

Ethological Perception of Nilgai (*Boselaphus tragocamelus*) and the Local Ecosystem of Gopalganj District of Bihar

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Abstract

Nilgai is a hoofed ungulate and the largest Asian antelope, also called as Blue Bull. It is endemic to peninsular India and also it is the single member of its genus. A study was conducted on the various behaviors of Nilgai in the Gopalganj district of Bihar from march 2023-february2024 for analyzing the behavioral pattern of Nilgai and its impact on the ecosystem of Gopalganj district of Bihar. Direct sighting and camera photography/recording along with questionnaire cum survey and personal conversation with the villagers was done. The animal was found grazing along with other cattle in the field, mingling in harmony with Grass egret, Mynah bird and dogs of the region indicating towards its docile behavior. Its highly adaptive feeding behavior led to destruction of crops of the area by feeding and trampling of the crops, while the dung piling habit helped in increased seed dispersal and soil enrichment of the area. Overall the impact was negative as well as positive on the local ecosystem.

Key words : Adaptive, Dung piling, Ecosystem, Nilgai, Seed dispersal.

Nilgai is the largest Asian antelope, often marked with white socks thus called white footed antelope also called as blue bull. It is a mixed feeder, primarily a grazer but also preferring browsing. It belongs to family *Bovidae*, sub-family *Bovinae* and tribe *Boselaphini*. It is the only species of *Boselaphus*⁴. It can thrive on variable proportion of grass herbs⁷. It also prefers to eat paddy, maize, sugarcane and gram¹⁰. Nilgai or Blue-

bull is one of the largest Antelope in the Indian subcontinent⁸. It is distributed in India from Himalayan foothills southward through Central India to Mysore¹¹. However introduced Nilgai population occurs in USA Mexico and South Africa². They are found in undulating hills, but not in the steeper hills. They are absent from true arid zones having inadequate woody cover. Sexual dimorphism is prominent. It is categorised as least concerned animal by IUCN red list⁶.

Due to exponential human population growth pollution, industrialisation, the natural habitat of Nilgai has rapidly dwindled resulting in their migration towards human settlements periphery for food and habitat purposes⁵. Moreover their adaptive ability is very high to their new habitat⁹. They are crop raiders. So the animal has been declared as vermin in many states and has been ordered for culling. This study was conducted to analyse the various behaviour of Nilgai and the possible impact of the animal's behaviour on the environment of the studied area.

Study area : The area for study chosen was Gopalganj district which is a part of Saran Division and is located in the western north corner of Bihar state covering an area of 2033 KM². (fig. 1) Geographically it is located between 83.54° – 85.56° latitude and 26.12° – 26.39° north longitude. The altitude is 73 feet above MSL. The soil of the district

is thick Alluvium deposited by river Gandak. The pH of the soil is mostly alkaline ranges from 7 – 8. The temperature ranges from 4° C. in winter (Dec. to Jan.) and more 44° C. in hot summer (May to June). The average annual rainfall is about 1218 mm The land of district is fertile and alluvial. So cultivation and irrigation prospects are good. The river Gandak by depositing the top quality of soil brought from Nepal and plays an important role in the economy of Gopalganj district. This district is an important agricultural centre in north Bihar and has several secondary and tertiary industries based on agriculture. This district is one of the largest sugarcane growing district in India and also known for its advances in horticulture The area has good potential for crop production particularly maize and sugarcane. The area has well irrigation facility due to Gandak river and it's tributaries like Jharahi, Khanwa, Daha, Dhanahi.

