Echinodermata larvae

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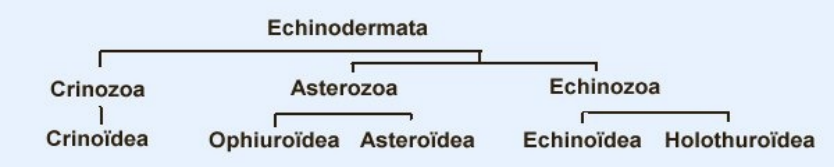
Echinoderms is a large group of exclusively marine organisms which includes more than 7000 species. Their name comes from the Greek “echino” = hedgehog and “dermo” = skin. Their rigid or semi-rigid skeleton is made of calcium carbonate and provided with outgrowths in the form of spines of the same mineral.



They have a radial symmetry of order 5, that is to say that the structures are spaced 72 degrees apart, for example the mouth of sea urchins has 5 teeth. In what follows we will not talk about Crinoidea which have a quite different morphology

What interests us here, as microscopic subjects, are their larvae which form part of the marine plankton and of which we will see some examples.

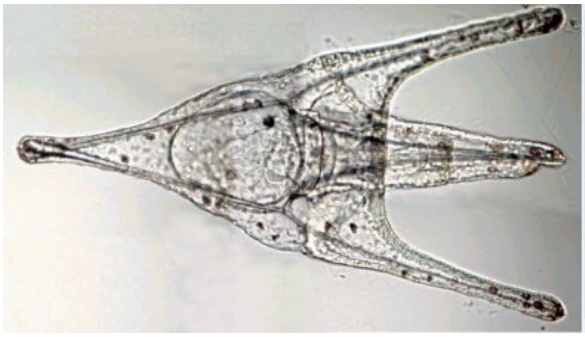
For the Echinoideae, of which around 950 species are known, the best known and most frequently encountered are the sea urchins, whose fossils date back 450 million years! Here is a live specimen (and which was put back in the water after photo) diameter 5 cm. The mouth which is used to scrape the algae is on the ventral side.

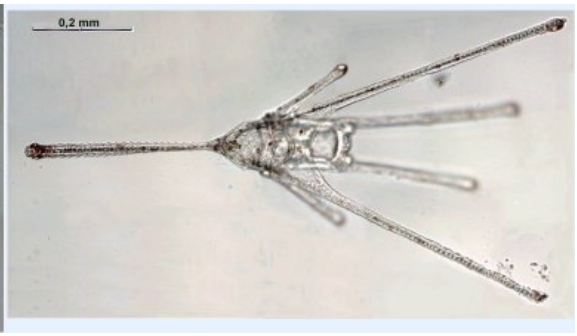
We can clearly see the rigid spines and also the longer podia (tube feet) in the form of fine filaments ending in a suction cup; see the link below for the study of podias, pedicellariae etc: (mainly page 2)

N*ote: in this link some images of larvae with large “arms” are actually those of ophiurida larvae! (In 20 years my knowledge has progressed!)*

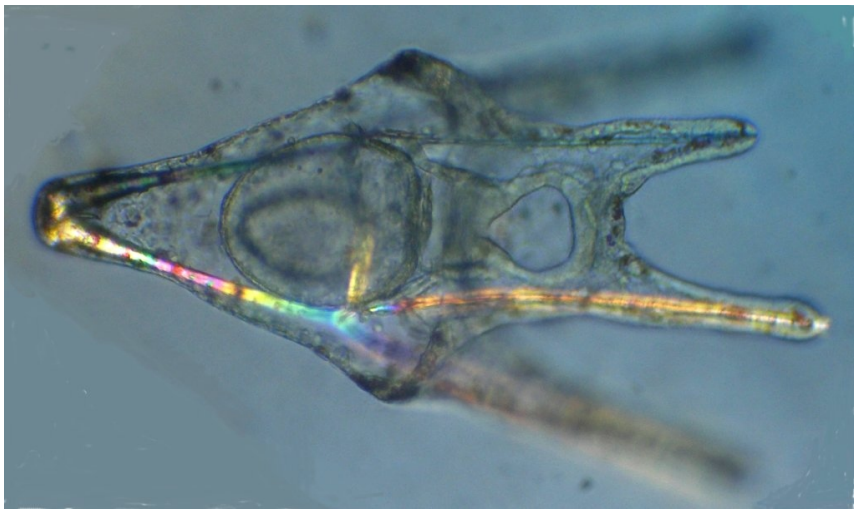
http://www.microscopy-uk.org.uk/mag/artjul00/urchin1.html

