

The birds of the Longbao National Nature Reserve and surrounding basin, Yushu county, Qinghai, China

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The Longbao National Nature Reserve lies at an elevation of 4,200 m on the Tibetan Plateau of southern Qinghai province, China. The reserve was established in 1986 as Qinghai's second national nature reserve and is the third most important known breeding ground of the Black-necked Crane *Grus nigricollis*. From October 2010 to July 2012, the authors conducted 18 complete and several part circuits of the main Longbao wetland at various times of year from early April to mid-November, the main residence period of migratory birds at the wetland. During these circuits, counts of all cranes sighted on the main wetland were made, as were extensive counts of other waterbird and non-waterbird species. In addition, avifauna on the Longbao wetland and in the surrounding basin was observed extensively on non-survey circuit days. In total, 67 bird species were recorded in the Longbao basin over the 21-month survey period, including 39 species with no known earlier records, extending the list of birds recorded at Longbao to 71. Direct threats to breeding waterbirds at Longbao include loose and feral herding dogs and recently erected powerlines that, at present, lack markers to increase their visibility to large passing birds. Indirect threats to waterfowl breeding on the Longbao wetland include increased livestock grazing pressure on the more resilient pastures of the main wetland, as pasture conditions on the hill slopes surrounding the wetland rapidly deteriorate, and climate change, which is believed to be causing the large-scale drying up of shallow wetlands in the region, primarily as a result of permafrost degradation and increased evaporation. The sum total of peak counts of individual waterbird species at Longbao in 2011 was 11,266. Notably, the Black-necked Crane population summering at the reserve roughly quadrupled between 1984 and 2011. Evidence is presented that the Longbao National Nature Reserve qualifies for Ramsar status under Ramsar Criteria 2 and 6.

INTRODUCTION

The Longbao National Nature Reserve (NNR) (33.183°N 96.583°E) is located on the Tibetan Plateau in southern Qinghai province, about 50 km north-west of the town of Jiegu in Yushu county, beside the highway connecting Yushu and Zhiduo counties. The Longbao reserve was established as Qinghai province's second NNR in 1986 and is the third most important known breeding ground of the Black-necked Crane *Grus nigricollis* after the Ruoergai Wetlands in northern Sichuan and the remote Seling Co Lake Region of the central Tibet autonomous region (Bishop 1996). The reserve covers roughly 100 km² comprising the boggy bottom of a long, fairly broad mountain basin, with a maximum length of 30 km and maximum width of 5 km. The reserve's primary ecological importance is its main wetland, which forms the eastern half of the reserve and is approximately 14 km long with a maximum width of about 3.5 km and is located at about 4,200 m. The entire nature reserve is flanked by steep ridges that typically rise up to 750 m above the valley floor. While lying outside the boundaries of the Longbao NNR, these surrounding mountains are nominally protected as part of the administratively distinct Sanjiangyuan NNR that protects the vast Yellow, Yangtze and Mekong river source regions of Qinghai province.

The main Longbao wetland is fed by groundwater, streams, precipitation and snow melt, and is frozen over from about late November to early March. The entire Longbao basin drains into the Yi Chu River, located north-west of the main wetland, a short tributary of the nearby Tongtian (upper Yangtze) River. Ecosystems in the reserve are primarily a mix of wet and dry *Kobresia/Carex* sedge meadows, but also include aquatic ecosystems such as lake, pond, marsh and riparian corridor-type ecosystems (Li & Zhou 1985, Li & Li 2005). Some limited willow *Salix* shrublands occur on hill slopes along the south-west of the main wetland. Mammals frequently seen on the wetland during this survey included the Tibetan Fox *Vulpes ferrilata*, Red Fox *V. vulpes*, Altai Weasel *Mustela altaica*, Himalayan Marmot *Marmota himalayana*, Woolly Hare *Lepus oiostolus*, Black-lipped Pika *Ochotona curzoniae* and a vole *Microtus*. Grey Wolf *Canis lupus*, Tibetan Gazelle *Procapra picticaudata*, White-lipped Deer *Cervus*

albirostris, Blue Sheep *Pseudois nayaur* and Snow Leopard *Uncia uncia* inhabit the mountains ringing the Longbao basin. Eurasian Otter *Lutra lutra* and various rodents additional to the foregoing have also been recorded at Longbao (Li & Zhou 1985).

