ON ONCHIDELLA INDOLENS (Gould, 1852)

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Professor A. Remane - Kiel (Germany) working as guest of the
Oceanographic Institute, Sao Paulo (Prof. W. Besnard), at the station
of Cananéia (Dr. V. Sadowsky) in 1952, observed certain slugs on the
rocks in front of the station. Later (1954) Dr. S. Gerlach - Kiel
and we found the same animals at Itanhaém, Sao Vicente, and Ubatuba.
This "lema da pedra", as it is appropriately called by the people
of the coast, is Onchidella indolens (Gould 1852) that was dis-
covered by the United States Exploring Expedition on the Ilha do Pai
near Rio de Janeiro.

The Onchidiacea are marine or exceptionally terrestrial
euthyneurous Gastropoda with a lung and retractile tentacles
bearing eyes on their summit. They hatch from the egg capsules with
the external appearance of the adults. Until recently (Thiele 1931,
p. 485) they were included in the Pulmonata Stylommatophora.
After Fretter's morphological and embryological study (1945) however
this classification is no longer possible. The Onchidiacea should
be placed with the Opisthobranchia and "regarded as a small twig
from the base of the main stem" (Fretter 1945, p. 717) or as an
independent Order of the Euthyneura in Bottger's system (1952,
p. 267, 286-90) that abandons the conventional Subclasses Opistho-
branchia and Pulmonata.

A few weeks ago we sent some morphological remarks on Onchidella
indolens and another species, that A. Remane had collected on the
Canaries, to the Editor of the "Kieler Meeresforschungen", in the
12th volume of which they are due to be published. Shortly after Prof. W. Besnard invited us for a stay at the second Station of the Oceanographic Institute, 14 km west of Ubatuba, where the Head, Dr. E. Nonato, received us with most amiable hospitality.

In the course of 1954 we had with repeated efforts that were often in vain brought together 21 Onchidella indolens. This time we were delighted to see hundreds of these nice slugs on our first look at the boulders and rocks of granite and gneiss around the station at half past six in the morning of July 3, 1955. Also on the following days we found them grazing on the rocks at low tide. At high tide they are hidden.

The greater number of the slugs were 12-20 mm long, but many were still larger, to a maximum of 30 mm length when creeping, 15 mm breadth, and 7 mm height. Their colour varies independent of age; dark pigmented (Fig. 1) and lighter (Fig. 2) specimens were mingled without relation to the substratum, dark tufts of Phaeophyceae and Cyanophyceae or light stretches of rock. Also the foot varies from pure white over dirty white to grayish brown. We did not observe any colour change that was noted in Onchidium diarili and O. chameleon (Brettsch 1919, p. 303).

The texture of dry and wet slugs is different. The creeping or browsing, almost dry animals (Fig. 4, 5) are firm and smooth and high, and their perinotal glands are hardly marked. Animals at rest on the dry rock often contract their notum in paramedian lines so that the middle appears somewhat puffy (Fig. 3). When they were wetted with sea water (Fig. 7) they flattened and their notal and marginal glands were produced and gave the notum a prickly aspect.

The richly developed cutaneous muscles permit the slugs to fold and to wrinkle their notal epidermis. Such an enlargement of the respiratory surface might be biologically significant for the cutaneous respiration under water, while during the aerial phase pulmonary respiration in the damp atmosphere enables active life (Fretter 1943, p. 697-98).

In the first week of July 1955 small slugs (Fig. 6) of about 5 mm length were rare. From this fact together with Fretter's data for O. celtica (1943, p. 706) one might perhaps conclude that O. indolens also lays its eggs in the warm season. Onchidella celtica, the northern limit of which is the extreme south western coasts of England, and Onchidium verruculatum from Japan, Misaki, Sagami Bay (Hirasaka 1922, p. 171) pass through a period of very limited activity in winter (Arey & Crozier 1921, p. 453). Such a hibernation does not occur in Onchidella indolens and in O. floridana from the Bermudas and Florida.
EXPLANATION OF THE FIGURE

