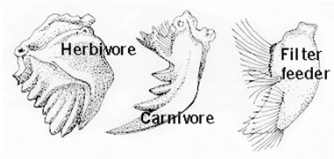
Main arthropod clades (Regier et al 2010)

- Trilobita
- Chelicerata
- Mandibulata
  - Myriapoda (Chilopoda, Diplopoda)
  - Pancrustacea
    - Oligostraca (Ostracoda, Branchiura)
    - Alticrustacea
      - Vericrustacea (Branchiopoda, Decapoda)
      - Miracrustacea
        - » Xenocarida (Remipedia, Cephalocarida)
        - » Hexapoda (Insecta)

Mandibulata

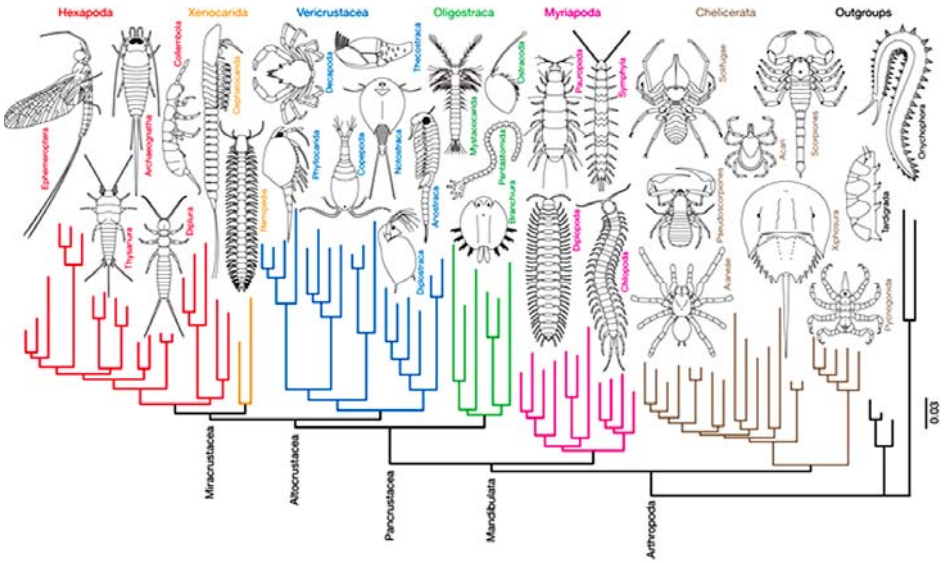


- Appendages of third post-acron segment modified as mandibles for chewing.
- Myriapods, Crustaceans, Hexapods all have mandibles.
  - Probable syapomorphy…but there are differences in mandible structure
  - Myriapod and hexapod jaws are uniramous (one-piece), crustacean jaws are jointed, at least during development

“Uniramia”

- Now discounted hypothesis linking Myriapoda and Hexapoda
- Head: acron plus 4 segments: 1 pair antennae, 1 pair mandibles, 2 pair maxillae
- Uniramous limbs and mandibles
- Tracheal system for gas exchange
  air-breathers
- Malphigian tubules for excretion
  purines as nitrogenous waste product
- Now these appear to be homoplasies (convergent).

Latest hypothesis of Arthropod phylogeny



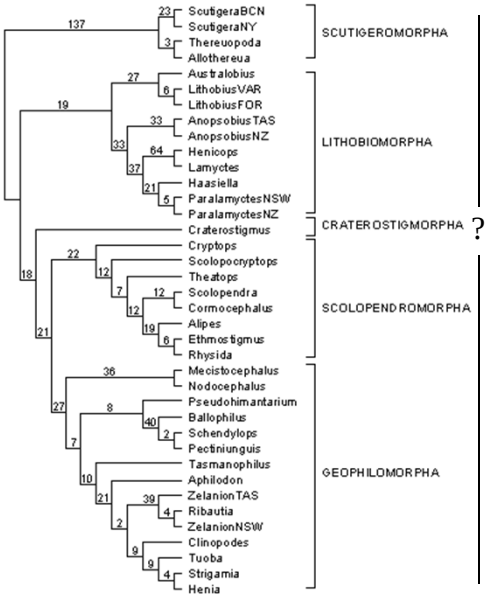
(Regier et al 2010, Nature)

Class Myriapoda

Subclass Chilopoda- centipedes

- 2800 species in 5 orders
- 1 pair antennae, jaws, 2 pair maxillae, one pair of poison maxillipeds
- Dorsoventrally flattened
- 15-191 pairs of legs (never 50 though!)
- all are carnivorous
- Mating by spermatophores

