J. Mountain Res. ISSN: 0974-3030
Vol. 12, (2017) 87-90

Diversity of riparian vegetation in western Nayar Valley on selected experimental spots

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Received: 20.10.2017; Revised: 26.11.2017; Accepted: 10.12.2017

Abstract: Riparian areas are important due to their disproportionately strong influences on both in stream and terrestrial ecosystems. Because of the importance of riparian areas, scientists and land managers are interested in understanding their dynamics. Many conceptual frameworks exist for examining longitudinal changes in biological function and diversity along rivers. One of these frameworks, the River Continuum Concept (RCC), postulates that longitudinal sections of river show gradients in the physical environmental factors that determine biotic communities. Preliminary survey has been conducted on the riparian vegetation of River western Nayar at 4 different spots which were technically selected in view of impact of riparian vegetation on aquatic biodiversity. The 4 spots selected were based on abundance of Pinus trees, Quercus trees, Shrub domination and abundance of toxic plants. These vegetations form considerable detritus in the river. The experiment is aimed at to evaluate biodiversity on different spots and to see the impact of these vegetations. The present paper embodies the representative riparian vegetation on selected spots apart from abundant species.

Keywords: Riparian vegetation • Western Nayar • experimental spots

Introduction

The word riparian is originated from Latin word *ripa* which means the bank of river, pond or lake of the surrounding landscape (Tabacchi et al., 1996; Goebel et al., 2003). Variety of herbs, shrubs and trees from the riparian vegetation and greatly contributes towards nutrient enrichment and productivity of streams. Riparian vegetation provides necessary shades and controls light intensity and temperature to influence stream health (Pusey and Arthington, 2003) most streams and rivers rely on the input of organic matter from terrestrial sources for carbon which provides the energy to drive the aquatic food web. Many species of plants and animals utilize riparian vegetation; for example, otters use tree roots as places for rest and protection, and bats use trees as roosts. Species in the water environment can be highly dependent on riparian vegetation; for example, insects falling off plant foliage can form a significant component of the food for salmon and trout. Indeed, leaves and other plant materials falling into water courses from riparian vegetation can form the basis for the entire food chain in the water environment. Caddis fly larvae often make their hoses on the woody parts (Dobriyal et al., 2011). Woody debris, often sourced from the riparian zone, plays an important role in

storing/recycling organic material in rivers, which in turn feeds invertebrates. It also provides refuge for fish. The shade and cover which riparian vegetation creates can also be important for aquatic organisms. In addition, the strips of riparian habitat along watercourses are often the only semi-natural habitat present in an area. The 'corridor' of habitat that a river bank can provide links areas together allowing species to move between them. Due to this availability of watered condition, humidity, and open areas provided by the river, vegetation present in this area will have some unique characteristics. The availability of water, seasonal flooding and sedimentation influences the vegetation and also its development. The plant communities provide shade, which will cool the water, slow the flow, control flooding, and provide microhabitats for a lot of aquatic organisms. This dynamic but stable environment also provides a unique ecosystem essential for the normal health of the river system. The unit characteristics of riparian system result from the spatial allocation and configuration. The plant communities in these systems are likely to be affected by both longitudinal i.e., upstream-downstream (Vannote et al., 1980) and transversal, i.e., stream- floodplain linkages for species recruitment and species diversity (Tabacchi, 1996). Apart from this it is also evident that some riparian vegetation may be lethal to biota due to their poison produce. Bhatt et al. (1987) have worked on effect of such plants on fishes. The present study is aimed in view of pointing out its impact on aquatic biota as the vegetation makes a considerable part of detritus.

Materials and Methods

Study area

The Nayar basin lies in Garhwal district (Pauri Garhwal) of Uttarakhand bounded by Tehri Garhwal in North, Almora in south-east, Chamoli Garhwal in east, Bijnor district in south- west, Nanital in south and Dehradun in the west. It is very important drainage basin in the Ganga river system and consist of 1997km sq area extending from 29º 45' to 30º 15' latitude and 78º 34' to 79º 12' longitude .To study the riparian vegetation 4 spots are selected along river Western Nayar , Chippalghat , Sakarsani, Inkleswar and Seoli.

Field survey was conducted from April 2015 to March 2017. Collected plants were identified by using local names consulted by the local inhabitants and then correlated by using different available floras. For the identification of riparian Plant components were identified during the field visit. Photographic documentation was also done. For the fieldwork, assistance was sought from the local people in the forest areas. After collection the plants were identify with the help of Botany Department at Pauri Campus and the Book, flora of Garhwal (Gaur, 1999)

Results and Discussion

Total four spot has been studied along the Western Nayar valley, these spots are Chippalghat, Sakarsani, Inkleswar and Seoli from these four spots 25 different plant species belonging to 23 different plant families were identified which contribute to riparian vegetation of this Nayar valley. From spot 1, eleven plants species were identified (Table 1). *Euphorbia royaleana, Sapium insigne, Berberis lyceum and Lantana camara* are dominant. From spot 2, fourteen plants species are identified. *Pinus roxberghii, Lantana camara, Berberis lyceum, Murraya koenigii*, *Acacia catechu, Corchorus aestuans* and *Carissa opaca* were the dominant species. From spot 3, *Lantana camara*, *Berberis lyceum, Galium asparifolium, Gnaphalium hypoleucum, Cyanotis cristata , Jatropa curcas* and *Solanum nigrum* were dominant, and from spot 4 , *Quercus leucutrichophora* ,*Canabis Sativa*, *Berberis lyceum,* and *Galium asparifolium* were available in dominance (Table 1). Work on impact of these species on aquatic biota is in progress.

