

SIPUNCULIDA

Phascolosoma gouldi

LIVING MATERIAL:

The adults are found on sand flats, just below low tide level. They are abundant at Hadley Harbor, near Woods Hole, Mass. Animals covered with a mass of sea-weed will remain in good condition, even after several hours of transportation. The sexes are separate, but similar in appearance.

BREEDING SEASON:

The season probably extends from mid-June through September. Eggs have been obtained at Woods Hole in July, August and early September.

PROCURING AND HANDLING MATERIAL:

A. Care of Adults: Since there are no external criteria for distinguishing the sexes, it is best to wash several animals free of mud and place them together in a large fingerbowl. A gentle stream of water should flow through the dish, but a direct current of water on the worms is undesirable.

B. Procuring Gametes: Although body-cavity eggs of several European species of *Phascolosoma* are readily fertilized, artificial insemination rarely succeeds in *P. gouldi* (Just, 1939). Normally-shed eggs are sometimes procured from animals kept in the laboratory; the shedding of sperm acts as a stimulus to egg-laying. Spawning occurs in the evening and during the night from 8 P.M. to 5 A.M., usually on the first or second day after collection if at all; however, occasionally several days may pass before the ova are shed.

C. Preparation of Cultures: Inseminated eggs should be transferred as soon as possible to a fingerbowl of fresh sea water, to prevent over-insemination, and the culture stored on a sea water table. In about 12 hours the rotating trochophores should be transferred to a fresh container of sea water. The larvae can be reared through metamorphosis.

NORMAL DEVELOPMENT:

A. The Unfertilized Ovum: The mature ovum is red-brown in color and is spherical, measuring 150 to 180 microns in diameter. It is enclosed in a chitinous, highly refractive vitelline membrane, which is three to four microns thick. Through the perforated "zona radiata" extend a number of fine filaments. The ovum is shed after formation of the first maturation spindle.

B. Fertilization and Cleavage: The fine filaments extending through the "zona radiata" are withdrawn at the time of fertilization. Cleavage is unequal and spiral, producing a D cell that is perhaps five times as large as the A, B or C cells. The micromeres of the first quartet are exceptionally large. Gastrulation is by epiboly.

C. Rate of Development: Development is relatively rapid. Gerould (1907) obtained rotating embryos 10 hours after insemination; by 24 hours the trochophores were fully formed, and at 48 to 60 hours after fertilization metamorphosis occurred. The temperature was not recorded.

D. Later Stages of Development and Metamorphosis: The young trochophore is spherical and has a long apical tuft and a very wide prototroch. By 48 hours the digestive tract is well developed, two eyespots are present, and the pre-oral band of long cilia is conspicuous. At metamorphosis, the yolk membrane is cast off and the body elongates. Figures of larval stages may be found in two papers by Gerould (1903, 1907).

REFERENCES:

- GEROULD, J. H., 1903. Studies on the embryology of the Sipunculidae. I. The embryonal envelope and its homologue. *Mark Anniv.* Vol., no. 22, pp. 437-452.
- GEROULD, J. H., 1907. The development of Phascolosoma. (Studies on the embryology of the Sipunculidae II.) *Zool. Jahrb., abt. Anat. u. Ontog.*, 23: 77-162.
- JUST, E. E., 1939. *Basic Methods for Experiments on Eggs of Marine Animals.* P. Blakiston's Son and Co., Inc., Philadelphia, p. 33.