1 - Plain slate gray specimen.
2 - Brownish slug with light areas around the large notal glands.
3 - Reeling animal with parameedian contractions.
4 - Creeping slug.
5 - Grazing slug.
6 - Young specimen.
7 - Animal that has been moistened with sea water.
During our observation period in the beginning of July the water at the station was rather turbid and rich in sediments. The bottom seaward to the inhabited stones was partly muddy, and the sediments are probably present all the year round. Therefore the rocks are covered with a fine layer of mud that forms a dense felt with the algae. Borne in a letter called this facies "Steinschlick" and stressed its importance for O.indolens. This layer of mud with Phaeophyceae and Cyanophyceae contains also great quantities of Diatom. The station lies in a deep bay protected against the surf of the open Atlantic by an island with 350m high hills (Ilha dos Porcos of older maps, to-day Ilha Anchieta). Sheltered positions are also indicated for other species of Onchidella (Joyeux-Laffuie 1882, p. 236; Arey & Crozier 1921, p. 463; Beauchamp 1923, p. 499; Fretter 1943, p. 685). Nevertheless the rocks around the station are differently exposed to the force of the waves corresponding to the configuration of the shore line and their seaward or landward position. The development of the mud layer varies likewise. Where it is very thick, there are no O.indolens, either because the mud fills their hiding places, or they cannot creep because their mucous trail does not adhere to the smooth and soft ooze. On rocks however, that appear devoid of algae to the eye, we found slugs, so that the occurrence of diatom beds can be inferred. The browsing slugs (Fig. 5) lift the anterior border of the notum so that one sees the oral lobes grasping an alga that is rasped off and eaten. The mud, the "tongue" of Vaillant (1871; Joyeux-Laffuie 1882, p. 238) is not eaten but taken into the stomach in small quantities together with the food plants. Also chance animals were found in the contents of the alimentary tract; in one large slug there were 10 mites and 2 Littorinea. Dark blue Protura that are frequent on the rock exposed by the tide often run over the notum of the slugs without producing any visible reaction. The slugs generally browse in the middle barnacle zone. Previously we found them in the zone of Sabellaris of the genus Phragmatopoma. As for O.celtica the necessities of protection and moisture (Beauchamp 1923, p. 499) may be offered by different biotopes (Prenant 1932, p. 84). Also at the Oceanographic Station of Ubatuba O.indolens occurs lower down among Tetracilia and higher up between oysters. Ligveda exotica is generally found on other stones than O.indolens; these scurrying Isopoda have a much greater vertical range. Several times we saw O.indolens on boulders that are separated from the rocks by sand at low tide and by water at high tide.
That shows that they are occasionally washed off from their rock and thrown onto another stone. We have seen some out on the rock that were splashed by single higher waves of the receding tide. Such slugs may be dislodged from their substratum. We did not find O.indolens easy to lift from the stones. O.celtica and O.floridana are said to be feebly attached to the rock (Joyeux-Laffuie 1882, p. 237; Arey & Crozier 1921, p. 451, 458). The loosened slugs curl up like sea cradles, and it takes a rather long time, about 1 minute at 20° C, till they uncurl.

Some of the rocks had small tide pools of 7-20 cm diameter and 3-6 cm depth. If the slugs came into these on their walk or were put into them, they either crept out or remained squashed into a cleft or hidden under a prominence. When they leave their crevice or return to it they often go in single file. This is not due to furrows on the surface or special smoothness of the stone but to the often very narrow entrance of the hiding place. Outside the slugs show pronounced gregariousness. They have well developed eyes with lenses and groups of sensory cells, probably chemo- and tangoreceptors, on their tentacles and oral lobes. Possibly the mucous track helps them to find their hiding place. In Queensland "the surroundings of the nest of Orchidium verruculosum in pieces of dead coral showed a worn appearance, as though the slugs had wandered to and from their cavities" (Allan 1930, p. 366). At a distance of 8-10 cm from their crevice the animals scatter and grass like a flock of sheep on a hill, often in groups of two or three, but also singly on the periphery. The 20-100 slugs that have emerged from one cleft remain in an area of about 1.5 m around the hiding place. They can eventually mix with the inhabitants of another nest. A group of about 30 slugs that we had marked with a spot of fuchsine on the back dispersed later on and went to different holes. The homing habits of Orchidella floridana were studied by Arey & Crozier (1921) and are excellently summarized in the "Bronn" by Hoffmann (1928, p. 1210-1212).