Riparian zone are very significant in ecology and environmental management, because of their soil conservation, habitat biodiversity and the influence on fauna and aquatic biodiversity. According to Hynes (1975), a general conceptual model of small stream ecosystem structure and function views the stream as a subsystem of its watershed and linkages among aquatic, riparian and upland forest habitats are best documented by

impacts on stream and terrestrial invertebrates (Baxter et al., 2005). Shyam (2008) studied the riparian vegetation around river Ganga from Hardwar to Gangotri and opined that riparian forests play a pivotal role in the life of peoples, to fulfill their daily requirements like timbers fuels, fodder, medicine, fruits, and other purposes. Some of these riparian zone plants are ecologically very important as they provide shelter to the aquatic animals for breeding and spawning (Bilgrami, 1991). Bhatt et al. (1987) have studied the effect of some toxic plants on fishes. Such plants are observed as riparian species in river Western Nayar.

Table 1 list of riparian vegetation along the Western Nayar river on selected spots.

S. No.	Botanical Name	Family	Common Name	Spot 1	Spot 2	Spot 3	Spot 4
1	*Euphorbia royleana*	Euphorbeaceae	Sulla	A	N	N	N
2	*Sapium insigne*	Euphorbeaceae	Khinna	A	R	N	N
3	*Ficus religiosa*	Moraceae	Peepal	C	N	N	N
4	*Lantana camara*	Verbenaceae	Big sage	A	A	A	C
5	*Salix*	Salicaceae	Manjar	C	N	N	N
6	*Olea glandulifera*	Oleaceae	Native olive	R	N	N	N
7	*Pinus rouxburghii*	Pinaceae	Chir	N	A	R	N
8	*Murraya koenigii*	Rutaceaea	Curry tree	N	C	R	N
9	*Acacia catechu*	Mimosaceae	Black cutch	N	A	C	R
10	*Carissa opaca*	Apocynaceae	Cudd	N	A	A	C
11	*Corchorus aestuans*	Tiliaceae	Chonch	N	C	C	N
12	*Berberis lyceum*	Berberidacea	Kingoorh	A	C	C	C
13	*Gnaphalium hypoleucum*	Asteraceae	Cudweed	N	N	C	R
14	*Cyanotis cristata*	Commelinaceae	Nabhali	N	N	C	R
15	*Jatropha curcas*	Euphorbiaceae	purging nut	N	N	C	R
16	*Solanum nigrum*	Solanaceae	Black nightshade	R	R	C	R
17	*Quercus leucotrichophora*	Fagaceae	Oak	N	N	N	A
18	*Cannabis sativa*	Cannabaceae	Bhang	R	C	C	A
19	*Galium asparifolium*	Rubiaceae	Goose grass	R	C	A	R
20	*Dalbergia sissoo*	Fabaceae	Biradi	C	R	N	N
21	*Phyllanthus urinaria*	Euphorbiaceae	Sulla hajarmani	N	A	R	N
22	*Oenothera rosea*	Onagraceae	Rose evening primrose	R	R	N	N
23	*Galium elegans*	Rubiaceae	Elegant goosegrass	N	R	C	N
24	*Oxalis corniculata*	Oxalidaceae	Amrul	N	N	N	N
25	*Pupalia lappacea*	Amaranthaceae	Nagadaminee	N	N	N	N

A- abundant, C- common, R- rare, N- nil

Riparian zones have been reported as some of the most species rich and most productive systems and they are also some of the most sensitive to human influence and potentially threatened ecosystems. The aquatic habitat is also enriched by the input of woody debris from bank vegetation via logs and branches. According to Srivastava (2007) the riparian vegetation have important bearing for the ecosystem of rivers as they exhibit multiscale function role to geomorphological, physical, chenical and biological condition of the river. Mc Dowall stated that the streams periphyton communities (algae, bactaria and fungi) from the basis of food chain and require hard surface such as fallen timber and rocks to develop. In addition some aquatic species are dependent on the provision of particular habitat for the completion of key life stage

(Rutherford and Cuddy, 2005). Apart from positive influence, the riparian vegetation may sometime prove harmful to stream communities, if their chemical constituent is unsuitable to them. Bhatt, et al. (1987) has studied the effect of some toxic plants on fishes such plants are observed as riparian species in river Western Nayar. Srivastav (2000) studied the influence of riparian vegetation on riverine ecology and biology productivity in Arunachal pradesh. Rias and Bailey (2006) studied the influence of riparian vegetation on macroinvertebrate communities in the stream of upper Thames river in south western Ontario .The riparian Contributes to stream in any form (leaves, twigs, wooden part) is term as detritus which apart from being used as microhabitat, as also as food by many insect larvae.

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