



REPORT

Survey and identify potential
White-bellied Heron nesting and feeding sites



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Developing Ecosystem-based Solutions for Managing Biodiversity Landscapes in Bhutan

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'Developing Ecosystem-based Solutions for Managing Biodiversity Landscapes in Bhutan' is a five-year project with a special focus on strengthening the conservation efforts of the Critically Endangered White-bellied Heron (WBH), through community engagement and livelihood enhancement activities.

One of the major outputs of the project is to rehabilitate and create degraded and new potential WBH habitats (feeding, roosting, and nesting).

The survey and mapping of White-bellied Heron's active and potential nesting habitats in Bhutan was conducted in April 2022 across the country, focusing on currently occupied WBH habitats. The nest survey sites were sampled based on the WBH occurrence record as per the annual population survey conducted in March 2022. During the survey, teams covered more than 120 km of four major river basins of Punatsangchhu, Mangdichhu, Wangchhu and Chamkharchhu and major tributaries. A total of three active nests were found: two in Punatsangchhu and one in the Mangdichhu basin. Some of the highly used feeding sites and potential nesting sites were also mapped during the survey. The data were gathered using the Epicollect5 data collection platform. During the survey, key environmental and biophysical parameters of nesting and feeding sites were collected which helps to better understand nest site selection as well as future modelling of potential nesting sites across the country.

All three active nests were in the same areas as the previous years. Although no new nesting sites were discovered during the survey, the data indicate huge potential sites for nesting and feeding within six WBH habitat zones. Potential nesting and feeding sites are areas which are environmentally and biophysically similar to existing nesting and feeding sites. The survey also recorded 82 species of birds and five species of mammals.

The survey was conducted by more than 30 surveyors from the Department of Forest and Park Services, members of Local Conservation Support Groups, local communities, and staff of the Royal Society for Protection of Nature.

The activity is part of an ongoing project funded by the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU), Germany through the International Climate Initiative (IKI) and co-funded by MAVA Foundation in Switzerland.

The 2015 international workshop held in Bhutan reported less than 60 confirmed White-bellied Heron (WBH) individuals distributed among four range countries of Bhutan, India, Myanmar and China. The first breeding record of the WBH in Bhutan was confirmed with the discovery of an active nest in 2003 from Zawa under Wangdue Phodrang District. Since then, 2 – 3 isolated nests in different parts of the country, restricted to Punatsangchhu and Mangdichhu river basins. The discovery of the first WBH nest was the hope for revising the low population in the world. However, with the extremely small population and low genetic diversity, finding more active nests and breeding lines is critical for a viable wild population. Therefore, surveying and identifying potential nesting sites is paramount in complementing the holistic effort to save WBH.

There are infrequent observations of nesting and breeding of WBH from the range countries. As per the literature, there were only two nests observed before the 1930s; one was recorded in Darjeeling and another in Myanmar. Apart from Bhutan, there are few records of WBH nests made from Arunachal Pradesh in India. There are no recent records of the active nests from Myanmar.

The WBH nests discovered so far in Bhutan can be characterized as solitary nests, built mostly on the east-facing aspect, and are found adjacent to the rivers with an average distance of 74 m from the water bodies. The elevation of nests recorded ranges from 250 - 1450 masl. The nests are built on the trees either on a strong horizontal branch or on the top of the tree canopy covered mostly with thorny lianas at an average height of 18.3 m having a good vantage point of the surrounding. Although most of the older nests were found on Chirpine (*Pinus roxburghii*) the recent active nests are all on broadleaved trees in the warm broadleaved forest at lower Punatsangchhu and Mangdichhu basins. According to our record, more than 28 nests were found of which 90% were successful and a few unsuccessful between 2003 to 2022. In total the herons have bred for more than 45 times from where more than 80 juveniles are expected to have pledged. Today, most of the older nesting sites have been abandoned and have shifted to lower elevation in the warm broadleaved forest. The annual WBH population survey for the year 2022 observed three past nests are being reused for this year's breeding season by six active breeding pairs.

The survey to identify potential WBH nesting and feeding sites was carried out in potential and least-explored sites in three major river basins of Bhutan. On the basis of the frequency of WBH observation from the annual population survey, the accessibility

to survey sites, and the nesting features described earlier, the survey was carried out. The data for the existing occupied nests, threats and other wildlife species present in the area was also gathered.

This survey to identify the potential nesting sites of WBH is one of the diverse approaches toward the conservation of WBH that the Royal Society for Protection of Nature (RSPN) is initiating. Identifying potential nesting sites will help direct the future conservation plan for WBH. The data gathered on a potential feeding ground for WBH and occupancy of other associated species will also help form the scientific basis of the conservation activities in saving WBH.

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MATERIALS/METHODS

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Surveyed area:

Based on annual WBH population survey data, which is conducted annually from February to March, the potential WBH habitats that were previously least explored were selected for conducting the survey and identifying potential nesting and feeding sites. A total of 14 major sites within six WBH habitat zones were surveyed (**Figure: 1**). Sites surveyed include one site in the Mangdechhu basin (Zone IX), twelve sites that fall within three zones (Zone II, III, IV, and V) of the lower Punatsangchhu basin and one site in Wangchhu basin (Zone XV). The survey sites range from 10 km to 40 km, and all are located below 1500 masl.