Here are 2 larvae: sea urchin *Paracentrotus lividus* and *Echinocardium cordatum* (right) both in the pluteus stage



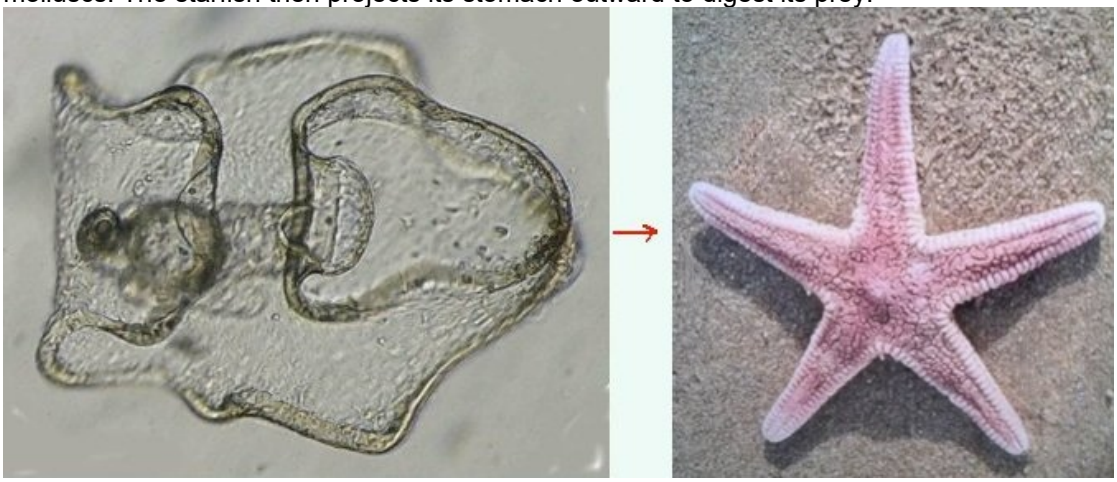


A polarized light image shows the calcareous nature (calcite) of the stems constituting the internal skeleton embryos. We can clearly see the mouth between the arms on the right which are covered with ciliae. The larva moves mouth forward to capture plankton.



We sometimes have the chance to see the metamorphosis of an 8-armed pluteus into a juvenile sea urchin that we can already see inside (blue arrow). On a juvenile (image on the right) - red arrows: outline of quills and green arrows: outline of tube feet.

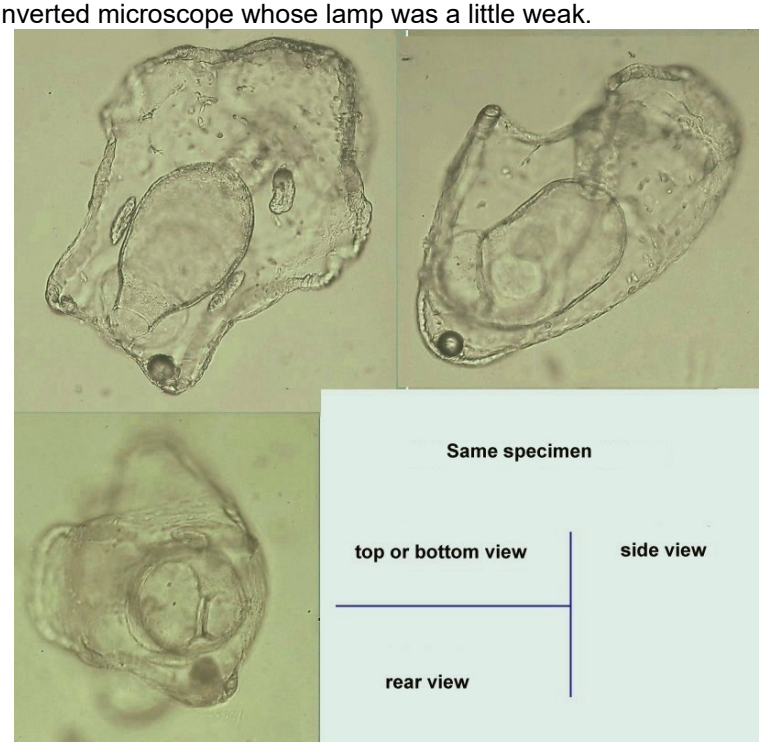
Other echinoderm: Asteroïdea or sea star or star fish: here a larva, (not 100% sure may be sea cucumber larva but at this point they look the same!) Right picture: adult(12 cm diameter). The 5 arms are relatively flexible and thanks to their feet tubes, can open the shell of bivalve molluscs. The starfish then projects its stomach outward to digest its prey.



