XV NOTES ON THE CILIATE PROTOZOA OF LAHORE.

By B. L. BHATIA, *M.Sc.*, *Assistant Professor of Zoology, Government College, Lahore.*

I. ON THE OCCURRENCE OF THREE CONTRACTILE VACUOLES IN SPECIMENS OF *PARAMAECIUM CAUDATUM.*

Paramaecium caudatum, Ehrbg., is found in large numbers both in infusions and in stagnant water in Lahore and is studied as a type by the students. Recently (June, 1916) when my B.Sc. class were examining this animal, my attention was drawn by two students, Mr. Sham Nath and Mr. Prashar, to the existence of a third contractile vacuole in the specimen which was being studied by each. None of the other specimens from the same tube showed this peculiarity. The water had been collected from a ditch outside the laboratory compound.

In both these specimens the two normal vacuoles, each with its own system of radiating canals, were situated at about one-fourth of the length of the animal from either end, as is usually the case. The third contractile vacuole was situated nearer to the posterior vacuole at one-fourth of the distance between the two vacuoles in one specimen, and midway between the two vacuoles in the other. In both specimens the third vacuole had its own system of radiating canals and showed its systole and diastole independently of the other two, the three contracting regularly one after the other.

So far as I am aware, this occurrence of a third contractile vacuole has not been observed in this species before though it was observed by Butschli in *P. putrinum*, as recorded in the following extract from Bronn's *Thier-Reichs* (1, p. 1417):—

"Erhöhung der vacuolenzahl ist nur von Paramaecium und Ophryoglena bekannt. Bei ersterer Gattung scheint die Zweizahl Regel zu sein (3 beobachtete Bütschli zuweilen bei *P. purtrinum* 1876, p. 88); beide Vacuolen liegen ungefähr auf den Grenzen des 1 und 2 sowie des 3 und 4 Körperviertel hintereinander."

II. RECORDS AND DESCRIPTIONS OF SPECIES.

The object of this paper is to record and describe a number of the more striking Ciliata that the writer has come across during the last two years in the water collected at various times from ditches, ponds, etc., in and about Lahore. The list represents

only a very small proportion of the Ciliate fauna of this place, and it is hoped to add to it occasionally in future communications.

Family ENCHELINA.

Subfamily *HOLOPHRYINA*.

Genus **Holophrya**, Ehrbg.

Holophrya indica, sp. nov.

Body evenly elliptical, a little more than one and a half times as long as broad; cuticular surface presenting distinct alternating longitudinal striae and furrows, ciliation uniform, cilia fairly long and distinct, disposed along the longitudinal striae; colourless;

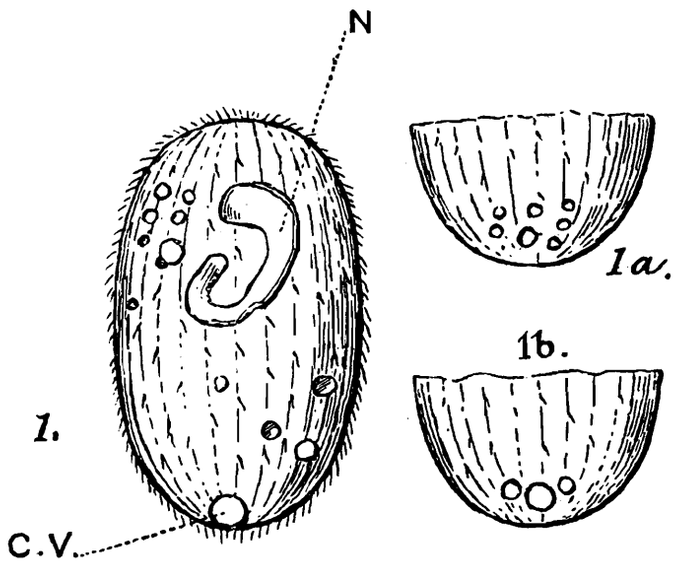

FIG. 1.—*Holophrya indica*, sp. nov., 1*a*. posterior end showing one principal and six subsidiary vacuoles; 1*b*. posterior end showing one principal and two subsidiary vacuoles.

(N. macronucleus; C. V. contractile vacuole or vacuoles.)

border of the oral aperture not projecting, pharynx absent; contractile vacuole single, spherical, postero-terminal, with a number of small circular feeding vacuoles in its neighbourhood which are not arranged in longitudinal rows; macronucleus large, band-shaped, curved in a horseshoe-shaped manner, situated in the anterior half of the body. Length 105 μ, width 63 μ. Habitat, stagnant water.

A few specimens of a new species of *Holophrya*, as defined above, were found in a temporary collection of water in a ditch on the roadside in front of the College compound in March, 1914. The body showed only a slight degree of flexibility, and was almost equally rounded at the anterior and posterior ends. On the surface presented to view, thirteen longitudinal striae, along which the cilia were disposed, were distinctly made out. So the animal

presented, both in its form and in its ciliary arrangement, a close resemblance to the theoretical diagram in Bronn's *Thier-Reichs*, fig. 17 a. The single spherical contractile vacuole situated near the posterior pole was seen to be surrounded by 5 to 7 small feeding vacuoles at the commencement of its diastolic phase. These were seen to contract and there would remain 3 only, the central one considerably larger than the 2 subsidiary ones now left. This main contractile vacuole then contracted and disappeared, the others following almost simultaneously and contributing to the formation of the vacuole afresh, the neighbouring subsidiary ones soon making their appearance again (figs. 1, 1*a*, 1*b*).