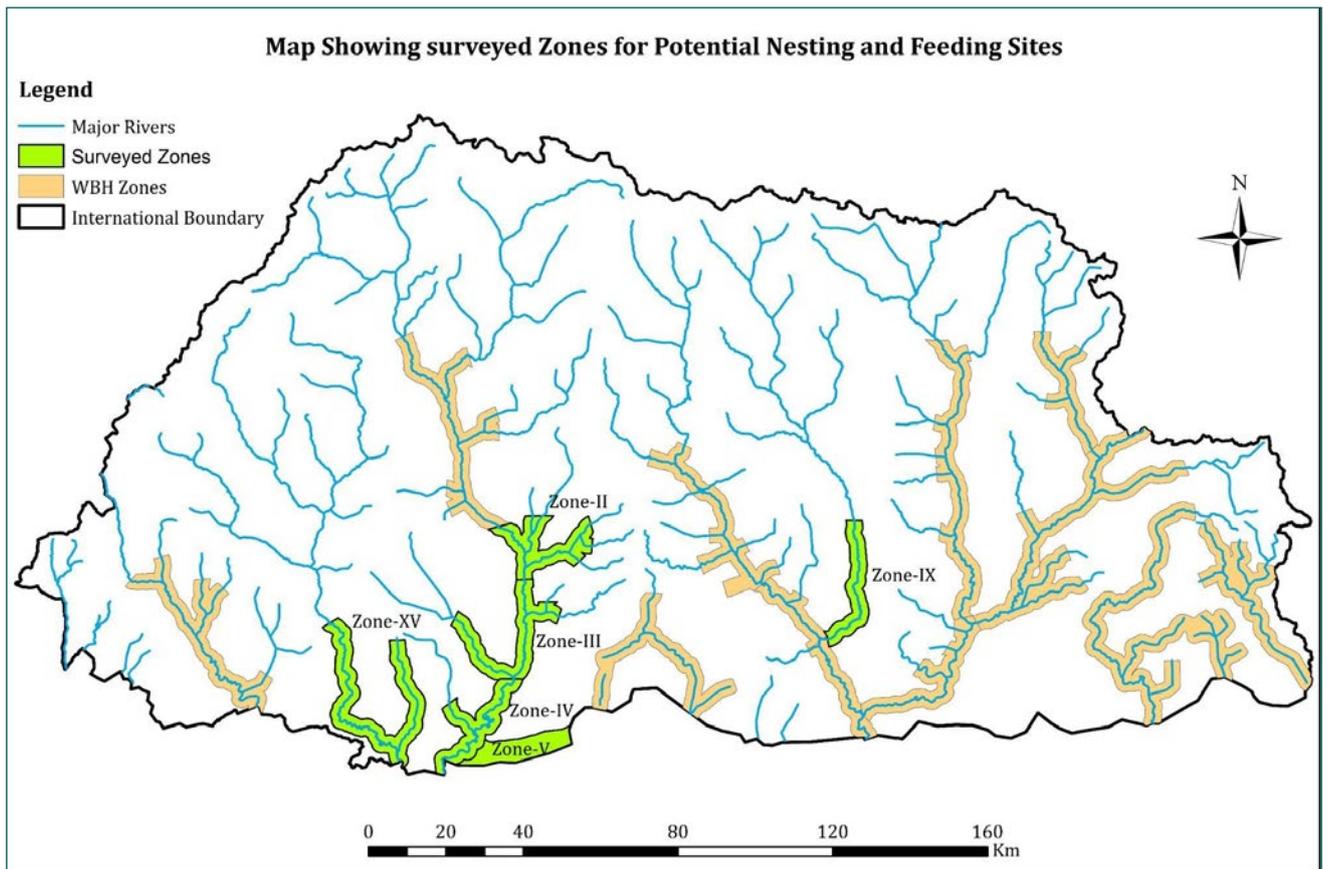


Figure 1. Map showing surveyed area

04 METHODS

The survey in identifying potential nesting and feeding sites of WBH used a modified area search method where the surveyors conducted the survey by visiting those sites that are currently occupied habitats of WBH or those habitats having the potential to be used in future by WBH. The data on WBH distribution in Bhutan in different places that are of both past and current habitats were gathered from the repository of RSPN and through the published reports of the Annual WBH Population Count.

During the survey, the surveyors walked along the river within the identified site assessing the river and riverside vegetation for potential nesting and feeding sites. The surveyors also documented associate species encountered during the survey and the threats observed. Data was gathered using the Epicollect5 V4.2.0 mobile app. The data collected includes GPS location of potential nesting/feeding sites with other parameters like aspect, slope, threats, distances to settlement, built-ups and confluences, vegetation type with dominant tree species at the site, and associate mammals and birds species encountered. If the surveyors come across the occupied WBH nest, the nest details like nest tree species, GPS coordinates, nest aspect, slope, distance to settlement, built-ups and confluences were gathered.

