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# FRESH WATER ALGAE OF SINDH-IV. THE GENUS CLOSTERIUM NITZSCH AND PLEUROTAENIUM NAGELI FORM LAKES & PONDS OF SINDH, PAKISTAN

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## Abstrect

In the present report 33 taxa of *Closterium* and 3 taxa of *Pleurotaenium* are reported from fresh water ponds and lakes of Sindh.

## Introduction

The study was under-taken to report *Closterium* and *Pleurotaenium* (Family *Desmidaceae*, Order Zygnematales)from the distributaries of river Indus where the alkalinity level is low. These species occour in planktonic form in fresh water bodies located in various districts of Sindh Province.

In Pakistan Sarim & Faridi 1976, 1988 & 1995 were the first to report *Closterium* and *Pleurotaenium* from N.W.F. Province followed by Masud-ul-Hassan *et al.*, (1995) from the rice fields of the Punjab.

The present report desceribes the occurrence of these species for the first time from the fresh water lakes and ponds of the Sindh, Pakistan.

## Materials and Method

Plants were collected from rice fields, drains, marshy places, pools & riverine pond of Hussainabad (Distt: Hyderabad), Kinjhar lake (District Thatta) and Bakar lake, (District Sanghar). Planktons were studied after presvering in 3-4% formaline. Dust and other organic material were removed by washing with 2-3% acetic acid to clear the specimen. The desicription is accompanied with camera lucida drawings, at magnification of 8x X 10 and 8x X 40 under the light microscope. Specimens were identified and compared with that of Sarim & Faridi (1976, 1995) and Prescott *et al* (1975).

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***Closterium dianae*** Ehr. var. ***dianae*** Prescott *et al* 1975:46

(P1.I, Fig. 7)

Cells 6-7 times longer than broad, strongly curved, and ventral margin slightly tumid. Chloroplast with 4-6 longitudinal ridges and with 6-8 pyrenoids in a series. Terminal vacuoles 10-20 granules. Cells 261-280 um long, 36-42 um wide. Apex 4.5-7.8 um.

**Localioty:** Khadejifall 22-8-1996.

**Distribution:** Cosmopolitan.

***Closterim dianae*** Ehr. var. ***brevius*** (Wittr) Petkoff.

Prescott *et al,* 1975:47; Sarim & Faridi, 1976:227

(P1.I, Fig. 8)

Cells 5-7 times longer than broad, swollen in the mid region. Chlotoplast with 5-7 pyrenoids. Cells 180-200 µm long 24 µm broad. Apex 2.5 - 3.5 µm.

**Locality:** River Indus pond at Kotri. 6-7-1995.

**Distribution:** Cosmopolitan.

***Closterium ehrenbergii*** Meneg. Prescott, *et al*, 1975:49; Islam *et al,* 1985:880.

(P1.I, Fig. 9)

Cells 350-500 um long 30-57 um wide. Apex 9-19.7 um, Slightly tuimid in the middle on the concave side.

**Locality:** Hussainabad pond, Distt Hyderabad.

**Distribution:** Cosmopolitan,

**Closterium ehrenbergii** Meneghini var. ***ehrenbergii,*** Prescott *et al*, 1975:49.

P1. I, Figs. 10 & 11)

Cells 6-7 time longer than broad, slightly curved dorsal wall convex, gradually attenuated to round poles; wall smooth colourless. Chloroplast with 3 or more gridle bands, pyrenoids numerous & scattered. Terminal vacuole with many garanules.

**Locality:** Bhitai Town, and Hussain abad pond, 15-5-1996.

**Distribution:** Cosmopolitan.

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***Closterium enhrenbergii*** var, ***atumidum*** Gronblad. Prescott *et al*, 1975:49

(Pl.I, Fig. 12)

Cells 150-210 um long, 25-30.5 um broad, chloroplast with longtiudinal ridges, with numerous scattered pyrenoids. Apex 4.5-6 µm, terminal vacuole with few granules.

