

A SYSTEMATIC ACCOUNT OF THE DIATOMS OF BOMBAY AND SALSETTE

PART I

Centrales : Sub-order—Discineæ and

**Pennales : Sub-orders—Araphidineæ, Raphidoidineæ,
Monoraphidineæ and Biraphidineæ.**

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INTRODUCTION

IN a comprehensive review of the available literature on Diatomaceæ, Patrick¹ has surveyed the information on diatoms given previously by other workers. The only records of diatoms from India included in the bibliography given by her are those of Biswas,² Majeed³ and Skvortzow.⁴ These are records of diatoms from North India only. Very admirable accounts of diatoms from South India are given by Venkataraman⁵ and Subrahmanyam.⁶ The former has surveyed the literature dealing with systematic accounts of diatoms in India, previous to the publication of his paper and mentions that all the references obtained till then relate to the diatoms of Upper India. As far as South India is concerned, these two workers have made up for any deficiencies by their admirable and very well-illustrated accounts of fresh-water, brackish-water and marine diatoms from South India. From the data given by Venkataraman,⁵ the fact emerges that no record of the diatoms of Bombay or of the Bombay State exists. It was in order to rectify this omission that the present investigation was undertaken. At first it was meant to be a survey of the diatoms of Bombay State, but as the number of diatoms found in Bombay and its environs alone was formidable, the survey was restricted to these areas only.

The investigation was carried out in the Botany Departments of the Institute of Science, Bombay, and the Karnatak College, Dharwar.

¹ Bot Rev 1948. 14: 473-524.

² Jour. Roy. Asiatic Soc. of Bengal 1936 2: 171-175.

³ Freshwater Algæ of the Panjab Part I. Bacillariophyta, Diatomeæ, Panjab University Publications, Lahore, 1935.

⁴ Phil. Jour Sci. 1935 58: 179.

⁵ Proc Ind Acad Sci. 1939 B. 10: 293-368.

⁶ Proc Ind Acad Sci. 1946. B. 24: 85-197.

Collections of diatoms were made from various tanks, ponds and streams, chiefly in Salsette, which is an island connected with that of Bombay. Very good collections were also obtained from the temporary rain-water pools and puddles, so common in and around Bombay during the monsoons. The brackish-water forms were collected chiefly from the Mahim and Chembur creeks.

The drawings of the forms were made from specimens prepared by adopting the method described by Venkataraman (1939).

A total of 267 forms have been recorded from this area. These represent 32 genera and include 10 new species, 21 new varieties and 40 new forms. In this paper, 61 forms are described. The remaining will be described in the subsequent papers of this series.

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Bacillariophyta (Diatomeæ)

A. Order	<i>CENTRALES</i>
I. Suborder	<i>DISCINEÆ</i>
(1) Family	<i>COSCINODISACEÆ</i>
(a) Subfamily	<i>Melosiroideæ</i>
Genus	<i>Melosira</i> Agardh, 1824.

1. *Melosira Juergensi* C. A. Ag.

(Fig 1)

Van Heurck, H., *Traité des Diatomées*, 1899, p. 442, pl. 28, fig. 612; Migula, W., *Kryptogamen-Flora*, Bd. VI, Teil 1 a, p. 153, Taf. 17, fig. 5; Gran, H. H., *Nordisches Plankton, Botanischer Teil*, Bd. VIII, 1909, p. 12, pl. 19, fig. 2; Schönfeldt, Pascher's *Süßwasser-Flora*, Heft 10, 1913, p. 15, fig. 1; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 84, fig. 40; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 1, 1930, pp. 238-39, fig. 99.

Frustules cylindrical, united in long chains. Outer mantle line straight, inner slightly wavy. Neck absent. Cell wall strong and punctate in spiral rows.

Dimensions	Diameter of the cell 23-25 μ
	Height of half cell 21.5-24 μ
	Rows of puncta 28-29 in 10 μ

Habitat . . . Fresh-water Powai lake. Common.

2 *Melosira granulata* (Ehr) Ralfs.

(Fig 2)

Van Heurck, H., *Traité des Diatomées*, 1899, p. 119, fig. 621; Schönfeldt, Pascher's *Süßwasser-Flora*, Heft 10, 1913, p. 16, fig. 9; Krieger, W., Kolkwitz's *Pflanzenforschung*, Heft 10, 1927, Taf. 1, fig. 1; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 87; fig. 44; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 1, 1930, p. 248, figs. 104, a, b, c, e; Skvortzow, B. W., Diatoms from Poyang Lake, Hunan, China, *Phil Jow. Sci.*, Vol. 57, 1935, p. 465, pl. 1, fig. 4; Diatoms from Kizaki Lake, Honshu Island, Nippon, Vol. 61, 1936, p. 9, pl. 1, fig. 8.

Frustules cylindrical, united in chains. Mantle line straight. Mantle portion well developed. Neck fairly large. Mantle surface straight and parallel. Surface of the mantle punctate with puncta in spiral rows. End cell with coarser puncta in parallel rows and also long spines directed inwards and outwards.

Dimensions	Diameter of the cell 8–10 μ Height of half-cell 9–13 μ Rows of puncta 9–10 in 10 μ No of puncta 9–11 in 10 μ No of puncta in the end cell 8–9 in 10 μ
Habitat	Fresh-water Streams at Borivli. Common. Brackish water. Mahim creek. Rare.

3 *Melosira granulata* (Ehr) Ralfs var. *muzzanensis* Meister

(Fig 3)

Bethge, H., Kolkwitz's *Pflanzenforschung*, Heft 13, 1925, p. 32, fig. 5; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 88, fig. 47; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 1, 1930, p. 251, fig. 105; Skvortzow, B. W., Diatoms from Biwa Lake, Honshu Island, Nippon. *Phil Jow. Sci.*, Vol. 61, 1936, p. 253, pl. 1, fig. 20.

Frustules short cylindrical, flat, united in chains by gelatinous cushions. Edges of the valves rounded. Neck large. Mantle line straight and parallel. Wall coarsely punctate in spiral rows. End cell coarsely punctate in straight rows. The spines project outside and inside in the same cell.

Dimensions	Diameter of the cell 18–20 μ Height of the cell 12–13 μ Rows of puncta 12–13 in 10 μ No. of puncta 18–20 in 10 μ
Habitat	Fresh-water Streams at Borivli. Not very common.

4. *Melosira islandica* O Müll subspecies *helvetica* O Müll

(Fig 4)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 89, fig 48; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, 1930, Teil 1, p. 254, fig 107; Skvortzow, B. W., Diatoms from Ikeda-Lake, Satsuma Province, Kiewisien Island, Nippon, *Phil. Jour. Sci.*, Vol 62, 1937, p. 191, pl. 2, fig 13.

Frustules cylindrical, united in chains. Valves thin with parallel margins. Neck ring-like. Wall clearly punctate in straight rows.

Dimensions . . . Diameter of the cell 8-9 μ
 Height of half-cell 12-13 μ
 Rows of puncta 13-14 in 10 μ
 No. of puncta 15-16 in 10 μ

Habitat . . . Fresh-water. Streams at Borivli. Common.

(b) Subfamily Coscinodiscoideæ

Genus *Cyclotella* Kützing, F. I., 1834.5 *Cyclotella stelligera* Cleve et Grun

(Fig 5)

Schönfeldt, Pascher's *Süßwasser-Flora*, Heft 10, 1913, p. 18, fig. 13; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 100, fig. 65; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 1, 1930, p. 339, fig. 172; Skvortzow, B. W., Diatoms from Kizaki Lake, Honshu Island, Nippon. *Phil. Jour. Sci.*, Vol. 61, 1936, p. 9, pl. 1, fig. 11; Diatoms from the Phillipine I. Diatoms from Drinking Water, Balara, Rizal Province, Vol. 64, 1937, p. 287, pl. 1, fig. 36; Venkataraman, G., A. Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.* Vol X, No. 6, Sect. B, 1939, p. 298, fig. 10.

Frustules almost discoid. Margin with coarse radiating striæ. The middle field has a punctum in the centre and short, thick radiating lines forming a star-like structure.

Dimensions . . . Diameter of the cell 9.5-11 μ
 Striæ 9-10 in 10 μ

Habitat . . . Fresh-water. Streams at Borivli, Powai lake.
 Not common.

6 *Cyclotella Meneghiniana* Kütz.

(Fig 6)

Van Heurck, H., *Traité des Diatomées*, 1899, p. 447, pl. 22, fig. 656; Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 155, Taf. 17, fig. 10; Schönfeldt, Pascher's *Süßwasser-Flora*, Heft 10, 1913, p. 19, fig. 17; Gustav, L., *Die Algen*, 1914, p. 135, fig. 229; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 100, fig. 67; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 1, 1930, p. 341,

Dimensions	Diameter of the cells 21-23 μ Striæ 8-10 in 10 μ
Habitat	Brackish-water Mahim-Creek Common.

9 *Cyclotella catenata* Brun

(Fig 9)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 108, fig. 83; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 1, 1930, p. 365, fig. 191

Frustules formed in chains. Valves arched, centric and small. The convex surface is slightly depressed in the middle. Striæ strong and wedge-shaped, radial. In the middle field large puncta are present forming radial striæ, short and long striæ alternating with one another

Dimensions	Diameter of the cell 11-18 μ Striæ 12 in 10 μ
Habitat	Fresh-water Powai Lake Not common
Genus	<i>Coscinodiscus</i> Ehrenberg, C. G., 1838

10 *Coscinodiscus radiatus* Ehr

(Fig. 10)

Van Heurck, H., *Traité des Diatomées*, 1899, p. 520, pl. 23, fig. 663; Gran, H. H., *Nordisches Plankton, Botanischer Teil*, Bd. VIII, 1908, pl. XIX, fig. 30; Lebour Marie, V., *Planktonic Diatoms of Northern Seas*, 1930, p. 39, fig. 15; Skvortzow, B. W., Pelagic Diatoms of Korean Strait of the Sea of Japan, *Phil. Jour. Sci.*, Vol. 46, 1931, p. 95, pl. I, fig. 3; Marine Littoral Diatoms from the Environs of Vladivostok, Vol. 47, 1931, p. 129, pl. 2, figs. 2-4, Bottom Diatoms from Olhon Gate of Baikal Lake, Siberia, Vol. 62, 1936, p. 293, pl. 2, figs. 17-18

Frustules in girdle zone low with no intercalary bands; surfaces slightly convex. Valves circular without any apicules or spinules. Aeriotes coarse and strong meshes of about the same size, slightly radiating from the centre to the margins. Aeriotes smaller at the extreme end.