2 superorders and 5 orders of Chilopoda



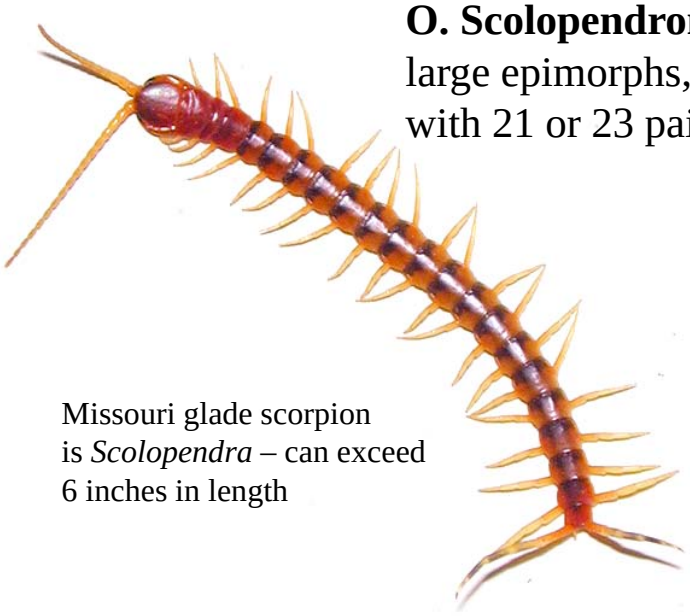
Chilopod phylogeny from:

Edgecombe, G.D., G. Giribet, and W.C. Wheeler. 1999. Phylogeny of Chilopoda: Combining 18S and 28S rRNA sequences and morphology. In A. Melic, J.J. de Haro, M. Mendez and I. Ribera (eds.), Evolución y Filogenia de Arthropoda. Boletín de la Sociedad Entomológica Aragonesa, 26: 293-331.

Subclass Chilopoda- centipedes
Superorder Epimorpha

- eggs brooded by female
- young hatch with full number of segments
- Includes scolopendromorphs and geophilomorphs

O. Scolopendromorpha
large epimorphs,
with 21 or 23 pairs of legs



Missouri glade scorpion is *Scolopendra* – can exceed 6 inches in length

Another *Scolopendra* from S. Arizona

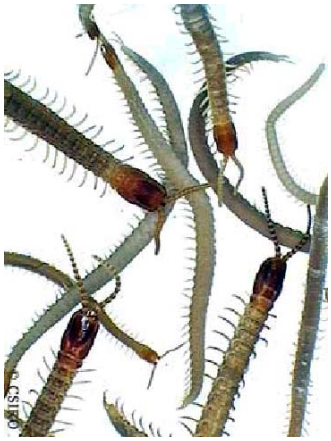
Scolopendra

The “bite” (really a pinch) is toxic but not usually serious. Several species are commonly sold as “pets”.

Female apparently allows young to feed from her leg joints for weeks

O. Geophilomorpha

earth centipedes- elongate, eyeless burrowers, with 191-310 pairs of legs



Subclass Chilopoda
Superorder Anamorpha

- eggs not brooded
- young hatch with reduced number of segments and add segments at subsequent molts

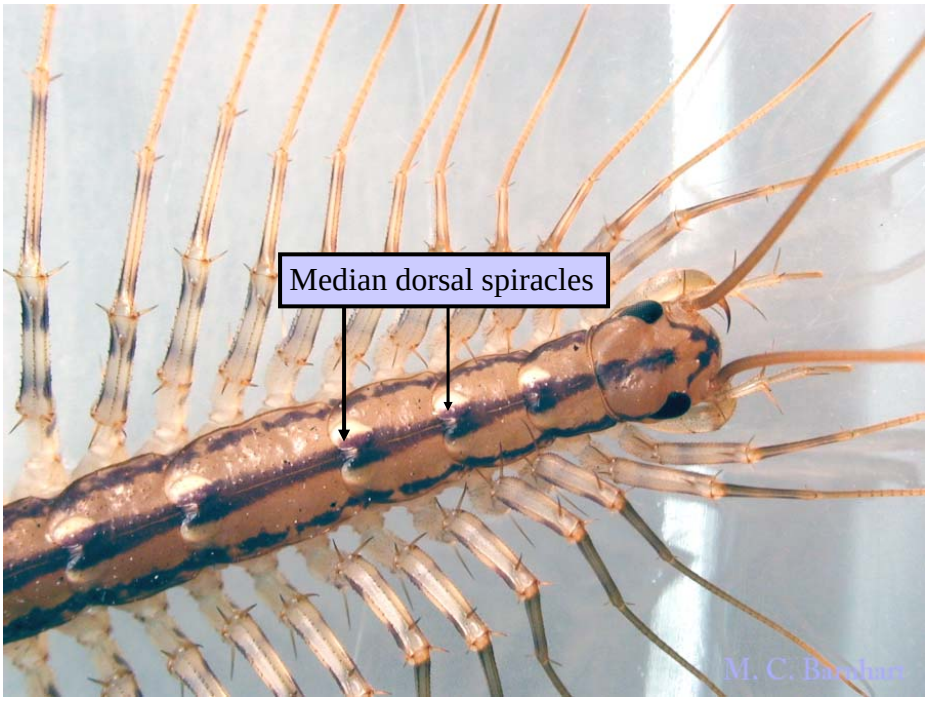
- **O. Lithiobiomorpha** stone centipedes
  15 pairs of legs
- **O. Scutigeromorpha** house centipedes
  15 pairs of very long legs, compound eyes, hemocyanin, dorsal spiracles.