**Locality:** Ponds, Distt . Jakababad, 22-3-1997.

**Distribution:** Cosmopolitan.

***Closterium exile*** west and west. Sarim & Faridi, 1976:228

Prescott et al, 1975:51,

(Pl. 1, Fig. 13)

Cells 7-10 times longer than broad, slightly curved, ventral margin concave, striaght in the middle region, acuminately rounded, chloroplast with 2-3 pyrenoids. Cells 72-80 µm long 9-10 µm broad. Apex 1.5-2.5 µm.

**Locality:** Hussainabad, Distt Hyderabad, 6-9-1997.

**Distribution:** U.S.A. Norway and Asia.

***Closterium lanceolatum*** **Kuetzing,** Precott, et al, 1975:59;

Sarim & Faridi, 1976:230

(P1:I, Fig, 14)

Cells 6-7 times longer than broad, striaght, slightly curved on the outer margin convex, the inner margin stright or slightly convex, with rounded poles. Chloroplast with 6-10 ridges and 7-10 axil pyrenoids. Cells 191-210 um long, 29.7-30 µm broad. Terminal vacuole with 8-10 granules. Apex round 6.6 µm.

**Locality:** River Indus at Kotri, 29-11-1996 Distt: Dadu.

**Distribution:** Cosmopolitan.

***Closterium leibleinii*** Kuetzing. Prescott *et al,* 1975:60;

Sarim & Faridi, 1976:230

(P1,IV, Fig. 40)

Cells 7-8 times longer than broad, cruved and slightly inflanted in the mid region gradually attenuated with rounded poles. Chlotoplast with 2-6 longtudinal ridges with 4-10 Pyrenoids in a series. Terminal vacuole with 8-10 granules. Cells 240 µm long and 30-33 µm broad. Apex 3.5-4.5 µm.

**Locality:** Chalgari pond, Distt: Hyderabad.

**Distribution:** Cosmopolitan,

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***Closterium cf. c. pulchellum*** West and West. Prescott *et al,* 1975:80

(P1. II, Fig 23)

Cells longer than broad, slightly curved in the ventral margin, concave not inflanted in the midregion, poles narrowly rounded, wall smooth. Chloroplast with 2 or more pyrenoids. Cells 80-85 um long, 11.5-15 um broad.

**Locality:** Hussainabad. Distt. Hyderabad.

**Distribution:** U.S.A and Asia.

***Closterium rostratum*** Ehre. Prescott *et al*;, 1975: 83

(P1. III, fig. 24)

Cells 9-12 times longer than broad, slightly curved, inflanted in the mid region, tapering in the apical region. Chloroplast 3-8 longitudinal ridges, with 6-8 axil pyrenoids, terminal vacule with 10-15 granules. Cells 262-300 µm long and 23 µm broad. Apex 2.5-3.4 µm.

**Locality:** River Indus pond near Jamshoro Barriage, Distt. Hyderabad.

**Distribution:** Cosmopoitan.

***Closterium spetsbergense*** Borge var. ***spetsbergense*** Perscott *et al*, 1975:85

(P1. III, Fig, 26)

Cells 5-7 times longer than broad, dorsal margin strongly bowed, the internal margin slightly concave. Chloroplast with 5-6 axil pyrenoids. Cells 290-300 µm long and 40-45 µm broad. Apex 5.9-6.8 µm.

**Locality:** Rawal Kot Kashmir 15-9-1995. Thano Bola Khan. 15-9-1995.

**Distribution:** U.S.A, Europe & Asia.

***Closterium subfusiforme*** Messiko. Prescott *et al*, 1975:89

(P1. III, Fig, 25)

Cells 10-12 times longer than broad, stright, fuisform equally convex on margin, Chloroplast with 3-4 longitudinal ridges, with 4-6 axil pyrenoids. Cells 198-220 µm long, 20-22.5 µm broads. Apex 4.5-5 µm.

