

# ***Fossils in the Phylogeny of the Isopod Crustaceans***

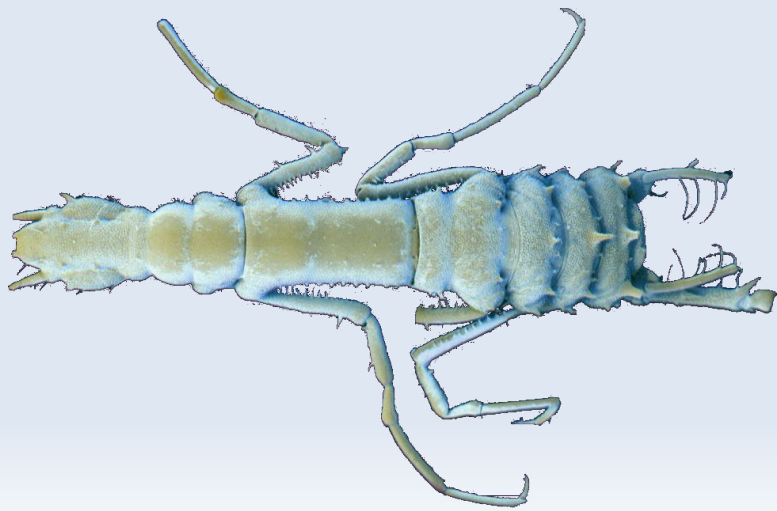
The Impact of Isopod Fossils



George D.F. Wilson  
Australian Museum

# outline

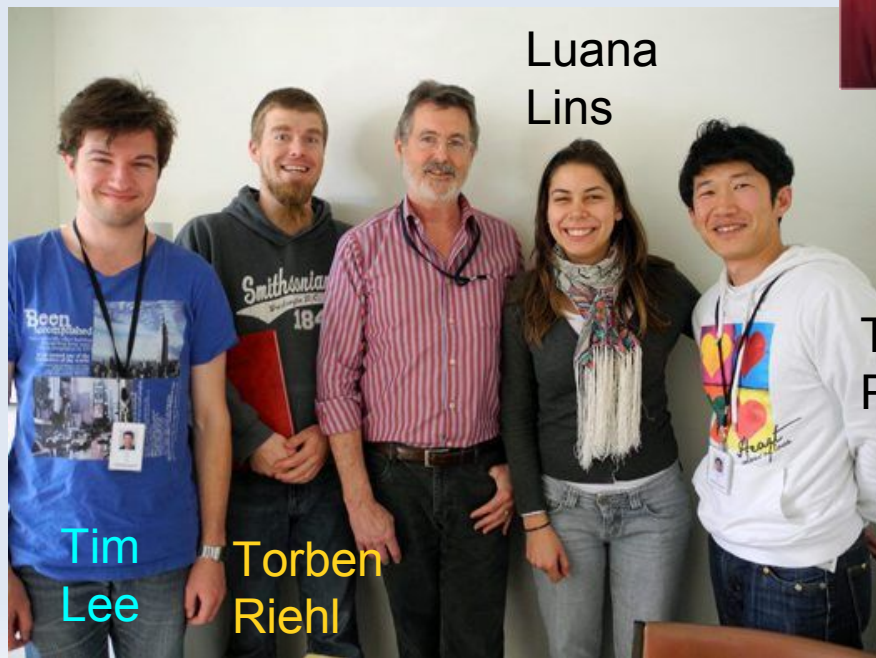
- The Isopoda – a diverse group of Crustaceans
- Classification
- Better known fossils
- Fossils in isopod phylogeny, morphological analysis
- Time of isopod origin, fossils in Bayesian analysis