O. Lithiobiomorpha

stone centipede- *Lithobius*
Common in Missouri woodlands

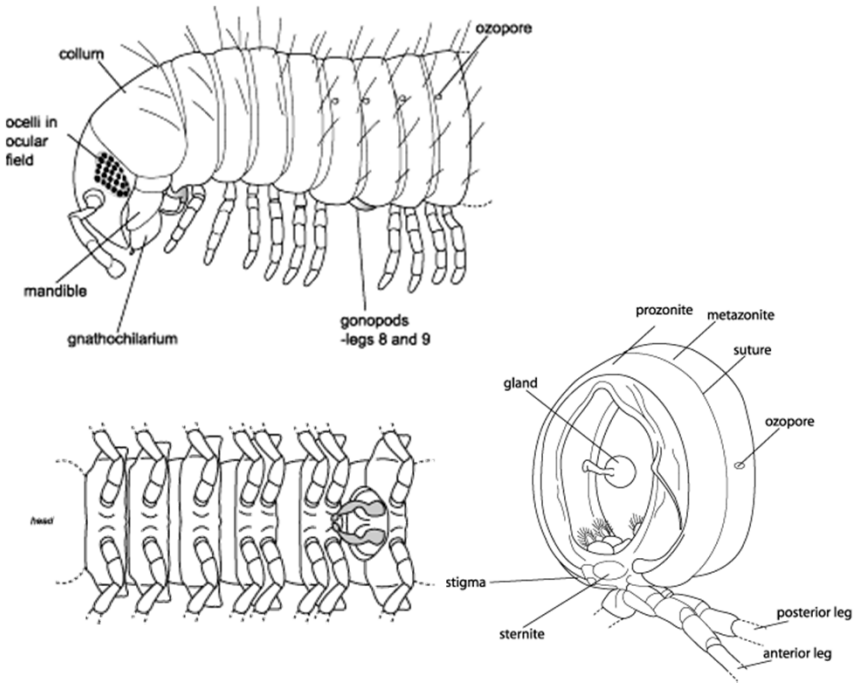
O. Scutigeromorpha

House centipede *Scutigera coleaptrata*
Introduced into North America from Europe



Subclass Diplopoda- millipedes

- More diverse than centipedes About 10,000 known species in 15-17 orders
- 1 pair antennae, jaws, first maxillae fused, second pair lost
- Compound eyes
- Tagma: collum, diplosegments
- Detritivorous, herbivorous
- Repugnatorial secretions

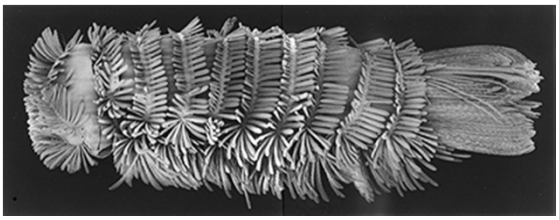


Reproduction in millipedes

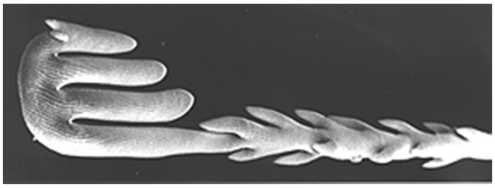
- Males have 1 or 2 pairs of limbs modified as gonopods for copulation
- Females make underground nest chamber lined with fecal secretions
- Young hatch with 3 pairs of legs and add segments with each molt to maturity
- Long lifespan and delayed sexual maturity in some species

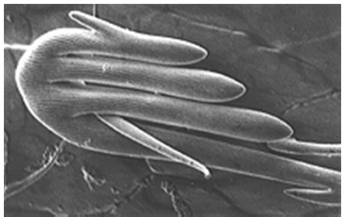
Subclass Diplododa
Order Polyxenida

- Tiny, hairy, can be mistaken for dermestid beetle larvae.



