

Isopod Crustaceans
Suborder Asellota
Superfamily Janiroidea

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The Asellota, subfamily Janiroidea

- Diversity and Morphology
- Phylogenetic relationships and age
- Where to find them and how to collect them;
What to expect in California
- How to identify Asellota; survey of common families
- Key to the families of the Asellota; interactive identification with DELTA INTKEY

What is a Janiroidean isopod?

- Isopod of the suborder Asellota
 - Pleon with one large merged somite, consisting minimally of telson + pleonites 3-6, anterior pleonites extremely short and ring-like
 - Male pleopod I and II highly transformed for sperm transfer; pleopod II geniculate
- Superfamily Janiroidea
 - Male pleopod I fused into single unit with sperm tube medially; pleopod II stylet form with sperm tube
 - Pereopod I carpus enlarged, not primitively propodo-subchelate
 - Pleopods I (when present) and II form operculum over remaining pleopods

Isopoda Asellota: a diverse suborder of crustaceans

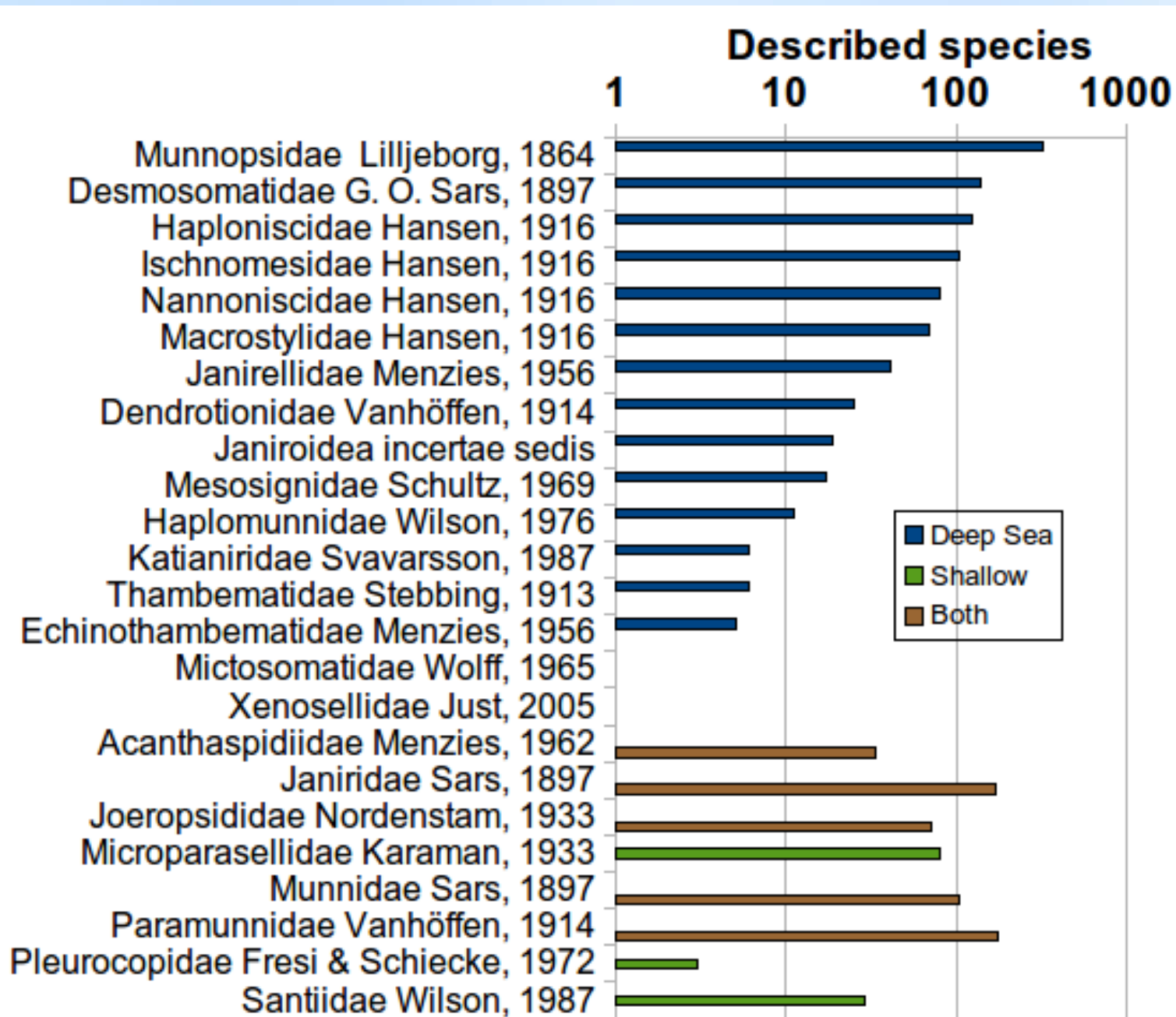
- More than 2,200 species described
- >1650 species in superfamily **Janiroidea**
- ~58% are **deep-sea**



Typical shallow marine Asellotan,
genus *Stenetrium*

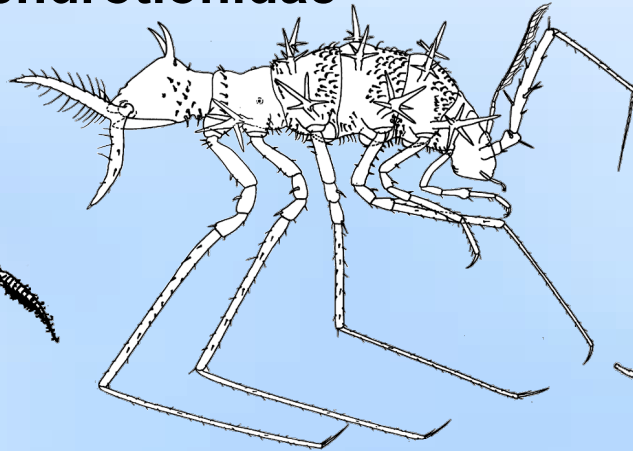
Janiroidea:

Known species richness of families

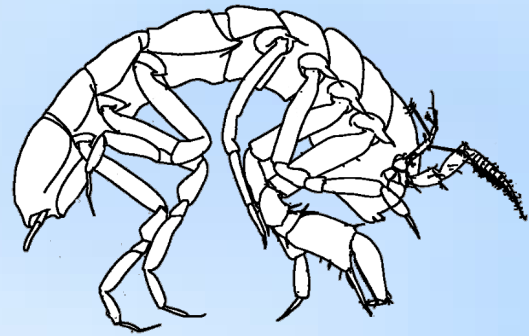
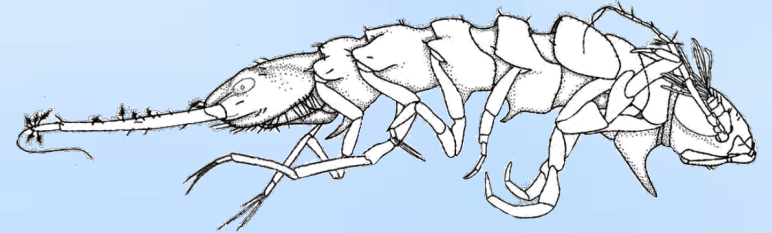


Deep-sea Isopoda: (Asellota, Janiroidea)

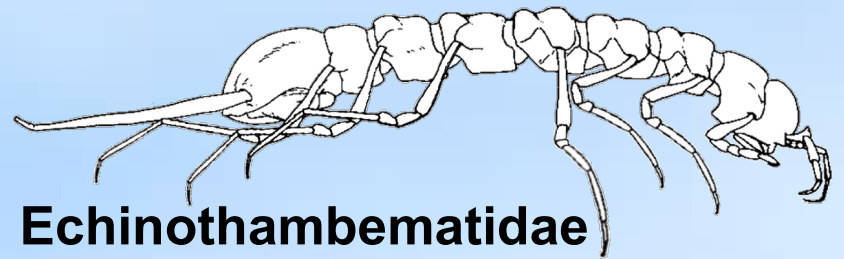
Dendrotonidae



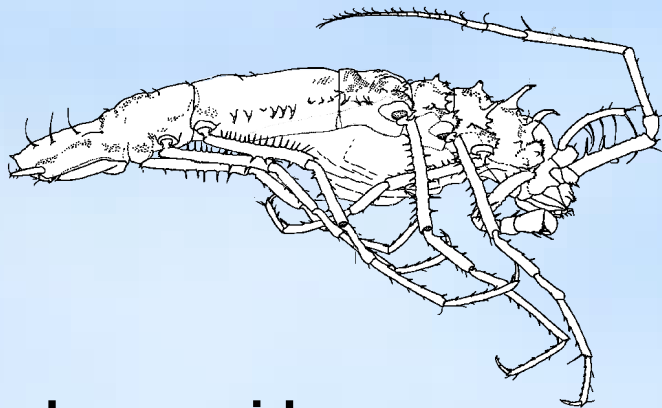
Macrostylidae



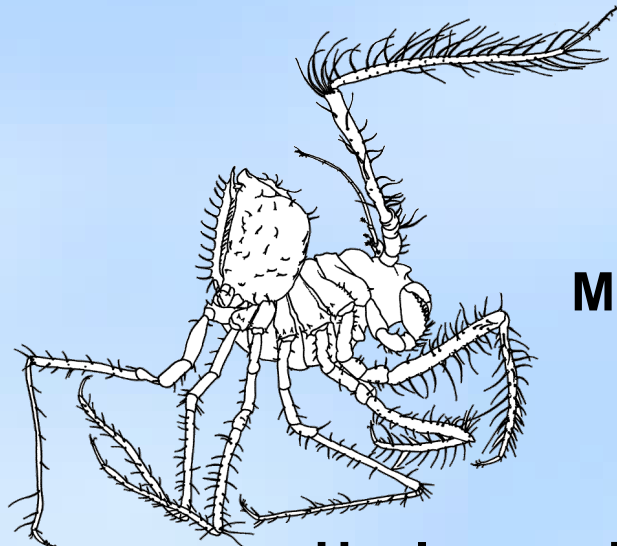
Desmosomatidae



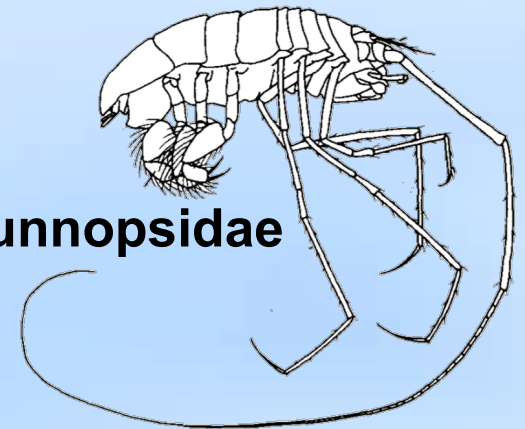
Echinothambematidae



Ischnomesidae

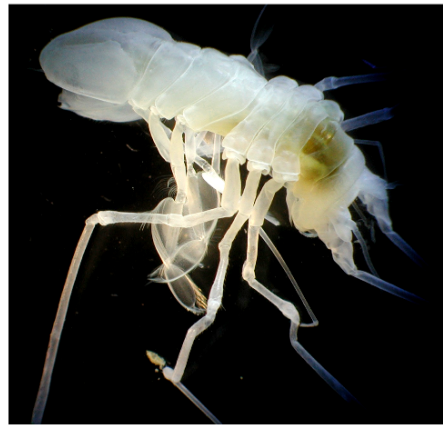
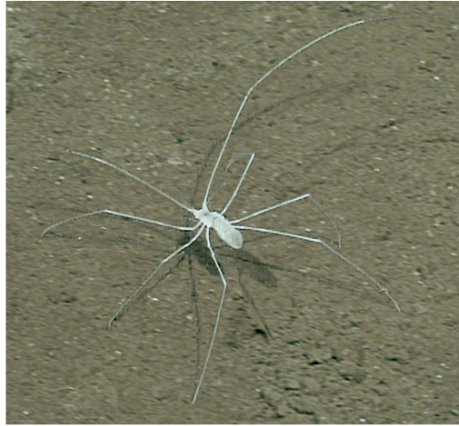


Haplomunnidae



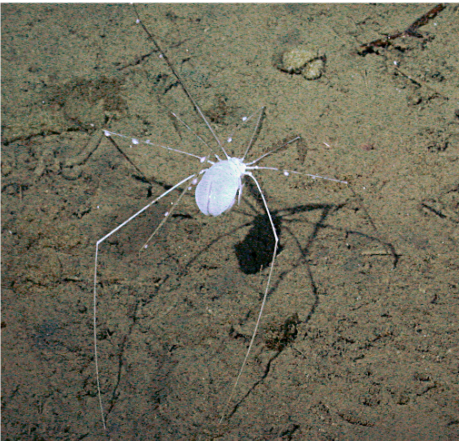
Munnopsidae

Unusual Adaptations



Munnopsidae,
benthopelagic species

- *Munnopsurus*

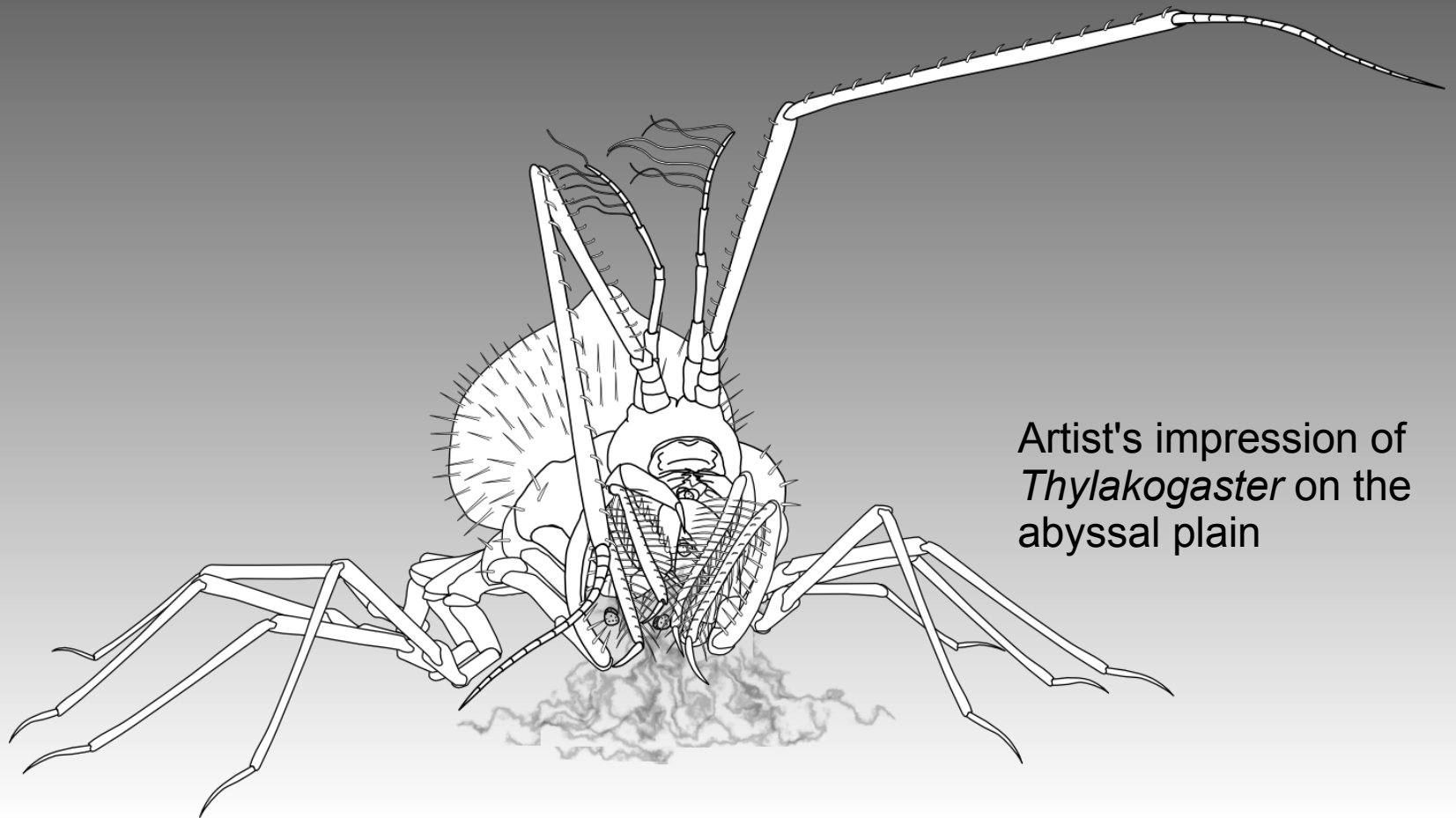


- *Paropsurus*

Credits:
Monterey Bay
Research Inst.

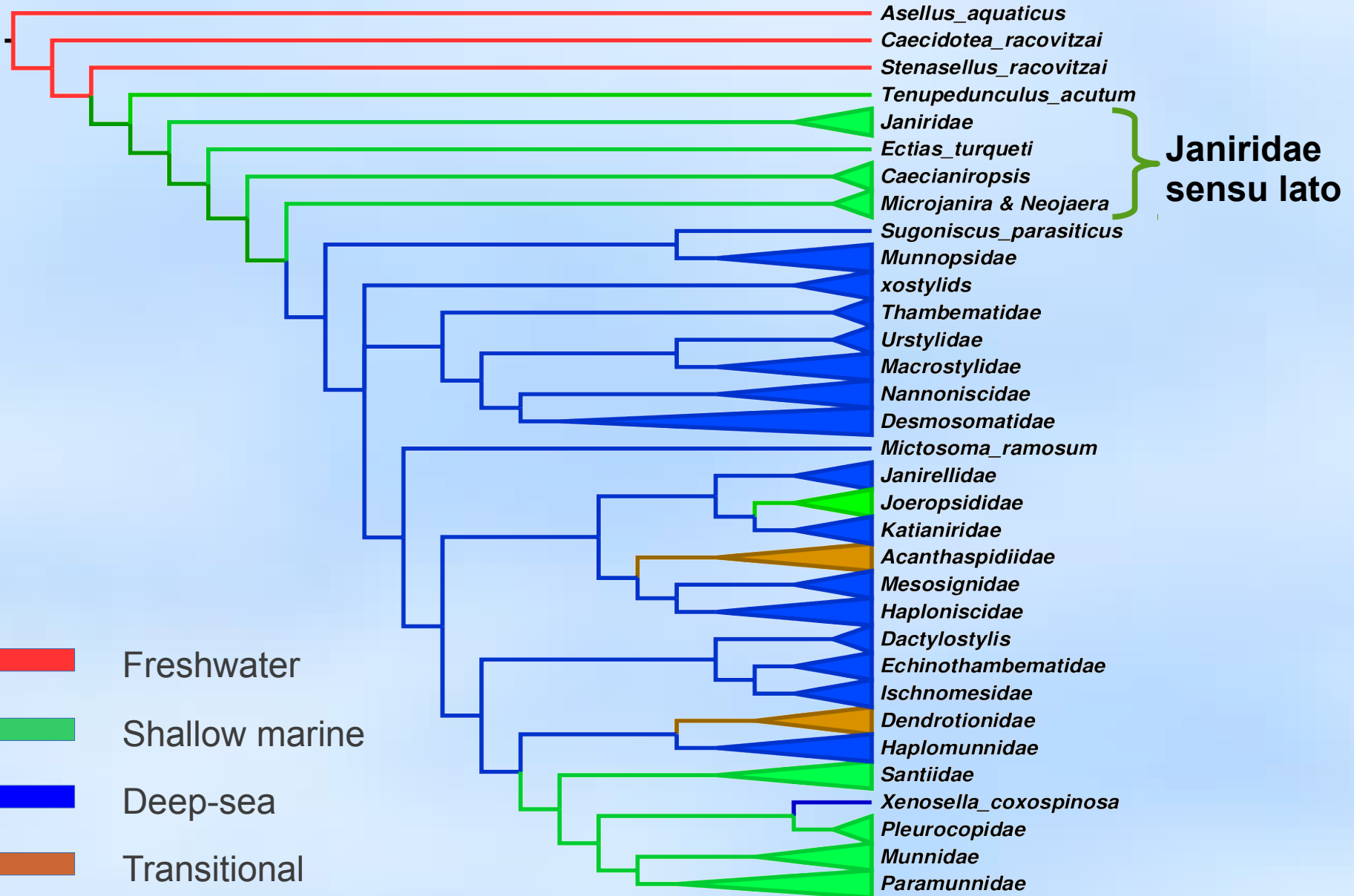
Credits:
Karen Osborn

Some morphologies are so strange that we can only guess or imagine what they do on the sea floor!



Artist's impression of
Thylakogaster on the
abyssal plain

Relationships of Janiroidean families



Isopod have a fossil history extending back to the Paleozoic

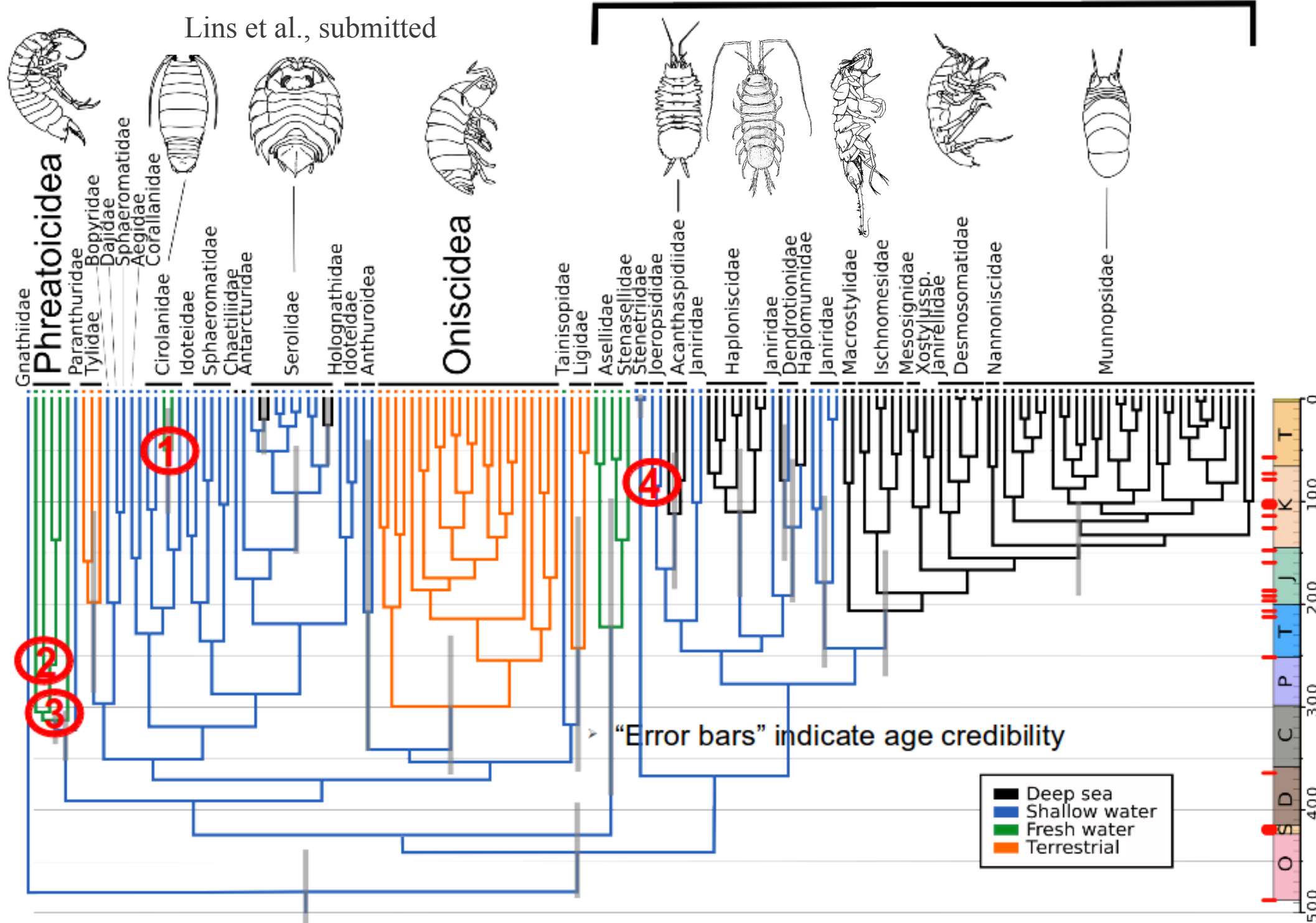


Hesslerella,
Middle Pennsylvanian,
Essex fauna, Mazon Creek

Bayesian analysis

Lins et al., submitted

ASELLOTA

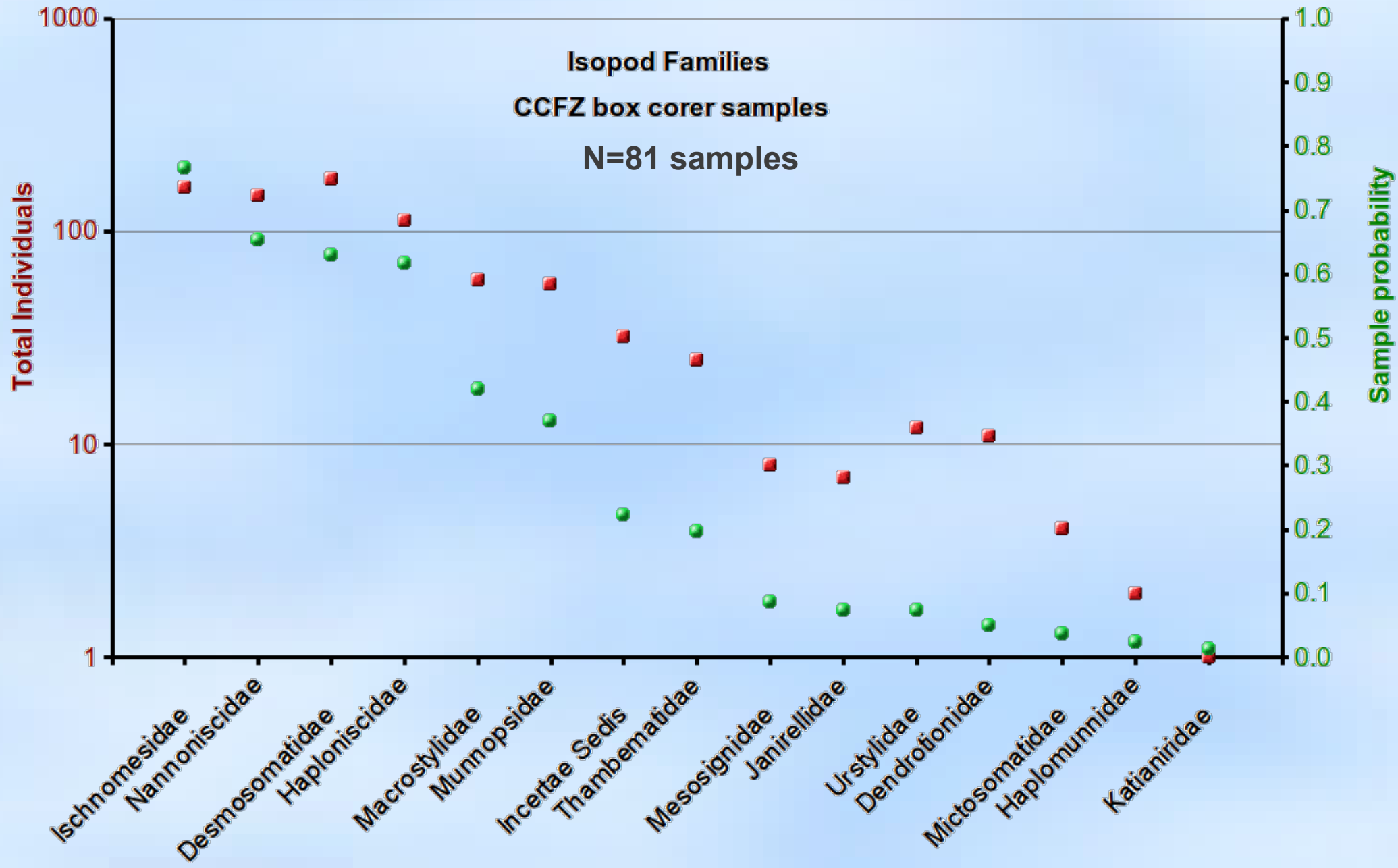


Where to find Asellota in shallow marine habitats

- Marine plants and other biotic substrates (e.g., sponges, tunicates, hydroids)
 - Diver collections in plastic bags
- Epibioties (e.g., Echinoderms, large isopods)
- Among gravel, rocks & cobbles, shallow sublittoral
 - Bucket washes; air lift
- Soft sediments, typically on surface
 - Grabs, corers, biological dredges & sleds