# Thanks to ...

Tom Hegna, Western Illinois University

Luana Lins, Tae-yoon Park,  
& the Isopod Group  
at the Australian  
Museum



Luana  
Lins

Tim  
Lee

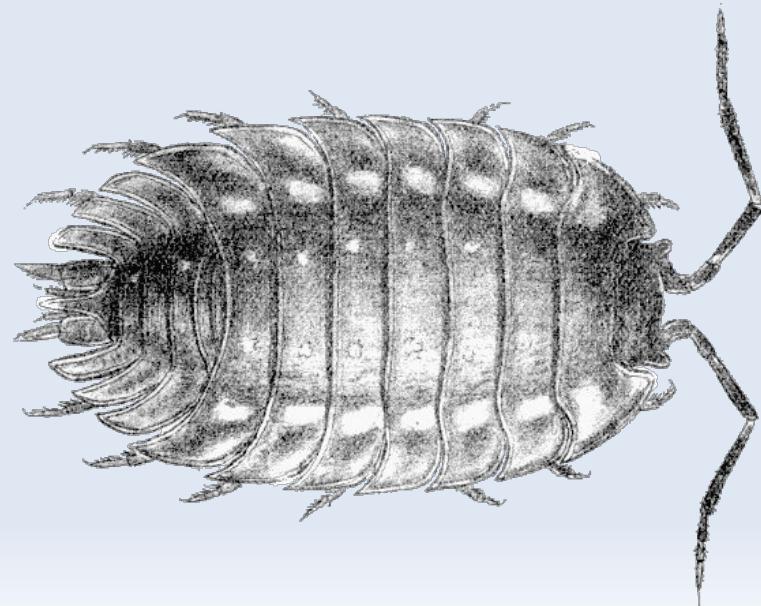
Torben  
Riehl

Tae-yoon  
Park

# Isopoda – fresh water & land



Phreatoicidea – Gondwana Freshwater  
Fossils Carboniferous to Jurassic



Oniscidea – Terrestrial & Diverse  
Fossils – Eocene or Miocene

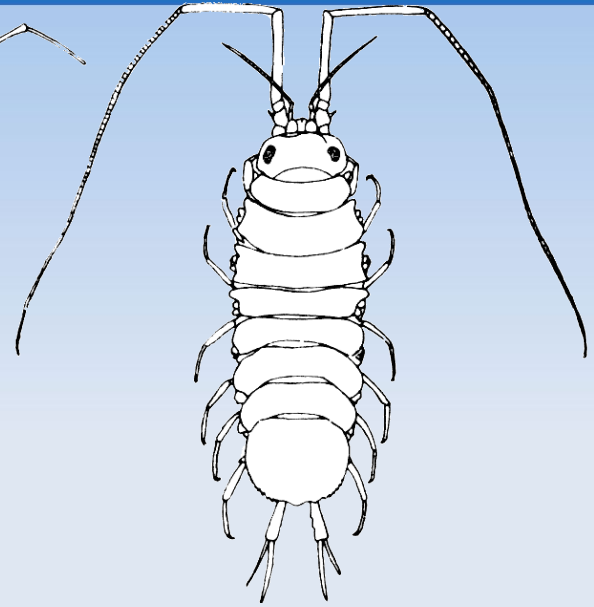
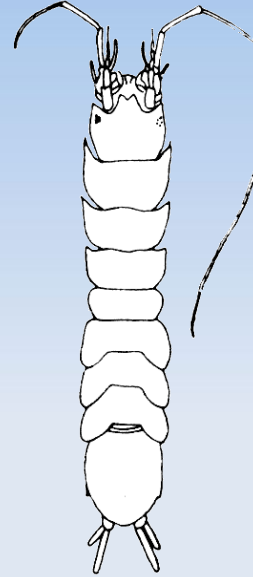
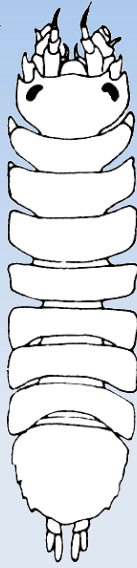
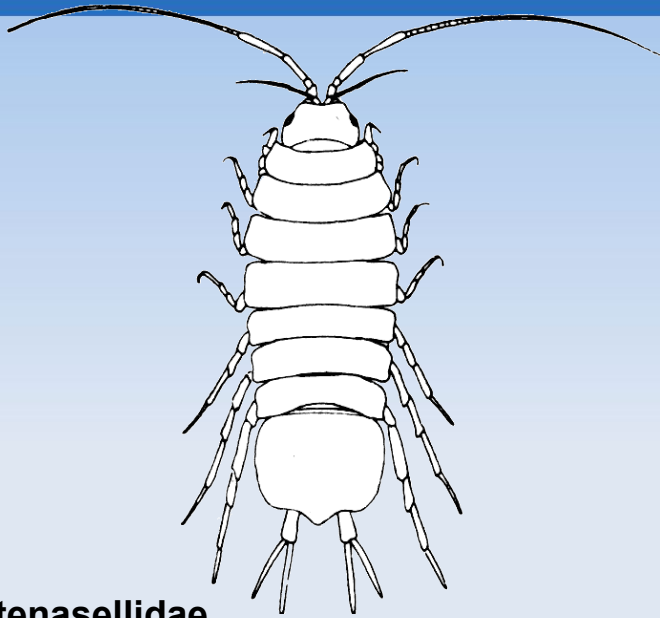
# Asellota – 30 families

