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**Inhalt:**



## I. Wissenschaftliche Mitteilungen.

### 1. The habits of a few Solenogastres.

By Harold Heath, Stanford University, Calif., U. S. A., Department of Zoology.

eingeg. 1. Februar 1904.

As is generally known the solenogastres constitute a group of organisms that have had a varied experience since coming to the attention of the zoologist more than half a century ago. At first they were considered to be gephyrean worms. Later they were believed to hold a position between the worms and molluscs, and at the present time some cling to this idea; but now the greater number of zoologists look upon them as members of the molluscan phylum though their exact position is still the subject of a lively controversy. Apparently the more generally accepted and best supported view is that they are most closely related to the chitons.

Generally speaking their habitat is the bottom of the sea between 15 and 1200 fathoms depth; and various dredging expeditions have shown them to be fairly common and of wide distribution. At the

present time upwards of 50 species are known chiefly from the waters north and south of Europe and the East Indian Archipelago. These species constitute two families, the Chaetodermatidae and the Neomenidae. The members of the last group are, in some respects at least, the more primitive and are readily recognized by the ventral furrow extending the length of the body and containing the rudimentary foot. Unlike the Chaetodermatidae they rarely burrow in the mud but crawl about on hydroid colonies or alcyonarian corals and occasionally on plants and some species of actinians.

The presence of these molluscs under such circumstances has been variously explained. Some consider that as a general thing it is a case of commensalism; others that the mollusc is a parasite and support their belief by those cases that are known to exist where the alimentary canal contained nettle cells and in one case (*Proneomenia Sluiteri*) a bit of *Alcyonium*. On the other hand the presence of diatoms in some of these same species indicates that they are not strictly parasitic. Furthermore those forms living on the eel grass (*Zostera*) are probably not commensals nor parasites, the presence here, and in several other cases, of a well developed radula indicating predatory habits. As the matter now stands these forms are very difficult to observe and our knowledge of their mode of life is still in such an imperfect state that one is not justified in making sweeping statements.

The U. S. Fish Commission steamer Albatross in her explorations about the Hawaiian Islands during 1902 brought up several species of solenogastres attached to hydroids or corals but in these cases there was nothing whatever to show that they were parasitic in their habits. The coelenterate host had in every case been preserved with great care and the most attentive examination failed to show any signs of mutilation. The finely granular contents of the alimentary canal of the mollusc also gave no definite evidence. However in one specimen belonging to the genus *Neomenia* definite proof is at hand to show that this species at least is parasitic. It was closely wrapped about a polyp of *Epizoanthus* or some closely related genus and subsequent examination showed that its proboscis had penetrated the body wall of its host and had removed some of the internal structures whose remains were present in abundance in the stomach. In this species well developed ventral salivary glands are present and in this particular specimen they opened at the free end of the fully extended proboscis and, in the absence of a radula, probably produced some secretion that exercised a solvent action on its prey.

As an aside it is interesting to note that some have considered the finger-shaped processes or cirri on the inner buccal wall to be not only

sensory structures but to aid in drawing food into the mouth. In the present case however only the proboscis was pushed into the anemone and under such circumstances the cirri can be of no service whatever in the collection of food. In one specimen of *Rhopalomenia* in my possession the cirri project some distance through the mouth opening and rather support the view that these organs are sensory entirely, enabling the animal to determine the presence of food or the nature of its surroundings.

During the past summer while acting as naturalist on board the Stmr. Albatross in the waters of Alaska, I had the opportunity of observing the habits of two species of solenogastres. The first belonging to the genus *Chaetoderma* was comparatively abundant in the tenacious glacial mud at a depth of about 300 fathoms and several specimens lived for several days in captivity. A tall jar was nearly filled with mud and immersed in a larger aquarium into which a stream of water was continually running. The specimens were the placed on the surface of the ooze and within a short time they commenced to burrow. This was accomplished almost entirely by movements of the prothorax essentially like those of the front end of an earthworm when in the act of burrowing. The operation was initiated by decreasing the calibre of the prothorax as much as possible whereupon it was pushed into the mud and then expanded to twice the minimum diameter. Judging from two specimens carefully observed the process occupied about 15 seconds and was at once repeated. With some other specimens it was much slower due perhaps to rough handling in the dredge. One individual, about 41 mm in length, disappeared from view in one hour and twelve minutes; another of about the same size vanished thirty-two minutes later; while others required all the way from three to nine hours.

In these movements the anterior third of the prothorax is the most active, often swelling to twice the greatest diameter of the remainder of the prothorax. At this time its trumpet-shaped appearance almost exactly duplicates the familiar drawing of *Chaetoderma nitidulum* by von Graff. While the extreme front end of the animal is thus most active in the excavation process the remaining parts of the prothorax also take a part. The same is true of the body proper. It is not passivly dragged into the opening but is forced in by slow vermicular or peristaltic movements that travel the entire length of the animal.

