



Environmental Science

An Indian Journal

Current Research Paper

ESAIJ, 9(4), 2014 [127-131]

Angiospermic diversity of Karwapani fresh water swamp forest in Doon valley, Uttaranchal

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INTRODUCTION

Swamps are the magnificent habitats where water oozes from the surface known as “oogals”. These are terrestrial habitats partially submerged by fresh water and often called as soft wetland. Like marshes, they are often found near rivers or lakes and have mineral soil that drains very slowly. Unlike marshes, they have trees and bushes. Swamps function as ecotones, transitions between different habitats, and have characteristics of both aquatic and terrestrial ecosystems.

Swamps exhibit great diversity in regard of flora and fauna due to their climatic and topographical variations and other ecological features. Various workers^[4-17] have worked out vegetation compositions of the swamps in various parts of the world. In India vegetation of swamps have been carried out by many workers^[2-7,9,12,13,18,19]. But no work on both floristic and ecology of Karwapani fresh water swamp forest is yet published.

STUDY SITE

The Karwapani swamp forest lies on 20 km southwest of Dehra Dun. It is a part of a magnificent stretch of dense and high sal forests and covers the entire northern aspect of Shiwalik hills. In the west it adjoins the Rajaji National Park while, eastwards it transgresses through a 35 km stretch of Asarori-Karwapani-Malhan-Timli forest ranges Figure 1. The climate of the

Karwapani swamp is more or less like that of Dehradun, being more temperate and humid than adjoining areas. The mean maximum temperature varies from 19.2°C (January) to 36.6°C (May) and the mean minimum temperature varies from 6.3°C (December) to 23.2°C July. Monsoon arrives at the end of June and washes the valley till October Figure 2.

Karwapani fresh water swamp is continuously being disturbed due to its close proximity to many villages. Construction of water storage tanks for the use of swamp water for drinking along with land filling practices to change the moisture status by raising the level of the land. It is therefore at many places swamp has transformed into an agricultural field, for the cultivation of various food and fodder species.

MATERIALS AND METHODS

The study was conducted during the year 2002-2003. The area was frequently surveyed. Usual methods of collection, preservation, and maintenance of specimen in herbarium were followed according to Jain & Rao^[11]. Several attempts were made for collection in different seasons. Collections of plant species were made throughout the year. After collection, the specimens were processed, preserved and mounted on herbarium sheets. The herbarium sheets were identified from the Botanical Survey of India, Northern circle, Dehradun. The descriptions of plants have been examined with the help of available literature^[1,8].

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RESULTS AND DISCUSSION

The vegetation of Karwapani fresh water swamp forest is sub-tropical dry deciduous type according to the classification of forest given by Champion & Seth (1968). The tree layer of the forest is dominated by *Shorea robusta*, which is associated with *Mallotus philippinensis*, *Mangifera indica*, *Phoebe lanceolata*, *Syzygium cuminii* etc, and the shrub layer is formed by *Ardisia solanacea*, *Asparagus adsendens*, *Calamus tenuis*, *Carissa opaca*, *Clerodendrum viscosum*, *Colebrookea oppositipholea*, *Indigofera atropurpurea* and *Lantana camara* while the herbaceous layer includes *Ageratum conyzoides*, *Centella asiatica*, *Curculigo orchioides*, *Cyperus rotundus*, *Desmodium microphyllum*, *Eragrostis uniloides*, *Mentha piperata*, *Oplismenus compositus*, *Pouzolzia pentandra*, *Rorippa nasturtium aquaticum*. The climbers are represented by *Smilax glaucophylla*, *Dioscorea daltoidea*, *Cocculus hirsute*, *Clematis gauriana* and *Cessampelos pareira*. The Karwapani fresh water swamp forest plant diversity is represented by 53 families, 130 genera and 155 species (TABLE 1).

The present study when compared with Babu^[1] and Daxini (1960) reveals low diversity of angiosperms (TABLE 2). However, the percentage contribution of dicots and monocots is very much similar to Daxini^[6].