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DATA ANALYSIS

The data uploaded to the “WBH Nest survey” project on Epicollect5 by the surveyors were analysed after downloading the file as a CSV. On the basis of data gathered for various parameters through this study, the analysis was made to identify potential nesting and feeding sites, nests found, observed associated species and existing threats.

The cleaning and segregation, and analysis of data were done in MS Excel 2010, and illustrative maps of potential nesting and feeding site location were done using ArcGis.

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RESULTS

During the entire survey period, a total of about 120 km length of the river stretch was surveyed in six WBH habitat zones. A total of 200 data entries were uploaded by surveyors, of which 0.5% (n = 1) was for new nest discovery, 48% (n = 96) for potential nesting/feeding sites, 5% (n = 10) for WBH direct sightings, and 46.5% (n=93) of the data was for other observed mammals and associated bird species (**Figure 2**).

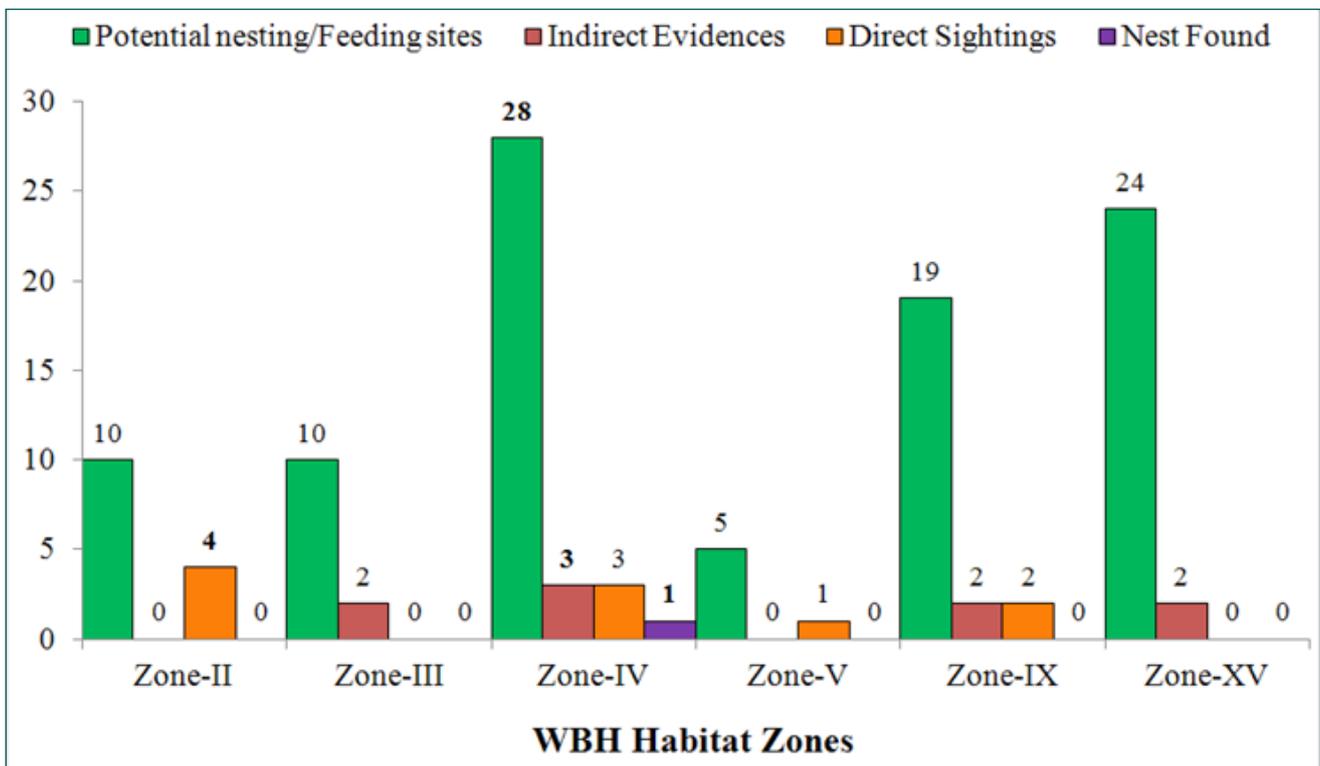


Figure 2. Showing the Potential nesting/ feeding sites with indirect signs, direct sightings and nests found in different Zones

The survey saw 96 sites within six WBH habitat zones that are potential areas for nesting or feeding. The maximum potential sites were recorded in zone IV ($n = 28$) followed by zone XV ($n= 24$) and least in zone V($n = 5$) as depicted in Figure 2. In these potential sites, 9.4% ($n= 9$) have positive signs for WBH with indirect signs of faeces and footprints observed, and a record of direct sightings made.

