

VI.—SOME NEW DIATOMS FROM THE JOG-FALLS (MYSORE STATE)

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EIGHTEEN TEXT-FIGURES

SYNOPSIS

Some new and interesting Diatoms from the Jog-Falls are described and illustrated. One species of *Achnanthes* is re-interpreted and five varieties are described as new to science.

INTRODUCTION

THE author, in an earlier paper (Gandhi, 1957), described some common Diatoms from the Jog-Falls, and gave details of the locality, collection, etc. In this paper some additional Diatoms which appear to be new and interesting are described from the same area. All these were collected from wet rocks encrusted with Bryophytes and Podostemonaceæ, and from shallow ditches on rocky cliffs of the Falls.

This investigation was carried out at Rajaram College, Kolhapur, during 1955-6, and completed at Gujarat College, Ahmedabad, during 1957.

1. *Achnanthes inflata* Kütz. var. *gibba* var. nov. (Figs. 1-2)

Frustula late-linearis, flexa in medio in aspectu zonali. Valvæ 34-40 μ longæ atque 14.3-15 μ latæ, lineares, fortiter gibbosæ in medio, ad apicem tumidæ, late-obtusæ-rotundatæ. Valva raphide: raphe tenuis, aliquantum curvata in medio; area axialis angusta, linearis; area centralis ampla, ad latera perveniens; striæ 10-12 in 10 μ , radiatæ, curvatæ atque crasse punctatæ (structura alveolaris). Valva sine raphide: pseudoraphe angusta atque unilateraliter evoluta; striæ crasse punctatæ atque aliquantum curvatæ in utroque apice, puncta 18-19 in 10 μ . Typus in coll. nostra; slide no. JF.63.

Frustules broadly linear, bent in the middle in girdle view. Valves 34-40 μ long and 14.3-15 μ broad, strongly inflated in the middle with swollen, broadly obtuse, rounded ends. Valve with raphe: raphe thin, slightly curved in the middle; axial area narrow, linear; central area large reaching the sides; striæ 10-12 in 10 μ , radial and curved, coarsely punctate (structure alveolar). Valve without raphe: pseudoraphe narrow, unilateral; striæ coarsely punctate and somewhat curved at the ends, puncta 18 in 10 μ .

Habitat: Found in shallow ditches on rocky cliffs of the Falls.

This Diatom, collected in small numbers, agrees with *Achnanthes inflata* Kütz., as described by Hustedt (1930, p. 209, fig. 307) in general outline, striæ, and other details. However, it differs from the type in being very gibbous in the middle and at the ends. Moreover, it is proportionately much broader than the type. It further differs from Mills's *A. inflata*

(Kütz) Grun. (Mills, 1932, p. 386, pl. I, figs 4-7), in gibbosity and somewhat in the outline. It is, therefore, considered as a new variety of *A. inflata* Kütz

2. *Achnanthes elata* (Leud.-Fort) comb nov. (Figs. 3-7, 10)

Navicula elata Leud.-Fort, Cat. Diat. Ceylan: 27 (1879)

Achnanthes inflata var. *elata* Hust in Arch. Hydrobiol., Suppl. Bd. 15: 206 (1937).

Frustules broadly linear and bent in the middle in girdle view. Valves 22-86 μ long and 11-19 μ broad, fusiform, linear-lanceolate, broadly tumid in the middle with subcuneate rounded ends. Valve with raphe: raphe thin and straight; axial area fairly wide, linear; central area large, reaching the sides; striae 8-9 in 10 μ , radial, clearly and coarsely punctate (structure alveolar), punctae 10-11 in 10 μ . Valve without raphe: pseudoraphe narrow, unilateral, close to the side; striae 9-10 in 10 μ , coarsely punctate and curved at the ends.

