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On Some Diatoms from Upper Mustang Trans-Himalaya Region, Nepal

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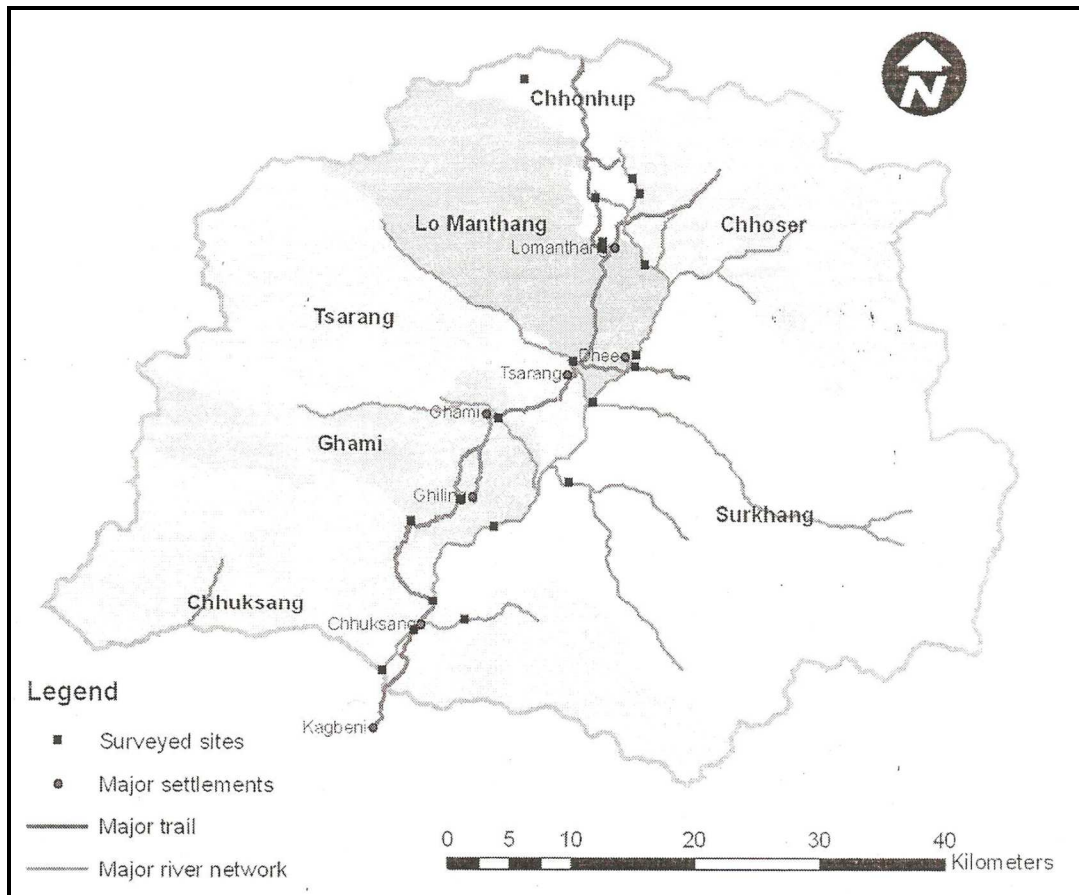
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A total 19 diatom taxa viz. *Achnanthes flexella* (Kütz.) Brun., *Amphora libyca* Ehr., *Cymatopleura solea* (Bréb.) W. Smith, *Cymbella affinis* Kütz., *Cymbella cistula* (Ehr.) Kirchn., *Cymbella helvetica* Kütz., *Cymbella radiosa* Reichelt, *Denticula elegans* Kütz., *Diatoma hiemale* (Lyngb.) Heib., *Gomphonema clavatum* Ehr., *Hannaea arcus* var. *arcus* (Ehr.) Patrick in Patrick & Reimer, *Navicula cuspidata* Kütz., *Neidium affine* (Ehr.) Pfitzer, *Pinnularia viridis* (Nitzsch) Ehr., *Rhopalodia gibba* (Ehr.) O. Müller, *Staurisirella leptostauron* (Ehr.) Williams & Round, *Surirella linearis* W. Smith, *Surirella spiralis* Bréb. and *Synedra ulna* (Nitz.) Ehr. under 15 genera were recorded from Upper Mustang Trans-Himalaya region, Nepal (Figs 1-22). Among these, *Cymbella*, *Diatoma*, *Hannaea* and

Pinnularia spp. were the most abundant genera whereas genera like *Amphora*, *Gomphonema* and *Neidium* were rare.

