

FAUNA OF RAJASTHAN PROTOZOA (No. 3)

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(With 1 Table and 3 Text-figs.)

INTRODUCTION

General

This is the third of the series of papers on the free-living protozoan fauna of Rajasthan, and is based on the collections made by the author during the period August-September 1964 from the Districts of Ajmer, Jaisalmer, Sirohi and Udaipur. Field cultures were prepared to obtain examples of the various species, except in the case of the testacean rhizopods, e.g., *Diffugia* spp. The material was subjected to appropriate *intra vitam* staining and were also observed under phase contrast microscope. In some cases, owing to the scarcity of the material these procedures could be followed only for one or two individuals. For the study of the ciliates, silver-line observations were taken as far as possible.

The numbers of examples mentioned under "Material" relates to the permanent preparations made, whereas several individuals were observed and studied in the field, and the final conclusions and identifications arrived at were based on both sets of observations.

A total of 19 species [(these are in addition to 63 species already described in the Parts 1 and 2 of this series) Mahajan 1969, 1971] belonging to 14 genera, 11 families of 7 orders and 3 classes (Mastigophora, Sarcodina and Ciliata) of protozoa are included in this paper. Of these, two taxa (one species and one subspecies both belonging to the class Ciliata) are new to science.

Abbreviations used

Distt.: District; Ex.: Example, Exs.: Examples; Hom.: Homonym; Syn.: Synonym; Z. S. I.: Zoological Survey of India.

List of Collecting Stations

The collecting stations, with their locations, etc. are listed in Table 1.

TABLE 1. List of collecting stations for Rajasthan Protozoa listed in this paper.

Collecting Stations.	Latitude (N) (Approx.)	Longitude (E) (Approx.)
(I) <i>Dist. Ajmer.</i>		
<i>Camp.—Ajmer.</i>		
1. Anna Sagar (near Ajmer)	26° 26'	74° 36'
2. Fai Sagar (near Ajmer)	27° 27'	74° 36'
3. Fushkar Lake	26° 30'	74° 34'
(II) <i>Dist.—Jaisalmer.</i>		
<i>Camp.—Jaisalmer.</i>		
4. Barabagh (12 km. from Jaisalmer)	26° 15'	70° 00'
5. Gariswar (Tank)	26° 55'	70° 57'
6. Gulab Sagar	26° 55'	70° 57'
(III) <i>Dist.—Jodhpur.</i>		
<i>Camp.—Phalodi.</i>		
7. Ramsar (Tank near Phalodi)	27° 08'	72° 22'
(IV) <i>Dist.—Sirohi.</i>		
<i>Camp.—Mount Abu.</i>		
8. Achalgarh Fort Area		
9. Banda (near Mount Abu)	24° 36'	72° 45'
10. Nakhi Lake (Mount Abu)	24° 36'	72° 45'
11. Nalā (near Mount Abu)	24° 36'	72° 45'
(V) <i>Dist.—Udaipur.</i>		
<i>Camp.—Udaipur.</i>		
12. Fateh Sagar (near Udaipur)	24° 37'	73° 38'
13. Pichola Lake (near Udaipur)	24° 34'	73° 38'
14. Sarup Sagar (near Udaipur)	24° 35'	73° 35'

SYSTEMATIC ACCOUNT

1. *Euglena sociabilis* Dangeard

1901. *Euglena sociabilis* Dangeard, *Recherches sur les Eugleniens*. La Bot. 18 : 97.

1965. *Euglena sociabilis*: Pringsheim, *Nova Acta Leop.* 18 (125) : 147.

Material. —2 exs., Barabagh (Jaisalmer), 14. viii. 1964.

Remarks. —Animals cylindrical in shape with delicate pellicle; flagellum slightly longer than body. Size 65-112 μ by 15-30 μ . In spite of the

long flagellum, these animals are not good swimmers; they are usually seen gliding.

Distribution. —Rajasthan (first record): As above. Other records from India are from Uttar Pradesh, Jammu and Kashmir and Bombay (Maharashtra).

2. *Euglena geniculata* Dujardin

1841. *Euglena geniculata* Dujardin, *Histoire Naturelle der Zoophytes Infusaire*, Paris : 22.

