BIO 221
Invertebrate Zoology I
Spring 2010

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Northern Arizona University

http://www4.nau.edu/isopod

Lecture 16

Nemertean Systematics

Based upon

a. proboscis characteristics

b. mouth location

c. location/complexity of musculature and nerve cords

Two Major Classes

Class Anopla - unarmed proboscis; subterminal mouth

1. mouth and proboscis separate
2. variation in dermal structure, sensory structures among

orders

a. **Paleonemertea** - thin dermis

b. **Heteronemertea** - thick dermis, lots of muscles

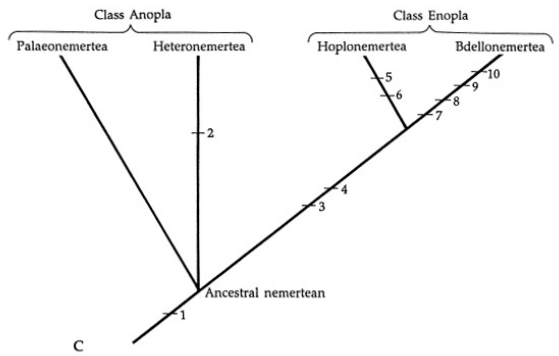
Two Major Classes

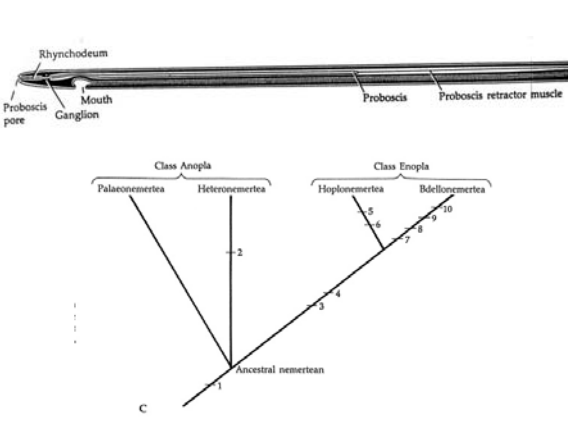
Class Enopla - armed proboscis (with exceptions); terminal mouth

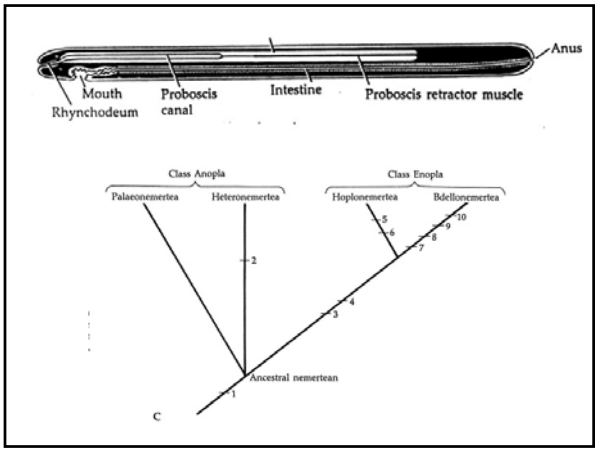
1. mouth and proboscis united
2. includes commensals on molluscs
3. orders

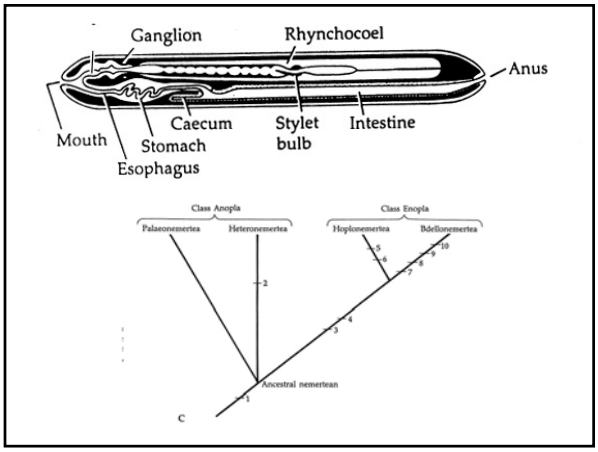
a. **Hoplonemertea** - armed proboscis

b. **Bdellonemertea** - commensals on molluscs






Anus
Mouth
Rhynchodeum
Proboscis canal
Intestine
Proboscis retractor muscle
Class Anopla
Class Enopla
Palaeonemertea
Heteronemertea
Hoplonemertea
Bdellonemertea
1
2
3
4
5
6
7
8
9
10
Ancestral nemertean
C


