

A NEW PERITRICHOUS CILIATE AS A SYMPHORIONT ON A TARDIGRADE

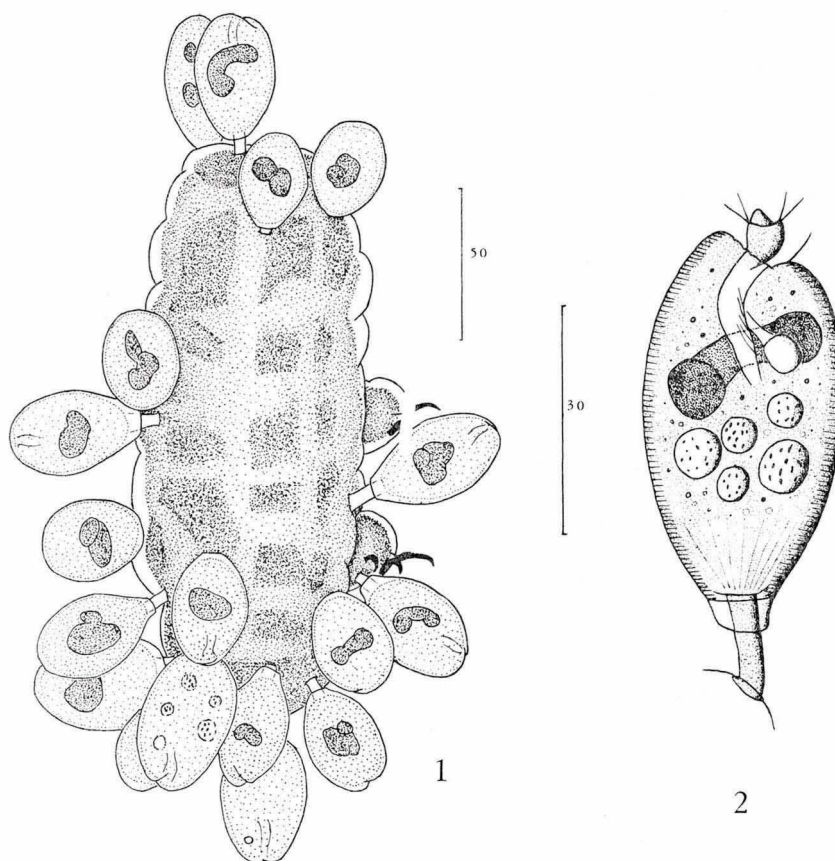
by

J. VAN DER LAND

Rijksmuseum van Natuurlijke Historie, Leiden

INTRODUCTION

On 24 September 1962 a number of Tardigrada was obtained from a sample of lichens from the French Alps. The lichens had been collected



Figs. 1, 2. *Pyxidium tardigradum* n. sp. on *Hypsibius oberhaeuseri* (Doy.).

on 27 June 1961 from a rock in the department Haute Savoie and had been preserved in a dry condition for nearly fifteen months. After washing, living specimens of three different species of Tardigrada (*Hypsibius oberhaeuseri* (Doyère), *Macrobiotus hufelandii* Schultze and *Echiniscus* spec. were found, together with some eggs of *Hypsibius oberhaeuseri* and *Macrobiotus hufelandii*, a small number of Rotatoria and some dead Oribatid Acari. About twenty Protozoa appeared to be attached to one of the specimens of *Hypsibius oberhaeuseri* (fig. 1). It was thought of interest to study these protozoan symphorionts.

OBSERVATIONS

At first the identity of the epizoa could not be determined as they were contracted and in an inactive state. Only nuclei were visible in the cells. The Tardigrade to which these Protozoa were attached, at first was alive; the foremost part of its body was contracted, but the legs moved. The animal was kept in the cavity of a slide partly covered by a cover-glass. The cover-glass was glued to the slide so that it could be placed vertically in a glass-tube with water. This is an easy way to keep such open slides for several days, while the object can be studied regularly, even with oil immersion.

After one day the Tardigrade did not move any more but in one of the Protozoa a pulsating contractile-vacuole could be seen. A day later contractile-vacuoles were visible in three or four specimens and two specimens even showed food-vacuoles. The macronuclei had become invisible in these specimens. During parts of this and the next day the animals were feeding, so that the extended disc and the rows of beating cilia could be seen (fig. 2). It is to be regretted that this action was not repeated later on and that the other animals showed no activity at all. Perhaps they were already dead; this seems the more likely as some of them showed a deformed nucleus. Surprisingly enough no Protozoa were found on any of the other animals at all.

The Protozoa appeared to belong to a hitherto unknown species of the Peritrichous genus *Pyxidium* (family Epistylidae), a diagnosis of which will be given below.

