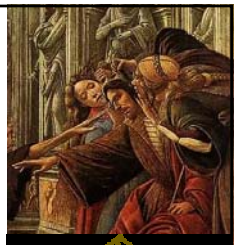
Phylum Nematomorpha

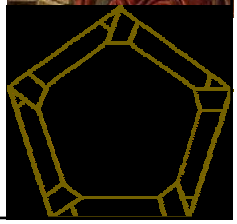
Historical Notes:

a. Example: *Gordius* after the Gordian Knot.

1. intricate knot tied by King Gordius of Phrygia

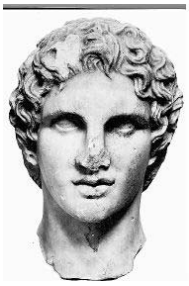
a. whoever untied it would be King of Asia.





Phylum Nematomorpha

b. Alexander cut it with his sword and became King of Phrygia



Phylum Nemata

A.k.a., Phylum Nematoda

General characteristics

1. widely distributed and unbelievably abundant!

Phylum Nemata

Nematodes are:

a. Free-living, commensal, parasitic.

b. Of tremendous economic importance.

c. The number of species defies description, evidently because their body form ***preadapts*** them to so many ecological niches.

"If all the matter in the universe except the nematodes were swept away, our world would still be dimly recognizable, and if, as disembodied spirits, we could then investigate it, we should find its mountains, hills, vales, rivers, lakes and oceans represented by a film of nematodes. The location of towns would be decipherable, since for every massing of human beings there would be a corresponding massing of certain nematodes. Trees would still stand in ghostly rows representing our streets and highways. The location of the various plants and animals would still be decipherable, and, had we sufficient knowledge, in many cases even their species could be determined by an examination of their erstwhile nematode parasites."

N.A. Cobb 1966.

Box Four

Characteristics of the Phylum Nematoda

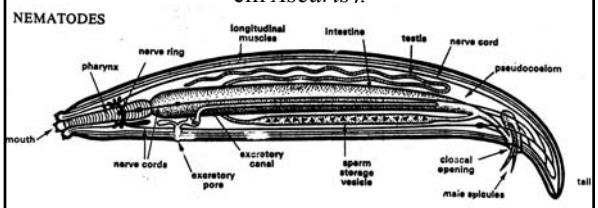
1. Triploblastic, bilateral, vermiform, unsegmented, pseudocoelomates
2. Body round in cross section and covered by a layered cuticle; growth in juveniles usually accompanied by molting
3. With unique cephalic sense organs called amphids; some have caudal sense organs called phasmids
4. Gut complete; mouth surrounded by six lips bearing sense organs (often reduced to three lips, or to a simple ring)
5. Most with unique excretory system, comprised of one or two renette cells or a set of collecting tubules
6. Without special circulatory or gas exchange structures
7. Body wall has only longitudinal muscles
8. Longitudinal muscle cells connected to longitudinal nerve cords by unique muscle arms
9. Epidermis produced into longitudinal cords housing nerve cords
10. Gonochoristic
11. Inhabit marine, freshwater, and terrestrial environments; some are free-living and some parasitic

Phylum Nemata

Body form

a. Slender, elongate, w/tapered ends, - good for interstitial environments.

b. Mostly small; < 3mm with some exceptions (20-30 cm *Ascaris*).



Nemata: Body Ends

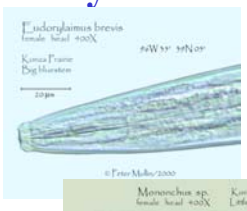
1. Anterior is radially symmetrical - 3 (or 6) lips.

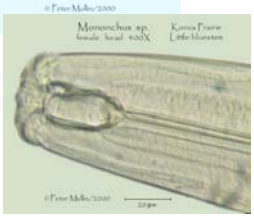
a. Suggests possible sessile ancestor.

b. Sensory papillae.

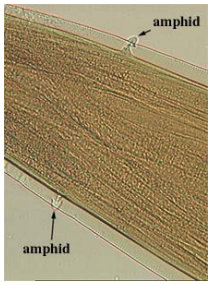
c. Chemosensory structures - ***amphids***

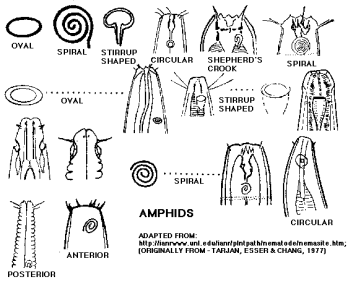
1. Well-developed in free-living forms.





Nemata: Amphids





Nemata: Body Ends

2. Posterior – often with adhesive structures.

a. Some species with other sensory structures - ***phasmids***

1. Well-developed in parasites.