Ganglion
Rhynchocoel
Anus
Mouth
Caecum
Stylet bulb
Intestine
Stomach
Esophagus
Class Anopla
Class Enopla
Palaeonemertea
Heteronemertea
Hoplonemertea
Bdellonemertea
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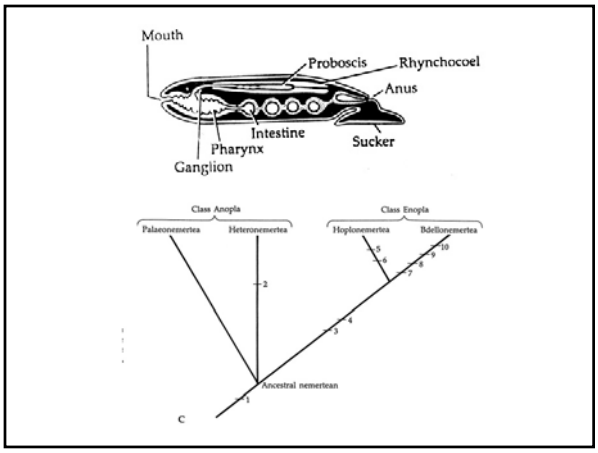
Mouth
Proboscis
Rhynchocoel
Anus
Intestine
Sucker
Pharynx
Ganglion
Class Anopla
Class Enopla
Palaeonemertea
Heteronemertea
Hoplonemertea
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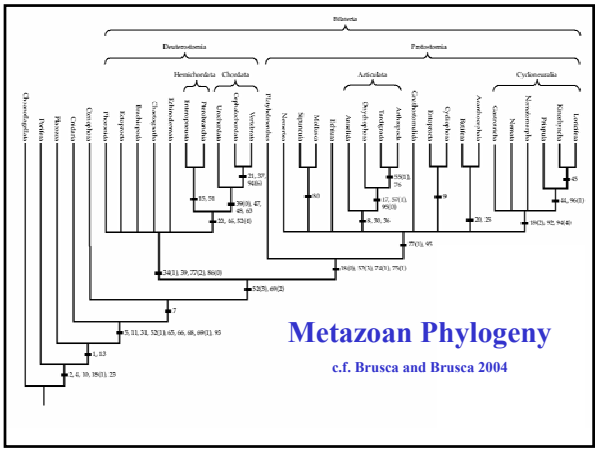
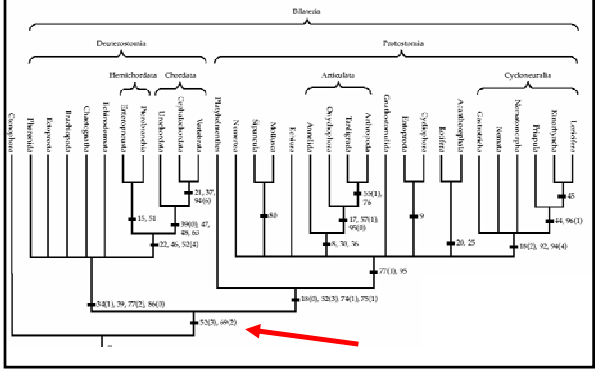


Rotation at the Proto-Deutero Node

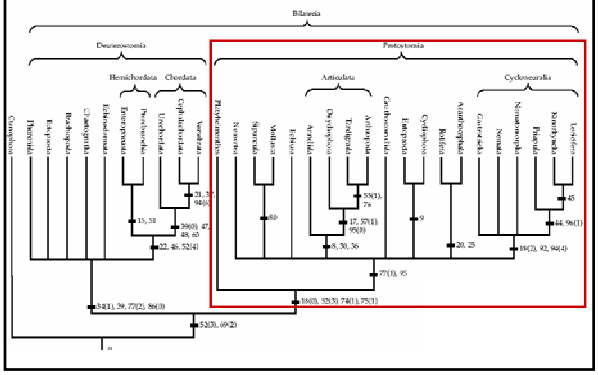


Synapomorphies Common to Bilateria

a. 52(3) -Ventrally located nervous system.

b. 69(2) - Primary symmetry bilateral with cephalization.

