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**Short Communication**

# FIRST RECORD OF SUCCESSFUL BREEDING OF THE CRITICALLY ENDANGERED WHITE-BELLIED HERON (*ARDEA INSIGNIS*) IN BROADLEAVED TREES

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## ABSTRACT

The global population of White-bellied Heron *Ardea insignis* is likely in rapid decline across its native range and verging on extinction. Although studies focusing on foraging habitat preferences and feeding ecology have been conducted in the past, its nesting ecology and breeding biology are poorly understood. Moreover, earlier records indicated that the bird exclusively nests on chir pine trees in temperate forest between the altitudes of 600-1200 m. Here, we report the first record of successful breeding on broadleaved trees in Bhutan. The two nests we discovered were platforms made from dried twigs and small leafless branches on the topmost canopies of two broadleaved species *Michelia champaca*, and *Pterospermum acerifolium* in riverine forest. Five juveniles (two from one nest and three from the other) fledged from these nests which were at much lower altitudes than previously known. These findings suggest a possibility of a wider distribution of nesting habitat in the region and a need for further research and protection of this heron's primary riverine habitat to save this bird from extinction.

**Keywords:** *Ardea insignis*, White-bellied Heron, Nesting, Broad-leaved trees, Conservation.
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## INTRODUCTION

The White-bellied Heron (WBH) (*Ardea insignis*: Hume, 1878), with an approximate global population of 50-249 individuals, is considered critically endangered (Birdlife International, 2018). As such, it is possibly the world's rarest heron (Glenday, 2014). WBH is both a riverine and a terrestrial species depending on lakes and small to large rivers for its foraging and chir pine (*Pinus roxburghii*) forests for its nesting (Price and Goodman, 2015). Of the 60 individuals of WBH confirmed across its range, 28 were recorded from Bhutan, 23 from Myanmar, 8 from India and one from China (RSPN, 2015). This number appears to have declined further since then (see below). WBH is currently threatened by habitat degradation and loss from hydropower construction, logging, mining and human induced forest fire (Dema *et al*., 2018).

In Bhutan, the Royal Society for the Protection of Nature (RSPN) recorded 14 WBH individuals in their first survey of the species in 2003 (RSPN, 2017). The estimated population increased until it reached a plateau in 2008 and 2009 which also saw the highest record of 30 individuals. However, in the last three years from 2016 to 2018, the population of WBH appears to have declined at an average of 2 individuals per year (RSPN, 2017). The latest population census found only 24 individuals of WBH detected in the river basins of Bhutan (RSPN, 2018).

Perhaps the first nest was reported from India which was a platform of sticks placed on the top of a large tree in the inaccessible terai swampland (Hume and Oates, 1890) and from Myanmar which was also placed on a tall tree with four eggs (Baker, 1930). After 73 years since the last nest was sighted in the world, the first nest in Bhutan was recorded in 2003 at Zawa, a remote village in the Wangduephodrang district, in a chir pine (*Pinus roxburghii*) tree (RSPN, 2011). Of the 27 active nests observed from 2003 to 2017 in Bhutan, all were found exclusively in *P. roxburghii* within altitudes of 600-1500 m.a.s.l. (RSPN, 2015). However, for the 2018 breeding season, no nest was found in *P. roxburghii* from the known habitat range in Bhutan.

The nests built in the *P. roxburghii* had an average diameter at breast height of 67 cm, and 27-43 m tall. RSPN in 2011 found that the nests in the *P. roxburghii* were located 12-22 m from the ground on large central branches which were usually forked. WBH were found to nest mostly in large diameter and tall sparsely distributed *P. roxburghii* trees on steep hills which had no or little undergrowth of shrubs and trees below them (RSPN, 2011). Based on the limited data available on the breeding behavior of the WBH, it suggested that tall trees were required for the nesting (BirdLife International, 2001).

The objective of this study was to describe two successful nests of White-bellied Heron in broad-leaved trees observed in two river basins in Bhutan. This is important because this may suggest that additional vegetation types need protection as potential WBH nesting habitat.

## MATERIALS AND METHODS

**Study Area**: Our study sites covered two major river basins within the confirmed habitat and range of WBH in Bhutan: Punatsangchhu (chhu = river) basin falling within the jurisdiction of Punakha, Wangduephodrang, Tsirang and Dagana districts; and Manas River of the Mangdechhu basin of Zhemgang district (Figure 1). The nesting site in Wagletar, Tsirang district, had approximately 88% forest cover, of which 77% was broadleaved; 7% chir pine, 3% mixed conifers and 1% fir forest (FRMD, 2016). The nesting site in Tsaidang, Zhemgang district, had 94% forest cover of which 89% was broadleaved, with 1% chir pine, 3% mixed-conifer and 1% fir forest (FRMD, 2016).

