

Human Impact on Wetlands: The Case Study of Santijan *Beel* of Nagaon District, Assam

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ABSTRACT

Wetlands are the creation of the natural or anthropogenic processes which characterize the water body either seasonally or permanently. Anthropogenic occupation over the surface of the earth stimulates ecological degradation. Most importantly some wetlands are caused to die and dry up due to unwise and harmful human activities in recent years. The growing intensity of human use of land, water and aquatic resources of Santijan has posed a serious threat to its ecology and biodiversity status. This research has focused primarily on human impact upon the wetland and its degradation issues. For this purpose, a primary field survey was conducted in the study area for better results. The findings of the study reveals that the Santijan has been heavily interfered by human activities which have transformed this living wetland into a dying condition.

Keywords: Water quality, Encroachment, Geo-ecology, Conservation, Sustainability

Introduction

Assam is a state of rivers among the entire North-Eastern part of India. It is drained by mainly two river basins, viz. the Brahmaputra and the Barak river systems and their enormous tributaries and sub-tributaries. Both the two river basins have much waterlogged and surface storage areas (Deka and Bhagabati, 2015). Among these waterlogged and surface storage areas, the 'Wetland' areas that have their own characteristics and entity.

The term "Wetland" was firstly used as the term "Swamp" (Wright, 1907). The term wetland has come gradually into common scientific usage only in the second half of the Twentieth century. As revealed from satellite data analyzed by the Assam Remote Sensing Application Centre (ARSAC), Guwahati, there are about 3474 wetlands having areal size equal to or more than 2.5 hectares each.

These wetlands cover an area of 1,01,229.4 hectares accounting for about 1.29 percent of the total geographical area of the state. Wetlands are locally called *beels* in the rural areas of Assam (Bora and Barman, 1998). The groundwater flow due to the geological or tectonic factors and the riverine tracts of Brahmaputra and Barak basins provide varieties of water bodies which grow and develop into wetlands (Bhagabati *et al.*, 2001). It is important to mention that 4/5 decades ago before the construction of embankments there was River dolphin in this *beel*. The embankments divide the connectivity of the feeder channels which connect the Santijan *beel* with the Brahmaputra.

Materials and Methods

Study area

The study area is situated in the historically and cul-

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turally famous village called Batadraba (Bordowa) where Mahapurush Srimanta Sankardeva was born. The study area falls in the district of Nagaon, Assam under the Dhing Revenue Circle at a distance of 20 km from the Nagaon town. The study area covers an area of 81.96 sq km with latitudinal extension of 26°21'12" North to 26°28'33" North and the longitudinal extension of 92°28'59" East to 92°35'10" East.

Study method

Different Geo-ecological aspects of the wetland have been studied with the help of primary data obtained from field observations and surveys from December, 2018 to July, 2019. The relevant secondary data are also collected from various secondary sources like- cadastral maps obtained from the D.C. Office of Nagaon District to find out the early stage of Santijan. With the help of GPS, the latitudinal and longitudinal data along with elevations of the points are collected from the field. The water samples are taken from the water body of Santijan mainly at three different points for better results and observations. The water samples are then analysed in OTT Hydro lab DS 5 in the Department of Geography, Gauhati University, Assam.

Results and Discussion

Impact on Water Quality

There are various impacts upon water quality by anthropogenic or natural factors. But, mainly anthropogenic factors are more important than natural factors. Now, in the present-day context human beings use many plastic and chemical products which are thrown into the water of Santijan after being used. It may have bad effects on the water quality and also on the aquatic living organisms. Through the chemical reaction in many portions of Santijan, the temperature of water (°C) also increases, which is also the cause of the increase of pH value and increase of the phycocyanin (cell/ml) also. Water samples from three different points of Santijan, have been collected. The lab analysis shows three different data of temperature, pH value, and phycocyanin quantity. We all know that where the pH value is equal to zero that type of water is pure, but when the pH value increases, the water quality or pureness also decreases. In the same way, same thing also happens with temperature and phycocyanin,

when the values or units increase, the temperature also increases and the phycocyanin reaction also increases. All three samples show that there is a uniform increase in temperature, pH value, and phycocyanin.

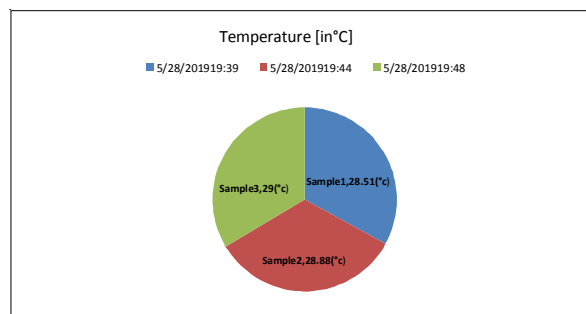


Fig. 1. Temperature (in °C) of water in Santijan at different times of the day.