Dimensions	Diameter of the cell 95-125 μ No. of aeriotes in the middle 4-5 in 10 μ No. of aeriotes at the margin 5-6 in 10 μ
Habitat	Brackish-water Mahim and Chembur Creeks Not common.

B. Order	<i>PENNALES</i>
I. Suborder	<i>ARAPHIDINEÆ</i>
(1) Family	<i>FRAGILARIACEÆ</i>
(a) Subfamily	<i>Fragilarioideæ</i>
Genus	<i>Ceratoneis</i> Kützing, F. I.

11 *Ceratoneis Ivengatii* sp. nov.

(Fig. 11)

Frustula solitaria libere fluctuantia. Valvæ fortissime arcuatae, prominenter tumescentes ad lateres concavi medium, tenuissime decrescentes a medio in utrumque apicem qui obtuse rotundus est. Raphe in utraque valva abest. Pseudoraphe uniformiter lata et distincta, aliquantum ex medio exorbitans. Area centralis unilateralis adest, sed indistinctissimis punctis signatæ. Striæ radiatæ et distincta punctatæ. Longit 63–67 μ ; latit 12–6–13 μ ; Striæ 8 in 10 μ .

Frustules solitary, free-floating. Valves very strongly arcuate with a prominent gibbosity in the middle of the concave side, tapering very slightly from the middle towards the poles which are broadly rounded. Raphe absent on both valves. Pseudoraphe uniformly broad and distinct, somewhat excentric. Unilateral central area present, but marked with indistinct scattered puncta. Striæ radial and distinctly punctate.

Dimensions	Length 63–67 μ
	Breadth 12·6–13 μ
	Striæ 8 in 10 μ

Habitat	Brackish-water Mahim Creek. Rare.
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This form differs from *Ceratoneis arcus* Kutz (Hustedt, in A. Pascher's *Süsswasser-Fl.*, p. 134, fig. 122) in being very strongly arcuate. Moreover it tapers very slightly towards the ends which are bluntly rounded. The striæ are distinctly punctate and more distantly placed. In the unilateral central area, indistinct, scattered puncta are seen. As it differs in so many respects, it is regarded as a new species.

Genus *Fragilaria* Lyngbye, 181912. *Fragilaria intermedia* Grun var. *robusta* Venkataraman

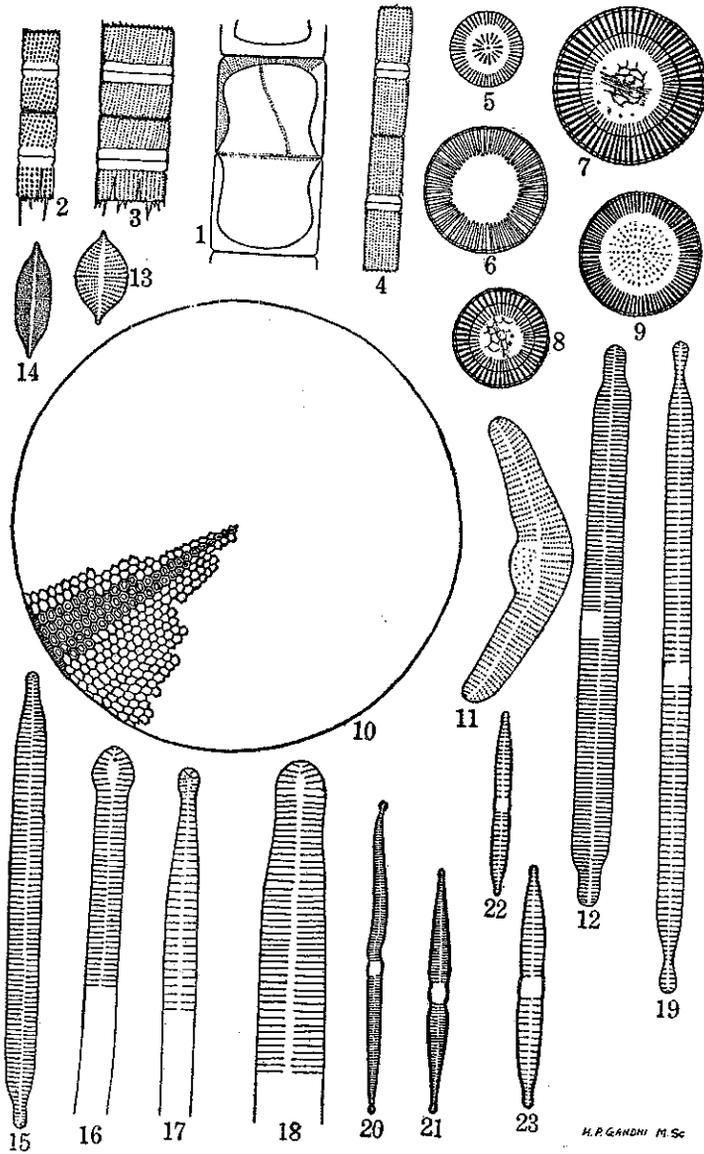
(Fig. 12)

Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol X, No 6, Sect B, 1939, p. 304, figs 27, 42.

Frustules in girdle view linear-rectangular, united by their margins to form long bands. Valves linear with parallel margins. Ends gradually tapering and rounded, very slightly capitate. Striæ coarse and distinct, in the middle absent on one side. Axial area narrow, linear.

Dimensions	Length 95–119 μ
	Breadth 6·7–2 μ
	Striæ 9–10 in 10 μ

Habitat	Fresh-water. Streams at Borivli and Powai Lake. Common.
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Figs. 1-23. Fig 1 *Melosira Juergensi* C. A. Ag., $\times 630$ Fig 2. *Melosira granulata* (Ehr.) Ralfs, $\times 630$. Fig 3. *Melosira granulata* (Ehr.) Ralfs var. *muzzanensis* Meister, $\times 630$ Fig 4. *Melosira islandica* O. Müll, subspecies *helvetica* O. Müll, $\times 630$. Fig 5. *Cyclotella stelligera* Cleve et Grun., $\times 1,000$. Fig 6 *Cyclotella Meneghiniana* Kütz., $\times 1,000$. Fig 7. *Cyclotella striata* (Kütz.) Grun., $\times 630$. Fig 8. *Cyclotella striata* (Kütz.) Grun var. *bipunctata* Fricke, $\times 630$. Fig 9. *Cyclotella catenata* Brun., $\times 1,000$ Fig 10. *Coscinodiscus radiatus* Ehr,

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×630. Fig. 11. *Ceratoneis Iyengarii* sp. nov., ×630. Fig. 12. *Fragilaria intermedia* Grun var. *robusta* Venkataraman, ×630. Fig. 13. *Raphoneis amphiceros* Ehr., ×630. Fig. 14. *Raphoneis amphiceros* Ehr. f. *linearis* f. nov., ×630. Fig. 15. *Synedra ulna* (Nitz.) Ehr., ×630. Fig. 16. *Synedra ulna* (Nitz.) Ehr. var. *biceps* Kütz., ×630. Fig. 17. *Synedra ulna* (Nitz.) Ehr. var. *danica* (Kütz.) Grun., ×1,000. Fig. 18. *Synedra ulna* (Nitz.) Ehr. var. *subæqualis* Grun., ×1,000. Fig. 19. *Synedra ulna* (Nitz.) Ehr. var. *amphirhynchus* (Ehr.) Grun., ×630. Fig. 20. *Synedra rumpens* Kütz., ×630. Fig. 21. *Synedra rumpens* Kütz. var. *familiaris* (Kütz.) Grun., ×630. Fig. 22. *Synedra rumpens* Kütz. var. *fragilarioides* Grun., ×630. Fig. 23. *Synedra rumpens* Kütz. var. *Meneghiniana* Grun., ×1,000.

This form agrees with *F intermedia* var. *robusta* Venkataraman, in all respects, except that the striæ are more distantly placed. The ends also seem to be more prolonged.

Genus *Raphoneis* Ehrenberg

13. *Raphoneis amphiceros* Ehr.

(Fig. 13)

Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil II, 1931-32, p. 174, fig. 680; Subrahmanyam, R., Marine Plankton Diatoms of the Madras Coast, *Proc Ind Acad Sci*, Vol. 24, No. 4, Sect B, 1946, p. 165, figs. 340-41.

Raphoneis rhombica, Van Heurck, *Traité des Diatomées*, 1899, p. 330, pl. 10, fig. 395.

Raphoneis rhombus, Roper, F. C. S., *Trans. Roy. Micros. Soc. Lond.*, N Ser., Vol. 2, 1854, p. 67, pl. 6, fig. 10.

Fragilaria amphiceros, Migula, W., *Kryptogamen-Flora*, Bd. II, Teil I a, p. 189, Taf. 13, Fig. 1; Karsten, G., Engler and Prantl's *Natur. Pflanzen*, Bd II, 1928, p. 262, fig. 338; Gustav, L., *Die Algen*, 1914, p. 144, pl. 10, fig. 262.

Frustules unicellular, free-living or in gelatinous masses, rectangular in girdle view. Valves broadly elliptical. Ends produced and acutely rounded. Pseudoraphe distinct, narrow, lanceolate. Striæ with large moniliform puncta, slightly radiating.

Dimensions	Length 19-22 μ
	Breadth 9-10 μ
	Striæ 7-10 in 10 μ
	Puncta 10 in 10 μ

Habitat Brackish-water. Chembur Creek. Not common.

This form is smaller than the type, but in all other respects, it agrees with it.

14. *Raphoneis amphiceros* Ehr. f. *linearis* f. nov.

(Fig. 14)

Valvae lineares ellipticæ, graciliores atque notis tenuioribus ornatae quam in specie typica; striæ propius inter se dispositæ; puncta tenuissima sed distincta. Longit. 21-24 μ ; latit. 7-6 μ ; striæ 20-24 in 10 μ .