The dominant vegetation recorded from these sites was broadleaved forest ($n = 81$, Zone III, IV, V, IX and XV) with dominant tree species; *Bombax ceiba*, *Daubanga grandifolia*, *Schima khasiana*, *Schima wallichii*, *Terminalia tomentosa*, *Sterculia villosa*, *Altingia excelsa*, *Acer oblongum*, *Ficus semecarpifolia*, *Ficus sp.*, *Lithocarpus sp.* *Albizia sp.* *Macaranga sp.* *Ficus sp.* *Terminalis indica*, *Tramilis nudiflora*, *Pterospermum acerifolium*, *Litsea sp.* *Bischofia javanica*, *Shorea robusta*, *Michelia sp.* *Prunus sp.* *Engelhardia spicata* And *Alnus nepalensis*. In Zone II, III, and IX ($n=9$), a mixed vegetation of Chirpine and broadleaved forest observed a species composition of *Pinus roxburghii*, *Quercus glauca*, *Daubanga grandifolia*, *ficus semecarpifolia*, *Ficus species*, and *Shema wallichii*. In a Chirpine forest ($n = 8$, Zone= II), a dominant species was *Pinus roxburghii*.

Regarding the geographical feature of the landscape in these potential nesting or feeding sites, there are presence of a wide valley (40%) followed by an open valley(24%) and U-shaped valley (4%)(**Figure 3**). The aspects recorded for the sites are mostly of area facing Northeast ($n = 25$), Southeast ($n=3$) and the North($n = 1$) (**Figure 4**).