Asellidae

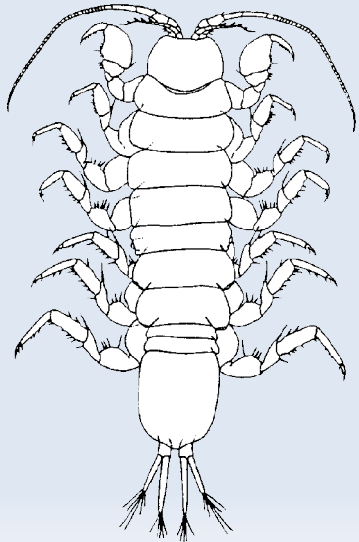
Stenetriidae

Stenetriidae

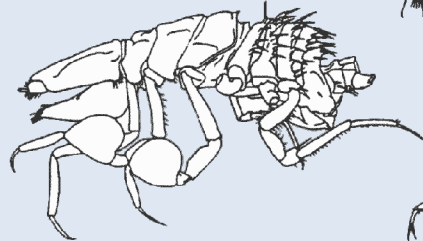
Janiridae



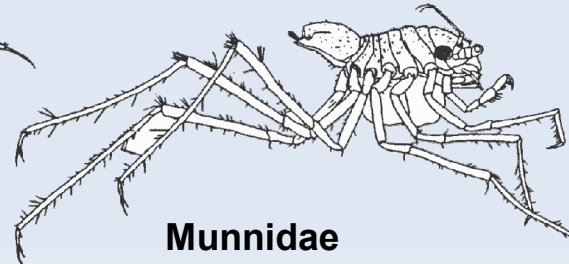
Stenasellidae



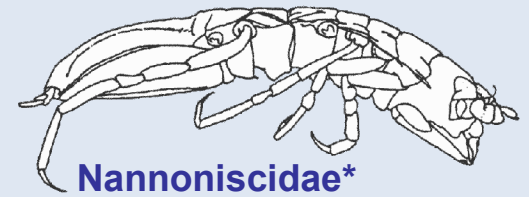
Desmosomatidae\*



Munnopsidae\*

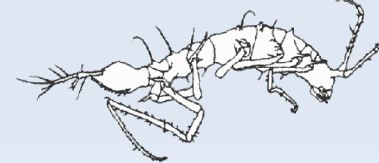


Munnidae



Nannoniscidae\*

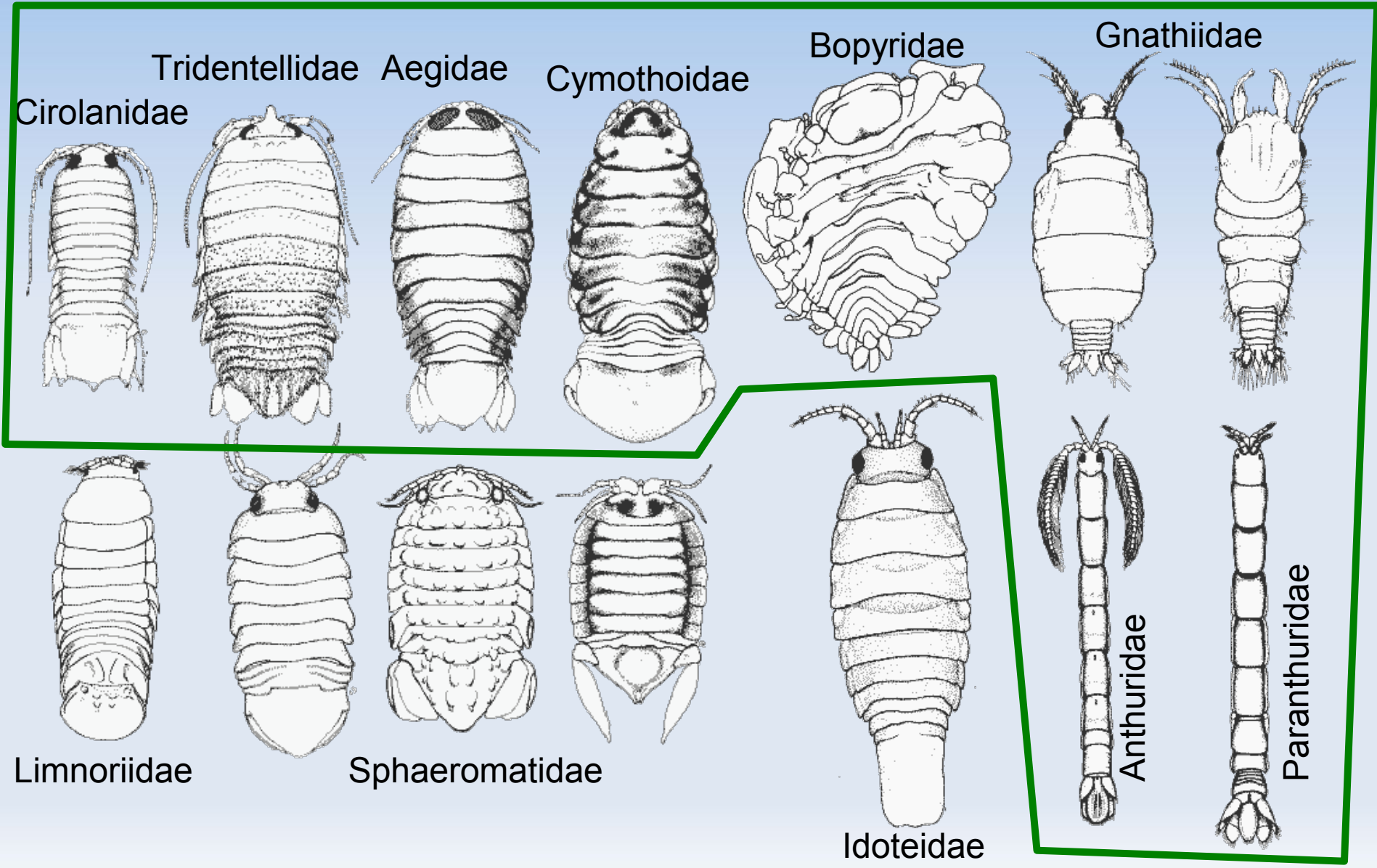
Dendrotionidae\*



\*Primarily deep-sea taxa