1965. *Euglena sociabilis*, Pringsheim, *Nova Acta Leop.*, 18 (125) : 72.

Material. —1 ex., Nala, Mount Abu (Distt. Sirohi) 31. viii. 1964.

Remarks. —Body elongate, sub-cylindrical, more or less even throughout, flexible but slightly contractile; with an obliquely directed tail-like prolongation; cuticular surface smooth, colour green; red pigment spot very conspicuous. Length 1-200 μ .

Distribution. —Rajasthan (first record): As above.

3. *Peranema trichophorum* (Ehrenberg)

(Text-fig. 1 a, b)

1938. *Trachelius trichophorum* Ehrenberg, *Die Infusionsthierchen als Vollkommene Organismen*. Leipzig : 322, pl. 33, fig. 11.

1945. *Peranema trichophorum* D. R. Pitelka, *J. Morph.*, 78 : 179.

Material. —3 exs., Barabagh (Jaisalmer), 14. viii. 1964.

Remarks. —The posterior end blunter than the front and looks as if truncated. Colourless, but granular cytoplasm sometimes gives a yellowish-gray tinge. Animalcule secretes a characteristic slimy substance. With two flagella, each arising from its own basal granule (the blepharoplast) in right side-wall of reservoir, one extending spirally backwards, adhering to the pelical and can be observed under phase-contrast microscope; the other one free and about as long as body.

Distribution. —Rajasthan (first record): As above. Other record from India: Guddapah (South India).

4. *Amoeba proteus* (Pallas)

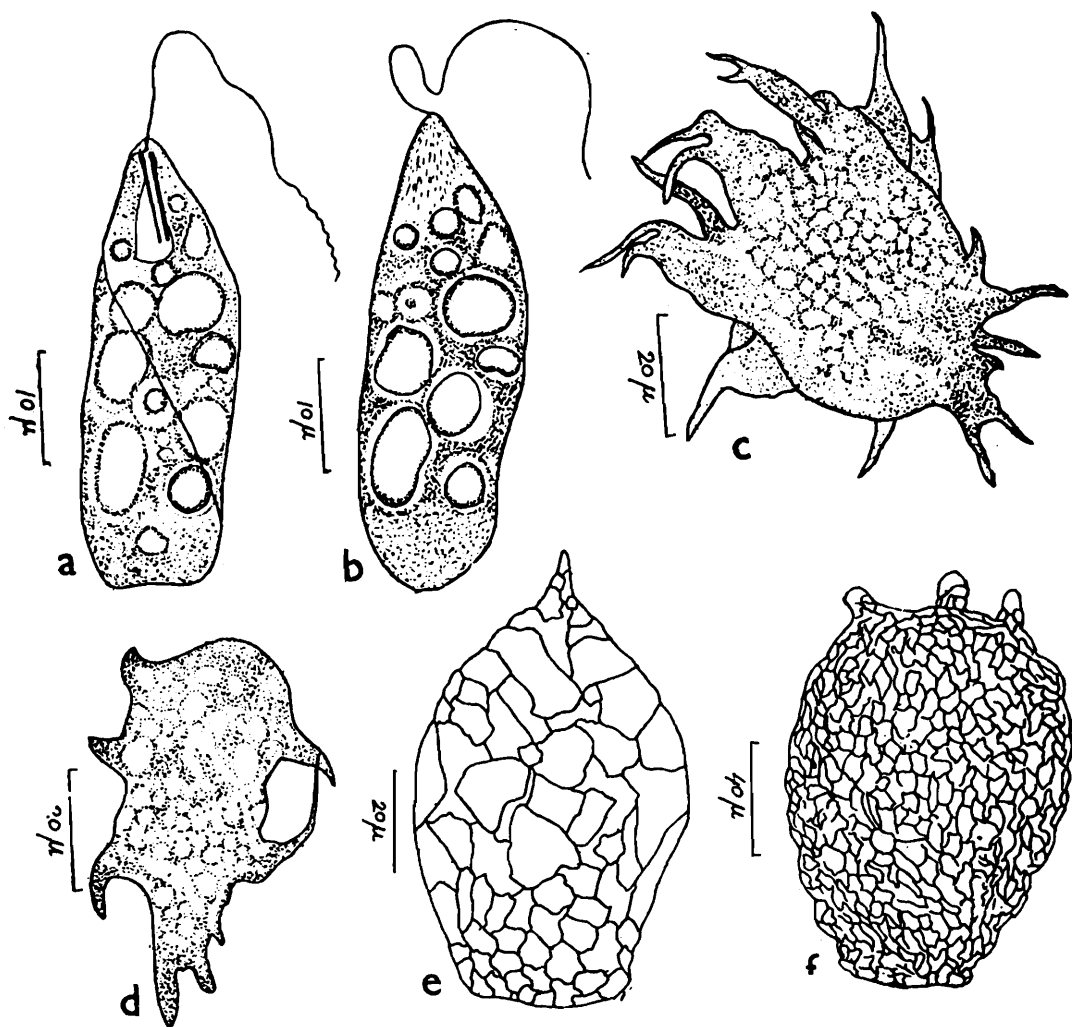
(Text-fig. 1 c, d)