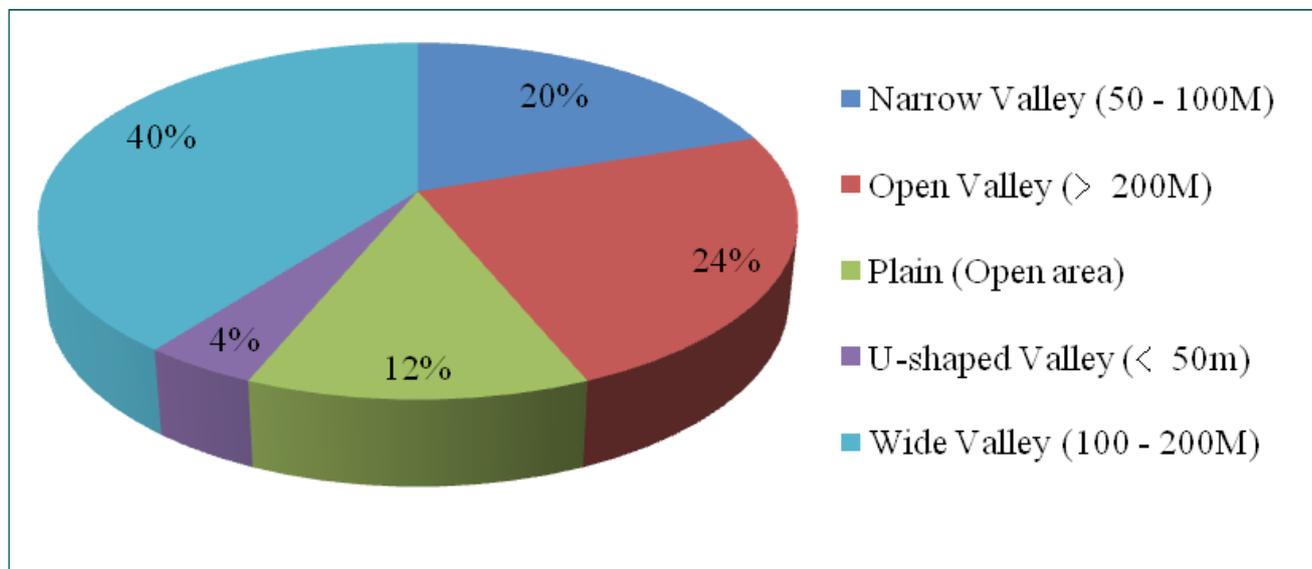


Figure 3. Graph showing the valley types in Potential nesting/feeding sites

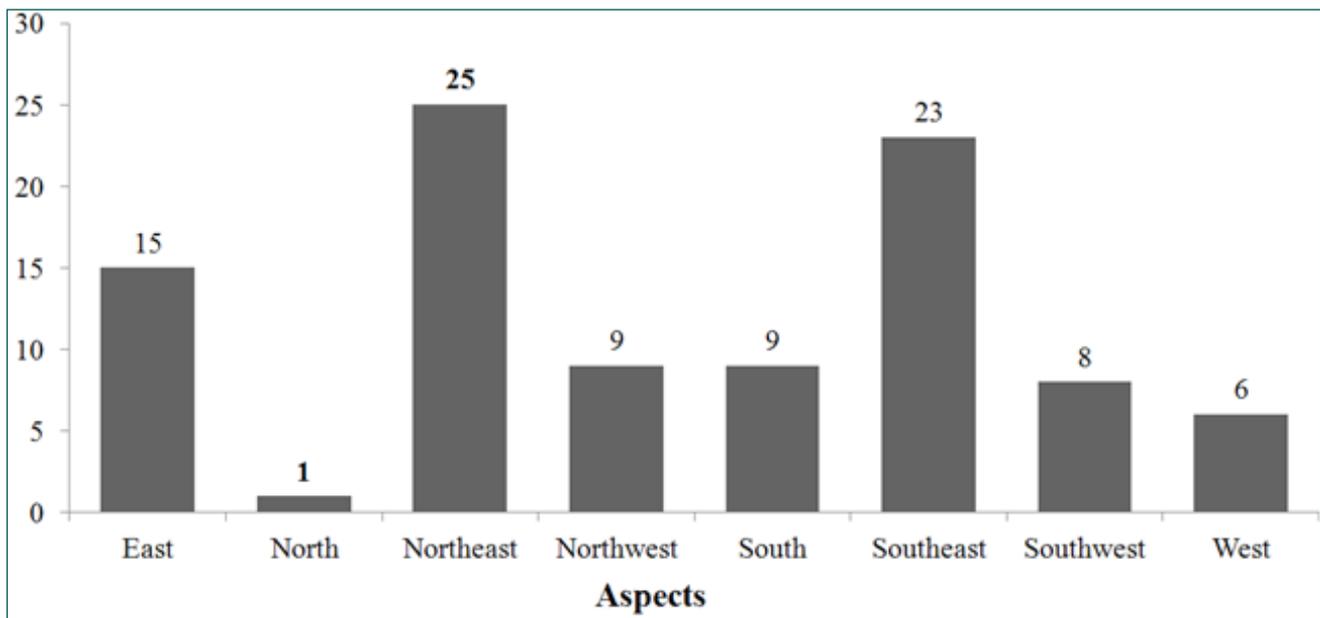


Figure 4. Graph showing the aspects of Potential nesting/feeding sites

For associated bird species and mammal species observed, the survey team has recorded a total of 531 individuals of bird species that belong to 82 species, and the mammal species of 88 individuals belonging to five species (**Annexure Table: 1 & 2**).

The new nest discovery was made in Zone IV, the lower Punatsangchhu basin (**Figure 5 & 6**). The new nest was observed in close proximity to the earlier nest that was abandoned by the breeding pair after disturbance from another heron. The new nest built was on top of the two tree canopies interconnected by woody climbers. The nest tree species are of *Pterospermum acerifolium* and *Bauhinia* sp. The height of the nest is about 19m and is located approximately 150m south of the earlier abandoned nest facing the east direction with a slope of about 58 degrees. The breeding pair of the new nest is probably the same breeding pair of the earlier nest as confirmed by a local conservation support group member in the area who regularly monitors the heron, and also the pair was seen taking the nesting materials from the abandoned nest