Of the several existing species of *Holophrya*, it shows some resemblance to *H. simplex* in the absence of trichocysts and pharynx, but differs considerably from it in the size of the body and the form of the macronucleus, specimens of that species being only about 35μ in size and the macronucleus globular. The only other species possessing a band-like nucleus is *H coleps*, Ehrbg., in which, however, it is curved in a spiral and the subsidiary vacuoles arranged in an elongated row. So the form described belongs to a new species, for which the name *H indica* is suggested.

Genus **Urotricha**, Clap. u. L.

Urotricha globosa, Schewiakoff.

Forms belonging to this species were found in the same locality as *H. indica* in April, 1914, and resembled closely the description given in Eyferth (3, p. 392); body egg-shaped with an anterior terminal mouth, and a posterior springing bristle elongated in the direction of the long axis of the body. A few points of difference were however observed. The macronucleus, which is spherical, is proportionately larger in size than there figured (tafel xii, 2), the contractile vacuole is placed in the median line near the posterior end and not on one side, and there are cilia on the posterior part of the body in the neighbourhood of the springing bristle also.

Genus **Enchelys**, Hill.

Enchelys arcuata, Clap. u. L.

Members of this species were found in an infusion of dry leaves in September, 1915, the dry leaves having been steeped in a dish of water about 10 days previously. Body rounded posteriorly, attenuated anteriorly. Length 80μ, maximum width 30μ. The animal is broadest at one-fourth of the length of the body from the posterior end, and begins to taper rapidly in the anterior fourth. Anterior end truncate, occupied by the mouth. Cilia covering the whole body, but very fine, rather longer ones at the oral end. Contractile vacuoles several, arranged in an arch along the margin of the body.

Genus **Lacrymaria**, Ehrbg.

Lacrymaria vermicularis (Ehrbg.).

(Syn. *Phialina vermicularis*, Ehrbg., Cl. u. L., and Kent.)

This animal was found in the same locality as *H. indica* in March, 1914. Body sub-cylindrical, or bottle-shaped if the apical lobe is taken into consideration, flexible and contractile, two and a half times as long as broad (Kent, 4, p. 519) appears to refer to the contracted state of the animal; in the fully extended condition in which I was able to observe it, it was 4 to 6 times as long as broad (figs. 2, 2*a*, 2*b*). Length about 104 μ. Apical portion in advance of the annular furrow short and cylindrical, anterior margin of the body truncate and bearing a single circlet of cilia

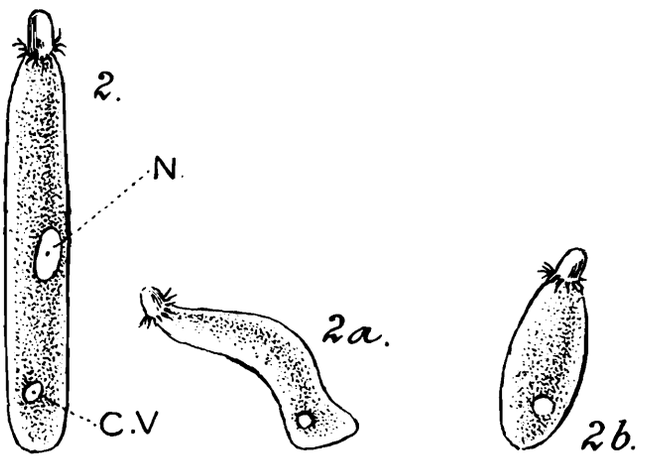

FIG. 2.—*Lacrymaria vermicularis* (Ehrbg.), fully extended; 2*a*. moderately extended; 2*b*. fully contracted.

(N. macronucleus; C. V. contractile vacuole or vacuoles.)

which are directed backwards, the rest of the body appeared, however, to be glabrous. The nucleus was seen to be oval in outline, and the single contractile vacuole situated near the posterior end.

Subfamily *COLEPINA*.

Genus **Coleps**, Nitzsch.

Coleps hirtus, O. F. Müll.

From a pond near Chota Ravi. Size 40 μ × 20 μ.

Subfamily *CYCLODININA*.

Genus **Didinium**, Stein.

Didinium nasutum, St.

From the pond in front of the Municipal Office. Size 123 μ × 84 μ.

Family TRACHELINA.

Genus **Loxophyllum,** Duj.

Loxophyllum fasciola (Ehrbg.), Cl. u. L.

(Syn. *Amphilephus fasciola*, Ehr., *Litonotus fasciola*, Kent., *Litonotus varsaviensis*, Wrz.)

subsp. **punjabensis,** subsp. nov.