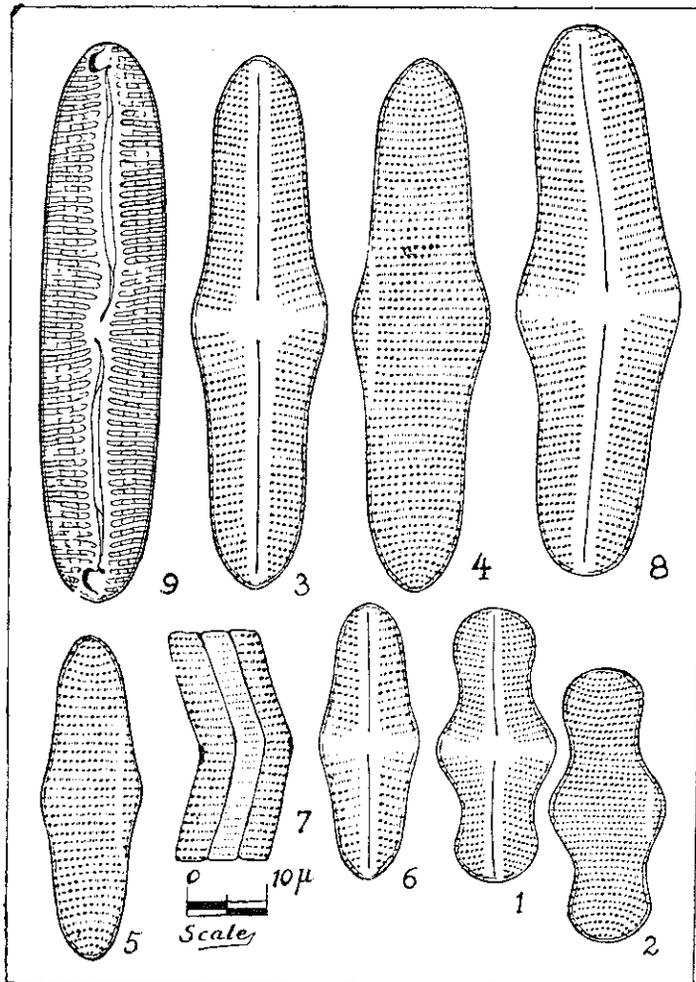


Fig. 1-2.—*Achnanthes inflata* Kütz. var. *gibba* var nov.

Fig. 3-6.—*Achnanthes elata* (Leud. Fort.) Gandhi.

Fig. 7.—*Achnanthes elata* (Leud.-Fort.) Gandhi in girdle view.

Fig. 8.—*Achnanthes elata* var. *curvula* var nov.

Fig. 9.—*Pinnularia viridis* (Nitzsch) Ehr. var. *curviraphe* var nov.

Habitat: Occurred in abundance on wet rocks encrusted with Bryophyta and Podostemonaceæ.

The earlier works dealing with the taxonomy of this diatom are not available to the author, but in his opinion present views on it need reconsideration and subsequent adjustment. This is attempted here.

This species is referred to *A. inflata* "javanische Form" by Geitler (1932, pp. 107-9), who observed auxospore forms of lengths 90-96 μ and other specimens of lengths 36-96 μ and breadths 14-21 μ . Geitler appears to classify these forms into two groups, viz: (1) longer ones having length to breadth proportions 85-96:18-21 μ , and (2) shorter ones with length to breadth proportions 36-40:13-14 μ . From these data it appears that he did not encounter forms with intermediate dimensions. The number and nature of the striae