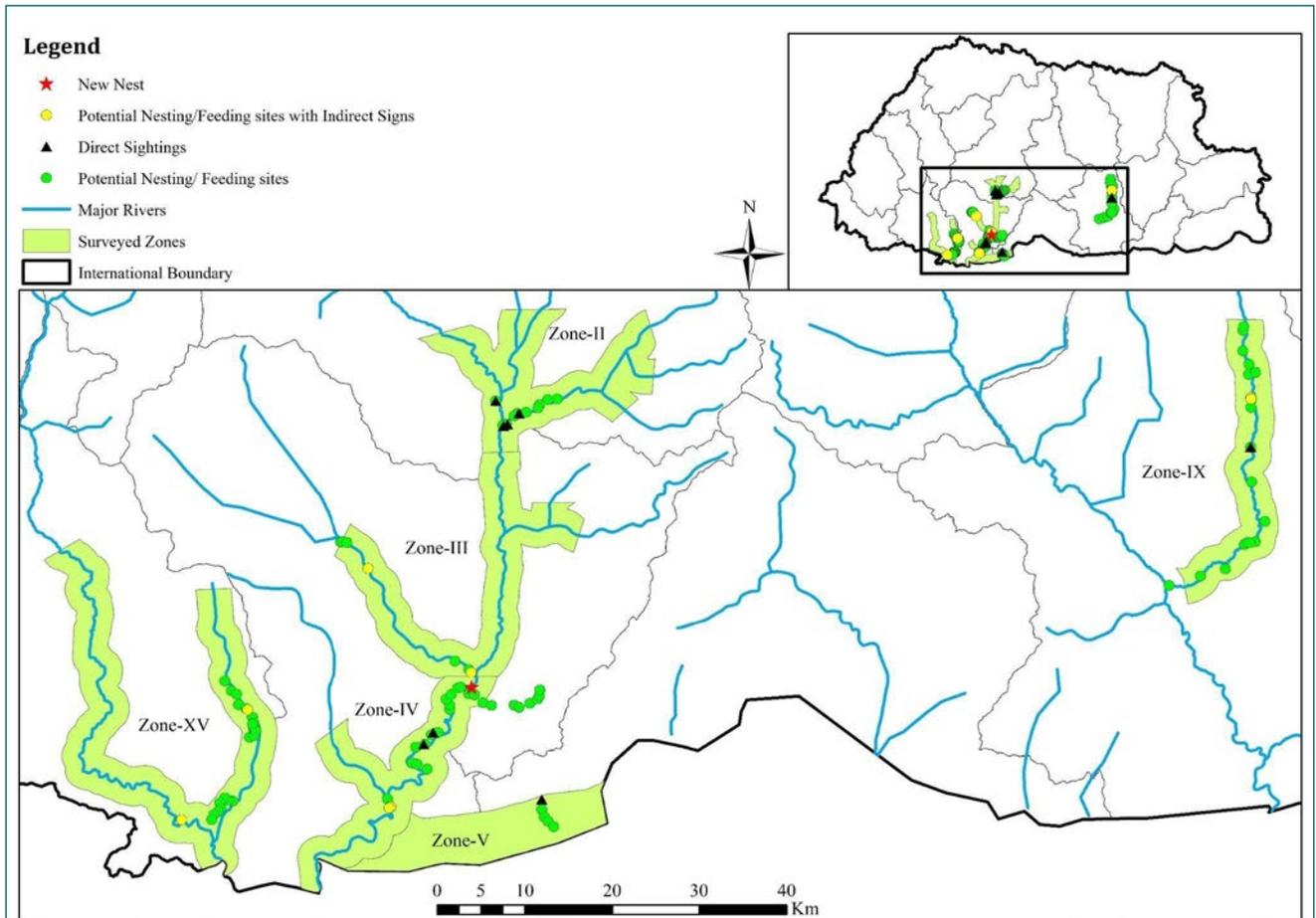


Figure 5. Map showing the Distribution of Potential nesting/feeding sites and new nest site



Figure 6. Picture of new Nest recorded in Zone IV

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THREATS

The threats described here are of any activities including the anthropogenic cause and the natural hazards that may threaten the WBH and its habitat. The survey team has made a total of 84 threat entries. The threat recorded was categorized into seven classes based on the nature of the threats. The maximum threat was fishing (63%) followed by Grazing (18%), and the least was habitat degradation and Hydropower (2%) (**Figure 7**).