1766. *Volvox proteus* Pallas, *Elenchus zoophytorum*, Hague - Comitum : 417.

1875. *Amoeba proteus* Leidy, *Proc. Acad. Nat. Sci. Philadelphia*, Philadelphia : 99.

Material. —2 exs., lake at Barabagh, 12 km. from Jaisalmer, 14. viii. 1964.

Remarks.—Body transparent; constantly changing shape by amoeboid movements, due to the mechanism of contraction-hydraulic



Text-fig. 1 a. & b. *Paranema trichophorum* (Ehb.) c. & d. *Amoeba proteus* (Pallas) e. *Diffugia acuminata* Ehb. f. *D. lobostoma* var. *tuborsa* Lievare and Thomas

system operating in protoplasm. Through this system the Amoeba makes more or less stiffly gelled tubes of the body (often called pseudopodia) which help in movement.

Ectoplasm hyaline, firm and very often with superficial longitudinal folds on body. Nucleus single, discoidal. Contractile vacuole single.

Bhatia and Mullick (1930) report it from Srinagar (Kashmir) as *Amoeba nitida* Penard (1902, p. 61) and relate it to *Amoeba proteus* Leidy (1878). Carter (1856) reports it as *Amoeba princeps* Carter from Bombay (Maharashtra). Later on, Leidy (1879) diagnosed Carter's species as *proteus*. The controversy of the name is discussed by Leidy (1878, p. 99) and Schaefer (1916 b). Bovee 1965, has discussed clearly the importance of movements in the taxonomy of Sarcodina, particularly that of *Amoeba*.

Distribution. —Rajasthan (first record): As above. Other records from India: Srinagar (Kashmir); Bombay (Maharashtra).

5. *Diffugia acuminata* Ehrenberg

(Text-fig. 1 e)

1838. *Diffugia acuminata* Ehrenberg, *Infusionthieschen* : 131, pl. IX, fig. 3.

Material. —1 ex., Fateh Sagar lake at Udaipur, 13. ix. 1964.

Remarks. —This species of *Diffugia* occurs in a considerable size range. The example recorded here appears to be largest recorded so far. Test with a pointed tubular extension at the anterior end of the dome. The quartz crystals of the test are big and some of them project out of the margin of the test.

Distribution. —Rajasthan (first record): As above. Other records from India is from Bombay (Maharashtra) Carter, 1856 : 229.

6. *Diffugia lobostoma* var. *tuberosa* Gauthier and Thomas

(Text-fig. 1 f)

1958. *Diffugia lobostoma* var. *tuberosa* Gauthier and Thomas, *Arch. Protistink.* Jena, 103 : 268, pl. 9, fig. 1.

Material. —4 exs., Nakhi lake, Mount Abu, 2. ix. 1964.

Remarks. —Body ovoid to subspherical, with 3-4 regular lobes in the pseudostome, which is terminal. Test composed of sand grains. Endoplasm colourless. Size, Pseudostome—18-32 μ , height 80-105 μ ; Dia. 70-95 μ .

Distribution. —Rajasthan (first record): As above. First record from India.

7. *Lacrymaria lagenula* Claparede and Lachmann

(Text-fig. 2 g)

1858. *Lacrymaria lagenula* Claparede and Lachmann, *Etudes sur les infusoires et les rhi opodes*, Geneve, 5 : 1.