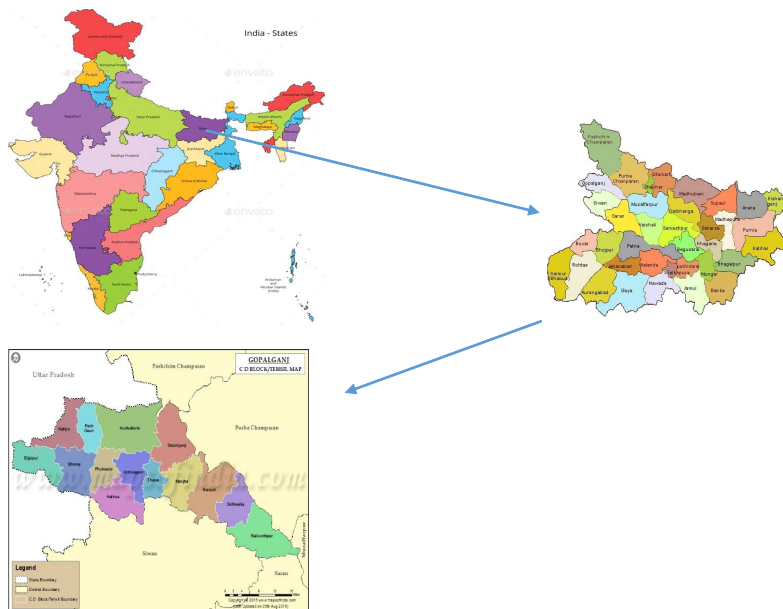


Fig. 1. Showing the study area in the Gopalganj district of Bihar
(Source: www.mapsofindia.com)

Sampling A survey to collect information on the various behavior of Nilgai and acknowledgement of the domestication aspect was done in march 2023-may 2023 in the Luhasi, Sathi, and Balesara village of Gopalganj district. The survey covered approximately 500 households in these villages. Here the households were considered as sampling units. Systematic random sampling technique was used. One household was selected after every three household Since in this area maximum cases of migration to Qatar is very much seen for service purposes, so the percentage of elderly population is higher than younger population. Only one respondent in each household generally the eldest and male member was chosen for interview as the male population was more engaged in agricultural activities and frequent movement as compared to females of the area. The questions of the interview was pre set in a semi structured manner with open ended questions to encourage discussion. Total 140 people were interviewed in these mentioned study areas.

Data Analysis :

After the sampling was completed, the analysis of the data collected from sampling, was done using the Statistical Package for Social Sciences (SPSS). For analyzing the numerical variables Descriptive study design was used, Moreover the demographic characteristics of the respondents was taken into account i.e the percentage of males and females, their age group categories, their occupation whether engaged in service, business or farming was also considered. Chi square test for goodness of fit was used to test for the differences between the expected

and observed frequencies of the variables. The percentage of important local food crops damaged by the animal was interpreted in a pie chart.

The methodology also followed direct sighting, which involved sighting of animals from a close distance and then the behaviour of animals was observed, during the different time intervals in a day along with photography and recording of the behaviour in a camera¹. So along with questionnaire cum survey, direct sighting method was also done. Moreover possible domestication aspect after analysing the behavioural impact on the flora, fauna and abiotic components of the area was emphasised. The total study including survey as well as behaviour recording by direct observation and conversation with the villagers was conducted from March 2023 to February 2024.

The results was categorised into two categories:

Survey cum questionnaire :

Out of 140 respondents 86 (61.42%) were males while 54 (38.57%) were females. The age categories of the respondents were 35-44 yrs (39, 27.85%), 45-54 yrs (68, 48.57%), 55 yrs or above (33, 23.57%). Those engaged in farming were 63 (45%), unemployed 36, (25.71%), and other like business or service were 41 (29.28%). The number of respondents having received formal education was 102 (72.85%) while 38 (27.14%) had no formal education at all. The result of the respondents indicated that the villagers were acknowledged about the aggressive, feeding, adaptive behaviour of Nilgai along with its dung piling habit very well but they were having lesser knowledge

about its reproductive and docile behaviour of the animal, About 85.71% of the local people respondent about the aggressive behaviour of male Nilgai, 53% responded about its social nature and 75% responded about the adaptive behaviour of Nilgai, 78.57% of villagers were well acquainted with the dung piling behaviour.

