

SOME DIATOMS FROM THE HOT SPRING OF LADAKH

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ABSTRACT

Eleven taxa of diatoms are being described from the hot spring of Puga geothermal field (Ladakh, Jammu & Kashmir) situated at an altitude of 4350 metres. Of these, two taxa, viz. *Fragilaria construens* var. *binodis* Grun. and *Cymbella parva* (W. Smith) Cleve constitute new records for the Indian flora. All are new records for the area.

INTRODUCTION

Very little information is available up-to-date on the high altitude algal flora of India in general and the Bacillariophyceae (Diatoms) in particular. The only existing records are those by DICKIE (1882), CARTER (1926), RAO (1963), SUXENA AND VENKATESWARLU (1968, 1970) and SUXENA *et al.* (1972). All these records except that of SUXENA AND VENKATESWARLU (1970) are from Eastern Himalayas. EHRENBURG (1854) and HUSTEDT (1922) have recorded some diatoms from Nepal and Tibet. As far as studies on Indian thermal algae are concerned, mention is to be made of the work of SKUJA (1932), DRUET (1938), GONZALVES (1947), THOMAS AND GONZALVES (1965a-g), PRASAD AND SRIVASTAVA (1965), VASHISHTA (1968), SUXENA AND VENKATESWARLU (1970), PATTNAIK AND RAO (1972), PATEL (1974) and RAO AND PATTNAIK (1975). Of these, only the work of SUXENA AND VENKATESWARLU (1970) pertains to high-altitude diatoms of thermal springs. As far as the authors are aware, no information is available on the algal flora of the Ladakh Province.

While conducting a survey on geothermal fields during September, 1981 at Puga, a few algal samples were collected* from a hot spring (81.5°C). Puga is situated on Indo-Tibet border at an altitude of 4350 metres in Ladakh (Jammu and Kashmir State) and lies between 33-34° north latitude and 78-79° east longitude. A taxonomical analysis of the collections revealed 11 taxa of diatoms. The number of taxa given in parentheses belonging to the five genera are as follows: *Navicula* Bory (4), *Cymbella* Agardh (3), *Fragilaria* Lyngb. (2), *Stauroneis* Ehr. (1) and *Rhopalodia* Muell. (1). Amongst these forms, two taxa, viz. *Fragilaria construens* var. *binodis* Grun. and *Cymbella parva* (W. Smith) Cléve, are new records for the algal flora of India.

SYSTEMATIC DESCRIPTION

All the taxa described in the present paper have been arranged after HENDEY (1964).

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Genus-**Fragilaria** Lyngb. 1819

1. **Fragilaria construens** (Ehr.) Grun. var. *binodis* (Ehr.) Grun. (Fig. 6)
Van Heurck, H. 1896, p. 326, pl. 11, fig. 452; Patrick, R. and Reimer, C.W. 1966,
p. 125, pl. 4, fig. 7.

Valve more or less broadly linear with rostrate apices; median portion deeply concave rather undulate; pseudoraphe rather lanceolate; length 15-16 μm , breadth 4-4.2 μm ; striae 14-15 in 10 μm .

2. **Fragilaria pinnata** Ehrenberg (Fig. 7)

Tiffany, L. H. and Britton, M. E., 1952, p. 234, pl. 62, fig. 700; Patrick, R. and Reimer, C.W., 1966, p. 127, pl. 4, fig. 10.

Valve broadly elliptical with evident linear pseudoraphe; transverse striations prominent, rib like, slightly radial at apices; length 16-17.5 μm , breadth 3.5-4.0 μm ; striae 12-13 in 10 μm .

Genus-**Navicula** Bory 1822

3. **Navicula cryptocephala** Kuetz. (Fig. 10)

Gonzalves, E.A. and Gandhi, H. P., 1954, p. 345, fig. 17.

Valve lanceolate with constricted, slightly produced capitate ends; raphe straight with distinct central pores, terminal ends not clear; axial area narrow and linear, central area moderate; striae lineate, radiate in the middle, convergent at the ends, 14-16 in 10 μm ; length 28-29 μm , breadth 7-7.5 μm .

4. **Navicula cuspidata** Kuetz. var. *ambigua* (Ehr.) Cleve (Fig. 1)

Foged, N. 1976, p. 32, pl. 11, fig. 3.

Valve elliptic-lanceolate with produced rostrate ends; axial area narrow, central area not well-marked; raphe thin and straight with conspicuous central pores; striae radial and punctate, 18-20 in 10 μm ; length 98-104 μm , breadth 23-24 μm .