**Nesting surveys and nest measurement**: An area count survey, following Kushlan (2011) was combined with systematic searching (Dorge *et al*., 2014; Fu *et al*., 2016). About 2-4 observers surveyed for nests along the major river basins and small streams which had a history of WBH sightings. The searches lasted for six months from the beginning of the breeding season at the start of February and continued until early July 2018. The observations were made using 8x42 binoculars and a 20–60x monocular spotting scope between 0530-1830 hours. The nests were spotted by tracking foraging adults often by trailing, using a car at a speed of 50–60 km per hour on roads running parallel to the rivers and through visual scanning of the forest within 10-100 m of the nearest riverbanks. A rangefinder (1 m accuracy) was used to measure the height of the nest from the ground and the distance from the nearest riverbank. Digital calipers (0.01 mm accuracy) were used to measure the diameter of the nesting materials. A measuring tape was used to measure the diameter of the nests and diameter at breast height of the two nesting trees.

## RESULTS

**Nest observations at Tsaidang**: A total of 28 days (224 hours) of continuous nest survey effort was used to locate the nests. At 07:45 on June 17, 2018, one nest was found in Tsaidang, Zhemgang district, in a broad-leaved tree species (*Michelia champaca*) after following an adult WBH, which flew 800 m downstream from its foraging site. The nesting tree was located at 432 m.a.s.l. The nest was located at a height of 23.5 m above the ground on the topmost branch, which was exposed and forked, providing support to the nest. The nesting tree was located at about 18 m from the nearest riverbank and had a diameter at breast height of 65 cm. The nest structure was an open platform made exclusively from dry twigs of diameter 0.5-2.5 cm. The height of the nesting tree was 23.5 m from the ground. The diameter of the nest was 105 cm.

We saw two juveniles and a parent on a nearby branch of the nesting tree (Figure 2). Upon seeing another parent approaching the nest, the other parent flew away. We estimated that the juveniles were ca. 60-65 days old based on a nestling period of 71-73 days from previous observations in captivity (n = 1) and from the wild (n = 5) in 2010 (Price and Goodman, 2015). Additionally, these juveniles fledged ten days after our initial observations.

**Nest observations at Wagletar**: In the morning of June 23, 2018, we saw three WBH juveniles along sandbars of mainstream riverbank of Punatsangchhu. They were found in a proximity of about 1-5 m from each other. We confirmed that all three WBH were juveniles only after one of the parents came to feed them. They also had short scapulars, lace-like white plumes on the nape, and a pale yellowish underbelly (Fig. 3). About 100 m from the nearest riverbank where these juveniles were found, we saw the nest from which we assumed these juveniles had fledged. It was also in a broad-leaved tree (*Pterospermum acerifolium*). The nesting tree was located at 443 m.a.s.l. The nest was located at a height of 25.2 m above the ground on the canopy of the tree with a diameter at breast height of 49.5 cm. The nest structure was an open cup made exclusively from dry twigs of diameter 0.5-2.5 cm (Fig. 4). The height of the nesting tree was 26.4 m from the ground. The diameter of the nest was 121 cm and 20 cm deep.