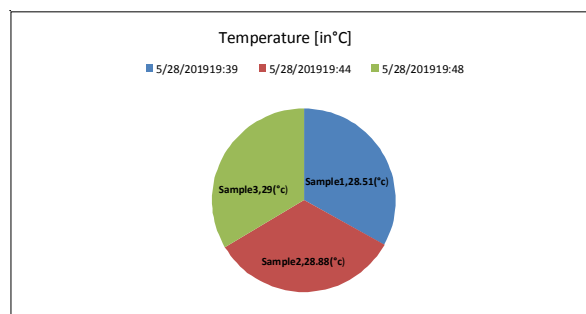


Fig. 2. pH value (in %) in the water of Santijan at different times of the day.

Human Settlement and Encroachment

In comparison to the earlier 50-60 years back, there was a sudden and high increase in population on both of the banks of Santijan *beel*. Due to the increase of population, there is a decrease in *beel* area, because the high population has put pressure on the

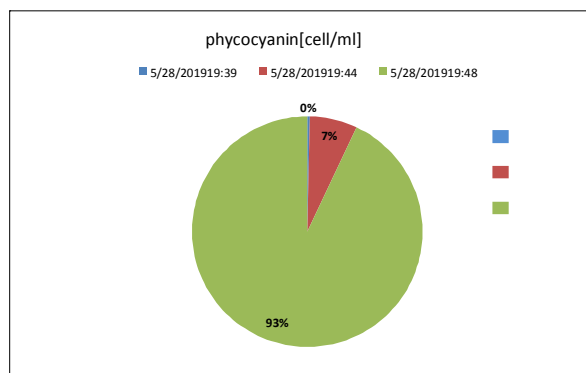


Fig. 3. phycocyanin [cell/ml] in the water of Santijan at different times of the day.

Table 1. Sample 1- Data of water sample analysis

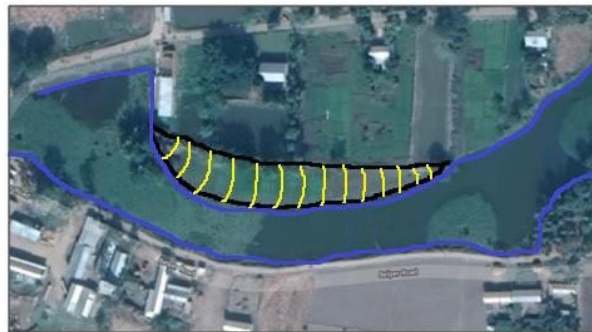
Date / Time	Temp [°C]	pH [Units]	OR P [mV]	SpC [mS/cm]	SpC [µS/cm]	Res pt [-cm]	Sal [p [kO /l]	TDS [g /l]	pH Volts [m V]	LDO % [Sat t]	LDO [m g/l]	LDO [mm /Hg]	Chlorophyll [µg/l]	Chlorophyll [Volt s]	phycocyanin [cell/m L]
5/28/2019 19:39	28.5	7.05	275	0	12	84	-0.01	0	1	101.3	6.52	635	0	0.0016	179 0.0038
5/28/2019 19:39	28.51	7.05	275	0	12	86	-0.01	0	1	101.6	6.53	635	0	0.0022	173 0.0038
5/28/2019 19:39	28.51	7.05	276	0	11	87	-0.01	0	0.9	101.6	6.53	635	0	0.0261	179 0.0037

Source: Based on water sample analysis done at Geography Department, G.U. with the help of OTT Hydro lab DS 5.

Table 2: Sample 2- Data of water sample analysis

Date/ Time s]	Temp [°C]	pH [Unit]	OR P[mV]	SpC [µS/cm]	SpC [mV]	Res [kO- [ppt]	Sal [g/l]	TDS [mV]	pH Volts [Sat]	LDO % [Sat]	LDO [m g/l]	LDO [% _BP [mm Hg]	Chlorophyll [µg/l]	Chlorophyll [Volt s]	phycocyanin [cell/ m L]
5/28/2019 19:44	28.88	7.13	287	0	0	0	-0.02	0	-4	109.9	7.02	635	0	0.0312	3317 0.0113
5/28/2019 19:44	28.88	7.13	287	0	0	0	-0.02	0	-4	109.9	7.02	635	0	0.0311	3314 0.0113
5/28/2019 19:44	28.88	7.13	287	0	0	0	-0.02	0	-4	109.9	7.02	635	0	0.0311	3312 0.0113

beel and occupied the *beel* area also. People have increased the agricultural land area on the bank of Santijan. There is also a linear settlement pattern on the banks of Santijan. Many plastered and also 'Katcha Ghor' are constructed by filling up the *beel* areas. For commercial purposes, some people have also dug some big fisheries and grown fish artificially.