Human presence in the Longbao NNR includes about 150 yak-herding households residing on or within 1 km of the perimeter of the main wetland, who all rely heavily on the wetland's pasture for much of the year. Most of the wetland has been divided into individual household pasture allotments, and since 1997 these single-family allotments have been fenced off, although some tracts of unfenced wetland pasture used collectively by groups of families remain. These households own an average of about 40 yaks each with a few households owning small numbers of sheep, goats and horses. In addition, a large village lies at the eastern end of the reserve, just north of the highway to Yushu, while Longbao, the local administrative town, is located on the highway at the western end of the reserve.

Because of its easy access, narrow geography and large intact wetland, the Longbao NNR is the premier site in Yushu prefecture for observing waterfowl, with the first geese and ducks arriving in early March and the last departing in mid to late November. However, until the present study, no in depth research on Longbao's avifauna had been conducted throughout the eight-month annual residence of migratory birds. Earlier knowledge of bird life at Longbao is based largely on Black-necked Crane breeding studies conducted during the 1980s by Li & Zhou (1985) and Li & Ma (1989), with the former having compiled a list of 31 bird species in spring and summer 1984; a single additional species was recorded by Li & Ma in summer 1988 (Table 1). Lin (2003) stated that there are 30 species of birds in the reserve, but gave no species list.

The avifauna survey described here took place over parts of the annual occurrence of migratory waterfowl in 2010, 2011 and 2012. The impetus behind this survey was to improve protection of cranes in the reserve and to determine if it qualified for designation as a Ramsar Wetland of International Importance based on its waterbirds. All bird species seen during the surveys were recorded, with detailed counts of all species observed on the main wetland in 2011.

METHODS

A preliminary survey on 28 October 2010 consisted of a cursory 'binoculars only' practice count of Black-necked Cranes on the main Longbao wetland. The wetland was circled clockwise by car; 118 Black-necked Cranes were counted, with eight other bird species recorded. This practice count established the basic survey methodology for the 2011 survey, which again consisted of driving clockwise around the entire perimeter (about 35 km) of the main wetland. This circuit started from the reserve headquarters and generally involved counting all birds seen at each of 22 set survey points established at good viewing locations giving full coverage of the wetland.

Between 6 April and 16 November 2011, a rotating team of three counters made 15 full and two part circuits, using spotting scopes and binoculars (Appendices 1 & 2). No count was made during August. In general, the entire circuit was counted in one day although one circuit was divided between two days on 12 and 13 May (Appendices 1 & 2). In addition to the formal survey circuits, supplementary observations were made during short walks along the wetland and in the surrounding mountains. Birds were identified using MacKinnon & Phillipps (2000) and Grimmett *et al.* (1999).

RESULTS

In total, 67 bird species were recorded in the Longbao basin over the nearly 21-month survey period, including 39 species with no known earlier records there. This expanded the list of birds recorded there from 32 species to 71 (Table 1); other unpublished records may exist. The counts during 2011 indicate how waterbird populations change on the main wetland from spring to autumn (Appendix 1). These were separated from counts made of non-waterbirds in order to determine if Longbao NNR qualifies for Ramsar designation based on Ramsar Criterion 5 (Appendix 2). Several bird species seen in 2011 do not appear in the bird count tables because they were not seen during counts. In 2012, full circuits of the wetland were made on 20 April and 30 June. Full counts were only made of Black-necked Cranes, although other bird species sighted were noted; counts were as follows: on 20 April – adult Black-necked Crane 178, Common Crane 7, on 30 June – adult Black-necked Crane 128, Black-necked Crane chicks 21, Common Crane 6, Cattle Egret 130.

Notes on species of interest at Longbao with respect to conservation and/or changing status follow.

Table 1. List of bird species recorded at the Longbao National Nature Reserve, 1984–2012.

Seasonality of occurrence: SV = Summer Visitor, PM = Passage Migrant, R = Resident (including altitudinal migrants).

Abundance categories: A = Abundant: regular in very large numbers, C = Common: regular in large numbers, F = Fairly common: regular in moderate numbers, U = Uncommon: somewhat regular in small numbers, R = Rare: occasional in very small numbers.

