

Plant Diversity of a Fresh Water Swamp of Doon Valley, India.

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ABSTRACT: The present study was conducted in a highly degraded and fragmented swamp of Doon valley, India. A total of 162 plant species were recorded from the swamp. Dicotyledons contributed 71%, monocotyledons 23.5% and pteridophytes 5.6%. Poaceae with 15 genera and 17 species was the most represented family. Biological spectrum of the present study site shows that therophytes were the most dominating life-form of the swamp, representing high anthropogenic disturbance in the region and limited niche space for the vegetation. [Journal of American Science 2009: 5(1), 1-7] (ISSN: 1545-1003)

Key words: Dicotyledons, swamp

1. INTRODUCTION

Fresh water swamps are the unique ecosystems having very specific vegetation. These are sites of natural succession and therefore contain all the groups of plant kingdom in a single place. Water is the prime requisite of the vegetation of the swamp forests and any alteration in the availability of water affects their presence as well as distribution. Doon valley, situated at the foothills of the Himalaya between rivers the Yamuna and the Ganges, use to have a chain of swamps (Manhas et al., 2007). But due to anthropogenic activities these forests are disappearing at a very fast rate. Nakraunda is one of the most degraded swamps of Doon valley. Most of the area of the swamp has been converted to agriculture fields and residential colonies.

Taxonomic study of swamp forests of Doon valley was first carried out by Kanjilal in 1901, since then a number of studies have been conducted by various workers for floristic diversity (Dakshini, 1960a, 1960b, 1965, 1970 and 1974; Dhyani and Joshi, 2007; Sharma and Joshi, 2008), successional studies (Som Deva and Srivastava, 1978; Srivastava et al., 2000) and community dynamics (Manhas et al., 2007; Kandwal et al., 2007). In the present paper we have studied floristic and life-form diversity of Nakraunda swamp forest of Doon valley.

2. MATERIALS AND METHODS

Study Site

Nakraunda swamp is situated about 15 km east of Dehradun on Dehradun-Doiwala road at 30° 14' 15" N

latitude and 78° 05' 55" E longitude. Most of the swamp is urbanized. A very few patches of swampy vegetation are present here and there along the river Dholani, a tributary of the Song river.

Methodology

Plant specimens were collected, dried, poisoned and mounted on the herbarium sheets. Standard methods given in Jain and Rao (1977) for collection, preservation and maintenance of specimen in herbarium were followed. Herbariums of Forest Research Institute and Botanical Survey of India, Northern Circle were consulted for the identification of each species. Floras written by Babu (1980) and Kanjilal (1901) were used for the nomenclature of the species. These plant species were further classified; first on the basis of habit and then on basis of life-forms as defined by Raunkiaer (1934).

3. RESULTS

A total of 162 plant species were found in the present study site (Table 1). The contribution of dicotyledons was 71.0%, monocotyledons 23.5% and pteridophytes 5.6%. Table 2 reveals that Poaceae (15 genera/ 17 species) was the most dominating family of Nakraunda swamp. The other important families were Asteraceae (11 genera/ 12 species), Acanthaceae (10 genera/ 11 species), Cyperaceae (6 genera/ 9 species) and Scrophulariaceae (4 genera/ 7 species). *Cyperus* and *Polygonum*, both having three species, were the most represented genera. Classification on the basis of habit (Figure 1) shows that herbs were the main vegetation form with 44.4% contribution followed by shrubs (15.4%) and grasses (10.5%).