**Locality:** River Indus pond, at Hussainabad Distt. Hyderabad.

**Distribution:** Cosmopolitan.

***Closterium venus*** kuetz. var. ***major*** Strom.

Prescott *et al*, 1975:96; Sarim & Faridi, 1968:235; Croasdale, 1955:527

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(P1. III, Fig. 27)

Cells curved 125-150 µm long and 20-22 µm broad. Chloroplast with 3-4 pyrenoid. Terminal vacuole with 2-3 granules.

**Locality:** Jamshoro pond, Distt. Dadu.

**Distribution:** Cosmopolitan.

***Closterium venus*** kuetz. var. ***croasdale*** Croasdale, 1955:527; Sarim & Faridi, 1976:235

(P1. III, Fig. 28)

Cells 70-95 µm long, 13.5-15 µm broad. Apex 1.9-2.3 µm wide, Chloroplast with 2-3 pyrenoids, Terminal granules 2-3, Apex acute.

**Locality:** Jamshoro pond Distt. Dadu. 18-7-1997.

**Distribution:** Cosmopolitan.

***Closterium venus*** Kuetz. var. ***Crassum*** croasdale.

Prescott *et al*, 1975:97; Sarim & Faridi, 1976:235

(P1. III, Fig. 29)

Cells 5-8 times longer than broad, wall smooth clorless. Chloroplast with 2-5 pyrenoids. Terminal vacuole with 4-5 granules. Cell 85-90 µm long, 12-15 µm broad. Apex 2.4-3 µm.

**Locality:** Hussauin abad pond Distt. Hyderabad.

**Distribution:** Cosmopolitan.

***Closterium venus*** kutz. var. ***apollonionis*** Croasdale. Prescott *et al*;, 1975:96

(P1. III, Fig. 30)

Cells 6-9 times longer than broad. Chloroplast with 3-4 pyrenoids. Terminal vacuole with 1-5 granules. Cells 130-140 µm long, 24-29 µm broad. Apex 3-3.5

**Locality:** Bakar lake Distt. Sanghar.

**Distribution:** U.S.A and Asia.

***Closterium venus*** var. ***venus f. major strom***. Prescott. 1975:96

(P1. III, Fig, 31)

Cells 35 µm long, 8.5-9 µm wide. Apex 1.2 µm with 2-3 granules.

**Locality:** Riverin pond. Kotri Distt. Dadu.

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**Distribution:** Cosmopolitan.

***Closterium venus*** kuetzing var. ***westii*** (West) Kriger. Prescott *et al*, 1975:97

(P1. II, Fig 32)

Cells 8-10 times longer than broad curved. Chloroplast with 2-3 pyrenoids. Cells 60-100 µm long, 8.5-10 µm broad. Terminal vacuole with few granules.

**Locality:** Hussainabad Pond Distt. Hyderabad.

**Distribution:** Cosmopolitan.

***Closterium gracele*** var. ***elongatum*** West & West. Proscott *et al* 1975:52

(P1. III, Fig. 33)

Cells 411-452 um long, 6-7.5 µm broad Apex 1.5-3 µm. In the centre 15-17.5 um long pore between the chloroplast. Chloroplast with 4-6 pyrenoids. Terminal vacuole with 3-5 granules.

**Locality:** Bakar lake. Distt. Sanghar.

**Distribution:** Cosmopolitan.

***Pleurotaenium trabecula*** (Ehr) Nageli, Prescott et al. 1975:133;

Sarim, 1995:131

(P1. IV, Fig, 34)

Cells medium size, 14-16 times longer than broad, with 1-2 swellings in the midregion tapered to the apex which is truncate with rounded apex, wall punctate. Chloroplast with 3-4 lateral bands, with a scattered pyrenoids. Cells 360-450 µm long, 36-42 µm broad Apex 30-33 µm. Isthmus, 27-32 µm.

**Locality:** Typha pond near Bhitai Nagar, Distt. Hyderabad. 18-4-1996.

**Distribution:** U.S.A. Europe and Asia.

***Pleurotaenuium ehrenbergii*** (Breb) De Bary var. ***ehrenbergii.***

Prescott *et al,* 1975:114; Sarim, 1995:129

(Pl. IV, Fig. 36-39)

Cells 14-18 times longer than broad, slightly constricted, with 2-3 swellings in the middle near the centre. Apex of semicell slightly tapered to rounded-truncate. Chloroplast longitudinal parietal bands with many pyrenoids. Cells 340-450 µm long and 30-35 µm broad. Apex 24-26 µm.