Name	Seasonality	Abundance	Name	Seasonality	Abundance
Bar-headed Goose <i>Anser indicus</i> ¹	SV	A	Eurasian Hobby <i>Falco subbuteo</i>	PM	R
Ruddy Shelduck <i>Tadorna ferruginea</i> ¹	SV	A	Saker Falcon <i>Falco cherrug</i>	R	F
Gadwall <i>Anas strepera</i>	PM	R	Great Crested Grebe <i>Podiceps cristatus</i>	SV	A
Mallard <i>Anas platyrhynchos</i>	PM	F	Little Egret <i>Egretta garzetta</i>	SV	U
Common Pochard <i>Aythya ferina</i>	PM	U	Great Egret <i>Casmerodius albus</i>	PM	U
Ferruginous Pochard <i>Aythya nyroca</i> ¹	SV	A	Cattle Egret <i>Bubulcus ibis</i>	SV	A
Common Goldeneye <i>Bucephala clangula</i>	PM	R	Grey Heron <i>Ardea cinerea</i>	PM	U
Common Merganser <i>Mergus merganser</i> ¹	PM	F	Black Stork <i>Ciconia nigra</i> ³	PM	R
Common Hoopoe <i>Upupa epops</i> ¹	PM	U	Hume's Groundpecker <i>Pseudopodoces humilis</i> ¹	R	C
Fork-tailed Swift <i>Apus pacificus</i>	PM	U	Red-billed Chough <i>Pyrrhocorax pyrrhocorax</i>	R	F
Little Owl <i>Athene noctua</i> ¹	R	F	Common Raven <i>Corvus corax</i> ¹	R	C
Hill Pigeon <i>Columba rupestris</i> ¹	R	F	Black Drongo <i>Dicrurus macrocercus</i>	PM	R
Common Crane <i>Grus grus</i>	PM	F	Daurian Redstart <i>Phoenicurus aureus</i>	PM	U
Black-necked Crane <i>Grus nigricollis</i> ¹	SV	A	Black Redstart <i>Phoenicurus ochruros</i> ¹	SV	F
Common Moorhen <i>Gallinula chloropus</i>	SV	R	White-winged Redstart <i>Phoenicurus erythrogaster</i> ¹	R	U
Common Coot <i>Fulica atra</i>	SV	C	Hodgson's Redstart <i>Phoenicurus hodgsoni</i> ²	PM	U
Black-tailed Godwit <i>Limosa limosa</i>	PM	U	Hodgson's Bushchat <i>Saxicola insignis</i>	PM	R
Common Redshank <i>Tringa totanus</i> ¹	SV	A	Sand Martin <i>Riparia riparia</i> ¹	SV	F
Common Sandpiper <i>Actitis hypoleucos</i>	SV	R	Barn Swallow <i>Hirundo rustica</i> ¹	SV	F
Temminck's Stint <i>Calidris temminckii</i>	PM	F	Tibetan Lark <i>Melanocorypha maxima</i> ¹	R	F
Little Ringed Plover <i>Charadrius dubius</i>	PM	R	Hume's Short-toed Lark <i>Calandrella acutirostris</i> ¹	SV	U
Lesser Sand Plover <i>Charadrius mongolus</i>	PM	R	Oriental Skylark <i>Alauda gulgula</i>	SV	U
Pallas's Gull <i>Larus ichthyætos</i>	SV	F	Horned Lark <i>Eremophila alpestris</i>	R	C
Brown-headed Gull <i>Larus brunnecephalus</i>	PM	C	Eurasian Tree Sparrow <i>Passer montanus</i> ¹	R	C
Black-headed Gull <i>Larus ridibundus</i>	PM	U	Tibetan Snowfinch <i>Montifringilla adamsi</i>	R	F
Common Tern <i>Sterna hirundo</i> ¹	SV	F	White-rumped Snowfinch <i>Pyrgilauda taczanowskii</i>	R	C
Whiskered Tern <i>Chlidonias hybridus</i>	SV	F	Rufous-necked Snowfinch <i>Pyrgilauda ruficollis</i> ¹	R	A
Black Kite <i>Milvus migrans lineatus</i> ¹	PM	F	White Wagtail <i>Motacilla alba</i> ¹	SV	U
Himalayan Griffon <i>Gyps himalayensis</i>	R	C	Citrine Wagtail <i>Motacilla citreola</i>	SV	U
Cinereous Vulture <i>Aegypius monachus</i> ¹	R	U	Yellow Wagtail <i>Motacilla flava</i> ¹	PM	R
Lammergeier <i>Gypaetus barbatus</i>	R	F	Robin Accentor <i>Prunella rubeculoides</i>	R	U
Upland Buzzard <i>Buteo hemilasius</i> ¹	R	C	Twite <i>Carduelis flavirostris</i> ¹	R	U
Pallas's Fish Eagle <i>Haliaeetus leucorhynchus</i> ²	PM	R	Brandt's Mountain Finch <i>Leucosticte brandti</i> ²	R	U
Steppe Eagle <i>Aquila nipalensis</i>	PM	F	Streaked Rosefinch <i>Carpodacus rubicilloides</i>	R	U
Golden Eagle <i>Aquila chrysaetos</i>	R	F	Great Rosefinch <i>Carpodacus rubicilla</i> ²	R	R
Common Kestrel <i>Falco tinnunculus</i> ¹	R	F			