[See species list handouts]

Sampling probability: abyssal box coring, Pacific Ocean



Preservation

- Depends on aims of collection
- Morphological studies
 - Aldehydes (buffered formaldehyde, gluteraldehyde solutions), transfer to >80% ethanol for general study
- Genetics
 - Pure ethanol, cold storage
- Both
 - Pure ethanol, but with ~5% glycerin to minimize brittleness

Morphology/Anatomy

- Much of janiroidean morphological diversity involves general body form
- Good news:
 - Janiroideans can be identified to genus- or species-level without dissection;
 - fragments can be identified to family or genus-level
- Bad news:
 - much of the literature was done by those unfamiliar with Asellota, so many important features are not illustrated well
 - For environmental studies using morphospecies counts, this may be less important

General point:

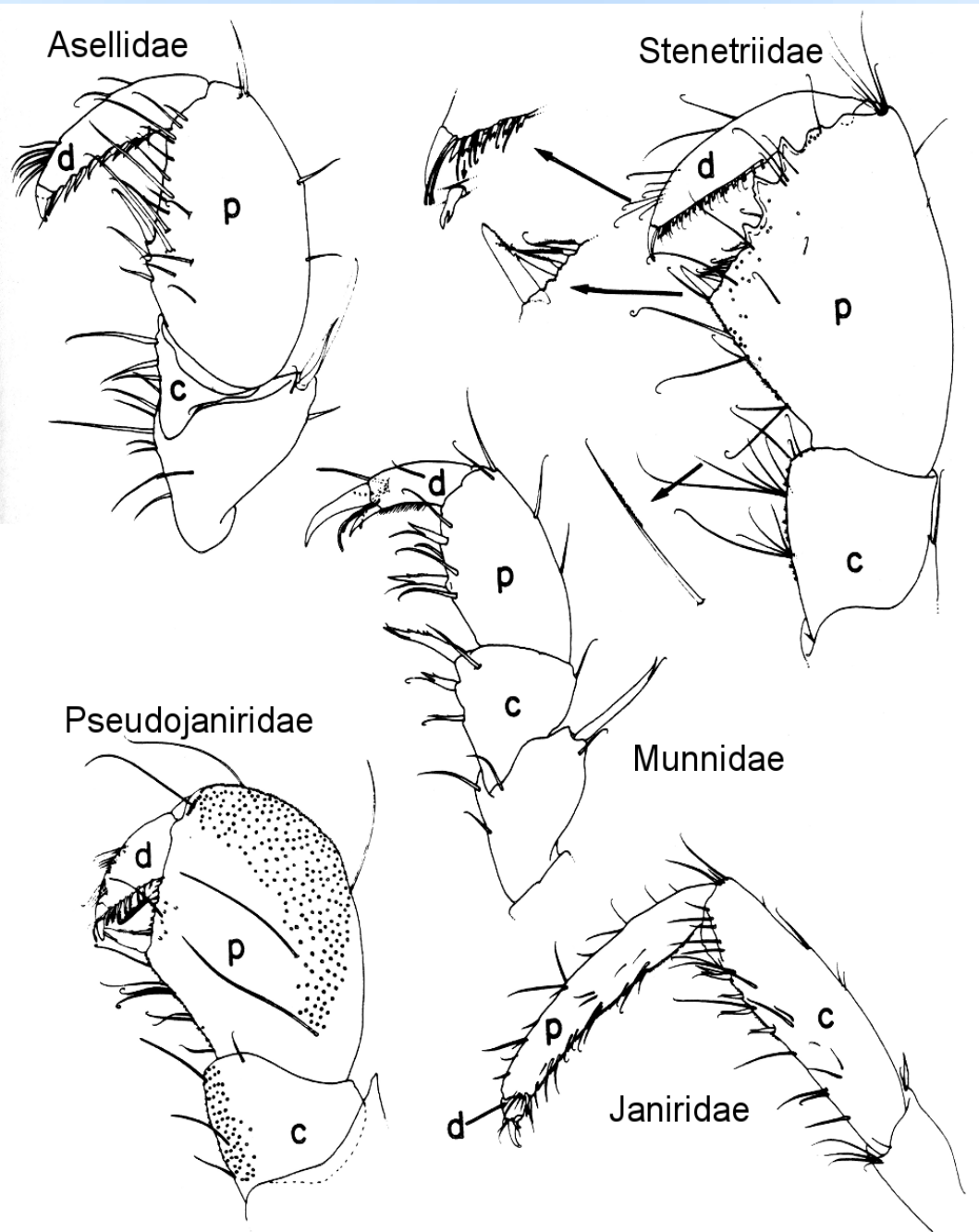
Identification of closely related species

- Within narrowly defined regions, species can be identified comparatively
- Co-occurring congeners often have differing phenotypes
- Between regions, species differences can be subtle
- “cryptic” species only exist if you don't look for differences

Important character complexes to consider in identifications

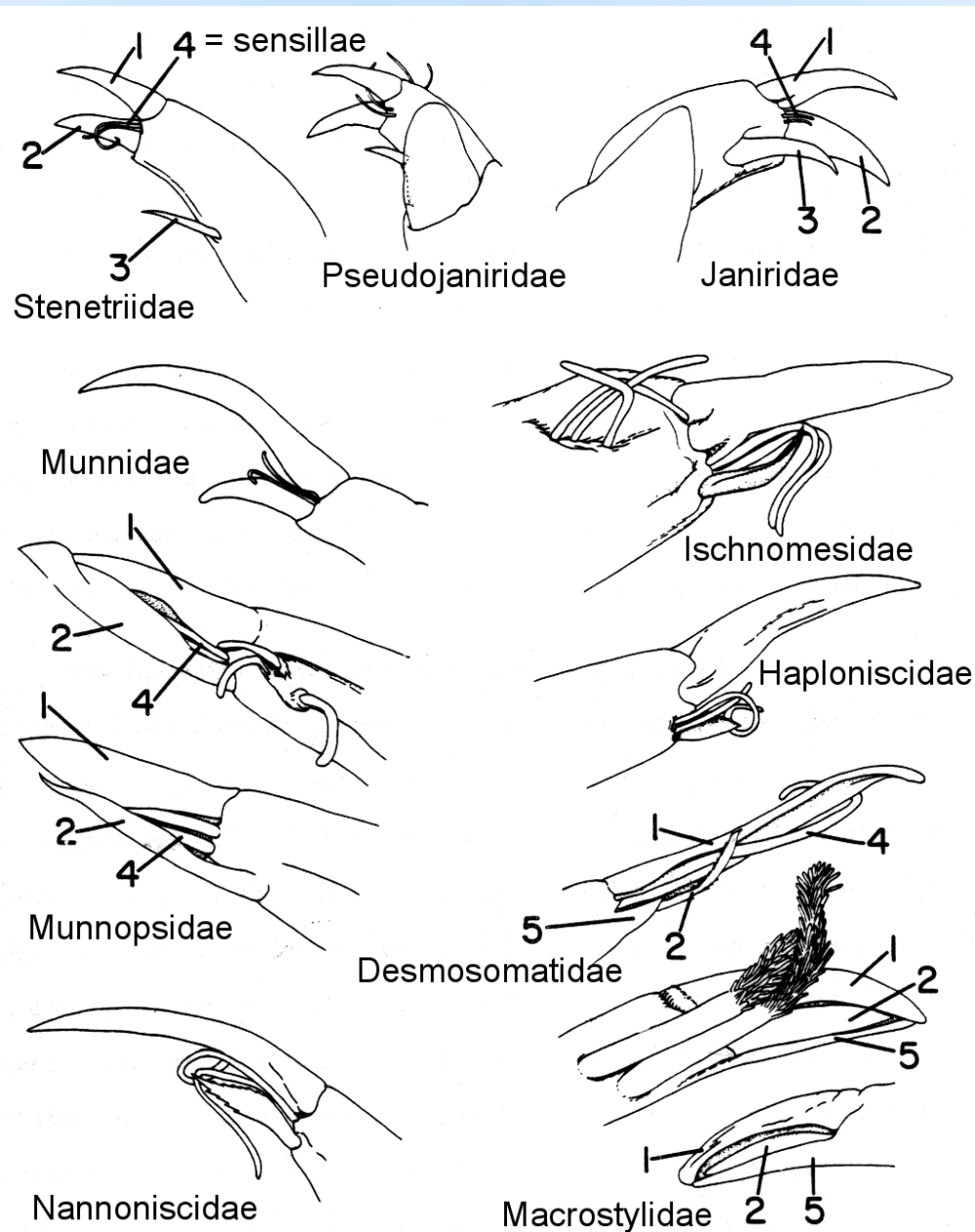
- Head frontal margin
- Basal articles of antenna, antennula
- Pereopod I: how distal articles rotate or oppose one another; robustness; setation & spines
- Position of coxae and projections (spines, plates, lappets) on tergites
- Body segments: setation, spines and projections; relative shape; tagmosis (integrated groups of segments)
- Pleotelson: shape relative to last pereonite, spines setation, position of anus and opercular pleopods
- Uropods

Pereopod I grasping



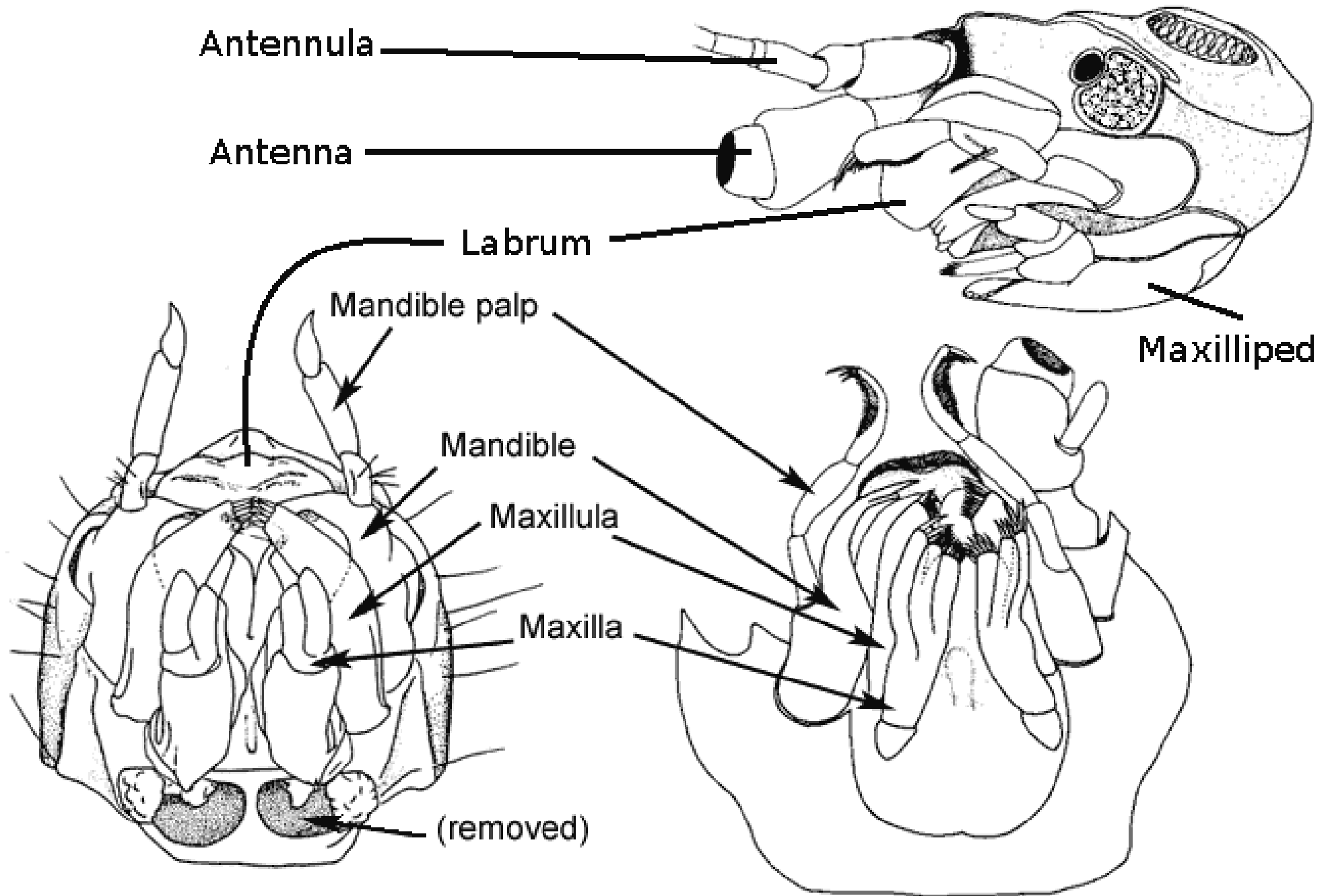
- Basal taxa (Aselloidea, Stenetrioidae) opposing segments between dactylus (d) and propodus (p)
- Most janiroideans: propodus+dactylus oppose the carpus
- Some have opposition between all three segments (e.g., Munnidae)

Dactylar Claws (= unguis)

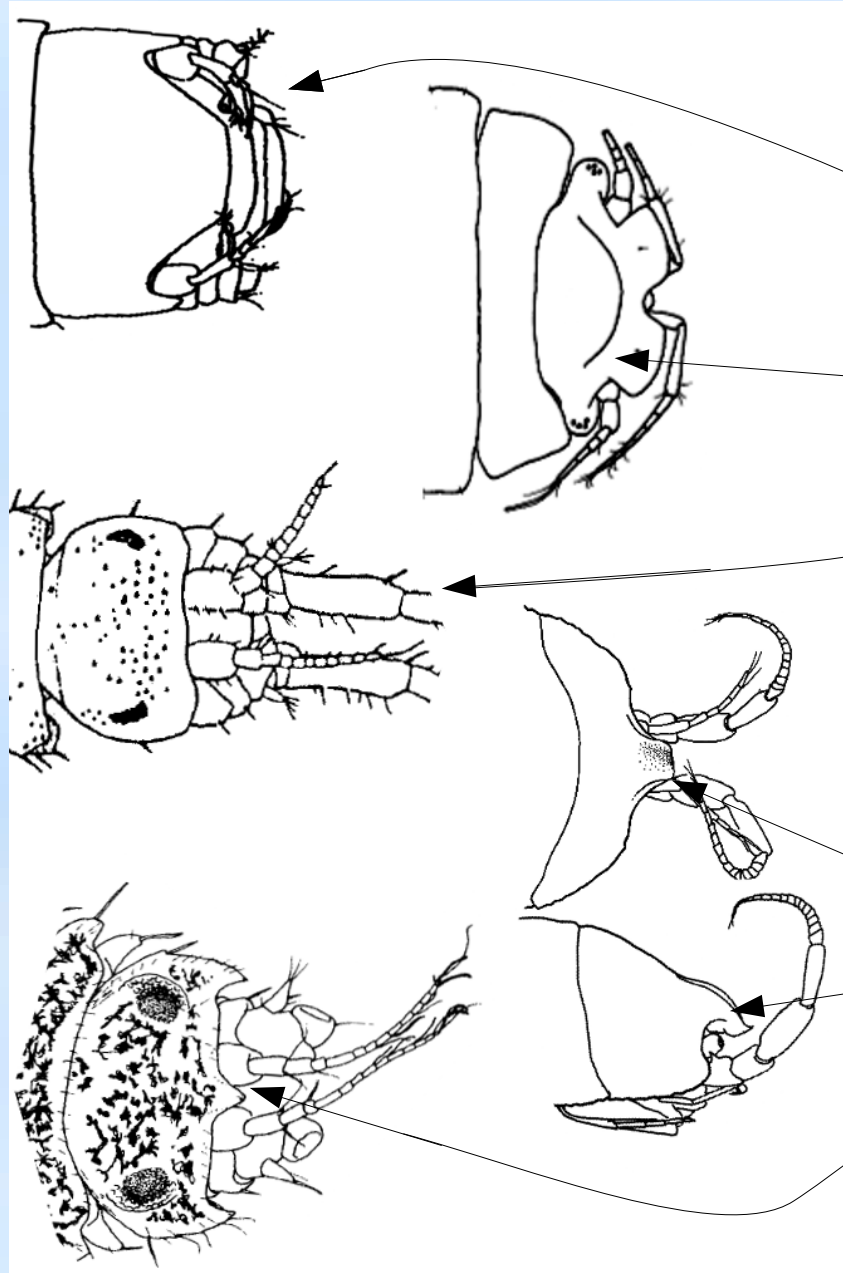


- Basal taxa have two nearly equal sized claws
- Janiridae have 3 claws
- Most others have 2 claws, with ventral claw (2) reduced or modified in various ways

Isopod head with mouthparts

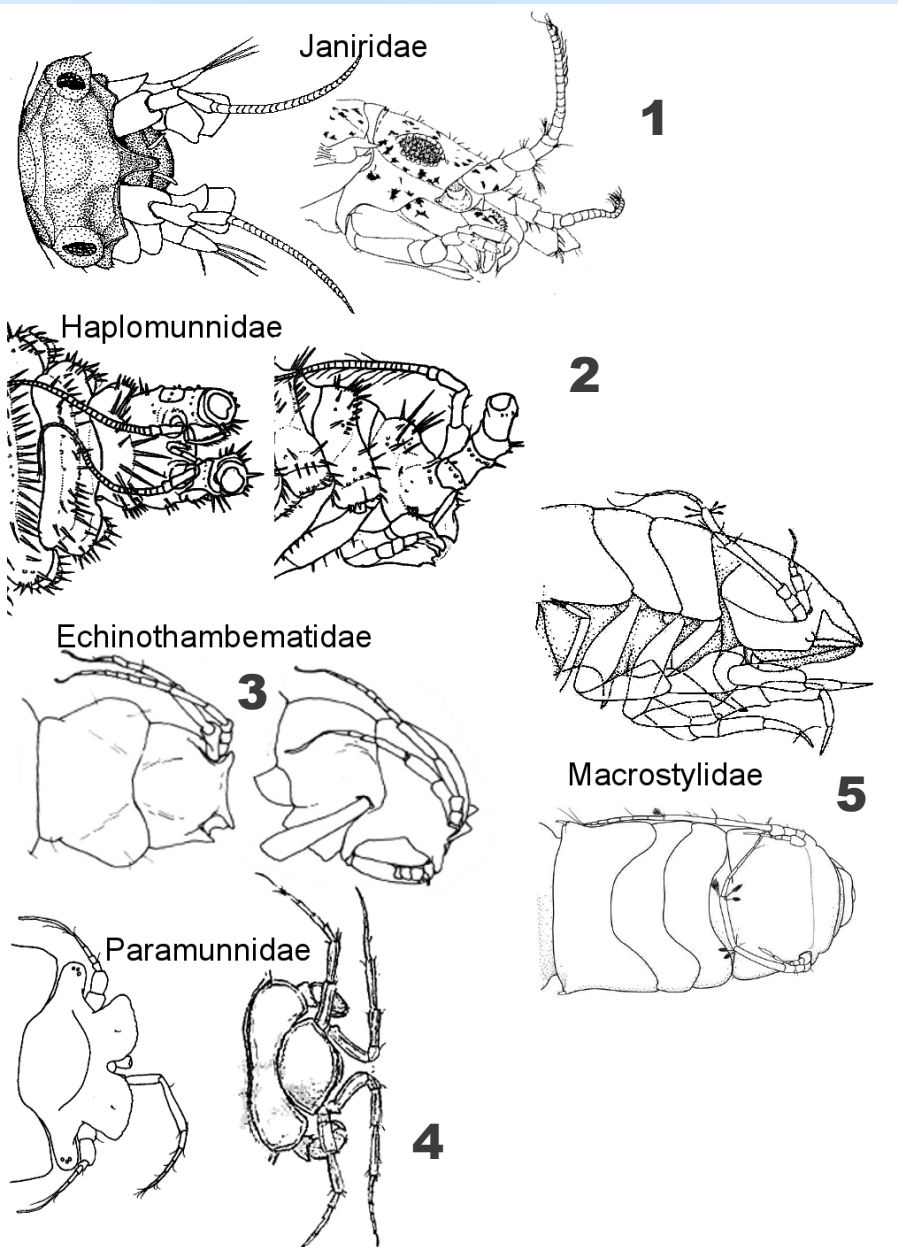


Head frontal margin



- Head frontal margin projecting anteriorly
 - Without frontal lobes
 - With frontal lobes
- Head frontal margin not projecting anteriorly
 - Without rostrum
 - With rostrum

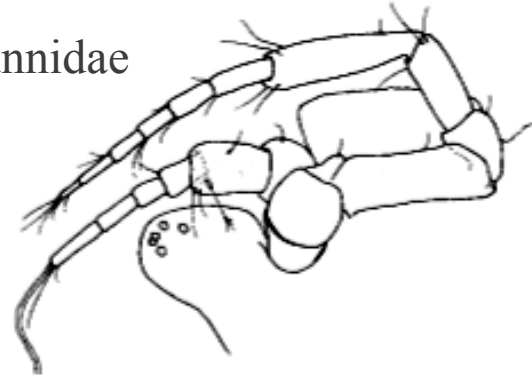
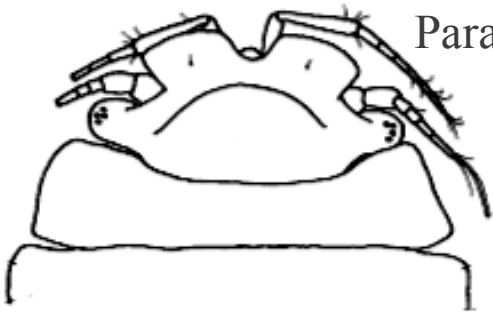
Antennula emerging from head basal article directed:



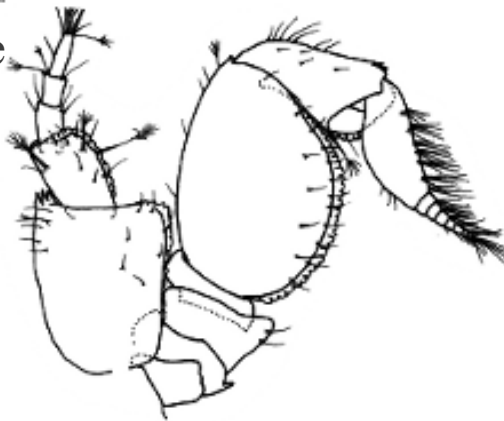
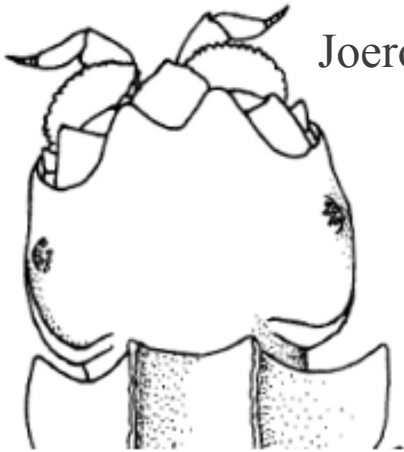
- 1) Anteriorly (e.g., Janiridae)
- 2) Anterodorsally (e.g., Haplomunnidae)
- 3) Anterodorsally and laterally (e.g., Echinothambematidae)
- 4) Anterolaterally or laterally (e.g., Paramunnidae)
- 5) Posterodorsally (e.g., Macrostylidae)