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Course of Santijan
Encroached areas

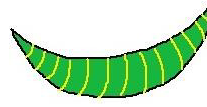


Fig. 4: Encroachment areas of Santijan *beel*, 2019



P 1



P 2

P 1 and P 2: People throw the waste materials during Devi Visarjan.

Table 3. Sample 3- Data of water sample analysis

Date / Time	Temp [°C]	pH [Units]	OR P[mV]	SpC [mS/cm]	SpC [µS/cm]	Res [kΩ-cm]	Sal [ppt]	TDS [g/l]	pH Volts [mV]	LDO % [Sat]	LDO [mg/l]	LDO [mm Hg]	Chlorophyll [µg/l]	Chlorophyll [Volts]	phycocyanin [cell/mL]	phycocyanin [Volts]
5/28/2019 19:49	29	7.19	295	0	0	0	-0.02	0	-7.6	112.2	7.15	635	0	0.0212	46100	0.1138
5/28/2019 19:48	29	7.19	295	0	0	0	-0.02	0	-7.8	112.1	7.14	635	0	0.0212	46071	0.1138
5/28/2019 19:48	29	7.19	295	0	0	0	-0.02	0	-7.5	112.1	7.15	635	0	0.0212	45987	0.1135

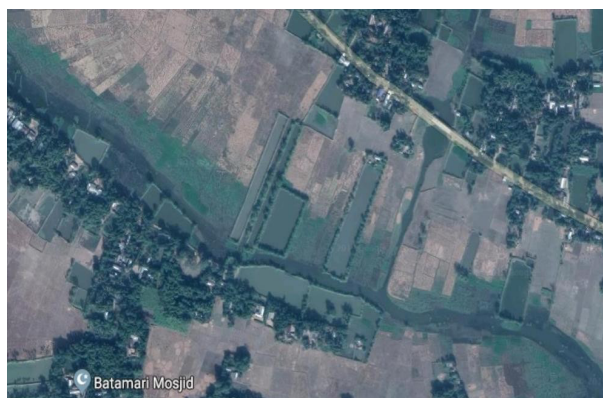


Fig.5 Fisheries that occupy some areas of the Santijan *beel* represent one form of encroachment.

Suggested Management and Conservation Strategies

During the Durga Puja time, when the 'Pratimas' and other waste disposals are thrown into the water of Santijan, it may affect the water quality and the aquatic living organisms directly or indirectly through the chemical reaction and waste products. So, only the earth-made Pratimas may be allowed to throw into the water, but not the other waste materials which may not dissolve or decompose in the water, otherwise causing pollution. In order to conserve the dying Santijan, government agencies should take some responsibilities for enacting restrictions in creation of ponds and fisheries affected to its banks. Some regulations may be effective to reduce the degradation of the banks of the wetland. Some regulations and act should also be introduced to reduce the catching of fishes and other aquatic and living organisms which favour the wetland ecology.

Conclusion

Santijan is famous for its historic significance. There is a mythological tale as regards this wetland. Santijan has now lost its original characteristics in terms of its length, width, soil and water quality, aquatic species, and overall biodiversity and converted into a small wetland or *beel* day by day. In recent years Santijan has experienced a number of problems. Due to unwise human encroachment with the growth and expansion of settlements, the depth

of the wetland has decreased and the width of this has also been reduced to a great extent. The waste products generated from the nearby households and families are going to pollute the water of this historically famous Santijan in a greater way.

Although some literate people of the area are aware of the geo-environmental problems of the *beel*, the majority of illiterate people do not take care of the *beel* environment. It is now high time to make collective efforts at the community level supported by strong public awareness and initiatives to conserve the ecology and environment of the Santijan for its future sustainable existence. However, the Government of Assam has taken some projects for its development and conservation. But, the efforts of the government should be continuous and eco-friendly taking the public and local communities in confidence. On the whole community participation may be an effective strategy and action plan for conservation and proper management of the famous Santijan which has its immense glory and significance.

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Conflict of interest

The authors declare no conflict of interest.

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