Valves linear-elliptical, more slender than the type with finer markings. The striae are more closely arranged. Puncta very fine but distinct

Dimensions Length 21–24 μ
 Breadth 7.6 μ
 Striae 20–24 in 10 μ

Habitat Fresh-water Pools at Wadala Rare.

This form is distinctly linear-elliptical and slender, unlike the type. The striae also are very closely placed, fine and distinctly punctate. It is, therefore, regarded as a new form

Genus *Synedra* Ehrenberg, C. G., 1830

15 *Synedra ulna* (Nitzsch) Ehr.

(Fig 15)

Van Heurck, H., *Traité des Diatomées*, 1899, p. 310, pl. 10, fig. 409; Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 193, Taf. XI, figs. 14–16; Schönfeldt, Pascher's *Süßwasser-Flora*, Heft 10, 1913, p. 38, fig. 60; Gustav, L., *Die Algen*, 1914, p. 147, pl. 10, fig. 270; Konrad, G., Kolkwitz's *Pflanzen*, Heft 6, 1926, p. 1, fig. 3; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 151, figs. 158–59; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief. 1–4, 1931–32, p. 195, fig. 691 A a-c; Biswas, K., Common Diatoms of the Loktak Lake, Manipur, Assam, *Jour. Roy. Asia Soc. Bengal*, Vol. 2, 1936–37, p. 173, pl. 5, fig. 8; Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol. 10, No. 6, Sect. B, 1939, p. 305, fig. 37.

Frustules linear in girdle view with a slight expansion at the poles. Valves linear to linear-lanceolate and tapering at the poles. Ends rounded. Pseudoraphe narrow, linear. Central area absent (in some cases present, reaching the margins). Striae coarse.

Dimensions Length 93–150 μ
 Breadth 7–8 μ
 Striae 9–10 in 10 μ

Habitat Fresh-water. Streams at Borivli, Powai Lake and other pools in its vicinity. Very common

16. *Synedra ulna* (Nitzsch) Ehr. var. *biceps* Kütz.

(Fig 16)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 154, fig. 166; Frietsch, F. E., and Rich, F., Contribution to Our Knowledge of the Fresh-water Algæ of Africa. Bacillariales (Diatoms) from Griqualand, West., *Trans. Roy. Soc. S. Africa*, Vol. 18, 1930, p. 97, fig. 2 r-t; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief. 1–4, 1931–32, p. 195; Skvortzow, B. W., Diatoms from

19. *Synedra ulna* (Nitzsch) Ehr. var *amphihynchus* (Ehr.) Grun

(Fig 19)

Schönfeldt, Pascher's *Süsswasser-Flora*, Heft 10, 1913, p. 39; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 154, fig. 167; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief 1-4, 1931-32, p. 200, fig 691, A. e.; Skvortzow, B. W., Diatoms from Khingan, North Manchuria, China, *Phil. Jour. Sci.*, Vol. 35, 1928, p. 39, pl. 1, fig. 21; Abdul Majeed, M., Fresh-water Algae of the Punjab, Part I. *Bacillariophyta* (Diatomeæ). *Punjab Univ. Publications*, Lahore, 1935, pl. 2, fig 2; Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol. 10, No. 6, Sect B, 1939, p. 308, figs 28, 30-32.

Frustules solitary, in girdle view robust, elongated with constricted truncate apices. Valves straight, linear or slightly linear-lanceolate, constricted to form capitate ends. Striæ distinct. Pseudoraphe moderately wide, central area present

Dimensions Length 130-150 μ
 Breadth 5.2-6 μ
 Striæ 7-10 in 10 μ

Habitat Fresh-water. Garden tank of Institute of Science, Bombay. Not common

20. *Synedra rumpens* Kütz

(Fig 20)

Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 156, fig. 175; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 207, fig. 697 a, b; Abdul-Majeed, M., Fresh-water Algae of the Punjab, Part I. *Bacillariophyta* (Diatomeæ). *Punjab Univ. Publications*, Lahore, 1935, pl. 1, fig 16; Skvortzow, B. W., Bottom Diatoms from Olhon Gate of Baikal Lake, Siberia, *Phil Jour. Sci.*, Vol. 62, 1937, p. 293, pl. 5, figs 6, 61.

Frustules usually bent or twisted in the middle. In girdle view narrowly linear with somewhat narrowed ends. Valves narrowly linear lanceolate, at the ends narrowed and capitate. Pseudoraphe linear and very narrow. Middle area without striæ. Striæ fine but distinct

Dimensions Length 70-74 μ
 Breadth 3 μ
 Striæ 19-20 in 10 μ

Habitat Fresh-water. Powai Lake, streams and puddles near Kanheri Caves. Common.

21. *Synedra rumpens* Kütz. var. *familiaris* (Kütz.) Grun.

(Fig. 21)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 156, fig. 176; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 209, fig. 697 c.

Valves somewhat lanceolate and at the ends distinctly constricted and capitate. Also slightly constricted on both the sides of the central area.

Dimensions	Length 48-49.5 μ
	Breadth 3.6 μ
	Striæ 16-18 in 10 μ
Habitat	Fresh-water. Streams at Borivli and puddles near Kanheri Caves. Common.

22. *Synedra rumpens* Kütz. var. *fragilarioides* Grun.

(Fig. 22)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 156, fig. 178; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 209, fig. 697 e; Hustedt, Fr., *Archiv f. Hydrobiol. Suppl.* Bd. XV, 1938, p. 131, pl. 131, pl. 10, figs. 43-50

Valves linear with narrow and capitate ends. The central area reaches the margins. Pseudoraphe linear and broad. Striæ fewer than in the type, strong and distantly placed.

Dimensions	Length 39.6-42 μ
	Breadth 3.6 μ
	Striæ 10 in 10 μ
Habitat	Fresh-water. Powai Lake and puddles near the Kanheri Caves. Common.

23. *Synedra rumpens* Kütz. var. *Meneghiniana* Grun.

(Fig. 23)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 156, fig. 179; Skvortzow, B. W., Diatoms from Ikeda Lake, Satsuma Province, Kiewsien Island, Nippon, *Phil. Jour. Sci.*, Vol. 62, 1937, p. 191, pl. 1, fig. 6; Sub-aerial Diatoms from Shanghai, Vol. 64, 1937, p. 443, pl. 2, fig. 6.

Valves linear lanceolate. Central area very distinct. Ends distinctly capitate. Striæ more distantly placed than in the type.

Dimensions	Length 35-36.6 μ
	Breadth 3.2 μ
	Striæ 12-13 in 10 μ
Habitat	Fresh-water. Streams at Borivli and Powai Lake. Common.

26 *Eunotia prærupta* Ehr var *muscolica* Petersen f. *major* f. nov

(Fig 26)

Valvæ lineares, ad medium ventris paullum concavæ. Dorsum fere rectum in medio, decrescens atque constrictum ad apices oblique truncatis. Longit 45–46 μ , latit 10 μ , striæ 10 in 10 μ .

Valves linear, slightly concave on the ventral side towards the middle. Dorsal side almost straight in the middle, narrowed and constricted at the ends. Apices obliquely truncate.

Dimensions Length 45–46 μ
 Breadth 10 μ
 Striæ 10 in 10 μ

Habitat Fresh-water Streams at Borivli. Rare

This form differs from Petersen's *E. prærupta* Ehr var. *muscolica* Petersen (Petersen, J. B., *Bot. Iceland*, Vol. 2, 1932, p. 325, fig. 3) in having obliquely truncate apices, and larger dimensions. It is 45–46 μ long, 10 μ broad, while Petersen's form is only 26–4 μ long and 6–8 μ broad. However, in general outline and nature and number of striæ it agrees with *E. prærupta* Ehr var. *muscolica* Petersen. Hence, it is regarded as a new form.

27 *Eunotia arcus* Ehr

(Fig 27)

Smith, W., *Syn. Brit. Diat.*, Vol. 1, 1853, pl. 2, fig. 15; Hassall, *Hist. Brit. Fresh-water Algae*, Vols. 1 and 2, 1857, pl. 35, fig. 5; Van Heurck, *Traité des Diatomées*, 1899, p. 296, pl. 9, fig. 362; Migula, W., *Kryptogamen-Flora*, Bd II, Teil 1 a, pl. 199, Taf. II, fig. 4; Gustav, L., *Die Algen*, 1914, p. 148, pl. 10, fig. 279; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 175, fig. 216; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief. 1–4, 1931–32, p. 282, fig. 748 a–c; Skvortzow, B. W., Diatoms from a Peaty Bog in Lianchihó River Valley, Eastern Siberia, *Phil. Jour. Sci.*, Vol. 66, 1938, p. 161, pl. 2, fig. 20; Abdul-Majeed, M., Fresh-water Algae of the Panjab, Part I. Bacillariophyta (Diatomeæ). *Panjab Univ. Publications*, Lahore, 1935.

Frustules delicate. Ventral side slightly concave, dorsal side arcuate and strongly constricted at the ends, which are somewhat capitate and flatly rounded. Very small area is seen at the ends. Striæ coarse.

Dimensions Length 39.6–48 μ
 Breadth 6–7 μ
 Striæ 11–12 in 10 μ

Habitat Fresh-water Streams at Borivli, Powai Lake.
 Not common.

28 *Eunotia arcus* Ehr. var. *uncinata* Grun.

(Fig. 28)

Van Heurck, *Traité des Diatomées*, 1899, p. 296, pl. 9, fig. 364; Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 200, Taf. XI, fig. 8; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 175, fig. 218; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 1, Lief 1-4, 1931-32, p. 282, fig. 748 e.

Valves arcuate. In all respects like the type, except that the ends are obliquely truncate and slightly constricted on the dorsal side. Striæ rather closely placed.

Dimensions Length 81-84 μ
 Breadth 10.5 μ
 Striæ 12-14 in 10 μ .

Habitat Fresh-water Streams at Borivli. Common.

29. *Eunotia fallax* A. Cleve var. *gracillima* Krasske

(Fig. 29)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 178, fig. 227; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 288, fig. 753 a; Hustedt, Fr., *Archiv f. Hydrobiol.*, Suppl. Bd. XV, 1938, p. 131, pl. 10, figs. 19-21.

