

Conservation threats of White-bellied heron (*Ardea insignis*) in Zhemgang district, Bhutan.

ABSTRACT

The study was conducted in 2018 along the Mangdechhu river basin and Bertichhu stream of Zhemgang district, which are the important habitats for White-bellied Heron (*Ardea insignis*) in Bhutan. We have documented the anthropogenic threats, directly affecting the survival of the species through focal sampling along established transects at the study area. The major anthropogenic threats leading to the habitat degradation encountered were overhead hydropower transmission lines installed across the river/stream, firewood collection from riverbank, sand/stone quarry, temporary cattle herding camp and grazing, camping/picnicking and fishing. This study found that the sites should be strictly monitored from the encroachment of illegal human activities and to have constant and active educational awareness campaign involving local community for protection of habitats.

Keywords: Anthropogenic threats, Awareness campaign, Bertichhu stream, Mangdechhu river, White-bellied heron.

1. INTRODUCTION

The White-bellied Heron (WBH) *Ardea insignis* Hume 1878 is a large heron species of the family Ardeidae, order Pelecaniformes, found in freshwater ecosystems of the Himalayas [1]. It is classified as critically endangered and also protected under the Schedule I of Forests and Nature Conservation Act 1995 of Bhutan [1, 2]. The estimated population size of WBH is 50–249 adults [1, 3], but in reality, fewer than 60 individuals are confirmed to exist in the world today [4]. The latest estimated population in Bhutan as of 2021 is 22 individuals [1, 5].

The species inhabit both the riparian and terrestrial ecosystem for nesting, feeding and roosting [4], but the records of nesting and breeding of this species are extremely rare [6, 7]. Moreover, the species is expected to be declining over a year [2, 8] due to habitat degradation and loss from hydropower construction, logging, mining and human induced forest fire [7, 9].

In Bhutan, WBH is distributed in temperate and mixed-broadleaf forests of two major river basins (Punatshangchu and Mangdechhu River) and its tributaries, at an altitudinal

range of 100 to 1500m asl [10]. Generally, the species is mostly sighted at undisturbed river beds and wetland habitats [10] and their presence indicates the health of the rivers, the fish population, water quality, level of disturbances, and above all, intactness of nature [1].

In one occasion each, it was also sighted in Kurichhu river basin in 2018 of Mongar district, Wangchhu river basin of Thimphu district in 2019, Chamkharchhu of Bumthang district in 2021, and also in other locations in the past [1, 11-13]. Sightings in new locations can be expected as the species may be embracing new habitat, due to loss of their old habitat. Therefore, this study was carried out in 2018 along the Mangdechhu river basin and one of its tributary, i.e., Bertichhu stream, being important habitats of WBH to access the threats affecting the survival of species.

2. MATERIAL AND METHODS

2.1 Study Area

The study was conducted along Mangdechhu River and Bertichhu stream located in Zhemgang district (Figure 1), which lies in south-central region of Bhutan at an altitude of 200 to 2,000 m asl. The district is centrally located at the latitude of 90.8294°E and longitude of 27.0770°N. Most of the area is in the contiguous Jigme Singye Wangchuck National Park and Royal Manas National Park of Bhutan [14]. The topography is rugged in most parts, dominated by warm broadleaf tree species that are multi-storey, dense and with a high diversity and density of woody tree species [15]. Moreover, the area harbors many important animal species including critically endangered White-bellied Heron.

