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Inter-relationship of fish culture, abiotic and biotic factor of river Sone

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Abstract- Animal and plants associated with water have from times immemorial signified life, fertility and abundance. The fishes, one of the first forms of evolutionarily higher life to appear in water is among the earliest vertebrates. It was therefore regarded as one of the "nighis" of water. The fish community of the Sone is very similar to that of the Alaknanda, although a few lowland species begin to appear, such as *Mastacembelus* and *Channa* so that the final species total is a little higher at 54. Again, however, numerically the snow trout and mahseers would tend to dominate the fishery. Fishes are considered as one of the important source of animal protein in all over the world and very popular in all economic classes. The equally in some water will provided embankment population have given most important nutritional food to the people of that were as well as to other parts of river that of the Ganga". Biological monitoring is a main aspect of today's water quality assessment of river and lakes. Both abiotic and biotic factors can have profound effects on population size in Sone. Zooplankton biomass and biodiversity were examined in a floodplain system of high hydrological dynamic. Temporal patterns were used to assess the significance of water retention time for the regulation of zooplankton population dynamics. The sampling period covered a board range of hydrological conditions ranging from lotic to lentic situations. Retention time could be identified as the driving variable governing total zooplankton biomass following a sigmoidal relationship. It also proofed to have different effects on rotifers and crustaceans. Rotifer biomass followed a polynomial 2nd order relationship showing a maximum at medium retention time while crustacean biomass was positively linear relation. The present work has presents inter-relationship of fish culture, abiotic and biotic factors of river Sone.

Keywords-

INTRODUCTION

Animal associated with water have from times immemorial signified life, fertility and abundance. The fishes, one of the first forms of evolutionarily higher life to appear in water is among the earliest vertebrates. Fishes are considered as one of the important source of animal protein in all over the world and very popular in all economic classes. The equally in some water will provided embankment population have given most important nutritional food to the people of that were as well as to other parts of river that of the Ganga". Biological monitoring is a main aspect of today's water quality assessment of river and lakes.

The Sone River at 784 kilometres (487 miles) long is one of the largest rivers of India. Its chief tributaries are the Rihand and the Koel. The Sone has a steep gradient (35-55 cm per km) with quick run-off and Ephemeral

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regimes, becoming a roaring river with the rain waters in the catchments area but turning quickly into a fordable stream. The Sone being wide & shallow leaves disconnected pools of water in the remaining part of the year. The channel of the Sone is very wide (about 5 km at Dehri) but the flood plain in narrow, only 3 to 5 wide

The division stretches between 24-0' to 24-32' North latitude and 83-32' to 83-52' East longitude. This forest division is bounded on the North by Sone River, on the East by North Koel, on the South by Garhwa South Division and at the west by Mirzapur district of U.P. There are 163 villages in Nagar register of Garhwa North Division. The fish community of the Sone is very similar to that of the Alaknanda, although a few lowland species begin to appear, such as *Mastacembelus* and *Channa* so that the final species total is a little higher at 54. Again, however, numerically the snow trout and mahseers would tend to dominate the fishery.

Eight different methods of fishing were documented and 23 species of recorded. The most common were the snow trouts, Schizothorax (3 species) contributing between 61 and 74 percent of the catch over a year. The sites ranged from 1855 masl to tehri at 770 masl with seasonal temperatures kept between 10.2^0 and 19.4^0 C by snowmelt near the source.

Notable contribution are those of Ahsan S N (1966), Baggerman, B. (1957), Ball, J. N. (1960), Cope, O.B. (1965), Herbert, D.W.M. and Shurben, D.S. (1964), Hoar, W.S. (1969), Idler, D.R. and Clemens, W.A. (1959), Khanna, S. S. and Sanwal, R. (1971), Loft, B. (1975), Robertson (1958), Sinha. V.R.P. and Srivastava, N.C. (1991) and Tan. C.E. Chong. H.K.S. and Moulton.T. (1972).

MATERIALS AND METHODS

The primary productivity in the River Sone was estimated at two sampling sites, during the present investigation from July 2005 to June 2007 on monthly basis. The sampling sites were Rihand (S1) and Koel (S2) representing the middle and lower section of the river, respectively. Initially , the classic method of Gaarder and Gran (1927) was adopted for in situation measurement of the rate of primary production for phytoplankton in the river (Table 4.2.1) the experiment could not materialize and was, therefore, terminated .

The primary production by Sone, was estimated by three standard methods, as follow:

1. Chamber Method: Of the several methods methods available for primary productivity measurements in streams (Bott *et al.*1978), polystyrene Chamber method of Rodgers *et al.* (1978) was selection as the most appropriate. The substrate bearing periphytons were incubated in a 1.93 liters molded polystyrene chamber for 4- hour incubation period (0800-1200 hr). A submersible pump powered by an attached battery resistor allowed variable flow I the chamber. Black plastic tape was used to cover dark (opaque) chamber.

Direct measurement of undisturbed periphyton in chamber in which the water is kept moving offers an accurate determination of primary productivity (Hynes, 1970).

The dissolved oxygen technique was applied in conjunction with light and dark incubation chamber for estimation of primary productivity.

