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Preliminary Report on Diatom Species of Brahmsarovar in District Kurukshetra, Haryana (India)

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Abstract : **Study has been conducted in diatomology division of forensic science laboratory, Madhuban, Karnal (29° 40′ 48″ N to 76° 58′ 48″ E), Haryana (27° 39′ and 30° 55′ N latitude, 74° 27′ and 77° 36′ E longitude), India. During fortnightly periodic visits (from November, 2011 to April, 2012) water samples were collected from study site (Brahmsarovar in district Kurukshetra, Haryana, India) and carried out in forensic science laboratory, Madhuban, Karnal (H). Water samples were centrifuged and identified with standard methodology (Venkataraman, 1939; Gandhi, 1956 and 1999; Smith, 1950; Digincamillus et. al., 2011). In our present study, ten numbers of diatom species namely, *Cymbella tumida, Melosira granulata, Cyclotella striata, Stephanodiscus sp., Tabelaria sp., Synedra ulna, Diploneis subovalis, Pennium sp., Gomphonema striata* and *Rhopalodia gibba* were observed. Equability index or species evenness (J) may varied from minimum 0.9613 (December, 2011) to maximum 0.9937 (February, 2012) with an average± S.E., 0.9802±0.0130; Shannon-Wiener index (H) of studied species may varied from minimum 2.930 (January, 2012) to maximum 3.193 (December, 2011) with an average± S.E., 2.988±0.172 and Simpson-Index (SI) of studied species may varied from minimum 0.0994 (February, 2012) to maximum 0.1354 (April, 2012) with an average± S.E., 0.1155±0.131.**

Keywords: Pond, Diatom, Centrifugation, Microscopy.

1. INTRODUCTION:

Diatoms are single celled predominantly microscopic algae which consist of two halves (valves) which fit one inside the other to make up a cell (frustules). Diatoms are one of the most common types of phytoplankton. Most diatoms are unicellular, although they can exist as colonies in the shape of filaments or ribbons (e.g. *Fragilaria*), fans (e.g. *Meridion*), zigzags (e.g. *Tabellaria*) or stellate colonies (e.g. *Asterionella*) (Hasle and Syvertsen, 1997). Diatoms are producers within the food chain. Unlike most other algae, diatoms construct their frustule from silica and undergo size reduction during vegetative reproduction since cell division occurs within the confines of the silica cell wall. Estimates of diatom species diversity vary enormously, predominantly due to conflicting species concepts, with suggested numbers of species ranging from 10,000 to 200,000 (Maan and Droop, 1996). Diatoms account for as much of 25% of the world's primary production, the majority in the oceans (Milligan and Morel, 2002) and are often the dominant or sub dominant phytoplanktons in Australian estuaries (Chan and Hamilton, 2001; Twomey et. al., 2002) and open ocean (Hallegraeff and Jaferry, 1993). Species of the toxic diatom *Pseudonitzschia* have been described from Australian coastal waters though their abundance has been relatively low and populations are mostly non toxic (Hallegraeff, 1994). Scanty information is available on various aspects of diatom species in the state of Haryana, in particular. Therefore, present study was planned to collect information on diatom species of holy pond of Brahmsarovar in district Kurukshetra, Haryana (India).

2. MATERIAL AND METHODS:

Study area:

Brahmasarovar (29.90^0 N to 76.83^0 E) is a lovely fresh water body where history, legends and beauty coincide with each other. It is situated in Thanesar city of district Kurukshetra, in the state of Haryana, India. Today, Brahmasarovar is manually cleaned water pond. It is 1800 feet long and 1400 feet broad. The tanks are especially crowded during solar eclipse because it is believed that a dip there during the solar eclipse absolves one of all sins.

Fortnightly periodic visits (from November, 2011 to April, 2012) were conducted to collect water samples from the study site. Collected water sample were carried out in the forensic science laboratory, Madhuban, Karnal, Haryana (India). For detection of diatoms, water sample, centrifugation in three times on centrifuge (Research centrifuge-REMI) with 4000 rpm for 8 minutes in 10 ml of centrifuge tubes. The supernatant discarded and residue put on slides. Slides were prepared with following method, Petrick and Reimer (1966). The slide put on warm hot plate. Finally, the slides were mounted with DPX and observe under the optimum 100X of microscope (LEICA-DMLB, Oil gel microscope). Taxonomic identification was made by consulting various publications and monographs like Venkataraman, (1939); Gandhi, (1956, 1999); Smith, (1950); Digincamillus et. al. (2011).