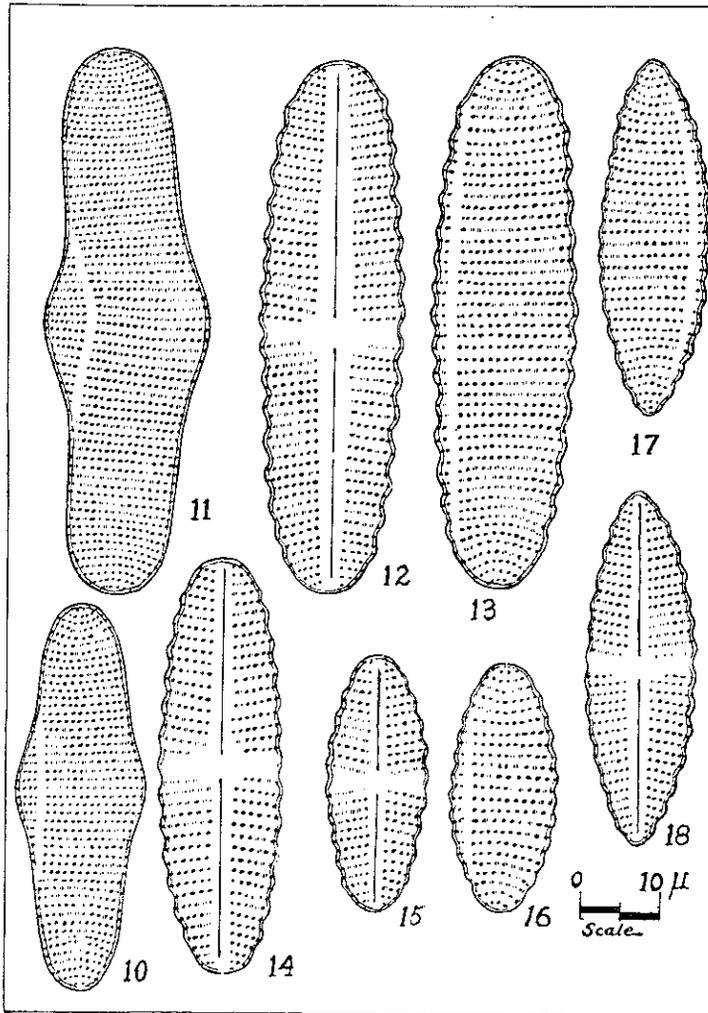


Fig 10—*Achmanthes elata* (Leud-Fort) Gandhi.
 Fig 11—*Achmanthes elata* var. *curvula* var nov.
 Fig 12-14.—*Achmanthes crenulata* var. *linearis* var nov.
 Fig 15-16.—*Achmanthes crenulata* var. *elliptica* var nov.
 Fig 17-18.—*Achmanthes crenulata* Grun.

on raphe and raphe-less valves are not mentioned in the text. Furthermore, no reference is made to Hustedt's (1930, p. 209) account of *A. inflata*. From this it appears that Geitler's and Hustedt's forms are two altogether different taxa. Geitler's (1932) fig. 66 a-f are of valves with raphe, and none of these have inflated apices such as are shown in Hustedt's specimens; Geitler's fig. 67 a-c represent girdle views and are characteristic of the whole of the genus *Achnanthes*.

Mills (1932, p. 386, pl. I, fig. 4-7) also referred this diatom to *A. inflata* (Kütz.) Grun.; his fig. 4 shows feebly inflated apices, but the specimens he illustrated correspond well with Hustedt's. Again, Mills makes no reference to Hustedt's or Geitler's accounts, suggesting that he had not seen these publications while preparing his own. The references cited by Mills suggest that the taxonomic position of this diatom is uncertain. Hustedt (1938, p. 206) later treated it as a variety of *A. inflata* under the name *A. inflata* var. *elata* (Leud.-Fort.) Hust., based on *Navicula elata* Leud.-Fort.

The author considers the diatom under discussion to be a distinct species rather than a derivative or variety of *A. inflata*. It is so considered because it was collected as a common form throughout the region he studied, occurring in varying amounts, occasionally gregarious and almost a pure stand among incrustations formed by Bryophytes and Podostemonaceae on wet rocks and in certain pools or ditches on the rocky cliffs of the Falls. Moreover, it showed its own derivative described below. The typical dimensions recorded for the species are set out in Table I. For comparison, Table II gives similar data for *A. inflata* as recorded by various workers. Comparison of the data in Tables I and II makes it evident that the dimensions of the two species show a similar range, although that of *A. elata* extends further at both ends than that of *A. inflata*. This comparison distinctly suggests the separation of the two types. The striae of the specimens of *A. elata* from the Jog-Falls are definitely coarser and less in number than those recorded for *A. inflata*, with the exception of those recorded by Gonzalves and Gandhi (1952). The structure of *A. elata* is clearly alveolar and the alveoli are quite large, numbering almost the same as the striae.

Hendey (1951) has studied *A. longipes* and recorded the cycle of variation within the species from year to year, and it appears that each set of variations could be given at least subspecific rank. None of the variations seen depart from the general configuration of the species to such an extent as to show gibbositities, whereas to treat the diatom under consideration as a variety of *A. inflata* would mean that the opposite change had taken place in the species, *A. inflata* losing apical gibbositities to form *A. inflata* var. *elata*. Again, in collections from the region studied, specimens of *A. inflata* were only very occasional but were distinctive, and they seldom occurred with the species in question. In the light of all these considerations, it is the opinion of the author that the specimens under consideration should be given specific rank.