Antennae geniculate

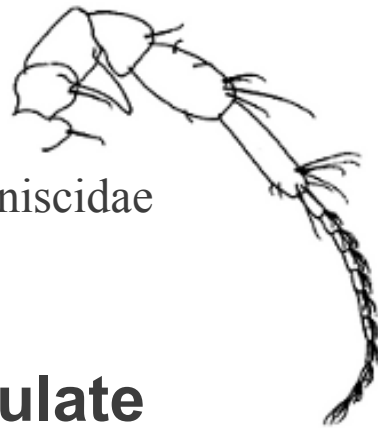
Paramunnidae



Joeropsididae

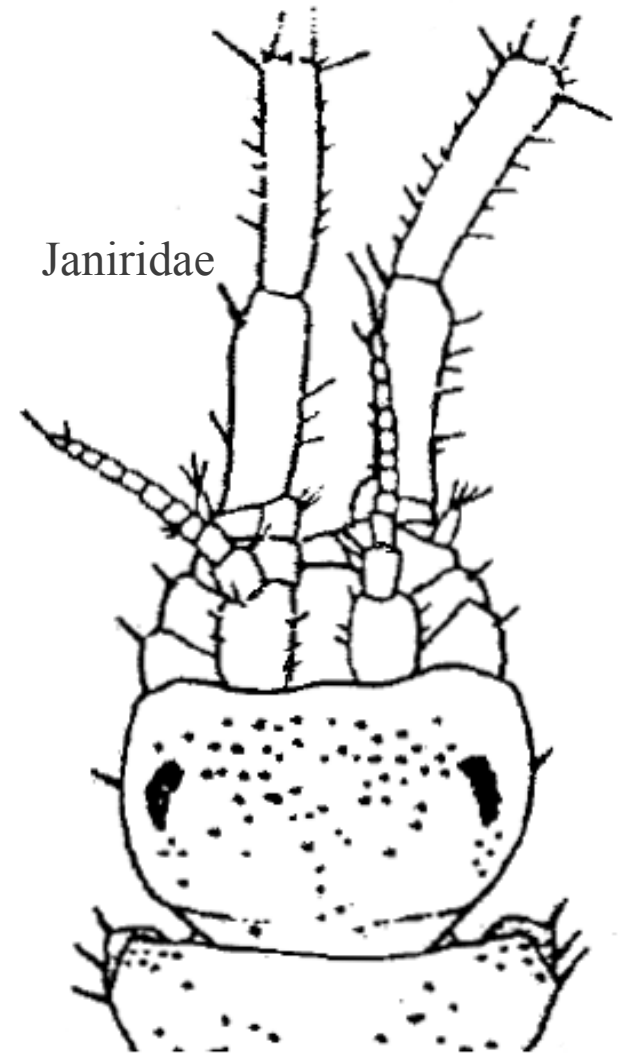


Haploniscidae



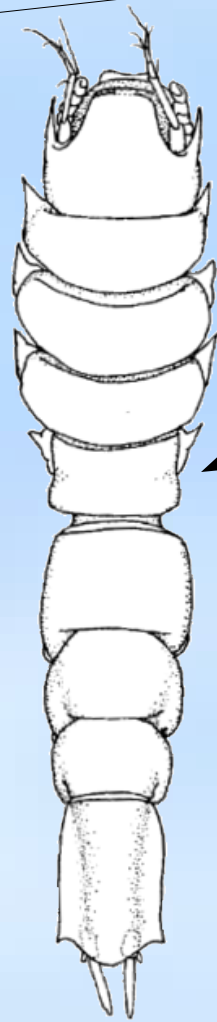
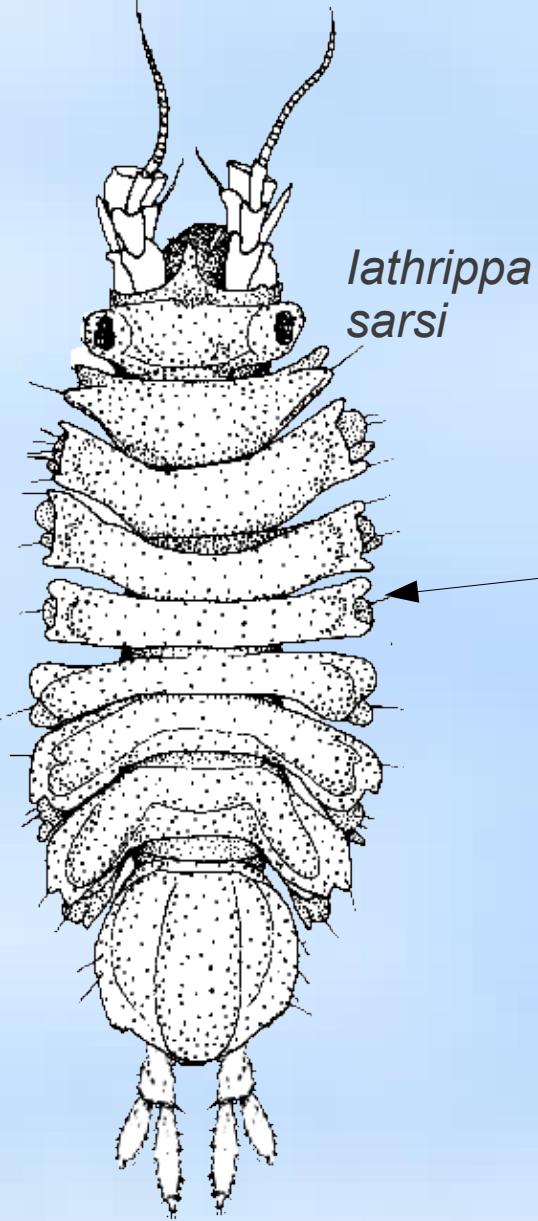
Geniculate

Janiridae



Not Geniculate

Position of coxa IV on body

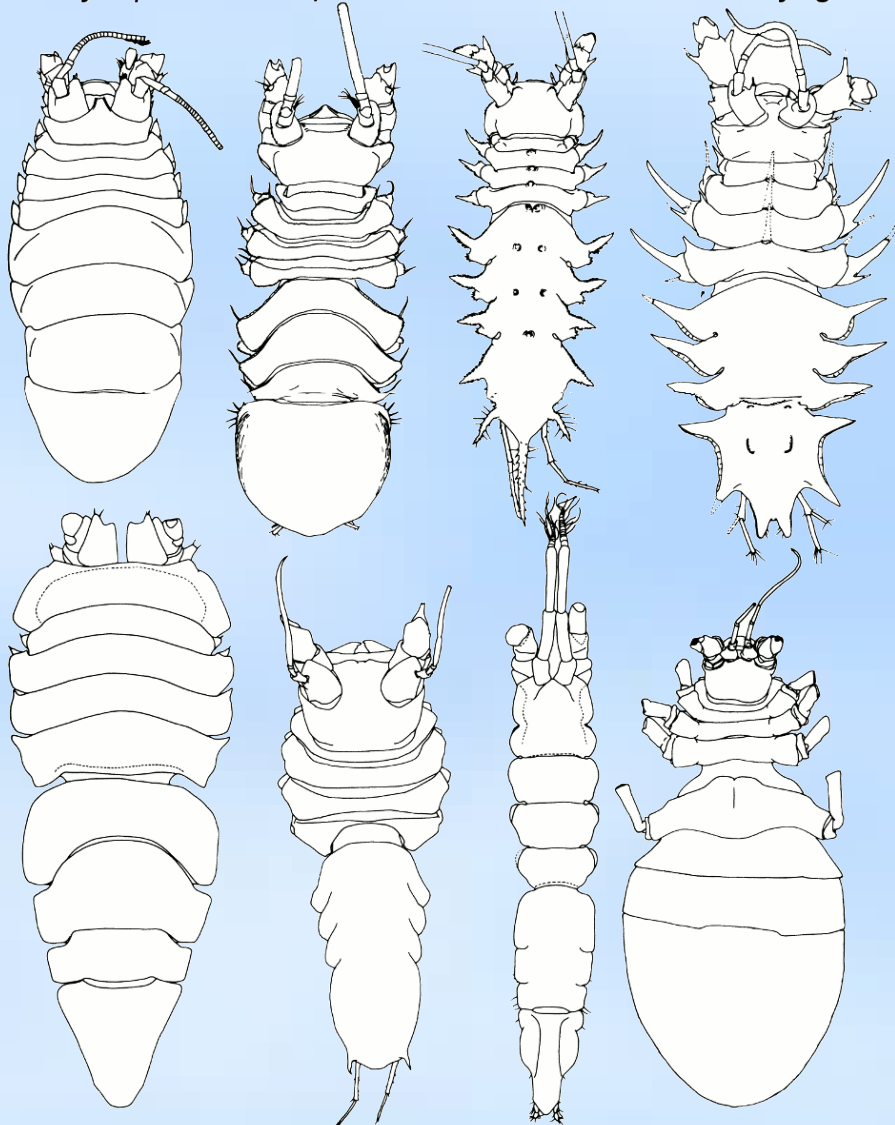


- Pereopod IV coxae inserting on mediolateral margin; associated pereonite is often short
- Pereopod IV coxae inserting on anterolateral margin; associated pereonite is often somewhat elongate

Natasome (= Munnopsidae)

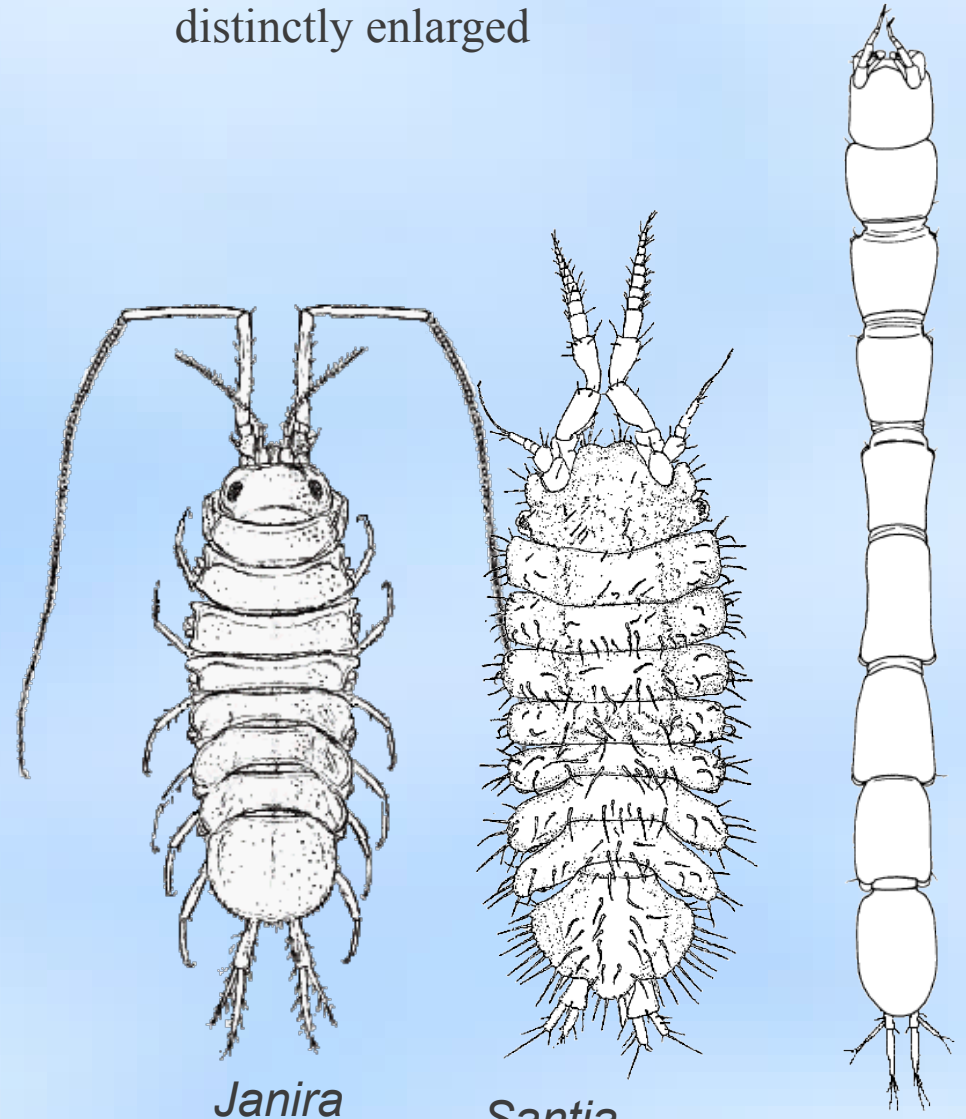
Posterior pereonites 5-7 and pleon integrated into natasome, dorsal surface vaulted, with enlarged pereonal musculature

Eurycope *Munnopsurus* *Acanthocope* *Storhyngura*



Ilyarachna *Munnopsis* *Syneurycope* *Paropsurus*

Posterior pereonites 5-7 serially homologous and not especially integrated with pleon, pereonal musculature not distinctly enlarged



Janira

Santia

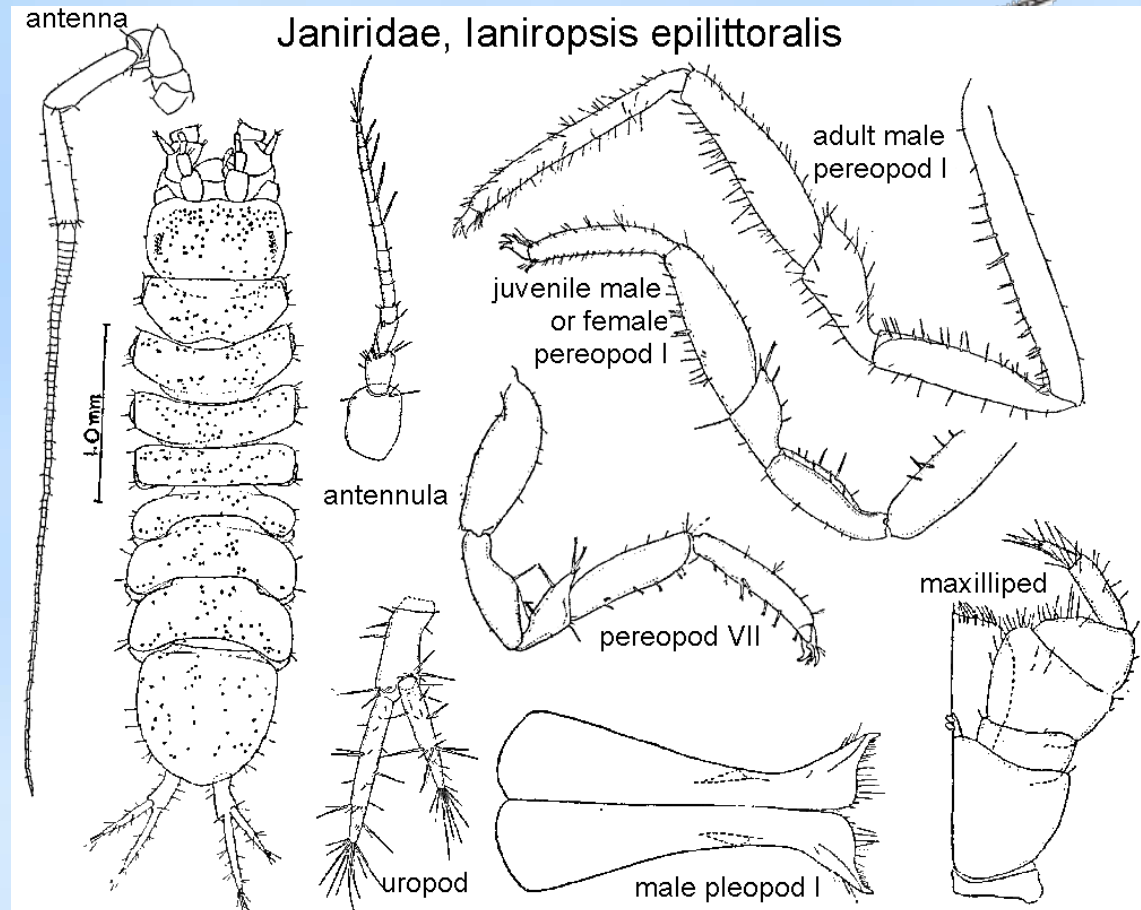
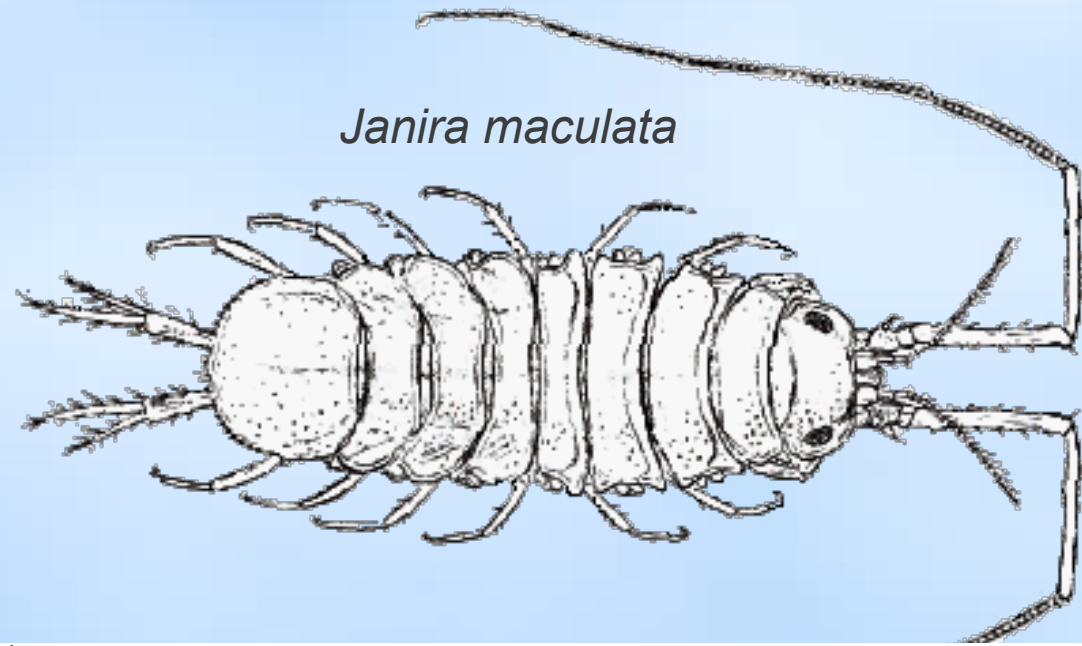
Thambema

Survey of more common families

- Focus on shallow water and more common deep sea families. Fresh water and non-janiroidean families omitted for now.
- A few rare families are mentioned
- Data currently based on exemplar species and genera, usually the type species of several genera
- DELTA database discussed at end is a work in progress.

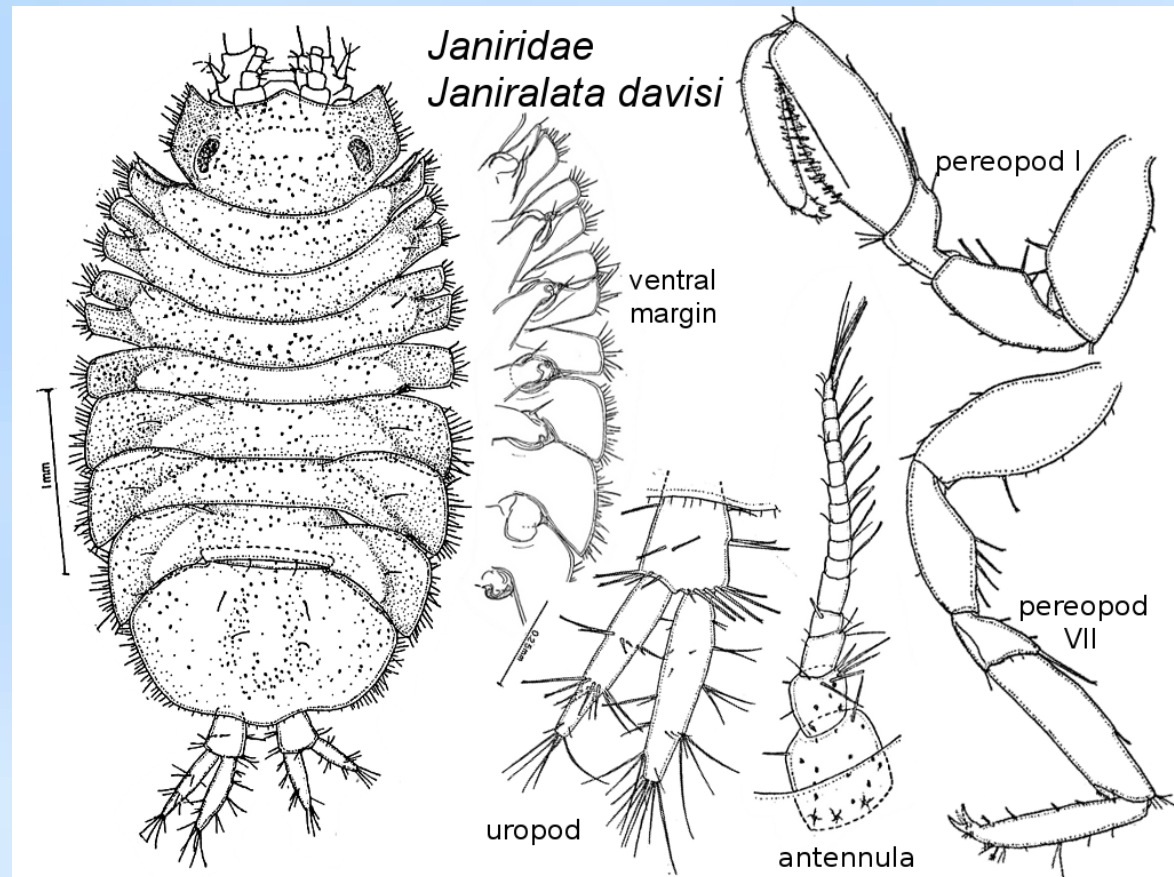
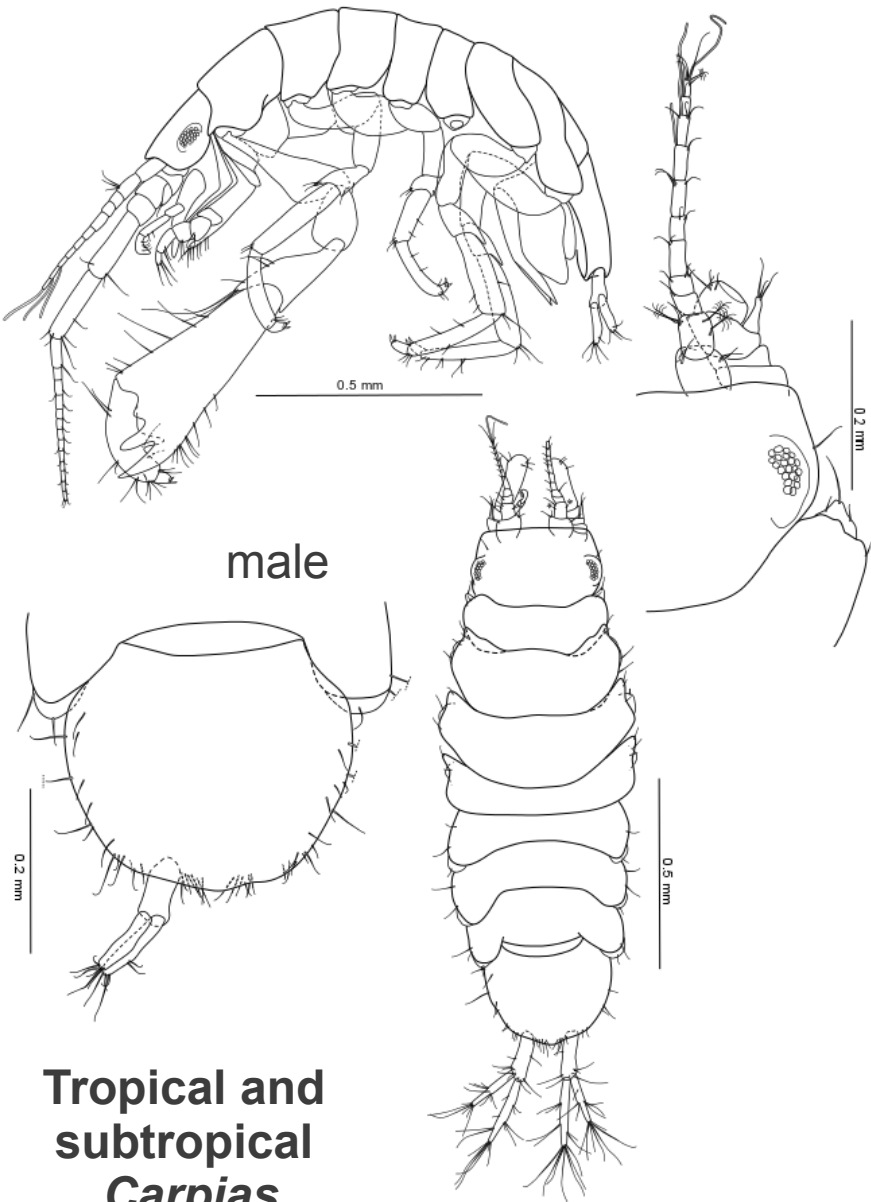
Janiridae

- Primarily shallow water group
- Can occur in high densities in patches
- Colorful if viewed alive – speckled pigment patches
- Sexual dimorphism in pereopod I or size

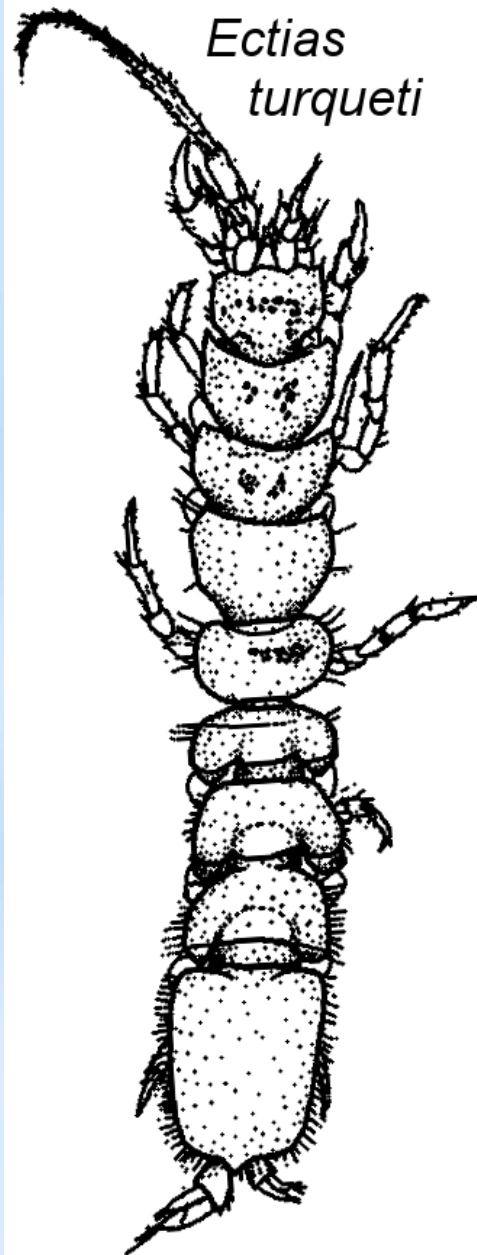


Janiridae, *sensu stricto*

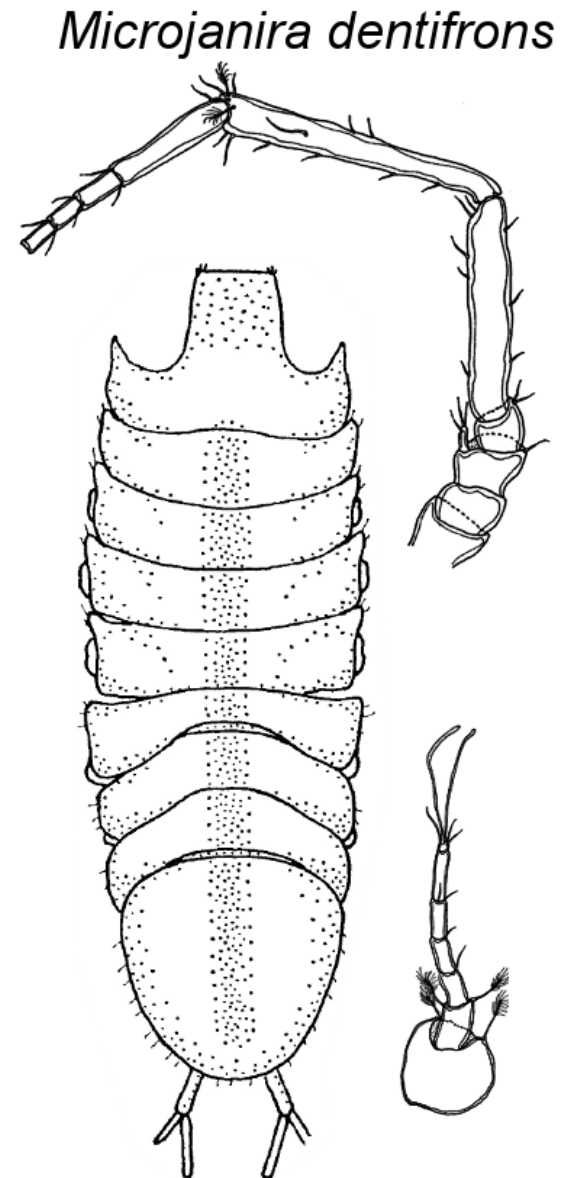
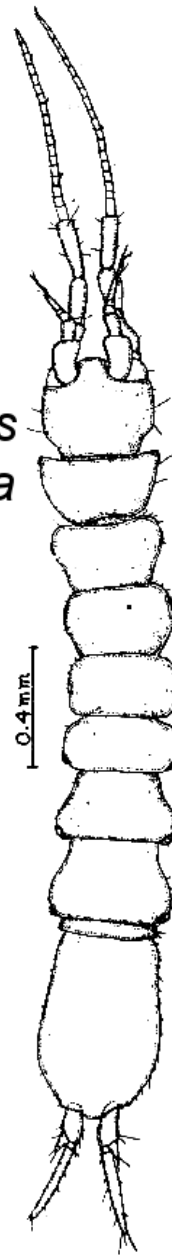
Look for 3 claws on walking legs and elongate carpus on the first leg