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Terminal vacule with many granules.

**Locality:** Jamshoro Colony S.U. Distt. Dadu. 10-2-1998.

**Distribution:** Cosmopolitan.

***Pleurotaenium nodulosum*** (Breb) De Bary. Prescott *et al*, 1975:126; Sarim, 1995:130

(P1. IV, Fig. 35)

Cells 11-14 times longer than broad, walls of semi cells undulating from moderate basal inflation to a tapering apical side. Apex smooth with rounded margin & 5-9 undulatio decreasing in size toword apex, cell wall punctate. Cells with 6-8 bands and chloroplast with many pyrenoids, 340-360 µm long, 30-36 µm broad. Isthmus 29.5.34 µm. Apex 29.5-32 µm.

**Locality:** Pond near Rajputana Hospital, Distt. Hyderabad. 2-4-1996.

**Distribution:** U.S.A., Europe, South America, and Asia.

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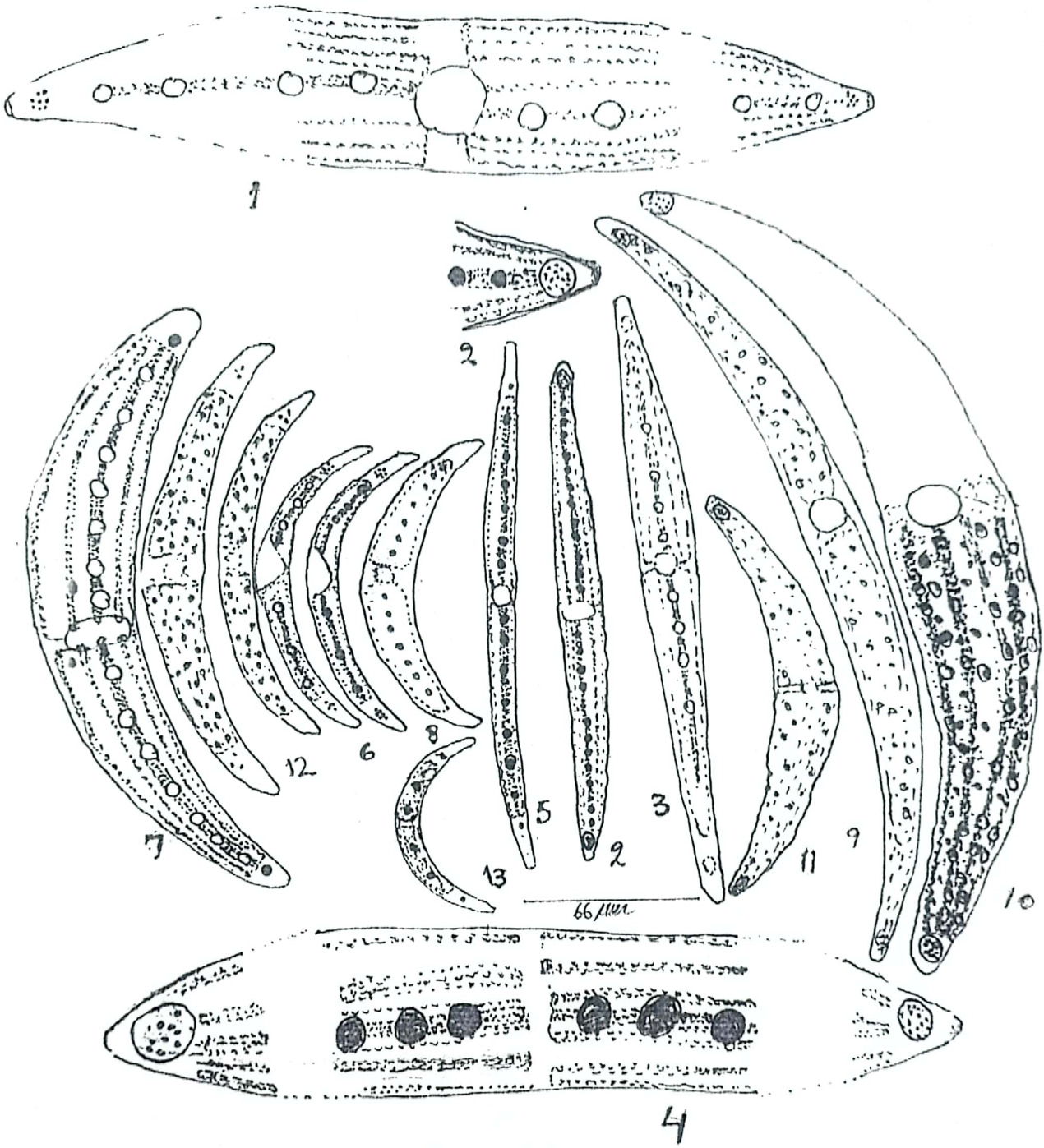