# Shallow marine Isopoda – Morphologically Diverse

## CYMOTHOIDA



# Classification

- Isopoda

- Phreatoicida →

- Asellota →

- Oniscidea →

- Cymothoidea

- Anthuridea →

- Cymothoidea →

- “Cirolanoidea” →

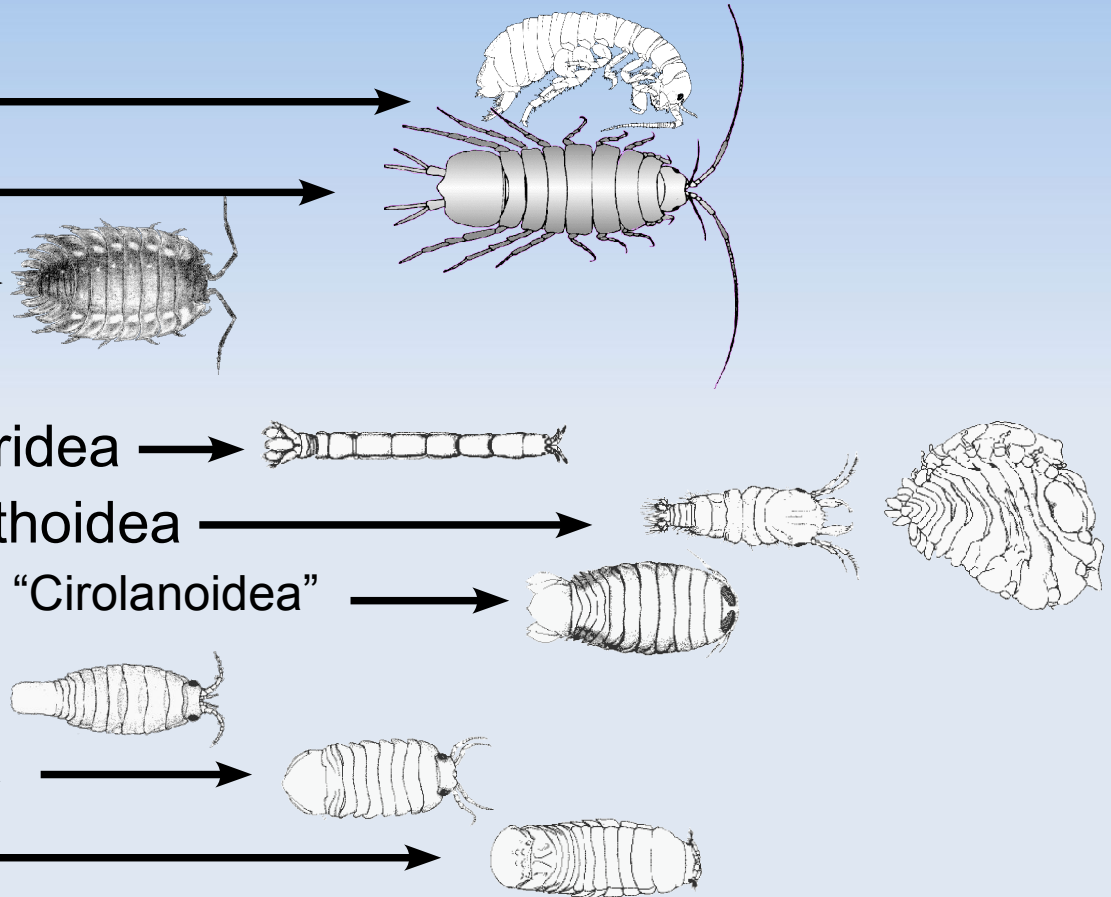
- Valvifera →

- Sphaeromatida →

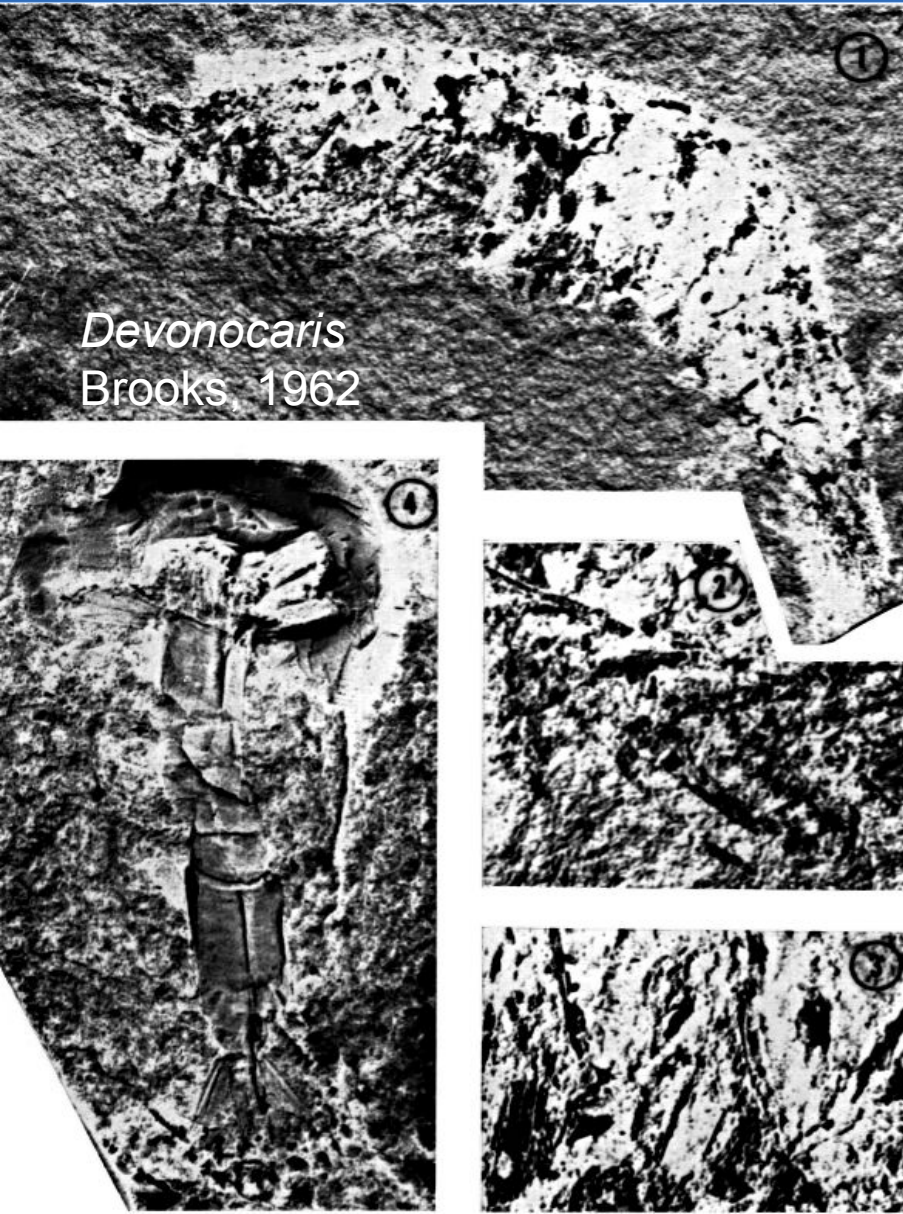
- Limnoriidea →

- + other taxa of undecided affinities

- e.g. *Tainisopus*



