ON SOME FRESHWATER RHIZOPODA AND HELIOZOA (PROTOZOA) FROM CALCUTTA AND ITS ENVIRONS. PART I.

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(With 3 Text-figures)

CONTENTS

I—INTRODUCTION

The first record of a Rhizopod in Calcutta is found in the work of Cantor (1842). Wallich (1864) in discussing the principal causes of structural variations among *Difflugia* Leclerc refers about four species of this genus collected from Gangetic Sundarbans of Lower Bengal without citing any specific locality. Simmons (1891) records a reticulated Amoeba (*Biomyxa vagans* n. sp.) from Calcutta. Ghosh (1923) refers about the peculiarities of *Arcella vulgaris* var. *gibbosa* West.

Even though there are a few references about the Rhizopodan fauna of this place, it seems that the study of this fauna has not received adequate attention from the earlier workers. In the present paper, an account of twentynine species of Rhizopoda and Heliozoa collected by the authors from the ponds in and around Calcutta is given. The major part of the material was collected during the years 1965 to 1967. The name of the localities, habitats and the date of collection are given in the systematic account under each species.

Rec. zool. Surv. India
65 (1-4), 1967, (1971).

II—Material and Methods

The water samples with the flocculent matter amongst the submerged and floating vegetation and the surface ooze of the bottom of the various ponds were brought to the laboratory and examined from time to time for the Rhizopods and Heliozoans. The living specimens were isolated and examined by keeping them in a drop of natural medium. For making permanent preparations, the specimens were fixed in Bouin's fluid or Schaudinn's fluid. For staining Delafield's haematoxylin, Heidenhain's iron haematoxylin and borax carmine were used. The empty tests, very frequently met with in abundance in the bottom ooze, were isolated, air-dried after two or three washings in absolute alcohol and mounted in Canada balsam. To avoid crushing of the delicate tests, tiny pieces of broken cover slips were kept a little away from the specimens to support the cover slip.

III—Acknowledgements

Our sincere thanks are due to Dr. B. S. Chauhan, Deputy Director, Zoological Survey of India for the encouragement and the helpful suggestions given during the course of this work. We are highly grateful to the Director, Zoological Survey of India for the facilities provided to carry out this study.

IV—List of the Species

Phylum PROTOZOA
Class SARCODINA
Order AMOEBIDA Ehrenberg
Family Amoebidae Bronn

1. *Amoeba vespertilio* Penard
2. *Amoeba discoides* Schaeffer
3. *Amoeba radiosa* Ehrenberg
4. *Pelomyxa palustris* Greeff

Order TESTACIDA Schultze
Family Arcellidae Schultze

5. *Arcella vulgaris* Ehrenberg
6. *Arcella gibbosa* Penard
7. *Arcella discoides* Ehrenberg
8. *Lesquereusia spiralis* (Ehrenberg)
9. *Lesquereusia modesta* Rhumbler

Family Difflugiidae Taránek

10. *Difflugia lobostoma* Leidy
11. *Difflugia urceolata* Carter

12. *Difflugia corona* Wallich
13. *Difflugia oblonga* Ehrenberg
14. *Difflugia acuminata* Ehrenberg
15. *Difflugia curvicaulis* Penard
16. *Difflugia pyriformis* Perty
17. *Difflugia tuberculata* (Wallich)
18. *Difflugia muriformis* Gauthier-Lievre & Thomas
19. *Centropyxis aculeata* (Ehrenberg)
20. *Centropyxis ecornis* (Ehrenberg)
21. *Centropyxis spinosa* (Cash & Hopkinson)

Family EUGLYPHIDAE Wallich

22. *Euglypha acanthophora* (Ehrenberg)
23. *Euglypha tuberculata* Dujardin
24. *Placocista lens* Penard
25. *Trinema enchelys* (Ehrenberg)
26. *Trinema lineare* Penard

Subclass 2. ACTINOPODA Calkins
Order HELIOZOIDA Haeckel
Family ACTINOPHRYIDAE Claus

27. *Actinophrys sol* Ehrenberg

Family ACANTHOCYSTIDAE Claus

28. *Acanthocystis spinifera* Greeff

Family CLATHRULINIDAE Claus

29. *Clathrulina elegans* Cienkowski

V—SYSTEMATIC ACCOUNT

1. **Amoeba vespertilio** Penard

(TEXT-FIG. 1A)

1901. *Amoeba vespertilio* Penard, *Rev. Suisse Zool.*, 9, p. 237.

1919. *Amoeba vespertilio :* Cash and Hopkinson, *The Brit. Fresh-water Rhiz. & Heliozoa*, 4, p. 10, pl. 58, fig. 2 & pl. 59, fig. 1-3.

Habitat & Locality.—Amongst pond vegetation and the surface scum ; Botanical Garden, Sibpur (Howrah Dist.) ; 21-9-1961.

Remarks.—Small *Amoeba* displaying clear web like expansion of cytoplasm in between the pseudopodia during active locomotion. Number of pseudopodia varies from four to six. Few food vacuoles and granules are seen concentrated in the central portion bearing

nucleus. Size—52-62 μ diameter, varying slightly depending on the range of expansion.