Frustules in girdle view, narrow rectangular. Valves delicate, linear and slightly arcuate. The side walls are somewhat parallel and tapering at the poles. Ends slightly constricted on the dorsal side, but not capitate. Ends backwardly bent. Raphe not well developed. Striæ distinct.

Dimensions Length 40.5-42 μ
 Breadth 3.6 μ
 Striæ 12 in 10 μ .

Habitat Fresh-water. Ponds at Goregaon and Jogeswari.
 Not very common.

30. *Eunotia fallax* A. Cleve var. *gracillima* Krasske f. *densistriata* f. nov.

(Fig. 30)

Valvæ delicatæ, lineares et paullum arcuatæ, dorsum distincte convexum venter concavus, apices ad dorsum constricti, decrescentes et producti, verum not capitata. Raphe parvum evoluta. Striæ tenuissimæ et proxime eviter se dispositæ.

Valves delicate, linear and slightly arcuate. Dorsal side distinctly convex, ventral side concave. Poles constricted on the dorsal side, tapering and produced, but not capitate. Raphe poorly developed. Striæ very fine and very closely placed.

Dimensions	Length	58 μ
	Breadth	3.6 μ
	Striæ	16-17 in 10 μ

This form differs from *E. fallax* A. Cleve var. *gracillima* Krasske as its ends are produced. Moreover the sides are not parallel for the greater portion of their length as in the type. The striæ also are very fine and very closely placed. Hence it is regarded as a new form.

31. *Eunotia valida* Hust. var. *ambigua* var. nov.

(Fig. 31)

Valvæ lineares, margine ventrali distincte concavo; dorsum arcuatum, ad medium cum ventre fere parallelum. Apices attenuati, valde constricti, etiam capitati atque rotundati. Striæ crassæ et longe inter se dispositæ. Ratio longitudinis ad latitudinem est 1: 13-16. Longit. 90-111 μ ; latit. 7.5-9 μ ; Striæ 8-9 in 10 μ .

Valves linear, ventral margin distinctly concave, dorsal side arched, almost parallel to the ventral side in the middle. Ends narrowed and strongly constricted, also capitate and rounded. Striæ coarse and distantly placed. Proportion of length: breadth = 1; 13-16.

Dimensions	Length	90-111 μ
	Breadth	7.5-9 μ
	Striæ	8-9 in 10 μ

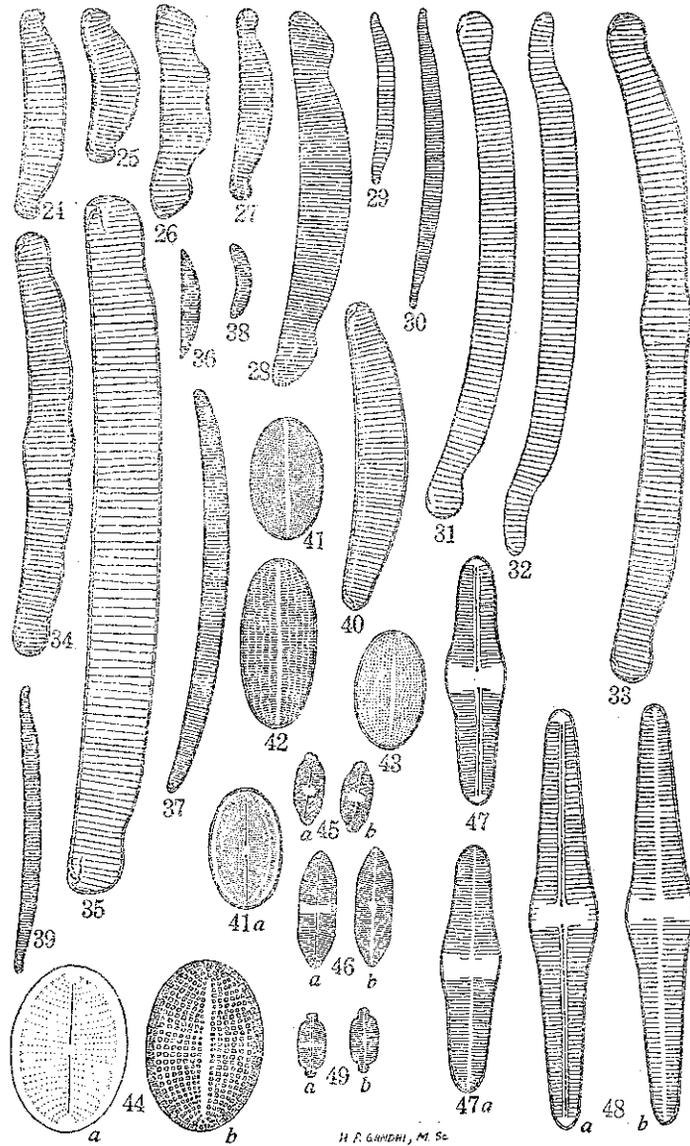
Habitat .. Fresh-water. Streams and pools at Borivli.
Not very common

This form at first sight resembles Hustedt's *E. pectinalis* (Kutz.) Rabh. (Hustedt, in A. Pascher's *Süsswasser-Fl.*, p. 180, fig. 237, 1930) in general outline. The ventral side here, however, is more concave and not at all gibbous, the dorsal side is distinctly arched and parallel to the ventral side and not flat as in the type. Moreover, the ends are suddenly constricted on the dorsal side, rounded, capitate and slightly bent backwards. It differs from *E. valida* Hust. (Hust. in A. Pascher's *Süsswasser-Fl.*, 1930, p. 178, fig. 229) as the constriction at the ends on the dorsal side is very conspicuous. It is also slightly broader and the striæ are not as closely placed as in *E. valida*. Of these two species it is nearer *E. valida* and is therefore, regarded as a new variety of *E. valida* Hust.

32. *Eunotia valida* Hust. var. *ambigua* var. nov. f. *Borivliana*
f. nov.

(Fig. 32)

Valvæ lineares, latere ventrali valde concavo, dorso arcuato et fere parallelo cum ventre. Apices valde attenuati neque capitati ut in typo *E. valida* Hust. var. *ambigua* var. nov. Striæ crassæ et distincte positæ. Longit. 118 μ ; Latit. 7.2 μ ; Striæ 8-9 in 10 μ .



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FIGS 24-49 b.—Fig. 24. *Eunotia praeupta* Ehr, $\times 630$. Fig. 25. *Eunotia praeupta* Ehr. var. *inflata* Grun., $\times 630$. Fig. 26. *Eunotia praeupta* Ehr. var. *muscicola* Petersen f. *major* f. nov., $\times 630$. Fig. 27. *Eunotia arcus* Ehr, $\times 630$. Fig. 28. *Eunotia arcus* Ehr. var. *uncinata* Grun., $\times 630$. Fig. 29. *Eunotia fallax* A. Cleve var. *gracillima* Krasske, $\times 630$. Fig. 30. *Eunotia fallax* A. Cleve var. *gracillima* Krasske f. *densestriata* f. nov., $\times 630$. Fig. 31. *Eunotia valida* Hust var. *ambigua* var. nov., $\times 630$. Fig. 32. *Eunotia valida* Hust var. *ambigua* var. nov. f. *Borivhana* f. nov., $\times 630$. Fig. 33. *Eunotia pectinalis* (Kütz) Rabh. var. *gibbulosus* Venkataraman, $\times 630$. Fig. 34. *Eunotia pectinalis* (Kütz) Rabh. var.

undulata (Ralfs) Rabh., $\times 630$. Fig 35 *Eunotia pseudopectinalis* Hust. f. *robusta* f. nov., $\times 700$. Fig. 36. *Eunotia veneris* (Kütz.) O. Müll., $\times 630$. Fig. 37 *Eunotia lunaris* (Ehr.) Grun., 700. Fig. 38. *Eunotia lunaris* (Ehr.) Grun. var. *subarcuata* (Naëg) Grun., $\times 630$ Fig. 39. *Eunotia alpina* (Naëg.) Hust., $\times 630$. Fig. 40. *Eunotia monodon* Ehr., $\times 630$. Fig. 41. *Cocconeis placentula* Ehr. rapheless valve, $\times 630$ Fig. 41 a. *Cocconeis placentula* Ehr., view of valve with raphe, $\times 630$. Fig. 42. *Cocconeis placentula* Ehr. var. *euglypta* (Ehr.) Cleve, $\times 630$. Fig. 43. *Cocconeis placentula* Ehr. var. *lineata* (Ehr.) Cleve, $\times 630$. Fig. 44 a. *Cocconeis scutellum* Ehr., view of valve with raphe, $\times 630$. Fig. 44 b. *Cocconeis scutellum* Ehr., view of rapheless valve, $\times 630$. Fig. 45 a. *Eucoconeis lapponica* Hust. f. *rostrata* f. nov., view of valve with raphe, $\times 630$. Fig. 45 b. *Eucoconeis lapponica* Hust. f. *rostrata* f. nov., view of rapheless valve, $\times 630$ Fig. 46 a. *Achnanthes hungarica* Grun., view of valve with raphe, $\times 630$ Fig. 46 b. *Achnanthes hungarica* Grun., view of rapheless valve, $\times 630$. Fig. 47 *Achnanthes andicola* (Cleve) Hust., view of valve with raphe, $\times 630$. Fig. 47 a *Achnanthes andicola* (Cleve) Hust., view of rapheless valve, $\times 630$. Fig. 48 a. *Achnanthes andicola* (Cleve) Hust. var. *elongata* var. nov., view of valve with raphe, $\times 630$. Fig. 48 b. *Achnanthes andicola* (Cleve) Hust. var. *elongata* var. nov., view of rapheless valve, $\times 630$. Fig. 49 a. *Achnanthes exigua* Grun., view of valve with raphe, $\times 630$. Fig. 49 b. *Achnanthes exigua* Grun., view of rapheless valve, $\times 630$

Valves linear, ventral side strongly concave, dorsal side arched, almost parallel to the ventral side. Ends strongly narrowed and not capitate as in the type *E. valida* Hust. var. *ambigua* var. nov. Striæ coarse and distantly placed.

Dimensions . . . Length 118 μ
 Breadth 7.2 μ
 Striæ . . . 8-9 in 10 μ

Habitat . . . Fresh-water Streams at Borivli Not common.

