

Observations on the ovarian structure and oogenesis of some pycnogonids

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There are some differences in the modes of oogenesis between two major arthropod groups, chelicerates and mandibulates (Makioka, 1987, 1988). In pycnogonids (pantopods or sea spiders), a minor group of marine arthropods, knowledge of the modes of oogenesis is still insufficient to be compared with those in other arthropod groups, although some studies have been done (Sanchez, 1959; King & Jarvis, 1970; Jarvis & King, 1978, etc.). In the present study, we compared the adult ovarian structures and oogenetic modes in some pycnogonid species in order to develop a generalized model.

Pycnogonid specimens were collected in the westernmost area of Sagami Bay in front of the Shimoda Marine Research Center, University of Tsukuba, located near the top of Izu Peninsula, central Japan. The following 6 species were examined:

CALLIPALLENIDAE: *Propallene longiceps*

PHOXICHILIDIIDAE: *Anoplodactylus perforatus*, *A. pulcher*, *A. shimodaensis*

AMMOTHEIDAE: *Ascorhynchus auchenicum*, *Cilunculus armatus*

Adult females were fixed with seawater-Bouin's solution. Serial paraffin sections 5-8 μ m thick were stained with Mayer's acid hemalum and eosin or with Heidenhein's Azan.

In most of the species, a U-shaped tubular ovary with anterior blind end was located in the body trunk (cephalothorax); four pairs of tubular ovarian diverticula entered the corresponding walking legs, reaching the femoral segments (Fig. 1-A), but in *Ascorhynchus auchenicum* they attained the tarsal segments. The ovary, both in the body trunk and in the walking legs, lay in the dorsal side of the gut (Fig. 1-B, C), and the ovarian wall consisted of a single epithelial layer. Only in *Propallene longiceps* was the ovary located, not in the body trunk, but in the femoral segment of each walking leg.

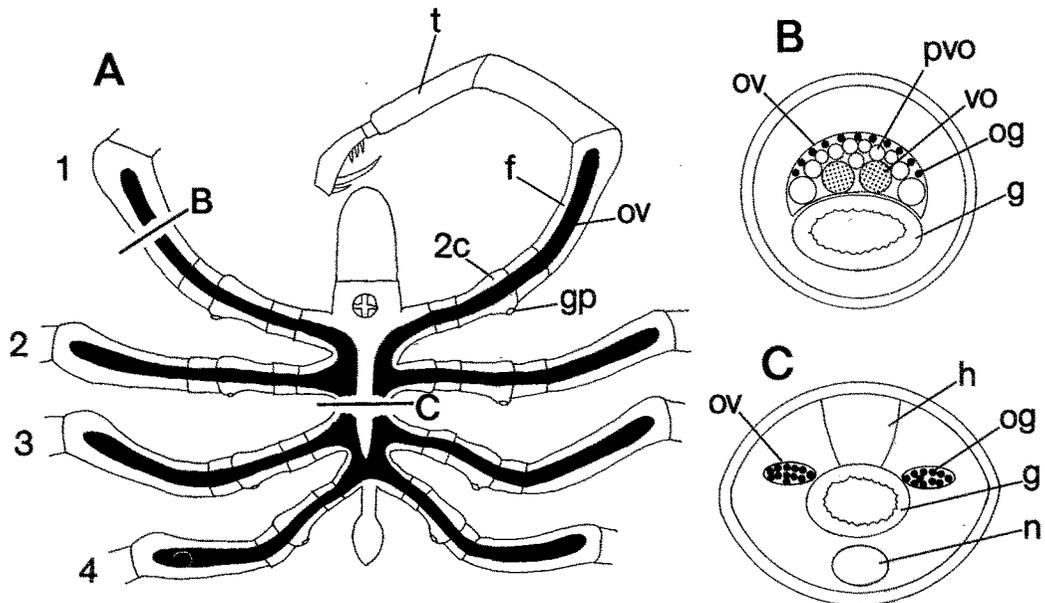


Fig. 1 Diagrammatic representation of position and shape of adult ovary in the present species, excepting *Ascorhynchus auchenicum* and *Propallene longiceps*. A. Extension of ovary in body trunk and walking legs (dorsal view). B. Cross-section of femoral segment of 1st walking leg. C. Cross-section of body trunk. B and C in A: positions and directions sectioned in B and C, f: femur, g: gut, gp: gonopore, h: heart, n: nerve cord, og: oogonium-like cell, ov: ovary, pvo: previtellogenic oocyte, 2c: second coxa, t: tarsus, vo: vitellogenic oocyte, 1-4: first-fourth walking legs.

Four types of egg cells were distinguished: oogonium-like spherical cells, previtellogenic and vitellogenic oocytes of varying sizes, and mature eggs. In most of the species, the oogonium-like cells were found in the dorsal epithelium throughout the ovary. Most oocytes were located only in the cavity of each pedal diverticulum, especially from the second coxa to the femur; the larger ones lay more ventrally, nearer the gut (Fig. 1-B, C). In *A. auchenicum*, all the types of egg cells occurred throughout the ovary, not only in the pedal diverticula. In *P. longiceps*, the oogonium-like cells were not found in the adult ovary. No follicle cells were found around any type of egg cell in any of the present species.

In many chelicerate arthropods such as the horseshoe crabs and arachnids, the cord-shaped germarium lies in the epithelial wall of the tubular ovary along its longitudinal axis. The growing oocytes migrate out of the germarium, not inward but outward, and protrude from the ovarian wall into the body cavity with the cellular egg-stalks connecting the oocytes with the ovarian epithelium. In many mandibulates, the germarium is located only at the terminal of each ovariole, and the oocytes grow in the cavity of the ovariole (the vitellarium).

In the present pycnogonid species, except for *P. longiceps*, the germarium lies in the wall of the tubular ovary, stretching throughout the ovary as in many chelicerates. However, the growing oocytes do not protrude from the ovarian wall into the body cavity, but enter the ovarian cavity as do the oocytes in many mandibulates. In *P. longiceps*, the adult ovaries are highly specialized both in locality and in structure. We will examine young females and larvae of this species in order to study the development of the ovary with a germarium.

References

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