Calculation for the oxygen produced over a given time period were made after running Winkler's test on each of the samples. Calculations for respiration, gross primary productivity were made as follow;

Respiration (R):

OC= OS- OE(black tamped chamber).

Gross Primary Productivity pg:

TOP=OE(chamber not covered)-OE(blacks taped chamber).

Net Primary Productivity (pn)= pg - R

OC= Oxygen Consumed; OC= Oxygen at Start

OE= Oxygen at End; TOP= Total Oxygen Produced

pg= Gross Primary Productivity;

pn= Net Primary Productivity

The values obtained in mg 1^{-1} oxygen were converted to milligrammes of carbon per square meter (mg C m^{-2}) multiplying the values by 375.36 (Strickland and Parssons, 1960). These were further expressed as grammes of carbon per square meter (g Cm^{-2}). The values in mg C m^{-2} can be converted to grams of dry weight (g dry wt. biomass m^{-2} surface) by multiplying the milligrammes of carbon by 2 and dividing by 1000. The value of dry wt. was converted to calories of energy multiply by 5.5.

Daily rated were obtained by multiplying the average hourly rate with the sunshine values. The date for the daily average sunshine hours were obtained from the field station

observatory of Central Soil & Water Conservation Research & Training Institute (ICAR), Dehra Dun (approximately. 60.0 km from the study area). Table 5.1 depicts the average daily average daily sunshine over the area for the study period. Monthly and annual rates were also estimated accordingly

2. Chlorophyll Estimtion: The chlorophyll content of attached communities is a useful index of the biomass of the phyto-periphyton. The pigments are extracted with aqueous and the optical of the extract is determined with a spectrophotometer.

The algal samples were collected from known area of 0.1x 0.1 m^2 and stored frozen and kept I dark (Grzenda and Brehmer, 1960) and brought to the laboratory.

3. Efficiency of light Energy Conversion : The overall efficiency under variety of ecological condition has been studied and it is found that the solar energy conversion seldom exceeds 10 or 12% of the available light energy (Oswald and Gotaas, 1957). Since the probable values for the amounts of visible light energy can be obtained from Kimaball (1935) or Smithsonian Meteorological Table (1951) or from a nearby observatory as in the present case for corresponding north latitudes of the Indian towns in the sampling sites are sites are sites are situated (Table 5.2), and photosynthetic efficiencies may be assumed, the quality of oxygen that will be produced for a given efficiency may be calculated from the equation:

RESULTS AND DISCUSSION

Both abiotic and biotic factors can have profound effects on population size in sone. Zooplankton biomass and biodiversity were examined in a floodplain system of high hydrological dynamic. Temporal patterns were used to assess the significance of water retention time for the regulation of zooplankton population dynamics. The sampling period covered a board range of hydrological conditions ranging from lotic to lentic situations.

Retention time could be identified as the driving variable governing total zooplankton biomass following a sigmoidal relationship.

It also proofed to have different effects on rotifers and crustaceans. Rotifer biomass followed a polynomial 2^{nd} order relationship showing a maximum at medium retention time while crustacean biomass was positively linear relation.

Biodiversity patterns of the two taxonomic groups differed significantly. Rotifer species number declined linearly along the hydrological gradient while crustacean species number increased exponentially, showing a maximum at periods of long lotic conditions.

We exaplained this "hydrological succession" by alternation of flood caused mortality (e.g. washing out effects) and taxa specific potential of reproduction along the hydrological gradient. Perioda of long retention, favoured crustacean development, most likely due to competitive advantages, where rotifer biomass and species number declined.

General multivariate models have appeal when analyzing ecological system because they have the potential to shed light on the relative importance of multifaceted factors. We hypothesized that plant community composition is a function of the interactions among three general constructs : abiotic and biotic factors and disturbance history. We sampled vegetation and soils on 75 randomly located 0.05 ha plots across a board soil gradient within an 110,000 ha ponderosa pine forest landscape in northern Arizona to evaluate this hypothesis.

The variation in abundances of 271 under story plant species was reduced to two orthogonal axes using non-metric multidimensional scaling. We evaluated the relationship between ordination results and environmental conditions using two types of structural equation models. 'Specific' models provided a details perspective of hypothesized relationship among observed variables. A 'general' model was evaluated to address the general hypothesis stated above. The general model employed composite variables, which specify the combined effects of multiple factors on a response, in order to evaluate the relative importance of the three theoretical constructs.

The results of the final specific model suggested that organic matter and nitrogen explained unique variation in composition, but the 'total effects' of organic matter were not significant due to offsetting direct and indirect pathways. Soil texture and Ph also constrained where many plant species occurred. Elevation was a strong determinant of species distributions, and its effects could be propagated through a network of processes involving soil mineral and organics properties.

The results of the general model provided new insight into the underlying structure of independent plat community

gradients in ponderosa pine forests. The model suggested that abiotic factors generated one gradient in community composition, whereas biotic factors, and to a lesser degree, disturbance history, generated a second independent gradient in community composition. Future evaluations of this composition model across a diversity of ecosystems could determine the generality and utility of this multivariate hypothesis. Water quality change is discussed in details, with emphasis on acidity formed from exposed pyrite material and on increase in dissolved soils. Preventive and treatment measures are recommended.

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