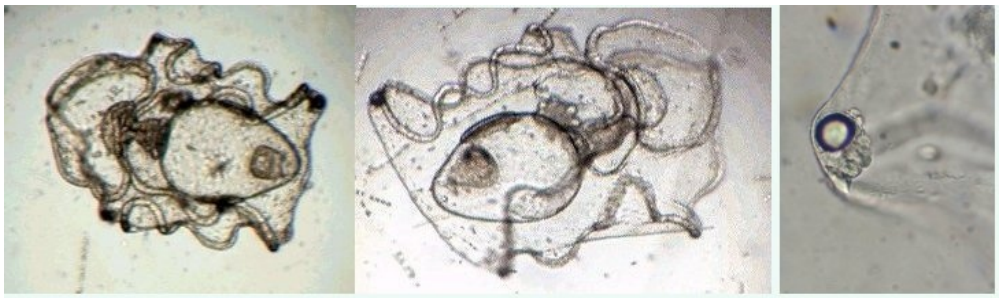
About Holothuroidea: The group has around 1200 species with an average size between 10 and 30cm. The nickname “sea cucumber” describes well the adult shape! Fifth order symmetry is less visible.
On the left picture earlier stage: gastrula - we see the beginning of the digestive system and on the right older larva

1 mouth, 2 stomach, 3 ciliated bands, 4 intestine, 5 ossicle

Here are 3 photos of the same larva: The images are not very contrasted because they were taken with an inverted microscope whose lamp was a little weak.



The larva then evolves into the form of auricularia: on the right, detail of an ossicle (objective x 40).



Ophiuroidea: (Brittle star) a very represented species (2000 species) and generally living on very deep seabeds:
https://www.researchgate.net/publication/7899207_Larval_Morphometrics_and_Influence_of_Adults_on_Settlement_in_the_Gregarious_Ophiuroid_Ophiothrix_fragilis_Echinodermata

Below is an image of two larvae at different stages of development: (also called: Ophiopluteus). On the right an older specimen in Rheinberg lighting.