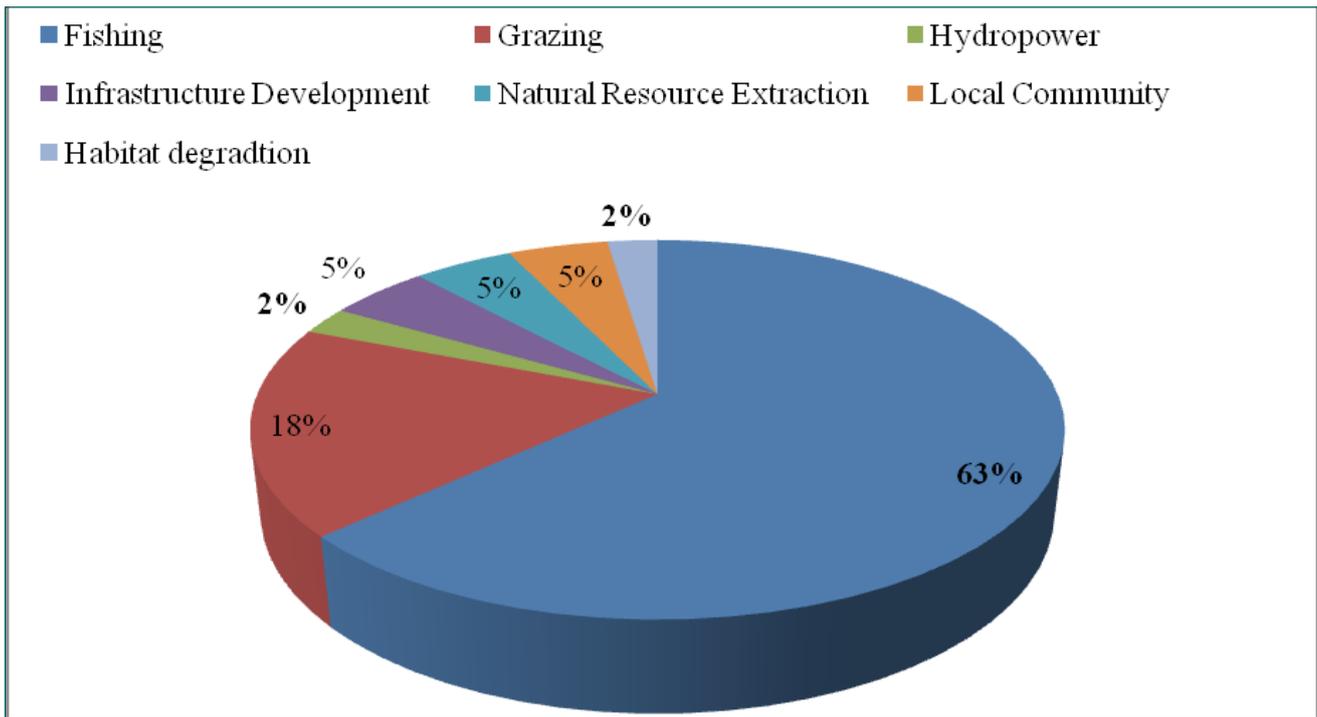


Figure 7. Showing threat distribution in different threat classes

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DISCUSSIONS

Bhutan is known to have half the global population size of WBH and it is extremely important to manage and enrich the habitat in supporting both nesting and feeding sites of heron. The survey indicates that sites such as Chamkharchu and the lower Punatshangchhu basin have some pristine habitats suitable for WBH. These sites can also be potential habitat for a future release of WBH that were bred in captivity. However, the currently occupied habitats mostly in the upper Punatshangchhu basin are threatened by a series of developmental activities happening along the riverine. Most of the past occupied nesting sites seen in upper Punatshangchhu are also abandoned and the shift

of nesting sites and feeding ground preferences in the least disturbed area towards the lower basin is evident with more sighting records from the lower basin.

If similar threats occur in the other existing and potential WBH habitats, there is a risk of driving out the WBH even from Bhutan and as well from the world.

Such a survey in future is highly recommended for other unexplored zones to further strengthen the conservation of WBH. However, due to the presence of difficult terrain and inaccessible areas, the use of modern technology like drones for future surveys will ease the gathering of more information. The survey timing, the capacity of surveyors, and field gears are also important to consider in conducting such a survey.

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ANNEXURES

Table 1. Checklist of Associate Bird species

Bird Checklist		
Family	Scientific name	Common Name
Accipitridae	<i>Ictinaetus malaiensis</i>	Black Eagle
	<i>Spilornis cheela</i>	Crested Serpent Eagle
	<i>Nisaetus nipalensis</i>	Mountain Hawk Eagle
	<i>Pernis ptilorhynchus</i>	Oriental Honey-buzzard
Alcedinidae	<i>Alcedo atthis</i>	Common Kingfisher
	<i>Megaceryle lugubris</i>	Crested Kingfisher
	<i>Alcippe nipalensis</i>	Nepal Fulvetta
	<i>Ceryle rudis</i>	Pied Kingfisher
	<i>Halcyon gularis</i>	White-throated Kingfisher
Anatidae	<i>Anser indicus</i>	Bar-headed Goose
Ardeidae	<i>Ardeola grayii</i>	Indian Pond Heron
	<i>Butorides striata</i>	Striated Heron

Family	Scientific name	Common Name
Bucerotidae	<i>Buceros bicornis</i>	Great Hornbill
	<i>Anthracoceros albirostris</i>	Oriental Pied Hornbill
	<i>Aceros nipalensis</i>	Rufous-necked Hornbill
	<i>Rhyticeros undulatus</i>	Wreathed Hornbill
Campephagidae	<i>Pericrocotus flammeus</i>	Scarlet Minivet
Charadriidae	<i>Vanellus duvaucelii</i>	River Lapwing
Fringillidae	<i>Chloris spinoides</i>	Yellow-breasted Greenfinch
Chloropseidae	<i>Chloropsis hardwickii</i>	Orange-bellied Leafbird
Ciconiidae	<i>Ciconia nigra</i>	Black Stork
Cinclidae	<i>Cinclus pallasii</i>	Brown Dipper
Cisticolidae	<i>Orthotomus sutorius</i>	Common Tailorbird
Columbidae	<i>Macropygia unchall</i>	Barred Cuckoo Dove
	<i>Spilopelia chinensis</i>	Spotted Dove
	<i>Ducula badia</i>	Mountain Imperial Pigeon
Corvidae	<i>Cissa chinensis</i>	Common Green Magpie
	<i>Dendrocitta formosae</i>	Grey Treepie
Dicruridae	<i>Eudynamys scolopaceus</i>	Asian Koel
	<i>Clamator coromandus</i>	Chestnut-winged Cuckoo
	<i>Centropus bengalensis</i>	Lesser Coucal
	<i>Dicrurus leucophaeus</i>	Ashy Drongo
	<i>Dicrurus macrocercus</i>	Black Drongo
	<i>Dicrurus aeneus</i>	Bronzed Drongo
	<i>Dicrurus paradiseus</i>	Greater Racket-tailed Drongo
Estrildidae	<i>Lonchura striata</i>	White-rumped Munia
Eurylaimidae	<i>Psarisomus dalhousiae</i>	Long-tailed Broadbill