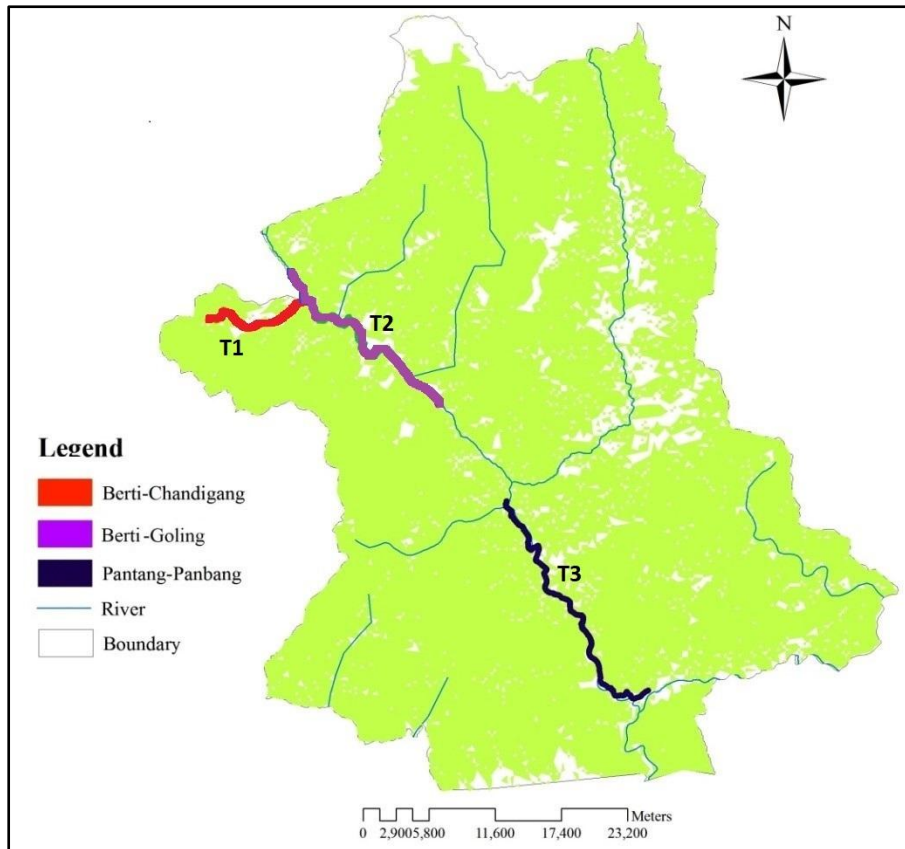


Figure 1: Study area showing the surveyed transect line along Mangdechhu River (Berti-Goling [$27^{\circ}08'40.3''N$ $90^{\circ}41'43.9''E$] and Pantang –Panbhang [$26^{\circ}58'19.1''N$ $90^{\circ}51'23.4''E$]) and Bertichhu stream (Berti – Chandigang [$27^{\circ}09'39.6''N$ $90^{\circ}39'14.0''E$]).

2.1 Data collection

The Mangdechhu River and Bertichhu stream were segmented into three transects, namely, Berti to Chandigang (T1=10 km), Berti to Goling (T2=25 km) and Pantang to Panbhang (T3=70km), covering a total length of 105 km (Figure 1). Transect T1 was located along the Bertichhu stream and transect T2 and T3 along Mangdechhu river. These transects were walked thrice a month between February to April in 2018, to detect the presence of species as well as the anthropogenic threats. These data were obtained opportunistically along the transects maintained at 300m from a river side. To obtain the correct data, each transect were independently observed by the different observers at the same time from 7 A.M-4.00 P.M. This was also supplemented by the structured questionnaire survey, and interviewed 96 random local people residing proximity to current study area. The data on anthropogenic threats were considered only when direct sightings of the species are recorded within 50 m from the river/stream edges.

3. RESULTS AND DISCUSSION

3.1 Sighting records of White-bellied heron

White bellied heron in the current study area was mostly being sighted at Goling and Berti localities within transect T1 and T2 (Figure 1). The species being a shy and most sensitive, carrying detail assessment of population was challenging. However, through rapid survey and regular observation, the research confirmed the presence of 4 individuals, sighted independently at transect T1 and T2 (2 individuals each) (Table 1). In most occasions, the species was sighted individually. However, none of the individuals were sighted from transect number 3 (T3), i.e., Pantang to Panbang.

Table 1: Sighting records of White bellied heron.

