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Wetland flora of Betkot lake, far western Nepal

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ABSTRACT

The tropical wetland flora from western Nepal is less explored in comparison to the temperate and alpine region.This study was therefore undertaken to document the vascular plants found on the foot trail of surrounding BetkotLake, in Chure (Siwalik) hills of Kanchanpur in far western Nepal. The study documented a total of 63 plant species of 40 families belonging to 4 life forms: herbs (31 species), shrubs (14 species), trees (15 species) and climbers (3 species). This present study could be a baseline for further research.

Keywords: Betkotlake,flora documentation, wetland vegetation

INTRODUCTION

The Ramsar Convention in 1971 uses a broad definition of the types of wetlands covered in its mission, including swamps and marshes, lakes and rivers, wet grasslands and peatlands, oases, estuaries, deltas and tidal flats, near-shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans (http://wwf.panda.org/what_we_do/how_we_work/policy/conventions/ramsar/). Wetlands are regarded as the most productive and dynamic ecosystem of the earth and also called as biological supermarket, natural infrastructure, kidneys of the landscape, carbon dioxide sink and climate stabilizer. Nepal Biodiversity Strategy 2002 has recognized wetland as one of the sectoral strategies (others are forest, conserved area, rangeland, mountain and agriculture). The wetlands are in vulnerable status around the world. In fact, wetlands are not wasting land, but they are waiting land (Bhandari*et al.,* 1994).

Nepal is rich in wetlands. It has 6,000 rivers and 5,358 lakes (http://www.nepallake.gov.np/). There are some studies about flora of wetlands in Nepal. Siwakoti (2006) recorded 720 species of vascular plants from the study of wetland flora of Terai regions. Sah (1997) summarized the biological resources of KoshiTappu Wildlife Reserve, eastern Terai. Likewise,Lamsal*et al.* (2014) documented 45 species of aquatic macrophytes and 54 species of terrestrial/riparian speciesfrom the study of Ghodaghodilake of Kailali district.In addition to Terai wetlands, wetland flora of Chitwan (Dangol, 2000-2001; Dangol *et al.,* 2014) and Myagdi (Basnet *et al.,* 2012) were also reported. The information about wetland flora of Nepal is not sufficient (Bhandari, 2008; Siwakoti, 2006). The tropical wetland flora from the Western part of Nepal is less explored in comparison to the temperate and alpine region. Hence, this study was conducted to document the plants of the Betkot lake area to provide baseline information useful for the 'Nepal Flora' publication.

MATERIALS AND METHODS

Study area

The scenic Betkotlake has special value for maintaining genetic and ecological diversity that merit legal protection (MFSC, 2002). It is situated at Daijee-5, Kanchanpur district at the altitude 490 m asl, having water body size 4 ha. and 915 m perimeter including foot trail, representing the geologically and hydrologically fragile Chure/Siwalik region. The study route was the complete foot trail of the lake. It can be reached by Kathmandu-Dhangadi-Daijee-Betkot.

Plant collections

Plants samples (mainly phanerogams, however ferns and mushrooms) were collected during February 1-4 and June 21-24 of 2013 following standard plant collection methods. Plants were identified with the help of experts and standard literatures (Stainton, 1972; Bhandari, 1998; DPR, 2001, 2002; Siwakoti, 2006;, Basnet*et al.,* 2012; Fraser-Jenkins *et al.,* 2015) and the deposited herbarium in the National Herbarium and Plant Laboratories (NHPL/KATH), Lalitpur.

