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DIATOMS OF SAIF-UL-MALOOK LAKE KAGHAN VALLEY-PAKISTAN

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Abstract: Twenty-six species belonging to Diatomales were recorded for the first time, from the Saiful Malook lake, Kaghan valley. The species are *Gomphonema geminatum, G. constrictum, G. olivaceum, G. acuminatum, Denticula vanheureki, Navicula rhyncocephala, N. cuspidata, var. robusta, N. cuspidata var. major, N. platystoma, N. mutica, N. protracta, Amphora ovalis, Cymbella cistula, C. naviculiformis, C. ventricosa, Diatoma elongatum, Pinnularia parva, P. tabellaria, P. interrupta, Synedra acus, Achanthes exilis, Gyrosigma scalproides, G. tenuissimum, Nitzschia linearis, Surirella splendida* and *Stenopterobia pelagica.*

Keywords: Diatoms flora, identification and preservation, lake, palaeoecological condition.

INTRODUCTION

Lake Saiful Malook is situated at a distance of 10 km from Naran at an altitude of 3500 m. It provides an excellent view of the 5290 m high Malika Parbat (Queen of the mountain).

The assemblages of diatoms preserved in the lake sediments have a direct bearing on the floristic composition and productivity of lake diatoms community, and can indirectly reflect upon the quality of lake water especially pH and alkalinity, nutrient status and salinity. Diatoms are also good indicators of the palaeoecological condition.

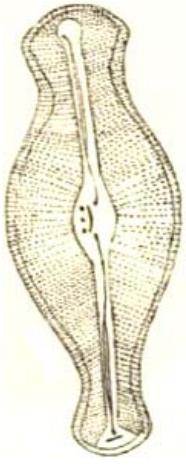
Diatoms have been recorded and classified for over two centuries. In the second decade of 20th century, palaeoecological value of diatoms in lake sediments began to be recognized. In lacustrine environment, these include the nature of lake in late glacial period, water level and associated climatic changes and the disturbance of lake systems as a result of human activity.

MATERIALS AND METHODS

Diatoms samples were collected from cold standing water as well as running water from different localities of lake in June, 1999 and August, 2000. The collection was made in clean small plastic bottles, upto 10m depth by sedimentation bottle. The specimens were brought to the laboratory and preserved in 4% formaline. The specimens were identified according to Salim [1954, 1963], Salim and Iqbal [1964], Salim and Khan [1967], Bradbury [1975] and Battarbee [1986]. Almost the description was made from the Tiffany and Britton [1952] and Fritsch [1961]. The specimens were deposited in the herbarium, Department of Botany, Islamia College, University of Peshawar, Peshawar.

DESCRIPTION OF THE SPECIES

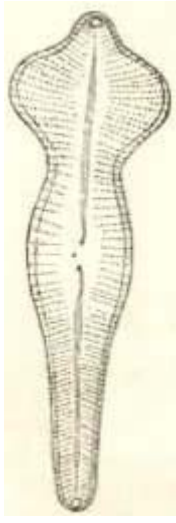
The following species of Diatomales have been identified in Saif-ul-Malook Lake:



Gomphonema geminatum x950

Gomphonema olivaceum var. x1600

Gomphonema constrictum x850



Gomphonema acuminatum x2100

Navicula cuspidata var. *robusta* x350

Navicula cuspidata x480

Navicula platystoma x1400

Navicula mutica x1900

Navicula protracta x1600

Cymbella cistula x900

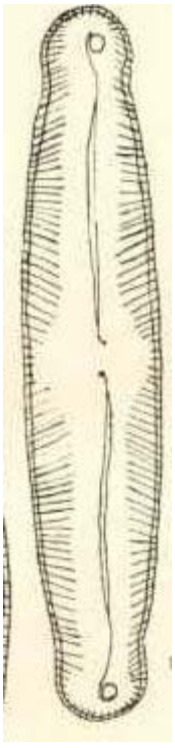
Cymbella naviculiformis x1700

1. ***Gomphonema geminatum*** **(Lyngb) C.A. Agardh**
   Valves biconstricted, with broad rounded subtruncate poles, the apex considerably larger than the base, axial area linear, central area rounded, with 2-4 dots in a longitudinal row, raphe with terminal dorsal hooks, transverse striations, generally radiate, medianly alternately long and short, length 97 μm and breath 41 μm.
2. ***Gomphonema olivaceum*** **var.** ***obtusum*** **var.** ***novo***
   Valves ovoid-clavate, with broadly rounded apex and acutely rounded base, axial area narrow, linear, central area widened transversely without dots. Differs from the type in having a smaller number of striae which are also thicker and more robust. Length 22.5 μm and breadth 8-l0 μm.
3. ***Gomphonema constrictum*** **var.*capitatum* (Eher.) Grunow**
   Valves typically clavate, transverse constriction below the broad, rounded apical end, with attenuated base, axial area narrow, central area broad with a dot on one side, transverse striations radial, indistinctly punctate, alternately long and in the middle, length 40 μm and breadth 12.5 μm.
4. ***Gomphonema acuminatum*** **Var.** ***coronatum*** **(Eher.) Rabenhorst**
   Valves generally cuneate, with a broad flat apex medianly acutely topped and with a deep subapical constriction, broadest near the apex and less so medianly, with attenuated base, axial area linear narrow, central area large often indefinite with an isolated dot, transverse striations somewhat radial, length 47 μm and breadth 10-14 μm.
5. ***Denticula vanheurcki*** **Brim; Fritsch [1961]**
   Cells solitary, free floating or joined valve to valve into short filaments with somewhat convex sides and truncate poles in girdle view, valves linear, lanceolate or elliptic, internal valve of fissure with indistinct circular poles, transverse septa appearing as costae, alternating with several striations or row of punctae, two longitudinal septa, each with single perforation between successive transverse costae.
6. ***Navicula rhyncocephala*** **Kuetzing; Tiffany and Britton [1952]**
   Cells 5-7 μm broad and 20-40 μm long, valves lanceolate with slender somewhat capitate ends, central area elongated transversely, striations medianly radial and polarly convergent.
7. ***Navicula cuspidata*** **var.** ***robusta*** **Var.** ***novo***
   Valves rhombo-lanceolate tapering sharply to rounded poles, transverse striations evidently punctate, longitudinal striations parallel to the narrow axial area. Differs from the type as well as var. major Meister is being longer and broader and also having a somewhat lesser number of striae, length 207 μm and breadth 45 μm.
8. ***Navicula cuspidata*** **var.** ***major*****. Meister**
   Valves large lanceolate-rhombic, poles produced and rounded. Arial area linear, striae fine, length 150 μm and breadth 35 μm.

9. ***Navicula platystoma* Eher.**
   Frustules solitary, valves broadly lanceolate with broad and rostrate poles, central area wide, striae fine radial, length 42 μm and breadth 16 μm.
10. ***Navicula mutica* (kg.) Grunow.**
    Valves lanceolate with broadly rounded ends, central area rectangular, with a single isolated puncta, transverse striations strongly punctate, radial often visible with difficulty especially in the middle of the valve, length 16.5 μm and breadth 7.5 μm.
11. ***Navicula protracta* (Grun) Cleve.**
    Valves lanceolate, elongated, poles broadly rostrate, striations fine, radial, axial area narrow, length 25 μm and breadth 8 μm.
12. ***Amphora ovalis* var. *gracilis* Meister.**
    Frustules solitary, girdle elliptic with truncate apices, valve lunate, raphe curved, striae finely punctate, with a row of short striae near the central surface, length 40 μm and breadth 12.5 μm.
13. ***Cymbella cistula* (Hemprich) Grunow.**
    Valves strongly asymmetric, naviculoid in shape with dorsal sides convex, ventral side concave with a median expansion, raphe excentric, broad, dorsally convex, axial area narrow, transverse striations radiate, punctuate, median ventral striations, ending in two or more dots, length 63 μm and breadth 18 μm.
14. ***Cymbella naviculiformis* Aversweld.**
    Valves naviculoid, somewhat asymmetric, with evident constriction below the rostrate poles, raphe slightly curved and excentric, axial area narrow, central area large, transverse striations radiate, length 34.5 μm and breadth 11 μm.
15. ***Cymbella ventricosa* Kg.**
    Valves somewhat semielliptic, dorsally convex, ventrally straight, with sharply rounded poles, raphe straight, closer to the ventral side except at the poles, axial area narrow, slightly expanded medianly without isolated dots, transverse striations generally radiate, punctate, length 32 μm and breadth 9 μm.
16. ***Diatoma elongatum* (Lyngb) Ag.**
    Frustules in zigzag bands, sometimes in stellate colonies, girdle view long narrow, slightly drawn in the middle, valves view linear, straight elongated, apices rounded, costae close together, pseudoraphe, narrow linear, length 35 μm and breadth 4 μm.
17. ***Pinnularia parva* Gregory.**
    Valves linear gradually tapering to obtuse somewhat capitate ends, axial area broad, central area band like, often extending to the margin, transverse striations, slightly radiate, convergent at the poles, sometimes bilaterally interrupted in the middle, length 61.5 μm and breadth 12 μm.