Date	Transect name	Time (hr)	No. of WBH	Activity	GPS Location		Altitude (M)
					Northing	Easting	
19/1/2018	Berti to Goling	3:31hr	1	Fly Over	27° 07' 44.6"	090° 42' 40.2"	468
31/1/2018	Berti to Goling	11:30 am	1	Flyover	27° 10' 18.6"	090° 39'31.5"	572
5/2/2018	Berti to Goling	3:10pm	2	Feeding	27° 07' 46.3"	090° 42'45.2"	474
25/2/2018	Berti to Goling	3:15 pm- 4:25 pm	1	Feeding	27° 07' 52.8"	090° 42' 29.8"	502
26/2/2018	Berti to Goling	1:45pm - 2:10pm	2	Feeding	27° 07' 44.6"	090° 42' 40.2"	468
26/2/2018	Berti to Chandigang	1:45pm- 2.10pm	2	calling	27° 09' 35.0"	090° 40'02.5"	560
27/2/2018	Berti to Chandigang	10:20 am - 11:00 am	1	Resting on tree	27° 09' 00.5"	090° 38'30.3"	647
15/3/2018	Berti to Chandigang	11:09 am -11:45 am	2	Feeding	27° 10' 26.6"	090° 39'18.5"	587

25/3/2018	Berti to Chandigarh	1:37pm	1	Flyover	27° 08' 39.0"	090° 37'09.5"	743
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Similarly, random local people residing in proximity to Berti stream and along Mangdechhu river basin were interviewed to collect the data on the sighting of WBH in an area over last five years, i.e., from 2014 to 2018. A total of 26 individuals, i.e. 12 from Berti to Chandigarh (T1) and 14 from Berti to Goling (T2) gave a positive sighting information of WBH at least once in five years period. Most of the respondents (n=12) sighted the WBH individually, either in flight, feeding or resting, and eight respondents have sighted them in pairs. Two respondents have sighted 3 individuals together during 2016 and 2017 in Berti locality. With combined data of this study and from the Annual Population Survey of WBH Report of Royal Society for Protection of Nature (RSPN) [1], we confirmed the regular sightings of WBH in current study area till date.

3.2 Conservation threats

The WBH and its habitat in the current study area was found subjected to several anthropogenic threats such as overhead transmission lines, cattle herders and grazing, sand/stone quarry, fishing, tree felling and firewood collection, municipal waste disposal, and camping sites. Since the species is sensitive to even slight disturbances [6], most of this disturbances poses a direct threats, particularly during the time of foraging and resting. These conservation threats are being separately discussed below.

3.2.1 Overhead hydro-power transmission lines

The construction of hydropower facility has incurred a direct threats to the flight route of WBH. A total of six overhead hydro-power transmission lines (HPTL) were present, crosscutting one at Bertichhu stream and five along Mangdechhu River, where both are important potential habitats for WBH. The mean height of HPTL was 17.5 ± 4.6 . Though WBH were seen flying mostly over these heights, but in some occasions, they were flying as low as 1 m near ground. In one occasion on 2017, WBH was found being killed after striking with overhead power lines at Berti locality (Personal communication, 2017). In the long run, this factor will pose a serious threat to the survival of WBH as Acharja [6] stated that the species forages up to 25 km along the rivers.

3.2.2 Habitat degradation through cattle herder and grazing

A total of 9 temporary cattle herder camp were observed within Berti locality located at a distance of minimum of 3m and maximum of 50m from river side. The mean distance was 28.56 ± 17.45 m. Due to this factor, habitat degradation such as **lopping** of fodder trees and clearing of areas for constructing temporary cattle **sheds** and camps were observed. Moreover, excessive grazing of grasses and premature sapling **was** recorded, which affects the regeneration and **accelerates soil degradation and** surface erosion. Presence of such biotic factors can pose immediate threats to the normal behaviour of WBH, especially while searching for foraging and resting ground.