Upper Mustang (28°47'39" to 29°19'54"N & 83°28'55" to 84°15'16"E) occupies almost half of the area (ca 2567 km²) of northern Mustang district in the Trans Himalayan region of Nepal, north to the Himalayan range (Map 1). It is bordered by Tibet of China, Dolpa district, Manang district and southern mountains in the north, west, east and south respectively. There are seven VDCs viz. Chhoser, Chhonup, Lo Manthang, Tsarang, Surkhang, Ghami and Chhuksang in which several freshwater streams and rivers flow originating from Himalayas and high mountains. The rocks are mainly metamorphic type comprising conglomerates, granite etc. and most of the observed rocks across the Kali Gandaki

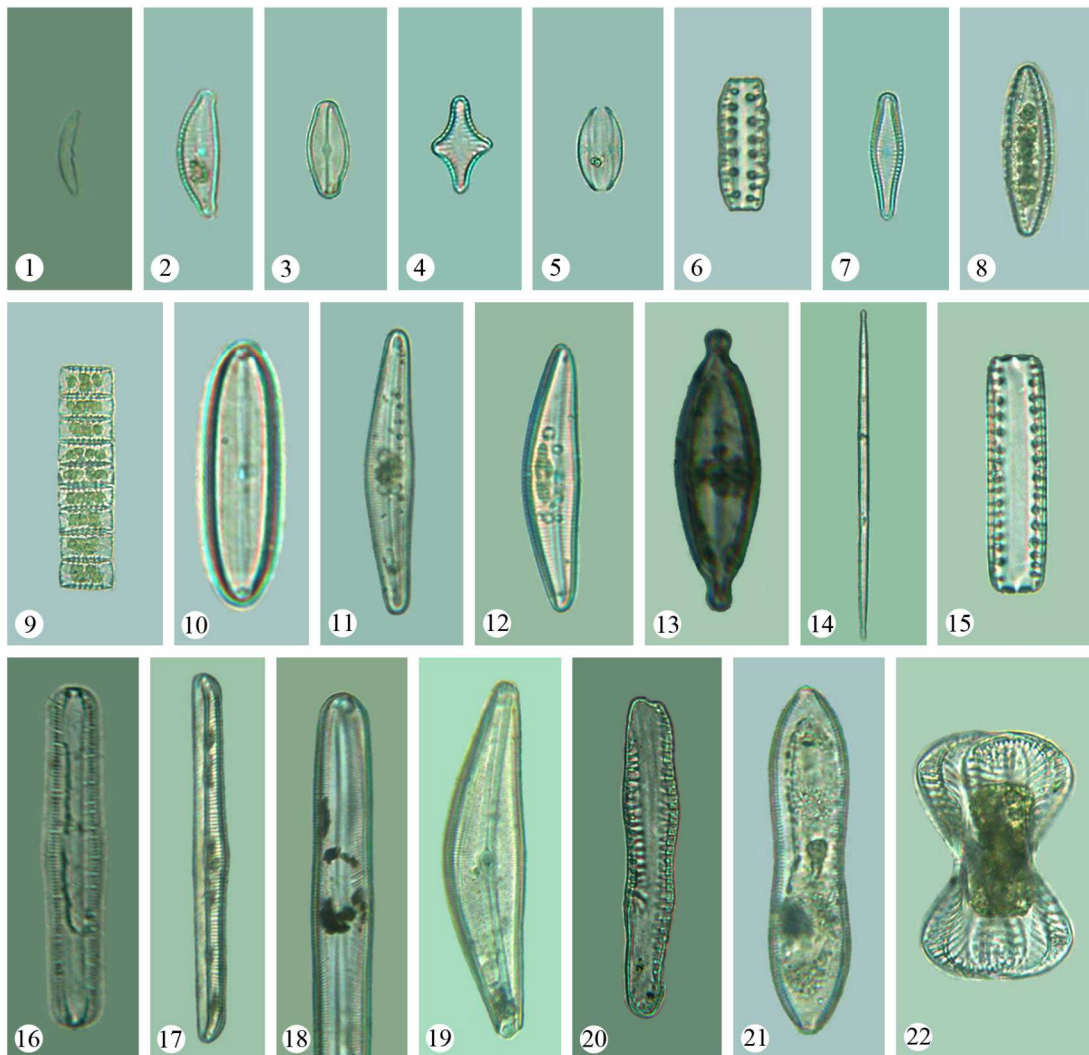


Map 1. Upper Mustang showing surveyed route and sample collection points.

river were found having fossils especially of marine mollusks which are remarkable natural resources restricted to Upper Mustang only. This region lies in the rain shadow and has very low precipitation. The temperature recorded from 8 pm to 5 pm during field survey in June ranged from 15°C to 24.8°C and humidity was between 38 and 41.