Material. —2 exs., Ramsar Phalodi, 22. ix. 1964.

Remarks. —Body elevate-shaped (while living changes to flask shape very often) and attenuated anteriorly; striated obliquely, (Striations can be observed only when alive and that too under phase-contrast). Finely and continuously ciliated; a single circlett of longer cilia around the oral region. Contractile vacuole single, terminal and posterior. Macronucleus short, sausage like; endoplasm granulated; body 60 μ long.

Distribution. —Rajasthan (first record): As above. First record from India.

8. *Trachelophyllum vastitum* Stokes

(Text-fig. 2h)

1884. *Trachelophyllum vastitum* Stokes, *Amer. Monthly Micr. J.*, 5 : 155, pl. iv, fig. 10.

Material. —3 exs., Barabagh, 12 km. from Jaisalmer, 14. viii. 1964.

Remarks. —Body flattened, flexible, ribbon-like, very extensible and elastic. Length about 4-5 times of breadth. Neck somewhat fusiform, and about one and half of the body in length. Apical constriction truncated. Cytopharynx narrow, round in cross-section. Ciliary rows widely apart. Two macronuclei. Length 180-200 μ .

My specimens are of average size and are obtained from the surface of submerged and water-soaked objects.

Distribution. —Rajasthan (first record): As above. First record from India.

9. *Loxodes striatus* (Engelmann)

(Text-fig. 2i)

1862. *Drepanostoma striatum* Engelmann, *Z. Wiss. zool.*, 2 : 382, pl. 21, fig. 7.

1917. *Loxodes striatus* (Engelmann): Penard, *Rev. suisse zool.*, Geneve, 25 : 471, figs. 5-12.

Material. —2 exs., Nullah at Mount Abu, 4. ix. 1964.

Remarks. —Body flattened and leaf-like, with a beak-like anterior end; ciliation uniform, cilia fine and small; cytostome cleft along the curved anterior part and followed by a tube-like pharyngeal tube; with two vesicular macronuclei; the two micronuclei situated at the posterior pole of the anterior, and the anterior pole of the posterior macronucleus; size 125-143 μ .

This species resembles *Loxodes vorax* Stokes in size but differs in having a pointed posterior end and in the disposition of micronuclei. Commonly observed with plenty of ingested algal fragments and diatoms. No Muller's corpuscles and tactile bristles observed. Specimens are small, nearly half of those recorded length by Kahl (length 200 μ).

Distribution. —Rajasthan (first record): As above. Other records from India: Calcutta (W. B.); Srinagar (Kashmir).