2. **Amoeba discoides** Schaeffer
(TEXT-FIG. 1 B)

1916. *Amoeba discoides* Schaeffer, *Arch. Protistenk.*, Jena, **37**, pp. 218-223, fig. 5a, b.

Habitat & Locality.—Amongst pond vegetation in still water; Shahid Colony, Paikpara (Calcutta); 5-11-1962. Kalyani (Nadia Dist.); 9-11-1964.

Remarks.—One of the big *Amoeba* of the region having plenty of granules distributed all over the endoplasm, rendering the observation of nucleus very difficult. In suspended condition resembles a big sized *Amoeba radiosa,* but the true palmate nature of pseudopodia is observed while creeping on the slide.

The specimens observed are small ranging 264-338 μ in maximum extended condition.

3. **Amoeba radiosa** Ehrenberg
(TEXT-FIG. 1 C)

1830. *Amoeba radiosa* Ehrenberg, *Abh. preuss Akad. Wiss.*, Berlin, p. 39.

1879. *Amoeba radiosa* : Leidy, *Rept. U.S. geol. Surv.*, **12**, pp. 59-62, pl. 4, figs. 1-18.

Habitat & Locality.—Amongst pond vegetation and surface scum in clear water; Botanical Garden, Sibpur (Dist. Howrah); 20-11-1961. Barasat (Dist. 24-Parganas); 6-12-1965. Rabindra Sarobar (Calcutta); 8-12-1965.

Remarks.—Small to medium sized *Amoeba* with a spherical central mass on which more or less long straight pseudopodia are usually seen. While creeping it resembles a true amoeba.

The local specimens are of average size measuring 36 μ diameter with pseudopodia as long as three to four times the body diameter.

4. **Pelomyxa palustris** Greeff
(TEXT-FIG. 1 D)

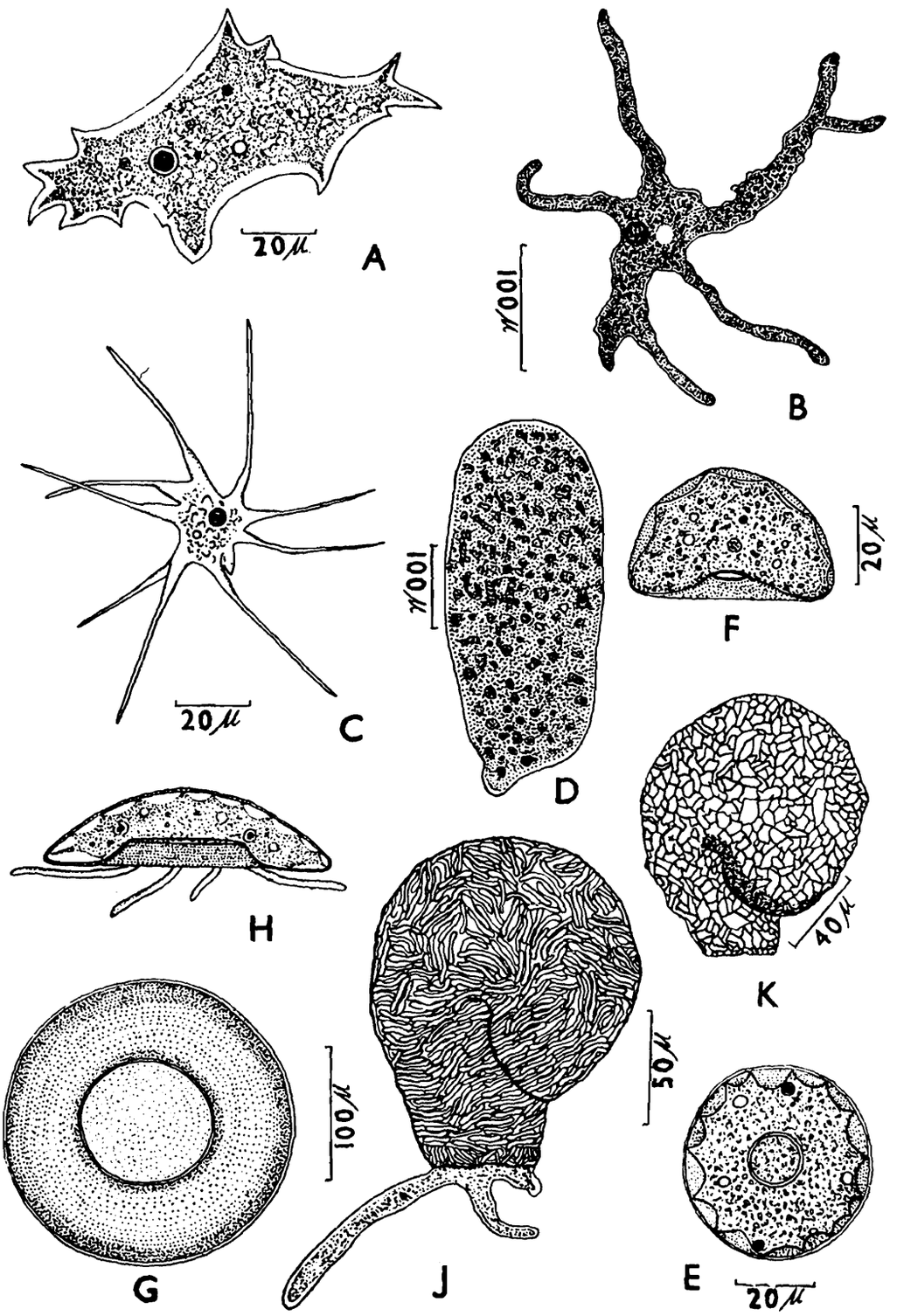
1874. *Pelomyxa palustris* Greeff, *Arch. f. mikr. Anat.*, **10**, p. 51, pls. 3-5.