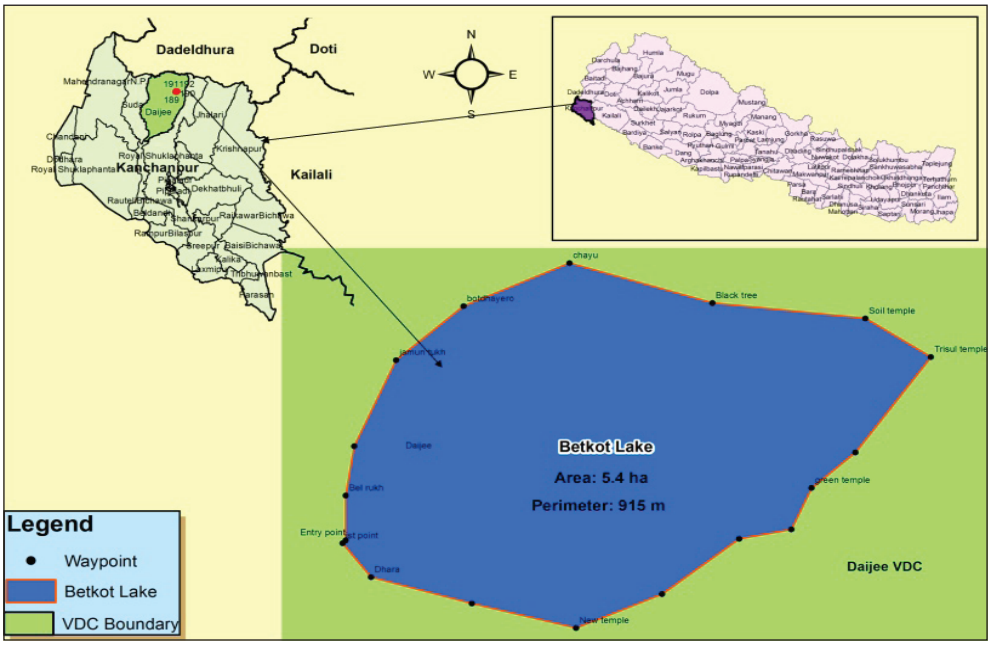

FIG. 1a. Map of study area.

FIG. 1b. Betkotlake, Daijee-5, Kanchanpur, Nepal (Photo: BASNET, R;MAP: KARNA, Y K).

RESULTS AND DISCUSSION

A total of 63 plant species representing 40 families were recorded from the present study area (table 1). Of the total species, majority were angiosperms (60 species) and the rest were ferns (2 species) and mushroom (1 species). Asteraceae was the largest family with 6 species followed by Fabaceae (4 species), and Solanaceae, Malvaceae, Acanthaceae (3 species). The rest 35 families composed of 1-2 species. Among the total plants, *Agele marmelos* (Bel), *Ficus religiosa* (Pipal) and *Sesamum indicum* (Til) were the religious plants. These plants were occurred because of a great religious spot for the Hindus especially in 'Shiva Ratri' (Lord Shiva's Night). Likewise, present study also recorded some common medicinal plants such as *Achyranthes aspera* (Datiwan), *Xeromphis spinosa* (Mainphal), *Syzygium cumini* (Jamun), and *Phyllanthus emblica* (Amala). *Quisqualis indica* L. (Combretaceae) and *Lygodium japonicum* (Lygodiaceae) were the two climbers with aesthetic ornamental value. The uses of plants of Beeshazar Tal and Rampur Ghol was also reported as medicine, food, aesthetic, fodder, fuelwood, etc. (Dangol, 2000-2001; Dangol*et al.,* 2014). The *Ageratum conyzoides* and *Parthenium hysterophorus* were two invasivespecies recorded in the study area. Different invasive species (such as *Mikania micrantha, Ageratum houstonianum, Eichhornia crassipes*) were reported from other wetlands of Nepal (Dangol*et al.,* 2014).

Betkotlake shows typical tropical forest type with *Shorea robusta, Haldina cordifolia, Mallotus philippensis, Syzygium cumini,* and *Bombax ceiba*. This study added information on plant species which is helpful to understand the wetland flora. Further research is recommended to study the aquatic and semi-aquatic plants including algae of the area to understand the total plant life of the lake to generate the baseline information (local flora) for the 'Nepal Flora' publication.

TABLE 1. Plant species from Betkotlake, far western Nepal.