About 70% of villagers responded that it breeds twice in a year which is not true as it breeds only once in a year. The Chi Square Test for goodness of fit indicated that the difference between the observed and expected variables is statistically significant.

Table-1. Assessment of respondents knowledge about various behaviors of Nilgai

S.N.	Behaviours	Questions	Responses	Frequency	Percentage	χ^2 statistics	p value
1	Aggressive behaviour	Which one is more aggressive?	Male Female Don't know	120 15 5	85.71% 10.71% 3.57%	173, df=2,	p<0.0001
2	Social behaviour	Is it a Social Animal?	Yes No Don't know	75 55 10	53.57% 39.28% 7.14%	47.50, df=2	p<0.0001
3	Reproductive behaviour	How many time Nilgai gives birth to calves in an year?	Once Twice Don't know	34 98 8	24.28% 70% 5.71%	91.94, df=2	p<0.0001
4	Feeding behaviour	What is the feeding pattern of Nilgai?	Grazing Browsing Mixed Don't know	72 32 31 5	51.42% 22.85% 22.14% 3.57%	65.52 df=3	p<0.0001
5	Ranging Behaviour	Does it's ranging pattern differ with season?	Yes No Don't know	88 46 6	62.85% 32.85% 4.28%	71.99 df=2	p<0.0001
6	Docile behaviour	Does it behaves amicably with other animals	Yes No Don't know	51 77 12	36.42% 55% 8.57%	45.93 df=2	p<0.0001
7	Defence behaviour	Is there any definite herd pattern for defence?	Yes No Don't know	68 64 8	48.57% 45.71% 5.71%	48.28 df=2	p<0.0001
8	Adaptive behaviour	Does the animal adapt easily in new habitat?	Yes No Don't know	105 23 12	75% 16.42% 8.57%	11.82 df=2	p<0.0001
9	Dung piling behaviour	Does the Nilgai defecates in the same place?	Yes No Don't know	110 25 05	78.57% 17.85% 3.57%	133.39 df=2	p<0.0001

Direct sighting and conversation with the Villagers :

It was seen that the docile nature of the animal was prominently noticed having positive interactions with Mynah bird, grass Egret, cattle and even dogs also ,highlighting the transition from wild to domestic in nature. However the cases of aggression was severe in the region leading to vehicle collisions. Moreover the highly adapted feeding behaviour of the animal had resulted in switching over to diverse ranges of crops leading to crop destruction by feeding and trampling. The results can be broadly studied under the following sub headings:

Effect on the Fauna of the region :

Since the animal was seen comfortable with other animals of the region, even it didn't show repulsive attitude towards humans in the farmland, this had led towards the increased trophic level competition among the other

herbivores of the region for food procurement. Not only the animal shown docile behaviour by mingling with cattle and dog's of the area ,but it was also seen that a young male calf being abandoned by it's owner somehow got mingled with herd of Nilgai in the sathi village of Gopalganj and later the male calf also actively foraged plant crops along with the herd leading to crop destruction ,pointing towards the modification of the fauna of the region. A bull was found attempting mating with a female Nilgai in the saathi village of the region pointing towards interbreeding process going on in nature leading to evolutionary changes. As Nilgai IL-8 is evolutionarily more related to cattle than other³. The defence strategy of the animal herd was well established owing to the territory protection, camouflage behaviour. The reproductive rate was high as mostly twins and triplets birth was noticed, moreover the number of females was high as compared to the males of the area, leading to the most successful herbivore of the area.