1905. *Pelomyxa palustris* : Cash & Hopkinson, *The Brit. Fresh-water Rhiz. & Heliozoa*, **1**, pp. 74-79.

Habitat & Locality.—From the bottom ooze of ponds; Garia (Dist. 24-Parganas); 8-2-1965.

Remarks.—Usually seen as a big opaque mass of protoplasm possessing a lot of assorted types of crystals, broken algal filaments and rod-shaped bacteria. In locomotion changes to rod-shape with a prominent pseudopodium in the front. At times the protuberance of a pseudopodium on the sides is also seen. The contractile vacuoles and the nuclei are not easy to detect.

The local specimens are of average size ranging 150-569 μ while in locomotion. The 'villi' are not very prominent in these specimens.



TEXT-FIG. 1. A. *Amoeba vespertilio* Penard; B. *Amoeba discoides* Schaeffer; C. *Amoeba radiosa* Ehrenberg; D. *Pelomyxa palustris* Greeff; E. *Arcella vulgaris* Ehrenberg (ventral view); F. *Arcella gibbosa* Penard (lateral view of test); G. *Arcella discoides* Ehrenberg (apertural view of test); H. *Arcella discoides* Ehrenberg (lateral view); J. *Lesquereusia spiralis* (Ehrenberg) (lateral view); K. *Lesquereusia modesta* Rhumbler (lateral view of test).

5. **Arcella vulgaris** Ehrenberg.

(TEXT-FIG. 1 E)

1832. *Arcella vulgaris* Ehernberg, *Abh. K. Akad. Wis.*, Berlin, p. 40, pl. 1, fig. 6.

1905. *Arcella vulgaris* : Cash & Hopkinson, *The Brit. Fresh-water Rhiz. & Heliozoa*, **1**, pp. 118-121, pl. 15, figs. 1-3, 13-15, text-figs. 17 & 18.

1928. *Arcella vulgaris* : Deflandre, *Arch. Protistenk.*, Jena, **64**, pp. 219-221, figs, 156-164.

Habitat & Locality.—Amongst the pond vegetation and on the surface scum, empty tests common in the bottom ooze. Jagannathpur, Falta (Dist. 24-Parganas); 11-6-1967. Burdwan (Dist. Burdwan); 12-11-1965. Gopal Nagar, Lakshmikantapur (Dist. 24-Parganas); 2-11-1966.

Remarks.—Typical specimens with varying size range are quite commonly met with in water samples. The young ones are having colourless test gradually changing from yellow to brown depending on the age.

Among the specimens the tests referable to variety *angulosa* and forma *undulata* are also observed.

Local specimens have test diameter ranging from 43-74. μ.

6. **Arcella gibbosa** Penard

(TEXT-FIG. 1 F)

1890. *Arcella gibbosa* Penard, *Mem. Soc. Phys. Geneve*, **31** (2), p. 155, pl. 5, figs. 96-99, pl.6, fig. 1.

Habitat & Locality.—Amongst the submerged pond vegetation, Jagannathpur, Falta (Dist. 24-Parganas); 11-7-1967.

Remarks.—Except for the gibbous nature of the test, the specimens are similar to the previous species. Very rare, the local specimens are smaller in size having diameter 45-50 μ The circular depressions on the surface of the test are very shallow.

7. **Arcella discoides** Ehrenberg

(TEXT-FIG. 1 G, H)

1843. *Arcella discoides* Ehrenberg, *Abh. preuss. Akad. Wiss.*, Berlin. p. 139.

1928. *Arcella discoides*: Deflandre, *Arch. Protistenk.*, Jena, **64**, pp. 25.6-257, figs, 324-326.

Habitat & Locality.—The living specimens in the flocculent matter amongst pond vegetation, empty tests are plenty in the bottom ooze. Himsagar, Kalyani (Dist. Nadia); 29-9-1965; Tribeni, (Dist Hooghly), 5-1-1967, 12-12-1967.

Remarks.—Empty tests are usually seen on the bottom ooze of ponds; the living animals are very rare. The local specimens are medium sized to big, ranging 104 to 220 μ in diameter, and the diameter of the mouth from 44-117 μ. Height of the dome $\frac{1}{4}$ to $\frac{1}{3}$ of the diameter of test.

8. **Lesquereusia spiralis** (Ehrenberg)

(TEXT-FIG. 1 J)

1840. *Difflugia spiralis* Ehrenberg, *Monatsb. Akad. Wiss.* Berlin, p. 199.

Habitat & Locality.—Empty tests on the bottom ooze, living specimens very rare amongst the pond vegetation. Kalyani (Dist. Nadia); 7-12-1964.

Remarks.—The spherical part and the tubular neck of the test are composed of vermiform pellets arranged very closely. The tests are transparent allowing the plasma to be seen very clearly. The pseudopodia are long, finger-shaped and branched.