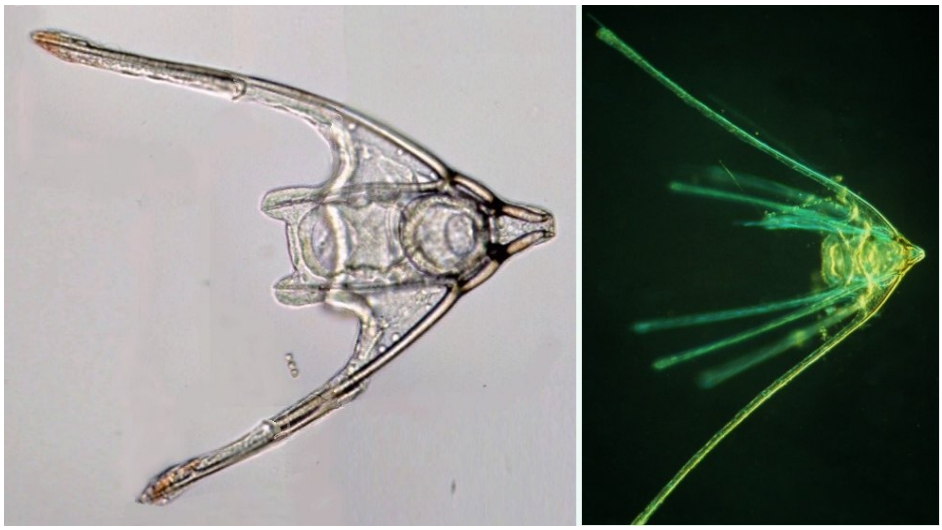
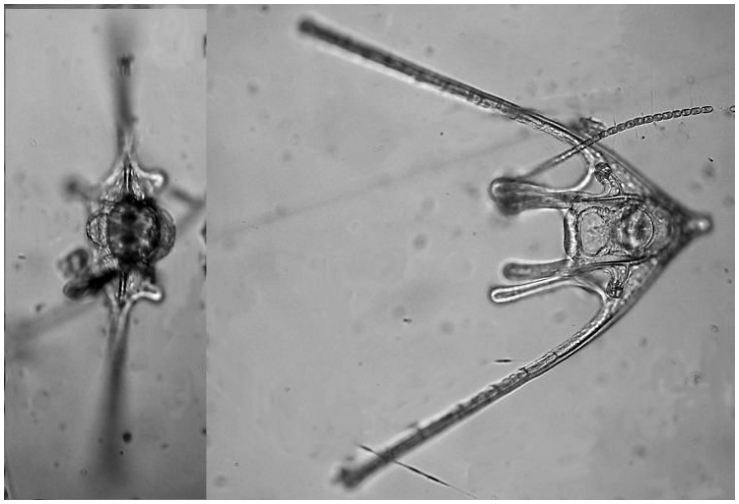
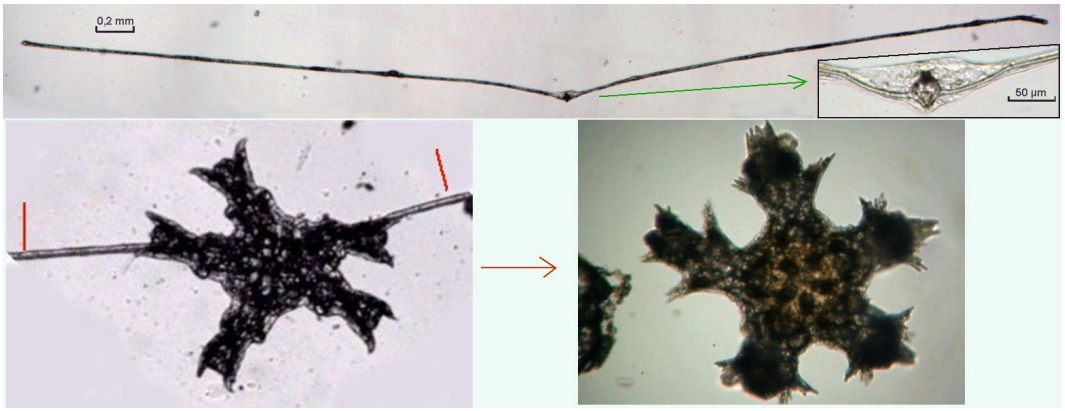


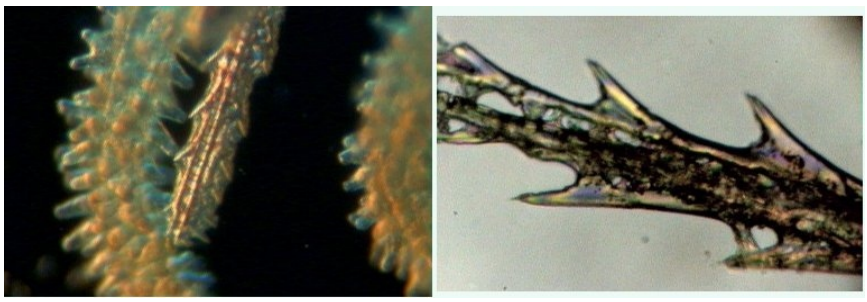
Image difficult to obtain: that of the same larva seen from the front on the left and from above. The front photo was made possible thanks to a micro aquarium containing more water than a slide and allowing the subject to move in 3 dimensions (not easy to make focusing!).



The larvae may differ slightly between species but the adult always develops at the junction of the arms: (shown here by red arrows) last image on the right: free adult. The image above shows a larva with excessively long arms: more than 4 mm in wingspan!



The arms of Ophiuridae are fragile and brittle. Much more flexible than those of sea stars, they are used for movement using a movement resembling the slithering of snakes. They are covered with limestone excrescences, of which here is an example in polarized light, right image, left detail of an arm:



Adults pictures:
https://en.wikipedia.org/wiki/Brittle_star

Overview of some echinoderms:

http://www.mesa.edu.au/echinoderms/gallery.asp

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