This form resembles *E. valida* Hust. var. *ambigua* var. nov., in all respects except that the ends are not capitate but produced. The ventral margin at the ends is slightly bent backward. The form is also slightly narrower. Hence, it is regarded as a new form of *E. valida* Hust. var. *ambigua* var. nov.

33. *Eunotia pectinalis* (Kütz.) Rabh. var. *gibbulosus* Venkataraman
 (Fig. 33)

Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol 10, No. 6, Sect. B, 1939, p. 309, fig. 22

Valves linear, dorsal side arcuate and distinctly tumid in the middle. Ventral side slightly concave and gibbous in the middle. Slight constriction present near the poles on the dorsal side. Ends broadly rounded. Striæ strong and distinct, but irregularly placed.

Dimensions . . . Length 125-134.5 μ
 Breadth 8-9 μ
 Striæ . . . 7-10 in 10 μ

Habitat . . . Fresh-water Streams at Borivli, Powai Lake.
 Not common

This form is slightly bigger than the one described by Venkataraman.

34. *Eunotia pectinalis* (Kütz) Rabh. var *undulata* (Ralfs) Rabh.
(Fig 34)

Smith, W., *Syn Brit. Diat.*, Vol. 1, 1853, pl. 33, fig. 281; Hassall, *Hist. Brit. Fresh-Water Algæ*, Vols. 1 and 2, 1857, pl. XCV, figs. b, c, d; Van Heurck, *Traité des Diatomées*, 1899, p. 301, pl. 9, fig. 320; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 182, fig. 240; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, pl. 298, figs. 763 f, g, i.

Frustules rectangular in girdle view. Valves linear. Dorsal side arcuate with distinct undulations. Ventral side gibbous in the middle. Ends rounded as in the type, raphe seen at the poles. Striæ strong and irregular, closely placed near the poles.

Dimensions Length 85-90 μ
 Breadth 8-9 μ
 Striæ 9-12 in 10 μ

Habitat Fresh-water. Powai Lake. Common.

35. *Eunotia pseudopectinalis* Hust f. *robusta* f. nov.

(Fig 35)

Valvæ lineares, aliquantum arcuatæ, lateribus fere parallelis. Dorsum leviter constrictum ad apices plane rotundatos. Margo ventralis tenui pseudoraphide ornatus. Apices nodulis bene evolutis præditi. Longit. 142 μ ; latit. 12 μ ; striæ 7-8 in 10 μ .

Valves linear, slightly arcuate with almost parallel sides. Dorsal side slightly constricted at the ends which are flatly-rounded. Ventral margin has faint pseudoraphe. Ends have well-developed nodules.

Dimensions Length 142 μ
 Breadth 12 μ
 Striæ 7-8 in 10 μ

Habitat Fresh-water. Streams at Borivli. Rare.

This form agrees with *E. pseudopectinalis* Hust (Hustedt, in Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 314, fig. 779) in general outline, polar nodules and narrowed ends. However, it differs from the type in having greater breadth and distantly placed striæ which are also strong. Hence, it is regarded as a new form of *Eunotia pseudopectinalis* Hust.

36. *Eunotia veneris* (Kütz) O. Mull.

(Fig 36)

Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 301, fig. 766; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 182, fig. 245; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 300, fig. 766; Skvortzow, B. W., *Diatoms from*

a Peaty Bog in Lianchiho River Valley, Eastern Siberia, *Phil. Jour. Sci.*, Vol. 66, 1938, p. 161, pl. 1, fig. 31.

Frustules rectangular and slightly rhombic in girdle view. Valve semi-lanceolate, with almost straight ventral margin. Dorsal margin strongly arched. Ends not constricted but acutely rounded. End nodules seen on the ventral margin. Striæ fine and very closely placed at the ends.

Dimensions . . . Length 23–29 μ
 Breadth 4 μ
 Striæ 14–16 in 10 μ

Habitat . . . Fresh-water. Pond at Jogeswari. Common.

37 *Eunotia lunaris* (Ehr.) Grun

(Fig. 37)

Van Heurck, *Traité des Diatomées*, 1899, p. 303, pl. 9, fig. 384; Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 203, Taf. VII E, figs. 3, 12; Schönfeldt, Pascher's *Süsswasser-Flora*, Heft 10, 1913, p. 51, fig. 91; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 183, fig. 249; Hustedt, Fr. Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief. 1–4, 1931–32, p. 303, fig. 748; Skvortzow, B. W., Diatoms from Khingan, North Manchuria, China, *Phil. Jour. Sci.*, Vol. 35, 1928, p. 39, pl. 2, figs. 4–5; Diatoms from Poyang Lake, Hunan, China, *Phil. Jour. Sci.*, Vol. 57, 1935, p. 465, pl. 1, fig. 15; Biswas, K., Common Diatoms of the Loktak Lake, Manipur, Assam, *Jour. Roy. Asiat. Soc. of Bengal*, Vol. II, No. 2, 1936, p. 174, pl. 5, fig. 9.

Frustules narrow, linear in girdle view. Valves very delicate and arcuate, usually strongly arched with almost parallel margins. Ends slightly narrowed, rounded and delicate. End nodules small. Raphe not well developed. Striæ fine.

Dimensions . . . Length 81–156 μ
 Breadth 4–5 μ
 Striæ 13–17 in 10 μ

Habitat . . . Fresh-water. Streams at Borivli, pools at Jogeswari. Common.

38 *Eunotia lunaris* (Ehr.) Grun. var. *subarcuata* (Naëg.) Grun.

(Fig. 38)

Van Heurck, *Traité des Diatomées*, 1899, p. 304, pl. 9, fig. 899; Hustedt, Fr. Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 185, fig. 251.

Frustules small, dorsal side of the valve arcuate, ventral side slightly concave. Ends rounded. Striæ like the type.

Dimensions . . . Length 18–20 μ
 Breadth 3–4 μ
 Striæ 13–15 in 10 μ

Habitat . . . Fresh-water. Powai Lake. Rare.

39. *Eunotia alpina* (Naëg.) Hust

(Fig. 39)

Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 185, fig. 252; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief 1-4, 1931-32, p. 304, fig. 770

Frustules linear in girdle view. Valves long and narrow, well arched, gradually tapering from the middle towards the ends. Ends acutely rounded, slightly bent backwards. End nodules clear. Raphe not well developed. Striæ fine.

Dimensions Length 63-80 μ
 Breadth 3 μ
 Striæ 15 in 10 μ

Habitat Fresh-water. Powai Lake, pools at Jogeswari, puddles at Wadala and other places. Common.

This form agrees with the type except that it is slightly broader.

40. *Eunotia monodon* Ehr.

(Fig. 40)

Smith, W., *Syn Brit. Diat.*, Vol I, 1853, p. 16, pl 2, fig. 16; Schönfeldt, Pascher's *Süsswasser-Flora*, Heft 10, 1913, p. 45, fig. 73; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 185, fig. 254; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief 1-4, 1931-32, p. 305, fig. 772 a, b; Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol. 10, No. 6, Sect. B, 1939, p. 310, fig. 40.

Valves arcuate. Dorsal side very strongly convex and gradually narrowing towards the ends which are rounded. Ventral margin slightly concave. Pseudoraphe present near the ventral margin, distinct. Striæ coarse, more closely placed near the poles.

Dimensions Length 68-75 μ
 Breadth 10.8-12 μ
 Striæ 8-10 in 10 μ

Habitat Fresh-water. Streams at Borivli, Powai Lake. Common.

III Suborder	MONORAPHIDINEÆ
(1) Family	ACHNANTHACEÆ
(a) Subfamily	Cocconeoideæ
Genus	<i>Cocconeis</i> Ehrenberg, C. G., 1838.

41. *Cocconeis placentula* Ehr.

(Figs 41, 41 a)

Smith, W., *Syn Brit. Diat.*, Vol I, 1853, pl 3, fig. 32; Van Heurck, *Traité des Diatomées*, 1899, p. 288, pl 8, fig. 341; Schönfeldt, Pascher's

Süsswasser-Flora, Heft 10, 1913, p. 58, fig. 106; Gustav, L., *Die Algen*, 1914, p. 153, pl. 11, fig. 293; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 189, fig. 260; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 347, figs. 802 *a, b*; Skvortzow, B. W., Diatoms from Calcutta, India, *Phil. Jour. Sci.*, Vol. 58, 1935, p. 179; Sub-aerial Diatoms from Shanghlai, Vol. 64, 1937, pl. 2, fig. 10; Notes on the Algal-flora of New Zealand. II. Fresh Water Algæ from Napier, Vol. 67, 1938, p. 411, pl. 1; Abdul-Majeed, M., Fresh-water Algæ of the Punjab, Part I. Bacillariophyta (Diatomeæ). *Panjab University Publications*, Lahore, 1935, p. 17, pl. 2, figs. 14-15.

Valves elliptical in outline. Valve with raphe has radial, fine but distinctly punctate striæ which are crossed by a hyaline band near the margin. Some distantly-placed prominent markings are also observed near the margin as in the type. Raphe straight, thread-like with closely placed central pores. Terminal fissures distant from the poles. Axial area very narrow, central area small, elliptical. Rapheless valve with striæ distinctly punctate. Pseudoraphe narrow and linear.

Dimensions	Length	25-27 μ
	Breadth	16-17 μ
	Striæ	23 in 10 μ

Habitat	Fresh-water. Streams at Borivli, Powai Lake.
	Common.

42. *Cocconeis placentula* Ehr var. *euglypta* (Ehr) Cleve.

(Fig. 42)

Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 190, fig. 261; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 349, fig. 802 *c*; Skvortzow, B. W., Diatoms from Poyang Lake, Hunan, China, *Phil. Jour. Sci.*, Vol. 57, 1935, p. 465, pl. 1, fig. 20; Diatoms from the Philippine, I. Diatoms from drinking water, Balara, Rizal Province, Vol. 64, 1937, p. 287, pl. 1, figs. 35, 37; Iyengar, M. O. P. and Subrahmanyam, R., Fossil Diatoms from the Karewa Beds of Kashmir, *Proc. of the National Acad. Sci. India*, Vol. 13, Pt. 4, 1943, p. 229, figs. 7, 8; Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol. 10, No. 6, Sect. B, 1939, p. 311, figs. 64-66.