# When did this diversity begin?

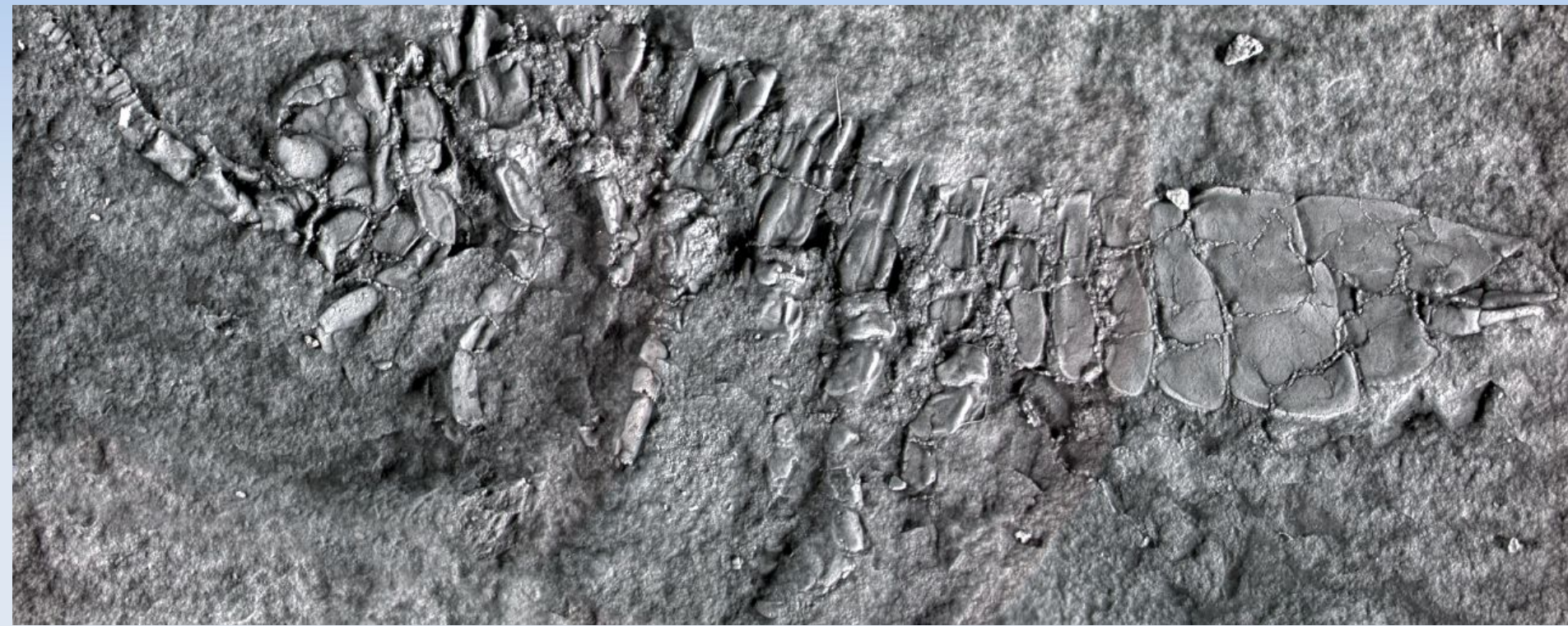


*Devonocaris*  
Brooks, 1962

- Malacostracans began appearing in Devonian: e.g., Eocarids
- Earliest isopod fossil Carboniferous *Hesslerella*
- Schram (1970) suggested an early-middle Devonian age for ancestral peracarids



# *Hesslerella shermani* Schram, 1970



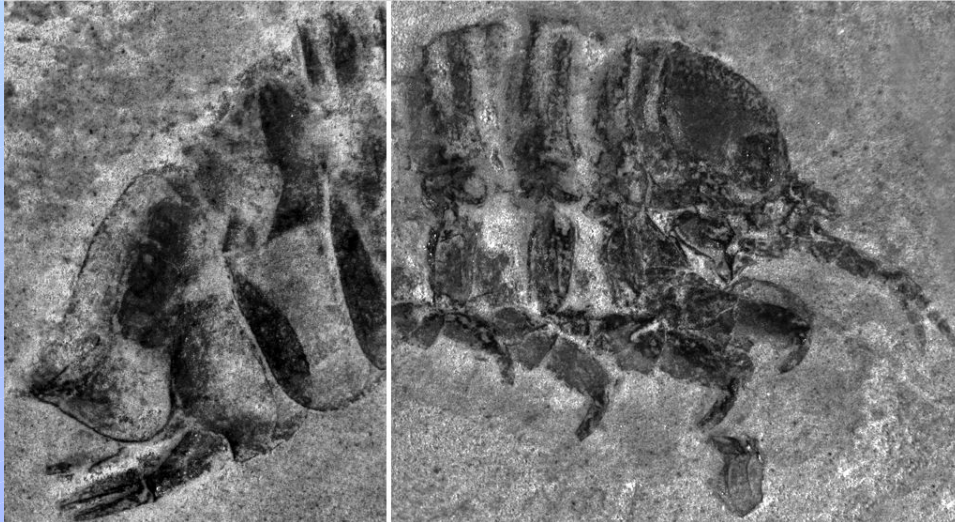
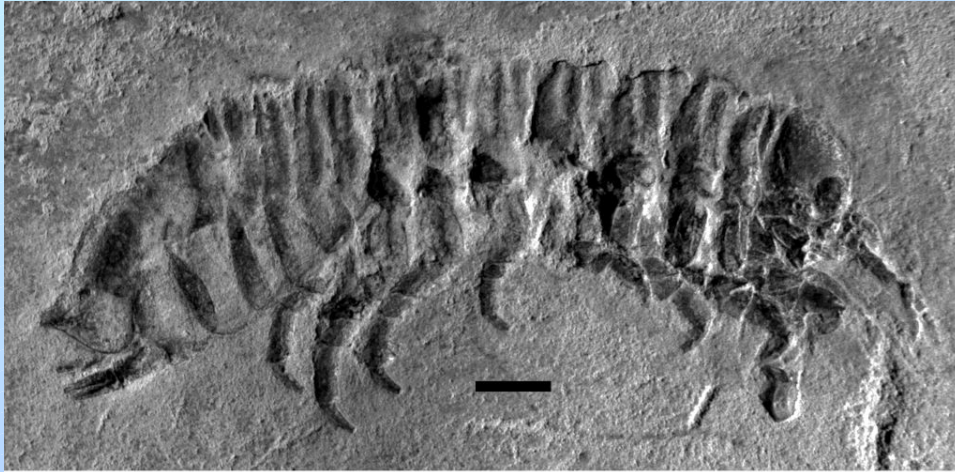
Middle Pennsylvanian Essex fauna, Mazon Creek