10. *Colpoda steinii* Maupas

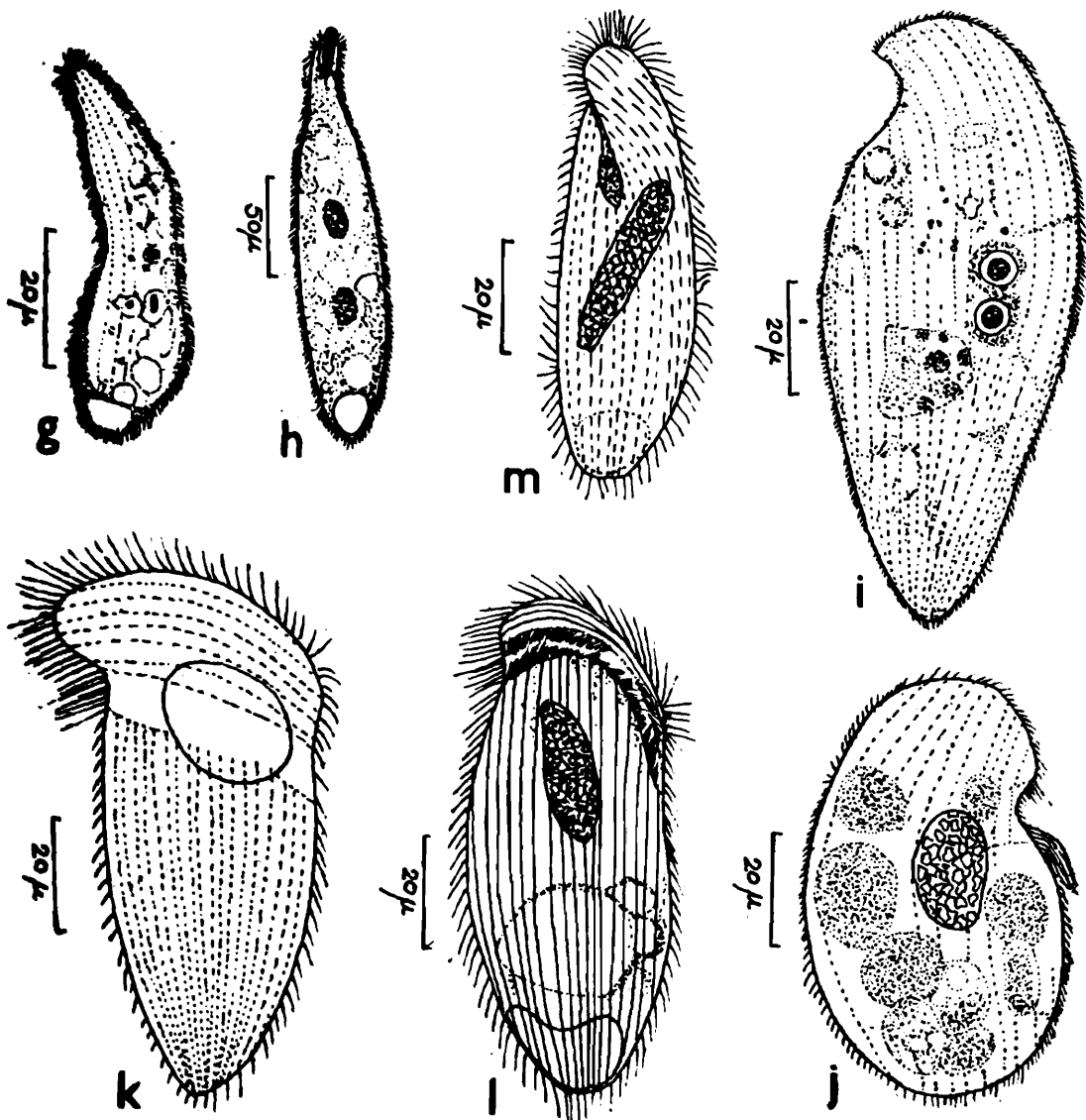
(Text-fig. 2j)

1833. *Colpoda steinii* Maupas, *Arch. zool. exp. gen.*, 1(2) : 436, pl. xix, figs. 7-14.

Material. —7 exs., Nakhi lake, Mount Abu, 4. ix. 1964.

Remarks. —Body cylindrically oval, anteriorly more narrow. Frontal dentation 6-7. Colour deep grey; cytostome at the bottom of

the depression followed by a short tubular cytopharynx. Large food vacuoles often present. Contractile vacuole single, and in the posterior region of the body. Macronucleus central and oval. Length: 25-60 μ , width : 9-15 μ .



Text-fig. 2 g. *Lacrymaria legenula* Clap. Lachman h. *Trachelophylum clavatum* Stokes i. *Loxodes atriatus* (Engelmann) j. *Colpoda steinii* Maupas k. *Metopus ovalis caudoconica* n. subsp. l. *Metopus barbatus* Kahl m. *Metopus fuscus* Kahl

My specimens are of average size.

Distribution. —Rajasthan (first record): As above. Other records from India are from soil of Pusa (Bihar); Sinnamara (Assam); Poona (Maharashtra); Kanara and Coimbatore (Kerala); Karnataka; Delhi; Dehradun (U.P.); and pond water at Srinagar (Kashmir).

11. *Metopus ovalis* Kahl *caudoconica* n. subsp.

(Text-fig. 2k)

Material. —2 exs., Nakhi lake, Mount Abu, 2. ix. 1964; 1 ex., Fatehsagar, Udaipur, 13. ix. 1964.

Remarks. —Body oval; posterior end distinctly conical with sharp angle; macronucleus single, oval and placed anteriorly. Size about 100 by 40 μ .

Comparison. —The new variety differs from the typical one as follows:— (i) Shape ovoid (instead of round) and posterior end produced into a cone. (ii) Size somewhat large and macronucleus also large, oval and placed anteriorly (instead of reniform and centrally placed).

