

**EXTERNAL MORPHOLOGY AND EARLY DEVELOPMENT OF
*PLEUROBRANCHUS (OSCANIUS) SP. FROM GULF OF MANNAR***

In a dredge collection from the Gulf of Mannar at one and a half fathoms depth near the Central Marine Fisheries Research Institute at Mandapam Camp four numbers of a species of sea-slug under the genus *Pleurobranchus* Cuvier and subgenus *Oscanius* (Leach) (*vide* Thiele 1931) along with their egg ribbons were obtained on 25th December, 1960. To the best of our knowledge the form obtained has not so far been described, although Bergh (1905) in his Report on Opisthobranchiata of Siboga Expedition in Tafel II, Fig. 2, gives an almost identical form as *Oscanius* sp. Unfortunately the original specimen of the Siboga Expedition as also the notes thereof were lost as stated under the legend to the figure referred to above.

The largest specimen in the collection measured 12 cm. long, 8 cm. wide and 3.5 cm. high. It has an ample mantle extending as a thin fold on either side and also on the posterior region of the body (Plate I, Fig. A, B & C). Anteriorly the extension of the mantle is comparatively narrower and also notched in the middle above the head wherefrom a pair of moderately long soft tentacles arises. The foot, like the

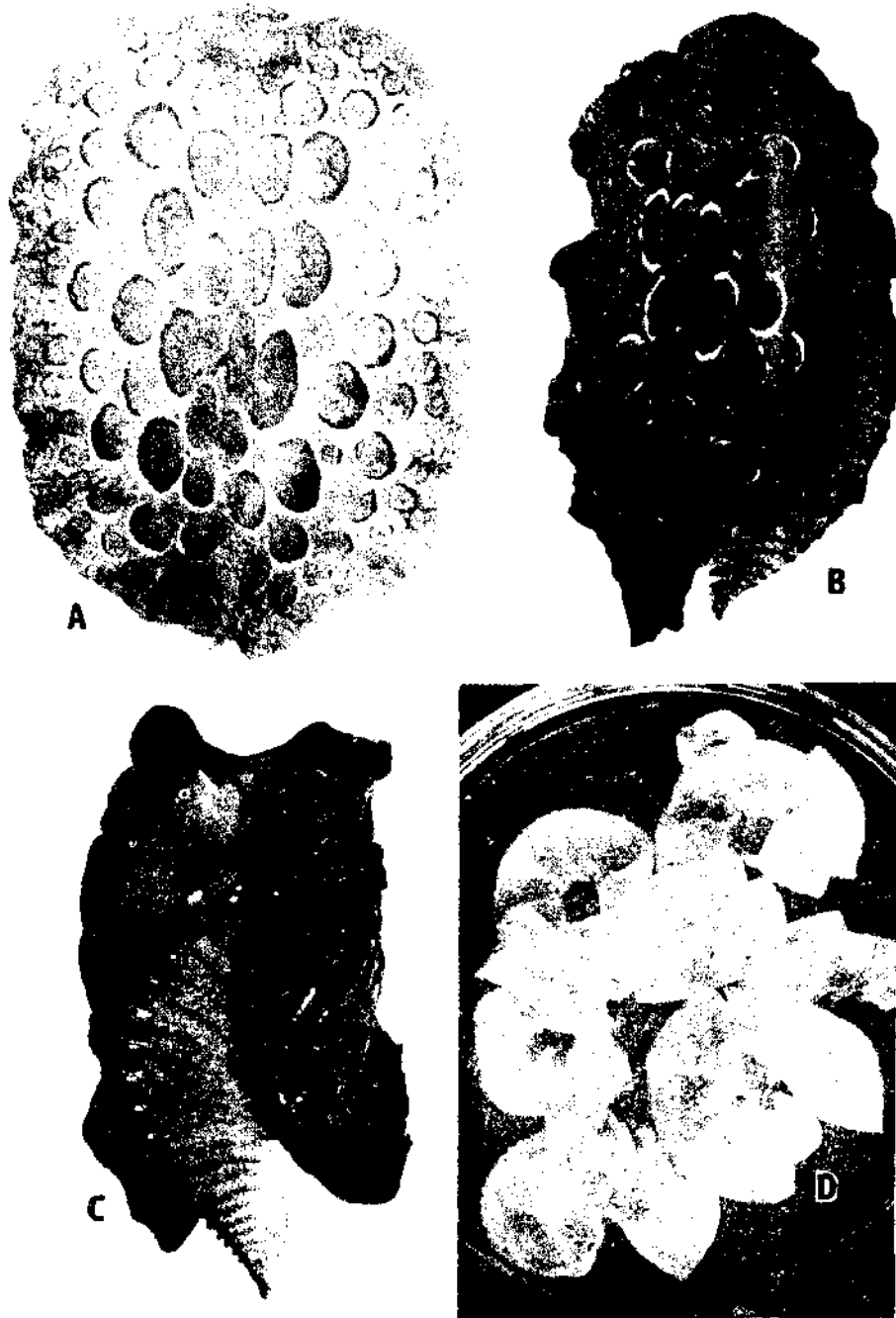


PLATE I. *Pleurobranchus (Oscanus)* sp. A. Dorsal view of lightly coloured specimen $\times \frac{1}{3}$. B. Dorsal view of darkly coloured specimen showing also the ctenidium. $\times \frac{1}{3}$. C. Side view of the animal showing the mantle, foot and the ctenidium. $\times \frac{1}{3}$. D. Freshly laid spawn. $\times \frac{1}{3}$.