Table 1
Floristic diversity in the Nakraunda swamp and its comparison with other swamps of Doon valley

Plant Groups	Families	Genera	Species	References
Angiosperms	53	130	155	Dhyani and Joshi (2007)
Angiosperms	71	218	278	Sharma and Joshi (2008)
Total (1 + 2)	61	141	162	Present study
1. Angiosperms (i + ii)	55	135	153	
(i) Dicotyledons	45	103	115	
(ii) Monocotyledons	10	32	38	
2. Pteridophytes	6	6	9	

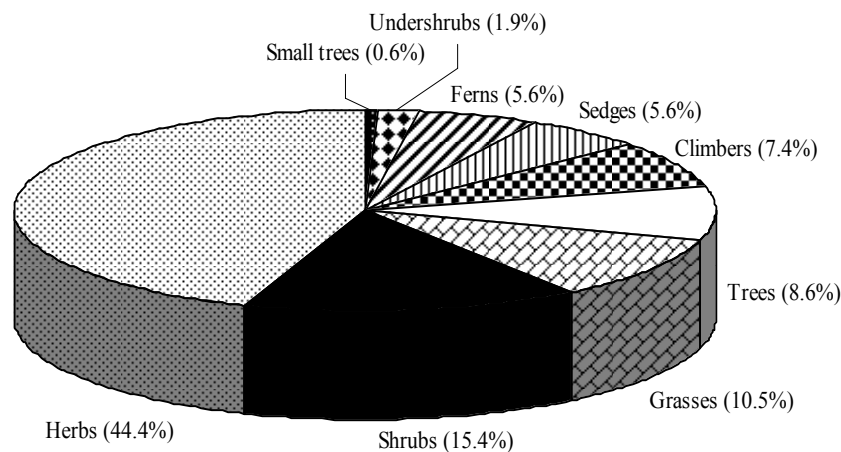


Fig 1: Pie diagram showing percentage contribution of various plant habits.

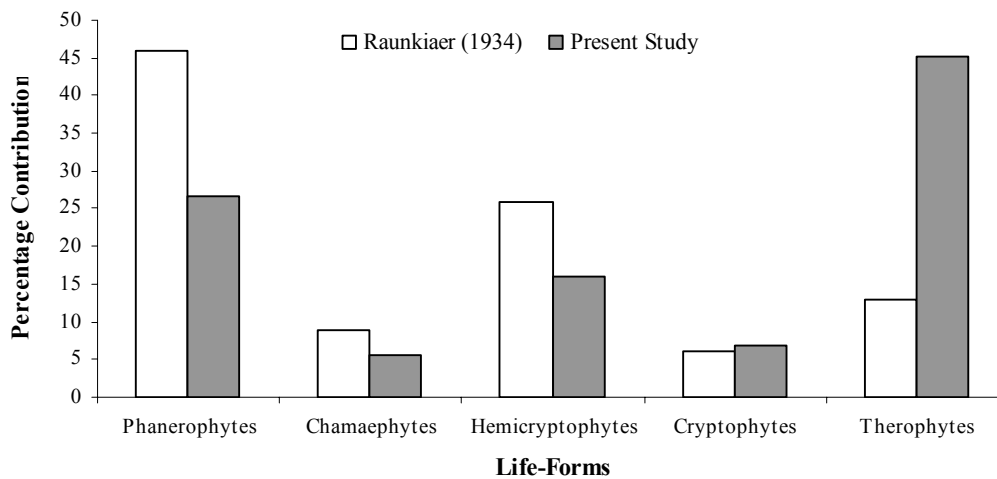


Fig 2: Biological spectrum of life-forms of present study and its comparison with the Raunkiaer's normal biological spectrum representing world flora.

Biological spectrum of the swamp was also studied (Figure 2) and compared with the Raunkiaer's normal biological spectrum (Raunkiaer, 1934) representing the world flora. Therophytes (45.1%) were

the most characteristic life-form of the present study as compared to phanerophytes in Raunkiaer's normal biological spectrum.

Table 2
List of plant species present in the Nakraunda swamp along with family, habit and life-form.
The life-forms mentioned in the table are: Ph = Phanerophytes; Ch = Chamaephytes; He = Hemicryptophytes; Cr = Cryptophytes; and Th = Therophytes (for definitions see Raunkiaer, 1934).