Type specimens. —Holotype: One ex., on slide; S.I. Reg. No. Pt. 601.

Type Locality. —Nakhi lake, Mount Abu.

Paratypes. —Two ex. on slide; S.I. Reg. No. Pt. 602 (2. ix. 1964), 603 (13. ix. 1964).

Distribution. —Rajasthan: As above.

12. *Metopus barbatus* Kahl

(Text-fig. 2l)

1927. *Metopus barbatus* Kahl, *Arch. Protistenk.* 57 : 146, fig. 13.

Material. —1 ex., Barabagh —12 km. from Jaisalmer, 18. ix. 1964

Remarks. —Body oval; posterior end conical with round apex: Macronucleus single; long and oval; placed near the anterior end. Size about 100 μ .

My specimens are of large size, almost double to Kahl's forms.

Distribution. —Rajasthan (first record from India): As above.

13. *Metopus fuscus* Kahl

(Text-fig. 2m)

1927. *Metopus fuscus* Kahl, *Arch. fur protistenk.* 57 : 147, fig. 14.

Material. —3 exs., Fateh Sagar (Udaipur); 20. ix. 1964.

Remarks. —Body elongated; posterior end oval; Macronucleus, sharply outlined and is well seen even in the living specimen, it is single, oval and placed in the first half of the body. Size 180-300 μ long and 40 μ thick, largest so far recorded.

Distribution. —Rajasthan (first record): As above.

14. *Caenomorpha medusula* Perty

(Text-fig. 3n)

1852. *Caenomorpha medusula*, Perty, *zur Kenntinis Kleinster Lebensformen*, Bern : 147.

1932. *Caenomorpha medusula*, Kahl, *Urtiere oder Protozoa, in Dalh's Tierwelt Deutsch.*, Jena, Pt. 25 : 430, fig. 71(30).

Material. —2 exs., Fateh Sagar lake (Udaipur); 20. ix. 1964.

Remarks.—Small, bell-shaped animalcul with a long caudal projection at posterior region. Peristome situated at base of bell-shaped part, with long and dense cilia on the posterior margin of the bell-shaped body; the long cilia in the anterior region in a bunch; contractile vacuole single and dumbbell shaped; a micronucleus lying just below the connecting strand of the ends of micronucleus ends; the animal moving by rotating on its long axes; size $60 \times 30 \mu$.

The specimens are very similar to the Kahl's *C. medusula* var *lata* in shape and disposition of nuclei, but are smaller than Kahl's forms (1932).

Distribution.—Rajasthan (first record) : As above. Other records from India: Calcutta (Mahajan & Nair 1971).

15. *Blepharisma undulans* Stein

(Text-fig. 3 o)

1859. *Blepharisma undulans* Stein, *F. Der Organismus der Infusionsthier.* II. *Wilhelm Engelmann*, Leipzig: 186.

Material.—6 exs., from the Nullah, Mount Abu, 4. ix. 1964.

Remarks.—Body oblong and almost colourless, about 90-140 μ long; macronucleus in two parts and the two nod-shape ends connected by a comparatively thin strand. Undulating membrane long and very prominent. Cytopharynx directed backward.

These specimens observed from the bottom ooze, and are of average size.

Distribution.—Rajasthan (first record from India) : As above.

16. *Blepharisma tropicum* Bhandari

(Text-fig. 3 p)

1962. *Blepharisma tropicum* Bhandari, *J. Protozool.* 9 (4) : 437, fig. 3.

Material.—6 exs., from Nullah at Mount Abu, 4. ix. 1964.

Remarks.—Body oblong, pink in colour. Undulating membrane not prominent; the macronucleus with two terminal nods as that of *B. undulans*, but connected by a very prominent thick strand much more conspicuous than that of *B. undulans*.

Distribution.—Rajasthan (first record from India): As above.