When the frontal disc was stretched, the cilia caused a water current, bringing Bacteria to the cytostome. At intervals a food-vacuole was formed at the distal end of the cytopharynx, near the middle of the cell. The food was brought in with sudden undulating movements of the cilia of the infundibulum. Immediately after that the vacuole started moving about with cyclosis. There were about six food-vacuoles at one time. The disc was retracted at intervals.

The contractile-vacuole pulsated rather rapidly: once every five to ten seconds. During systole the duct through which the contents of the vacuole was discharged into the infundibulum, became visible.

Many stalked Peritrichida have well developed myonemes in the peduncle, but such myonemes were not visible in the present specimens. The peduncle was not contractile but it allowed the animals to make a slowly swaying movement. In many specimens myonemes could be seen running longitudinally from the peduncle. They are situated in the outer part of the cell, perhaps in the outer layers of the endoplasm, and not in the deeper parts.

Pyxidium tardigradum

Material: Bonneval-sur-Arc, Haute Savoie, France; altitude 1800 m; from lichens on a rock; 27 June 1961; leg. J. van der Land.

A solitary species attached to various parts of the body and legs of the Tardigrade *Hypsibius oberhaeuseri* (Doy.).

The outline of the body is a regular oval, except for a small but distinct basal part. Length (without peduncle and disc) 45-50 μ , width $\pm 25 \mu$. A distinct pellicular striation is present.

The peduncle is non-contractile, not branching, slender and of moderate length ($\pm 7 \mu$), inserted deeply in the cell, $\pm 5 \mu$ from the base. Distinct attaching-disc present.

The mouth region is not separated from the body by a constriction; its edge is crenate but not very distinctly so. The oral disc is rather small, its maximum width being not much more than 5 μ ; the length of the cilia is less than 5 μ . The infundibulum is small; the cytopharynx nearly reaches the middle of the cell.

The contractile-vacuole is situated at about $\frac{1}{4}$ from the top of the cell; its duct is about 5 μ long. The macronucleus has the shape of a telephone receiver (group 2 of Lust, 1950), and is situated in the middle of the cell or above it.

The endo- and ectoplasm are distinctly separated in the basal part of the cell.

The contracted animals have no peculiarities as is the case with many other species. They are only a bit shorter and broader than when they are stretched.

Pyxidium tardigradum can easily be distinguished from other species by the shape of the cell and the disc, and by the dimensions and peculiarities of the stalk.

ECOLOGICAL NOTES

Ciliata have been found on most aquatic animals, so that it could be expected that they would be found on Tardigrada too, but as far as I know, this has not happened so far.

It is a well known fact that Ciliata occur among mosses and lichens, but until now only very few species of Peritrichida have been found inhabiting habitats afforded by these plants. For instance *Opercularia arenicola* Greef was found among lichens and *Rhabdostyla muscorum* Kahl and *Pyxidium invaginatum* Stokes were found among mosses. Biegel (1954) found two *Pyxidium* species in litter of tree leaves, but most investigators got their material exclusively from habitats that are permanently wet.

The habitat afforded by lichens growing on rocks is subject to considerable changes. The temperature can reach very high values and above all the water supply is very irregular. The animals must be able to survive long periods of complete desiccation. In the present case Protozoa remained in a cryptobiotic state for nearly fifteen months without forming cysts, conditions which at least part of the population survived.

In most cases such epizoa are completely harmless but it is difficult to believe that this Tardigrade was not troubled by its guests. They must at least have limited its movements in the narrow space of its habitat, while on the other hand it did not profit by the water-current caused by the ciliary action. This represents indeed an extreme case of symphorism.

REFERENCES

- BIEGEL, M., 1954. Beitrag zur Peritrichen Fauna der Umgebung Erlangens. Arch. Protistenkunde, vol. 100, pp. 153-182.
- CORLISS, J. O., 1956. On the evolution and systematics of ciliated Protozoa. Syst. Zool., vol. 5, pp. 68-91, 121-140.
- , 1959. An illustrated key to the higher groups of the ciliated Protozoa, with definition of terms. J. Protozool., vol. 6, pp. 265-284.
- KAHL, A., 1935. Peritricha und Chonotricha. In: DAHL, FR., Die Tierwelt Deutschlands, vol. 30, pp. 651-886, Jena.
- KEISER, A., 1921. Die sessilen Peritrichen und Suktorien von Basel und Umgebung. Rev. suisse Zool., vol. 28, pp. 121-241.
- LUST, S., 1950. Symphorionte Peritrichen auf Käfer und Wanzen. Zool. Jb. (Syst.), vol. 79, pp. 353-436.
- NENNINGER, U., 1948. Die Peritrichen der Umgebung von Erlangen mit besondere Berücksichtigung ihrer Wirtsspezifität. Zool. Jb. (Syst.), vol. 77, pp. 169-266.
- SOMMER, G., 1951. Die Peritrichen Ciliaten des Grossen Plöner Sees. Arch. Hydrobiol., vol. 44, pp. 349-440.