Protostomia



Protostomia

1. Synapomorphies

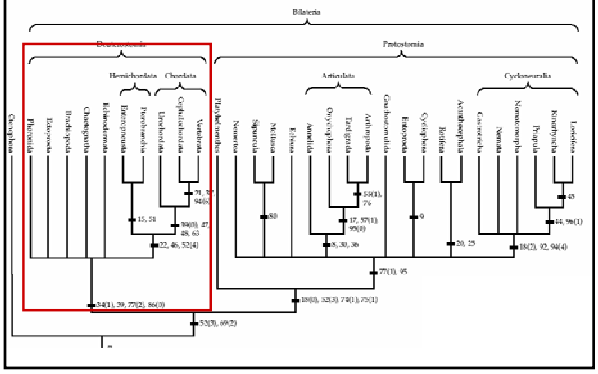
a. 18(0) – Cleavage pattern spiral.

b. 52(3) – Ventral or ventrolateral synaptic nervous system.

c. 74(1) – Entomesoderm derived from a single mesentoblast (4d) cell.

d. 75(1) – Subepidermal muscle in sheets, derived (at least in part) from 4d cell.

Deuterostomia



Deuterostomia

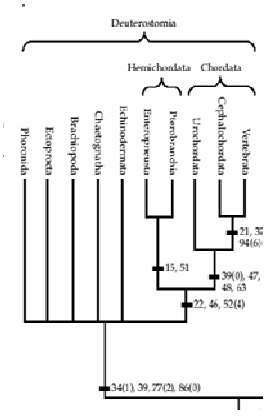
1. Synapomorphies

a. 34(1) – mesoderm derived from archenteron by enterocoelic pouching

b. 39 – tri partite coelom (anterior, middle and posterior compartments)

c. 77(2) – internal body cavity lined by peritoneum (mesodermally derived).

d. 86(0) – anterior body cavity unmodified as a proboscis.



Deuterostomes:

Lophophorates (?)

Chaetognatha

Echinodermata

Hemichordata

Chordata

Phylum Echinodermata

Box One

Characteristics of the Phylum Echinodermata

1. Calcareous endoskeleton arising from mesodermal tissue and composed of separate plates or ossicles; each plate formed as a single calcite crystal and developed as an open meshwork structure called a stereom, the interstices of which are filled with living tissue (the stroma)
2. Adults with basic pentamerous radial symmetry derived from bilaterally symmetrical larvae (when present); body parts organized about an oral–aboral axis
3. Coelomic water vascular system composed of a complex series of fluid-filled canals, usually evident externally as muscular podia
4. Embryogeny primitively deuterostomous, with radial cleavage, entodermally derived mesoderm, enterocoely, and mouth not derived from the blastopore
5. Gut complete except where secondarily incomplete or lost
6. No excretory organs
7. Circulatory structures, when present, compose a hemal system derived from coelomic cavities and sinuses
8. Nervous system diffuse, decentralized, usually of a nerve net, nerve ring, and radial nerves
9. Mostly gonochoristic; development direct or indirect

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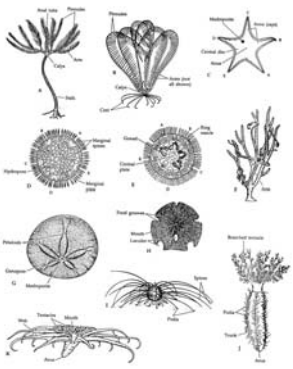

