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


## ABSTRACT

The study was conducted in 2018 along 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 observation along established transects at the study area. The major anthropogenic threats leading to the habitat degradation encountered were overhead hydropower transmission lines built 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

White-bellied Heron *Ardea insignis* (WBH) is classified as critically endangered with last remaining of 50-249 mature individuals worldwide (BirdLife International, 2021). The latest estimated population in Bhutan as of 2021 is 22 individuals (RSPN, 2021). The species inhabit both the riparian and terrestrial ecosystem for nesting, feeding and roosting (Price & Goodman, 2015) but the records of nesting and breeding of this species are extremely rare (Acharja, 2019; Dorji, 2011). Moreover, the species is expected to be declining over a year (BirdLife International, 2021; Khandu et al., 2020) due to habitat degradation and loss from hydropower construction, logging, mining and human induced forest fire (Dema et al., 2018; Dorji, 2011).

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 to1500 m (Acharja, 2019). In one occasion each, it was also sighted in Kurichhu

river basin in 2018 of Mongar district and Wangchhu river basin of Thimphu district in 2019, in which the experts suggested that the species embraces new habitat, due to loss of their old habitat (Gyem, 2018; Dem, 2019). Generally, the species is mostly sighted at undisturbed river beds and wetland habitats (Acharja, 2019). 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 (Sherub and Tshering, 2019). 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 (Sherub and Singh, 2019). Moreover, the area harbors many important animal species including critically endangered White-bellied Heron (*Ardea insignis*).

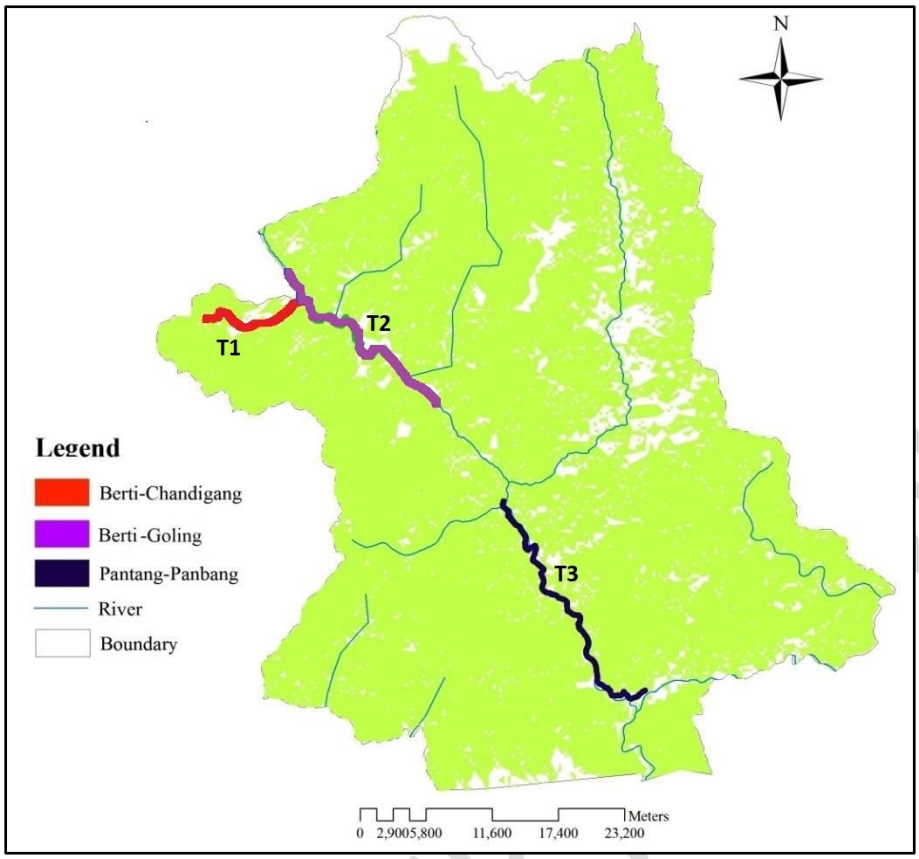


**Figure 1:** Study area showing the surveyed transect line along Mangdechhu River (Berti-Goling and Pantang -Panbhang) and Bertichhu stream (Berti - Chandigang).