Family	Scientific name	Common Name
Falconidae	<i>Microhierax caerulescens</i>	Collared Falconet
Laniidae	<i>Lanius tephronotus</i>	Grey-backed Shrike
Leiothrichidae	<i>Argya striata</i>	Jungle Babbler
	<i>Garrulax leucolophus</i>	White-crested Laughingthrush
Megalaimidae	<i>Psilopogon virens</i>	Great Barbet
	<i>Psilopogon asiaticus</i>	Blue-throated Barbet
Meropidae	<i>Merops leschenaulti</i>	Chestnut-headed Bee-eater
Motacillidae	<i>Motacilla cinerea</i>	Grey Wagtail
	<i>Anthus roseatus</i>	Rosy Pipit
	<i>Motacilla alba</i>	White Wagtail
	<i>Motacilla maderaspatensis</i>	White-browed Wagtail
Muscicapidae	<i>Monticola solitarius</i>	Blue Rock Thrush
	<i>Myophonus caeruleus</i>	Blue Whistling Thrush
	<i>Phoenicurus coeruleocephala</i>	Blue-capped Redstart
	<i>Saxicola torquatus</i>	Common Stonechat
	<i>Saxicola ferreus</i>	Grey Bushchat
	<i>Phoenicurus hodgsoni</i>	Hodgson's Redstart
	<i>Copsychus saularis</i>	Oriental Magpie Robin
	<i>Cyornis unicolor</i>	Pale Blue Flycatcher
	<i>Phoenicurus fuliginosus</i>	Plumbeous Water-redstart
	<i>Enicurus schistaceus</i>	Slaty-backed Forktail
	<i>Niltava macgrigoriae</i>	Small Niltava
<i>Phoenicurus leucocephalus</i>	White-capped Water Redstart	
Paridae	<i>Melanochlora sultanea</i>	Sultan Tit
Passeridae	<i>Passer montanus</i>	Eurasian Tree Sparrow
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant

Family	Scientific name	Common Name
Phalacrocoracidae	<i>Microcarbo niger</i>	Little Cormorant
Phasianidae	<i>Gallus gallus</i>	Red Junglefowl
Picidae	<i>Chrysophlegma flavinucha</i>	Greater Yellownappe
	<i>Dendropicos spodocephalus</i>	Grey-headed Woodpecker
Pycnonotidae	<i>Hemixos flavala</i>	Ashy Bulbul
Pycnonotidae	<i>Hypsipetes leucocephalus</i>	Black Bulbul
	<i>Pycnonotus flaviventris</i>	Black-crested Bulbul
	<i>Pycnonotus leucogenys</i>	Himalayan Bulbul
	<i>Pycnonotus cafer</i>	Red-vented Bulbul
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper
Strigidae	<i>Ketupa zeylonensis</i>	Brown Fish Owl
	<i>Bubo nipalensis</i>	Spot-bellied Eagle Owl
	<i>Ketupa flavipes</i>	Tawny Fish Owl
Sturnidae	<i>Acridotheres fuscus</i>	Jungle Myna
	<i>Sturnia malabarica</i>	Chestnut-tailed Starling
Timaliidae	<i>Erythrogenys erythrogenys</i>	Rusty-cheeked Scimitar Babbler
Zosteropidae	<i>Zosterops palpebrosus</i>	Indian White-eye
	<i>Yuhina flavicollis</i>	Whiskered Yuhina
	<i>Yuhina bakeri</i>	White-naped Yuhina

Table 2. Checklist of Associate mammals

Family	Scientific Name	Common Name
Bovidae	<i>Naemorhedus goral</i>	Goral
	<i>Capricornis thar</i>	Serow
Cercopithecidae	<i>Trachypithecus geei</i>	Golden Langur
	<i>Semnopithecus entellus</i>	Hanuman Langur/Gray Langur
Cervidae	<i>Muntiacus muntjac</i>	Barking Deer
Elephantidae	<i>Elephas maximus</i>	Asian Elephant

Table 3. Name of the Surveyors

Sl.No	Name	Agency
1	Mr. Indra P. Acharja	RSPN
2	Mr. Tshering Tobgay	RSPN
3	Mr. Thinley Phuntsho	RSPN
4	Mr. Thserwang Lhendup	RSPN
5	Mr. Sonam Tshering	RSPN
6	Mr. Tsheten Dorji	RSPN
7	Mr. Narayan Ghalley	RSPN
8	Mr. Dhendup Wangchuk	RSPN
9	Mr. Tshering Dendup	RSPN
10	Mr. Tenzin Nima	RSPN
11	Mr. Lungten	RSPN
12	Mr. Gyeltshen	Local Guide
13	Mr. Ekta Subba	LCSG
14	Mr. Sanjit Subba	Local Guide
15	Mr. Karma Jamtsho	Local Guide
16	Mr. Garjaman Rai	LCSG

17	Mr. Gyan Kumar Subba	LCSG
18	Mr. Nar Bahadur Rai	LCSG
19	Mr. Penjor	LCSG
20	Mr. Gyenpa	DoFPS
21	Mr. Sherub Jamtsho	DoFPS
22	Mr. Thinley Wangchuk	DoFPS
23	Mr. Dorji Rabten	DoFPS
24	Mr. Kuenley Gyeltshen	DoFPS
25	Mr. Tshering Nidup	DoFPS
26	Mr. Pema Jamtsho	DoFPS
27	Mr. Nima Tshering	DoFPS
28	Mr. Tashi Phuntsho	DoFPS
29	Mr. Kunzang Lhendup	DoFPS
30	Mr. Dorji	DoFPS
31	Mr. Penden Wangchuk	DoFPS
32	Mr. Chimi	DoFPS
33	Mr. Ugyen Dorji	DoFPS



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