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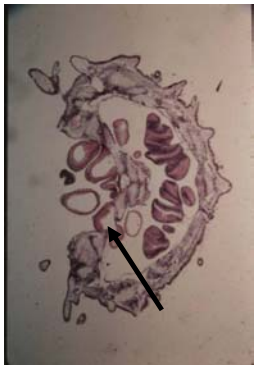

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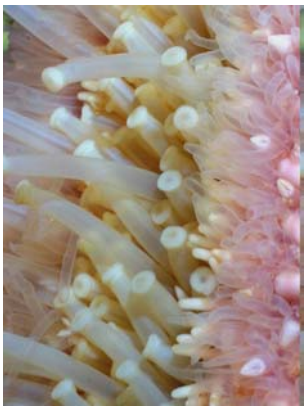

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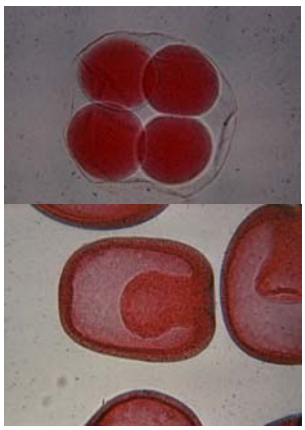

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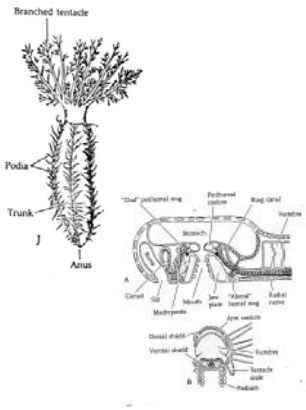

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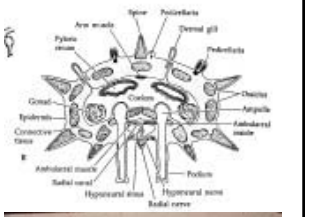

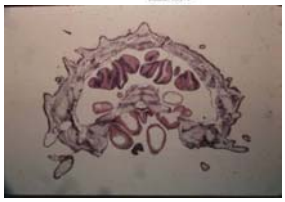

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Subphylum Pelmatozoa

1. Bodies resemble an upturned cup.
2. The oral surface is directed upward.
3. A stalk or small ambulatory cirri project from the aboral surface.

Subphylum Pelmatozoa

4. Ambulacra are located on the rays with ambulacral grooves open.

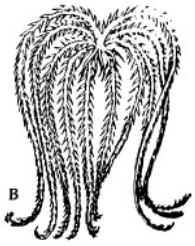
Subphylum Pelmatozoa

5. Madreporite in is absent.
6. Mouth and the anus are located on the oral surface.

Class Crinoidea

Sea lilies, feather stars and extinct crinoids.

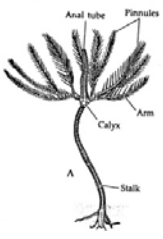
Ambulacra may branch more than once.



a. *Antedon* - the sea lily.

Class Crinoidea

Extinct Crinoids



Subphylum Eleutherozoa

1. Body form is highly variable but always with oral side down or body extended horizontally.

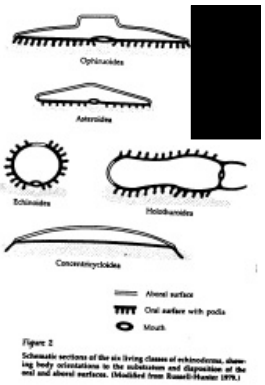


Figure 2
Schematic sections of the six living classes of echinoderms, showing body orientations to the substratum and disposition of the oral and aboral surfaces. (Modified from Russell-Hunter 1979.)

Subphylum Eleutherozoa

1. The aboral side of the body is unstalked.
2. Madreporite is present.

Class Asteroidea

Sea stars

- Possess a stellate (star shaped) body with five or more rays.

Class Asteroidea

1. The disk and rays are usually not distinctly articulated.
2. Ambulacral grooves always open.

Class Asteroidea

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Class Asteroidea

3. Podia that possess internal ampullae.
4. Madreporite is aboral.