**Plate I**

Fig. 1. ***Closterium acerosum*** (Schrank) Ehr. var. ***acerosum***.
Fig. 2. ***Closterium acerosum*** (Schrank) Ehr. var. ***elongatum*** de Brebission.
Fig. 3. ***Closterium acerosum*** (Schrank) Ehr. var. ***minus*** Hantzsch.
Fig. 4. ***Closterium attenuatum*** Ehr.
Fig. 5. ***Closteruim Cornu*** Ehr.
Fig. 6. ***Closterium Calosporum*** var. brasiliense Borgesen.
Fig. 7. ***Closterium dianae*** Ehr. var. ***dianae***.
Fig. 8. ***Closterium dianae*** Ehr. var. ***brevius*** (witter) Pet Koff.
Fig. 9. ***Closterium ehrenbergii*** Meneghini.
Fig.10-11. ***Closterium ehrenbergii*** Meneghini var. ehrenbergii.
Fig. 12. ***Closterium ehrenbergii*** Ehr, var. ***atumidum*** Gronblad.
Fig. 13. ***Closterium*** cf. ***c. exile*** West and West.

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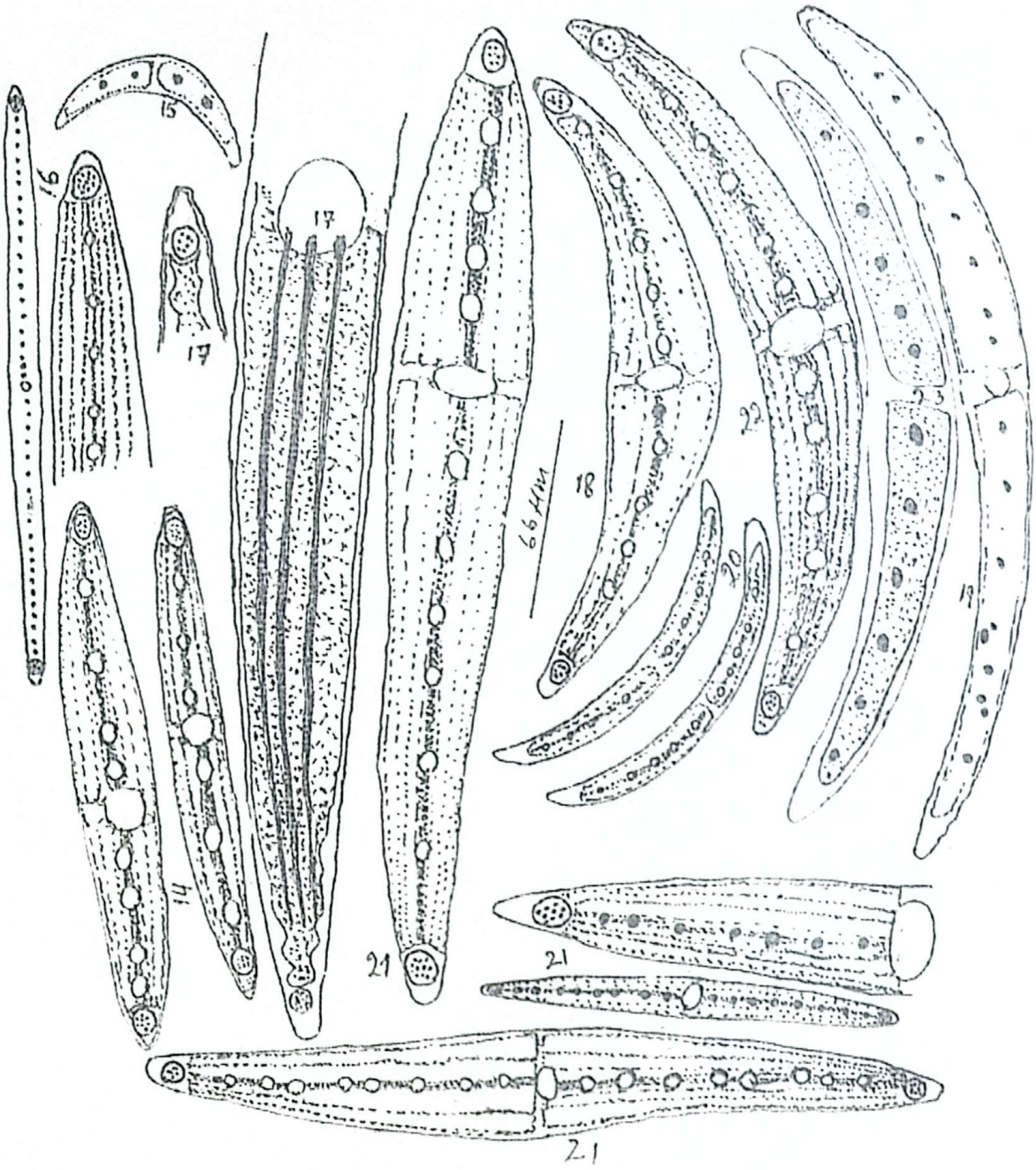



**Plate II**

Fig. 14. ***Closterium lanceolatum*** Kuetz.
Fig. 15. ***Closterium leibleinii*** Kuetz var. cf ***minimum*** Schmidle.
Fig. 16. ***Closterium lineatum*** (Ehr) var. ***lineatum.***
Fig. 17. ***Closterium lunula*** (Mull) Nitzsch var. ***lunula.***
Fig. 18. ***Closterium moniliferum*** (Bory) Ehr. var. ***moniliferum.***
Fig. 19. ***Closterium parvulum*** var. ***maius*** West & West.
Fig. 20. ***Closterium parvulum*** Neageli.
Fig. 21. ***Closterium pritchardianum*** (Archer) var. ***pritchardianum.***
Fig. 22. ***Closterium pseudolunula*** Broge var. ***pseudolunula.***
Fig. 23. ***Closterium cf. c. pulchellum*** West and West.