TABLE 2 : Comparison of family, genera and species of angiospermic plants of Karwapani swamp in present with^[1-3]

groups	%	%	P.W	%	%	%	P.W	%	%	%	P.W	%						
Dicot	88	77	60	85	44	83	439	70	201	77	102	70	829	67	276	78	121	78
Monocot	27	23	11	15	9	17	185	30	60	23	28	30	401	33	80	22	34	22
Total	115		71		53		624		261		130		1230		356		155	

TABLE 3 : Enumeration of angiosperms plant species

FAMILY	BOTANICAL NAME
Ranunculaceae	<i>Clematis gouriana</i> Roxb.ex DC., <i>Ranunculus arvensis</i> Linn.
Menispermaceae	<i>Cissampelos pariera</i> Linn., <i>Cocculus hirsutus</i> (Linn.).
Papaveraceae	<i>Argemone maxicana</i> Linn.
Brassicaceae	<i>Rorippa nasturtium aquaticum</i> (Linn,s) Hayck, <i>Lepidium virginicum</i> Linn.
Caryophyllaceae	<i>Drymaria cordata</i> (Linn.) Willd., <i>Stellaria media</i> (Linn.) Villars, <i>Silene conoidea</i> Linn.
Malvaceae	<i>Azanza lampas</i> (Cav.) Alaf., <i>Malvastrum coramendlicum</i> (L.)Gracke, <i>Sida cordata</i> (Burm f.)Borss., <i>Sida cordifolia</i> Linn., <i>Sida veronicifolia</i> Lamk., <i>Urena lobata</i> Linn.
Cucurbitaceae	<i>Zehneria umbellate</i> Thwaites
Oxalidaceae	<i>Oxallis corniculata</i> Linn., <i>Oxalis acetosella</i> Linn.
Rutaceae	<i>Murraya koenigii</i> (Linn.)Spreng.
Rhamnaceae	<i>Ziziphus nummularia</i> (B.f.) Wight & Arn.

The low diversity of angiosperms may be attributed to relatively closed canopy of the forest, oogals confined to only one locality (Aamsaur) and frequent disturbance along the swamp course due to human activities. Enumeration of angiospermic plant species are given in TABLE 3.

Fresh water swamp forests form a distinct ecosystem in Doon valley. Unfortunately, due to increased population pressure, city expansion and various developmental activities have resulted in continuous encroachment upon forestland. Many of swamp forests of Doon valley have shrunked and only a few small and scattered patches of swamps are left. The goal of this effort is to conserve this irreplaceable biodiversity and to minimize its loss through sustainable management and conservation practices. The first step in conservation of biodiversity is to assess the diversity of natural resources present and identify those, which are important and most irreplaceable^[10]. An urgent conservation strategy with strict follow up seems to be the only solution.

TABLE 1 : Family, genera and species of dicots and monocots of the Karwapani fresh water swamp forest

Groups	Family	%	Genera	%	Species	%
Dicotyledons	44	83.02	102	78.46	121	78.06
Monocotyledons	9	16.98	28	21.54	34	21.94
Total	53		130		155	