The local specimens averaging 148-158 μ by 115-132 μ in size are bigger than the specimens recorded from British Isles.

9. **Lesquereusia modesta** Rhumbler

(TEXT-FIG. 1 K)

1895. *Lesquereusia modesta* Rhumbler, *Zeits. Wiss. Zool.*, **61** (1), p. 101, pl. 4, fig. 2.

Habitat & Locality.—Empty tests on the bottom ooze of ponds. The living specimens are rare and seen amongst the aquatic vegetation. Kalyani (Dist. Nadia); 14-9-1964. Diamond Harbour (Dist. 24-Parganas); 4-9-1964.

Remarks.—Very similar to the preceding species in shape but with encrustation of quartz crystals on the test instead of vermiform pellets. The test is opaque and the details of the nucleus and contractile vacuole are not easy to make out.

The local specimens are bigger in size measuring 112-122 μ by 89-102 μ than the specimens described from the British Isles.

10. **Difflugia lobostoma** Leidy

(TEXT-FIG. 2 A)

1879. *Difflugia lobostoma* Leidy, *Fresh water Rhiz. N. America*, p. 112, pl. 15, figs. 1-14, 20-24, pl. 16, figs. 25-29.

Habitat & Locality.—The living ones amongst the pond vegetation and empty tests are commonly seen in the bottom ooze. Bandel (Dist. Hooghly); 9-11-1964. Tribeni (Dist. Hooghly); 12-12-1966. Burdwan (Dist. Burdwan); 14-11-1966. Krishna Sayar (Dist. Burdwan); 9-8-1966.

Remarks.—The tests of the local specimens are generally ovoidal in shape, medium sized with small angular quartz crystals covering the test. All the specimens observed are with trilobed pseudostome. Size 63-119 μ by 46-106 μ.

11. **Difflugia urceolata** Carter

(TEXT-FIG. 2 B)

1864. *Difflugia urceolata* Carter, *Ann. Mag. nat. Hist.*, (3) **13**, pp. 27, 37, pl. 1, fig. 7.

Habitat & Locality.—In the bottom ooze of ponds. Kalyani (Dist. Nadia); 7-12-1964. Akna village, Bandel (Dist. Hooghly), 9-11-1964.

Remarks.—The tests of the specimens observed are spherical with a broad reflected rim around the pseudostome. The test and the rim surfaces are quite smooth. The angular quartz crystals on the rim are smaller than the ones on the spherical part.

One of the biggest *Difflugia* observed in this place. The local specimens are of average size, measuring 165-317 μ by 115-314 μ.

12. **Difflugia corona** Wallich

(TEXT-FIGS. 2 C, D)

1864. *Difflugia corona* Wallich, *Ann. Mag. nat. Hist.*, (3) 13, p. 244, pl. 15, figs. 4 b, c, pl. 16, figs. 19,20.

Habitat & Locality.—Amongst the pond vegetation and the bottom ooze. Empty tests are quite common in the ooze of ponds, the living ones are very rare. Manohar Das tadak (Calcutta); 8-10-1963. Ghosh para, Kalyani (Dist. Nadia); 14-9-1964. Naihati (Dist. 24-Parganas); 4-9-1964. Barasat (Dist. 24-Parganas); 6-12-1965.

Remarks.—The tests of the local specimens are spherical in shape with five pointed spines on the periphery of the fundus. The surfaces of the test and the spines are smooth, formed by quartz crystals. The pseudostome characteristically crenulated, crenulation varying from 10-12 in number.

The local specimens are smaller, measuring 109-147 μ in diameter of test and 50-60 μ in diameter of the pseudostome, than the specimens reported from British Isles.

13. **Difflugia oblonga** Ehrenberg

(TEXT-FIG. 2 E)

1838. *Difflugia oblonga* Ehrenberg, *Infusionsthierchen*, p. 131, pl. 2, fig. 3 a-d.

Habitat & Locality.—In the bottom ooze of ponds. Himsagar, Kalyani (Dist. Nadia); 9-11-1964.

Remarks.—The test is typically oblong with smooth surface, composed of big angular quartz crystals. The empty tests are only observed measuring 360-426 μ by 138 μ.