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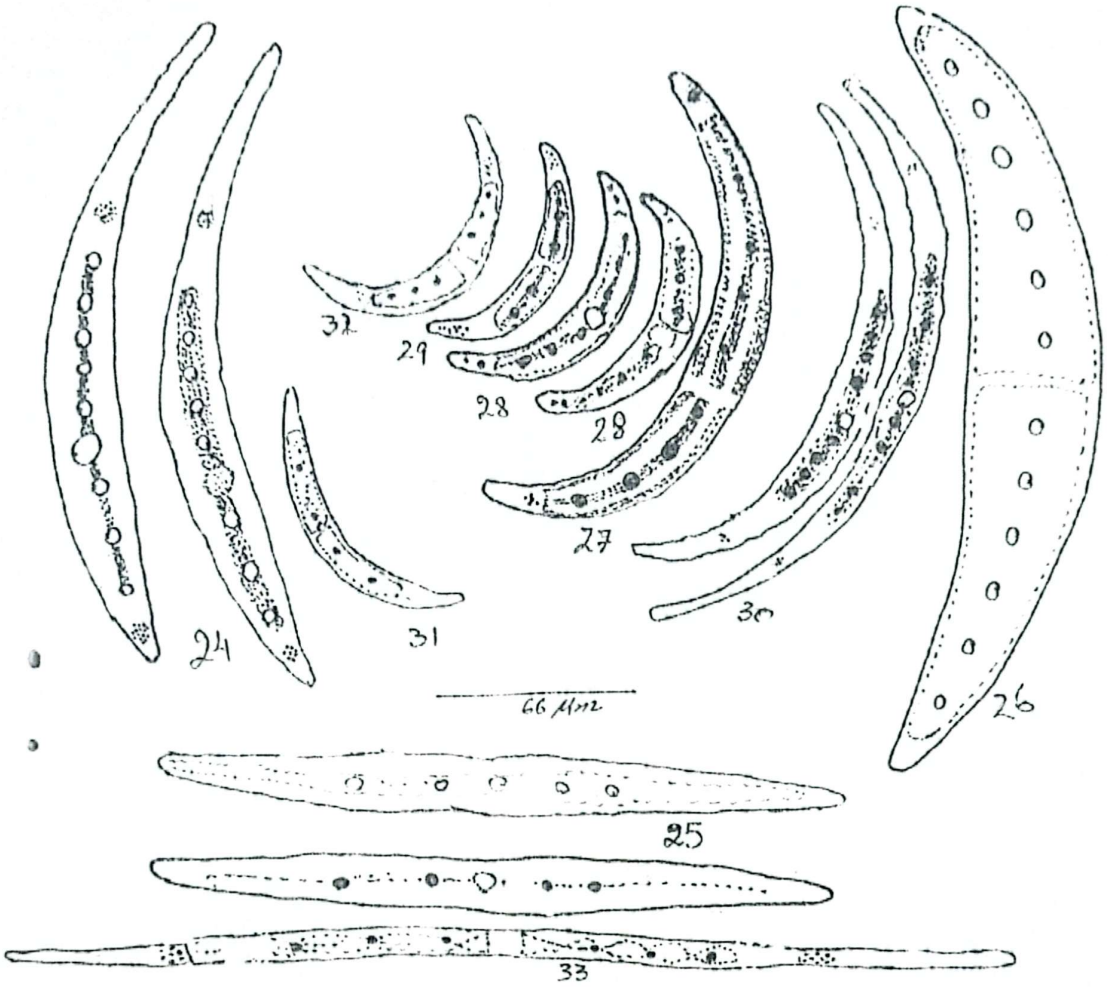



**Plate III**

Fig. 24. ***Closterium cf. c. rostratum*** Ehrenberg.
Fig. 25. ***Closterium subfuisforme*** Messikommer.
Fig. 26. ***Closterium spetsbergense*** Borge var. ***spetsbergense***.
Fig. 27. ***Closterium venus*** Kutzing var ***major*** Strom.
Fig. 28. ***Closterium venus*** Kutzing var. ***croasdale***.
Fig. 29. ***Closterium venus*** Kutzing var. ***crassum*** Croasdale.
Fig. 30. ***Closterium venus*** Kutzing var. ***apollonionis*** Croasdale.
Fig. 31. ***Closterium venus*** Kutzing var. ***venus f.major*** Strom.
Fig. 32. ***Closterium venus*** Kutzing var, ***westii*** (West) Kriger.
Fig. 33. ***Closterium gracele*** var. ***elgongatum*** West & West.