Janirids as currently classified but probably belong in another family-level group

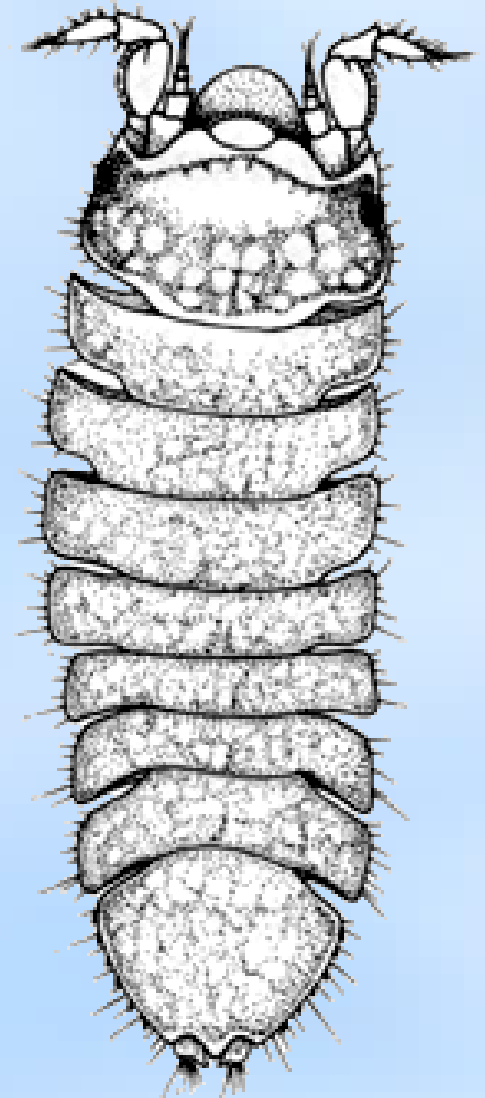


Caecianiropsis psammophila

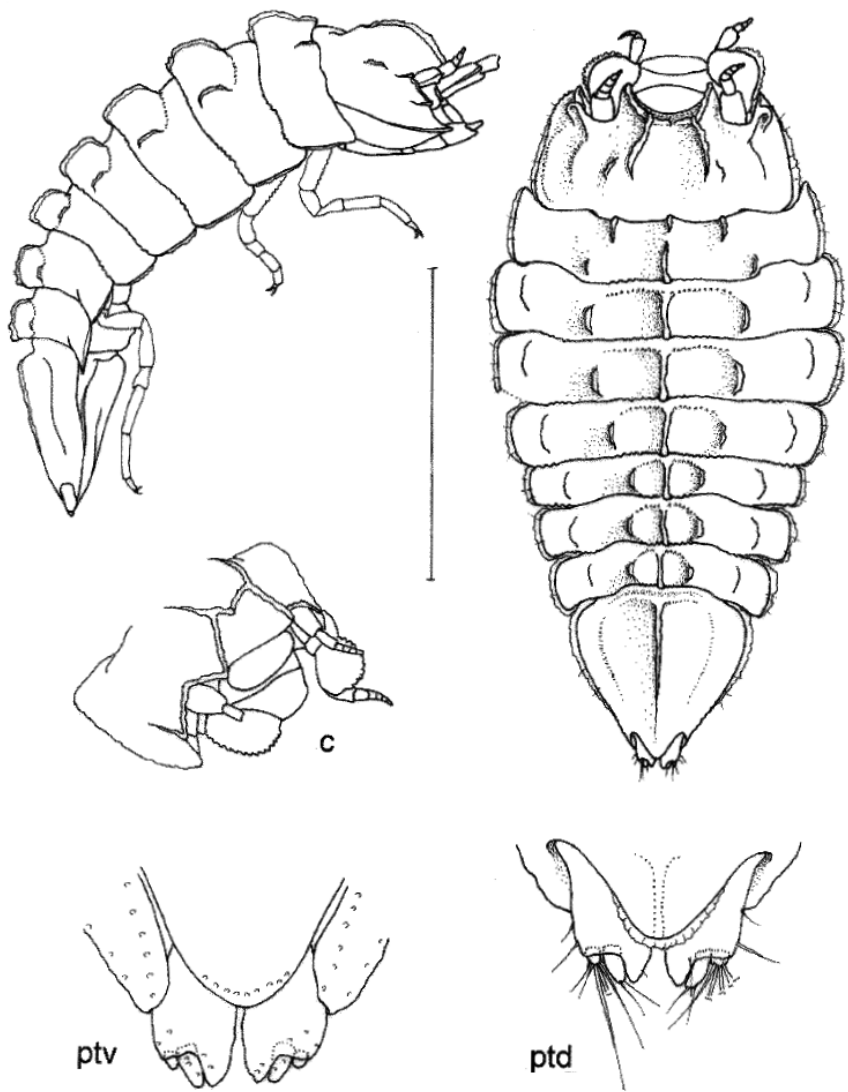


Joeropsididae

- Many species in *Joeropsis*, with rarer southern hemisphere genera
- Pigment patterns useful for distinguishing species
- Micropredators on benthic copepods

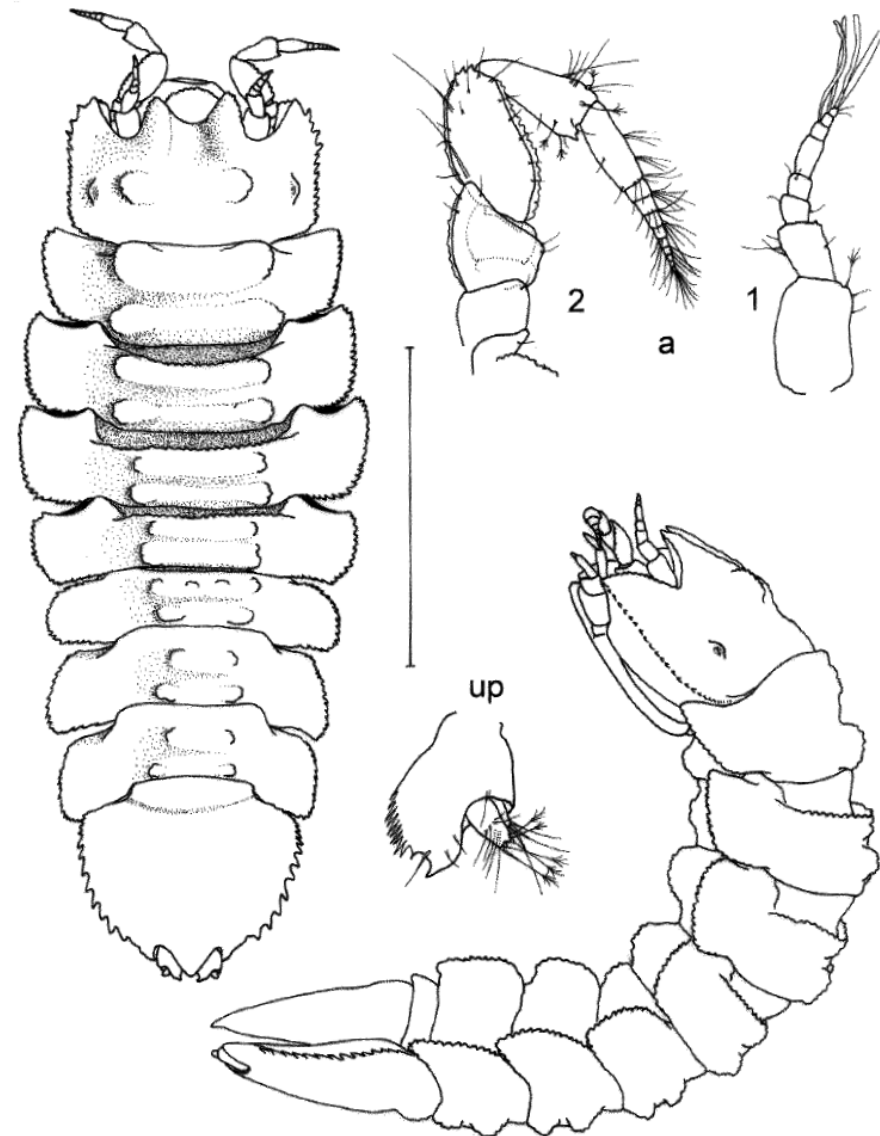


Other Joeropsididae



Scaphojoeropsis

Figure 14. *Scaphojoeropsis multicarinata* gen. nov., sp. nov., holotype. c, cephalon, anterolateral view; ptd, apex of pleotelson, dorsal view; ptv, apex of pleotelson, ventral view, setae omitted. Habitus scale bar: 1 mm.

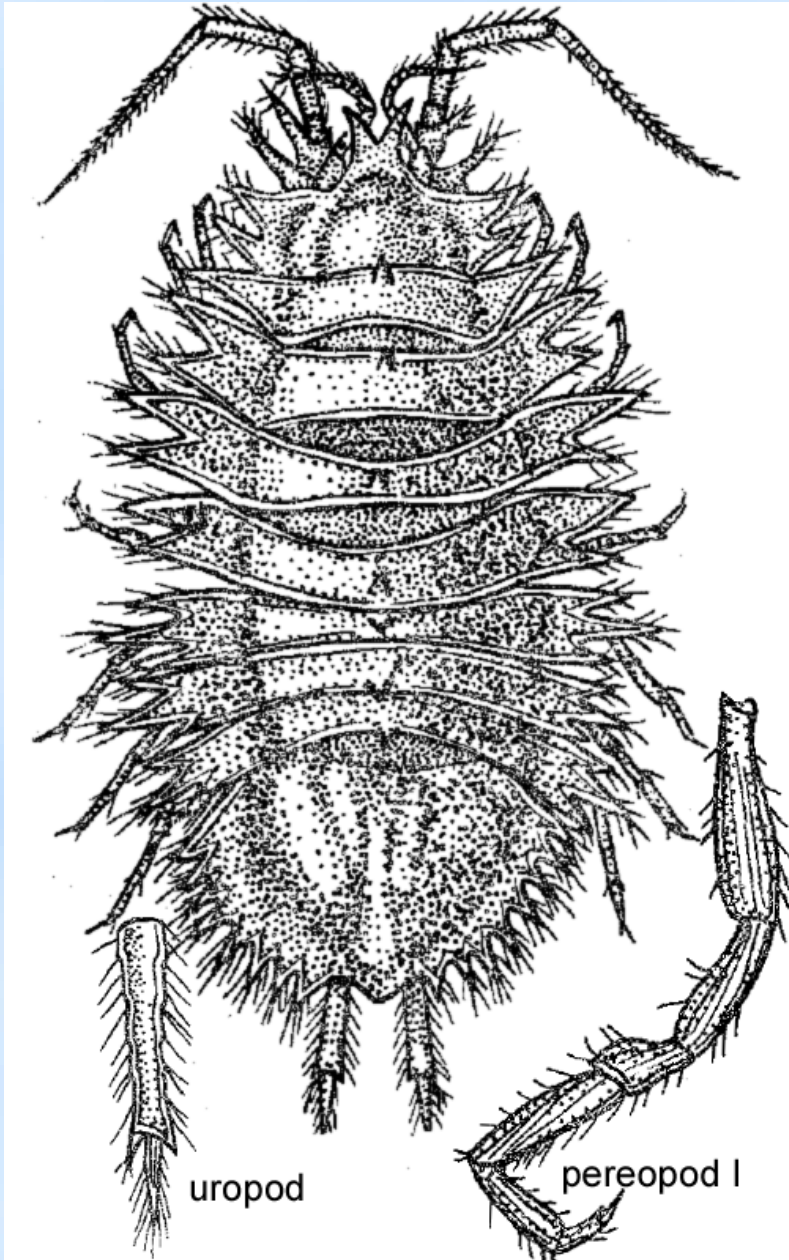


Rugojoeropsis

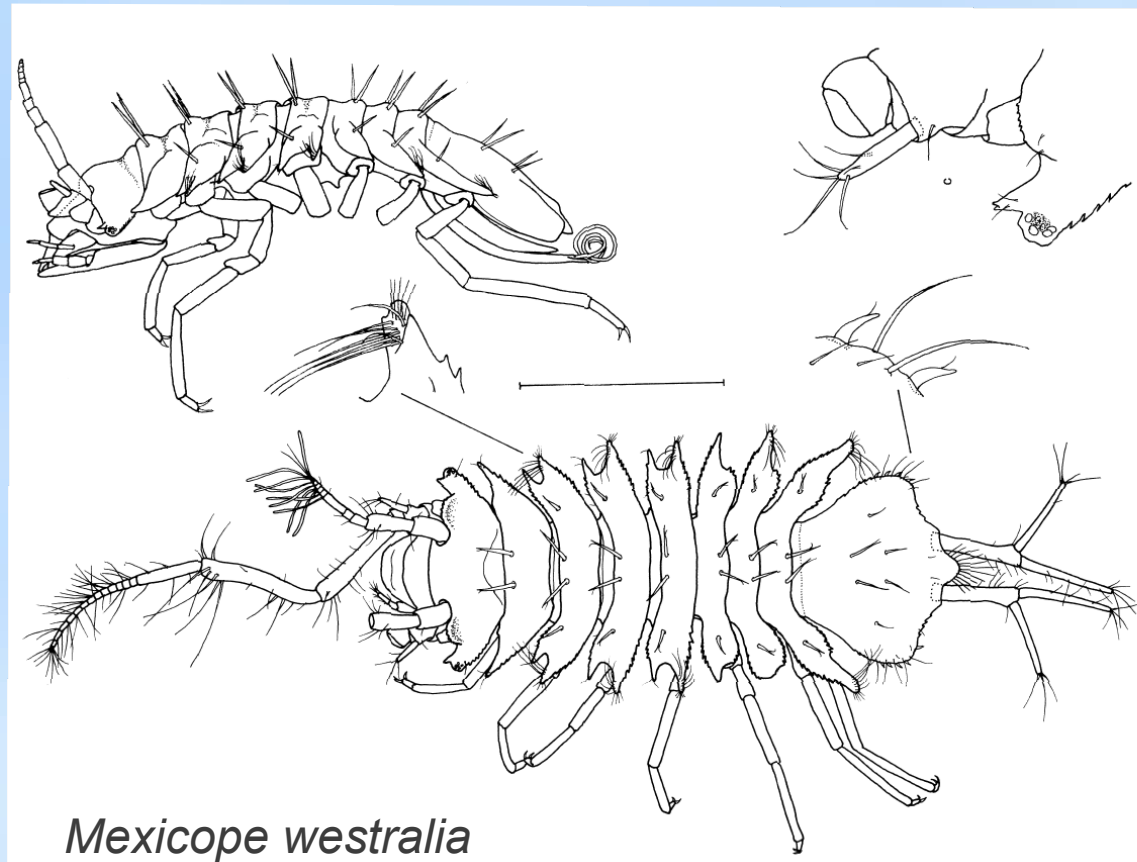
Figure 8. *Rugojoeropsis rugosa* gen. nov., sp. nov., holotype. a, antennae (1 and 2, right, dorsal view); up, uropod, left, ventral view. Habitus scale bar: 1 mm.

Acanthaspidiidae

Acanthaspidia typhlops

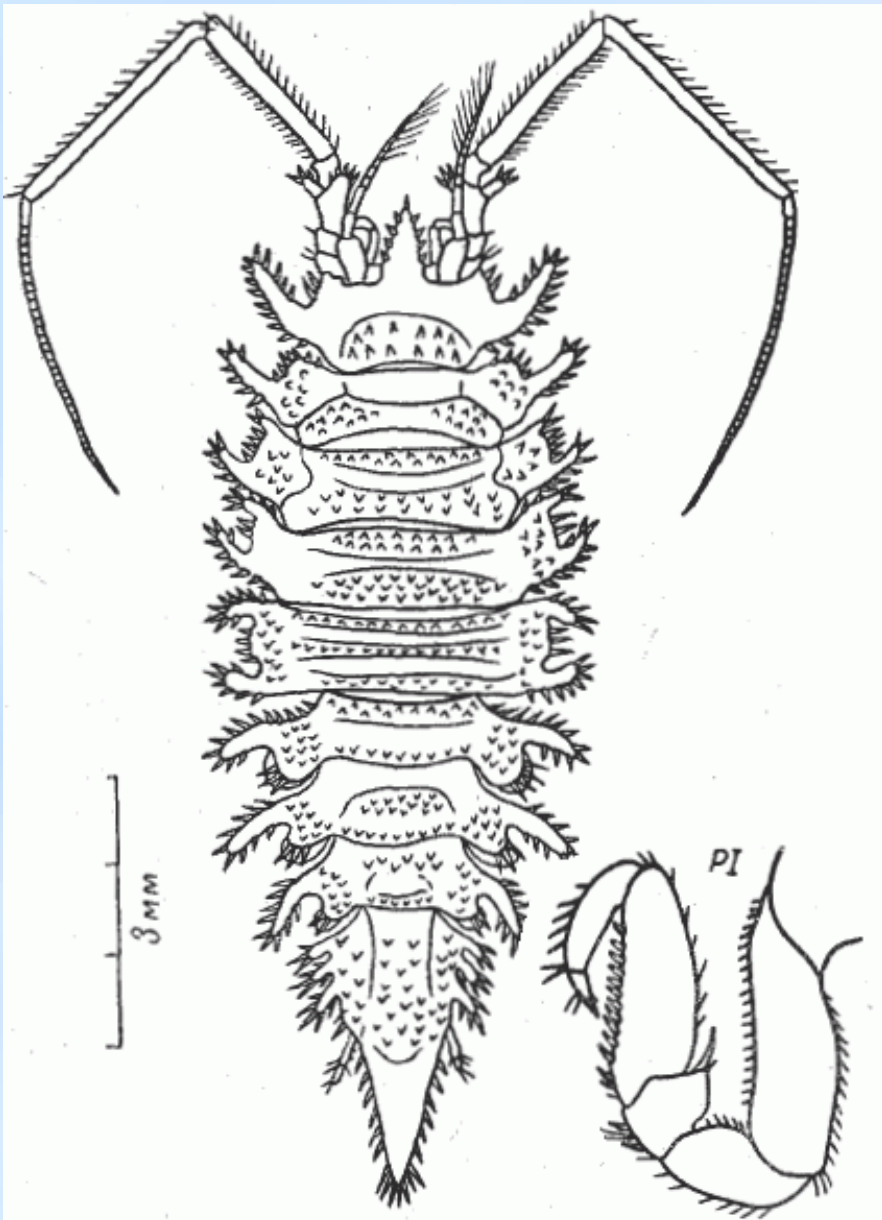


- Group transitional to deep water
- Shallower occurring species have eyes



Janirellidae

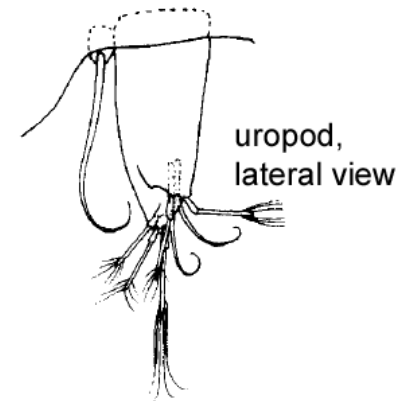
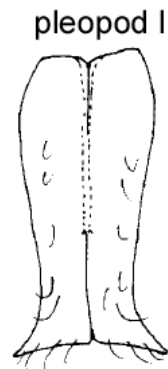
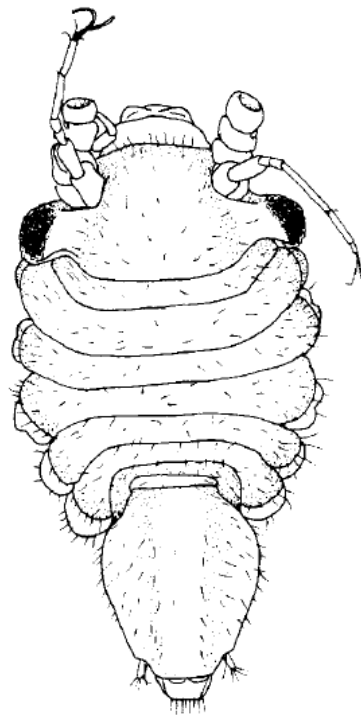
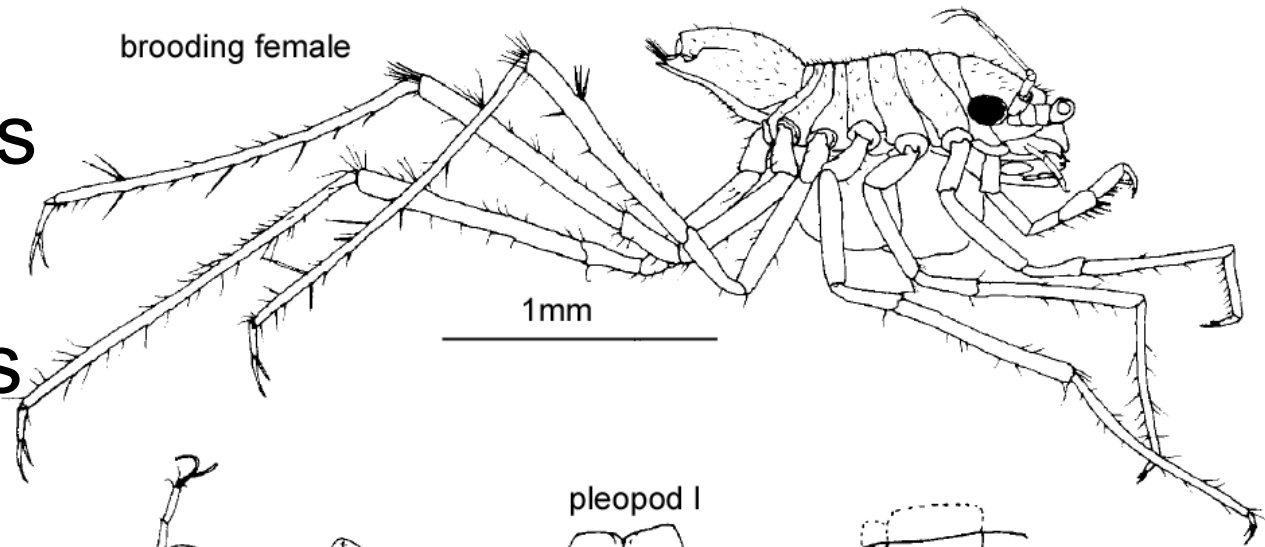
Janirella macrura



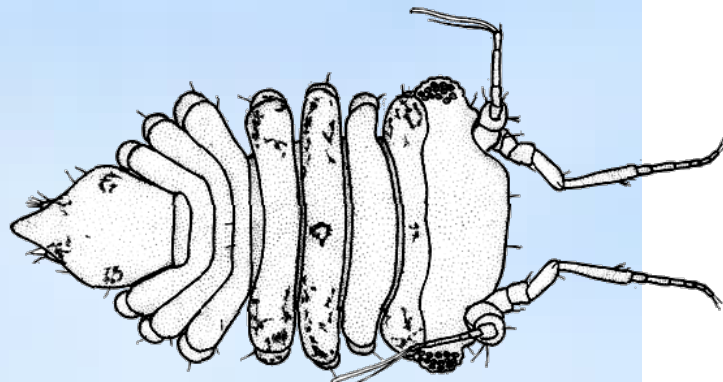
- Deep-sea epibenthic
- May be found on hard substrates or manganese nodules
- Large bodied species frequent
- Projections or spines on all lateral margins

Munnidae

- Epibenthic, quick runners (“squirrels of the sea”)
- Pedunculate eyes
- Long legs and antennae usually lost in sampling



Munnidae, *Munna* sp.