Valves linear-elliptical to elliptical, both the valves similar in outline but dissimilar in structure. Valve with raphe has distinct central nodule, striæ radial, finely punctate. Margin of the valve separated from the central part by a hyaline band outside which is a striated ring. Rapheless valve with narrow linear pseudoraphe. Striæ not finely punctate but linear, so that a large number of longitudinal bands appear as if crossing the striæ.

- Dimensions . . . Length 37-40 μ
 Breadth 16-17 μ
 Striæ on the valve with raphe 23 in 10 μ
 Striæ on the raphe-less valve 18 in 10 μ
- Habitat . . . Fresh-water. Streams at Borivli, Powai Lake.
 Not common

43. *Cocconeis placentula* Ehr. var. *lineata* (Ehr.) Cleve.

(Fig 43)

Van Heurck, *Traité des Diatomées*, 1899, p. 288, pl 8, fig. 344; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 190, fig 262; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 348, fig. 802 d; Skvortzow, B. W., Diatoms from Kizaki Lake, Honshu Island, Nippon, *Phil. Jour Sci.*, Vol 61, 1936, p. 9, pl 2, fig. 5; Abdul-Majeed, M., Fresh-water Algæ of the Panjab, Part I Bacillariophyta (Diatomeæ) *Panjab University Publications*, Lahore, 1935, p. 18, pl 1, figs. 17, 18.

Valves elliptical. Rapheless valve with radial clearly punctate striae, but near the margin puncta become irregular. On the valve with raphe hyaline band present as in the type, near the margin. Central nodule small.

- Dimensions . . . Length 25-28 μ
 Breadth 15-15.6 μ
 Striæ . . . 18-20 in 10 μ .
- Habitat . . . Fresh-water. Garden tank, Institute of Science,
 Powai Lake. Not common.

44. *Cocconeis scutellum* Ehr.

(Figs. 44 a, b)

Smith, W., *Syn. Brit. Diat.*, Vol. I, 1853, pl. 3, fig. 34; Van Heurck, *Traité des Diatomées*, 1899, p. 287, pl 8, fig. 338; Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 206, Taf. VII E, fig. 6; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 191, fig. 267; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 338, fig. 790.

Frustules flat. Valves elliptical to broadly elliptical in outline. Valve with raphe has radial, slightly curved and finely punctate striae. Puncta near the margin in groups, separated by a hyaline band. A second hyaline band present, parallel to the one near the margin. Raphe thin and straight, terminal fissures distant from the ends. Central nodule very small. Rapheless valve with large squarish puncta arranged in radial rows. On the margin a double row of small puncta present in small compartments. Pseudoraphe narrowly lanceolate.

Dimensions	Length 25–37 μ
	Breadth 20–25 μ
	Striæ on valve with raphe 7–8 in 10 μ
	Puncta 10 in 10 μ
	Striæ on raphe-less valve 7 in 10 μ
	Puncta 7–8 in 10 μ .
Habitat	Brackish-water. Mahim creek Common
(b) Subfamily	Achnantheoideæ
Genus	<i>Eucocconeis</i> Cleve

45. *Eucocconeis lapponica* Hust. f. *rostrata* f. nov.

(Fig. 45 a, b)

Valvæ lineares, ellipticæ, apicibus late rotundatis et rostratis. Valva inferior raphide prædita est. Raphe recta, paulum ad apices curvata. Striæ aliquantum radiales. Area axialis angusta, area centralis parva et rotunda. Valva superior pseudoraphide atque maiore area centrali vel rectangulari vel quadrata prædita. Longit 14–16 μ : latit 5–4 μ : striæ 30 in 10 μ .

Valves linear elliptical with broadly rounded rostrate ends. Lower valve with raphe. Raphe straight, slightly curved at the poles. Striæ slightly radial. Axial area narrow, central area small and rounded. Upper valve with pseudoraphe and a bigger rectangular or square central area.

Dimensions	Length 14–16 μ
	Breadth 5–4 μ
	Striæ indistinct nearly 30 in 10 μ

Habitat Fresh-water. Pools at Jogeswari Rare.

This form differs from *Eucocconeis lapponica* Hust. (Hust. in Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 194, fig. 272) in having suddenly contracted, broadly rostrate ends. The valves also are more linear. In the number of striæ, central areas, obliquely placed raphe and pseudoraphe it resembles *E. lapponica* Hust. It is, therefore, regarded as a new form of *E. lapponica* Hust.

Genus	<i>Achnanthes</i> Bory, 1822
Subgenus	<i>Microneis</i>

46. *Achnanthes hungarica* Grun.

(Fig. 46 a, b)

Van Heurck, *Traité des Diatomées*, 1899, p. 280, pl. 8, fig. 328; Migula, W., *Kryptogamen-Flora*, Bd II, Teil 1 a, Taf. VII E, p. 212, fig. 14; Schönfeldt, Pascher's *Süßwasser-Flora*, Heft 10, 1913, p. 56, fig. 101; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 201, fig. 283; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief 1–4, 1931–32, p. 383, fig. 829; Skvortzow, B. W.,

Diatoms from Poyang Lake, Hunan, China, *Phil. Jour. Sci.*, Vol. 57, 1935, p. 465, pl. I, figs. 16-19; Abdul-Majeed, M., Fresh-water Algae of the Panjab, Part I. Bacillariophyta (Diatomeae). *Panjab University Publications*, Lahore, 1935, p. 18, pl. 2, figs. 7-8.

Valves broadly linear with wedge-shaped ends. Valve with raphe has thread-like raphe, bent towards one side at the poles. Axial area narrow, extended to the margins in the middle. Central area one-sided, on the opposite side short striae are present. Striae slightly radial. Rapheless valve has narrow pseudoraphe. Central area very small, due to shortening of the middle striae. Striae perpendicular to the middle line in the centre and radial at the ends.

Dimensions	Length	20-25 μ
	Breadth	7.2-7.7 μ
	Striae on the valve with raphe	20-21 in 10 μ
	Striae on the rapheless valve	22 in 10 μ
Habitat	Fresh-water.	Streams at Borivli, pond at Andheri, garden tank of Institute of Science. Common

47. *Achnanthes andicola* (Cleve) Hust.

(Fig. 47, 47 a)

Hustedt, Fr., *Pascher's Süßwasser-Flora*, Heft 10, 1930, p. 201, fig. 234; Hustedt, Fr., *Rabenhorst's Kryptogamen-Flora*, Bd. VII, Teil 2, Lief. 1-4, 1931-32, p. 384, fig. 830

Valves linear-lanceolate in outline, gibbous in the middle. Ends obtusely rounded. Valve with raphe has straight raphe with distinct central pores. Terminal fissures not reaching the poles. Axial area narrow and linear. Central area broad, reaching the side walls. Polar area distended. Striae strong, usually perpendicular to the middle line or slightly radial. Rapheless valve with narrow pseudoraphe and linear central area reaching the sides. Striae strong, very slightly radial or perpendicular to the middle line. Polar areas absent in rapheless valve.

Dimensions	Length	45-50 μ
	Breadth	10-10.8 μ
	Striae	15 in 10 μ
Habitat	Fresh-water.	Streams at Borivli. Rare.

48. *Achnanthes andicola* (Cleve) Hust. var. *elongata* var. nov.

(Fig. 48 a, b)

Valvæ lanceolatæ vel leviter lineari-lanceolatæ, in medio gibbosæ. Apices rotundati. Valva raphide prædita rectam raphidem poris centralibus distinctis habet. Pori terminales longius a polis sunt. Area axialis angusta, linearis. Area centralis lata, sed usque ad margines non extensa. Parvæ striæ in area centrali apparent. Striæ fortes,

in medio aliquantum radiales, ad apices perpendiculares. Valva non raphide prædita pseudoraphide lineari ornata, et area centrali usque ad margines extensa. Longit, 90–92 μ ; latit, 13 μ ; striæ 10 in 10 μ .

Valves lanceolate or slightly linear-lanceolate in outline, gibbous in the middle. Ends rounded. Valve with raphe has straight raphe with distinct central pores. Terminal pores distant from the poles. Axial area narrow, linear. Central area broad not reaching the margins. Small striæ are present in the central area. Striæ strong and slightly radial in the middle and perpendicular at the poles. Rapheless valve with linear pseudoraphe and central area reaching the sides.

Dimensions . . . Length 90–92 μ
 Breadth 13 μ
 Striæ 10 in 10 μ

Habitat . . . Fresh-water. Streams at Borivli Rare

This form differs from the type *A. andicola* (Cleve) Hust. (Hust. in A. Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 201, fig. 234; in Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief. 1–4, 1931–32, p. 384, fig. 830), in having elongated, and strongly striated valves. The Striæ are more distantly placed than in the type. Moreover, the central area has short striæ on the valve with raphe which are absent in the type. Hence, it is regarded as a new variety of *A. andicola* (Cleve) Hust.

49. *Achnanthes exigua* Grun.

(Fig. 49 a, b)

Migula, W., *Kryptogamen-Flora*, Bd. II, Teil, 1 a, p. 212, Taf. VII F, fig. 5; Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 201, fig. 286; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief. 1–4, 1931–32, p. 386, fig. 832 a, b; Skvortzow, B. W., Diatoms from Calcutta, India, *Phil. Jour. Sci.*, Vol. 58, 1935, p. 179, pl. 1, fig. 2; Diatoms from Kizaki Lake, Honshu Island, Nippon, Vol. 61, 1936, p. 9, pl. 7, fig. 16.

Valves rectangular-elliptical to almost quadrate in the middle portion, constricted at the ends which are rostrate. Valve with raphe has thin straight raphe. Axial area narrow and central area linear reaching the margins. Striæ distinct and slightly radial. Rapheless valve with linear-lanceolate pseudoraphe and central area absent.

Dimensions . . . Length 14–16 μ
 Breadth 5–6 μ
 Striæ 22 in 10 μ

Habitat . . . Fresh-water. Streams at Borivli and garden tank of Institute of Science Not common

50. *Achnanthes exigua* Grun. var. *heterovalvata* Krasske

(Fig. 50 a, b)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 202, fig. 288; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 387, figs 832, e, f.