3. *Achnanthes elata* var. *curvula* var. nov. (Figs. 8, 11)

Frustula late-linearis, flexa in medio in aspectu zonali. Valvæ 60-68 μ longæ atque 19-21 μ latæ, differunt a typo es quod sunt latæ, aliquantum curvatæ, ad apicem obtusæ. Pseudoraphe unilaterialis atque curvata. Striæ ut in typo. Typus in coll. nostra; slide no. JF.66

Frustules broadly linear and bent in the middle in girdle view. Valves 60-68 μ long and 19-21 μ broad, differs from the above type in being broader, slightly bent or curved with obtuse ends. Pseudoraphe unilateral and curved. Striæ as in the type.

Habitat: Found with the type encrusting wet rocks.

TABLE I
DIMENSIONS RECORDED FOR *Achnanthes elata*

Length in μ	Breadth in μ	Striæ in 10 μ		Alveoli in 10 μ
		On raphe valve	On raphe-less valve	
22	11	8-9	9-10	10-11
33	12.2	8-9	10	10-11
36	13	8-9	9-10	9-10
40	13	8-9	9-10	10-11
48	15	8.5-9	9-10	9-10
57	16	8.5-9	9-10	10-11
64.5	16	8.5-9	9-10	10-11
66-72	16.5-17	8-9	10	9-10
82-86	19	8	9-10	9-10
36-40*	13-14*	—	—	—
85-96*	18-21*	—	—	—
30-96†	10-21†	—	—	—

* Data recorded by Geitler (1932) for *A. inflata* "javanische Form".

† Data recorded by Hustedt (1938) for *A. inflata* var. *elata*, based partly on Geitler's data.

TABLE II
DIMENSIONS RECORDED FOR *Achnanthes inflata*

Author	Length in μ	Breadth in μ	Striæ in 10 μ		Alveoli in 10 μ
			On raphe valve	On raphe-less valve	
Hustedt (1930)	30-65	10-18	10-13	9-11	—
Venkataram (1939)	44-50	10-14	10-12	—	—
Gonzalves and Gandhi (1952)	76-80	16.6	—	8-9	—
Gandhi (1957b)	45-50	10-11	11-12	9-11	—

4. *Achnanthes crenulata* Grun (Figs. 17-18)

Hustedt, 1938, p. 206, t. 14, figs. 7-8.

Valves 35-50 μ long and 13-14.5 μ broad, lanceolate, margin crenulate or repand and ends acutely rounded. Valve with raphe: raphe thin and straight; axial area fairly wide, linear or sublinear; central area narrowly rectangular and reaching the sides; striæ 7-8 in 10 μ , clearly and coarsely punctate, punctæ 9-11 in 10 μ (structure alveolar). Valve without raphe: pseudoraphe very narrow, linear, unilateral or close to one side; striæ about 7 in 10 μ , very coarsely punctate, middle rows in straight transverse lines, those towards the apices curved.

Habitat: This species was found in large numbers encrusting wet rocks along with Bryophyta or Podostemonaceæ.

5. *Achnanthes crenulata* var. *linearis* var. nov. (Figs 12-14)

Frustula late-linearis, flexa in medio in aspectu zonali. Valvæ 53-65 μ longæ atque 15-17 μ latæ, robustæ, sublineares; marginibus crenulatæ, ad apicem late rotundatæ. Valva raphide: raphe tenuis et recta; area axialis fere ampla, linearis vel sublinearis; area centralis tenui-rectangularis ad latera perveniens; striæ 6-8 in 10 μ , radiatæ, clare atque crasse punctatæ (structura alveolaris); puncta 10 in 10 μ in ordinibus longitudinalibus fere rectis. Valva sine raphide: pseudoraphe angustissima, linearis atque unilaterialis

lateri proxima; striæ 7 in $10\ \mu$, rectæ in medio et curvatæ in utroque apice, crassæ punctatæ. Typus in coll. nostra; slide no. JF 67.