¹First record by Li & Zhou (1985), 1984. ²Only record by Li & Zhou (1985), 1984. ³First record by Li & Ma (1989), 1988.

Bar-headed Goose *Anser indicus*

The common goose of the Tibetan Plateau, this is by far the most numerous species at Longbao, with a high count of 8,282 at the height of the spring migration on 5 May 2011. Numbers quickly declined: much lower numbers, both breeding and non-breeding, summered (Appendix 1). On 16 November 2011, only three remained on the main wetland; these presumably left during the third week of November. In 2012, the first returning Bar-headed Goose was recorded by the reserve staff on 4 March.

Ruddy Shelduck *Tadorna ferruginea*

The common duck of the Tibetan Plateau, this is the second most numerous bird species at Longbao. A high count of 1,560 on 5 May 2011 declined precipitously the following week. Much lower numbers remained to breed (Appendix 1). On 16 November 2011, 110 remained, when the main wetland was about 90% frozen over; these presumably had departed by the end of November. In 2012, the first returning Ruddy Shelduck was recorded by the reserve staff on 3 March.

Ferruginous Pochard *Aythya nyroca*

Near Threatened (BirdLife International 2013a). Nevertheless, it is locally common at Longbao, with 257 recorded during spring migration on 5 May 2011, 392 at the height of autumn migration on 6 November 2011, and smaller numbers believed to breed (Appendix 1).

Black-necked Crane *Grus nigricollis*

Vulnerable (BirdLife International 2013a) because of its single small population that may be in decline through loss and degradation of wetlands and changing agricultural practices in its breeding and wintering grounds (Bishop *et al.* 2000, Yan & Wu 2005, Wang *et al.* 2006, Farrington 2009, Ma *et al.* 2009). In July 1984, the peak count of adult and returning young Black-necked Cranes on the Longbao wetland was 24 (Li & Zhou 1985). Following 25 years of concerted protection at Longbao and throughout its range, a historical high count of 216 was made at Longbao on 25 April 2011 (Appendix 1; also Farrington & Zhang 2013). These numbers more than halved by the beginning of summer. On the main Longbao wetland in 2011, 29 pairs produced 43 offspring, as counted on 28 July (Appendix 1).

Black-tailed Godwit *Limosa limosa*

Near Threatened (BirdLife International 2013a). This species was recorded just once at Longbao: on 5 May 2011 a group of 80 was seen on a stopover.

Cinereous Vulture *Aegypius monachus*

Near Threatened (BirdLife International 2013a). Although apparently resident in very small numbers in eastern Yushu prefecture, the only record on this survey was of one individual at Longbao on 17 November 2011, feeding on carrion next to the highway at the eastern end of the reserve with a small group of Himalayan Griffons *Gyps himalayensis*.

Pallas's Fish Eagle *Haliaeetus leucoryphus*

Vulnerable (BirdLife International 2013a). The only known record at Longbao is a sighting by Li & Zhou (1985) in 1984. JDF's only sighting on the Tibetan Plateau was on 18 May 2012: one individual near the mouth of the Yike Wulan Chu River on the northern shore of Qinghai Lake. Given this sighting north of Longbao, the occasional Pallas's Fish Eagle may well stop over at the Longbao wetland while on migration (BirdLife International 2013b).

Saker Falcon *Falco cherrug*

Endangered (BirdLife International 2013a). The most common

falcon of the Longbao basin and on the grasslands of Yushu prefecture during this survey, it was regularly sighted in small numbers in the Longbao NNR and in the surrounding mountains where it is known to breed (Appendix 2).