Like the type in shape and other characteristics. The only difference is that the striæ on the valve with raphe are more than on the rapheless valve. Poles are somewhat capitate and truncate. Central area in the rapheless valve reaches the side walls

Dimensions	Length	12.5-15 μ
	Breadth	5.4-6 μ
	Striæ on the valve with raphe	30 in 10 μ
	Striæ on the rapheless valve	22 in 10 μ
Habitat	Fresh-water. Streams at Borivli, garden tank of Institute of Science. Fairly common.	

51. *Achnanthes lanceolata* Bréb

(Fig. 51 a, b)

Van Heurck, *Traité des Diatomées*, 1899, p. 282, pl. 8, fig. 336; Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 212, Taf X, fig. 13; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 207, fig. 306 a; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 408, figs. 863 a-b; Geitler, L., *Der Formwechsel der pinneten Diatomeen (Kieselalgen)*, *Archiv f. Protistenkunde*, Heft 1, Vol. 78, 1932, p. 100, figs 59-65; Skvortzow, B. W., *Diatoms from Kizaki Lake, Honshu Island, Nippon*, *Phil. Jour. Sci.*, Vol. 61, 1936, p. 9, pl. 2, figs. 11-12; *Bottom Diatoms from Olhon Gate of Baikal Lake, Siberia*, Vol. 62, p. 293, pl. 5, fig. 13.

Valves elliptical-lanceolate, somewhat dilated in the middle. Ends broadly rounded and flat. Raphe thread-like. Axial area narrow, linear. Central area broad. Striæ strong, radial. Rapheless valve with lanceolate pseudoraphe. In the centre on one side, a horse-shoe-shaped marking is clearly seen.

Dimensions	Length	12.6-15 μ
	Breadth	5-5.6 μ
	Striæ	12-13 in 10 μ
Habitat	Fresh-water. Garden tank of Institute of Science. Common. Only smaller forms were seen.	

52. *Achnanthes lanceolata* Bréb var. *elliptica* Cleve

(Fig. 52 a, b)

Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 208, fig. 306 c; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief 1-4, 1931-32, p. 410, figs 863 n, o; Skvortzow, B. W.,

Diatoms from Kizaki Lake, Honshu Island, Nippon, *Phil. Jour. Sci.*, Vol. 61, 1936, p. 9, pl. 2, fig. 29; Bottom Diatoms from Olhon Gate of Baikal Lake, Siberia, Vol. 62, 1937, p. 293, pl. 5, fig. 14

The valves here are elliptical in outline. Striæ fine and radial. Horse-shoe-shaped marking present on one side of the central area.

Dimensions . . . Length 9-13 μ
 Breadth 4-5-6 μ
 Striæ 14-15 in 10 μ

Habitat . . . Fresh-water. Garden tank of Institute of Science. Common.

53. *Achnanthes lanceolata* Bréb. var. *tenuis* var. nov.

(Fig. 53 a, b)

Valvæ lineares, ad medium dilatatæ. Apices late rotundati et plauti. Valva raphide instructa rectam raphidem habet. Area axialis angusta, linearis, ad medium ita latior ut aream centralem efficiat. Striæ radiales. Valva sine ulla raphide, pseudoraphide instructa, ad medium lanceolata. Striæ equinæ soleæ figuræ in medio ad alterum latus videtur. longit. 23-24 μ ; Latit. 4-5 μ ; striæ 13-14 in 10 μ .

Valves linear, dilated in the middle. Ends broadly rounded and flat. Valve with raphe has straight raphe, axial area narrow, linear, widening in the middle to form the central area. Striæ radial. Rapheless valve with pseudoraphe lanceolate in the middle. A horse-shoe-shaped marking is seen in the centre to one side.

Dimensions . . . Length 23-24 μ
 Breadth 4-5 μ
 Striæ 13-14 in 10 μ

Habitat . . . Fresh-water. Garden tank of Institute of Science. Rare.

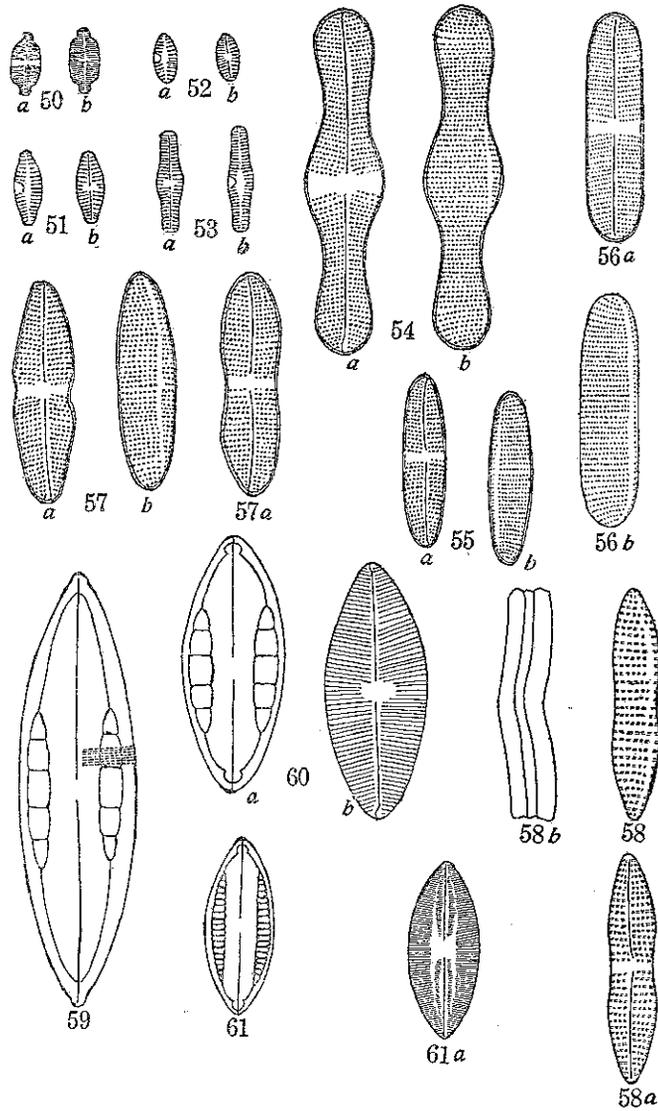
This form is linear and is more slender and more delicate than the type. It resembles *A. Grimmei* Krasske, (Hustedt in Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 205, fig. 302) in shape and dimensions, but differs in having a distinct horse-shoe-shaped marking on the rapheless valve, on one side of the central area. The striæ are also coarser than in *A. Grimmei*. As this form only differs from the *A. lanceolata* Bréb. in having linear valves and broadly truncate ends, it is regarded as a new variety of *A. lanceolata* Bréb.

Subgenus *Achnanthidium* (Kütz.) Heiberg, 1863.

54. *Achnanthes inflata* Kütz.

(Fig. 54 a, b)

Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 209, fig. 307; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief. 1-4, 1931-32, p. 421, fig. 873; Skvortzow, B. W., Alpine



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FIGS. 50 a-61 a.—Fig. 50 a. *Achnanthes exigua* Grun. var. *heterovalvata* Krasske, view of valve with raphe, $\times 630$. Fig. 50 b. *Achnanthes exigua* Grun. var. *heterovalvata* Krasske, view of rapheless valve, $\times 630$. Fig. 51 a. *Achnanthes lanceolata* Bréb., view of rapheless valve, $\times 630$. Fig. 51 b. *Achnanthes lanceolata* Bréb., view of valve with raphe, $\times 630$. Fig. 52 a. *Achnanthes lanceolata* Bréb. var. *elliptica* Cleve, view of valve without raphe, $\times 630$. Fig. 52 b. *Achnanthes lanceolata* Bréb. var. *elliptica* Cleve, view of valve with raphe, $\times 630$. Fig. 53 a. *Achnanthes lanceolata* Bréb. var. *tenuis* var. nov., view of valve with raphe, $\times 630$.

Fig. 53 *b*. *Achnanthes lanceolata* Bréb. var. *tenuis* var. nov., view of rapheless valve, $\times 630$. Fig. 54 *a*. *Achnanthes inflata* Kütz., view of valve with raphe, $\times 630$. Fig. 54 *b*. *Achnanthes inflata* Kütz., view of rapheless valve, $\times 630$. Fig. 55 *a*. *Achnanthes coarctata* Bréb. var. *elliptica* Krasske, view of valve with raphe, $\times 630$. Fig. 55 *b*. *Achnanthes coarctata* Bréb. var. *elliptica* Krasske, view of rapheless valve, $\times 630$. Fig. 56 *a*. *Achnanthes coarctata* Bréb. var. *parallela* Venkataraman, view of valve with raphe, $\times 630$. Fig. 56 *b*. *Achnanthes coarctata* Bréb. var. *parallela* Venkataraman, view of rapheless valve, $\times 630$. Fig. 57 *a*. *Achnanthes brevipes* Agardh var. *intermedia* (Kütz.) Cleve, view of valve with raphe, $\times 630$. Fig. 57 *b*. *Achnanthes brevipes* Agardh var. *intermedia* (Kütz.) Cleve, view of rapheless valve, $\times 630$. Fig. 58. *Achnanthes longipes* Agardh, view of valve without raphe, $\times 630$. Fig. 58 *a*. *Achnanthes longipes* Agardh, view of valve with raphe, $\times 630$. Fig. 58 *b*. *Achnanthes longipes* Agardh, frustule in girdle view, $\times 630$. Fig. 59. *Mastogloia amoyensis* Voigt var. *robusta* var. nov., $\times 1,000$. Fig. 60 *a*. *Mastogloia exigua* Lewis f. *brevirostris* Venkataraman, valve showing loculi, $\times 1,000$. Fig. 60 *b*. *Mastogloia exigua* Lewis f. *brevirostris* Venkataraman, valve showing striations, $\times 1,000$. Fig. 61. *Mastogloia dolosa* Venkataraman var. *ambigua* var. nov., valve showing loculi, $\times 630$. Fig. 61 *a*. *Mastogloia dolosa* Venkataraman var. *ambigua* var. nov., valve showing striations, $\times 630$.

