

## Homology of the "Dohrn's septum" in pycnogonids

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In pycnogonids, a double-layered septum, which is called the "Dohrn's septum", divides the hemocoel into the dorsal pericardial sinus including the heart and the ventral perivisceral one including the gut and ventral nervous system. Two different opinions have been proposed about the homology of the Dohrn's septum: Clarke (1979) stated that the Dohrn's septum is homologous with the pericardial septum in other arthropods, whereas Firstman (1973) did that it is homologous with the endosternite in chelicerates. Considering these opinions, both of them seem to have some doubts.

*Clarke's opinion:* Clarke (1979) paid attention to the pericardial septum, *i.e.*, a longitudinal horizontal septum dividing the hemocoel into dorsal and ventral sinuses between the heart and gut, which is known for in all arthropod groups. He postulated the homology of these septa of arthropods and regarded the Dohrn's septum in pycnogonids as the homolog of the pericardial septum in other arthropods.

The mandibulates (crustaceans, myriapods and insects) actually have a double-layered horizontal pericardial septum resembling the Dohrn's septum. They are, however, definitely different in respect of what they enclose: the Dohrn's septum encloses the gonads between its dorsal and ventral layers, whereas the pericardial septum in mandibulates does the alary muscles. In arthropods other than pycnogonids, the gonads are always present in the perivisceral sinus. Clarke mentioned that the gonads in pycnogonids lay in the pericardial sinus, but he obviously overlooked the double-layered nature of the Dohrn's septum.

The chelicerates (arachnids and merostomes) seem not to develop such a horizontal septum as found in pycnogonids and mandibulates. Although Clarke maintained that the pericardium, *i.e.*, a cellular sac surrounding the heart, is homologous with the pericardial septum, it may be not double-layered, and encloses neither the alary muscles nor the gonads.

*Firstman's opinion:* Firstman (1973) proposed that the Dohrn's septum and the endosternite, *i.e.*, a cartilaginous plate functioning as an inner skeleton in chelicerates, have the same evolutionary origin. The opinion is based on his observations, by means of comprehensive dissections on main groups of pycnogonids and chelicerates, that both the Dohrn's septum and the membrane extended from endosternite enclose the gut and ventral nervous system. He maintained that the endosternite is merely the thickened portion of the nerve-enclosing membrane, and further supposed that the condition of the Dohrn's septum-enclosure represents the ancestral nature in arachnids and merostomes.

Firstman, however, did not take the position of gonads into account. In chelicerates, the gonads are never present in the endosternite-enclosure, but obviously in the perivisceral sinus. Moreover, he paid no attention to the pericardium in chelicerates. The details of the enclosures formed by the Dohrn's septum and the endosternite are uncertain, as he did not make histological or ultrastructural observations.

### Observations and Discussion

As briefly reviewed above, some disagreements are found among the Dohrn's septum and its sup-

posed homologs, which cast a doubt on the previous opinions on their homology. My histological observations concerning the present theme are not enough so far, but they may provide an interesting information.

In the first-instar larva of a merostome, *Tachypleus tridentatus*, I found that a thin cellular layer divides its hemocoel horizontally between the heart and gut. This layer reminds us of the Dohrn's septum in pycnogonids and the pericardial septum in mandibulates, although it seems not to be double-layered. It is possible that the layer transforms into the pericardium during the further development, as no such a horizontal layer remains in the adult stage and no pericardium is observed in the first-instar stage.

I observed that a thin cellular layer encloses the gut and ventral nervous system in some pycnogonids, seemingly as Firstman (1973) described. Firstman considered that the ventral layer of the Dohrn's septum itself encloses these organs, but in fact the ventral layer seems to fork into two and one of the branch goes ventrally to enclose the organs.

The information on the Dohrn's septum and its supposed homologs is far from sufficient. Comprehensive observations especially on the ultrastructure and embryology of these septa are necessary, in order to solve the problem on their homology and further to make a critical discussion on the evolution of arthropod internal morphology.

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#### References

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