FAMILY	BOTANICAL NAME
Anacardiaceae	<i>Magnifera indica</i> Linn.
Fabaceae	<i>Flemingia bractiota</i> (Roxb.) Wt., <i>Flemingia strobilifera</i> (Linn.)R.Br., <i>Desmodium caudatum</i> (Thunb.)Dc. <i>Desmodium gangeticum</i> (Linn.) Dc., <i>Desmodium hetrocarpon</i> (Linn.) Dc, <i>Desmodium laxiflorum</i> DC., <i>Desmodium microphyllum</i> DC., <i>Desmodium pulchellum</i> (Linn.) Benth. <i>Indigofera atropurpurea</i> Buch-Ham., <i>Indigofera cassioides</i> Rottler ex DC., <i>Trifolium repens</i> Linn., <i>Vicia hirsute</i> (Linn.) SF. Gray.
Mimosaceae	<i>Albizia chinensis</i> (Osbeck.) Merr.
Caesalpinaceae	<i>Bauhina vahlii</i> , <i>Casia laevigata</i> Willd., <i>Cassia mimosoides</i> Linn., <i>Cassia occidentalis</i> Linn., <i>Cassia tora</i> Linn.
Lythraceae	<i>Ammannia baccifera</i> Linn., <i>Rotala rotundifolia</i> (Roxb.) Koechne.
Rosaceae	<i>Duchesnea Indica</i> (Andrews), <i>Fragaria indica</i> Andrews., <i>Potentilla sundaica</i> (Bl.) Kuntze., <i>Rubus ellipticus</i> J. E. Smith, <i>Rubus niveus</i> Thunb.
Myrtaceae	<i>Psidium guajava</i> Linn., <i>Syzygium cumini</i> Linn.
Rubiaceae	<i>Borreria articularis</i> (L.f.) FN. Williams, <i>Coffea benghalensis</i> Roxb., <i>Galium aperina</i> Linn., <i>Hedyotis hispida</i> Retz.
Asteraceae	<i>Adenostemma lavenia</i> (Linn.) Kuntze., <i>Ageratum conyzoides</i> Linn., <i>Bidens biternata</i> (Lour.) Merr&Sherf ex sherf, <i>Circium arvens</i> Linn., <i>Conyza viscidula</i> Wallich, <i>Dichrocephala integrifolia</i> (L.f.), <i>Eupatoorium adenophorum</i> Sprengel., <i>Emilia sonchifolia</i> (Linn.) DC, <i>Gnaphalium hypoleucum</i> DC, <i>Sonchus asper</i> Linn., <i>Siegesbeckia orientalis</i> Linn., <i>Vernonica anagallis aquatica</i> Linn., <i>Xanthium indicum</i> Koenig., <i>Youngia japonica</i> (Linn.) DC.
Primulaceae	<i>Anagallis arvensis</i> L.
Myrsinaceae	<i>Ardisia solanacea</i> (Poir.)Roxb.. <i>Embelia robusta</i> Roxb.
Apocynaceae	<i>Carissa opaca</i> Stanf., <i>Rauwolfia serpentine</i> (Linn.) Benth ex. Kuntze.
Convolvulaceae	<i>Ipomoea cairica</i> (Linn.) Sweet, <i>Ipomoea carnea</i> (Linn.) Lam., <i>Evolvulus alsinodes</i> (L.) Linn.
Apiaceae	<i>Apium tenuifolium</i> Thell., <i>Centella asiatica</i> Linn.
Solanaceae	<i>Solanum nigrum</i> L., <i>Solanum torvum</i> Sw., <i>Solanum viarum</i> Dunal.
Scrophulariaceae	<i>Lindenbergia indica</i> (Linn.)O.Kuntze., <i>Lindernia ciliata</i> (Colsm.) Merr., <i>Mazus pumilus</i> (Burm f) Steen., <i>Torenia cordifolia</i> Roxb.
Acanthaceae	<i>Barleria strigosa</i> Willd., <i>Dicliptera rouxburghiana</i> Nees., <i>Lepidagathis incurva</i> Buch-Ham ex. D.Don, <i>Phlogacanthus thyrsoiflorus</i> (Roxb.) Nees, <i>Rungia parviflora</i> (Retz.)Nees.
Verbenaceae	<i>Calicarpa macrophylla</i> Vahl., <i>Clerodendrum viscosum</i> Vent., <i>Lantana camara</i> L., <i>Tectona grandis</i> L. f.
Lamiaceae	<i>Brunella vulgaris</i> Linn., <i>Colebrookia oppositifolia</i> J. E. Smith, <i>Lamium amplexicaule</i> Linn., <i>Leucas lanata</i> Benth., <i>Plectranthus coetsa</i> Buch-Ham.ex D.Don, <i>Pogostemon benghalense</i> (Burm. f.) Kuntze., <i>Mentha piperita</i> L., <i>Salvia plebeia</i> R.Br.
Oleaceae	<i>Jasminum multiflorum</i> (B.f.) Andrews.
Amaranthaceae	<i>Achyranthus bidentata</i> Blume., <i>Aerva sanguinolenta</i> (Linn.).
Polygonaceae	<i>Polygonum barbatum</i> Linn., <i>Polygonum hydropiper</i> Linn.
Dipterocarpaceae	<i>Shorea robusta</i> Gaertn. F.
Piperaceae	<i>Peperomia pellucida</i> (Linn.)HBK
Onagraceae	<i>Ludwigia parviflora</i> Roxb.