3. RESULTS AND DISCUSSION:

Nine numbers of diatom species namely, *Navicula yatukaensis, Diploneis yatukaensis, Gomphonema tetrastigmatum, Didymosphenia fossilis, Pinnularia yatukaensis* in selected pond of Tokyo (Tuji, 2004). Five numbers of diatom species namely, *Cyclotella meneghiniana, Synedra ulna, Eunotia tschiriana, Diploneis subovalis* and *Gomphonema striata* were identified in some around Vashna village of Ahmadabad, Gujarat, India (Gandhi, 1959).

Parik et. al. (2011) studied twenty four species of diatoms from Galta Kund, Jaipur. These species belong to eleven genera namely, *Cyclotella, Melosira, Navicula, Achnanthes, Amphora, Synedra, Nitzschia, Gomphonema, Hantzschia, Pinnularia* and *Fragillaria*. A diatom community of Mawatha lake comprised of 30 species representing 8 centric and 22 pennate forms and abundance were *Navicula, Gomphonema, Nitzschia, Synedra, Melosira, Coscinodiscus, Fragillaria* with single species of the following diatoms, *Stephanodiscus, Pinnularia, Hantzschia, Cocconeis, Eunotia, Diadesmis, Cyclotella, Amphora, Surirella, Diatoma, Rhopalopodia* and *Anomoeneis*. The presence of these typical eutrophic species is characteristically indicative of the organically riches. Majority of the forms were solitary and few colonial. Particularly, centric diatoms like *Amphora, Coscinodiscus, Stephanodiscus, Melosira* and *Cyclotella* were most dominant during the monsoon whereas distinct numbers of dominant genera of pennate diatoms like *Nitzschia, Navicula, Gomphonema, Pinnularia, Synedra, Fragillaria, Surirella, Diatoma* and *Anomoeneis* were dominant during winter season (Singh et. al., 2011). Phukan and Bora (2012) observed sixteen numbers of diatom species namely, *Cymbella gracilis, Cymbella reinhadtii, Fragilaria capucina, Gomphonema augur, Gomphonema subtile, Gomphonema truncatum, Mastogloia braunii, Navicula cryptocephala, Navicula simplex, Nitzschia obtuse, Pinnularia acrosphaeria, Pinnularia stauroptera, Pinnularia virids* and *Synedra ulna* were found in the Sivasagar District of state Assam (India). Similarly, in our present study ten numbers of diatom species namely, *Cymbella tumida, Melosira granulata, Cyclotella striata, Stephanodiscus sp., Tabelaria sp., Synedra ulna, Diploneis subovalis, Pennium sp., Gomphonema striata* and *Rhopalodia gibba* were observed in Brahmsarovar of district Kurukshetra, Haryana, India (fig. 1).

This study concludes that the diatoms attains maximum growth and numbers during the winter season and gradually declines in summer to reach its minimum during the rainy season (Philipose, 1960; Karikal, 1995; Parik et. al., 2011). Similarly, in our present study maximum numbers and growth of diatom species observed in winter season and gradually decreased in summer season.

Shannon-Weiner diversity index (H') value (1.372) and Evenness (J') value (0.903) were found to be highest during winter while Simpson-Index of dominance (0.147) was highest in monsoon (Singh et. al., 2011). During six month of study, Equability index or species evenness (J') may varied from minimum 0.9613 (December, 2011) to maximum 0.9937 (February, 2012) with an average± S.E. 0.9802±0.0130; Shannon-Wiener index (H') of studied species may varied from minimum 2.930 (January, 2012) to maximum 3.193 (December, 2011) with an average± S.E. 2.988±0.172 and Simpson-Index of studied species may varied from minimum 0.0994 (February, 2012) to maximum 0.1354 (April, 2012) with an average± S.E. 0.1155±0.131 (table 1).

Low count of diatom in monsoon is attributed to rainfall which dilutes the water and disturbs the structure and composition of aquatic ecosystem. The disturbance influenced by high flow of water on aquatic life is also been studied by several workers (Stevenson et al., 1996; Biggs et al., 1998). Our study site is fresh water body and it is manually cleaned. Hence, it may be main reason of scanty species of diatom in study site.

4. SIGNIFICANCE OF DIATOM SPECIES COMPOSITION:

Diatoms can be used as indicators of past and present environmental conditions in aquatic ecosystem. This is because many diatom species have clearly defined, and frequently narrow, preferences for particular habitats (e.g. there are open water planktonic, plant dwelling-epiphytic, fine sediment epipelic and sand associated episammic species) and water quality conditions. In addition, diatoms are abundant and secrete a siliceous cell wall which can preserve in sediment, and which can be used to hind-cast some important aspects of water quality and habitat condition. Changes in diatom species composition along dated sediment cores can thus be highly valuable for determining whether the contemporary conditions of an aquatic water body within the range of natural variability. Analysis of diatom species assemblages has also led to substantial advances in the understanding of human impact on aquatic habitats and water quality on timescales ranging from sub decadal to millennial.