Little Egret *Egretta garzetta*

Although very conspicuous, Little Egret was not noted by Li & Zhou (1985) in 1984. More commonly associated with low-lying areas of southern China, South Asia, South-East and East Asia and elsewhere, the numbers of Little Egrets summering on the Tibetan Plateau may be increasing. In 2011, it was sighted on the Longbao wetland four times between 12 May and 4 July with the highest count being two on 27 May (Appendix 1). A group of 11 were sighted next to the highway beside the outflow marsh at the western end of the wetland on 30 June 2012, and four were seen nearby on 11 July 2012.

JDF's first sighting of Little Egret on the Tibetan Plateau was on 11 July 2009: eight in Lhasa's Lhalu wetland. These birds apparently summered there; JDF's last sighting (of five) on the Lhalu that year was on 17 October. An exhaustive search of English and Chinese literature revealed no earlier records for the Lhasa area, and no mention of Little Egret on the Tibetan Plateau is made in the comprehensive works of Vaurie (1972) and Zheng *et al.* (1983).

Cattle Egret *Bubulcus ibis*

Cattle Egret is another very conspicuous species not noted by Li & Zhou (1985) in 1984. In 2011, it was regularly seen at Longbao from 5 May until 6 November, with the highest count being 106 on 4 July 2011 (Appendix 1). On 30 June 2012, 130 were counted on the Longbao wetland, corroborating the opinion of reserve staff that the species has increased significantly in recent years.

Black Stork *Ciconia nigra*

The first Black Stork record at the Longbao wetland was made by Li & Ma (1989). About 30 stopped over in the relatively drier eastern end of the reserve for about a month in spring 1988. Eight were seen on 4 May 1988 being driven away from a Black-necked Crane nesting site by the male crane (Li & Ma 1989). Since that time, Black Stork numbers at Longbao have declined dramatically, and none was seen in 2011. The species was in decline in China as early as 2000 (MacKinnon & Phillipps 2000). Prior to 2012, the last known sighting at Longbao was in June 2008: one individual seen by reserve staff just east of the reserve headquarters. On 15 June 2012, four individuals were seen just below the highway on the north side of the main wetland about 3 km north-west of the Longbao Monastery at the eastern end of the reserve. Five were sighted there on 27 June 2012. JDF's only other sighting in Qinghai province was on 19 November 2011: a pair in southbound flight over a forested ridge at about 2,900 m near the town of Dongxia in Datong county, about 45 km north of the provincial capital, Xining.

Black Drongo *Dicrurus macrocercus*

In eastern Qinghai, Black Drongo is presumably a rare spring passage migrant and possibly a summer resident. In the Longbao basin, it was sighted once: on 3 June 2011 next to the reserve headquarters. Elsewhere in eastern Qinghai, JDF has seen a single bird on two other occasions in June 2011 and July 2012.

Hodgson's Bushchat *Saxicola insignis*

Vulnerable (BirdLife International 2013a). A lone male was sighted on the south side of the Longbao NNR on 25 April 2011, presumably while stopping over on migration from the plains of the northern Indian subcontinent to its main breeding grounds in western Mongolia.

DISCUSSION

During the survey, 67 bird species were recorded in the Longbao wetland basin. With the four species recorded by Li & Zhou (1985) not sighted on the current survey (Pallas's Fish Eagle, Hodgson's Redstart *Phoenicurus hodgsoni*, Brandt's Mountain Finch *Leucosticte brandti* and Great Rosefinch *Carpodacus rubicilla*), 71 bird species have been formally recorded at Longbao. These include three Near Threatened species—Ferruginous Pochard, Black-tailed Godwit and Cinereous Vulture; three Vulnerable species—Black-necked Crane, Pallas's Fish Eagle and Hodgson's Bushchat— and one Endangered species—Saker Falcon (Birdlife International 2013a). Categorising the seasonal occurrence of birds of the Longbao basin is obviously fraught with uncertainty in the absence of winter observations; tentative classifications based on current observations in the basin itself, not the broader eastern Tibetan Plateau region, are provided in Table 1. This suggests that 24 species are resident (including altitudinal migrants), 21 are summer visitors, and 26 are passage migrants; many individuals of several species that are summer visitors simply use the basin as a migration stopover site.