Frustules broadly linear, bent in the middle in girdle view. Valves $53\text{--}65\ \mu$ long and $15\text{--}17\ \mu$ broad, robust, sublinear with crenulate margins and broadly rounded ends. Valve with raphe: raphe thin and straight; axial area fairly wide, linear or sublinear; central area narrowly rectangular reaching the sides; striæ 6–8 in $10\ \mu$, radial, clear and coarsely punctate (structure alveolar); punctæ 10 in $10\ \mu$, arranged in almost longitudinal rows. Valve without raphe: pseudoraphe very narrow, linear, unilateral and close to one side; striæ 7 in $10\ \mu$, straight in the middle and curved at the ends, coarsely punctate.

Habitat: Found abundantly in shallow ditches as brownish scum, and on wet rocks as a slimy encrustation with Bryophytes

6 *Achnanthes crenulata* var. *elliptica* var. nov. (Figs. 15–16)

Valvæ $31\text{--}45\ \mu$ longæ atque $14\text{--}15\ \mu$ latæ, ellipticæ vel subellipticæ; marginibus crenulatæ, ad apicem late-rotundatæ. Valva raphide: raphe tenuis et recta; area axialis linearis; area centralis ampla ad latera perveniens; striæ 8 in $10\ \mu$, radiatæ, crasse punctatæ (structura alveolaris), puncta 9–10 in $10\ \mu$. Valva sine raphide: pseudoraphe angusta, unilateralis lateri proxima; striæ ut in typo. Typus in coll. nostra; slide no. JF 68

Valves $31\text{--}45\ \mu$ long and $14\text{--}15\ \mu$ broad, elliptical or subelliptical, with crenate margins and broadly rounded ends. Valve with raphe: raphe thin and straight; axial area linear; central area broad, reaching the sides; striæ 8 in $10\ \mu$, radial, coarsely punctate (structure alveolar), puncta 9–10 in $10\ \mu$. Valve without raphe: pseudoraphe narrow, unilateral, close to a side; striæ as in the type.

Habitat. Found in shallow ditches on rocky cliffs of the Falls along with the type

This variety, found sometimes with the type in smaller number, differs in being distinctly elliptical to subelliptical with broadly rounded ends. The central area also appears to be larger. It is, therefore, considered to be a distinct variety.

7 *Pinnularia viridis* (Nitzsch) Ehr. var. *curviraphe* var. nov. (Fig. 9)

Valvæ $67\text{--}75\ \mu$ longæ atque $15\text{--}15.4\ \mu$ latæ, lineares atque subcuneatæ-rotundatæ in utroque apice. Raphe crassa, complexa, fortiter undulata, poris centralibus distincte unilateraliter inclinatis atque fissuris terminalibus oblique curvatis. Area axialis angustissima, undulata ut raphe; area centralis parva aliquantum unilateraliter dilatata. Striæ 8 in $10\ \mu$, crassæ, paullulum radiatæ in medio atque convergentes in utroque apice, vittæ longitudinales claræ ac angustæ. Typus in coll. nostra; slide no. JF 90

Valves $67\text{--}75\ \mu$ long and $15\text{--}15.4\ \mu$ broad, linear with subcuneate rounded ends. Raphe thick, complex, strongly undulate with conspicuously unilaterally bent central pores and obliquely curved terminal fissures. Axial area very narrow, undulated as the raphe; central area small, slightly unilaterally widened. Striæ 8 in $10\ \mu$, thick, slightly radial in the middle and convergent at the ends, longitudinal bands narrow and distinct

Habitat: Found in shallow ditches on rocky cliffs of the Falls.

This diatom occurred in small number along with *Pinnularia viridis* and its varieties, forming marginal scum or brownish film among the Bryophytes. It resembles *P. viridis* and its varieties as described by Hustedt (1930, p. 334, fig. 617 (a)), Cleve-Euler (1955, p. 73, fig. 1103) and others, in the outline, striæ, and complex raphe. However, it differs from them in having a strongly undulate raphe, very conspicuously unilaterally bent central

pores, and obliquely-curved terminal fissures. Moreover, the axial area is very narrow and undulated like the raphe. This Diatom appears to be distinctive and is regarded as a new variety of *P. viridis*, with which it occurred and which it resembles considerably.

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