The "diatom test" for drowning is one of the most often applied and studied application of diatom analysis in forensic investigations and become an established forensic technique because diatoms have many attributes that are applicable to forensic science. The basic principal of the "diatom test" in drowning is based on inference that diatoms are present in the medium where the possible drowning took place and that the inhalation of water causes penetration of diatoms into the alveolar system and blood stream, and thus, their deposition into the brain, kidneys and other organs.

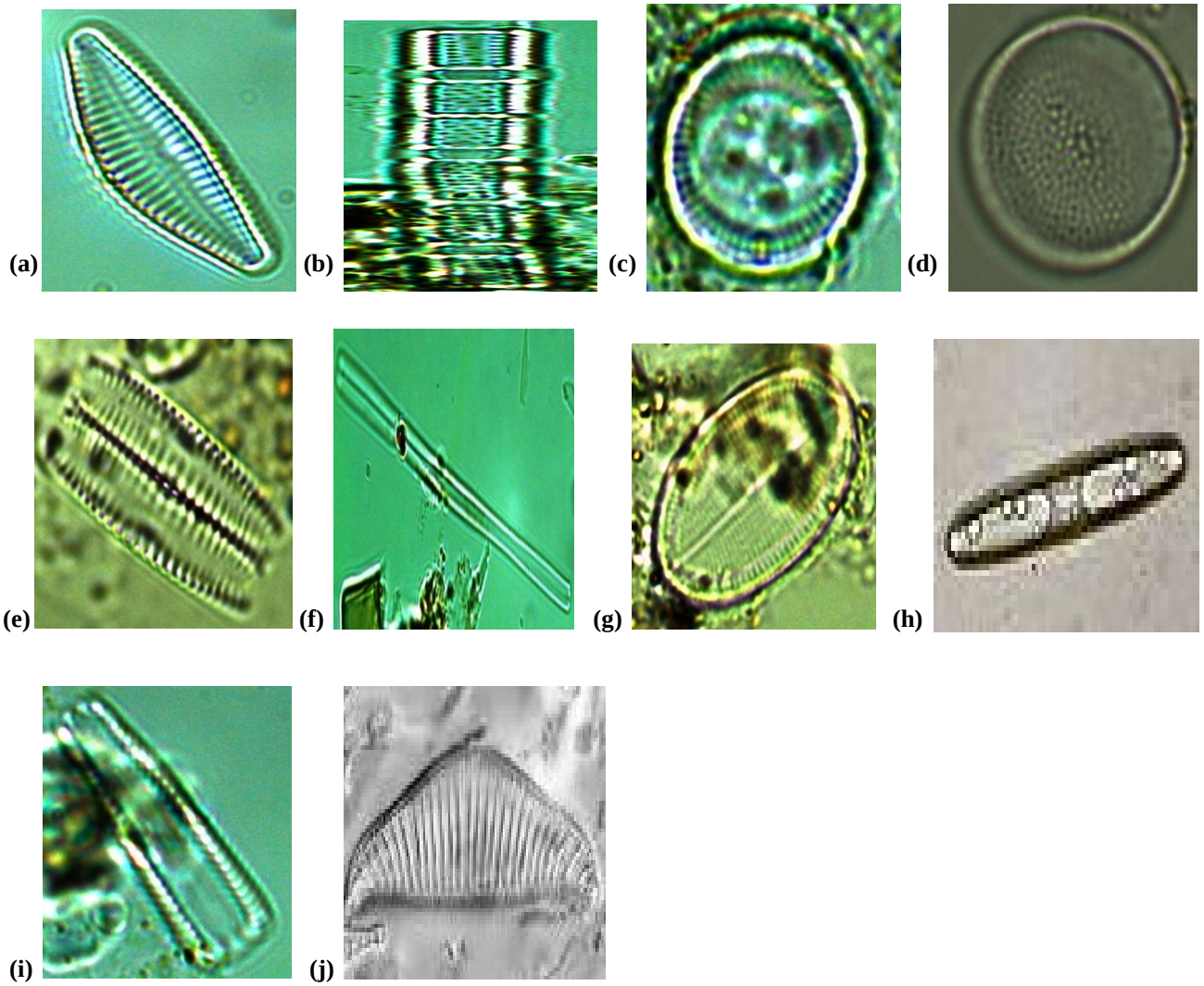

Fig. 1 Various species of diatoms namely, (a) *Cymbella tumida* (b) *Melosira granulata,* (c) *Cyclotella striata,* (d) *Stephanodiscus sp,* (e) *Tabelaria sp.,* (f) *Synedra ulna,* (g) *Diploneis subovalis,* (h) *Pennium sp.,* (i) *Gomphonema striata* and (j) *Rhopalodia gibba* in Brahmsarovar of district Kurukshetra, Haryana (India).