The hiding places are in long and probably deep crevices, in which one cannot see the slugs except at the moment of their emerging. They are also inhabited by crabs that do not seem to interfere with the slugs. Some of the latter that were seen on stones without any crefts and surrounded by sand may have hidden in empty shells of Taxactis. Such was also observed on the Fumudin, for a biologically different, only 2,5 cm long (Arey & Crozier 1919, p. 163, note 4), species that creeps about when covered by the sea and shelters within dead barnacle shells and the like during low tide (Arey & Crozier 1921, p. 446). Under the stones of 20-30 cm
diameter lying beside inhabited boulders we did not find any slugs.
Eight specimens that we collected in November 1954 under several
stones had possibly been swept from their original lodgings.
Certain Ochridiaceae, e.g., Watsoniella lesliei (Stearns) occur
normally under stones (Steinbeck & Ricketts 1941, p. 220; 545).
Generalizing one can say: in the region inhabited by O.indolens
the slugs are outside their nest from one and a half hour before to
two hours after low tide. We assume that the oxygen entering with
the air into the cavity when the tide goes out stimulates the slugs.
The hiding places are dark or almost dark, and in them there will
only be diatoms washed in by the waves as available food. Therefore
the alarmed animals, if they are hungry, will leave their cleft.
According to the different depths of the holes they will take more
or less time to emerge. While they creep out they will be chiefly
directed by optic impressions; outside they probably depend upon
their statocysts and wander mostly farther up the rock to their
pasture-grounds. On their return they glide more continuously.
The slugs from one hole may already be coming home when those from
another are just leaving theirs. Probably differences in hunger
cause irregularities of going out. Joyeux-Laffuie (1882, p. 238)
has observed slugs remaining in a nest from which others had
emerged. The different depth of the cavities, their height in
relation to the tide, and their position towards the wind are
further causes for varying exits of the slugs. For example the
animals from a higher cleft in a farther seaward stone may be out,
while those from a landward deeper cave are not yet visible.
If these appear later, they would be neither satiated nor dried
when the tide turns and reaches them. Under such instances they may
be washed into the water, where they can save themselves if they
happen to come under stones, as certain other slugs that we had
found last year.
When it is windy or rains, only single, probably very hungry
slugs emerge, generally not the largest specimens, and stay where
they are protected against the wind. As wind dries them, and rain
is a hypotonic liquid, the negative response to wind and rain are
biologically significant. After Joyeux-Laffuie (1882, p. 246) the
caride of O.celtica is dissolved by fresh water. Negative ammo-
taxis is reported for O.celtica, O.floridana, and Ochridium
verruculatum (Fretter 1943, p. 685; Arey & Crozier 1921, p. 430).
We observed the negative influence of wind alone, without rain, but
had no opportunity to watch the behaviour of the animals on rainy,
calm days.
With Joyeux-Laffuie (1882, p. 237-8) we think that drying is
the main reason for return, be it the drying of the wall of the lung cavity or that of the sole or of the pasture. The slugs do not avoid sun nor react to the sudden shadow of the observer. But if they have been exposed to plain sun for a time, f. ex., a middle-sized slug for 20 minutes, it moves rapidly away from the sun. Larger slugs, that have a relatively smaller evaporating surface, bear exposure to sun for a longer time. With other species it is different, Mostoniella leslei, f. ex., must be "strong and tough for they were in the high rocks, fairly dry and exposed to the killing sun" (Steinbeck & Ricketts 1941, p. 226).

RESUMO
A "lesma da pedra", Ochidilla indelens (Gould, 1865), descrita da Ilha do Pai, perto do Rio de Janeiro, e, em 1952-54, verificada em várias localidades da costa de São Paulo, foi encontrada, em julho de 1956, em centenas, nas rochas situadas defronte à "Base Norte" do Instituto Oceanográfico, 16 km ao oeste de Ubatuba. Essas lesmas comem Diatomées e outras algas encravadas na película de sedimentos que recobre as pedras. Sobram estas deslizam durante a veraneio, fora d'água, respirando ar atmoicos por meio da sua cavidade pulmonar. Antes de voltar a maré, as lesmas se escondem em fendas das rochas, onde permanecem durante a enchente. Debaixo d'água, a respiração é cutânea. Nos dias ventosos não saem dos seus ninhos.

Sistemáticamente, não são mais incluídas nas Palamonata Stylostomata, mas consideradas como pertencentes a uma Ordem especial, seja dos Opisthobranchia ou seja, para que se prefira exprimir essa Subclasse dos Cestropoda, dos Ruthennina.

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