S.N.	Scientific name	Family	Local name	Life forms	Coll. nr.
1.	*Achyranthes aspera* L.	Amaranthaceae	Datiwan	Herb	05 BT
2.	*Agele marmelos* (L.) Corr[1]	Rutaceae	Bel	Tree	09 BT
3.	*Ageratum conyzoides* L.[1]	Asteraceae	Gandhe	Herb	022 BT
4.	*Aleuritopteris bicolor* (Roxb.) Fraser-Jenk.	Pteridaceae	Fern	Herb	031 BT
5.	*Amanita* sp.	Amanitaceae	Chyau	Herb	049 BT
6.	*Arisaema intermedium* Bl.	Araceae	Sarpakomakai	Herb	015 BT
7.	*Artemisia vulgaris* L.	Asteraceae	Pati	Herb	031 BT
8.	*Biden spilosa* L.	Asteraceae	Kurro	Herb	032 BT
9.	*Bombax ceiba* L.[2]	Bombaceae	Simal	Tree	044 BT
10.	*Canscora decussate* Schult.	Gentianaceae	Aakankuriphul	Herb	037 BT
11.	*Capillipedium assimile* (Steud.) A. Camus	Poaceae	Musa khari	Herb	028 BT
12.	*Cassia fistula* L.	Fabaceae	Rajbriskya	Tree	035 BT
13.	*Cassia tora* L.	Fabaceae		Shrub	033 BT
14.	*Centella asiatica* (L.) Urb.	Apiaceae	Ghodtapre	Herb	039 BT
15.	*Cissamo pelospareira* L.	Menispermaceae	Batulpate	Climber (Herb)	038 BT
16.	*Clerodendrum indicum* (L.) Kurtze	Verbenaceae	Bhargi	Shrub	046 BT
17.	*Colebrooke aoppositifolia* Sm.	Lamiaceae	Dhasure	Shrub	036 BT
18.	*Colocasiae sculenta* (L.) Schott.	Araceae	Jaluko	Herb	033 BT
19.	*Crotalaria albida*Heyne ex. Roth.	Fabaceae	Putaliphul	Herb	037 BT
20.	*Curculigo orchioides* Gaertn.	Hypoxidaceae	Kalomusali	Herb	055 BT
21.	*Cyperusco rymbosus* Rottb.	Cyperaceae	Mothe	Herb	062 BT
22.	*Dioscore abulbifera* L.	Dioscoreaceae	Githetarul	Herb	048 BT
23.	*Diospyros smalabarica* (Desr.) Kostel	Ebenaceae	Khallu/Tezu	Tree	056 BT
24.	*Diploknema butyraceae* (Roxb.) H.J. Lam.[3]	Sapotaceae	Chiuri	Tree	064 BT
25.	*Ficus religiosa* L.[4]	Moraceae	Pipal	Tree	039 BT
26.	*Flemingia paniculata* Wall. ex. Benth.	Fabaceae		Herb	044 BT
27.	*Gossypium arboreum* L.	Malvaceae	Kapas	Tree	07 BT
28.	*Grangea maderaspatana* (L.)	Asteraceae		Herb	029 BT

29.	*Haldina cordifolia* (Willd.exRoxb.) Ridsdale	Rubiaceae	Haldu/Karma	Tree	08 BT
30.	*Hemidesmus indicus* R.Br.	Asclepiadaceae	Anantmul	Herb	040 BT
31.	*Holarrhena pubescens* (Buch.-Ham.) Wall. ex G. Don[5]	Apocynaceae	Indrajau	Shrub	031 BT
32.	*Hygrophila auriaulata* (Schumach) Hein.	Acanthaceae		Herb	057 BT
33.	*Lagerstroemia parviflora* Roxb.	Lythraceae	Bod Dhayro	Tree	035 BT
34.	*Lepidagathis incurva* Buch.-Ham. ex D. Don	Acanthaceae		Herb	03 BT
35.	*Lygodium japonicum* (Thum.) Sw.	Lygodiaceae	Fern	Climber (Herb)	017 BT
36.	*Mallotus philippensis* (Lam.) Muell.-Arn.	Euphorbiaceae	Sindhure	Tree	049 BT
37.	*Mangifera indica* L.	Anacardiaceae	Aanp	Tree	050 BT
38.	*Murraya koenigii* (L.) Spreng.	Rutaceae	Mithanim	Shrub	044 BT
39.	*Nerium indicum* L.	Apocynaceae	Karvir	Shrub	047 BT
40.	*Parthenium hysterophorus* L.[1]	Asteraceae		Herb,	011 BT
41.	*Persicaria barbata* (L.) H.Hara	Polygonaceae		Herb	062 BT
42.	*Phyla nodiflora* (L.) Greene	Verbenaceae		Herb	064 BT
43.	*Phyllanthus emblica* L.[5]	Euphorbiaceae	Amala	Tree	040 BT
44.	*Pogostemom benghalenis* (Burm.f.) Kuntze.	Lamiaceae	Rudilo	Herb	057 BT
45.	*Psidium gujava* L.	Myrtaceae	Amba	Tree	034 BT
46.	*Quisqualis indica* L.[6]	Combretaceae		Climber	025 BT
47.	*Rungia parviflora* (Retz.) Nees	Acanthaceae	Ukuchejhar	Herb	022 BT
48.	*Salix babylonica* L.	Salicaceae	Bains	Tree	053 BT
49.	*Schleichera oleosa* (Lour.) Okm	Sapindaceae	Kusum	Tree	039 BT
50.	*Semecarpus anacardium* L.f.	Anacardiaceae	Bhalayo	Tree	030 BT
51.	*Sesamum indicum* L.[4]	Pedaliaceae	Till	Herb	04 BT
52	*Shorea robusta* Gaertn.[7]	Dipterocarpaceae	Sal	Tree	019 BT
53.	*Sida rhombifolia* M. Wight & Arn	Malvaceae		Herb	016 BT
54.	*Smilax zeylanica*L.	Liliaceae	Kukurdiano	Climber (Shrub)	08 BT