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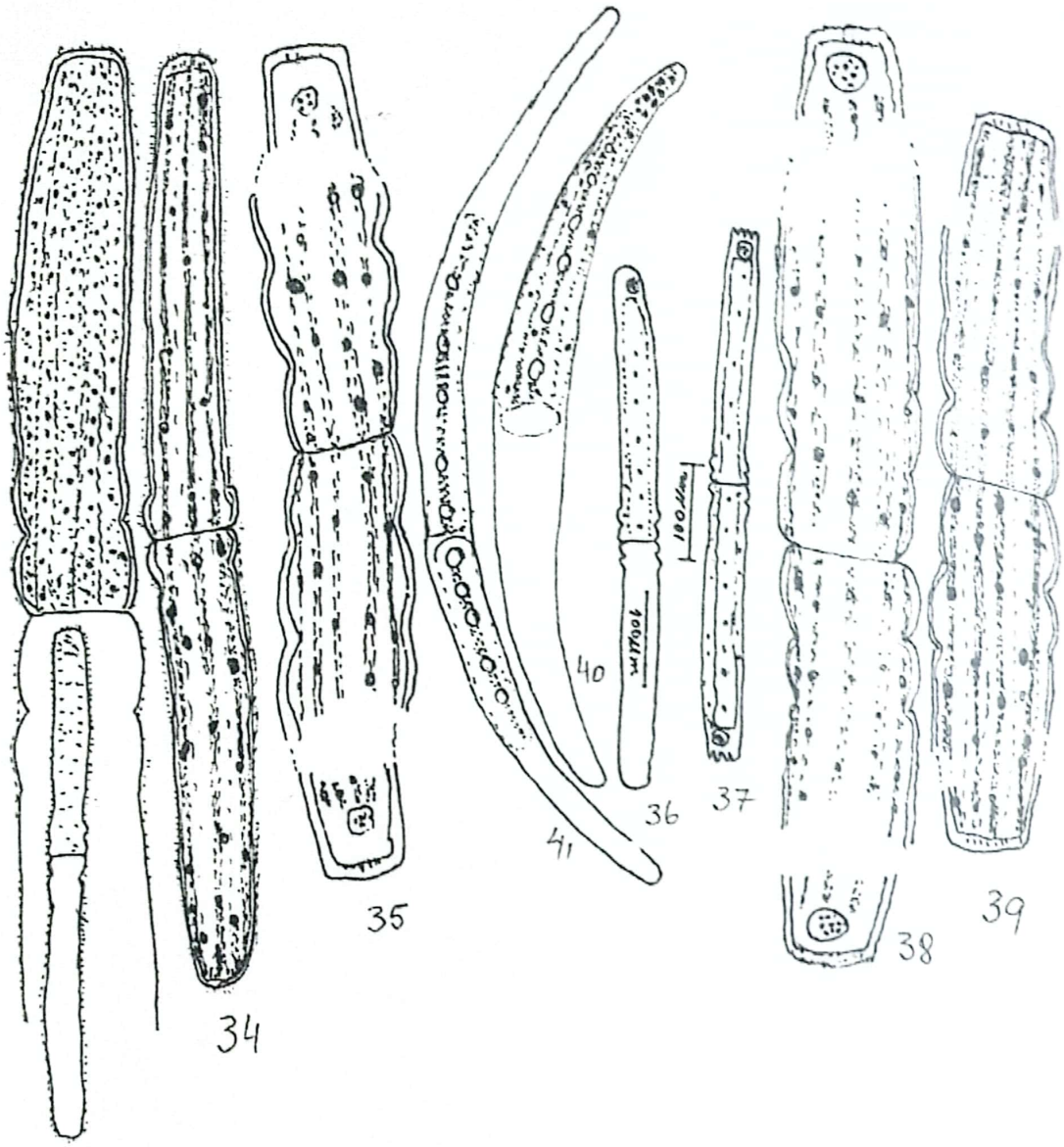



**Plate IV**

Fig. 34. ***Pleurotaenium trabecula*** (Ehr.) Nageli.
Fig. 35. ***Pleurotaenium nodulosum*** (Breb) De Bary.
Fig. 35-39. ***Pleurotaenium ehrenbergii*** (Breb) De Bary var. *ehrenbergii*.
Fig. 40. ***Closterium leibleinii*** Kutzing.
Fig. 41. ***Closterium dianae*** Ehr. var. ***arcuatum*** (Breb) Raben.

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