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**Some Morphological Features of Pearl-Sac Tissues in
Relation to the Normal and Abnormal Pearl
Production in the Pearl-Oyster
(*Pinctada martensii*)¹⁾**

By

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(With 4 Text-figures)

In the artificial pearl cultivation of the Japanese pearl oyster (*Pinctada martensii*), the production of abnormal-shaped pearls is frequent: periostracal pearl (Fig. 1,c) and prismatic pearl (Fig. 1,b) are of common occurrence as abnormal pearls. They are valueless from the commercial point of view.

Recent studies into the histological features of the pearl-sac tissue of the cultured pearl (Ojima and Watanabe 1953, Kawakami 1952), have revealed that the pearl-sac tissue is a derivative from the transplanted mantle epithelium, and that the regular pearl-sac epithelium which is related to the production of the normal pearly layer is flat and simple in structure.

The present paper describes the results of a preliminary study of the morphology of the pearl-sac tissue with particular regard to normal and abnormal pearl production. The irregular pearls dealt with in this study are prismatic and periostracal pearls.

The samples for study were obtained from the pearl fishery ground in Ago Bay in November and December, 1955. The study was carried out using paraffin sections, with the material fixed in buffered formalin (pH. 7.0), Formol-Zenker, and some other specimens, stained with haematoxylin-eosin.

Observations

(1) *Pearl-sac epithelium which produced normal pearls* (Fig. 2): The pearl-sac embracing the pearl of regular appearance consists of a simple epithelium; the epithelial cells form a flat, or sometimes cuboidal layer. Free surface of each epithelial cell assumes a compact appearance. The nucleus is seen situated in the central area of each cell. The epithelial cell layer varies in thickness from 2 to 10 μ . There are occurrences of granular amoebocytes and vacuolized cells in the epithelial layer.

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(2) *Prismatic pearls* (Fig. 3): The pearl-sac containing prismatic pearls is also provided with a simple epithelial tissue, but its cells are longer in shape than those of the normal type. The thickness of the epithelial layer varies from

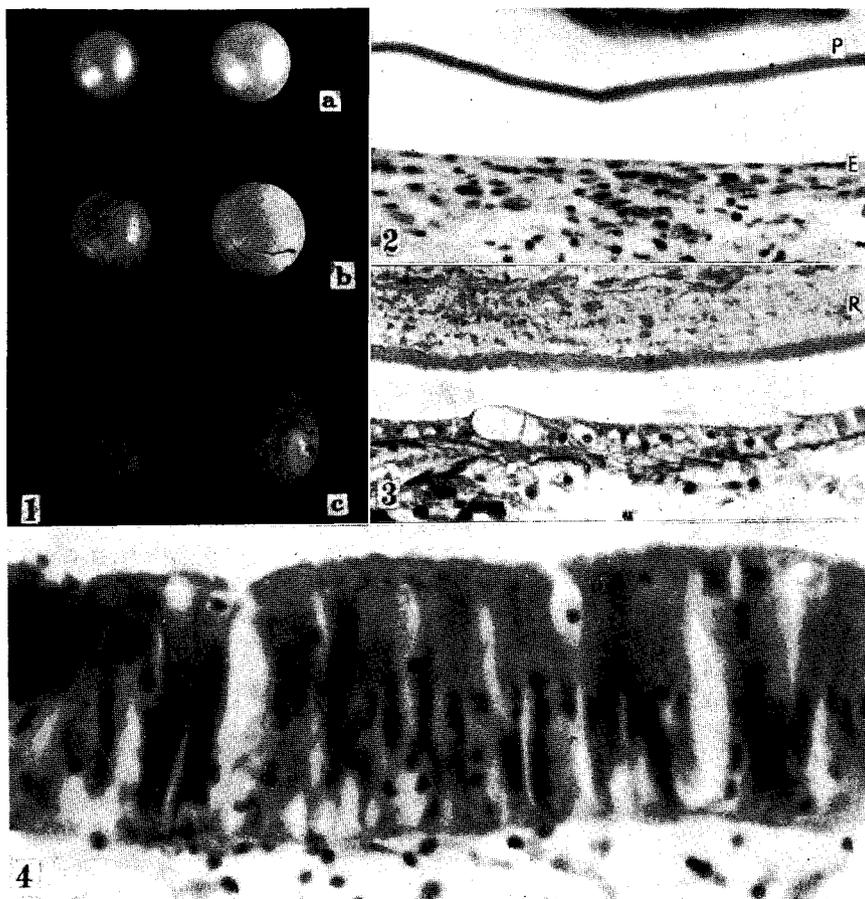


Fig. 1. 2 \times . a, normal pearl. b, prismatic pearl. c, periostracal pearl.

Fig. 2. 360 \times . Photomicrograph showing the pearl-sac of a normal pearl. E, epithelium. P, pearly layer. Fixed with formol-Zenker, decalcified with 5% trichloroacetic acid, and stained with haematoxylin-eosin.

Fig. 3. 360 \times . Pearl-sac of a prismatic pearl. E, epithelium. R, prismatic layer. Fixed with buffered formalin, decalcified with 5% trichloroacetic acid, and stained with haematoxylin-eosin.

Fig. 4. 480 \times . Showing the pearl-sac epithelium which produced periostracal pearl. Fixed with buffered formalin and stained with haematoxylin-eosin.

10 to 20 μ . Free surface of each epithelial cell is rough in contour. Vacuolized cells occur abundantly in the epithelium.

(3) *Periostracal pearls* (Fig. 4): The pearl-sac containing periostracal pearls is characterized by a simple columnar epithelium. Many granules stained red with eosin are seen distributed between the free surface and the nucleus of each cell. Vacuolized cells are entirely non-occurrent, but amoebocytes are frequently observable among them. Remarkable it is that the epithelial cells of this type are tallest in shape among the three types, being 80 μ in thickness. The free surface of each epithelial cell offers a rough contour with granular cytoplasmic structure.

Remarks

Histological investigations of pearls have indicated that the pearl sac tissue generally appears around growing pearls. It has been shown in this study that there are two types of abnormal pearls, and that the pearl sacs which have to do with the formation of abnormal pearls differ in structure between the two abnormal types, as well as from that of the normal type.

Kawakami (1952) has reported that the secretion activity of the pearl-sac is alternative in the early stage. As a rule the epithelium secretes the substances forming the periostracal, prismatic and nacreous layer in the order named. The results of the present study have indicated that the completed pearl sacs connected with the formation of normal and abnormal pearls correspond in structural features to those reported by Kawakami (1952) for the early stage material; her views are strongly supported.

In view of the above facts it is evident that there is a close correlation between the histological structure of the pearl-sac and its function. Further it seems probable that the pearl-sac may be structurally changeable between the normal pearl and the abnormal one.

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