mantle, is large. It is flat and more or less oval. At the mid-posterior region on its surface, when viewed ventrally, there is an oval patch of a lighter colouration than the surrounding region denoting the position of the pedal gland as in other members of the genus. About one-third the length of the body from the anterior end the ctenidium arises on the right side close behind the genital orifices (Plate I, Fig. C). Posteriorly it extends slightly behind the region of the mantle.

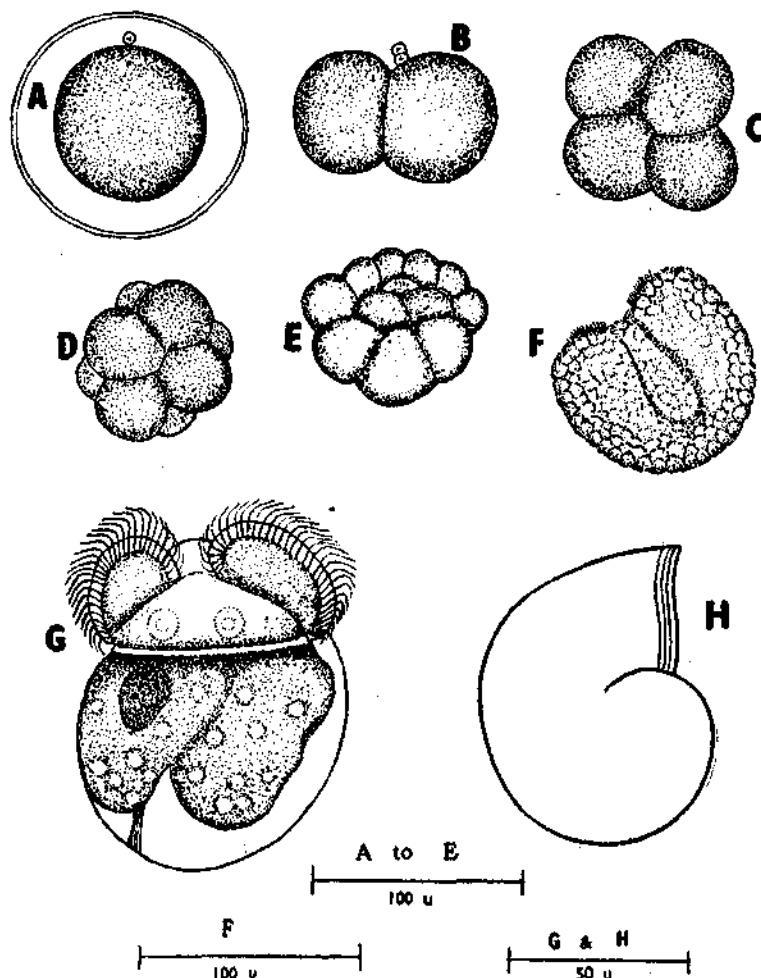


FIG. 1. Early developmental stages of *Pleurobranchus (Oscanus)* sp.
A. Egg enclosed in the capsule before cleavage. B. Two-cell stage. C. Four-cell stage.
D. Eight-cell stage. E. Formation of blastula. F. Gastrula. G. Veliger. H. Larval shell.

The mantle presents dorsally a finely tuberculated and tessellated appearance and bears a number of close set conspicuous oval or roundish markings. These are very large and mostly oval in the middle region and much smaller and circular in outline on the periphery of the mantle. Each of these markings, particularly the larger ones, has for its border a darker hue immediately followed by a whitish or light yellowish region like a halo. The markings on the mantle described here appear to

be very characteristic of the species and they are exactly similar to the ones noticeable in the figure given by Bergh (1905).