Plant Species	Family	Habit	Life-form
<i>Achyranthes aspera</i> Linn.	Acanthaceae	Herb	Th
<i>Acorus calamus</i> Linn.	Araceae	Herb	Cr
<i>Adenostemma lavenia</i> (Linn.) O. Kuntze.	Asteraceae	Shrub	Ch
<i>Adhatoda vasica</i> Nees	Acanthaceae	Shrub	Ch
<i>Adiantum capillus-veneris</i> Linn.	Adiantaceae	Fern	Cr
<i>Adiantum incisum</i> Forssk.	Adiantaceae	Fern	Cr
<i>Aerva sanguinolenta</i> (Linn.) DC.	Amaranthaceae	Herb	Th
<i>Aerva scandens</i> Wall.	Amaranthaceae	Herb	Th
<i>Ageratum conyzoides</i> Linn.	Asteraceae	Herb	Th
<i>Alternanthera sessilis</i> R. Br.	Amaranthaceae	Herb	Th
<i>Amaranthus spinosus</i> Linn.	Amaranthaceae	Herb	Th
<i>Anagallis arvensis</i> Linn.	Primulaceae	Herb	Th
<i>Anisomelas indica</i> Kuntze.	Lamiaceae	Herb	Th
<i>Apium leptophyllum</i> (Pers.) F. Muell. Ex Benth.	Apiaceae	Herb	Th
<i>Arachne cordifolia</i> (Decne) Hurusawa	Euphorbiaceae	Herb	Th
<i>Argemone mexicana</i> Linn.	Papavaraceae	Herb	Th
<i>Arundo donax</i> Linn.	Poaceae	Grass	He
<i>Asclepias curassavica</i> Linn.	Asclepiadaceae	Shrub	Ph
<i>Asparagus racemosus</i> Willd.	Liliaceae	Herb	Ph
<i>Bacopa monniera</i> (Linn.) Wettst.	Scrophulariaceae	Herb	Th
<i>Bacopa procumbens</i> (Mill.) Greenm.	Scrophulariaceae	Herb	Th
<i>Bauhinia vahlii</i> Wight and Arn.	Caesalpiniaceae	Climber	Ph
<i>Bauhinia variegata</i> Linn.	Caesalpiniaceae	Tree	Ph
<i>Belamcanda chinensis</i> (Linn.) DC.	Iridaceae	Herb	Cr
<i>Bidens tripartite</i> Linn.	Asteraceae	Herb	Th
<i>Bischofia javanica</i> Blume	Euphorbiaceae	Tree	Ph
<i>Boehmeria platyphylla</i> D. Don	Urticaceae	Herb	Th
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae	Herb	Th
<i>Bombax ceiba</i> Linn.	Bombaceae	Tree	Ph
<i>Butea monosperma</i> (Lamk.) Taub.	Fabaceae	Tree	Ph
<i>Caesalpinia decapetala</i> (Roxb.) Alston	Caesalpiniaceae	Climber	Ph
<i>Calamus tenuis</i> Roxb.	Palmaceae	Shrub	Ph
<i>Capparis zeylanica</i> Linn.	Capparidaceae	Climber	Ph
<i>Capsella bursa-pastoris</i> (Linn.) Medic	Brassicaceae	Herb	Th
<i>Carissa opaca</i> stapf.	Apocynaceae	Shrub	Ph
<i>Cassia tora</i> Linn.	Caesalpiniaceae	Herb	Th
<i>Cheilanthes farinosa</i> Blanford	Sinopteridaceae	Fern	Cr
<i>Chenopodium album</i> Linn.	Chenopodiaceae	Herb	Th
<i>Chenopodium ambrosioides</i> Linn.	Chenopodiaceae	Herb	Th
<i>Chloris dolichostachya</i> Lagasca	Poaceae	Grass	He
<i>Clerodendron viscosum</i> Vent.	Verbenaceae	Undershrub	Ph
<i>Coccinea grandis</i> (Linn.) Voigt.	Cucurbitaceae	Climber	Ph
<i>Coix lachrymal-jobi</i> Linn.	Poaceae	Grass	He