Body elongate, transparent, flexible but scarcely contractile, three and a half times as long as broad, pointed posteriorly but not prolonged into a distinct tail-like portion, tapering gradually towards the anterior extremity which is curved towards the right;

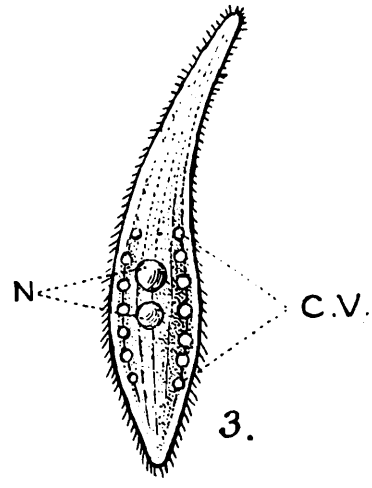

FIG. 3.—*Loxophyllum fasciola punjabensis*, subsp. nov.
(N. macronucleus; C. V. contractile vacuole or vacuoles.)

oral aperture nearly median; cuticular surface striate longitudinally; cilia on the neck region most conspicuous; contractile vacuoles arranged in two rows, seven along each border; macronuclei two in number, not united by a filament, spheroidal, subcentral. Length about 100 μ. Habitat, stagnant water.

A single specimen of this form, from water from the ditch in front of the College compound, came under my observation in March, 1914. The animal showed slow locomotion, now moving forwards, then suddenly in a backward direction. The length of the specimen was 147 μ and the maximum width 42 μ. The form showed closest resemblance to *Litonotus varsaviensis*, Wrz. (Kent, p. 744, pl. xlii, fig. 4), from which, however, it differed in the absence of trichocysts, number of contractile vacuoles, and their arrangement in two longitudinal rows instead of one containing five contractile vacuoles only (fig. 3). In the footnote Kent

observes as follows: "The large number of contractile vesicles serve to distinguish this species from *L. fasciola*, which in other respects it closely resembles." On this consideration there would be abundant justification for the erection of a new species for the present form, but by later writers *L. varsaviensis*, Wrz., does not appear to have been considered as specifically distinct from *L. fasciola*, which it closely resembles and in which there is only one contractile vacuole. I should think that *L. varsaviensis*, Wrz., and the form under consideration are sufficiently distinct to rank as subspecies. *Lionotus fasciola* has however since been separated from the genus *Lionotus* (falslich zuerst *Litonotus* genannt—Bronn), which is reserved for species with a very long neck (in some being even longer than the body) and placed again under *Loxophyllum*, to which indeed it originally belonged (Clap. u. L.). So the form described above may be identified with *Loxophyllum fasciola*, and the name *punjabensis* given to the subspecies to indicate its special peculiarities.

Family CHLAMYDODONTA.

Genus **Nassula**, Ehrbg.

Nassula stromphii (Ehrbg.)

(Syn. *Liosiphon stromphii* Ehrbg.).

Found in water from a ditch on the roadside outside the College compound in March, 1914. The animals examined are referable to *Nassula stromphii* (Ehrbg.) as described in Kent (p. 496), but the description given there is inadequate, and so the following description is appended:—

Body ovate, with a distinct large prolongation of the anterior region beyond the oral aperture, anterior portion flexible; length 57 μ, width 36 μ; colour green owing to the ingestion of algae as food particles; cilia uniform; pharynx armed, tubular, with a cylindrical fascicle of rod-like teeth; contractile vacuole large, posteriorly situated, with pinkish contents, with two or more smaller vacuoles irregularly distributed; macronucleus oval, subcentral and eccentric.

Family CHILIFERA.

Genus **Trichoda**, O. F. Müll.

Trichoda pura, Ehrbg.

In infusions of dry leaves.

Genus **Colpoda**, Müll.

Colpoda cucullus, Ehrbg.

In infusions of hay.

Family PARAMAECINA.

Genus **Paramaecium,** Hill.

Paramaecium caudatum, Ehrbg.

In pond water and infusions of dry leaves.

Family PLAGIOTOMINA.

Genus **Spirostomum,** Ehrbg.

Spirostomum ambiguum, Ehrbg., var. **minor,** Eyf.

In large numbers among the roots of *Eichhornia* growing in an aquarium. Length about 765 μ.

REFERENCES TO LITERATURE.

1. Bütschli, O. Protozoa. In Bronn's *Klassen und Ordnungen des Thier-Reichs*, Vol. I, Dritte Abtheilung. (Leipzig u. Heidelberg : 1889.)
2. Doflein, F. .. Lehrbuch der Protozoenkunde. (Jena : 1909.)
3. Eyferth, B. Einfachste Lebensformen der Tier- und Pflanzenreiches. Vierte Auflage von W. Schoenichen und A. Kalberlah. (Braunschweig : 1909.)
4. Kent, S. A Manual of the Infusoria. (London : 1880-1882.)
5. Minchin, E. A. An Introduction to the study of the Protozoa. (London : 1912.)

In addition to the works cited above, current literature in *Archiv fur Protistenkunde, Journal of the Royal Microscopical Society*, etc., have also been consulted.