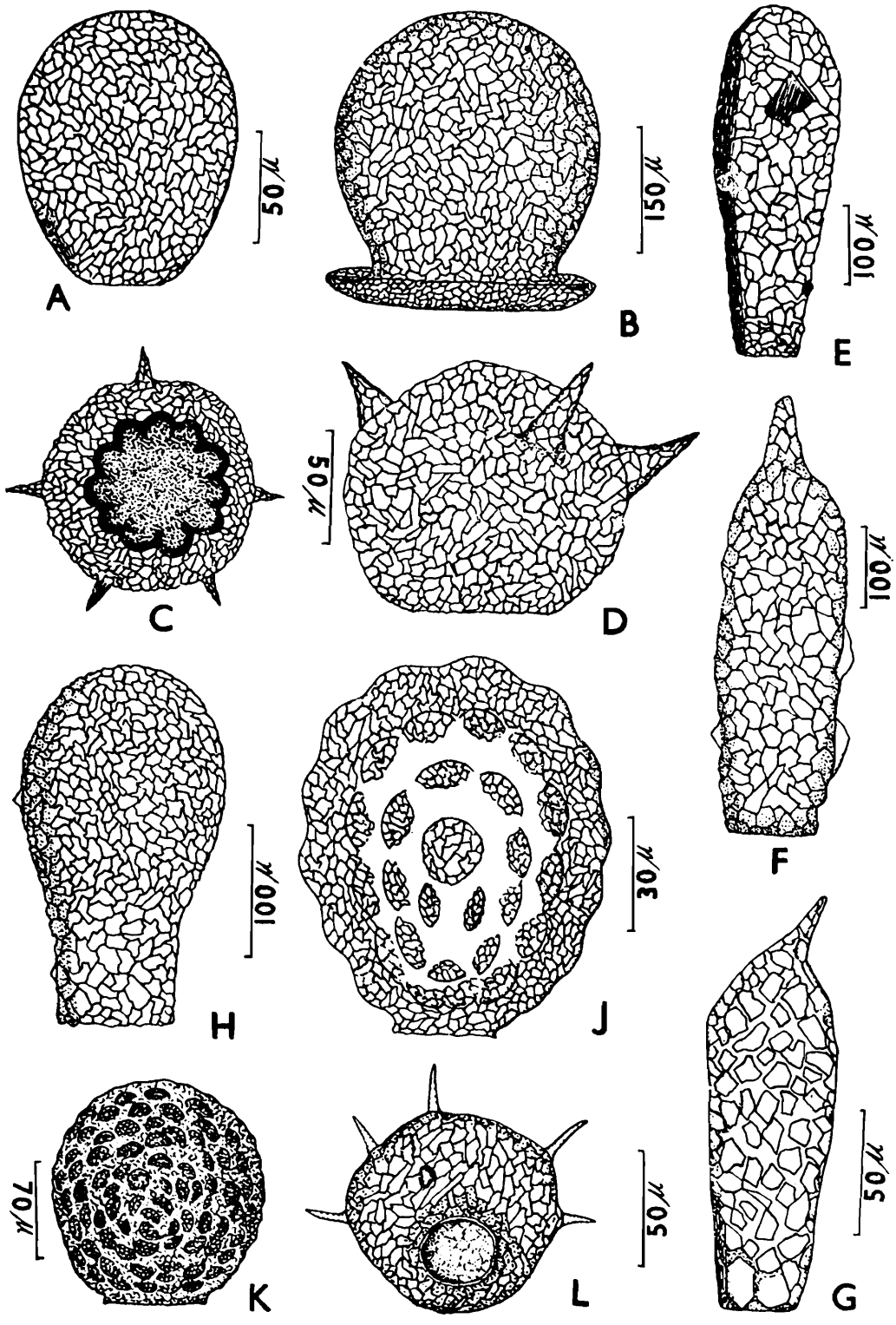
The specimens collected are bigger in size than the specimens reported from British Isles.

14. **Difflugia acuminata** Ehrenberg

(TEXT-FIG. 2 F)

1838. *Difflugia acuminata* Ehrenberg, *Infustonsthierchen*, p. 131, pl. 9, fig. 3.

Habitat & Locality.—In the bottom ooze of ponds. Kalyani (Dist. Nadia), 14-9-1964, 17-12-1964. Diamond Harbour (Dist. 24-Parganas); 10-8-1964. Pathipukur (Dist. 24-Parganas); 21-4-1964. Gopal Nagar, Adisaptagram (Dist. Hooghly); 5-1-1967.



TEXT-FIG. 2. A. *Difflugia lobostoma* Leidy (lateral view of test); B. *Difflugia urceolata* Carter (lateral view of test); C. *Difflugia corona* Wallich (Apertural view of test); D. *Difflugia corona* Wallich (lateral view of test); E. *Difflugia oblonga* Ehrenberg (lateral view of test); F. *Difflugia acuminata* Ehrenberg (lateral view of test); G. *Difflugia curvicaulis* Penard (lateral view of test); H. *Difflugia pyriformis* Perty (lateral view of test); J. *Difflugia tuberculata* (Wallich) (lateral view of test); K. *Difflugia muriformis* Gauthier-Lievre & Thomas (lateral view of test); L. *Centropyxis aculeata* (Ehrenberg) (apertural view of test).

Remarks.—One of the species of *Difflugia* showing a considerable size range, from small sized to giant sized tests with a pointed tubular extension at the apex of the fundus. The quartz crystals of the test are

big and some of them project out of the margin of the test giving an irregular appearance to the border.

Size ranging from 184-338 μ by 59-96 μ. The specimens are medium sized when compared to the measurement of specimens (338-390 μ by 90-100 μ) reported by Gauthier-Lievre & Thomas (1958).

15. **Difflugia curvicaulis** Penard

(TEXT-FIG. 2 G)

1899. *Difflugia curvicaulis* Penard, *Rev. Suisse Zool.*, 7 (1), p. 36, pl. 3, figs. 2-6.

Habitat & Locality.—In the bottom ooze of ponds, Naihati (Dist. 24-Parganas); 17-10-1966.

Remarks.—The texture and shape of the test are very similar to *D. acuminata* except for curved prolongation on the fundus and the transparent nature of the test. The crystals on the chitinous tests are scanty and the gradual narrowing of the test towards the pseudostome is not seen in the specimens.