Salvatiella

Munnidae

- *Zoromunna*: Not all munnids have eyes

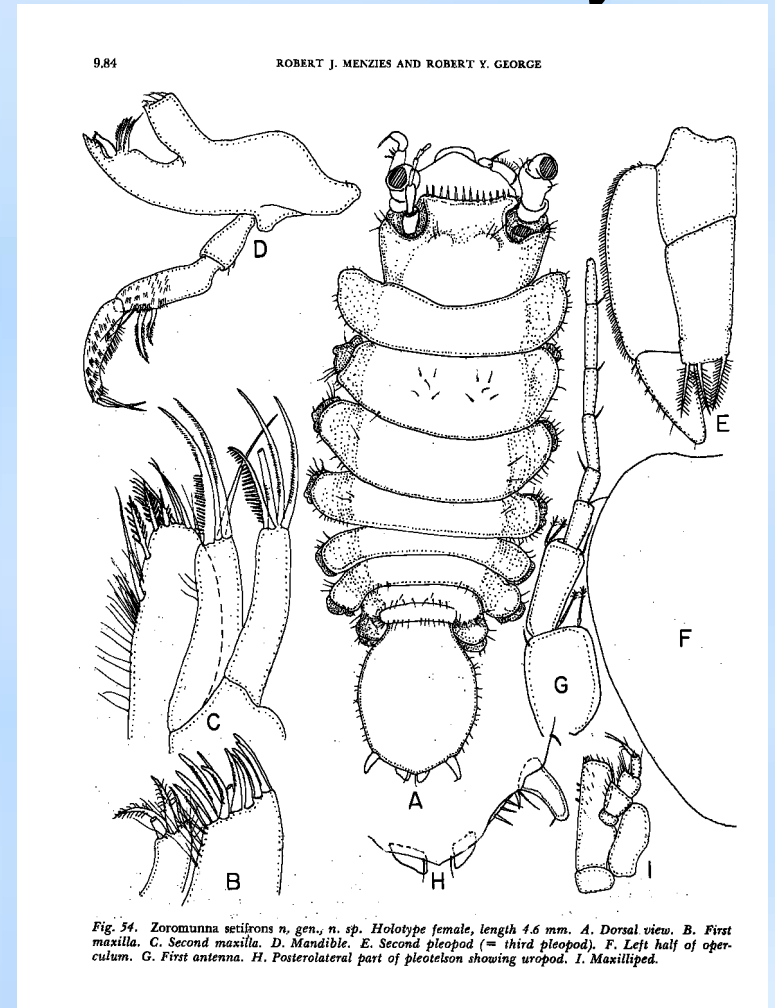
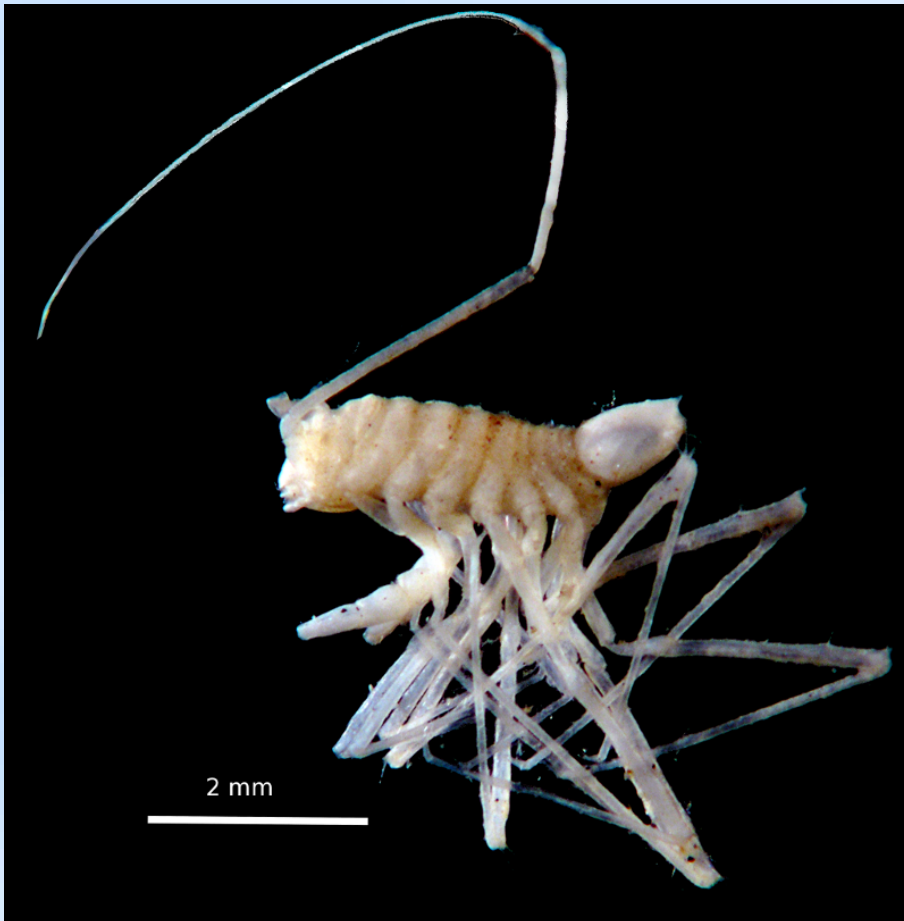
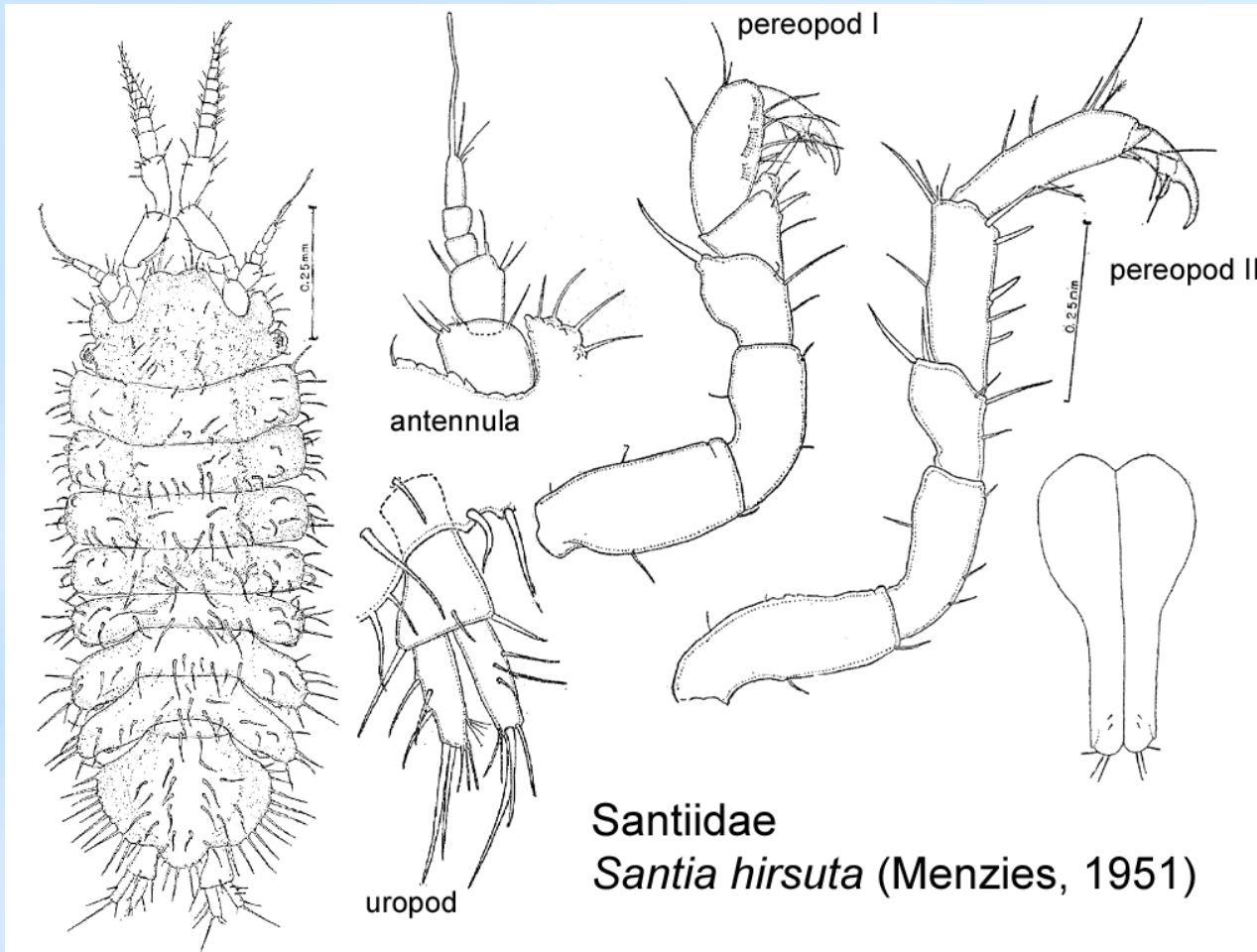


Fig. 54. *Zoromunna setifrons* n. gen., n. sp. Holotype female, length 4.6 mm. A. Dorsal view. B. First maxilla. C. Second maxilla. D. Mandible. E. Second pleopod (= third pleopod). F. Left half of operculum. G. First antenna. H. Posterolateral part of pleotelson showing uropod. I. Maxilliped.

Santiidae (syn: Antiasidae)



- Benthic, hard substrates typically
- Related to Munnidae; pedunculate eyes; pereopod I propodocarpo-subchelate
- Uropod always with protopod, but can be uniramous

Paramunnidae

Paramunna bilobata

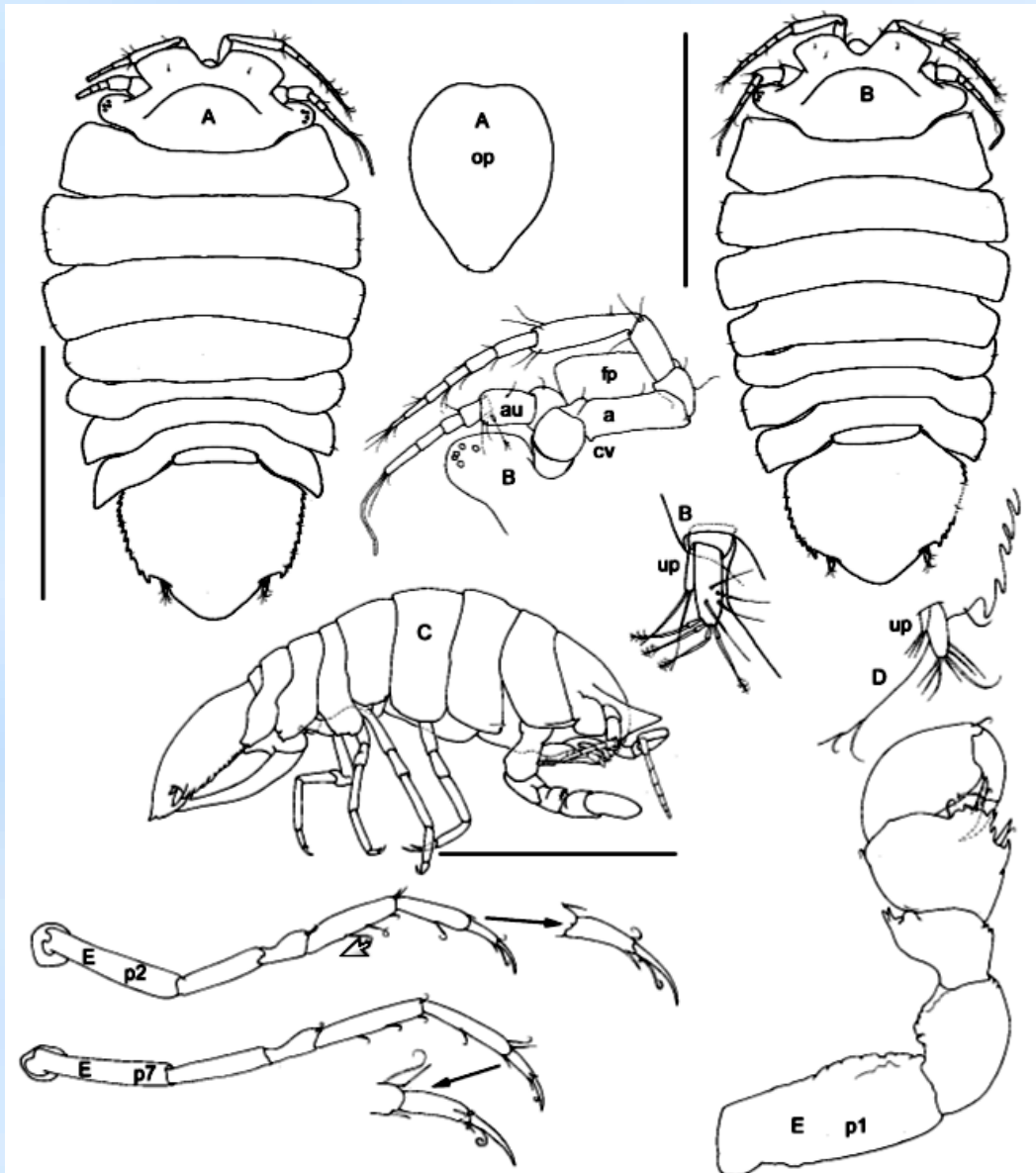


Fig. 4. *Paramunna bilobata* Sars, 1866. A, preparatory female (ZMUC CRU-5827); B, male B (ZMUC CRU-5827); C, E, males C and E (ZMO F15384); D, brooding female D (ZMUC CRU-3879). a, antenna; au, antennula; cv, head ventral view; fp, frontal projection; op, operculum;

- Epibenthic, shallow marine to deep-sea
- Pedunculate eyes, antennula lateral
- Typically flattened, but not always
- Highest diversity in southern hemisphere

Other Paramunnidae

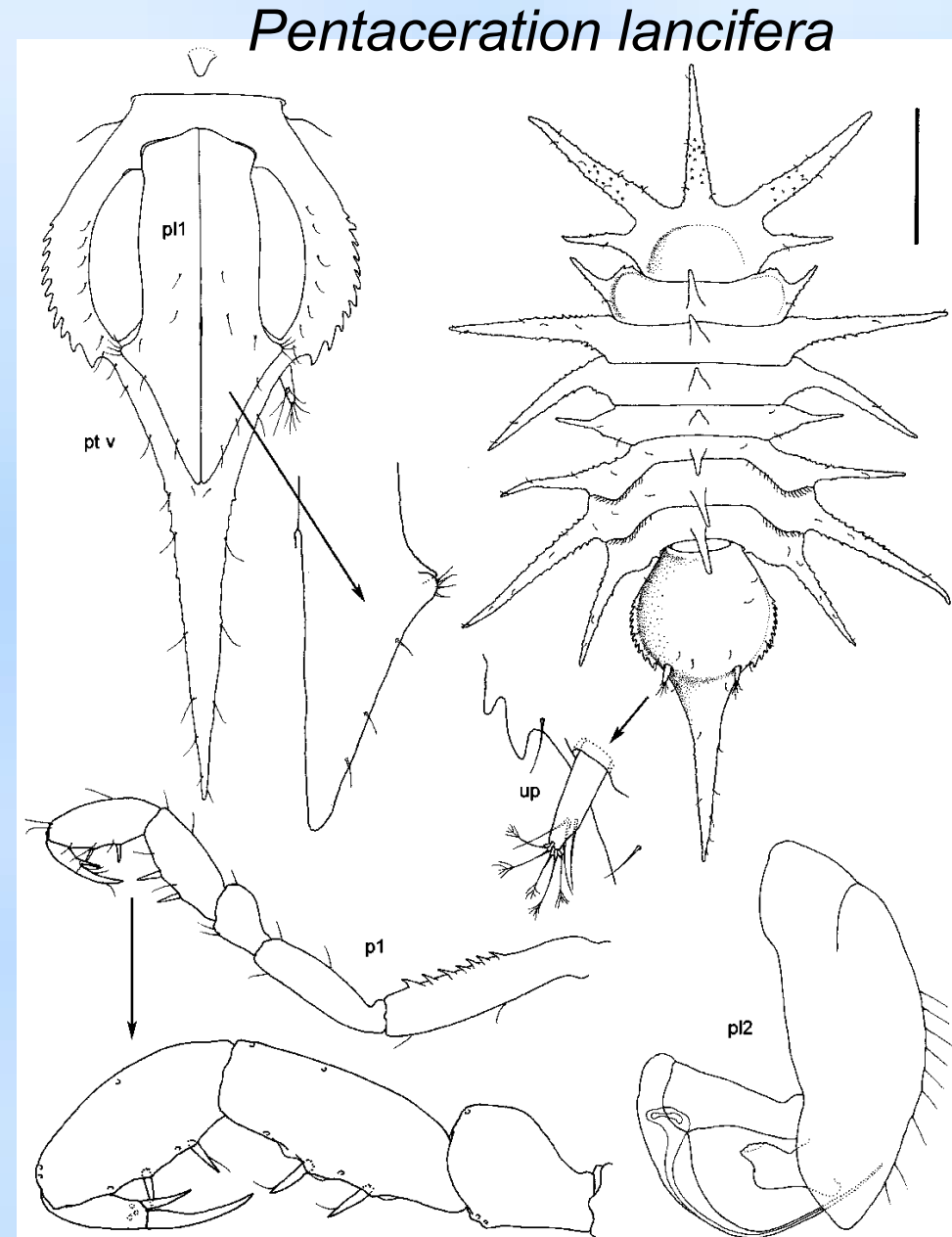
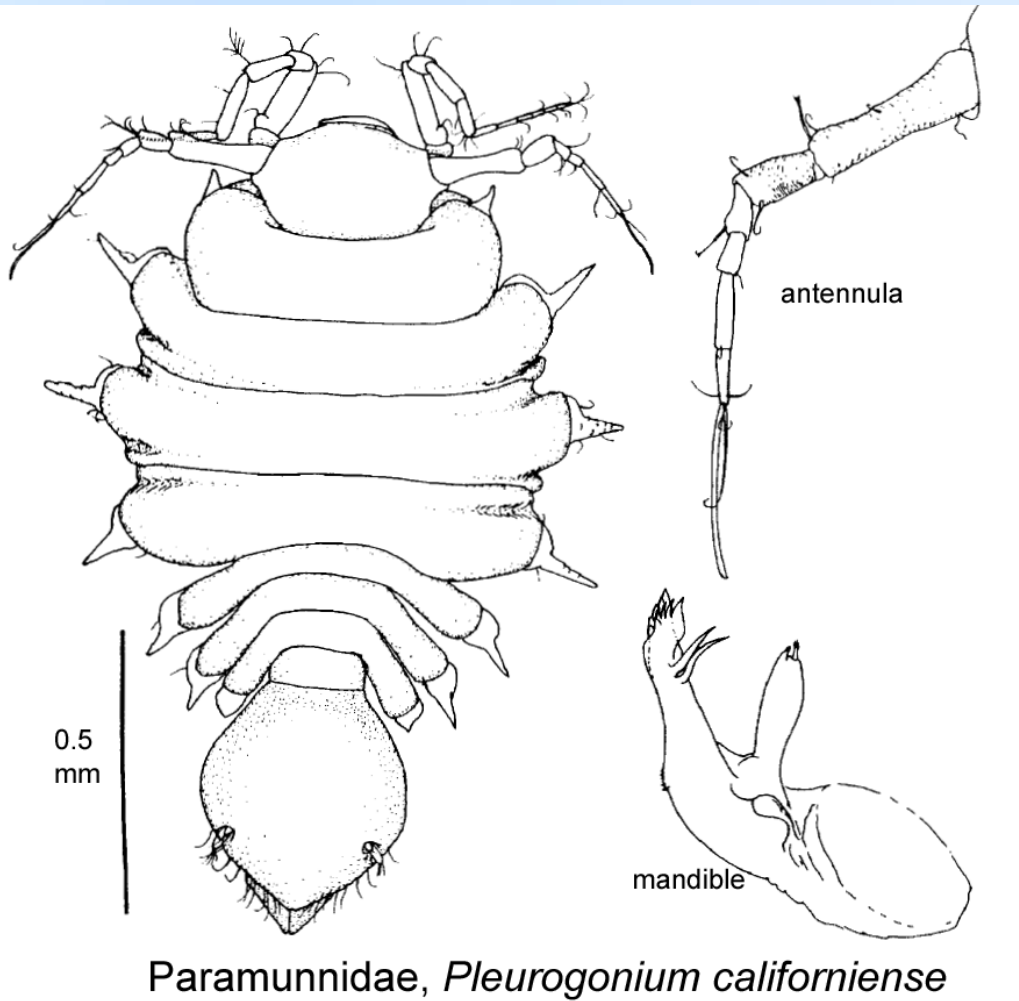
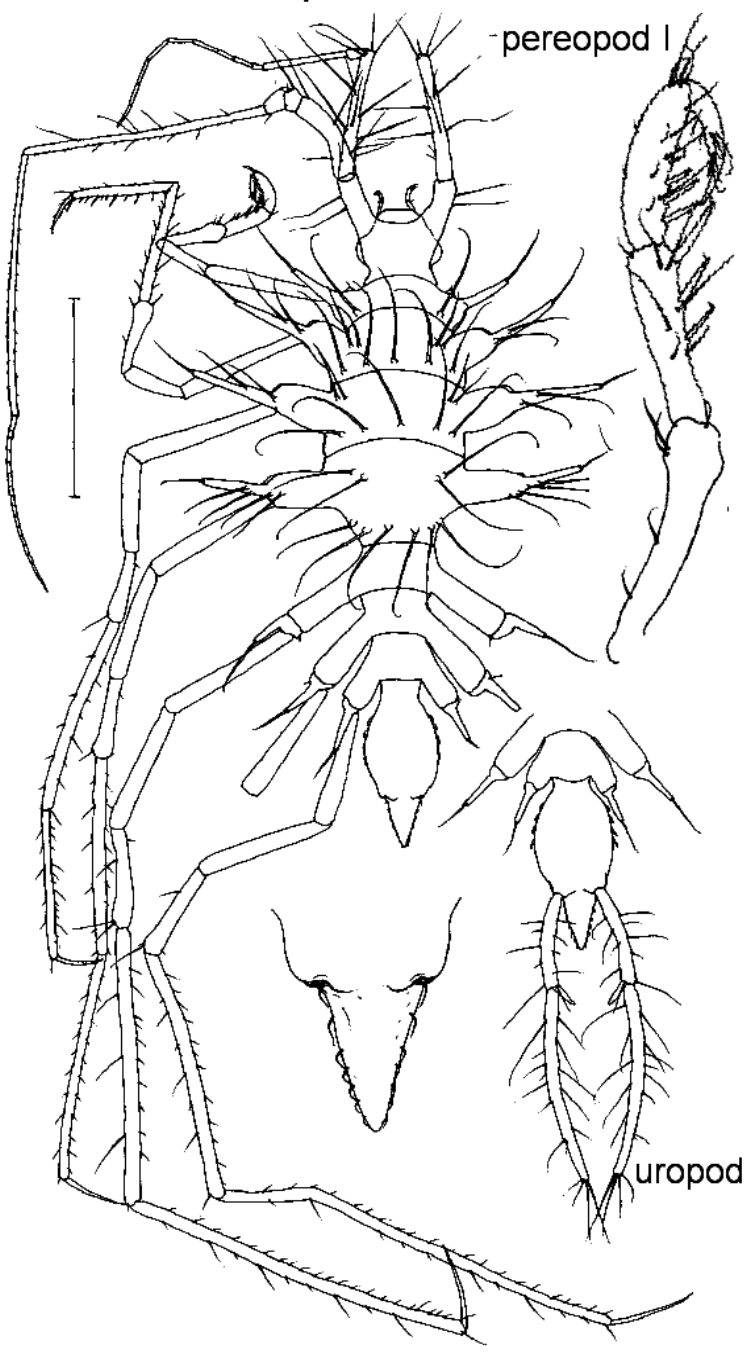


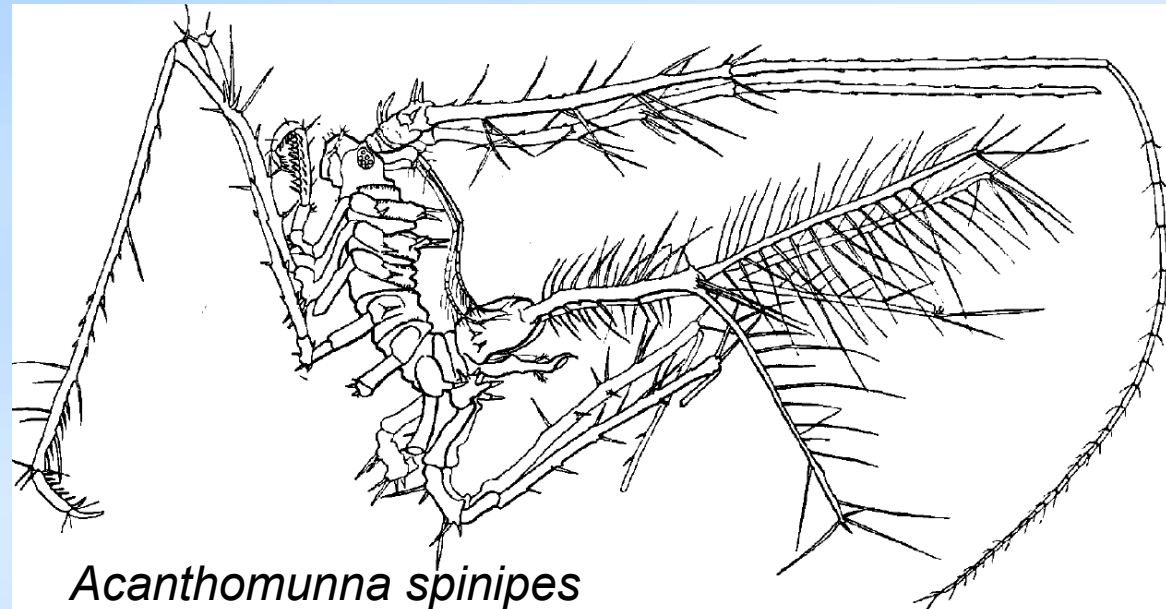
FIGURE 6. *Pentaceration lancifera* sp. nov. Holotype, ♂. p1, pereopod 1; pl1-2, pleopods 1 and 2; pt v, pleotelson ventral

Dendrotonidae

Dendroton composita



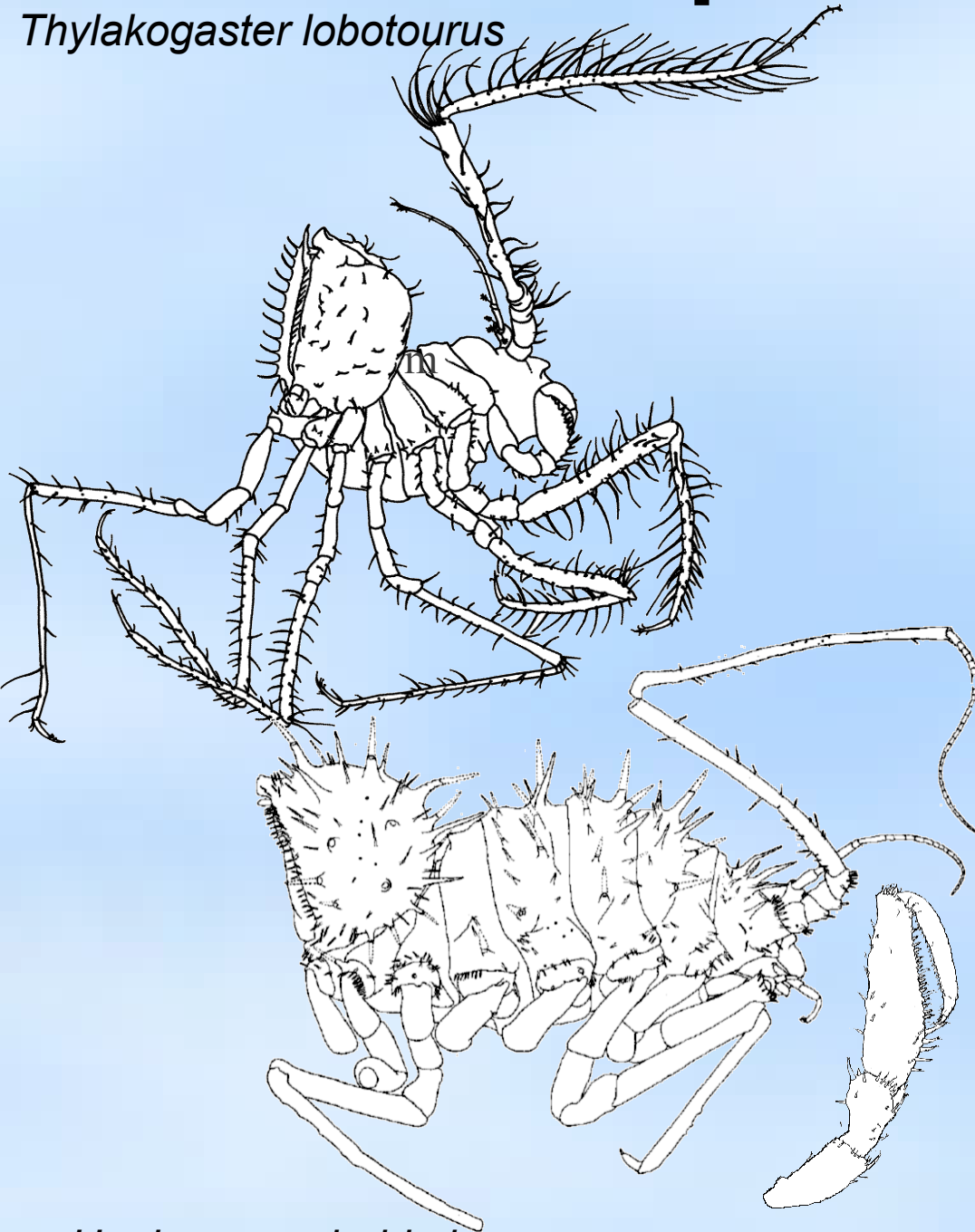
- Rarer group, transitional to deep-sea
- Shallow water genera with eyes
- Pereopod I may be secondarily propodo-subchelate