Formerly the largest direct threat to local waterfowl was the widespread collection of eggs, particularly from Bar-headed Goose, Ruddy Shelduck and Black-necked Crane, by both locals and outsiders for personal consumption. Such collection was largely stopped following the establishment of the Longbao NNR in 1986 and the subsequent enforcement of regulations banning the practice. Loose and feral Tibetan mastiff herding dogs were regularly seen on the wetland during the survey, with six counted on 23 October 2011. These are a threat primarily to eggs, unfledged chicks and injured birds. A new threat to large waterfowl at Longbao is the erection (in late 2011) of high-voltage powerlines along the entire north side of the wetland. Powerline strikes by Black-necked Cranes were documented by Li *et al.* (2011) although this hazard can be mitigated easily, by installing coloured markers on the cables (Li 2002, Li *et al.* 2011).

The primary threat to habitat on the Longbao wetland is degradation through grazing damage and climate change. In recent decades, upland summer pastures on hill slopes surrounding the main wetland have been severely degraded. This probably results from overgrazing, consequent to overstocking in the basin during the collective period from the 1960s to the 1980s. This degradation is believed to have been exacerbated by recent climate change, such as permafrost degradation, which can result in reduced seep areas and lower soil moisture, and the recent intensification of precipitation in the region, which accelerates erosion of degraded slopes (Wang *et al.* 2006, Farrington 2009, Qiu 2012). Consequently, household pastures on the more resilient Longbao wetland are now grazed intensively for up to 10–12 months per year by thousands of domestic yaks and smaller numbers of sheep, goats and horses. Notably, livestock numbers on the wetland peak in May when the first shoots of green grass in the basin appear at precisely the same time as waterfowl begin nesting. During this survey, a high count of 5,357 yaks was made on the main Longbao wetland on 11 May 2011.

Pasture conditions on the wetland remain fairly good, yet all local herders interviewed indicated that grass height and pasture productivity have declined in recent years. Presumably, disturbance to nesting birds has increased with increased grazing pressure on the wetland (Li & Ma 1989). Rising temperatures and permafrost degradation on the Tibetan Plateau has led to widespread drying up of shallow, permafrost-controlled wetlands in the Longbao region and elsewhere on the plateau. As temperatures rise, the upper permafrost melts, allowing surface water to percolate into the ground (Wang *et al.* 2006, Farrington 2009, Ma *et al.* 2009, Qiu 2012, Farrington & Zhang 2013). Ultimately such drying of shallow wetlands must negatively affect plateau waterbirds.

A main objective of this survey was to determine if the Longbao NNR qualified for Ramsar Wetland of International Importance

designation based on its waterbird populations. Under Ramsar Criterion 5, a wetland is considered internationally important if it regularly supports at least 20,000 waterbirds (Ramsar 2009). In order to see if Longbao met this criterion, the highest counts of each waterbird species in 2011 were totalled, regardless of when the peaks occurred. The 2011 total of 32 waterbird species came to 11,266, far short of meeting Criterion 5.

However, under Ramsar Criterion 6, a wetland is considered internationally important if it regularly supports 1% of the individuals in a population of one species of waterbird (Ramsar 2009). The most recent estimate of the total Black-necked Crane population is 11,000 (Bishop & Drolma 2007). The average total of 132 Black-necked Cranes counted over 20 survey circuits during 2010–2012 therefore qualifies the Longbao wetland for Ramsar designation under Criterion 6 (Farrington & Zhang 2013). Black-necked Crane is listed as Vulnerable on the IUCN Red List, so Longbao wetland also qualifies for Ramsar designation under Criterion 2, whereby a wetland is considered internationally important if it supports Vulnerable, Endangered or Critically Endangered species (Ramsar 2009).

In addition to qualifying for Ramsar designation based on its Black-necked Crane population, according to 2012 estimates of waterbird populations compiled by Wetlands International (2013), the Longbao wetland also qualifies for Ramsar designation under Criterion 6 based on its Bar-headed Goose, Ruddy Shelduck and Black Stork populations (Table 2).

Notably absent during this survey were two bird species seen by JDF along rivers elsewhere in Yushu county but not in the Longbao basin itself, Ibisbill *Ibidorhyncha struthersii* and Red-rumped Swallow *Hirundo daurica*, as well as a number of waterbird species commonly sighted throughout much of the Tibetan Plateau, including Indian Spot-billed Duck *Anas poecilorhyncha*, Common Teal *Anas crecca* and Red-crested Pochard *Netta rufina*. Inevitably other bird species will be recorded at Longbao by future observers. Finally, this survey should provide a baseline for gauging future changes in the avifauna of the Longbao wetland, especially given that this remarkable, yet fragile, high-altitude wetland will continue to undergo profound ecological shifts resulting from climate change in years to come.