These specimens are doubtfully referred to this species here.

16. **Difflugia pyriformis** Perty

(TEXT-FIG. 2 H)

1848. *Difflugia pyrformis* Perity, *Mittheil. Naturf. Gesells.*, Bern, p. 168.

Habitat and Locality.—In the bottom ooze of ponds, the living specimens are very rare, the empty tests are seen in good number. Diamond Harbour (Dist. 24-Parganas); 18-8-1964. Kalyani (Dist. Nadia); 14-9-1964. Burdwan (Dist. Burdwan); 14-2-1966.

Remarks.—The shape of the test is characteristically pyriform with smooth margins, small angular quartz crystals and mud particles encrusted on the chitinous membrane.

Local specimens are of average size measuring 181-301 μ by 99-181 μ.

17. **Difflugia tuberculata** (Wallich)

(TEXT-FIG. 2 J)

1864. *Difflugia proteiformes* subsp. *globularis* var. *tuberculata*, Wallich, *Ann. Mag. nat. Hist.*, (3) **13**, p. 241, pl. 15, fig 48 and pl. 16, fig. 18.

Habitat & Locality.—Empty shells are seen in the bottom ooze of ponds, very rare. Garia (Dist. 24-Parganas); 5-10-1964. Barrackpore (Dist. 24-Parganas); 25-1-1967.

Remarks.—Test ovoidal in shape with pseudostome hexagonal in outline with obtuse angles. The tubercles on the test of the local specimens are of very feeble amplitude.

The speciments are of average size measuring 100-133 μ by 79-100 μ in size.

18. **Difflugia muriformis** Gauthier-Leivre & Thomas (TEXT-FIG. 2 K)

1958. *Difflugia muriformis* Gauthier-Lievre & Thomas, *Arch. Protistenk.*, Jena. **103** (2), p. 271, pl. 10, fig. a-c.

Habitat & Locality.—In the bottom ooze of ponds; only empty tests are observed. Kalyani (Dist. Nadia); 7-12-1964. Bandel (Dist. Hooghly); 9-11-1964.

Remarks.—The test is spherical with a small collar around the pseudostome, the pseudostome is trilobed, the test bearing evenly distributed small disc-shaped protuberances of feeble amplitude on it. In this character these specimens very clearly resemble the description of *D. muriformis* Gauthier-Lievre and Thomas (1958).

The local specimens are bigger in size measuring 172-210 μ by 158-178 μ than the size reported by Gauthier-Lievre and Thomas (1958).

19. **Centropyxis aculeata** (Ehrenberg) (TEXT-FIG. 2 L)

1832. *Arcella aculeata* Ehrenberg, *Abh. preuss. Akad. Wiss.*, Berlin, p. 40.

Habitat & Locality.—The living animals usually amongst the pond vegetation, empty tests quite frequent on the bottom ooze. Diamond Harbour (Dist. 24-Parganas); 31-8-1964. Bandel (Dist. Hooghly); 9-11-1964. Garia (Dist. 24-Parganas); 8-2-1965. Krishna Sayar (Dist. Burdwan); 7-8-1965. Barasat (Dist. 24-Parganas); 6-9-1965 & 6-12-1965. Naihati (Dist. 24-Parganas); 17-10-1966.

Remarks.—The size of the specimens varies considerably, usually with quartz crystals on the test, the specimens with admixture of diatoms, fistules and sand particles are very common.

The specimens collected are of medium size to big ones ranging from 88-250 μ in diameter of test and the pseudostome 33-99 μ The spines number varies from four to six; the spines are devoid of crystals and diatom encrustation.

20. **Centropyxis ecornis** (Ehrenberg) (TEXT-FIG. 3 A)

1843. *Arcella ecornis* Ehrenberg, *Abh. preuss. Akad. Wiss.*, Berlin, p. 368, pl. 1, fig. 9, pl. 3, fig. 46.

Habitat & Locality.—Amongst the pond vegetation and on the bottom ooze. Bandel (Dist. Hooghly); 17-11-1964. Diamond Harbour (Dist. 24-Parganas); 31-8-1964. Garia (Dist. 24-Parganas); 8-2-1965.

Remarks.—Very similar to *Centropyxis aculeata* in nature and texture of the test, but devoid of spines. The pseudostome is circular and placed eccentrically.

