

PLATYHELMINTHES

Hoploplana (formerly *Planocera*) *inquilina*

LIVING MATERIAL:

The adult polyclads are found inhabiting the mantle cavity of *Busycon canaliculatum* and may easily be dissected from the gill chambers. They are numerous in freshly caught specimens of *Busycon*, but the worms rapidly decrease in number if the snails are allowed to remain in the aquaria for a few days.

BREEDING SEASON: June to September.

PROCURING AND HANDLING MATERIAL:

If adult worms are placed in jars of fresh sea water through which an air current is allowed to bubble, they will soon deposit their eggs on the bottom or sides of the dish.

Surface (1907) warns that the eggs do not develop normally after experimental handling, although untreated eggs and larvae are easily reared in the laboratory.

NORMAL DEVELOPMENT:

A. Egg Characteristics: The eggs are deposited without any special orientation in tough, gelatinous, spiral capsules. Each capsule contains from 100 to 200 eggs, each of which is surrounded by a membrane. The eggs measure 100 microns in diameter and are densely granular with yolk. Fertilization is internal, although the eggs are still in the germinal vesicle stage when they are laid.

B. Cleavage and Gastrulation: Cleavage is unequal and spiral. It is peculiar in that, after giving off the fourth quartet of micromeres, the macromeres are very small and eventually degenerate. The fourth quartet of micromeres thus takes over the function of forming both endoderm and mesoderm. Gastrulation is by epiboly.

C. Time Table of Development: The first polar body is formed an hour after the eggs are laid; the second polar body and early cleavages follow at one-hour intervals. Gastrulation is completed by the end of the second day; rotation within the capsules occurs on the third day; eyes appear on the fourth day; contractility and the development of ciliated lobes can be observed during the fifth day; and on the sixth day, the larvae leave the capsules.

D. Later Stages of Development: The larva is of the type known as Müller's larva. It is oval in shape, bearing at its lower pole an ectodermal stomodeum which leads to an irregular, ciliated, endodermal sac. Eight ciliated lobes can be seen just below the equator, and at the aboral pole a plate of very small cells covers a mass of ganglion cells. The further metamorphosis of the larva has not been followed in this species, although Lang (1884) has described the later development of a Müller's larva of another genus.

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PLATYHELMINTHES

Polychoerus caudatus

LIVING MATERIAL:

This small orange-red flatworm is characterized by one or more filamentous tails between its two caudal lobes. It was formerly common on *Ulva* in Little Harbor at Woods Hole, and on the mud flats of Hadley Harbor (Mark, 1892). It disappeared from the Woods Hole region with the eel grass, but has since been found near the breakwater at Provincetown. A close relative, *Polychoerus carmelensis*, has been found in enormous numbers at Carmel Bay, on the coast of California (D. P. Costello and H. M. Costello, 1938).

BREEDING SEASON: June through August.

PROCURING AND HANDLING MATERIAL:

A. Care of Adults: After collection, the adults are placed in an aquarium through which sea water is gently flowing. The animals crawl about on the glass sides, or on *Ulva* placed in the water. Under these conditions, the adults may live for some weeks, but usually produce gametes only during the early part of this period.

B. Procuring Embryos: The following account is based on data for *Polychoerus carmelensis*, but probably applies equally well to *P. caudatus*.

The adults are hermaphroditic, and usually mate during the early morning hours (H. M. Costello and D. P. Costello, 1938). The sperm presumably pass from the anterior pocket of the vagina through the bursa, and fertilize the eggs while the latter are in the parenchyma. Egg-laying occurs by extrusion involving a disruption of the ventral body wall.

Deposition of the egg-masses usually occurs at sundown. These egg-masses are small gelatinous bodies containing from five to twenty eggs. They are fastened to the glass sides of the aquarium, or attached to *Ulva*. To collect egg-masses, it is convenient to remove 20 or 30 adults to fingerbowls of standing sea water on the sea water table. This sea water may be changed once or twice a day. Egg capsules are usually deposited on the side of the dish away from the light.

It is possible to dissect the fertilized eggs from the body, since they can be seen readily through the body wall, but their viability is not known. Past investigators have depended upon being present at the time of egg-laying to obtain the earliest developmental stages. The embryos are easily dissected from the gelatinous masses, but do not develop well after removal.

NORMAL DEVELOPMENT:

A. Egg Characteristics: The eggs originate in the *eilager*, which is situated just behind the statocyst. Two divergent streams of developing ova extend posteriorly toward the bursa. The full-grown oöcytes are found at the level of the bursa.

The egg is in the germinal vesicle stage when it is penetrated by a spermatozoon. This stimulus causes the egg to undergo its maturation division and to proceed to the metaphase of the first cleavage division, preceding egg-laying. The large "polar suns" of the first cleavage spindle may sometimes be seen through the body wall of a flattened animal.

After the eggs are laid, the polar bodies are not visible at the egg surface, and there is no marker for the animal pole. These unextruded polar bodies remain submerged in the egg cytoplasm, where they eventually degenerate.

The fixed eggs of *Polychoerus carmelensis* measure about 220 microns in diameter. Those of *Polychoerus caudatus* are probably about the same size, although Gardiner (1895) states that they measure 40 by 60 microns. The eggs lack a fertilization membrane, and contain flecks of red-yellow pigment. In the freshly-laid egg, these pigment granules extend throughout the cytoplasm except in the region of the amphiaster, which is thus outlined as an enormous dumb-bell. The pigment granules move along the cleavage furrows during division.

B. Cleavage and Gastrulation: Cleavage is total and, after the two-cell stage, unequal. According to Costello (1937, 1948) the cleavage is best described as spiral cleavage by duets, instead of by quartets. It was described earlier as bilateral. Gastrulation occurs by a curious pivoting type of epiboly. See the papers by Bresslau (1933) and Gardiner (1898) for figures of cleavage stages.

C. Later Stages of Development: *Polychoerus* has a direct development, and the embryo, when hatched from the egg mass, is a small worm with eyespots, and with typical caudal lobes.

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