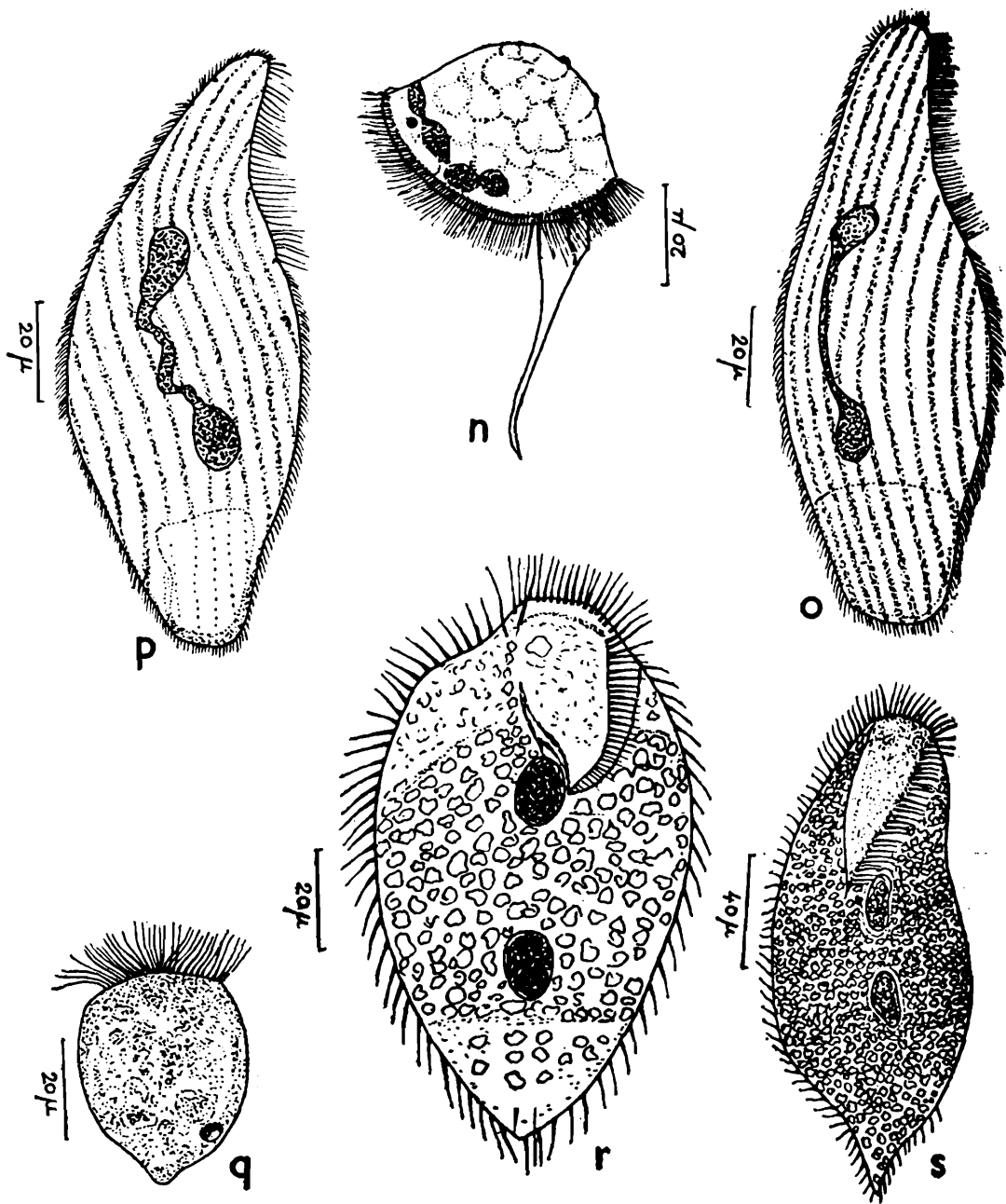
17. *Strobilidium gyrans* (Stokes)

(Text-fig. 3 q)

1887. *Strobilidium gyrans*, Stokes, *J. Royal Micros. Soc.* February, 7 : 35-40.

1932. *Strobilidium gyrans*: Kahl, *Urtiere order Protozoa Tierwelt Dtsch.*, Pt. 25, Teil (3) : 510, fig. 82(7).

Material. —2 exs., Nullah, Mount Abu, 4. ix. 1964; 1 ex., Nakhi lake, Mount Abu, 2. ix. 1964.