Acanthomunna spinipes

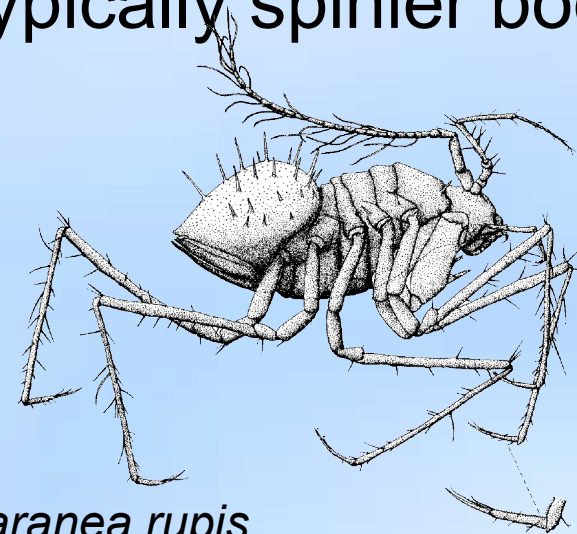
Haplomunnidae

Thylakogaster lobotourus



Haplomunna hubbsi

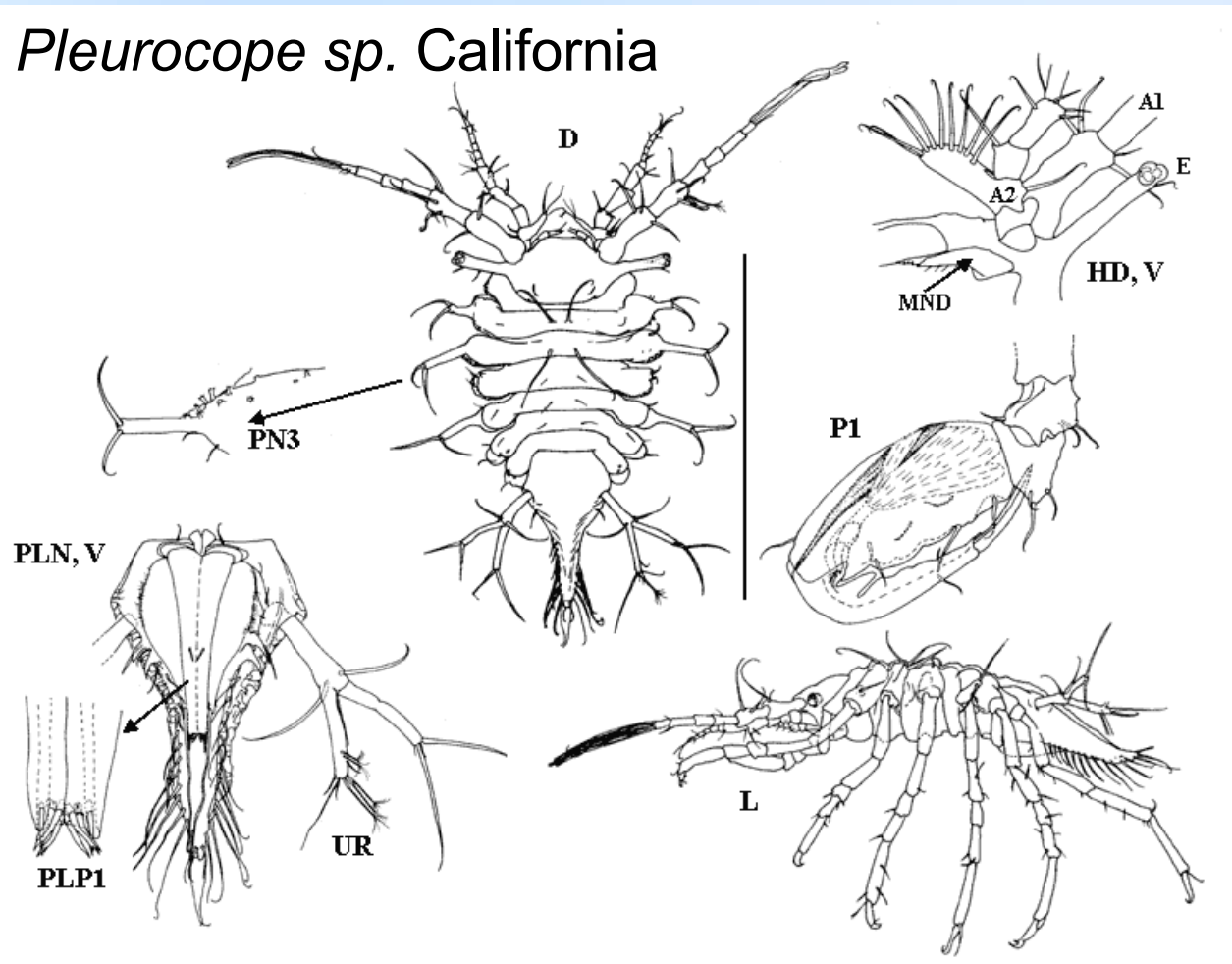
- Morphologically diverse family
- Strictly deep-sea epibenthic
- Rare in most areas
- Related to Dendrotonidae but with tiny uropods and typically spinier bodies



Abyssaranea rupis

Pleurocopidae

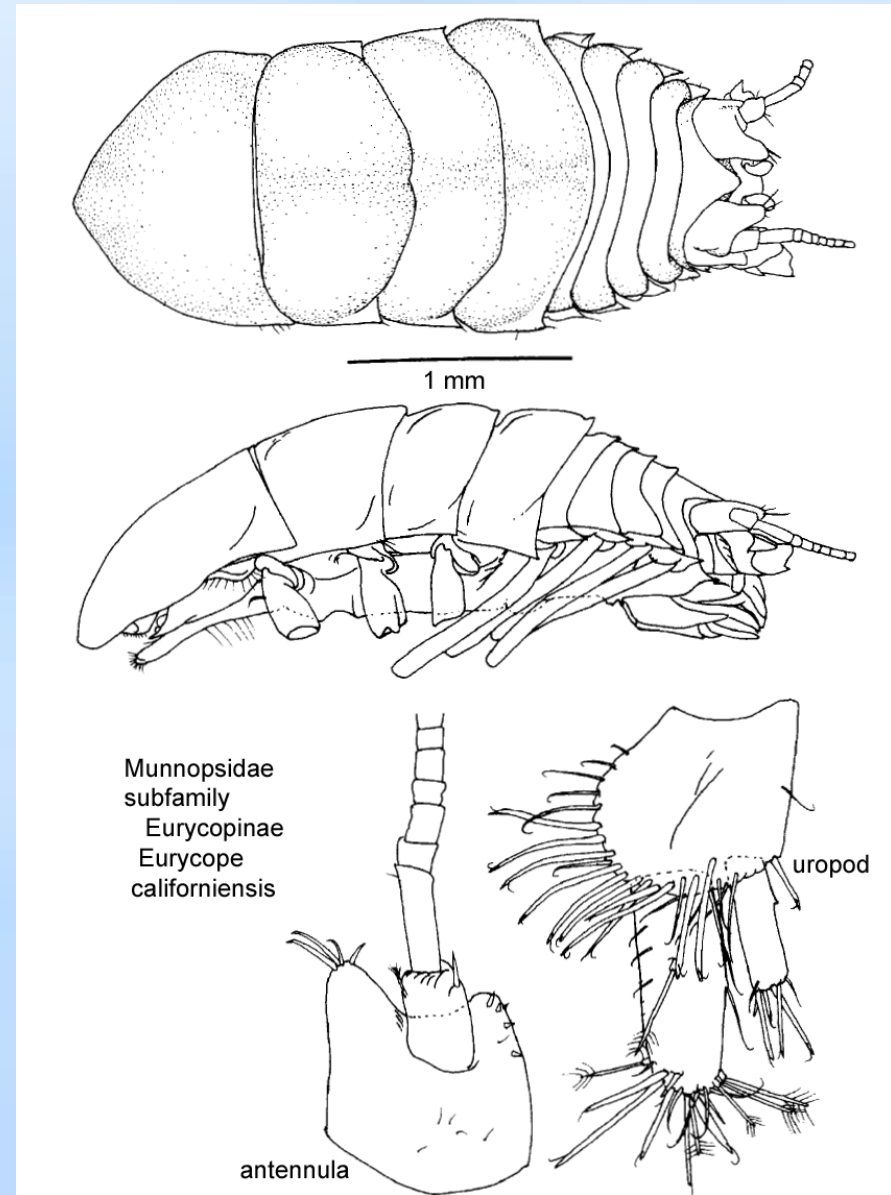
Pleurocope sp. California



- Tiny inhabitant of hard or biotic shallow water substrates
- Micropredator
- Propodo-subchelate pereopod I
- Thin pedunculate eyes

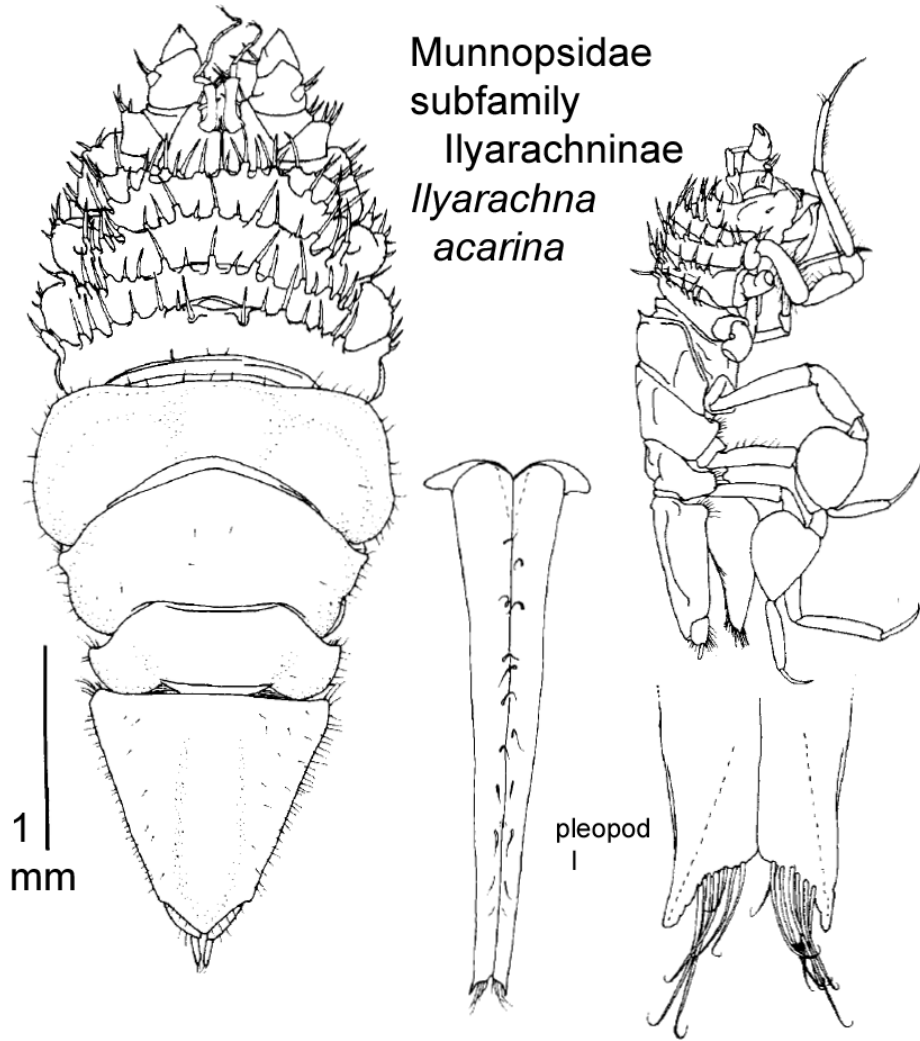
Munnopsidae

- Good swimmers
- Elongate anterior legs and antennae are usually lost in collection
- Most are epibenthic but with many holopelagic or benthopelagic species (see Osborn list)
- Some genera lack natapods on pers V-VII

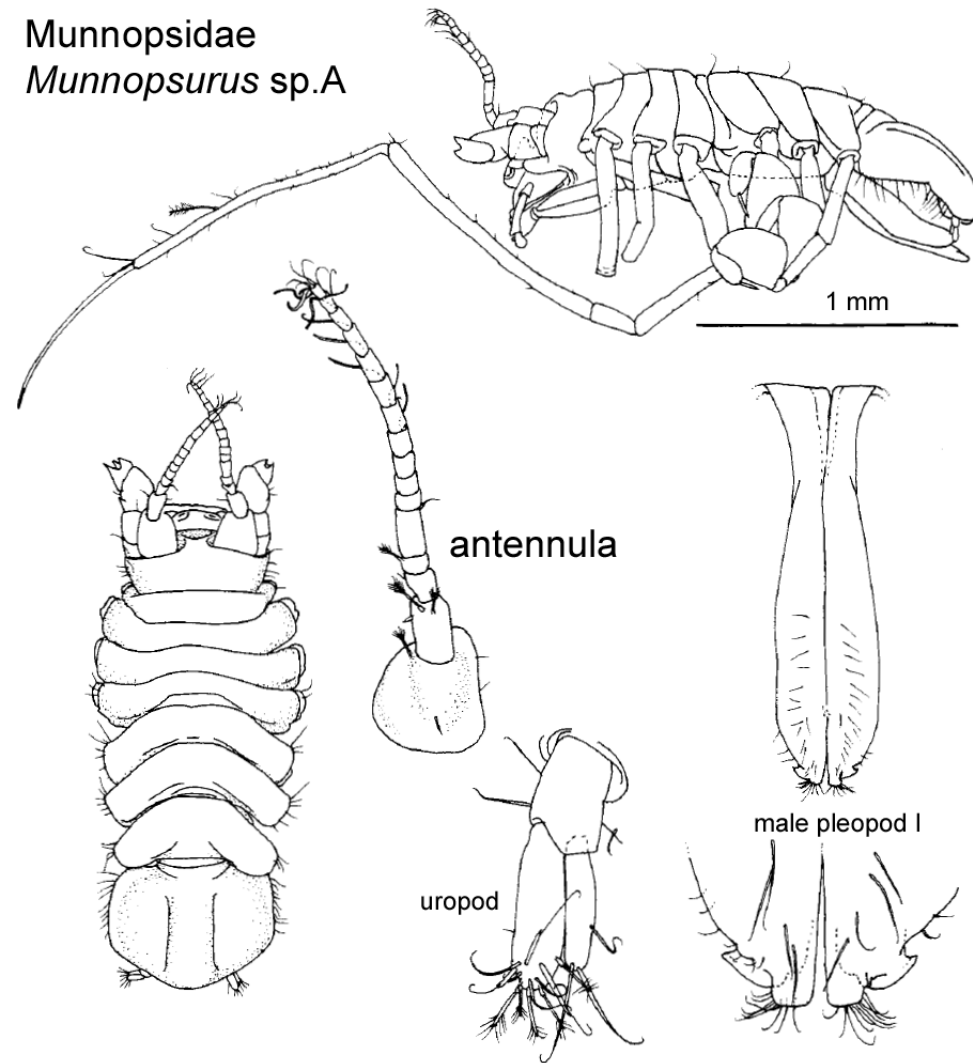


Other Munnopsidae

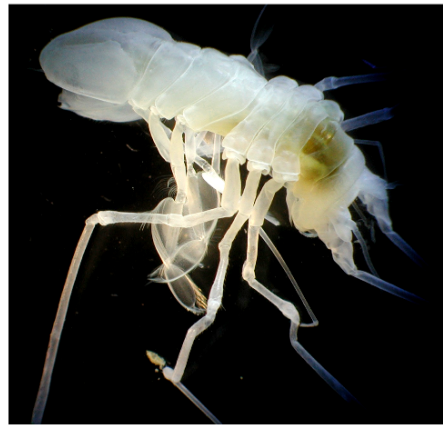
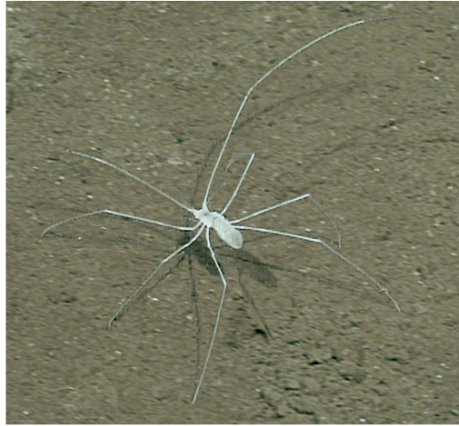
Munnopsidae
subfamily
Ilyarachninae
Ilyarachna
acarina



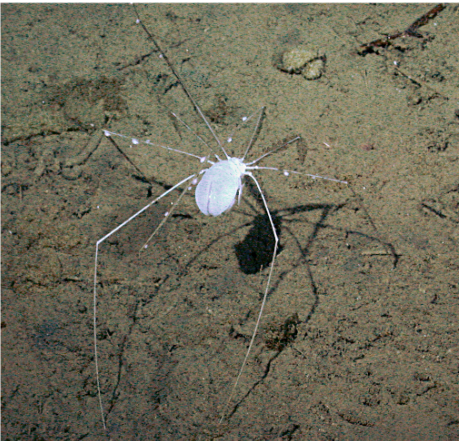
Munnopsidae
Munnopsurus sp.A



Benthopelagic Munnopsidae



- *Munnopsurus*



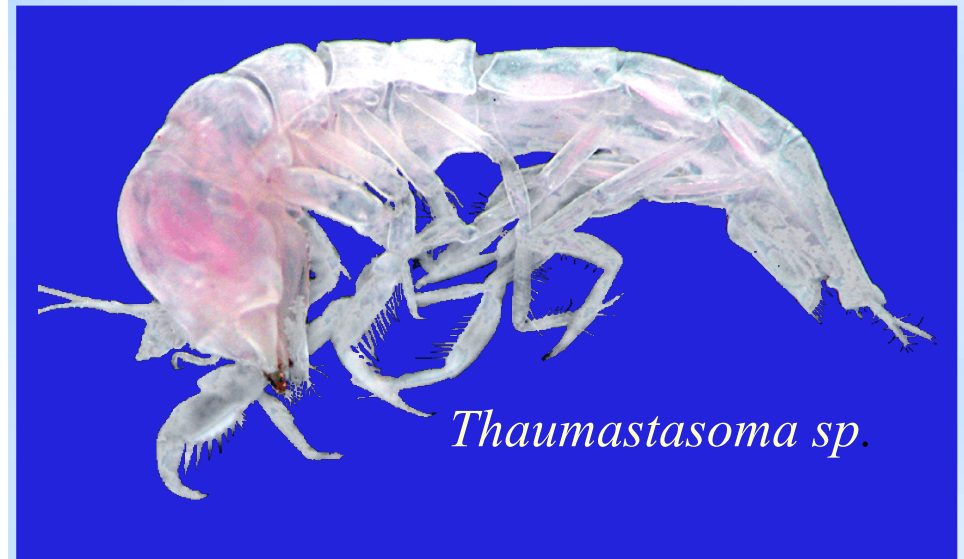
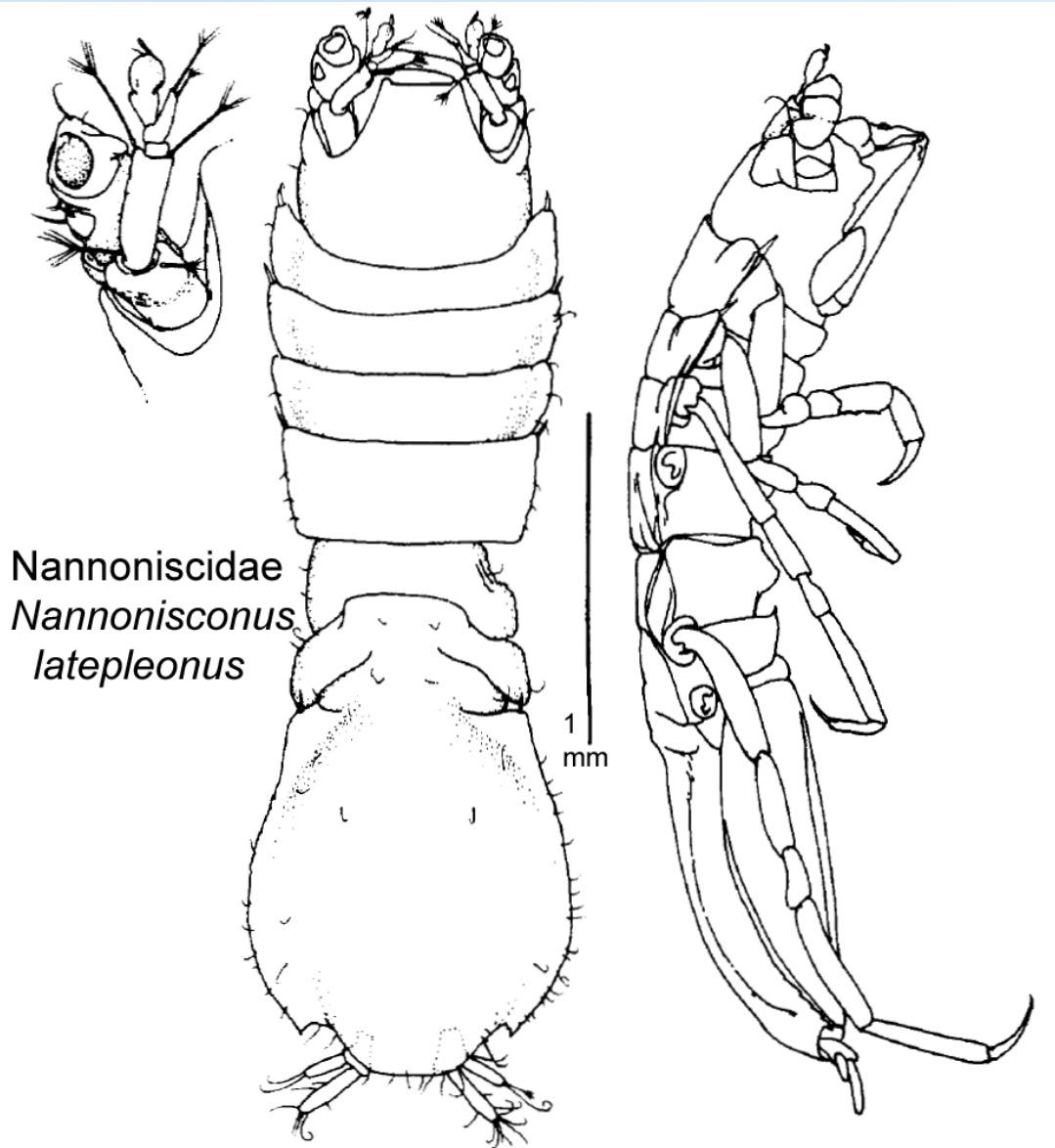
- *Paropsurus* – giants of the family

Credits:
Monterey Bay
Research Inst.

Credits:
Karen Osborn

Nannoniscidae

- Benthic deep-sea
- Always with projecting frons and biramous uropods
- Varying degrees of loss of articulation in the posterior pereonites and pleotelson



Other Nannoniscidae

Nannoniscus oblongus

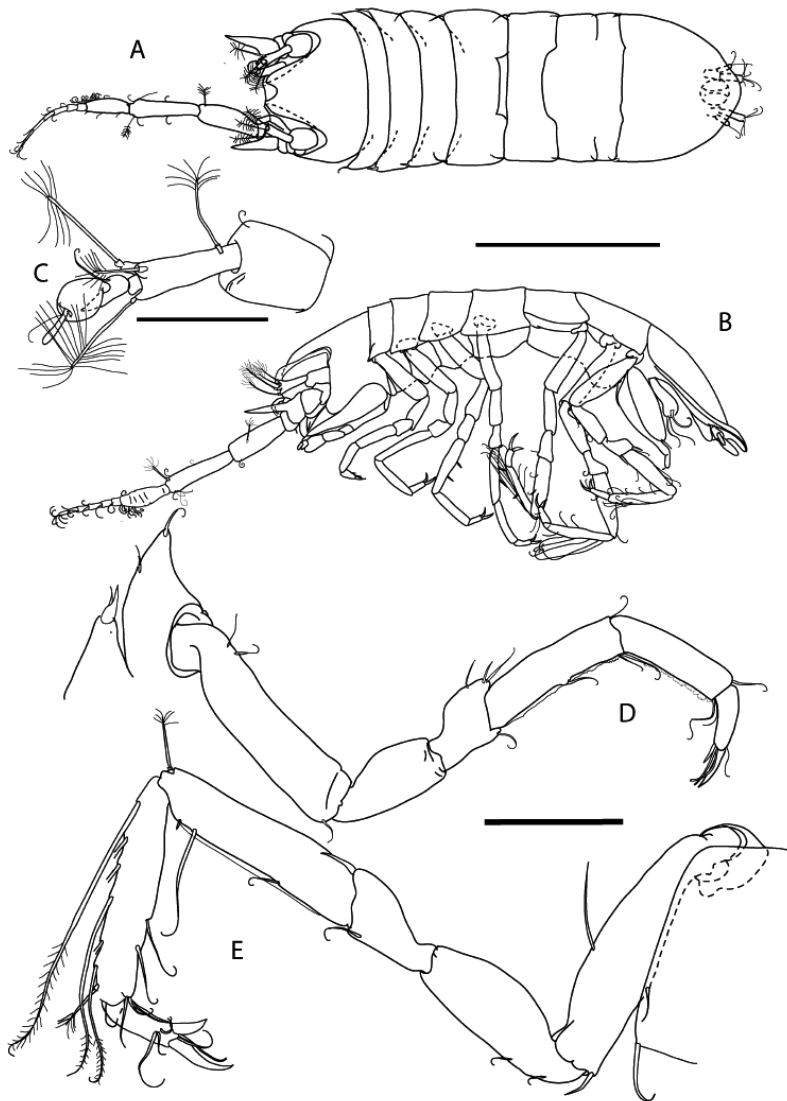


FIGURE 2. *Nannoniscus oblongus* Sars, 1870 (Hjeltefjord Norway, AM P.74562), adult male, all parts drawn in situ. A, B, body, dorsal and lateral view. C, left antennula, dorsal view. D, right pereopod I. E, right pereopod VII. Scale bars: A, B, 0.5 mm, C-E, 0.1 mm.