The general colouration of the dorsal surface of the mantle, ctenidium and the foot appears to vary widely in different individuals. Of the four specimens in the collection the ground colour in two was yellowish brown, in one it was of a deep pinkish hue and in the fourth a combination of yellow, brown and pink. The under surface of the mantle and the sides of the body are more or less pale white. The animal appears to change its ground colour possibly in relation to change in environment. The colouration along the border of the markings is invariably of a darker hue as stated above ranging from deep brown to greyish black. The ground colour of the original form as shown in Bergh's figure is deep orange yellow. The foot in the mid-posterior region is shown in his figure as having a deep cleft. If the present form is identical with the one figured by Bergh the cleft shown by him in the foot is possibly a mutilation which is not found in the specimens examined by us.

Embedded in the skin are numerous rod-shaped spicules.

The freshly laid spawn (Plate I, Fig. D) attached to the weeds and obtained in the dredge along with the adult specimens was gelatinous, ribbon-shaped and spirally twisted with the different whorls resting on the same plane. The largest of the spawn measured about 40 cm. long, 4 cm. wide and 2 mm. thick. The edges of the ribbon were parallel to each other while its surface within the whorls had undulations presenting a flower-like appearance when found on weeds and remaining in water undisturbed. On close examination, each ribbon revealed a large number of minute eggs arranged in parallel oblique rows. They were over a million in number in a moderately long ribbon.

As the entire ribbon being large, was found unwieldy for tracing the developmental stages, strips about a cm. long were separated from it and placed in finger-bowls containing aerated sea water which was frequently changed. Smaller bits of these pieces were carefully removed at intervals to study the course of development.

The eggs were spherical, whitish and laden with yolk, each measuring 75μ in diameter and enclosed in a separate double-walled transparent capsule of 120μ in diameter (Fig. 1, A). The space between the egg and the capsular membrane is filled with a transparent, colourless, albuminous fluid as in other species of *Opisthobranchs*. At first when the eggs were examined they did not show any cleavage but they had extruded one or two polar bodies. About 3 hours later the first cleavage took place in a vertical plane dividing the egg into two equal halves (Fig. 1, B). This was followed by a second cleavage in the same plane resulting in four cells (Fig. 1, C). In about six and a quarter hours after the extrusion of the polar bodies a stage had reached with four large and four other small cells (Fig. 1, D). Subsequent cleavages took place in rapid succession and in about twelve hours the embryo reached the blastula stage. This was followed by gastrulation which was completed by about twenty-nine hours. The gastrula (Fig. 1, F) with finely developed cilia began to rotate within the capsule and measured 85μ across. Further development led to the formation of the veliger with a conspicuous shell enclosing the soft body with prominent velar lobes, foot, digestive, excretory and sensory organs (Fig. 1, G). Close beneath the foot was seen the operculum. A pair of statocysts with a single statolith in each was clearly visible beneath the region of the velar lobes through the transparent tissues. The mouth, oesophagus, stomach and intestine were well developed. The liver lobes were prominent. There was a pink coloured excretory organ towards the

anterior right region, on account of which the entire ribbon with the developing embryo inside at this stage had assumed a pale pink colouration. Thorson (1946) observed in *Philine scabra* Muller a similar excretory organ, carmine in embryos and jet black in the pelagic larvae. In general, most of the tectibranch larvae in their free swimming stages possess a large black excretory organ. Several hours later the veligers were liberated from the capsule but they were without eyes. They measured each 105μ along the long axis and their shells presented near the aperture a few parallel striations (Fig. 1, H). Further stages could not be obtained as they were quickly attacked by ciliates.

A detailed systematic study of the present form is being attempted.

Our sincere thanks are due to Dr. S. Jones, Director, for the keen interest he has shown in the preparation of this note, to Shri S. Mahadevan who collected the materials and for having placed them at our disposal and to Shri P. R. S. Tampi of the Central Marine Fisheries Research Institute for taking the photographs.

Central Marine Fisheries Research Institute,
Mandapam Camp.

K. VIRABHADRA RAO
K. ALAGARSWAMI

REFERENCES

- ALLAN, J. 1950. *Australian shells*. Australiana Society, Georgian House, Melbourne : 206-209.
- BERGH, R. 1905. *Siboga-Expedite*, 50 : 1-248.
- THIELE, J. 1931. *Handbuch der systematischen Weichtierkunde*. Jena, Gustav Fischer. Bd. 1 : 418-419.
- THOMPSON, T. E. AND D. J. SLINN. 1959. *J. Mar. biol. Ass., U.K.*, 38 : 507-524.
- THORSON, G. 1946. Meddelelser Fra Kommissionen For Danmarks Fiskeri—Og Havundersøgelser, København. Bd., 4: 258-260.