A millipede “porcupine”
Polyxenus fasciculatus
(Tom Eisner, Cornell)





Subclass Diplododa Order Spirobolida

- Cylindrical body
- Includes the largest-bodied U.S. species: *Narceus*
- Benzoquinone secretion

Narceus americanus- widespread in eastern US, common in Ozark woodlands

Subclass Diplododa
Order Polydesmida

- Dorsoventrally flattened, with lateral dorsal paranota
- Colorful, common in woodlands
- Can produce cyanide gas from the ozopores

Polydesmida
Xystodesmidae
Apheloria
White Rock, Franklin Co AR

10

12

14

15

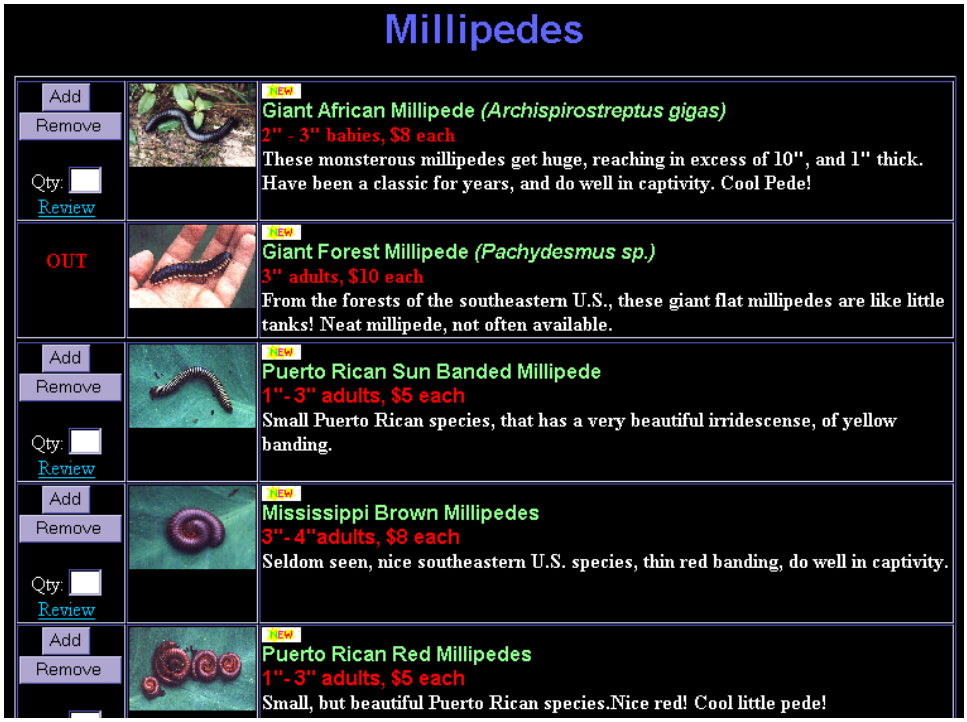
13


Order Callipodida
From Buseik WLA

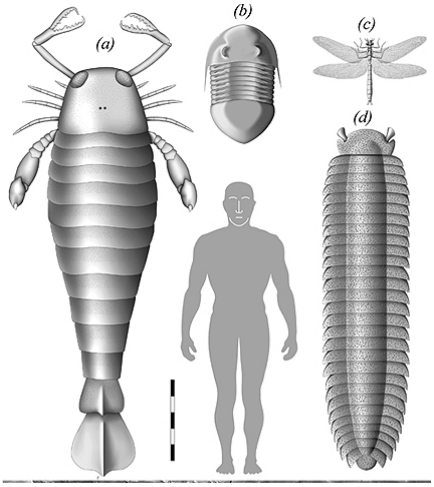

Order Julida
from Buseik WLA

Ecological significance of millipedes

- Most are detritivores, and they are often very abundant.
- Role in breakdown of leaves and woody debris and recycling of cellulose
- Occasional pest status- especially introduced species, eg. Black Portuguese millipede ***Ommatoiulus moreletti*** in Australia



Arthropleura is a fossil myriapod from the Upper Carboniferous (~335 mya) up to 2.5 meters long



Reconstructions of some of the largest paleozoic arthropods (a) eurypyterid, b) trilobite, c) insect, e) myriapod

Arthropleura tracks from Crail, Scotland