FMNH PE 16527, latex cast

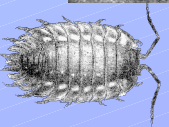
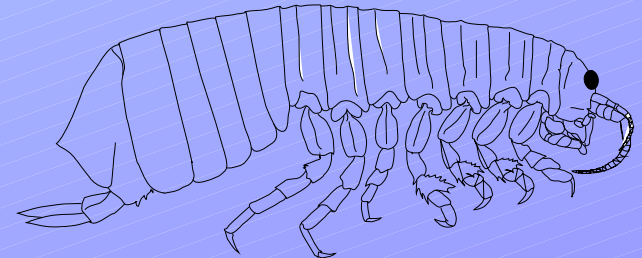
Composite photo by Tom Hegna

# *Protamphisopus* Nicholls, 1943

Triassic, Yunnan Province, China

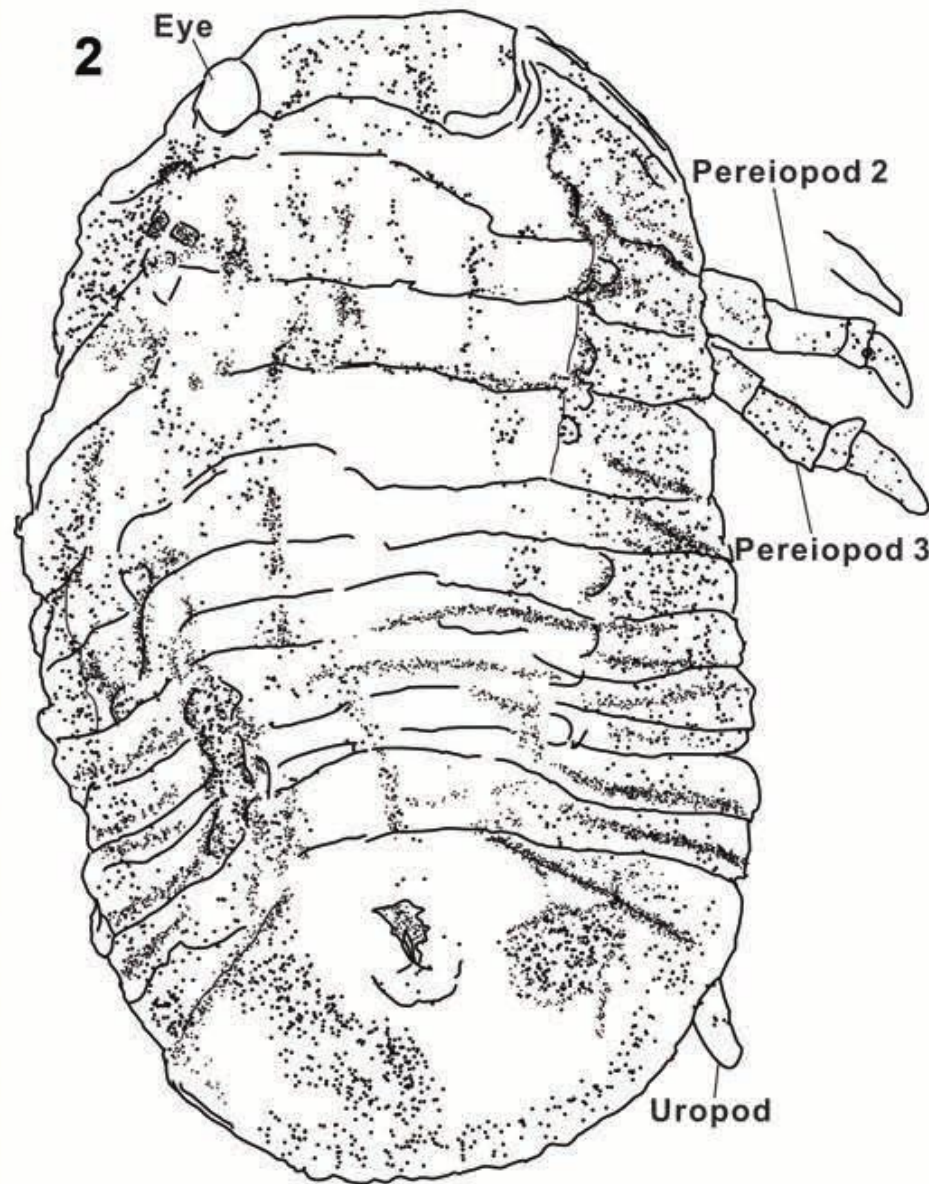


Triassic, Eastern Australia



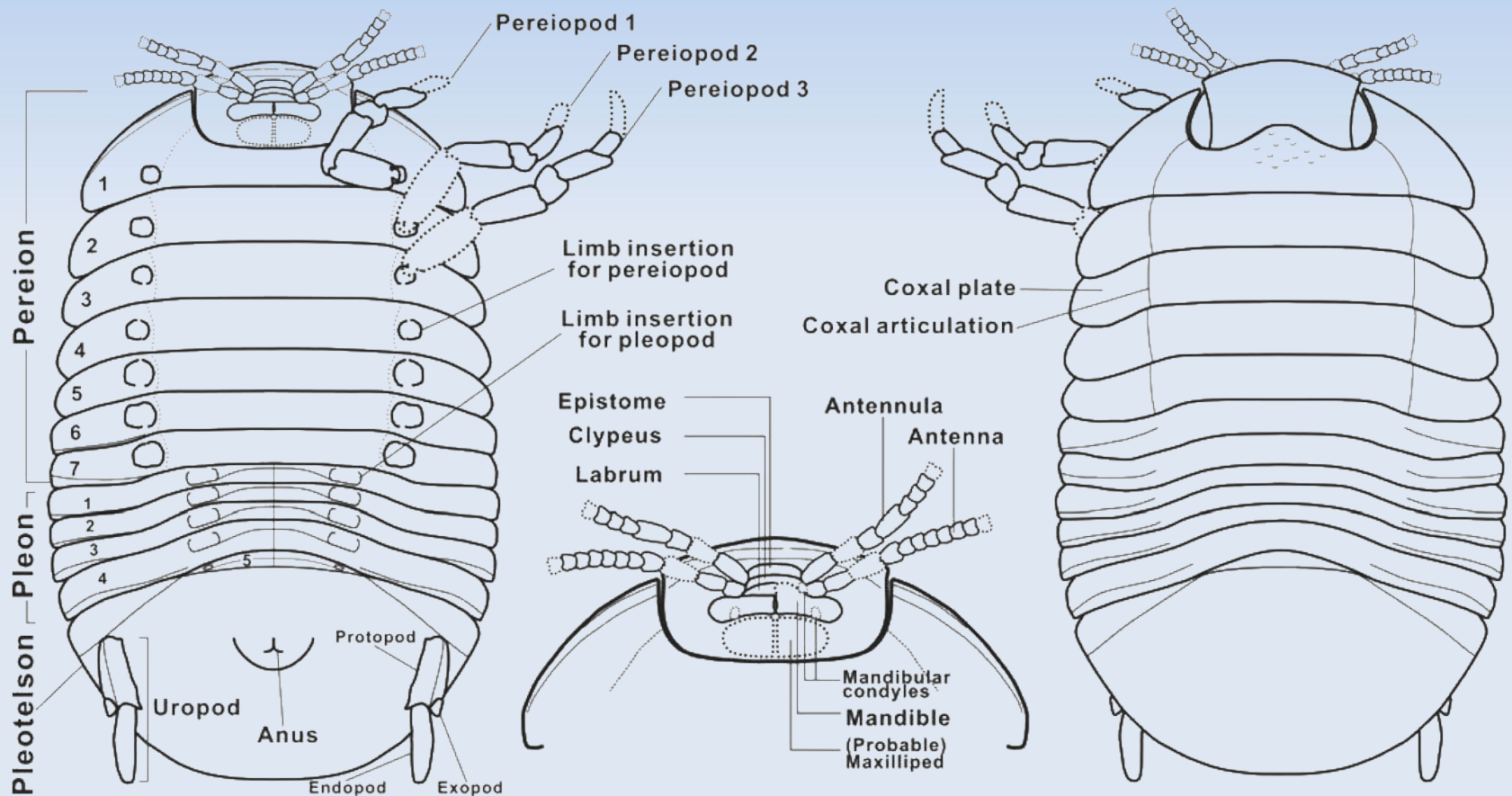
Also Jurassic, Antarctica (in progress!)

# *Archaeoniscus* from Korea



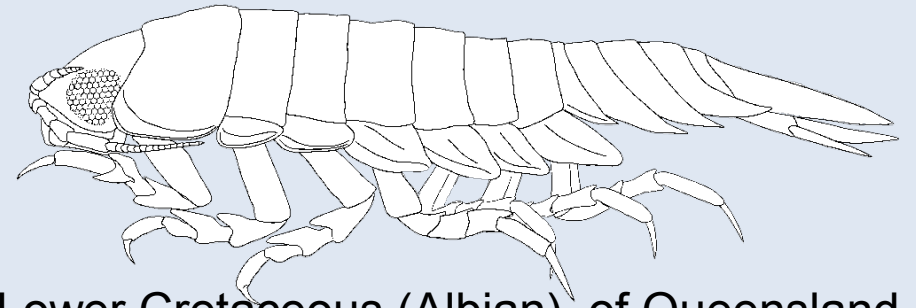
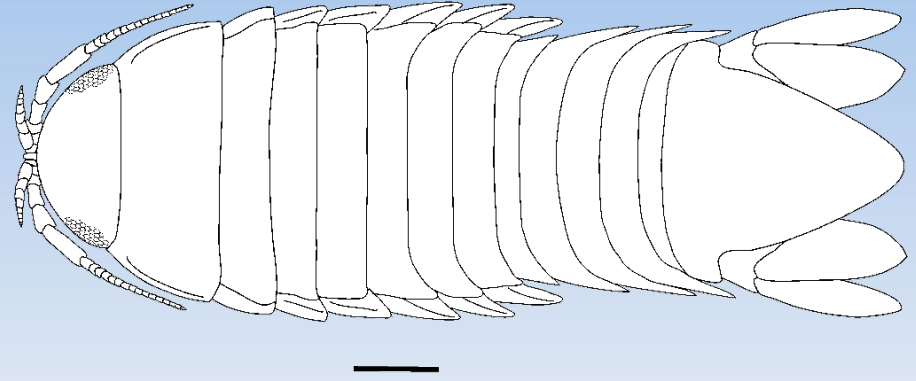
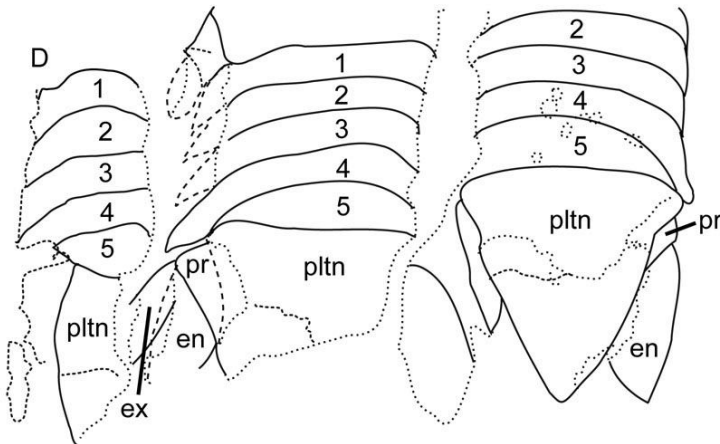
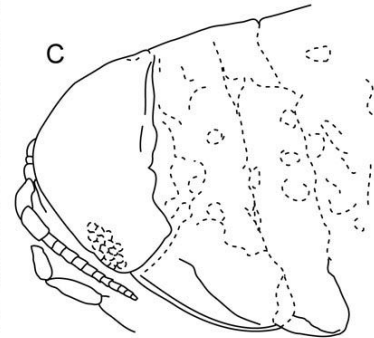
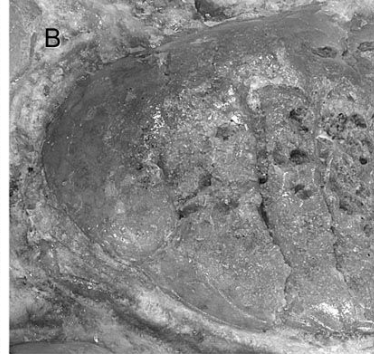
# Archaeoniscus reconstruction

Park, Wilson et al., 2012. J. Paleont.