55.	*Solanum americanum* Mill.	Solanaceae	Kamai	Herb	038 BT
56.	*Solanum indicum* L.	Solanaceae		Shrub	017 BT
57.	*Solanum surattense* Bu.	Solanaceae	Kanthakari	Shrub	018 BT
58.	*Spilanthes acmella* (L.) L.	Asteraceae		Herb	040 BT
59.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun	Tree	029 BT
60.	*Urena lobata* L.	Malvaceae	Bhalukuro	Herb	028 BT
61.	*Xeromphis spinosa* (Thumb.) Keay	Rubiaceae	Main phal	Shrub	019 BT
62.	*Zingiber* sp.	Zingiberaceae		Herb	049 BT
63.	*Zizyphus mauritiana* Lam.	Rhamnaceae	Bayer	Tree	023 BT

[1]Invasive; , Fruit edible and religious value; [2]Habitat for vulture; [3]Fodder; [4]Religious value; [5]Medicinal value; [6]Ornamental value; [7]Timber value; and [8]Fruit edible

These species represented 31 herbs, 16 shrubs, 15 trees and 3 climbers (fig. 1). Dominance of herbs in the wetland study areas in Nepal were also reported by other authors (Sah, 1997; Siwakoti, 2006; Dangol *et al.,* 2014; Lamsal *et al.,* 2014).

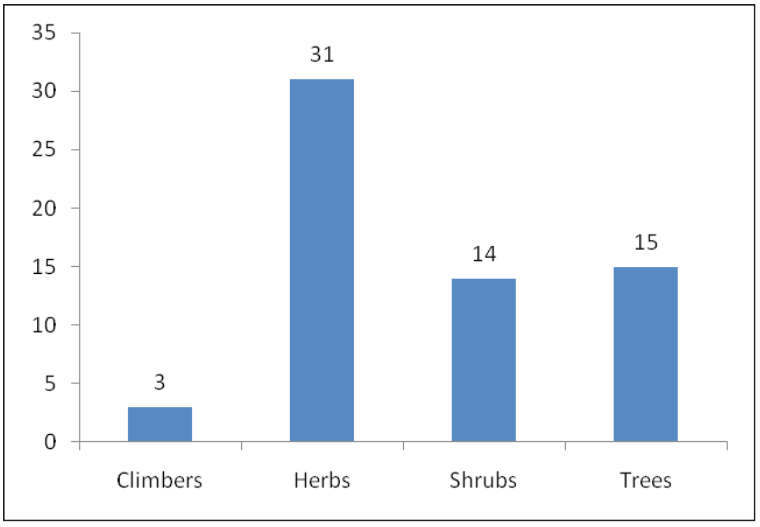

FIG. 1. Life form of plants of Betkotlake, far western Nepal.

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