Table 2. Summary of 1% thresholds for Ramsar Criterion 6 qualification for four species of waterbirds at the Longbao wetland and the high counts of these species made in 2011–2012.

Species	2012 waterbird population estimate 1% threshold ¹	2011–2012 high count at Longbao
Bar-headed Goose	560	8,282
Ruddy Shelduck	710	1,560
Black-necked Crane	100	216
Black Stork	1	5

¹Source: Wetlands International 2013.

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Appendix 1. 2011 counts of waterbird species at the Longbao wetland.

Highest count for each species is shown in bold. NC= No count made.

	6 April	12 April	18 April	25 April	5 May	12–13 May	27 May	3 June	8 June	4 July	28 July ¹	12 Sept ²	26 Sept ²	9 Oct ²	23 Oct ³	6 Nov ³	16 Nov	Highest count
Bar-headed Goose	1,500	2,920	3,500	7,326	8,282	7,279	7,701	5,412	5,484	1,945	NC	381	274	117	268	106	3	8,282
Ruddy Shelduck	356	962	1,496	1,502	1,560	782	592	251	310	197	NC	101	181	65	153	89	110	1,560
Gadwall	0	0	0	0	2	0	0	0	0	0	NC	0	0	0	0	0	0	2
Mallard	12	11	14	14	12	0	1	6	2	3	NC	0	0	0	0	0	36	36
Common Pochard	1	1	0	4	8	2	0	0	0	0	NC	0	0	0	0	0	0	8
Ferruginous Pochard	5	25	73	82	257	54	121	115	105	55	NC	72	113	288	284	392	31	392
Common Goldeneye	0	0	0	0	0	0	0	0	5	0	NC	0	0	0	0	0	0	5
Common Merganser	4	0	24	16	8	9	0	5	2	2	NC	0	0	0	0	0	6	24
Common Crane	6	7	14	5	12	8	2	5	6	0	1	3	0	0	0	0	0	14
Black-necked Crane adults	130	135	144	216	156	125	103	109	129	102	115	88	88	100	81	153	0	216
Black-necked Crane chicks	0	0	0	0	0	0	0	1	6	31	43	30	31	34	28	24	0	NA
Common Coot	0	2	20	1	1	12	6	19	4	4	NC	0	46	0	0	0	0	46
Black-tailed Godwit	0	0	0	0	80	0	0	0	0	0	NC	0	0	0	0	0	0	80
Common Redshank	0	0	0	0	3	31	39	128	137	118	NC	25	5	8	1	1	0	137
Temminck's Stint	0	0	0	4	28	1	0	12	6	0	NC	0	0	0	0	0	0	28
Little Ringed Plover	0	0	0	0	0	0	2	1	0	0	NC	0	0	0	0	0	0	2
Lesser Sand Plover	0	0	0	0	0	0	2	2	2	0	NC	0	0	0	0	0	0	2
Pallas's Gull	4	1	1	0	2	0	0	1	1	1	NC	0	3	1	0	0	0	4
Brown-headed Gull	6	53	2	13	15	8	6	0	0	0	NC	0	0	0	0	0	0	53
Black-headed Gull	0	0	0	0	17	3	0	0	0	0	NC	0	0	0	0	0	0	17
Common Tern	0	0	0	0	6	6	0	2	0	0	NC	1	0	0	0	0	0	6
Whiskered Tern	0	0	0	0	2	15	15	13	22	28	NC	9	7	1	0	0	0	28
Great Crested Grebe	0	0	49	12	78	20	46	172	174	46	138	15	4	12	0	2	16	174
Little Egret	0	0	0	0	0	1	2	0	1	1	NC	0	0	0	0	0	0	2
Grey Heron	0	0	0	1	5	1	0	0	4	0	NC	0	0	0	0	0	0	5
Great Egret	0	0	1	2	4	1	1	1	0	0	NC	0	0	0	0	0	0	4
Cattle Egret	0	0	0	0	2	33	21	51	55	106	NC	16	27	0	2	2	0	106
Sand Martin	0	0	0	0	0	1	4	1	6	2	NC	0	0	0	0	0	0	6
Tibetan Lark	0	0	0	4	0	0	4	0	1	1	NC	11	8	11	7	7	0	11
White Wagtail	0	0	0	0	0	0	0	0	0	0	NC	0	0	1	0	0	0	1
Citrine Wagtail	0	0	0	12	0	0	1	1	0	0	NC	0	0	0	0	0	0	12
Yellow Wagtail	0	0	0	0	0	0	0	0	0	0	NC	3	0	0	0	0	0	3

¹ Due to time restrictions, only counts of Black-necked Cranes and Great Crested Grebes were made.² Count made from 21 of 22 survey points only.³ Count made from the 11 survey points along the highway on the north side of the wetland only due to deep snow covering the jeep track on the south side.