Some of the specimens, generally the weaker, excavated relatively short tunnels from which they extended the posterior end of the body with the gills expanded. The more active individuals tunneled much more extensively; in fact some of them appeared to be at work contin-

ually until at the end of a week's time there was a perfect meshwork of burrows in view through the glass that had been kept darkened. These passageways rarely descended more than 7 cm from the surface. Sooner or later the outer openings of some of the burrows became covered over with debris and some I purposely closed. They were never reopened, the water of the burrow apparently containing sufficient oxygen, nor did the animal so far as I know, ever appear upon the surface. At the end of two weeks time some of the specimens had died but the others were active and apparently in a normal condition; at all events the forward end of the alimentary canal in some of the specimens that I have sectioned, contained food, undigested and apparently only recently captured.

The food of this species consists mainly of organic debris in which it is possible to recognize bits of plants, numbers of what appear to be vegetable spores and occasionally foraminifera, sponge spicules and other substances of unknown origin. In some specimens sponge spicules had made their way through the intestinal wall and were located in various parts of the body, in one instance in the brain itself. Some of the foraminifera, of the *Rotalia* type, had been taken in entire and their protoplasmic substance was still in a fair state of preservation. Many of the plant spores and other vegetable substances had likewise escaped comminution by the radula. On the other hand there were many pellets of organic matter, finely ground and apparently adhering together by means of mucus, that may have been subjected to the action of the radula, though it appears more probable that these substances had been collected by the lips and molded by them into a ball, the large tooth of the radula serving merely to carry the bolus back into the stomach-intestine.

Along with some of the above mentioned species of *Chaetoderma* were several specimens that undoubtedly must be considered as members of Thiele's proposed genus, *Prochaetoderma*. They are invested with a thin yet very rigid cuticle owing to the strongly developed spicules and were accordingly very sluggish in their movements. A few were placed on the surface of the mud in an aquarium and the first specimen disappeared from view in two hours and nine minutes; another in forty-one minutes more; while the others required from four to nine hours. Their method of excavation was essentially the same as in the foregoing species- chiefly by means of the prothorax assisted by slight movements of the body proper. In some cases they formed a relatively short tube of wide calibre communicating with the surface by the small opening through which they entered. The majority, however, formed tunnels immediately beneath the surface after the

habit of a mole. One of these burrows extended for a distance of over two feet and was being added to day by day. Here too the point of entrance into the burrow was obliterated and was never reopened. At times some of the individuals could be seen (through the glass that formed one side of their burrow) resting quietly with gills fully extended but the disturbance produced by the removal of the shade caused them to withdraw their gills slightly and commence once more the work of excavation.

This species of solenogastre has no ventral furrow and yet the radula is higly developed, being as long as the diameter of the body and consisting of powerful teeth. This latter character suggests predatory habits yet in all the individuals I have examined the alimentary canal was empty or filled with a finely granular coagulum.

## 2. Beschreibung neuer Reptilien aus den Gattungen Acanthosaura, Calotes, Gastropholis und Typhlops.

Von Dr. Franz Werner.

eingeg. 5. Februar 1904.

1. *Acanthosaura fruhstorferi.*

Nahe verwandt mit *A. hainanensis* Blngr., aber mit niedrigerem Kopf, weniger steilem Schnauzenprofil und längeren Gliedmaßen. Supraocular- und Interorbitalschuppen nicht größer als die auf der Schnauze. Der Supraciliarstachel ist beim ♀ kleiner als beim ♂, etwas kürzer als der vertikale Tympanumdurchmesser und dieser halb so lang als die Augenlidöffnung (nicht Orbitaldurchmesser). Der Nackenstachel ist ebenso lang als der supraciliare (♂), oder dreimal so lang (♀), sehr spitz kegelförmig und an der Basis von mehreren kleinen Stacheln umgeben. Nuchalkamm ebenfalls aus sehr spitzkegelförmigen Stacheln bestehend, von denen 7—8 so lang wie der einzelne (supratympanale) Nackenstachel sind, während der vorhergehende und folgende viel kleiner sind. Der niedrige Rückenkamm ist vom Nackenkamm deutlich getrennt und besteht aus dreieckigen, eine schwache Säge bildenden, seitlich kompressen Schuppen, die nach hinten an Größe etwas abnehmen. Die Schuppen an der Basis der Kämme sind nicht auffallend größer als die vergrößerten lateralen Rumpfschuppen. Die Kiele dieser letzteren laufen in eine deutliche, abstehende Spitze aus. Hinterbeine erreichen mit der Spitze der 4. Zehe den Vorderrand der Orbita oder die Schnauzenspitze (♀) oder reichen darüber hinaus (♂). Färbung ähnlich *A. hainanensis*. Kopf oben dunkelbraun, manchmal mit einem gelblichen, dunkel gesäumten Interorbitalband. Nackenzeichnung ganz wie bei der Hainan-Species; Ober-