Image 1. Nilgai along with dogs in the Balesara village Gopalganj(JNV campus)

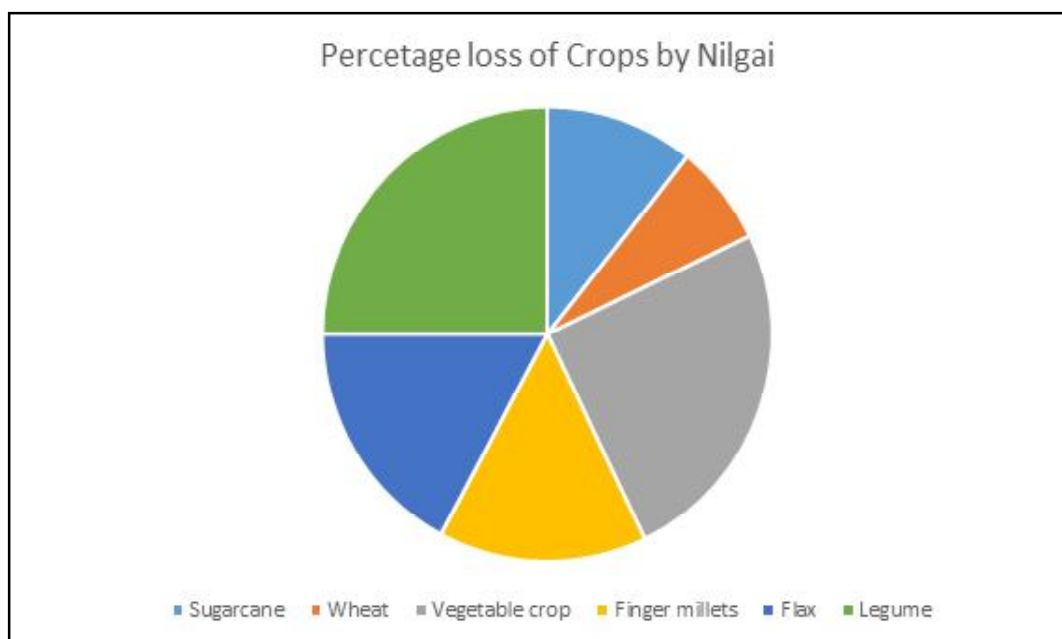


Chart 1. Pie chart showing loss of crops by Nilgai in the studied Area

Effect on the flora of the region :

Nilgai mostly destroyed the crops like wheat, sugarcane, and almost all the vegetables. It has adaptive feeding behaviour, even it ate bitter gourd which it didn't preferred previously. The villagers reported about 40% loss of crops. In Budhia village of Sidhwalia block, Sher panchayat and Matauli village Nilgai have destroyed about 15% of sugarcane crops in tender stage. In Gamhari panchayat of Baikunthpur block they have damaged the wheat seedling upto 10%. In Sirsa village and Dighwa Dubauli village they have destroyed the vegetable crops upto 30-40% especially in germinating stage. Moreover the villagers of Luhasi and Saathi village have chosen finger millet farming in small scale, but Nilgai had destroyed the crop by trampling the millet in young stage, resulting in economic loss of the

farmers about 21% and leguminous crops was destroyed about 35%. The local rural mass also cultivated Flax (*Linum usitatissimum*) for their daily consumption of its oil and powder of roasted seeds for meeting their nutritional needs in a cheaper way. But now they almost stopped its cultivation due to Nilgai, as the animal easily adapts its feeding habit and the crop loss was about 24%. So the animal had altered the flora structure of the area.

Effect on the soil structure of the area :

The dung piles of Nilgai have been found to contribute significantly to soil fertility. The seeds present in the dung can easily germinate, aiding in afforestation.

The animal's behaviour had manipulated the local flora and fauna of the studied area.

But still several measures have to be further explored for managing Nilgai population in a scientific way. Since every animal has to perform some definite ecological role. So some effective plan must be made to deal with the problem as lack of proper forest management has laid to an exponential rise in the herbivore population. Poor forest cover, lack of predators and a fragmented corridor forced the Nilgai to leave their natural habitat as the Nilgai population of this area are said to be migrated from Valmiki Tiger Reserve of West Champaran district. So they should be translocated to forested areas having plenty of food and predators. Domestication can also be possibility for providing financial incentive to humans. But finally the awareness has to be initiated.

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