Cretaceous, Aptian to Albian, freshwater facies

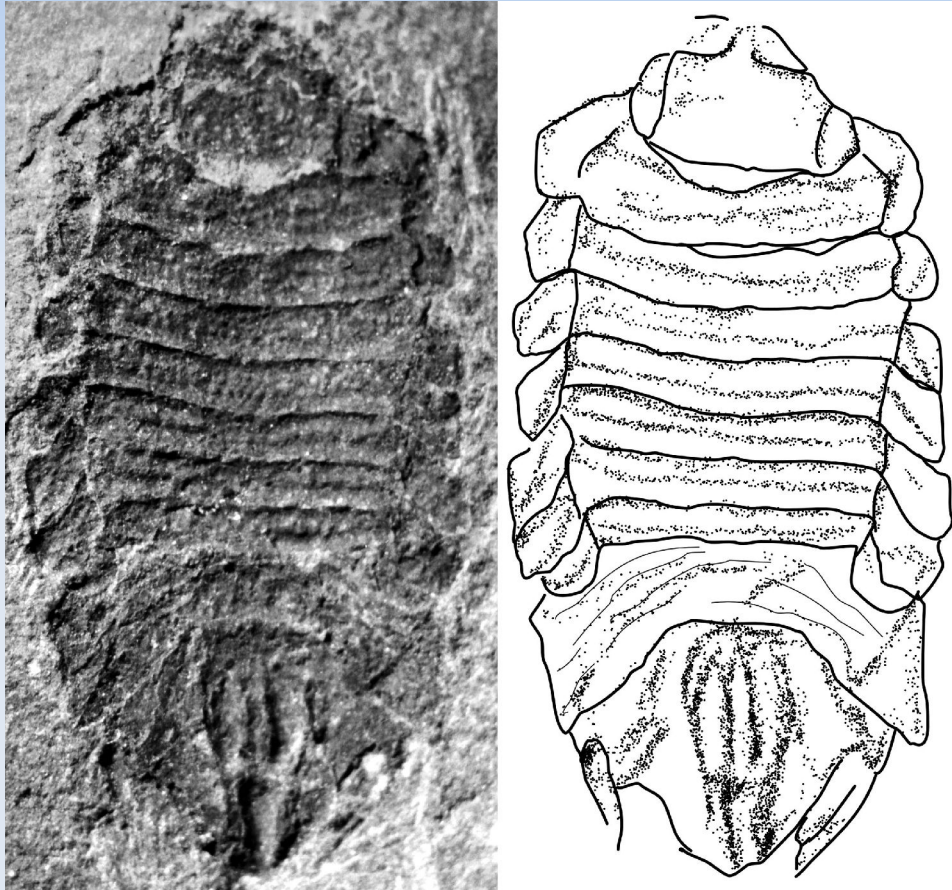
# *Brunnaega* scavenging Cirolanidae



Lower Cretaceous (Albian) of Queensland, Australia, in carcass of fish, *Pachyrhizodus marathonensis* (marine)

Wilson, G. D. F., J. R. Paterson and B. P. Kear. 2011. *Palaeontology* 54:1053-1068

# *Triassphaeroma* Basso & Tintori, 1995



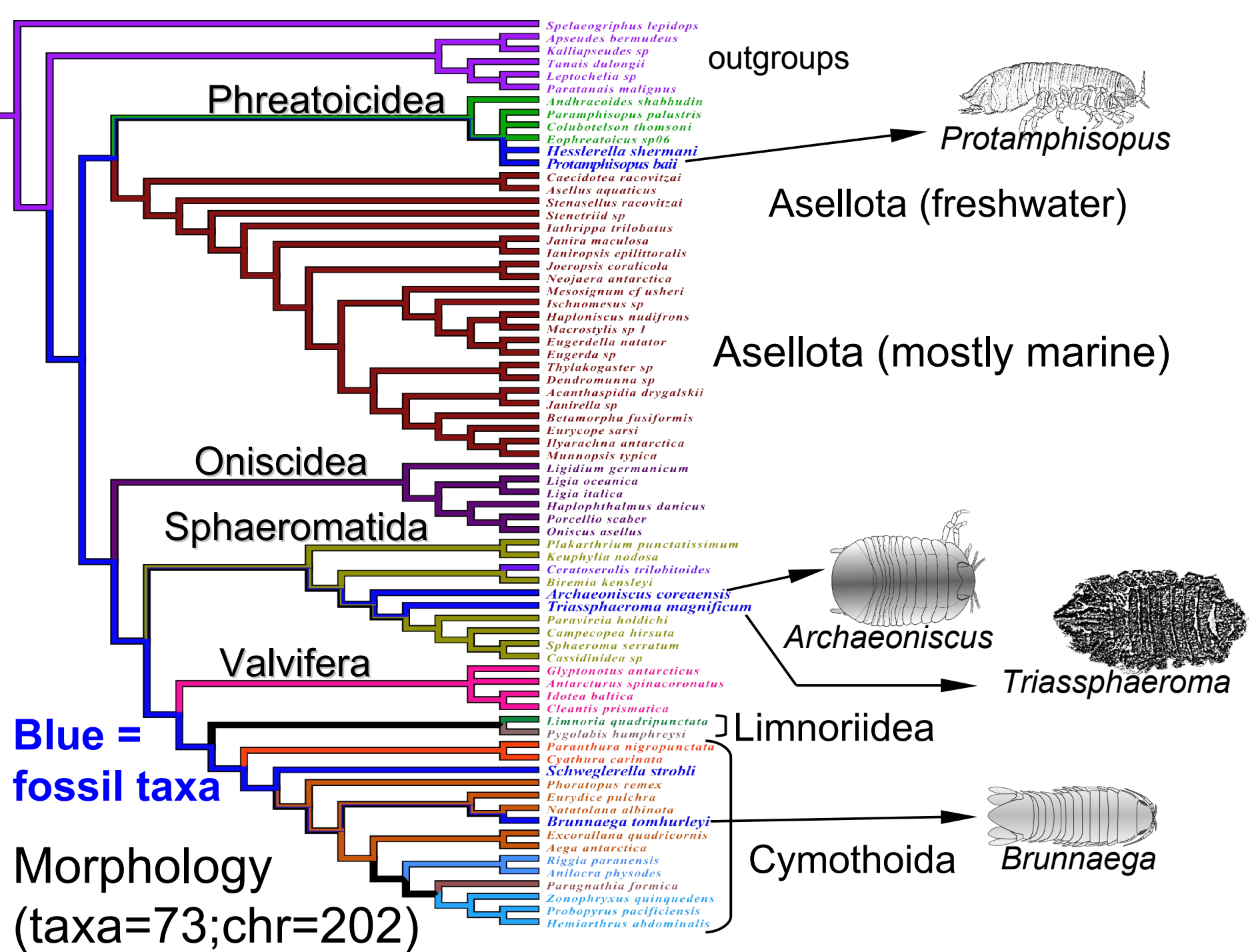
Reconstruction  
in progress,  
Park & Wilson

Marine Sphaeromatoid, Late Triassic (middle-late Norian)

# *Schweglerella strobli* Polz, 1998



Solnhofen Plattenkalk, Bavaria, Jurassic (Lower Tithonian)





# Using Isopod fossils to date events in isopod evolution

- GenBank & new sequences: 18S, 28S, 16S, Cox I
- Select well-defined fossils
- Infer phylogeny (Bayesian)
- Anchor nodes based on dates from fossils
- Establish time credibility intervals using clock assumption (Beast & Phylobayes)

Lins et al., 2012. Biol. Lett.