Exiliniscus hanseni

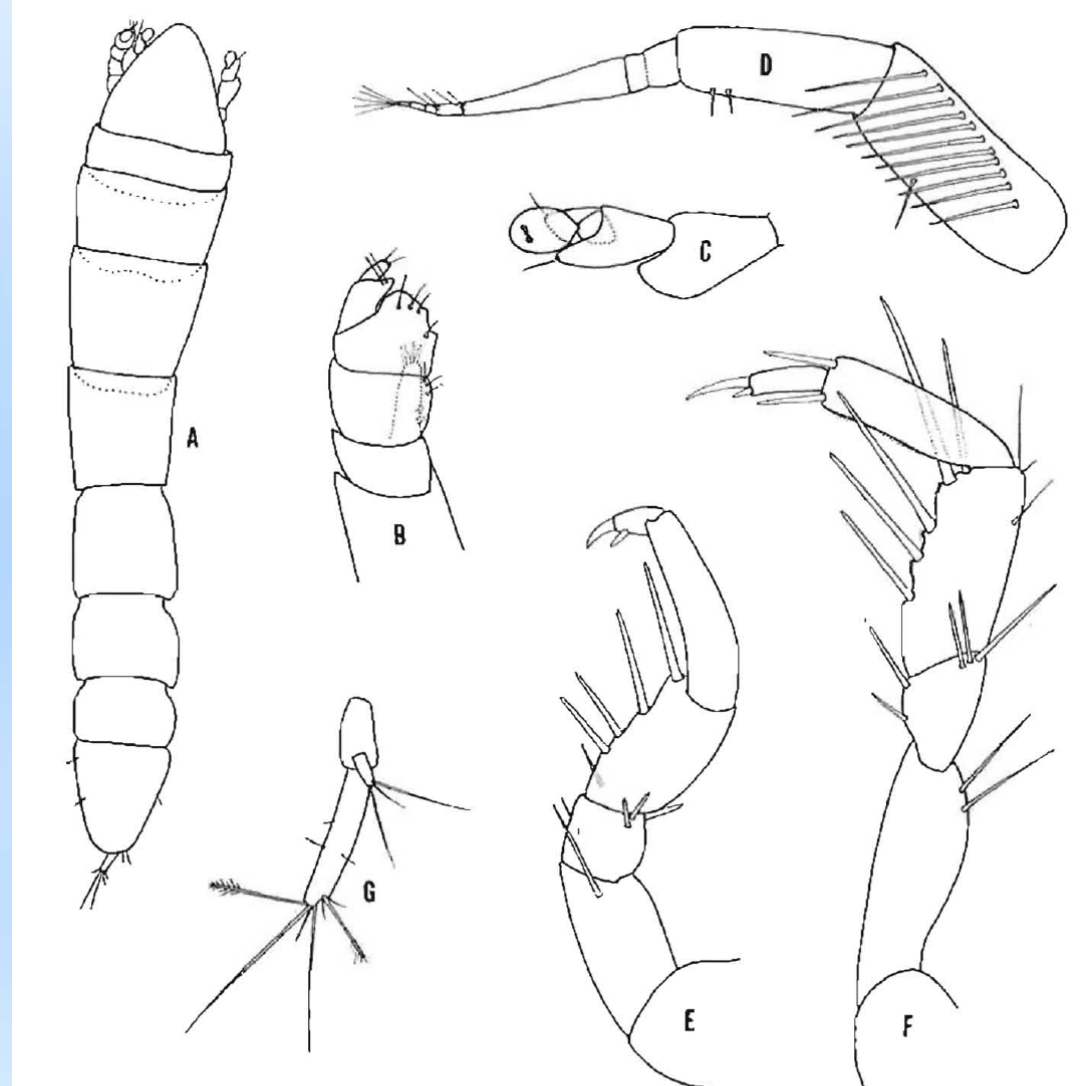
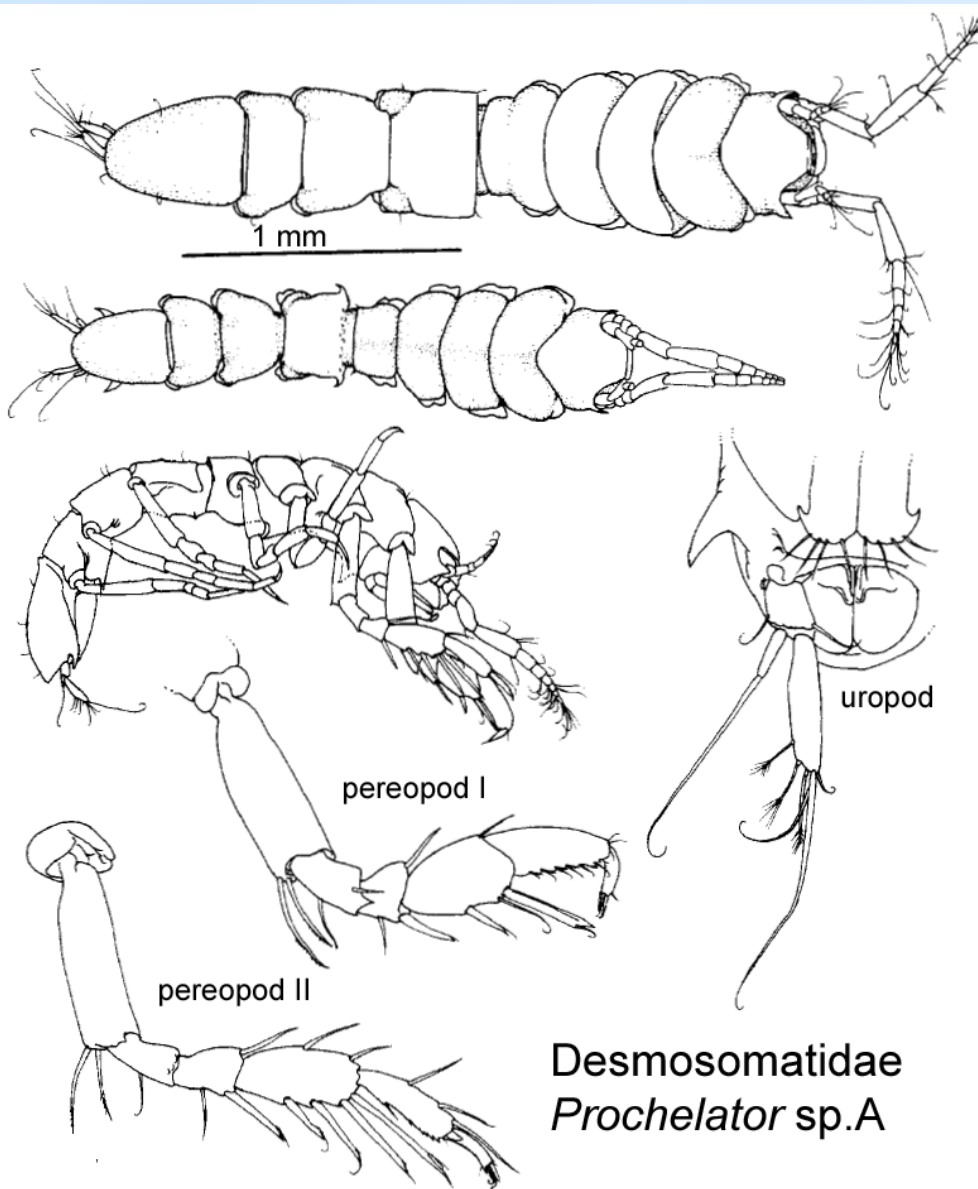


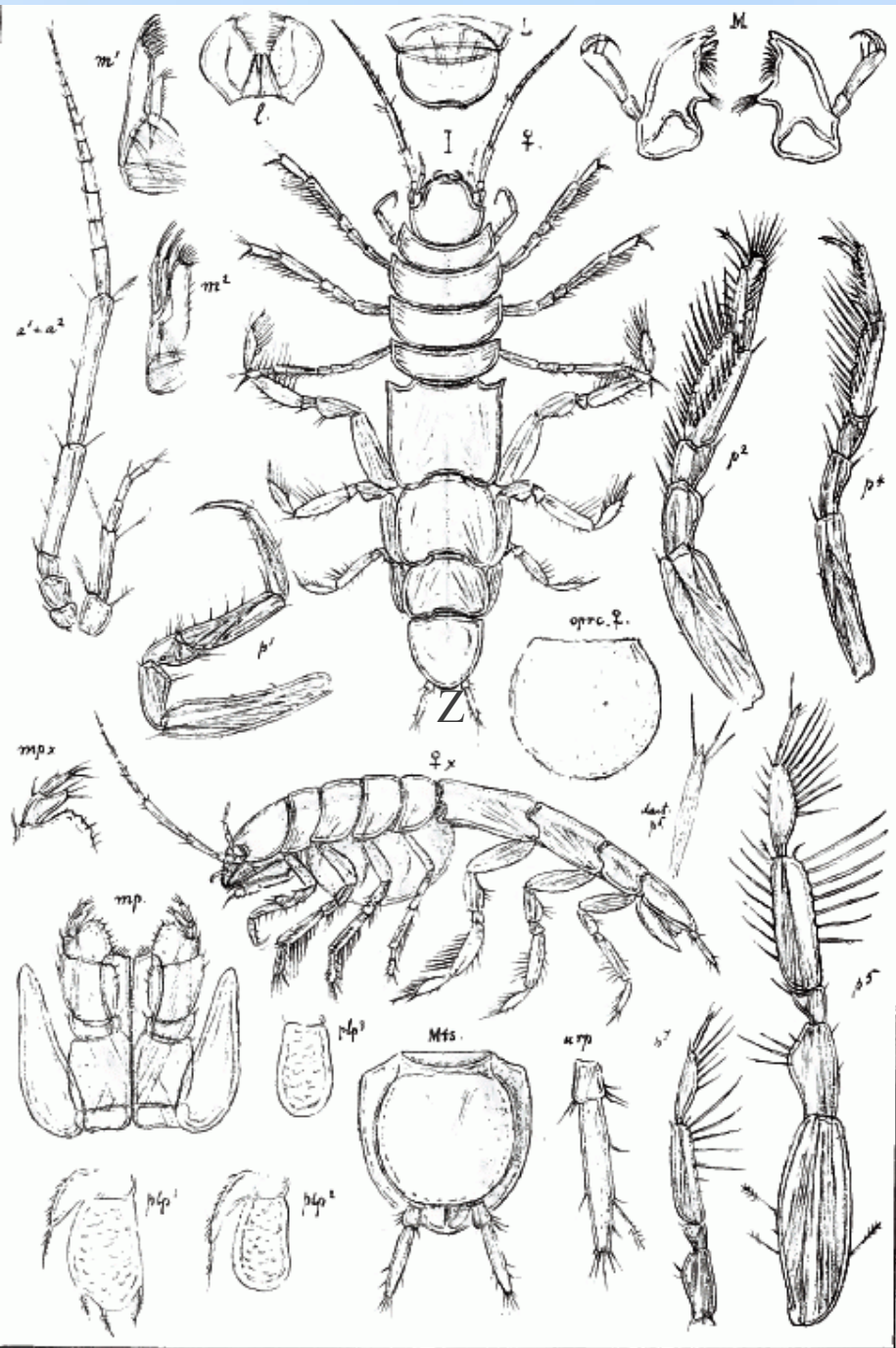
Fig. 3. *Nannoniscus hanseni* nov. sp., A-D: cotype, female of 2.0 mm, E-G: holotype. — A: dorsal view, B: maxilliped, C: antenna 1, D: antenna 2, E: pereopod 1, F: pereopod 2, G: uropod.

Desmosomatidae

- Benthic deep-sea but can be found on outer shelf
- After Munnopsidae, most diverse family
- Appear similar to Nannonicidae, but always with coxae at margin of pereon



Other Desmosomatidae



Desmosoma lineare, G.O. Sars. ♀

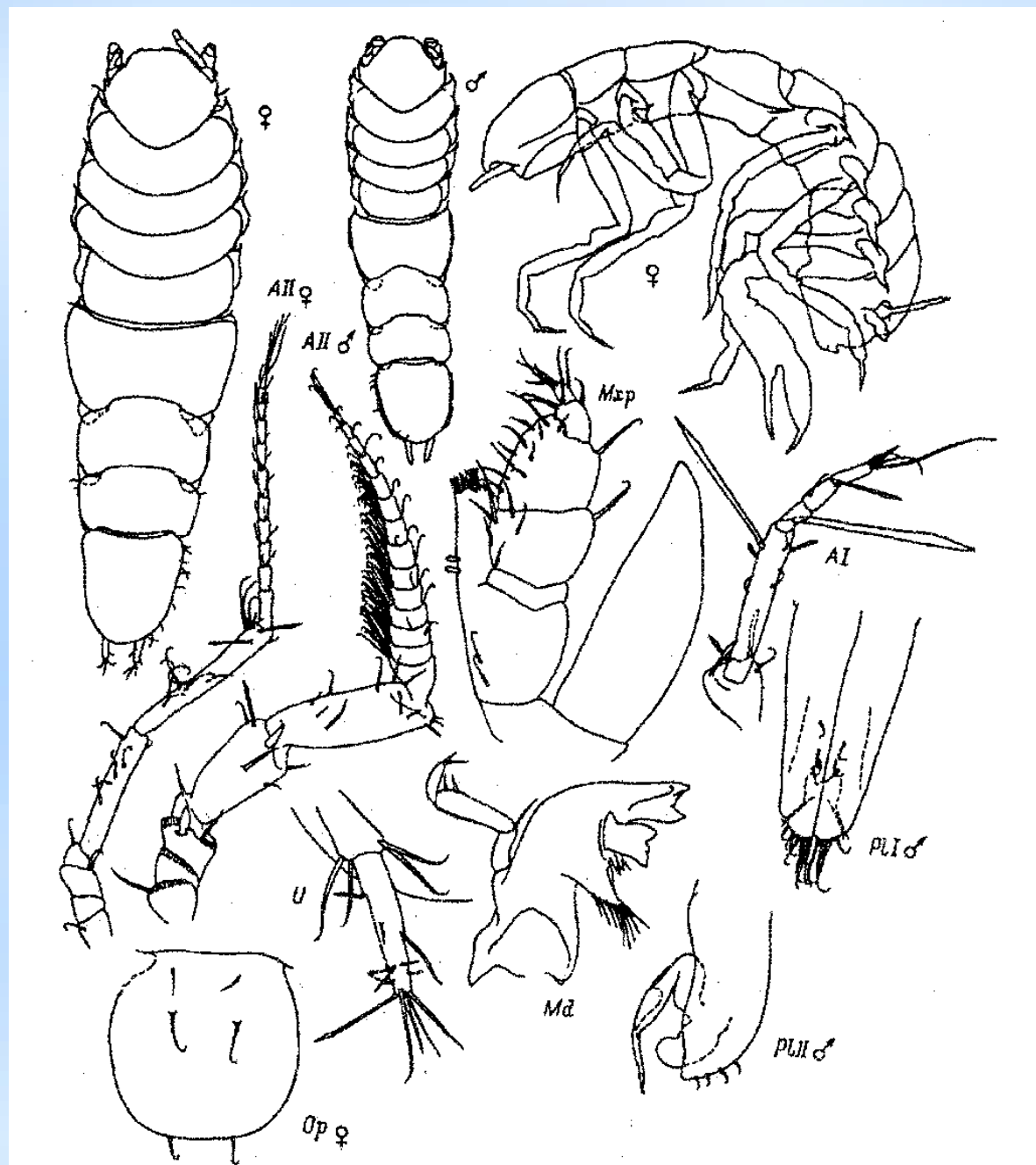
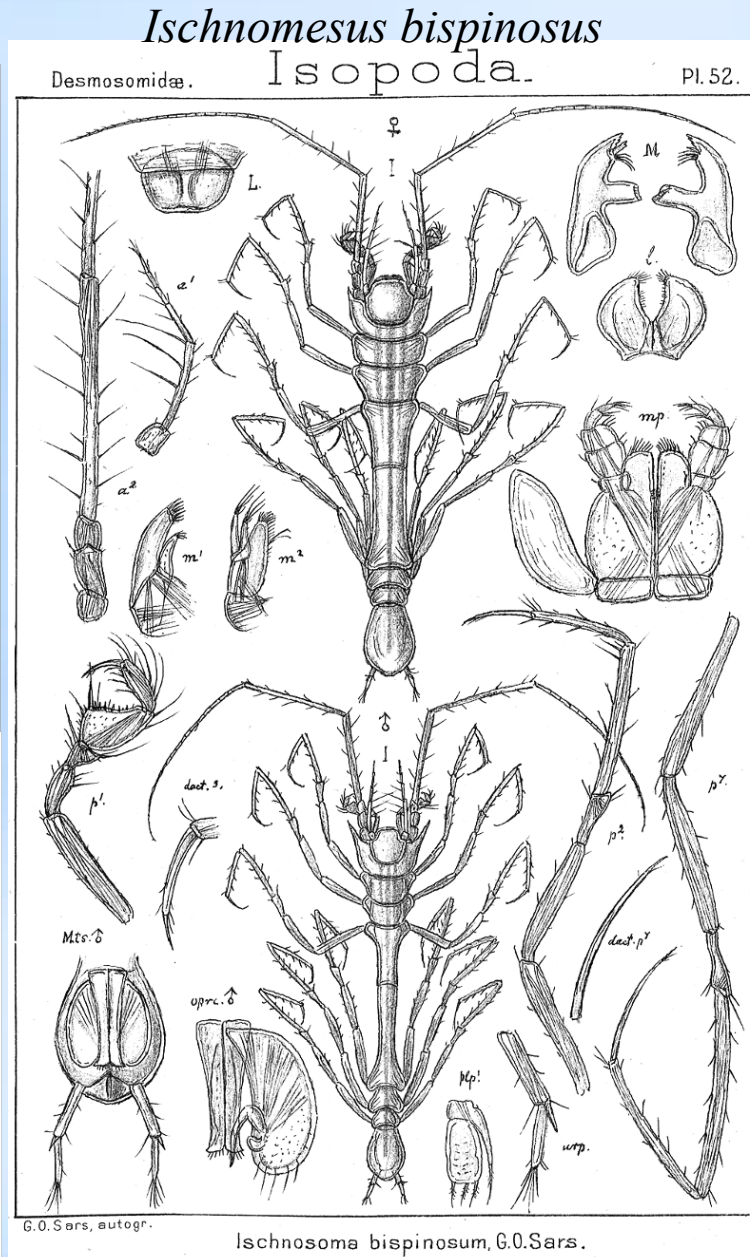
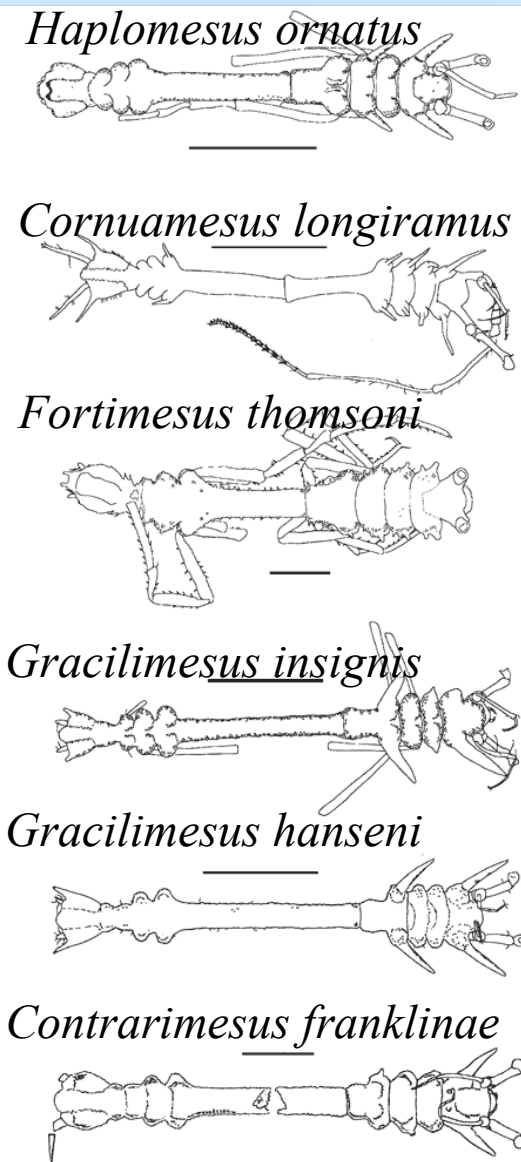


Рис. 183. *Chelator insignis* (Hansen). Внешний вид самца сверху, самки сверху и сбоку; головные придатки и конечности. (По: Hessler, 1970).

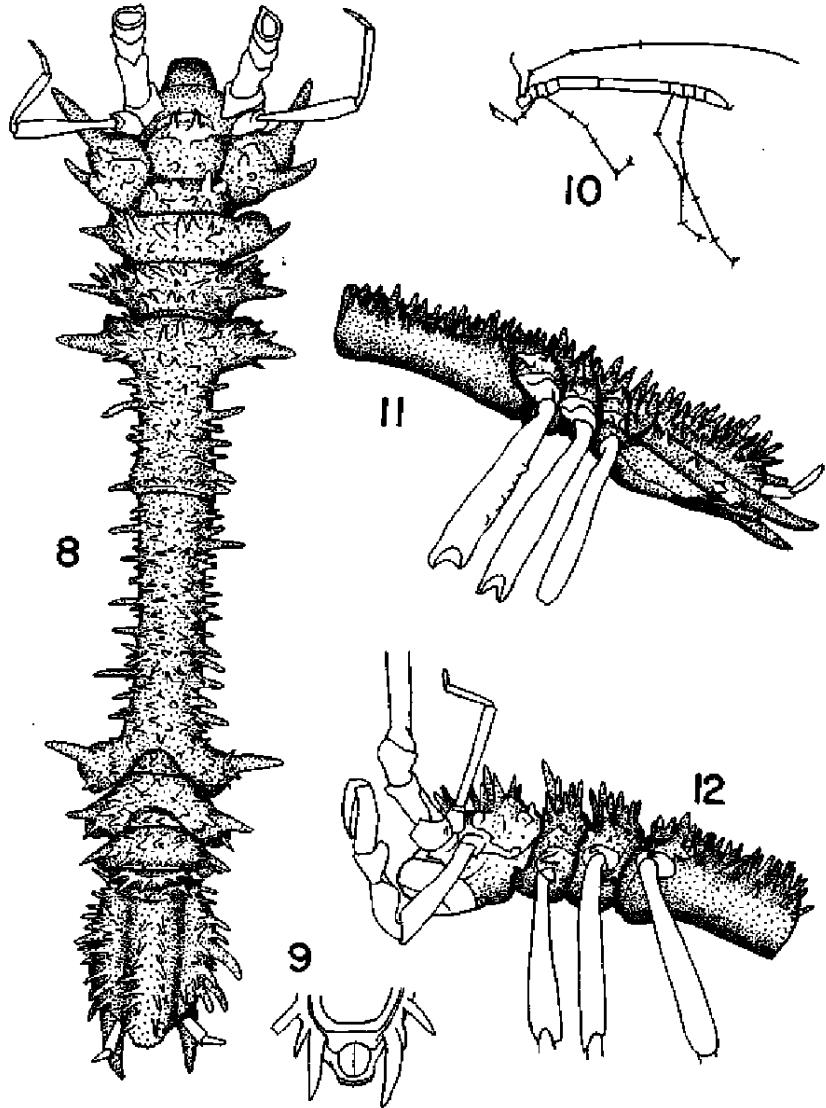
Ischnomesidae



- Deep-sea benthic
- Body always thin and elongate, especially pereonite 5
- Legs similar throughout, except for pereopod I, which is usually robust, carposubchelate