Text-fig. 3 n. *Caenomorpha medusula* Perty o. *Blepharisma undulans* Stein p. *Blepharisma tropicum* Bhandary q. *Strobilidium gyrans* (Stokes) r. *Oxytricha acuminata* n. np. s. *Uroleptus piscis* (Müller)

Remarks.—Body like a top and less than twice as long as broad. Macronucleus horse-shoe shaped. Micronucleus lies among the open ends of the macronucleus. The anterior end with a crown of cilia whereas the posterior one ending into a knob-like projection. Nucleus can be studied in detail in living specimens only under phase-contrast microscope.

These specimens are commonly observed on the bottom. My specimens are of large size.

Distribution.—Rajasthan (first record from India): As above.

18. *Oxytricha acuminata* n. sp.

(Text-fig 3 r)

Material.—8 exs., Fateh Sagar (Udaipur) 13. ix. 1964.*Remarks.*—Body broadly oval and posteriorly drawn as inverted cone. Frontal cirri 9, ventral 5, anal 5, marginal running interrupted upto posterior end; macronucleus in 2 oval parts; contractile vacuole situated in one side of peristome, size $100\ \mu - 115\ \mu$ by $50-60\ \mu$.*Comparison.*—The new species differs from allied ones, as below: 1. From *Oxytricha ovalis* Kahl: Body being proportionately more broad; posterior end not rounded but drawn into a cone. 2. From *Oxytricha oblongatus* Mahajan: Body almost oval and sides not parallel (vs. not so).*Type specimens.*—*Holotype*: 1 ex. on a slide, Z. S. I. Reg. No. Pt. 694.*Type Locality.*—As above.*Paratypes.*—7 exs., on 7 slides, Z. S. I. Reg. No. Pt. 695-701.*Distribution.*—Rajasthan: As above.19. *Uroleptus piscis* (Müller)

(Text-fig. 3 s)

1773. *Trichoda piscis* Müller, *Verminum terrest. et fluviatils animal. infusoria. etc. historia* Havniae et Lipsiae, : 73.1838. *Uroleptus piscis* Ehrenberg, *Die Infussionsthierchen als vollkommene Organismen*. Leipzig : 358, pl. xI, fig. 1.*Material.*—3 exs., Fai Sagar lake (Udaipur), 17. ix. 1964.*Remarks.*—Body exceedingly elastic and variable in shape, fusiform but elongated, about 6 to 8 times longer than broad, anterior end rounded, with a long ribbon-shaped tail, ending bluntly and turning slightly towards right. Peristome extending from one-fourth to one-third of the body. Macronucleus consisting of two ovoid masses occupying the middle part of the body.Living forms quite large i.e. about 800 to $1000\ \mu$ long and 80 to $120\ \mu$ broad, always fully ladden with injected food material. The animal is very sensitive and contracts considerably at the slightest disturbance.*Distribution.*—Rajasthan (first record): As above. Other records from India are from soil of Indore (M.P.); Coimbatore (Tamil Nadu) and Freshwater of Srinagar (Kashmir).

SUMMARY

This paper (third in series of papers on protozoa of Rajasthan) deals with freshwater protozoa, collected by the author during August-

September, 1964, in Rajasthan in the districts of Jaisalmer, Sirohi, Udaipur and Ajmer.

19 species belong to 14 genera, 11 families, 5 orders and 3 classes (Mastigophora, Sarcodina, Ciliata) are included; of these the following two taxa (1 species and 1 subspecies) both belonging to the class ciliata are new to science.

(A) Sub-cl. Holotricha, Ord. Heterotrichida: (Family Metopidae).

1. *Metopus ovalis caudoconica* n. subsp.

(B) Sub-cl. Spirotricha, Ord. Hypotrichida: (Family Oxytrichidae).

2. *oxytricha acuninata* n. sp.

All the 19 species are recorded for the first time from Rajasthan, whereas the 14 of them are first record from India.

ACKNOWLEDGEMENTS

My thanks are due to the following for assistance rendered: To the Staff of the Protozoology Section at Calcutta for assistance in the field as well as in the laboratory.

To the Rajasthan State authorities, particularly the Collectors of Ajmer, Jaisalmer, Sirohi and Udaipur. To Shri Madan Lal Sharma, Superintendent, Circuit House, Mount Abu, Shri Bhim Sen, Principal, M. B. College, Udaipur, for their valuable assistance at Mount Abu and Udaipur respectively, and finally, to the Director, Zoological Survey of India, for his kind suggestions and guidance.

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