<i>Commelina benghalensis</i> Linn.	Commelinaceae	Herb	Th
<i>Corchorus acutangular</i> Lamk.	Tiliaceae	Herb	Th
<i>Coronopus didymus</i> (Linn.) J.E. Smith	Brassicaceae	Herb	Th
<i>Crotalaria albida</i> Heyne.	Fabaceae	Herb	Th
<i>Curculigo orchioides</i> Gaertn.	Hypoxidaceae	Herb	Cr
<i>Cyathocline purpurea</i> (D.Don) O. Kuntze	Acanthaceae	Herb	Th
<i>Cynodon dactylon</i> (Linn.) P. Beauv.	Poaceae	Grass	He
<i>Cyperus iria</i> Linn.	Cyperaceae	Sedge	He
<i>Cyperus niveus</i> Retz.	Cyperaceae	Sedge	He
<i>Cyperus rotundus</i> Linn.	Cyperaceae	Sedge	He
<i>Desmodium trifolium</i> DC.	Fabaceae	Herb	Th
<i>Dicliptera roxburghiana</i> Nees	Acanthaceae	Herb	Th
<i>Digitaria adscendens</i> (HBK) Henr.	Poaceae	Grass	He
<i>Digitaria ischaemum</i>	Poaceae	Grass	He
<i>Dioscorea bulbifera</i> Linn.	Dioscoreaceae	Climber	Ph
<i>Dryopteris cochleata</i> (D.Don) C. Chr.	Aspidaceae	Fern	Cr
<i>Duchesnea indica</i> Focke.	Rosaceae	Herb	Th
<i>Echinochloa colonum</i> (Linn.) Link.	Poaceae	Grass	He
<i>Eclipta prostrata</i> Linn.	Asteraceae	Herb	Th
<i>Emilia sonchifolia</i> DC.	Asteraceae	Herb	Th
<i>Eranthemum nervosum</i> (Vahl) R.Br.	Acanthaceae	Herb	Th
<i>Eriophorum comosum</i> Wall.	Cyperaceae	Sedge	He
<i>Eupatorium adenophorum</i> Spreng.	Asteraceae	Herb	Th
<i>Euphorbia hirta</i> Linn.	Euphorbiaceae	Herb	Th
<i>Ficus palmata</i> Forssk.	Moraceae	Tree	Ph
<i>Ficus religiosa</i> Linn.	Moraceae	Tree	Ph
<i>Fimbristylis dichotoma</i> (Linn.) Vahl.	Cyperaceae	Sedge	He
<i>Fimbristylis falcata</i> (Vhl) Kunth	Cyperaceae	Sedge	He
<i>Flacourtia indica</i> (Burm. f.) Merr.	Flacourtiaceae	Shrub	Ph
<i>Flemingia bracteata</i> Wight	Fabaceae	Shrub	Ph
<i>Floscopa scandens</i> Lour.	Commelinaceae	Herb	Th
<i>Galinsoga parviflora</i> Cav.	Asteraceae	Herb	Th
<i>Hemigraphis rupestris</i> Heyne ex T. Anders.	Acanthaceae	Herb	Th
<i>Holarrhena antidysentrica</i> Wall.	Apocynaceae	Small tree	Ph
<i>Holoptelia integrifolia</i> (Roxb.) Planch.	Ulmaceae	Tree	Ph
<i>Ichnocarpus frutescens</i> (Linn.) R. Br.	Apocynaceae	Climber	Ph
<i>Imperata cylindrical</i> (Linn.) Beauv.	Poaceae	Grass	He
<i>Ipomoea palmata</i> Forsk.	Convolvulaceae	Climber	Ph
<i>Ipomoea quamoclit</i> Linn.	Convolvulaceae	Climber	Th
<i>Isachne globosa</i> (thumb.) O. Kuntze	Poaceae	Grass	He
<i>Jasminum multiflorum</i> (Burm. f.) Andr.	Oleaceae	Climber	Ph
<i>Juncus bufonius</i> Linn.	Cyperaceae	Sedge	He
<i>Justicia gendarussa</i> Linn.	Acanthaceae	Shrub	Ch
<i>Justicia quinqueqngulqris</i> Koenig ex Roxb.	Acanthaceae	Shrub	Ch
<i>Kyllingia triceps</i> Rottb.	Cyperaceae	Sedge	He
<i>Lantana camara</i> Linn.	Verbenaceae	Shrub	Ph
<i>Lepidagathis cuspidate</i> Nees	Acanthaceae	Shrub	Ph
<i>Lindernia ciliate</i> (Col.) Pennell	Scrophulariaceae	Herb	Th
<i>Lindernia crustata</i> (Linn.) F. Muell.	Scrophulariaceae	Herb	Th
<i>Lygodium flexuosum</i> (Linn.) Sw.	Schizaeaceae	Fern	Cr
<i>Mallotus philippensis</i> Muell. Arg.	Euphorbiaceae	Tree	Ph
<i>Malvaviscus penduliflorus</i> DC.	Malvaceae	Shrub	Ph
<i>Martynia annua</i> Linn	Martyniaceae	Undershrub	Th