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FAMILY	BOTANICAL NAME
Combretaceae	<i>Terminalia alata</i> Heyne ex Roth., <i>Terminalia bellarica</i> (G.) Roxb.
Euphorbiaceae	<i>Mallotus philipinensis</i> Muell-Arg., <i>Sapium sebiferum</i> (Michaux) Roxb., <i>Ricinus communis</i> Linn.
Linaceae	<i>Reinwardtia indica</i> Dumort
Urticaceae	<i>Boehmeria frutescens</i> Thunb., <i>Pouzolzia pentandra</i> (Roxb.) Benn.
Moraceae	<i>Ficus heterophylla</i> L.f.
Zingiberaceae	<i>Zingiber roseum</i> (Roxb.) Roscoe
Smilacaceae	<i>Smilax glaucophylla</i> Klotzsch
Hypoxidaceae	<i>Curculigo orchioides</i> Gertn.
Dioscoreaceae	<i>Dioscorea bilophylla</i> Voig., <i>Dioscorea daltoidea</i> Linn.
Orchidaceae	<i>Goodyera procera</i> Hook
Liliaceae	<i>Asparagus adscendens</i> Roxb.
Commelinaceae	<i>Commelinia benghalensis</i> L., <i>Cyanotis cristata</i> (Linn.) D. Don., <i>Murdannia divergens</i> (Cl.) Bruckn., <i>Floscopa scandens</i> Lour.
Arecaceae	<i>Calamus tenuis</i> Roxb.
Cyperaceae	<i>Carex nubigena</i> D. Don., <i>Cyperus distans</i> L.F., <i>Cyperus kyllingia</i> Endl., <i>Cyperus nutans</i> Vahl., <i>Cyperus rotundus</i> Linn., <i>Fimbristylis dichotoma</i> (Linn.) Vahl.
Poaceae	<i>Dactyloctenium aegypticum</i> Linn., <i>Eragrostis atrovirens</i> Desf., <i>Eragrostis uniolooides</i> (Retz.) Nees ex Stewdel, <i>Apluda mutica</i> Linn., <i>Bambusa arundinacea</i> Willd., <i>Capillipedium assimile</i> (Steudel), <i>Cynodon dactylon</i> (Linn.) Pers., <i>Cyrtococcum accrescens</i> (Trin.) Stapf, <i>Digitaria biflora</i> Willd., <i>Elusine indica</i> (Linn.) Gaertn., <i>Oplismenus compositus</i> (Linn.) P.Beauv., <i>Panicum psilopodium</i> Trinius, <i>Pennisetum orientale</i> Linn., <i>Poa annua</i> L., <i>Saccharum spontaneum</i> Linn., <i>Setaria glauca</i> P.Beauv.

REFERENCES

- [1] C.R.Babu; Herbaceous Flora of DehraDun. Pub. & Inf. Directorate, CSIR, New Delhi, (1977).
- [2] K.M.M.Dakshini; The vegetation of Mothronwala Swamp forest, A preliminary Survey, Bull. Bot. Surv. India, **9**, 57-59 (1960a).
- [3] K.M.M.Dakshini; The vegetation of Mothronwala swamp forest (Plant communities of swamp zone), Indian Forester, **86**, 728-733 (1960b).
- [4] K.M.M.Dakshini; A study of the vegetation of Mothronwala Swamp forest Dehradun India, Jour. Ind. Bot. Soc., **44**, 411-428 (1961).
- [5] K.M.M.Dakshini; A study of the vegetation of Mothronwala Swamp forest Dehradun, India. Jour. Ind. Bot. Soc., **44**, 441-448 (1965).
- [6] K.M.M.Dakshini; The flora of Mothronwala Swamp, Jour. Bomb. Nat. Hist. Soc., **67**, 176-186 (1970).
- [7] K.M.M.Dakshini; The flora of Mothronwala Swamp, Jour. Bomb. Nat. Hist. Soc., **71**(2), 235-243 (1974).
- [8] R.D.Gaur; Flora of District Garhwal North West Himalaya (with ethnobotanical notes). Transmedia Publisher, Srinagar (Garhwal). India, 811 (1999).
- [9] J.C. Ghildiyal; Ecological studies on a Tropical Fresh Water Swamp at Rishikesh (Dehradun), U.P.D. Phil Thesis. University of Garhwal, Srinagar, U.P., India, (1986).
- [10] B. Groombridge, M. Jenkins; Freshwater Biodiversity: A Preliminary Global Assessment. WCMC-World Conservation Press, (1998).
- [11] Jain, Rao; A Handbook of field and Herbarium methods. Today & Tomorrow's printers & Publishers, New Delhi, (1977).
- [12] U.N. Kanjilal; Swamp forests in Dehradun, N.W. Province, Indian Forester, **27**, 228-230 (1901).
- [13] O.N. Kaul, D.C. Sharma, V.N. Tandon; Biomass distribution and productivity in a poplar plantation, Indian For, **109**(11), 822-828 (1983).
- [14] D.J. Mac Intosh; Riches lie in tropical Swamps. In: Geographical Magazine, **55**(4), April (1983).
- [15] E.P. Odum; Organic production and turn over in old field succession, Ecology, **41**, 34-39 (1960).
- [16] E.P. Odum; Fundamentals of Ecology. W.B. Saunders & Company, Philadelphia, 574 (1971).

Current Research Paper

- [17] D.A.Scott; A Directory of Asian Wetlands. IUCN, Gland, Switzerland, and Cambridge, UK, (1989).
- [18] D.N.Sen; Ecological studies on aquatic and swampy vegetation of Gorakhpur, Ag.Univ., Jour.Res., **8**, 1-14 (1959).
- [19] Som Deva, M.M.Srivastava; An ecological study of vegetation of Golatappar swamp, Indian.Jour.For, **1(1)**, 44-52 (1978).