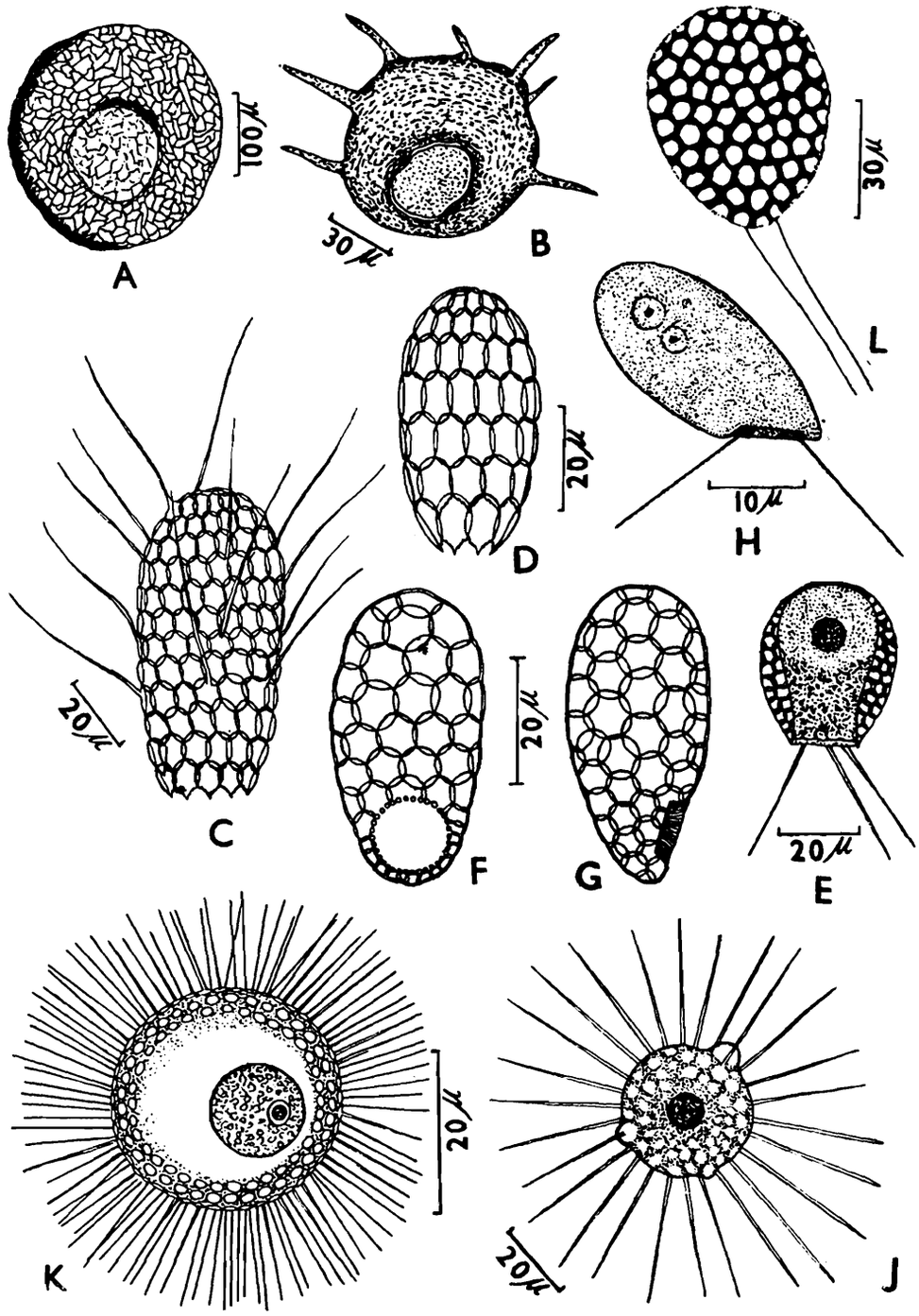
Size 195-267 μ in diameter and the height of the test on the non-depressed border ranges from 85-102 μ.

21. Centropyxis spinosa (Cash & Hopkinson)

(TEXT-FIG. 3 B)

1905. *Centropyxis aculeata* var. *spinosa* Cash & Hopkins n, *The British Fresh-water Rhiz. & Heliozoa*, **1**, p. 135, pl. 16, fig. 15 and text-fig. 26.

Habitat & Locality.—Amongst the pond vegetation and the surface scum. Krishna Sayar, Burdwan (Dist. Burdwan); 9-8-1965.



TEXT-FIG. 3. A. *Centropyxis ecornis* (Ehrenberg) (apertural view of test); B. *Centropyxis spinosa* (Cash & Hopkinson) (apertural view of test); C. *Euglypha acanthophora* (Ehrenberg) (lateral view of test); D. *Euglypha tuberculata* Dujardin (lateral view of test); E. *Placocista lens* Penard (broad side view); F. *Trinema enchelys* (Ehrenberg) (apertural view of test); G. *Trinema enchelys* (Ehrenberg) (lateral view of test); H. *Trinema lineare* Penard (lateral view); J. *Actinophrys sol* Ehrenberg; K. *Acanthocystis spinifera* Greeff; L. *Clathrulina elegans* Cienkowski (lateral view of a capsule)

Remarks.—The test is chitinous and with very few crystals of quartz or diatom fistules encrusting on it. The spines vary from six to eight and arranged on two levels on the periphery of the broader end. The pseudostome is irregularly circular in shape, with invaginated borders. Size: 86 μ in diameter, mouth 46 μ in diameter and spine length varies from 30-41 μ. The local specimens are of smaller size than those recorded by Cash and Hopkinson (1905) who give 120-140 μ diameter.

22. **Euglypha acanthophora** (Ehrenberg)

(TEXT-FIG. 3 C)

1842. *Difflugia acanthophora* Ehrenberg, *Abh. Acad. Berlin*, pp. 413, 414, pl. 4, 1 fig. 36.

Habitat & Locality.—Amongst the pond vegetation and on the bottom ooze of ponds. Hridayapur, Barasat (Dist. 24-Parganas); 6-9-1965, 6-12-1965. Adisaptagram (Dist Hooghly); 5-1-1967.