<i>Mazus pumilus</i> (Burm. f.) Steenis	Scrophulariaceae	Herb	Th
<i>Mentha piperita</i> Linn.	Lamiaceae	Herb	Th
<i>Mimosa pudica</i> Linn.	Mimosaceae	Shrub	Ch
<i>Monochoria vaginalis</i> Presl.	Pontederiaceae	Herb	Th
<i>Morus alba</i> Linn	Moraceae	Tree	Ph
<i>Murraya koenigii</i> (Linn.) Spreng.	Rutaceae	Shrub	Ph
<i>Narenga porphyrocoma</i> (Hance ex Trim.) Bor	Poaceae	Grass	He
<i>Nepeta hindostana</i> (Roth.) Haines	Lamiaceae	Herb	Th
<i>Ocimum gratissimum</i> Linn.	Lamiaceae	Herb	Th
<i>Oenanthe stolonifera</i> DC.	Apiaceae	Herb	Th
<i>Ophioglossum reticulatum</i> Linn.	Ophioglossaceae	Fern	Th
<i>Ophioglossum vulgatum</i> Linn.	Ophioglossaceae	Fern	Th
<i>Oplismenus compositus</i> (Linn.) P. Beauv.	Poaceae	Grass	He
<i>Panicum miliaceum</i> Linn.	Poaceae	Grass	He
<i>Parthenium hysterophorus</i> Linn.	Asteraceae	Shrub	Th
<i>Paspalum distichum</i> Linn.	Poaceae	Grass	He
<i>Passiflora incarnate</i> Linn.	Passifloraceae	Climber	Ph
<i>Phlogacanthus thyrsoformis</i> (Hardw.) Mabb.	Acanthaceae	Shrub	Ch
<i>Phoenix acaulis</i> Buch.	Palmaceae	Tree	Ph
<i>Phragmites karka</i> Trin	Poaceae	Grass	He
<i>Phyla nodiflora</i> Linn.	Verbenaceae	Herb	Th
<i>Phyllanthus niruri</i> Linn.	Euphorbiaceae	Herb	Th
<i>Pilea scripta</i> (Buch.- Ham. ex D.Don) Wedd.	Urticaceae	Undershrub	Ph
<i>Plantago major</i> Linn.	Plantaginaceae	Herb	Th
<i>Plumbago zeylanica</i> Linn.	Plumbaginaceae	Herb	Th
<i>Pogostemon plectranthoides</i> Desf.	Lamiaceae	Shrub	Ch
<i>Polygonum barbatum</i> Linn.	Polygonaceae	Herb	Th
<i>Polygonum hydropiper</i> Linn.	Polygonaceae	Herb	Th
<i>Polygonum plebejum</i> R. Br.	Polygonaceae	Herb	Th
<i>Pouzolzia pentandra</i> (Roxb.) Benn.	Polygonaceae	Herb	Th
<i>Pteris quadriaurita</i> Retz.	Pteridaceae	Fern	Cr
<i>Pteris villata</i> Linn.	Pteridaceae	Fern	Cr
<i>Pyrus pashia</i> Buch.- Ham. ex D. Don	Rosaceae	Tree	Ph
<i>Ranunculus sceleratus</i> Linn.	Ranunculaceae	Herb	Th
<i>Rorripa nasturtium-aquaticum</i> (Linn.) Hayek.	Brassicaceae	Herb	Th
<i>Rotula aquatica</i> Lour.	Boraginaceae	Herb	Th
<i>Rouvolfia serpentine</i> (Linn.) Benth.- ex Kurz.	Apocynaceae	Shrub	Ch
<i>Rubus niveus</i> Thunb.	Rosaceae	Shrub	Ph
<i>Rumex nepalensis</i> Spreng.	Polygonaceae	Herb	Th
<i>Rungia pectinata</i> (Linn.) Nees	Acanthaceae	Herb	Th
<i>Scirpus juncooides</i> Roxb.	Cyperaceae	Sedge	He
<i>Setaria glauca</i> Baeuv.	Poaceae	Grass	He
<i>Shorea robusta</i> Gaertn. f.	Dipterocarpaceae	Tree	Ph
<i>Sida cordifolia</i> Linn.	Malvaceae	Herb	Th
<i>Smilax zeylanica</i> Linn.	Liliaceae	Climber	Ph
<i>Solanum hispidum</i> Pers.	Solanaceae	Shrub	Ph
<i>Solanum torvum</i> Swartz.	Solanaceae	Shrub	Ph
<i>Sporobolus diander</i> Beauv.	Poaceae	Grass	He
<i>Sporobolus indicus</i> R. Br.	Poaceae	Grass	He
<i>Stellaria media</i> Linn.	Caryophyllaceae	Herb	Th
<i>Syzygium cumini</i> (Linn.) Skeel	Myrtaceae	Tree	Ph
<i>Tectona grandis</i> Linn. f.	Verbenaceae	Tree	Ph
<i>Trifolium repens</i> Linn.	Fabaceae	Herb	Th