Table 1 Monthly Variation of diversity indices of diatoms of Brahmsarovar of district Kurukshetra, Haryana (India) during November, 2011 to December, 2012.

Month of year	Number of species	Equitability index (Species evenness)	Shannon-Wiener Index (log)	Simpson-Index
November, 2011	8	0.9796	2.939	0.1199
December, 2011	10	0.9613	3.193	0.1027
January, 2012	8	0.9768	2.930	0.1269

February, 2012	9	0.9937	3.150	0.0994
March, 2012	8	0.9917	2.975	0.1085
April, 2012	7	0.9782	2.746	0.1354
Mean±S.E.	8.33±0.13	0.9802±0.0130	2.988±0.172	0.1155±0.131

References:

Chan, T.U. and Hamilton, D.P. (2001) Effect of freshwater flow on the succession and biomass of phytoplankton in a seasonal estuary. *Marine and Freshwater Research.*, **52**, 869-884.

Digincamillus, C., Gibbeli, D. and Cattaneo, C. (2011) Diatom extraction with HCL from animal tissue: A technique note Elsvier Science. *Canadian Journal of Hydrobiology.*, **14**,142-146.

Gandhi, H.P. (1959) On the diatom flora of some around Vashna village of Ahmadabad, Gujarat, India, *The Journal of Indian Botanical Society.*, **29**, 558-567.

Gandhi, H.P. (1999) Fresh Water Diatoms of Central Gujarat, Bishen Sing Mahendra Pal Singh, Dehradun. 324.

Hallegraeff, G.M. (1994) Species of the Diatom Genus Pseudonitzschia in Australian Waters. *Botanica Marina.*, **37**, 397-411.

Hallegraeff, G.M. and Jeffrey, S.W. (1993) Annually recurrent diatom blooms in spring along the New South Wales coast of Australia. *Australian Journal of Marine and Freshwater Research.*, **44**. 325-34.

Hasle, G.R. and Syvertsen, E.E. (1997) Marine Diatoms. In: Tomas. *Identifying Marine Diatoms and Dinoflagellates.*, 5-385.

Mann, D. and Droop, S.J.M. (1996) Biodiversity, biogeography and conservation of diatoms. *Hydrobiologia*., **33**, 19-32.

Milligan, A.J. and Morel, F.M.M. (2002) A Proton Buffering Role for Silica in Diatoms. Science., **297**, 1848-1850.

Nautiyal, R., Nautiyal, P. and Singh H.R. (1996) Pennate diatom flora of a cold water mountain river. *Phykos.*, **35**: 5763.

Parik, R., Singh, G.P. and Singh, R. (2011) Some fresh water diatoms of Galta kund, Jaipur, India. *Journal of Soil Science and Environmental Management*., **2**, 110-116.

Patrick, R. and Reimer, C.W. (1966) The diatoms of the United States, exclusive of Alaska and Hawaii. *Monograph of the Academy of Natural Sciences, Philadelphia.*, **13**, 688.

Phukan, S. and Bora S.P. (2012) Preliminary report of diatoms from Sivasagar district of Assam. *Indian Journal of Fundamental and Applied Life Sciences*., **2**,55-61.

Singh, M., Lodha, P., Singh, G.P. and Singh, R. (2011) Studies on diatom diversity in response to abiotic factors in Mawatha lake of Jaipur, Rajasthan. *International Journal of Life science and Pharma Research.*, **1**, 29-37.

Tuji, A. (2004) Five diatom species described by Okuno (1943, 1944) from the Yatuka, Tokyo, *Bull. Natn. Sci. Mus.*, **30**, 79-88.

Twomey, L., John, J. and Thompson, P. (2002) Seasonal succession of diatoms and other phytoplankton in a bar built estuary, Wilson Inlet, Western Australia. In: *Proceedings of the 15th International Diatom Symposium, Perth, Australia*., 395-420.

Venkataraman, G. (1939). A systemic account of some South Indian Diatoms. *Proceeding of Indian Acad. Science.*, **10**, 293-336.