### 2.1 Data collection

The Mangduechhu 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 transect were walked thrice, atleast once a month in 2018 to detect the presence of species as well as the anthropogenic threats. Both these data were obtained opportunistically along the transect maintained at 300m from a river side. To obtain the presence 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 interview with local people residing proximity to current study area. The data on anthropogenic threats were considered only when there was presence evidences of species within 50 m from the river/stream edges.

## 3. RESULTS AND DISCUSSION

### 3.1 Sighting records of White-belied heron

White bellied heron in the current study area was mostly being sighted at Goling and Berti localities (Table 1) 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). In most occasion, the species was sighted individually. However, none of the individuals were sighted from transect number 3 (T3), i.e., Pantang to Panbang.

Similarly, a random local people residing in proximity to Berti stream and along Mangdechhu river basin were interviewed to collect the responses on the sighting of WBH in an area over last five years, i.e., 2014 to 2018. A total of 26 individuals, i.e. 12 from Berti to Chandigang (T1) and 14 from Berti to Goling (T2) gave a positive sighting information of WBH atleast 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. Through this information, we can conclude that the WBH occurs throughout the year in current study area.

### 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. 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. 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 a long run, this factor will be a serious threat to the survival of

WBH as the Acharja (2019) stated that the species travel up to 25 km along the rivers for feeding purposes.

### 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 minimum of 3m and maximum of 50m from river side. The mean distance was 28.56±17.45m. Due to this factor, habitat degradation such as looping of fodder trees and clearing of areas for constructing temporary cattle herd and camps were observed. Moreover, excessive grazing of grasses and premature sapling were recorded, which affects the regeneration and loosening of river beds. Presence of such biotic factors poses immediate threats to the normal behaviour of WBH such as feeding and resting.

### 3.2.3 Quarry (Sand and Stone)

The quarry sites taking place were recorded at six localities along the Mangdechhu river basin. These activities occurs within 3-35m from river side, and has manipulated the riparian habitats in terms of disturbances. Temporary road connection to quarry sites has loosen the river bed and also the vegetation along the river bank were covered by the dust particles (pollutants) disturbing the normal growth of plant species. However, intervention has been done in which only handpicking of stone and sands were allowed since 2018. Moreover, this is being strictly monitored by the Department of Forest and Park Services. However, since most of the quarrying are occurring within the sighting sites of WBH, presence of human might impose disturbances to normal behaviour of WBH.

### 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 an 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 trap inside. It can be expected that the WBH may get entangled in those net while feeding or scanning in those shallow water.

### 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 river 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. WBH also used the river beds standing trees for resting and cover. However, tree felling was observed in the important habitat affecting the river bed ecosystem and its periphery. With all these activities, the routine behaviours of WBH gets disturbed by eliminating their habitat and changing the habitat structures. Similarly, Khrisna *et al*. (2012) stated that the river bank with sand and gravel surrounded by tropical forests harbour perfect habitat for this bird to survive.

### 3.2.6 Municipal waste disposal

A municipal waste disposal sites 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 a hazardous to aquatic environment. This can results in a dramatic decline and disrupt the community composition of fishes (Galib et al., 2018). This may also affect the abundance and fish diversity, which ultimately affect the survival of WBH in a long run. Alternately, due to modification of waste products inside water into the shape of fish may accidentally feed 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, located proximity to river side at the mean distance of 25±9.35m. 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 (Acharja, 2019). During the absence of picnickers, WBH can be spotted at this area. So, it is expected that if this activities continues, posing a frequent disturbances may lead to loss of WBH population from these sites.

## 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 to 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 and involving the local community for protection of habitats. The major disturbances area designated in this study with respect to sighting of WBH (resting and feeding) need to be protected and conserve. Lastly, the researcher need to carry out intensive research activities for longer duration to come up with concrete data on distribution and threats to WBH, which can lead to protection as well as restoration of degraded area to ensure long term survival of WBH 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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