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Inhalt:

I. Wissenschaftliche Mitteilungen.

1. Water Pores of Bullia digitalis.

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(Zoological Department of the South African College, Cape Town.)

(Whit 3 figures.)

eingeg. 31. Oktober 1910.

Bullia digitalis, one of the Nassidae, is found abundantly on the shores of Muizenberg in False Bay. Like certain species of the Naticidae and some Lamellibranchs, it is possessed of an aquiferous system. This Gastropod has a large flat foot, and when it is picked up or touched the foot is retracted into the shell, and at the same time jets of water are shot out from the foot. Some forms however will not eject the water even when considerably irritated. The water issues with considerable force and may be ejected to a distance of three or four feet. There are four such jets of water, and the pores are situated close to the pedal tentacles. Two of these tentacles are placed anteriorly, one on each side, at the lateral margin of the broad foot. They are about $^1/_4$″ in length, and project outwards and backwards. The other

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two are close together at the posterior margin of the foot; they project backwards and are usually slightly longer than the anterior tentacles. The position of these tentacles is indicated in Fig. 1. The anterior pores are situated in the groove just posterior to the bases of the anterior pedal tentacles; the posterior pores are on the inside of the bases of the posterior tentacles. In many cases there are two projecting papillae on the inside of the base of the posterior tentacles, and the pores are near the apices of these papillae. Sometimes the two posterior pores are so close together that the two jets of water merge into one, and it appears as if there were only one pore. These pores are not visible from the exterior, even when examined with a lens, and are only seen when water is artificially injected through them. The quantity of water which is ejected by the animal often equals as much as two to three centimetres.

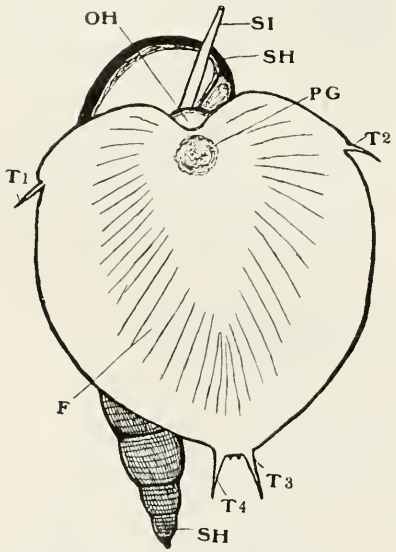

Fig. 1. Ventral view of animal showing position of the pedal tentacles on the foot. T_1, T_2, T_3, T_4, pedal tentacles; *SH*, shell; *SI*, siphon; *OH*, oval hood; *PG*, pedal gland; *F*, foot.

Owing to the highly contractile foot of these animals, it was very difficult to obtain them killed in the fully expanded state for section cutting. The best expanded specimens were obtained by use of cocaine, added gradually until the animals were fully narcotised, and then placing in corrosive sublimate. The sections were cut by the parrafin method, and haematoxylin used as the stain. The first series of sections of the anterior tentacular regions of the foot, cut in transverse, horizontal and vertical planes, showed in all cases a slight indentation of the ectoderm at the point were it was expected that the pore would be situated, but in no case was there a definite break in the epithelium to show communication with the interior of the foot. It was therefore concluded that the muscular contraction of the foot had been too great, and that the pores had become closed up. This conclusion was rendered more likely by the fact that in no cases had the animals when dead shown the full expansion of the foot. For this reason, before cutting the next series of sections, an injection was made into the anterior region of the foot. This was found to issue at the two posterior pores at the inner base of the two posterior tentacles. Again an injection was

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made at posterior end of the foot, and the water was found to issue at the two anterior lateral pores just behind the base of the lateral pedal tentacles. These experiments were repeated several times on different specimens and the same results obtained each time. After squirting water gently through these anterior and posterior pores the syringe was filled with a 10 % solution of formalin, and this was passed through the pores for some time, in order to fix the opening in an expanded state, the material being at the same time dipped in corrosive sublimate. A second series of sections of anterior and posterior pores was then made in all three planes as before, and it was found that the inpushings of the ectoderm had at their base a definite opening. There is only a short invagination of the ectoderm, opening abruptly into large space in the foot (Fig. 2 and 3). This foot cavity is bounded by no definite epithelial wall, but by muscular tissue, and there are numerous muscular strands connecting floor and roof, and dividing the cavity up into a number of spaces. The disposition of the muscular strands is readily seen by cutting a thin tangential section of a portion of the foot. These strands

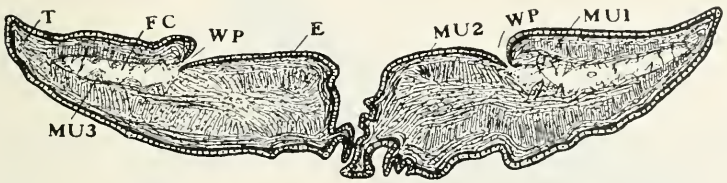

Fig. 2. A section in posterior region of foot showing pores leading into foot cavity. *WP*, water pore; *E*, epithelium; *FC*, foot cavity; *T*, base of tentacle; MU_1, MU_2, MU_3, muscle layers.

are in three groups, one group in the longitudinal plane, and the other two at right angles to one another, and obliquely to the longitudinal group, giving the whole a network-like appearance. It is seen in some of the sections that well marked muscular bands are attached to the inturned epithelium at the pores, and these are probably of the nature of sphincters for closing the pores.

These aquiferous spaces are completely separated from the circulatory apparatus, and when filled with water serve to distend the foot in the action of crawling and burrowing in the sand, while, when the water is out of the foot, it is readily withdrawn into the shell.