<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae	Herb	Th
<i>Vallisneria spiralis</i> L.	Alismaceae	Climber	Ph
<i>Vernonia anthelmintica</i> Willd.	Asteraceae	Herb	Th
<i>Vernonia cineria</i> (Linn.) Lees.	Asteraceae	Herb	Th
<i>Veronica agrestis</i> H.K.f.	Scrophulariaceae	Herb	Th
<i>Veronica anagallis</i> Linn.	Scrophulariaceae	Herb	Th
<i>Vicia sativa</i> Linn.	Fabaceae	Herb	Th
<i>Vitex negundo</i> Linn.	Verbenaceae	Shrub	Ph
<i>Woodfordia fruticosa</i> (Linn.) Kurtz.	Lythraceae	Shrub	Ph
<i>Xanthium strumarium</i> Linn.	Asteraceae	Shrub	Th
<i>Youngia japonica</i> DC.	Asteraceae	Herb	Th
<i>Zeuxine strateumatica</i> (Linn.) Schltr.	Orchidaceae	Herb	Cr
<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Shrub	Ch

4. DISCUSSION

The floristic diversity (162 plant species) is very less as compared to Mothronwala swamp (Sharma and Joshi, 2008), and higher than Karwapani swamp (Dhyani and Joshi, 2007). The possible reason for less floristic diversity may be closeness of swamp to human habitations and dependence of human population on these swamp forests for fuelwood, fodder, food, medicinal plants etc. Sharma and Joshi (2008) have also given similar reasons for the dwindling diversity and degradation of Mothronwala swamp of Doon valley. We found that herbs were the most dominant habit followed by shrubs among all the plant forms. Sharma and Joshi (2008) have also reported similar results from Mothronwala swamp of Doon valley. Dominance of herbs and shrubs again signify high rate of anthropogenic disturbances.

High percentage of therophytes in the present study is an indicator of the amount of influence such as grazing (Tiwari, 2005) and anthropogenic activities like catching of fishes and other eatable fauna, collection of vegetables etc. (Manhas et al., 2007), which maintain the vegetation open for further invasion of therophytes. The dominance of therophytes also point towards the harsh environmental conditions of the swamp, which provide very limited niche space to vegetation of these marshy areas.

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