Remarks.—The test is ovoidal and very closely resembles the descriptions of the species by Cash & Wailes (1915) in the nature of spines, the serrated apical scales bordering the pseudostome and in the shape and structure of the plasma.

Size 53-73 μ by 22-33 μ, spines five to six varying from 18-32 μ in length.

The specimens referable to *E. acanthophora* var. *flexuosa* Penard are also quite common in the water samples. Except for the flexuous nature of the spines, these specimens agree in other respects with the typical forms. The specimens with two to three tiers of flexuous spines at varying intervals are also present in the collection. Size of these specimens ranges from 53-56 μ by 26 μ.

23. **Euglypha tuberculata** Dujardin

(TEXT-FIG. 3 D)

1841. *Euglypha tuberculata* Dujardin, *Zooph. Infus.*, pp. 251-252.

Habitat & Locality.—Amongst the pond vegetation and the bottom ooze. Barasat (Dist. 24-Parganas); 6-9-1965. Barrackpore (Dist. 24-Parganas); 25-1-1967.

Remarks.—The test is oval in shape, composed of oval shaped silicious scales, regularly imbricated. The apical scales are serrated and the pseudostome is circular. Size of the test 56-58 μ by 23-26 μ.

24. **Placocista lens** Penard

(TEXT-FIG. 3 E)

1902. *Placocista lens* Penard, *Faune Rhiz. Leman*, pp. 514-515, 3 figs.

Habitat & Locality.—The bottom ooze of ponds. Gopalnagar, Lakshmikantapur (Dist. Hooghly); 2-11-1966.

Remarks.—The test is broadly oval in shape, made of small oval shaped silicious scales; very much compressed hence the plasma is seen very clearly, the pseudostome is bordered by a very delicate membrane.

Size 40-46 μ by 33 μ in the broad view and the maximum thickness in side profile 10-15 μ. The local specimens are smaller in size than the ones reported from the British Isles. It is of considerable interest to note that this species has been reported from deep lakes in Europe.

25. **Trinema enchelys** (Ehrenberg)

(TEXT-FIGS. 3 F, G)

1838. *Difflugia enchelys* Ehrenberg, *Infusionsthierchen*, p. 132, pl. 9, fig. 4 a, b.

Habitat & Locality.—Amongst the pond vegetation and the bottom ooze of ponds. Barasat (Dist. 24-Parganas); 6-12-1965. Adisaptagram (Dist. Hooghly); 5-1-1967.

Remarks.—Very common in the ponds, the scales are circular and imbricated, the pseudostome is circular bordered by small incurved silicious plates.

Size 49. 5 μ by 23-28 μ, the diameter of the pseudostome 10-12 μ.

26. **Trinema lineare** Penard

(TEXT-FIG. 3 H)

1890. *Trinema lineare* Penard, *Mem. Soc. Geneve.*, **31** (1 & 2), p. 187, pl. 11, figs. 5-17.

Habitat & Locality.—On the bottom ooze of ponds with *Trinema enchelys* specimens. Barasat (Dist. 24-Parganas); 6-12-1965.

Remarks.—The shape of the test is very similar to the previous species, but the silicious scales of the test are not very distinct, and the size of the specimens is very small not exceeding 25 μ in length. The living specimens in conjugation are usually seen in the collections.

27. **Actinophrys sol** Ehrenberg

(TEXT-FIG. 3 J)

1830. *Actinophrys sol* Ehrenberg, *Abh. preuss. Akad*, Berlin, p. 42, pl. 2, fig. 4.

Habitat & Locality.—In long standing still water, amongst the pond vegetation. Wellington square fountain pond (Calcutta); 2-5-1959. Indian Museum Pond (Calcutta); 18-1-1960. Botanical Garden, Sibpur (Dist. Howrah); 4-2-1960. Adisaptagram (Dist. Hooghly); 28-2-1967.

Remarks.—Very common heliozoan usually seen in all the ponds of the locality. Size of the specimens varies according to the habitat and age differences.

28. **Acanthocystis spinifera** Greeff

(TEXT-FIG. 3 K)

1869. *Acanthocystis spinifera* Greeff, *Arch. mikr. Anat.*, **5**, p. 493, pl. 27, figs. 20-23.

Habitat & Locality.—Adisaptagram (Dist. Hooghly); 5-1-1967.

Remarks.—The body is spherical with numerous, slightly curved spines of unequal length on the entire surface. The nucleus is eccentrically placed. The axopodia are not observed in these specimens. Size 26-33 μ diameter, spine length varying from 3-8 μ The specimens are of small to medium size.

29. **Clathrulina elegans** Cienkowsky

(TEXT-FIG. 3 L)

1867. *Clathrulina elegans* Cienkowski, *Arch. mikr. Anat*, 3, p. 311, pl. 18, figs. 1-15.

Habitat & Locality.—On the submerged vegetation of ponds. Bandel (Dist. Hooghly); 5-12-1964. Barasat (Dist. 24-Parganas); 6-12-1965.

Remarks.—Solitary individuals and colonies with 8 to 10 individuals are commonly seen.

The length of each stalk 191-285 μ, diameter of each capsule 43-53 μ, each pore having diameter 3.5-4. 5μ

The capsule of the local specimens are spherical and smaller in size than those reported from Europe and N. America.

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