Diatoms from Fukein Province, South China, *Phil. Jour. Sci.*, Vol. 41, 1930, p. 39, pl. 1; Mills, Fr., Some Diatoms from Warri, South Nigeria, *Jour. Roy. Microsc. Soc.*, London, Vol. LII, Ser. III, 1932, p. 383, pl. II, figs 4-7; Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol. 10, No. 6, Sect. B, 1939, p. 314, figs 52, 54, 67.

Frustules in girdle view linear, bent in the middle. Valves linear, dilated in the middle. Ends somewhat capitate with broadly rounded poles. Valve with raphe has strong and straight raphe. Axial area narrow, central area stauroid. Striæ radial, punctate. Puncta moniliform. Rapheless valve with narrow, excentric and distinct pseudoraphe. Striæ are in the middle perpendicular to the middle line, at the poles radial and curved, punctate; puncta moniliform.

Dimensions	Length	76-80 μ
	Breadth	16.6 μ
	Striæ	8-9 in 10 μ

Habitat . . . Fresh-water. Streams at Borivli. Rare. This form is slightly larger than the type

55. *Achnanthes coarctata* Bréb. var. *elliptica* Krasske

(Fig. 55 *a, b*)

Hustedt, Fr., Pascher's *Süsswasser-Flora*, Heft 10, 1930, p. 210, fig. 308 *b*; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief 1-4, 1931-32, p. 420, fig. 872

Valves somewhat elliptical, in the middle not constricted like the type. Poles slightly narrowed and broadly rounded. Valve with raphe has straight and strong raphe. Axial area narrow but distinct, central area broad, reaching the side walls. Striæ are slightly radial with small, moniliform puncta. Rapheless valve with strongly excentric pseudoraphe. Striæ punctate.

Dimensions	Length	37.6–50 μ
	Breadth	9–10.8 μ
	Striæ	8–11 in 10 μ
	Puncta	10 in 10 μ
Habitat	Fresh-water.	Streams at Borivli. Rare.
	Brackish-water.	Mahim creek. Common.

56. *Achnanthes coarctata* Bréb. var. *parallela* Venkataraman

(Fig. 56 a, b)

Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol 10, No 6, Sect. B, 1939, p. 314, figs. 46, 47, 48.

Frustules in girdle view, linear and bent unilaterally. Valves linear with broad rounded ends. Walls almost parallel in the middle. Raphe straight and coarser in the middle. Axial area broad, reaching the margins, rectangular. Striæ distinctly punctate and radial. Pseudoraphe excentric on the rapheless valve.

Dimensions	Length	41–50 μ
	Breadth	10 μ
	Striæ	10–12 in 10 μ
Habitat	Fresh-water.	Streams at Borivli. Fairly common

57. *Achnanthes brevipes* Agardh var. *intermedia* (Kütz.) Cleve

(Fig. 57 a, b)

Schönfeldt, Pascher's *Süßwasser-Flora*, Heft 10, 1913, p. 58; Hustedt, Fr., Pascher's *Süßwasser-Flora*, Heft 10, 1930, p. 210, fig. 310; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd VII, Teil 2, Lief 1–4, 1931–32, p. 425, figs. 877 c, d; Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind. Acad. Sci.*, Vol. 10, No. 6, Sect. B, p. 315, figs. 55, 58, 59, 60, 63

Valves linear with rounded ends, constricted in the middle on the side of valve with raphe, while the rapheless valve is not constricted in the middle. Raphe straight, slightly excentric. Central area stauroid. Pseudoraphe strongly excentric on the rapheless valve. Rows of puncta more radial at the poles. Puncta are large and distinct

Dimensions	Length	47–50 μ
	Breadth	10.8 μ
	Striæ	9–10 in 10 μ
Habitat	Fresh-water.	Streams at Borivli. Not common

58. *Achnanthes longipes* Agardh

(Fig. 58, 58 a, b)

Van Heurck, H., *Traité des Diatomées*, 1899, p. 229, pl. 8, fig. 323; Migula, W., *Kryptogamen-Flora*, Bd. II, Teil 1 a, p. 210, Taf. X, fig. 10; Gustav, L., *Die Algen*, 1914, p. 258, pl. 11, fig. 290; Karsten, G., Engler and Prantl's *Die Natürlichen, Pflanzenfamilien*, Bd. II, 1928, p. 269, fig. 357 b; Hustedt, Fr., Rabenhorst's *Kryptogamen-Flora*, Bd. VII, Teil 2, Lief. 1-4, 1931-32, p. 427, fig. 878; Skvortzow, B. W., Marine Diatoms from the Kanazawa Oyster Experimental Station of Japan, *Phil. Jour. Sci.*, Vol. 47, 1932, p. 119, pl. 2, figs. 10, 11.

Valves in girdle view linear elliptical, distinctly constricted in the middle with wedge-shaped narrow rounded ends. Valve with raphe has distinct, axial raphe. Axial area narrow, central area somewhat smaller, sometimes extended to margins of the valves forming a narrow stauos. Striæ almost perpendicular to the middle line. On rapheless valve excentric pseudoraphe present. Striæ punctate. Puncta are distinctly linear, arranged in pairs. At the ends striæ are radial.

Dimensions Length 48-52 \cdot 4 μ
 Breadth 9-10 \cdot 5 μ
 Striæ 6-7 in 10 μ
 Puncta 9 in 10 μ

Habitat .. Brackish-water. Mahim creek Not common.

IV Suborder BIRAPHIDINEÆ

(1) Family NAVICULACEÆ

(a) Subfamily Naviculoideæ

Genus *Mastogloia* Thwaites, 1856.

59. *Mastogloia amoyensis* Voigt var. *robusta* var. nov.

(Fig. 59)

Valvæ lanceolatae, apicibus paullum constrictis atque acute rotundatis. Area axialis angusta. Area centralis aliquantum parva. Raphe tenuis et recta. Striæ parallelæ, punctatæ. Puncta elongata. Loculi in medio ampliores, minores ad apices, longius ab apicibus deficientes. Longit. 58-60 μ ; latit. 12-5 μ ; striæ, 16-20 in 10 μ .

Valves lanceolate with slightly constricted and acutely rounded ends. Axial area narrow. Central area fairly small. Raphe thin and straight. Striæ parallel, punctate. Puncta elongated. Loculi larger in the middle and smaller at the ends, ending at a distance from the poles.

Dimensions Length 58-60 μ
 Breadth 12-5 μ
 Striæ 16-20 in 10 μ
 Length of the larger loculi 3-6-5 μ
 Length of the smaller loculi 2-5 μ

Habitat .. Fresh-water. Pools and streams at Borivli.
 Common.

This form resembles *M. amoyensis* Voigt (Voigt M., Contribution to the knowledge of the Diatom Genus *Mastogloia*, *Jour. Roy. Microsc. Soc. London*, Vol. 62, 1942, Ser III, p 1, pl. 1, fig 1) in outline, number of loculi and their configuration. However, due to robustness of the valves, the larger dimensions, the distantly placed linear and distinctly punctate striae and the greater distance of the loculi from the poles as compared to the type, the present form is considered as a new variety of *M. amoyensis* Voigt

60. *Mastogloia exigua* Lewis f. *brevirostris* Venkataraman

(Fig 60 a, b)

Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc. Ind Acad. Sci.*, Vol. 10, No. 6, Sect B, 1939, p 317, figs 44-45.

Valves elliptical, with broadly rounded ends. Raphe straight with slightly bent terminal fissures. Axial area narrow, central area somewhat square. Striae radial and indistinctly punctate. Loculi five in number, bigger in the middle and smaller at the ends. The two longitudinal septa bands curve suddenly inwards and out again before joining together near the ends. Thus their outline appears capitate at the ends.

Dimensions . . . Length 30-6-34 μ
 Breadth 12-6-13 μ
 Striae 18-20 in 10 μ
 Length of larger loculi 3-4-5 μ
 Length of smaller loculi 2-2-5 μ

Habitat . . . Fresh-water. Streams at Borivli. Common

This form resembles *M. exigua* Lewis f. *brevirostris* Venkataraman in all details, except that the breadth is more and the striae are slightly less in number.

61. *Mastogloia dolosa* Venkataraman var. *ambigua* var. nov.

(Fig 61, 61 a)

Valvæ ellipticæ lanceolatae, apicibus rotundis. Area axialis angusta: area centralis ampla, rectangularis, duabus notis hyalinis longitudinalibus litteræ H similibus ornatae quæ in apicibus convergere et convenire videntur. Striæ pallum radiales, tenuiter punctatae. Loculi plures in medio ampliores, paulo minores in apicibus. Septa longitudinalia primo intus, tum extus curvantur tandem haud longe ab apicibus conveniunt. Longit., 37-38.5 μ ; latit. 14.4 μ ; striæ 20-24 in 10 μ .

Valves elliptical lanceolate with rounded ends. Axial area narrow, central area big, rectangular with two hyaline H-shaped longitudinal markings which seem to converge and meet at the ends. Striae slightly radial and finely punctate. Loculi numerous, bigger in the middle, slightly smaller at the ends. The longitudinal septa bend inwards and out again before joining near the ends.

Dimensions	Length	37-38.5 μ	
	Breadth	14.4 μ	
	Striae	20-24 in 10 μ	
	Breadth of loculi	2 μ	
	No. of loculi	4-5 in 10 μ	
Habitat	Fresh-water	Streams at Borivli	Not very common.

This form resembles *M. dolosa* Venkataraman (Venkataraman, G., A Systematic Account of Some South Indian Diatoms, *Proc Ind. Acad. Sci.*, Vol. 10, No. 6, Sect. B, 1939, p. 316, fig. 49) in its shape and in having H-shaped hyaline furrows in the middle, but the ends are narrowly rounded and not subrostrate as in the type. The end portion of the longitudinal septa is distinctly capitate, as in *M. exigua* Lewis f. *brevirostris* Venk. (*Venk. op cit.*, p. 317, figs 44, 45). Hence this form is between *M. dolosa* Venk. and *M. exigua* Lewis f. *brevirostris* Venk. resembling the former in shape and hyaline H-shaped furrows and the latter in the capitate end portion of the longitudinal septa. As it shows greater resemblance to *M. dolosa* Venk. it is considered as a new variety of *M. dolosa* Venk.