3.2.3 Quarry (Sand and Stone)

The quarrying operations was another threat that poses direct disturbances, particularly when **WBH fly over for foraging**. This activities were observed within 3-35m from river side at six locations. The temporary road connection to quarry sites has loosened the river bed and also the vegetation along the river bank was covered by the dust particles (pollutants), disturbing the normal growth of plant species. However, from 2018, the Department of Forest and Park Services (DoFPS) allowed only handpicking of stone and sands to reduce disturbances to WBH and it is being strictly monitored. **At least one quarrying site located at Berti locality is a frequent sighting sites of WBH, usually seen feeding and resting when human are not there.** **Therefore, overlapping with foraging time and human presence may impose direct disturbances, which may lead to abandoning the habitats in long run.**

3.2.4 Fishing

The fishing incidences encountered were of two types such as presence of human using the casting net (four incidences) and gill net (four incidences). All of these incidences were encountered between Berti and Goling localities, which **were** important habitats of WBH. Moreover, due to legalized fishing, people of Berti locality often used the river stretch for fishing which diverts the flight of WBH while searching for feeding sites. Regarding the use of gill net, people often kept it in the shallow water for a day or two **for fish to be trapped** inside. It can be expected that the WBH may get entangled in those net while feeding or scanning in those shallow water. **Such incidences were reported for most of the water birds and sea birds, drowning them to death [16, 17].**

3.2.5 Tree felling and firewood collection

WBH and cormorant were observed using the dead branches, logs, roots and other wood pieces that have been brought down by heavy down pour on the river bank during the summer season for resting or hiding, making the habitat more suitable for their existence. The inhabitants settled at the edge of the river and cattle herder frequently collect these dead trees to be used as fuel wood or the timber species with clean bole were sawn for rural house building. The species was also seen using the river side standing trees for resting and cover. However, tree felling was observed in the important habitat affecting the river bed ecosystem and its periphery, which in long run may lead to total change of habitable environments. Similarly, Khrisna et al. [18] stated that the river bank with sand and gravel surrounded by tropical forests harbour perfect habitat for WBH to survive.

3.2.6 Municipal waste disposal

A municipal waste disposal site is located at 50 m from Mangduechhu River side in Tingtibi town, located between Goling and Berti localities. The solid waste like plastic cups, plastic bottles, diaper, wrapping materials, non- organic construction debris, etc. dumping nearby water bodies can be hazardous to aquatic environment. This can result in a dramatic decline and disrupt the community composition of fishes [19]. This may also affect the abundance and fish diversity, which ultimately affect the survival of WBH in the long run. Alternately, due to modification of waste products inside water into the shape of fish may accidentally be fed by WBH, thus causing death.

3.2.7 Picnic spot and camping

There were five picnic spots used frequently by the visitors between Berti and Goling localities, in proximity to river side at the mean distance of 25 ± 9.35 m. The lowest distance was at 25m and highest at 35m. The picnickers had selected these sites near clean and shallow water for easy access to water facilities. They also assemble grasses from river bed for bedding purposes and logs and tops for bonfire. On the other hand, WBH rest and feed in shallow water with safety area from predators and disturbances [6]. During the absence of picnickers, WBH can be spotted at this area.

4. CONCLUSION

The Protection and conservation of the White-bellied Heron is now important due to declining global populations. The current studies found that Bertichhu stream and Mangduechhu River between Berti and Goling is an important habitat of WBH based on their

frequent sightings. However, various anthropogenic threats have also been observed as addressed above, posing direct threats to the habitats as well as disturbing the normal behaviour of WBH.

With the presence of all these disturbances, it is important to have constant and active awareness educational campaign by involving the local communities of Berti, Goling and Tingtibi localities for protection of habitats. The sites which are frequently used by WBH for feeding and resting should be identified, mapped and protected. Lastly, the researchers and relevant agencies need to carry out intensive research, particularly focussing on distribution pattern and associated threats to WBH, which can lead to protection as well as restoration of degraded area to ensure its long term survival in Zhemgang district.

CONSENT (WHERE EVER APPLICABLE)

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

It is not applicable to this research

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