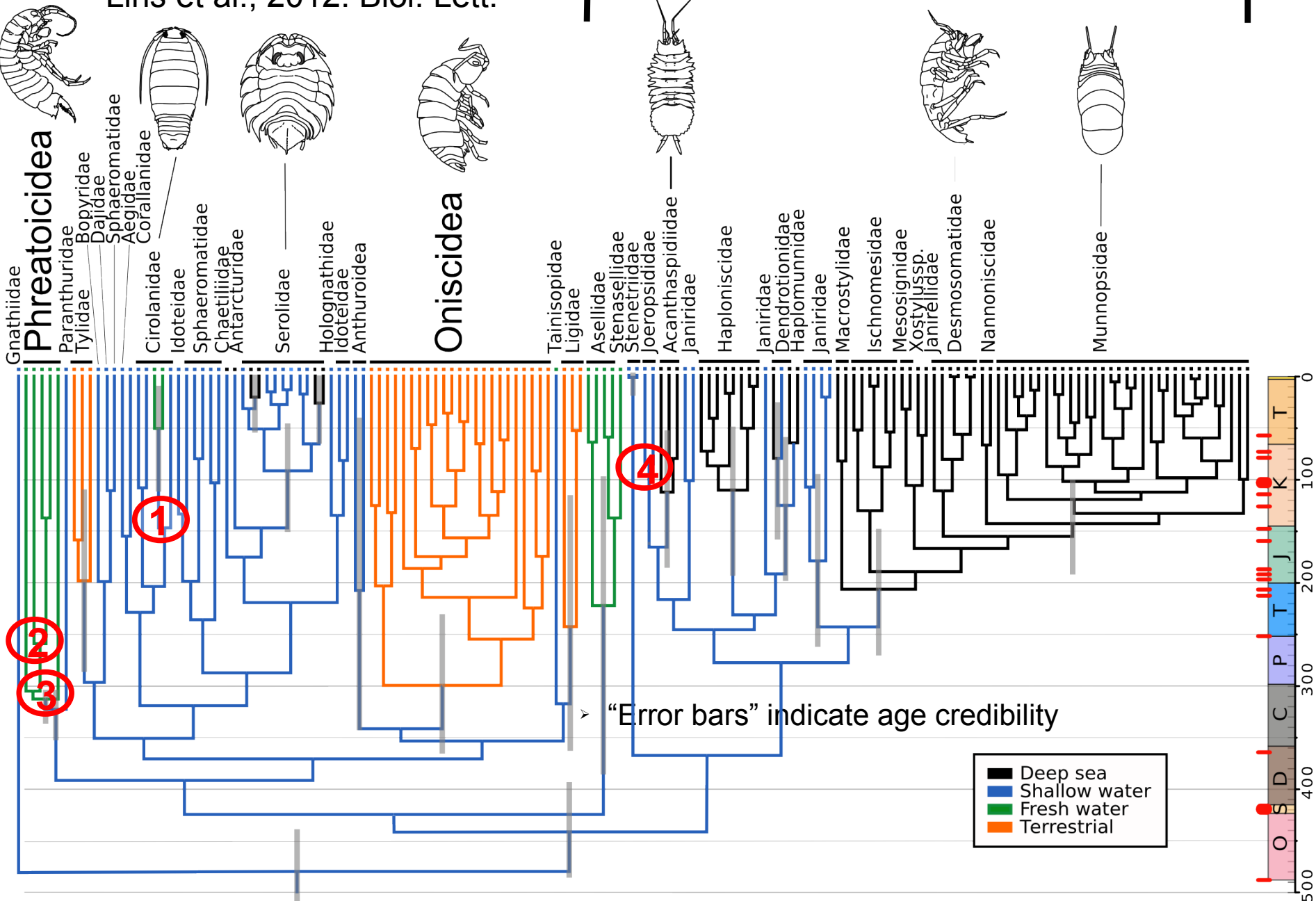
# Fossil calibration

	<b>Taxa</b>	<b>MY</b>	<b>Reference</b>	<b>Calibration point</b>
1	<i>Brunnaega roperi</i>	150.8–155.7	Polz, 2005	Cirolanidae, Cymothoidea
2	<i>Protamphisopus baii</i>	237-245	Fu et al., 2010	Amphisopidae, Phreatoicidea
3	<i>Hesslerella shermani</i>	307	Schram, 1970; 1974, 1977	Phreatoicidea root
4	Joeropsididae	93.5–99.6	N.Morel, pers.comm	Joeropsididae, Asellota
	<i>Ophthalmidiastylis parvulostrum</i>	318.1-328.3	Schram et al., 2003	Cumacea, peracarid outgroup
	<i>Securicaris spinosus</i>	318.1-328.3	Schram et al., 2003	Cumacea, peracarid outgroup
	<i>Rehbachella</i>	499	Walossek, 1993	Crustacea Root

# Bayesian analysis

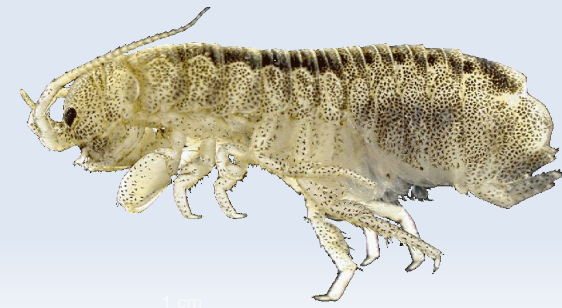
Lins et al., 2012. Biol. Lett.

## ASELLOTA



# In summary...

- Isopod fossils can be used with extant taxa in phylogenetic analyses
- Most fossils in or related to crown groups
  - Embedded in distal branches
  - Little influence on morphological analysis
- Bayesian estimates of modern taxa
  - Fossils provide estimate age of nodes
  - Ordovician-Devonian origin



# The way forward



- Planned analyses:
  - Extend morphological databases with fossil data
  - Obtain key sequences (e.g., *Gnathia*; *Limnoria*)
  - Combined analysis using all data (morphological; genetic; fossil)





Thank you for your attention.  
Any questions?