The present diatom samples were collected by Dr. B.R. Subba during the expedition on “An inventory of aquatic biodiversity of Upper Mustang, Nepal” in the period of 12-25 June, 2005 (Map 1). Collection were made from 19 fresh water

streams starting from Bhalle Khola (29°18'08.5"N & 083°5.3'41.8"E, 4688 msl) to Sangta Khola (28°52'41.6"N & 083°47'31.1"E, 2888 msl) and from one pond Chhyo Pema (29°13'10.5"N & 083°58'44.9"E, 3839 msl). Between these, other diatom localities were Nhijung Dhokpo (29°10'53.4"N & 83°57'5.8"E, 3825 msl), Lo Manthang Khola (29°11'8.0"N & 83°57'7.5"E, 3769 msl), Chharang/Mharchung (29°10'12.5"N & 83°58'59.6"E, 3627 msl), Kimling Khola (29°13'0.1"N & 83°56'48.9"E, 3997 msl), Tsarang Khola- Ghuyung Dhokpo (29°06'03.2"N & 83°55'50.9"E, 3463 msl),



Figures: 1. *Hannaea arcus* var. *arcus* (Ehr.) Patrick in Patrick & Reimer, 2. *Cymbella affinis* Kütz., 3. *Achnanthes flexella* (Kütz.) Brun., 4. *Staurosirella leptostauron* (Ehr.) Williams & Round, 5. *Amphora libyca* Ehr., 6. *Denticula elegans* Kütz., 7. *Gomphonema clavatum* Ehr., 8. *Surirella linearis* W. Smith, 9. *Diatoma hiemale* (Lyngb.) Heib., 10. *Neidium affine* (Ehr.) Pfitzer, 11. *Cymbella helvetica* Kütz., 12. *Cymbella radiosa* Reichelt, 13. *Navicula cuspidata* Kütz., 14. *Synedra ulna* (Nitzsch) Ehr., 15. *Denticula elegans* Kütz., 16-17. *Rhopalodia gibba* (Ehr.) O. Müller, 18. *Pinnularia viridis* (Nitzsch) Ehr., 19. *Cymbella cistula* (Ehr.) Kirchn., 20. *Denticula elegans* Kütz., 21. *Cymatopleura solea* (Bréb.) W. Smith, 22. *Surirella spiralis* Bréb.

Dhey Khola (29°04'17.0"N & 83°56'43.7"E, 3315 msl), Tangya Khola (29°00'50.1"N & 83°55'41.4"E, 3235 msl), Dhee Khola (29°06'19.8"N & 83°58'36.4"E, 3384 msl),

Yara Khola (29°05'50.2"N & 83°58'34.2"E, 3414 msl), Garphu Khola (29°13'48.8"N & 83°58'26"E, 3891 msl), Ghami Khola (29°03'35.2"N & 83°52'35.2"E, 3475 msl),

Kali Gandaki river near Ghiling (28°58'58"N & 83°52'25.7"E, 3025 msl), Tamagaun Khola (29°00'7.4"N & 83°50'55.5"E, 3604 msl), Yamda Khola (28°59'11.1"N & 83°48'45.5"E, 3889 msl) and Narsingh Khola (28°54'53.3"N & 83°51'7.7"E, 3089 msl) (Locality photographs).

Epiphytic forms were squeezed from root and leaves of submerged macrophytes, epilithic forms were scrubbed from pebble surfaces using toothbrushes and planktonic forms were trapped using phytoplankton net (mesh size-10 μ). Diatom samples were preserved in 4% (final concentration) formalin. In laboratory, samples were centrifuged, washed with hot saturated solution of chromic acid (K₂Cr₂O₇ in conc. H₂SO₄) and mounted by euparal. The slides thus prepared were observed and microphotographs of the frustules were taken using Carl Zeiss Axiostar plus Microscope and Canon digital camera. The diatoms were identified following monographs of Tiffany and Britton (1952), Hustedt (1961-1966), Prowse (1962), Metzeltin and Lange-Bertalot (1998), Gandhi (1999), You *et al.* (2009) and ADIAC database. Slides have been deposited at the Department of Botany, P.G. Campus, Biratnagar.

Himalayan diatoms of Nepal has been studied by Hirano (1955, 1963, 1969, 1984), Suxena and Venkateswarlu (1968), Suxena *et al.* (1972), Jüttner *et al.* (1996, 2000, 2003, 2004) and Yoshimura *et al.* (1997, 2000, 2006). Though, thousands of glacier lakes, icefed streams and ponds are still untouched phycologically. From Mustang, Hirano (1955) has reported few diatoms from Tukucha moor (2600 msl) and tributaries of Kali Gandaki (2500 msl) but after that no other reports have been

released from this area. Thus, in the present study, an attempt has made to explore high altitude diatoms from Nepal Himalayas.

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