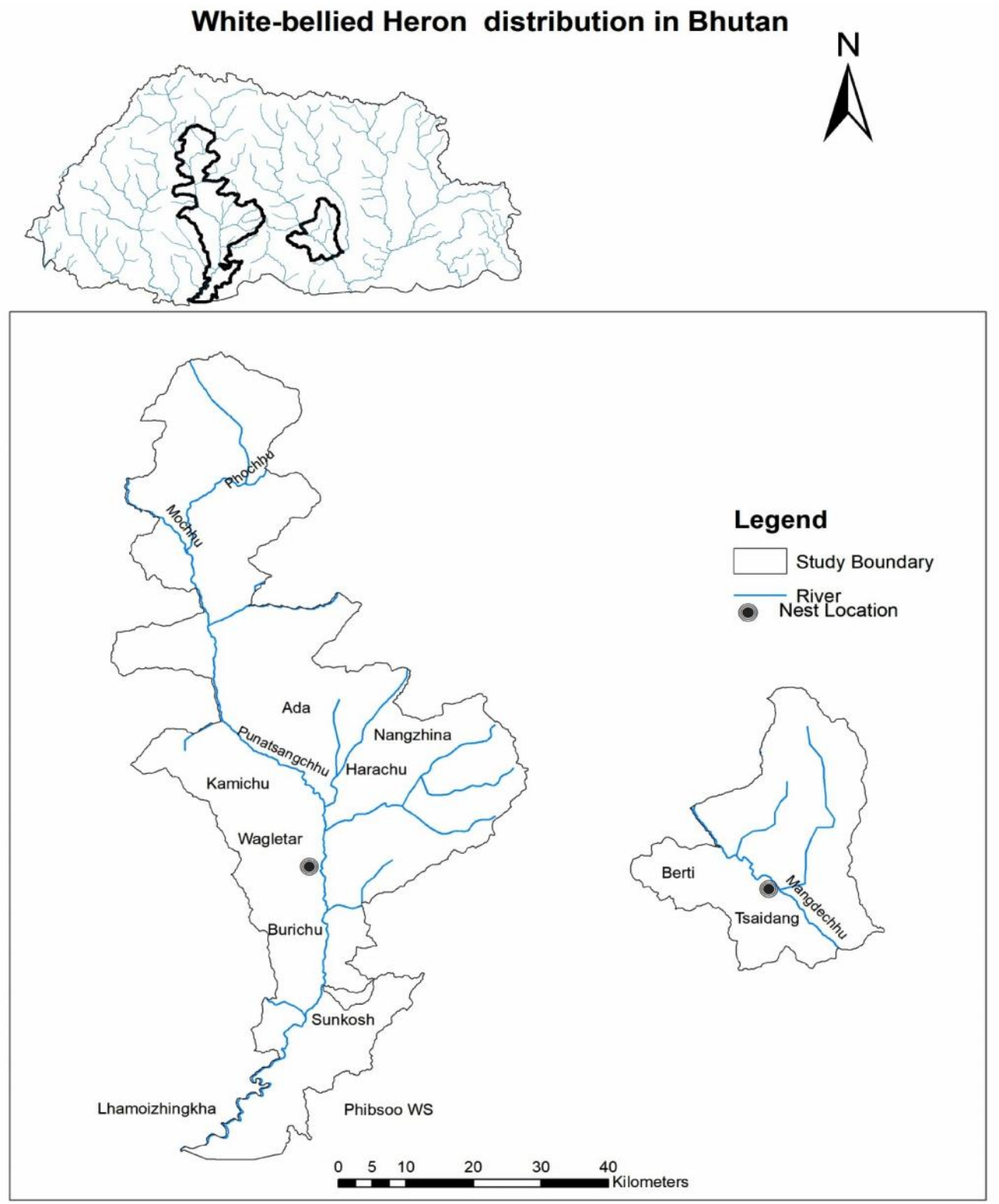


**Figure 1. Locations of the successful 2018 nests in Tsaidang within Mangde-Chhu (bottom right) and Wagletar of Punatsang-Chhu (bottom left) basins**

**Figure 2. A parent and two WBH Juveniles on a nesting tree *Michelia champaca* in Tsaidang, Mangde-Chhu basin**

**Figure 3. WBH juveniles perched in the nest (right) and on the branch of a nesting tree (left)**

**Figure 4. A nest of the WBH in Wagletar, Punatsang-Chhu basin.**

## DISCUSSION

These are the first records of successful breeding of WBH in broad-leaved trees in Bhutan. Globally, the first recorded nest of WBH in a broad-leaved tree, *Terminalia myriocarpa* was observed in Namdapha Tiger Reserve, Arunachal Pradesh, India in 2014 (Mondal and Maheswaran, 2014). However, the researchers could not continue observing the nest before ascertaining the outcome of the nest. Therefore, our finding not only reinforces previous findings but also provides empirical evidence to support that WBH can also breed in the broad-leaved trees.

Further, in 2019 two additional nests were reported by local observers from broad-leaved trees from Punatsangchhu and Mangdechhu river basins (T. Lhendup pers. comm.). Nests in broad-leaved trees may be less prone to fire, since chir pine forest burns every year, especially during the early and mid-breeding season (February-April). This coincides with the dry winter to early spring seasons, the driest period of the year, when the country receives less than 50 mm of rainfall (The World Bank Group, 2018). At least 3 nests have been lost to fire in the recent past (RSPN, 2011).

The use of broad-leaved trees for nesting also suggests that conserving broad-leaved forest at least within the foraging range of this heron's primary riverine habitat in Bhutan and other range countries (Myanmar, India, and China) would help secure and enhance its nesting habitat. This also suggests that besides the chir pine (*Pinus roxburghii*), broad-leaved trees are an important nesting habitat for their breeding success. Thus, we recommend that ensuring riverbanks at both sides to remain forested at least within a radius of 100-500 m from their foraging habitats to prevent soil erosion, safeguard dispersal corridors for all birds and other wildlife as well as protect WBH nesting habitat.

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