5. **Navicula dicephala** (Ehr.) W. Smith var. *sphaerophora* Clève (Fig. 5)

Gandhi, H. P., 1958, p. 258, fig. 14.

Valve linear-elliptic with capitate rounded ends; raphe thin and straight; axial area narrow, linear; central area conspicuous, roundish in appearance; striae radial, curved throughout, 14-16 in 10 μm , length 22-24.5 μm , breadth 8-8.2 μm .

6. **Navicula variostriata** Krasske (Fig. 11)

Gandhi, H. P., 1970, p. 782, fig. 72; Patrick, R. & Reimer, C.W., 1966, p. 447, pl. 40, fig. 6.

Valve linear elliptical with rounded ends; axial area narrow, distinct; central area roundish, striae radiate, punctate, 16-18 in 10 μm at the centre, closer at apices; length 38-39 μm , breadth 8.5-9.0 μm .

The present taxon is slightly bigger than the form recorded by GANDHI (1970), however it is well within the range of measurements given by PATRICK AND REIMER (1966).

Genus **Stauroneis** Ehrenberg, 1843

7. **Stauroneis phoenicentron** (Nitzsch) Ehrenberg (Fig. 2)

Gandhi, H. P., 1957, p. 53, fig. 18.

Valve broadly lanceolate with constricted, produced, rounded ends; raphe thick; axial area narrow, linear; central area a stauros, slightly widening near the margins; striae fine, punctate, 18-20 in 10 μm ; length 82-88 μm , breadth 19.5-20 μm .

Genus **Cymbella** Agardh 1830.

8. **Cymbella gastroides** Kuetz. (Fig. 4)

Van Heurck, H., 1896, p. 146, pl. 1, fig. 35.

Valve broadly cymbiform with obtuse rounded apices; dorsal margin arcuate, ventral margin slightly concave with median portion a little inflated; raphe slightly arcuate, surrounded by a very conspicuous hyaline zone; faintly dilated around the central nodule, central nodule conspicuous, terminal nodules not clear; striae robust, 9-10 in 10 μm consisting of coarse beads; length 135-142 μm , breadth 30-31 μm .

9. **Cymbella kolbei** Hust. (Fig. 9)

Foged, N., 1976, p. 17, pl. 17, figs. 6 & 7.

Valve lunate with convex dorsal side and almost straight ventral side; median portion conspicuously inflated; axial area moderate, linear; central area not very well marked; raphe slightly arcuate with prominent central nodule; striae strong, lineate, radiate, distantly placed in the middle, around 10-11 in 10 μm ; length 28-29 μm , breadth 8.2 μm .

10. **Cymbella parva** (W. Smith) Cléve (Fig. 8)

Tiffany, L. H. and Britton, M. E., 1952, p. 279, pl. 74, fig. 874.

Valve semilanceolate with dorsal side convex, ventral side almost straight or slightly concave with round poles; raphe excentric, arcuate; axial area narrow, central area moderate; striae radiate, strongly cross-lined, 10-12 in 10 μm ; length 44-46 μm , breadth 9.5-10 μm .

Genus-**Rhopalodia** Mueller, 1898

11. **Rhopalodia gibba** (Ehr.) O. Muell. (Fig. 3)

Venkataraman, G., 1939, p. 349, fig. 115.

Frustule linear (Girdle view), gibbous in the middle, broad, gradually tapering at the ends. Valves linear, arcuate on the dorsal, straight on the ventral side, ends reflexed; costae strong, 7-8 in 10 μm ; length 69-72 μm , breadth of frustule 20.5-21 μm .

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EXPLANATION OF FIGURES

Figs. 1-11:—1. *Navicula cuspidata* Kuetz. var. *ambigua* (Ehr.) Cleve (X 1225); 2. *Stauroneis phoenicentron* (Nitzsch) Ehr. (X 972); 3. *Rhopalodia gibba* (Ehr.) O. Muell. (X 1000); 4. *Cymbella gastroides* Kuetz. (X 935); 5. *Navicula dicephala* (Ehr.) W. Smith var. *sphaerophora* A. Cleve (X 1097); 6. *Fragilaria construens* (Ehr.) Grun. var. *binodis* (Ehr.) Grun., X 1812; 7. *F. pinnata* Ehr., X 1625; 8. *Cymbella parva* (W. Smith) Cleve, X 1025; 9. *C. kolbei* Hust. (X 1036); 10. *Navicula cryptocephala* Kuetz. X 1066; 11. *N. variostrata* Krasske X 1000