Cymbella ventricosa x700

Diatoma elongatum x800



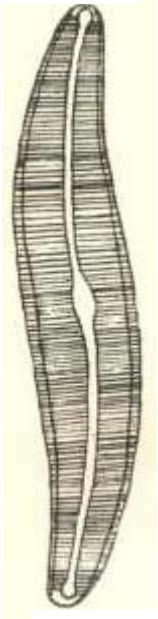
Pinnularia parva x2200

Pinnularia tabellaria x800

Pinnularia interrupta x1000

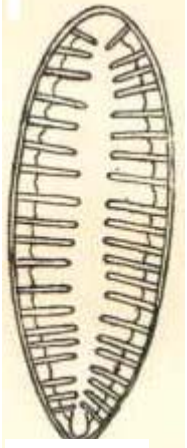
Synedra acus x1000

Achanthes exilis x1400



Gyrosigma scalproides x2200

Nitzschia linearis x400



Surirella splendida x950

18. ***Pinnularia tabellaria*** **Eher.**
    Valves linear, broadest medianly and polarly, with broad and capitate ends, axial area narrow, central area rounded, striations medianly radial, polarly convergent, length 52 μm and breadth 9 μm.
19. ***Pinnularia interrupta*** **M. Smith.**
    Valve linear, sides convex, poles capitate, axial area broader in the middle, striations fine, length 55 μm and breadth 8 μm.
20. ***Synedra acμs*** **Kg.**
    Solitary, valves linear-lanceolate, becoming needle like towards the scarcely rounded poles, pseudoraphe narrow, linear, length 113.4 μm and breadth 5.4μm.
21. ***Achanthes exilis*** **Kg.**
    Frustules free, solitary, valve linear-lanceolate, poles rounded, raphe with a stauros, striae indistinct very fine, length 18μm and breadth 5 μm.
22. ***Gyrosigma scalproides*** **(Rabenhorst) Cleve.**
    Valves attenuated to rounded poles transverse striations, striations usually perpendicular to the middle line, longitudinal striations indistinct in this case, length 48 μm and breadth 8 μm.
23. ***Gyrosigma tenuissimum*** **W. Smith.**
    Frustules free, solitary, valve sigmoid, linear lanceolate, raphe central, poles acute, striation indistinct, length 85 μm and breadth 8 μm.

Gyrosigma tanuissimum x1200

Stenopterobia pelagica x800

24. ***Nitzschia linearis*** **(Ag.) W. Smith.**
    Valves linear with parallel side and a slight constriction in the middle, poles smaller capitate, girdle view linear-rectangular, with distinct median constriction, striations indistinct, length 110 μm and breadth 6μm.
25. ***Surirella splendida*** **(Eher.) Kg.**
    Cells not isopolar, valves oval, pseudoraphe linear, narrow, length 207 μm and breadth 66 μm.
26. ***Stenopterobia pelagica*** **Hust.**
    Frustules free floating, sigmoid, elongated, broader middle portion linear-lanceolate poles markedly narrow elongated beaked, keel costae fine, pseudoraphe wide, length 115 μm and breadth 65 μm.

RESULTS AND DISCUSSION

An effort has been made to explore the diatoms of the Lake as very little work has been done on the diatoms [Shah 1996] and on the algae as a whole in Pakistan.

Twenty-six species were collected in which *Navicula* is the leading genus followed by *Gomphonema*. By the publication of this paper, the diatoms of Saif-ul-Malook Lake will be explored and will be the foundation stone for the future phycologists.

Acknowledgement

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References

Battarbee, W.R. (**1986**) “Diatom analysis”, In: Bjorn E. Berglund (Ed.), *Handbook of Holocence Palaeoecology and Palaeohydrology*, John Wiley and Sons, New York.

Bradbury, J.P. (**1975**) “Diatom stratigraphy and human settlement in Minnesota", *Geol. Soc. Am.*, (Special paper) 171.

Fritsch, F.E. (**1961**) “The structure and Reproduction of the Algae", Vol. 1, Cambridge University Press, London, p. 495.

Salim, K.M. and Khan, Mir Hashim (**1967**) "The Fresh water Diatom of Peshawar valley”, Spinzer Printers, Peshawar, Pakistan.

Salim, K.M. (**1963**) "A systematic account of marine diatoms from the Karachi Coast", *J. University of Peshawar*, 8,19-52.

Salim, K.M. (**1954**) "Some plankton Diatoms from Karachi", *Pak J. Sci.*, 6 (2), 106-110.

Salim, K.M. and Iqbal, M.M. (**1964**) "Distribution of Diatoms in the intertidal zone Rockey ledge, Manora”, *Pak J. Sci*., 16.

Shah, J. and Hassan, U.M. (**1996**) "Diatoms of Borit lake, Hunza Valley, Pakistan", *Scientific Khyber*, 9 (2), 71-77.

Tiffany, L.H and Britton, M.E. (**1952**) “The Algae of the Illinois", University of Chicago Press, Chicago, p. 610.