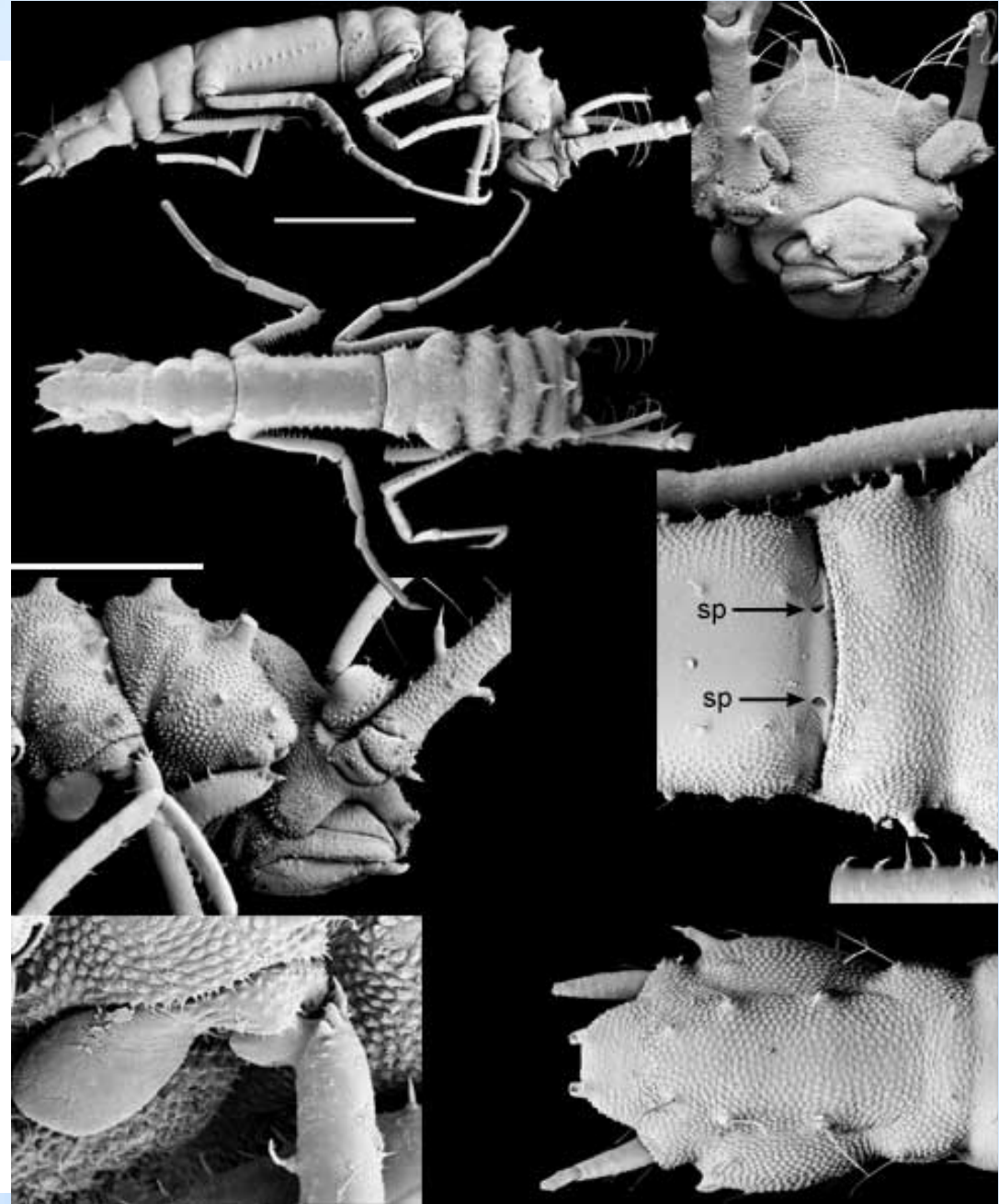
Other Ischnomesidae

Ischnomesus antarcticus



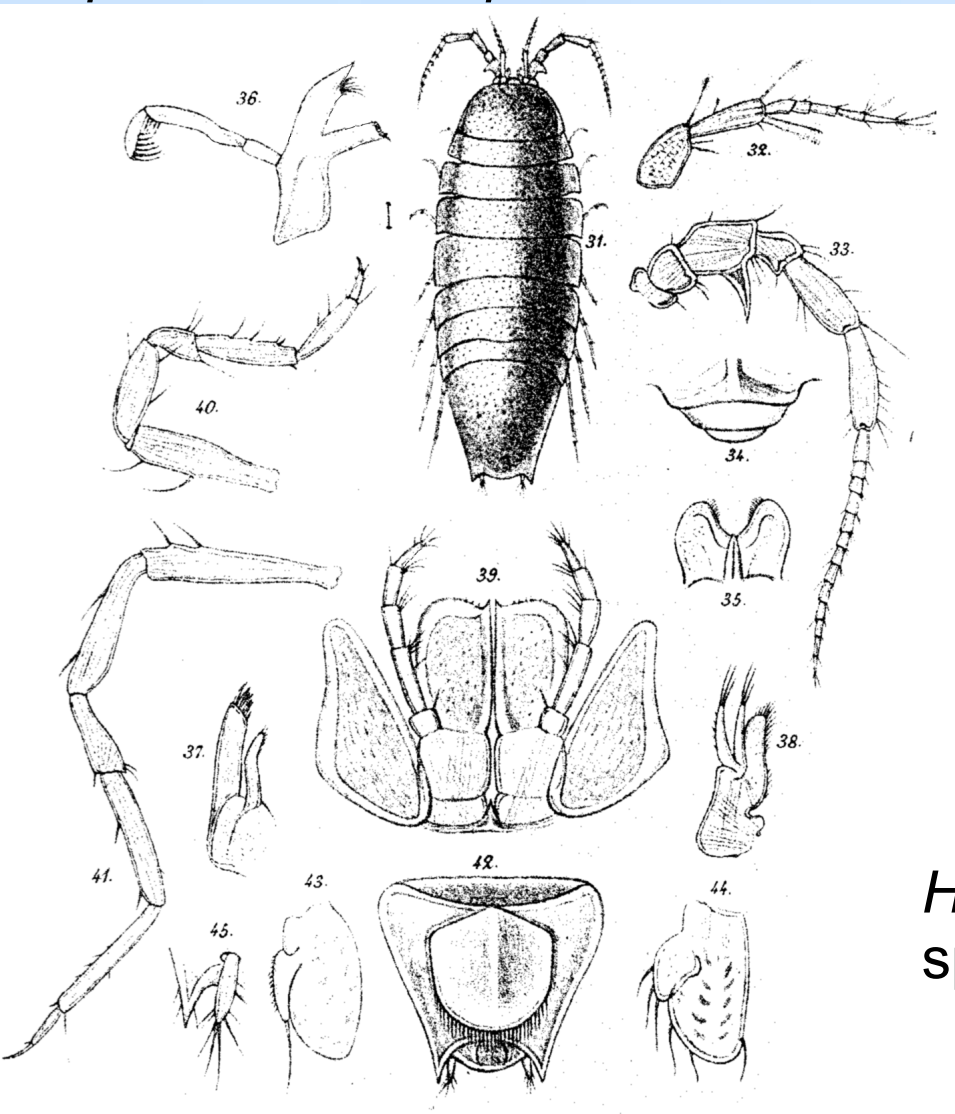
Figs. 8-12. *Ischnomesus antarcticus* n. sp., holotype male 8.3 mm long. 8, dorsal view holotype; 9, ventral view posterior part pleotelson; 10, schematic showing relative appendage lengths; 11, lateral view posterior half; 12, lateral view anterior half.

Heteromesus ctenobasius



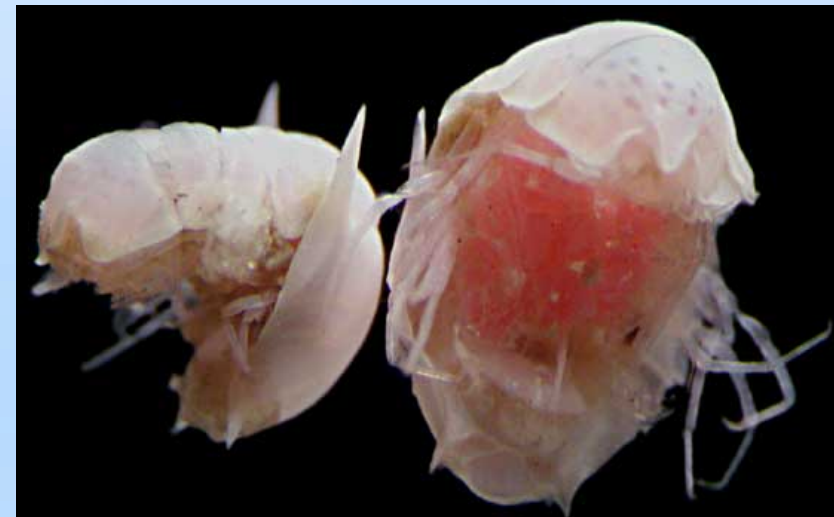
Haploniscidae

Haploniscus bicuspis



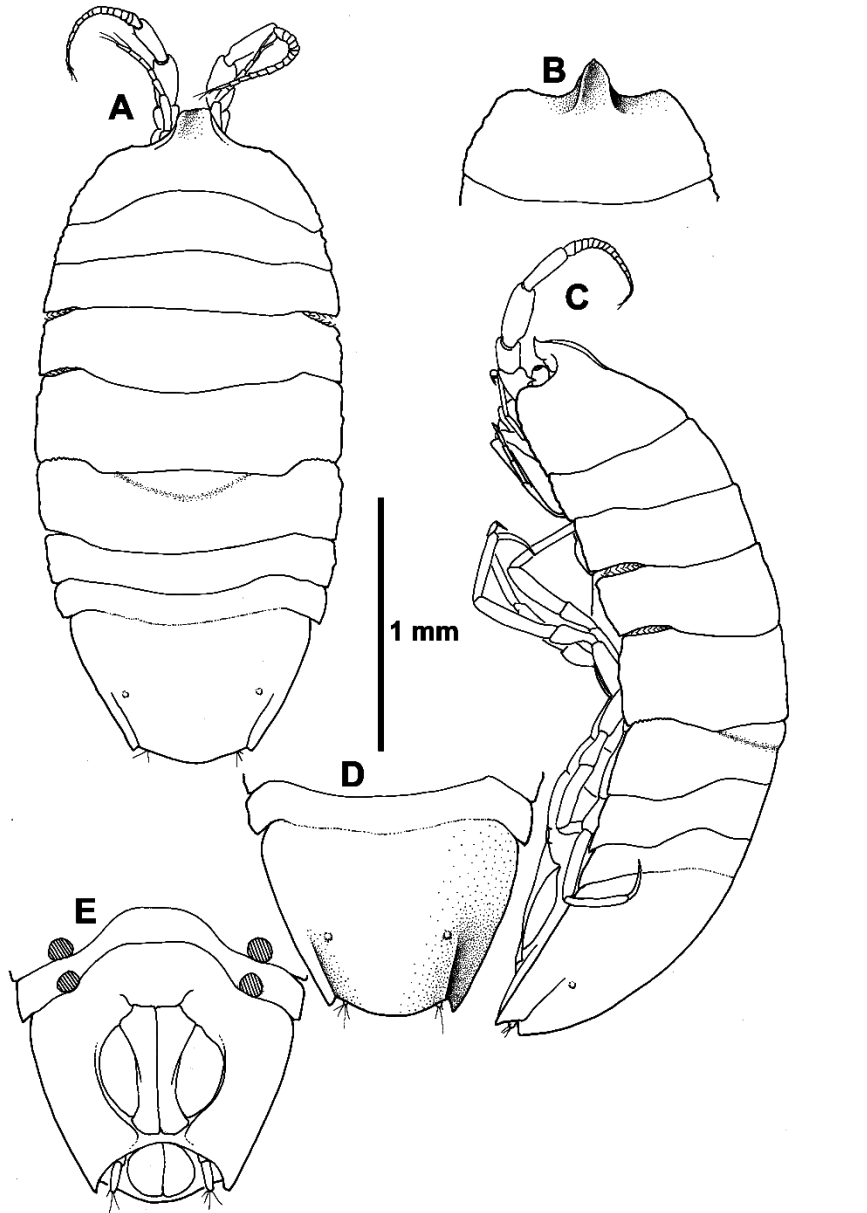
- Most “isopod” of the deep-sea isopods; walking legs all similar; body typically with continuous margin
- Head frontal margin not projecting, but clypeus often robust
- Varying loss of articulations in posterior pereonites
- Some species can enroll

Hydroniscus
sp. 527 GoM



Other Haploniscidae

Haploniscus castillatus



Antennuloniscus menziesi

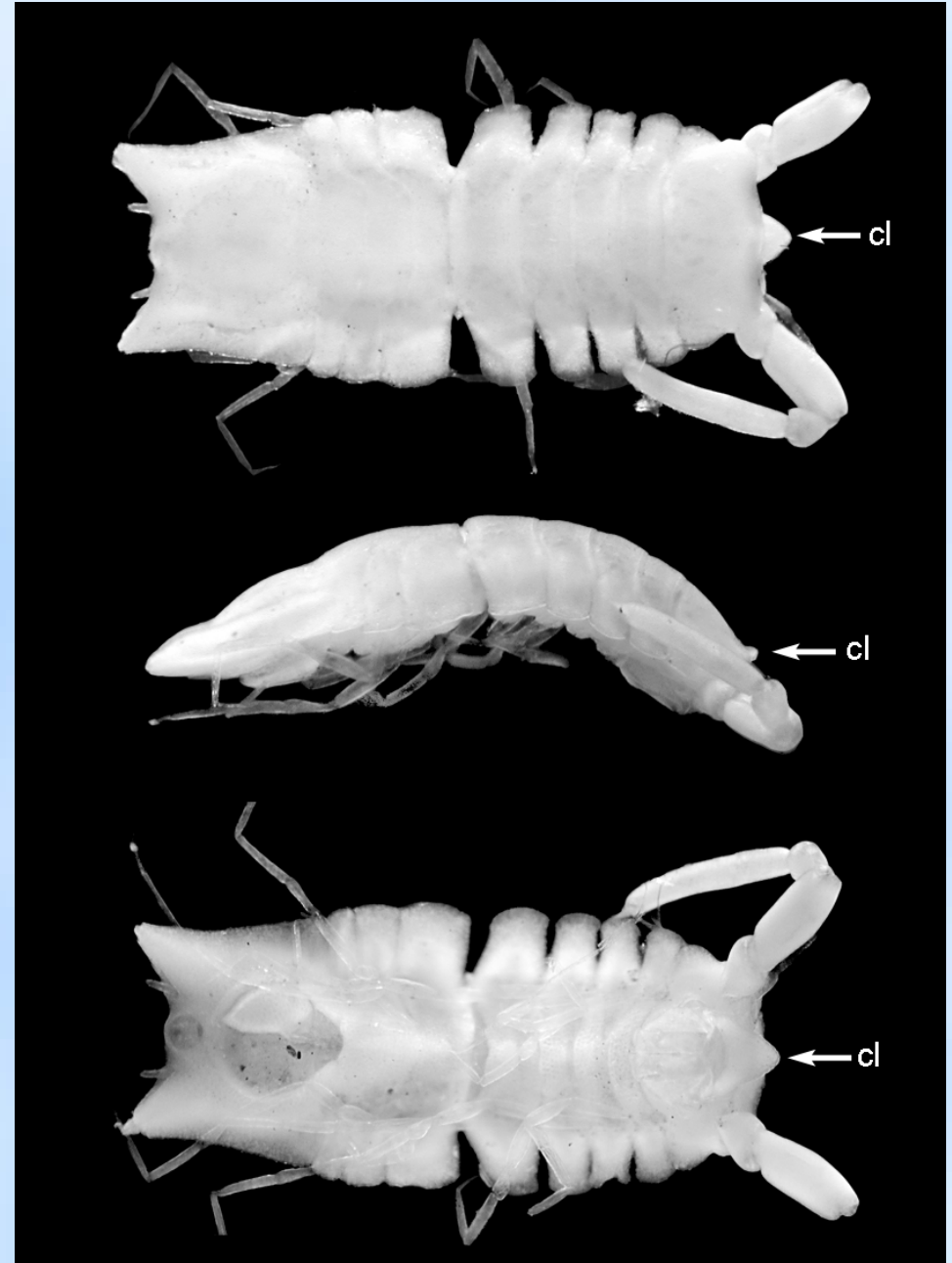
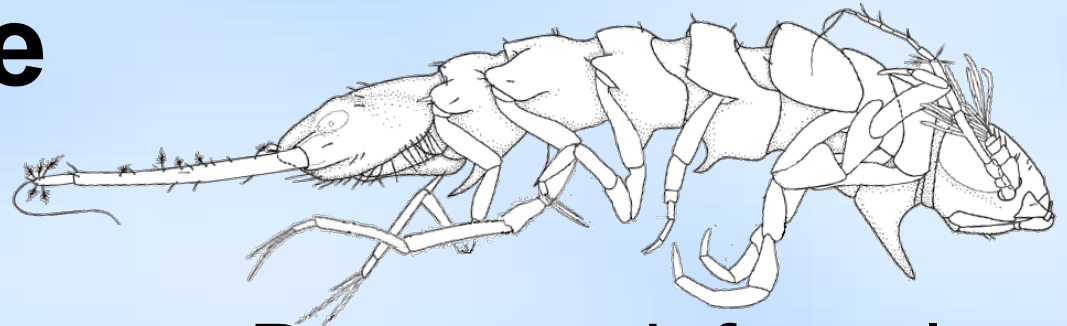


Figure 2. *Haploniscus cassilatus* sp. nov., holotype, male, K40756, 3.9 mm: A, dorsal view; B, anterior body, straight dorsal view; C, lateral view; D, posterior body, straight dorsal view; E, posterior body, ventral view.

Macrostylidae



- Deep-sea infaunal, burrower
- Fossosome
- Uropods elongate uniramous, stiff; often lost
- Over 70 described species, but many more unknown
- Being revised

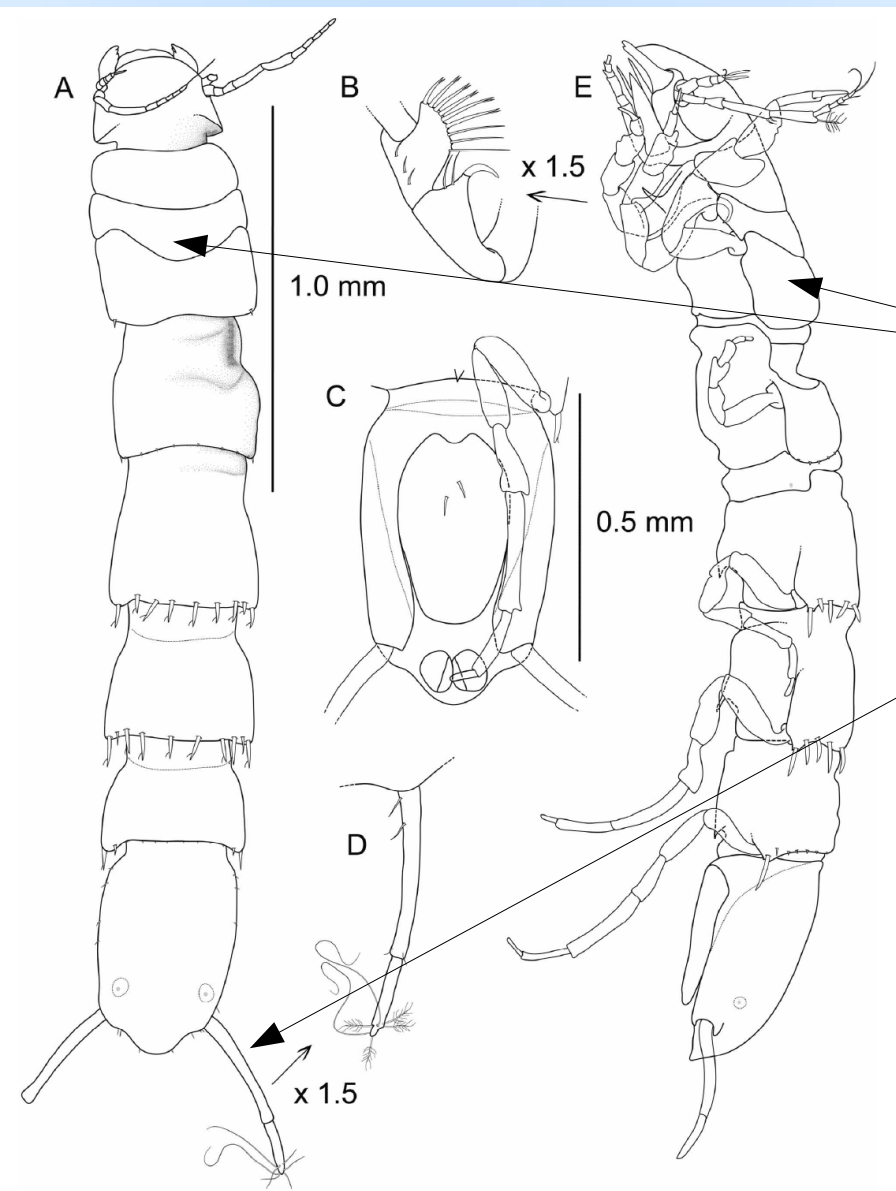
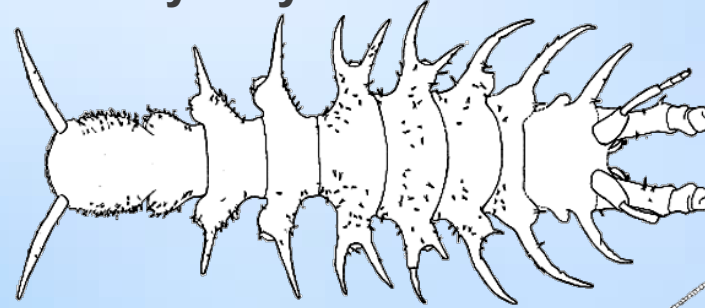


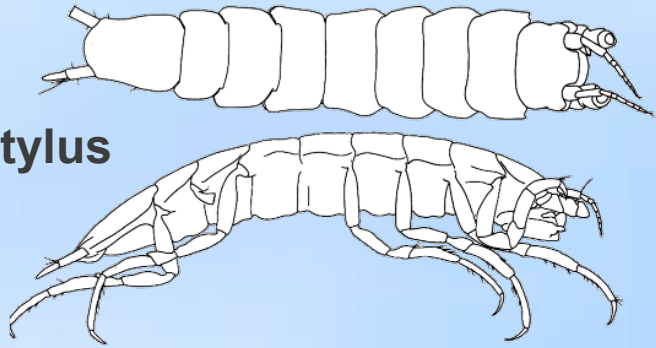
FIGURE 1. *Macrostylis dorsaetosa* n. sp. A-E, holotype ♀ (AM P86000). A, dorsal habitus, imbricate ornamentation and fine setation omitted. B, left pereopod III ischium, close-up. C, pleotelson, ventral. D, right uropod, close-up. E, lateral habitus. Scales: A, D-E = 1 mm. B-C = 0.5 mm.

Other rare taxa

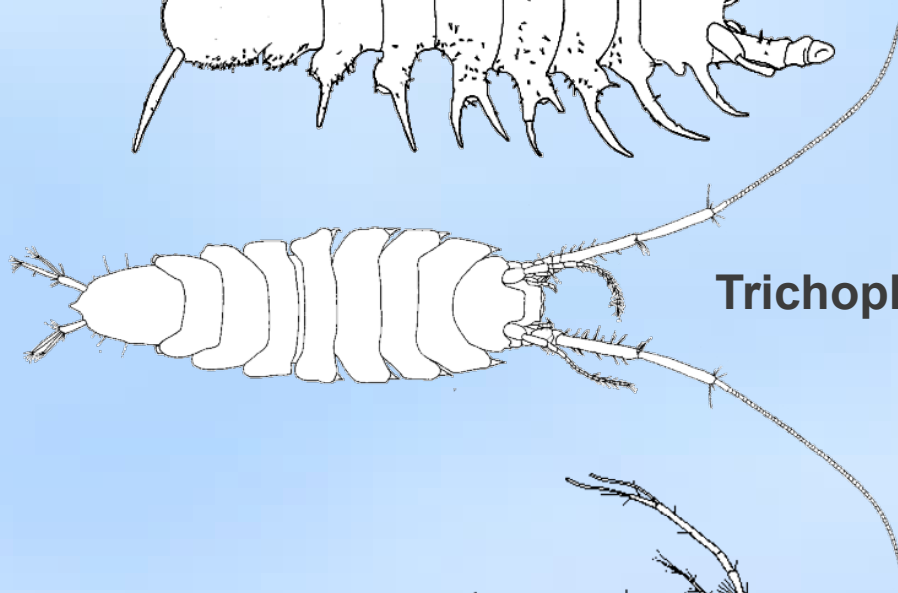
Dactylostylis



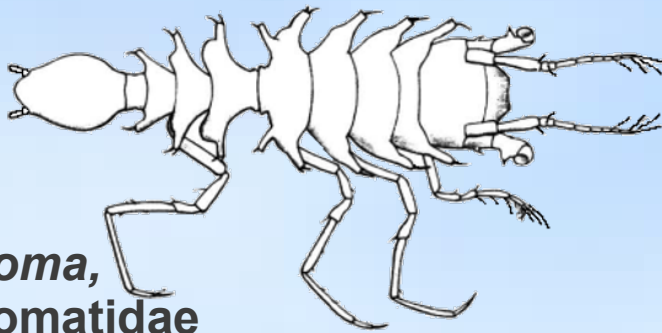
Xostylus



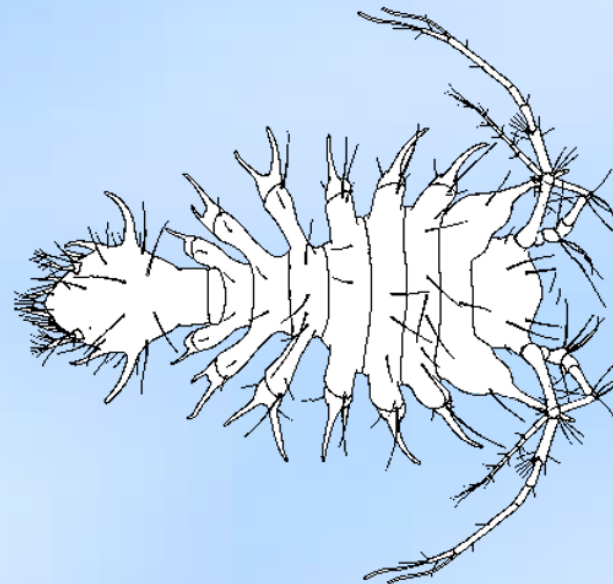
Trichopleon



**Mictosoma,
Mictosomatidae**

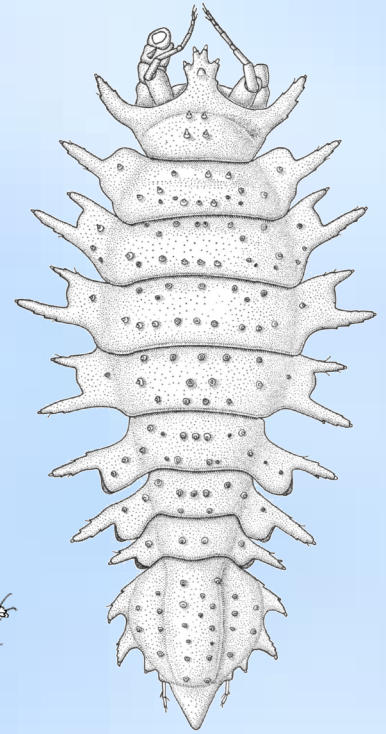
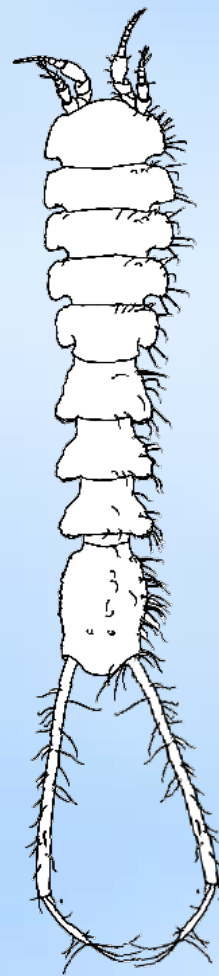
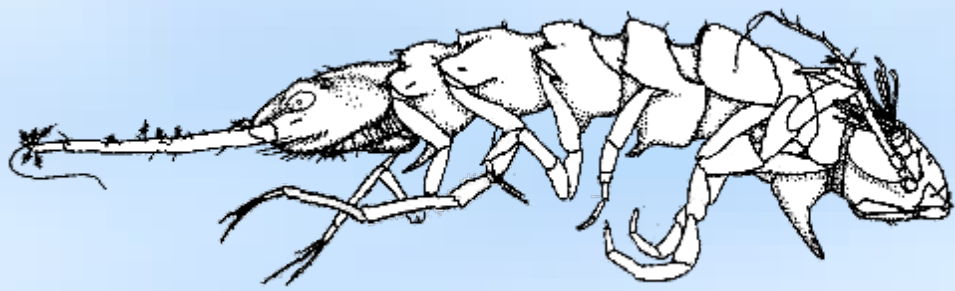


**Xenosella
Xenosellidae**



Key to the Janiroidean families

- Derived from a Mesquite phylogenetic database
- Converted to a DELTA database of exemplar species
- Converted to a family database and key generated
- BETA version – work in progress!
- Interactive identification using INTKEY (part of the DELTA system)



End