Some of the habits of the animal are noteworthy in this connection. At high tide it remains buried in the sand, but at low tide it comes out to feed, and, in the summer months, large numbers may be seen crawling about in the moist sand. A common article of diet is the polypes of *Physalia*, which are washed up on the beach in immense quantities

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in the summer months after the strong south east winds. It also feeds on small Crustaceae and Medusae, which it appears to catch, when covered by the water of the incoming tide, by entrapping them by the rapid motion of a muscular fold in the anterior region. This muscular fold is also used rather like a shovel in burrowing. In crawling along the sand the anterior lateral portions of the foot move together like wings, and, as they are pushed back, the anterior and posterior pedal tentacles are pushed into the sand. These tentacles then appear to assist in obtaining a grip of the ground, so that the animal may push itself along. They are not steering organs as has been suggested. When picked up by the shell it does not immediately retract, unless the foot or some protruded part is touched, but first attempts to remove the ob-

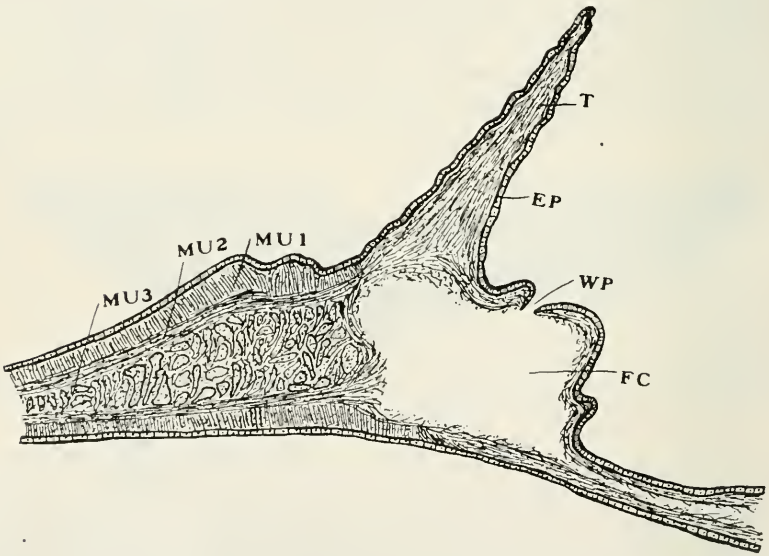

Fig. 3. A section in anterior lateral region of foot, showing pedal tentacle and pore leading into foot cavity. *WP*, water pore; *FC*, foot cavity; *T*, tentacle; *EP*, epithelium; MU_1, MU_2, MU_3, muscle layers.

ject holding the shell. This it does by gritting the serrated operculum, situated on the dorsal surface of the foot, against the object. At the same time it endeavours to bite by means of the mandibles of the mouth. The head tentacles are situated laterally just in front of the siphon. They are sensitive but without eyes. The osphradium is large and pectinated. Their sense of smell is well developed, as is evidenced by the fact that, when feeding on the polypes of *Physalia*, they readily find them again, even when waves wash them behind obstructions.

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The smooth polished shell is oblong ovate, yellowish white banded with light brown. The spire is conical and there are usually 6 or 7 whorls. Shell approximately $1^1/_2$″ long and $^3/_4$″ broad at base. The shell is often coloured green owing to the presence of unicellular blue-green Algae or Cyanophyceae which resemble Chroococcus. The expanded foot is white and nearly circular, though a little longer than it is broad. The operculum is thin, yellow and corneous, irregularly triangular and smaller than the aperture of the shell. It is serrated with three or four projecting cusps on each side. In the median ventral line anteriorly is a large pedal gland which secretes abundant mucous.

This work was undertaken at the suggestion and with the kind assistance of Dr. J. D. F. Gilchrist, Professor of Zoology at the South African College.

2. Skorpiologische Beiträge[1].

Von A. Birula.

Kustos am Zoologischen Museum der Kais. Akademie der Wissenschaften in St. Petersburg.

eingeg. 1. November 1910.

7. *Psammobuthus* gen. nov.

(Fam. Buthidae).

Cephalothorax ohne deutliche Cristenbildung; Truncus einkielig oder undeutlich dreikielig; Unterrand des unbeweglichen Mandibularfingers mit einem Zahn; Protarsus der sämtlichen Beinpaare flach und erweitert; 5. Caudalsegment unten mit einem mittleren Längskiele versehen; beide hinteren Beinpaare mit Tibialspornen bewaffnet; Tarsalsporne auf allen Beinen einfach (d. h. nicht zweispitzig); Fußsohle der Tarsen beborstet; Klauen bogenförmig; Klauenlobus kurz.

8. *Psammobuthus zarudnyi* sp. nov.

Färbung: Der ganze Körper nebst sämtlichen Extremitäten ist sandgelb oder bräunlichgelb; der Augenhügel und die Seitenaugen sind schwarz; beide Stirnhügel vom Augenhügel bis zum Vorderrande, ein Querfleck hinter dem Augenhügel und je ein Querstreifen beiderseits am Hinterrande des Cephalothorax sind bräunlichschwarz verdunkelt, die Palpen an den Oberrändern des Humerus und am Vorder(Innen)-rande des Brachiums, sowie die Femora des 2. und 3. Beinpaares am Vorder- und Hinterrande sind mehr oder weniger geschwärzt; der Schwanz ist besonders auf den hinteren Segmenten mehr oder weniger rötlichbraun gefärbt; basal ist jedes Segment desselben unten und oben

[1] Zool. Anz. Bd. XXXIV. Nr. 11/12. 1909. S. 356.

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