Appendix 2. 2011 counts of non-waterbird species at the Longbao Wetland.

Highest count for each species is shown in bold. NC= No count made.

	6 April	12 April	18 April	25 April	5 May	12-13 May	27 May	3 June	8 June	4 July	28 July ¹	12 Sept ²	26 Sept ²	9 Oct ²	23 Oct ³	6 Nov ³	16 Nov	Highest count
Common Hoopoe	0	0	0	0	0	0	0	0	0	0	NC	4	0	2	0	2	0	4
Fork-tailed Swift	0	0	0	0	0	0	4	6	2	0	NC	0	0	0	0	0	0	6
Little Owl	0	2	1	2	1	1	1	2	1	2	NC	1	1	1	0	0	0	2
Hill Pigeon	0	10	0	0	0	5	0	0	7	0	NC	0	0	0	0	0	1	10
Black Kite	1	0	0	0	0	0	0	0	0	0	NC	1	0	0	0	0	1	1
Himalayan Griffon	1	1	0	4	7	6	0	0	0	0	NC	12	0	3	0	7	0	12
Lammergeier	0	0	1	0	1	0	0	0	0	0	NC	0	0	0	0	0	0	1
Upland Buzzard	4	5	7	3	6	6	0	2	7	2	NC	6	7	11	4	4	48	48
Steppe Eagle	0	0	0	2	3	0	0	1	0	0	NC	1	0	2	0	1	0	3
Golden Eagle	0	0	3	0	1	0	0	1	1	1	NC	0	0	0	0	0	0	3
Common Kestrel	1	3	0	0	0	0	0	0	0	0	NC	0	0	0	0	0	0	3
Saker Falcon	0	0	0	0	1	0	1	0	0	0	NC	4	3	1	0	1	2	4
Hume's Groundpecker	0	0	6	2	3	2	6	3	0	4	NC	29	21	10	3	22	13	29
Red-billed Chough	1	6	21	0	4	2	0	0	2	6	NC	0	3	5	3	0	2	21
Common Raven	0	0	2	1	3	0	1	0	0	1	NC	21	17	26	13	13	31	31
Daurian Redstart	0	0	0	0	0	0	0	0	0	0	NC	0	0	1	0	0	0	1
White-winged Redstart	2	0	0	0	0	0	0	0	1	0	NC	0	1	0	0	0	0	2
Black Redstart	1	3	4	0	2	0	2	1	2	2	NC	3	2	2	0	2	0	4
Hodgson's Bushchat	0	0	0	1	0	0	0	0	0	0	NC	0	0	0	0	0	0	1
Barn Swallow	0	0	0	0	0	0	0	1	18	22	NC	0	0	0	0	0	0	22
Hume's Short-toed Lark	0	0	0	12	0	0	0	0	0	0	NC	0	0	0	0	0	0	12
Oriental Skylark	0	0	0	0	0	0	2	0	1	0	NC	0	0	0	0	0	0	2
Horned Lark	0	2	55	4	4	0	6	1	2	8	NC	7	12	6	11	7	5	55
Eurasian Tree Sparrow	10	10	0	0	20	0	4	0	4	2	NC	0	0	0	0	0	0	20
Tibetan Snowfinch	2	0	0	0	0	20	0	12	2	6	NC	7	8	9	0	3	0	20
White-rumped Snowfinch	30	24	7	0	12	2	3	7	2	3	NC	44	39	29	42	30	19	44
Rufous-necked Snowfinch	20	17	15	2	30	6	17	8	4	12	NC	420	705	41	359	151	0	705
Robin Accentor	0	0	0	0	0	1	0	0	0	0	NC	0	0	0	0	0	0	1
Twite	0	0	0	0	0	0	0	0	0	5	NC	0	0	0	0	0	0	5
Streaked Rosefinch	0	0	0	0	0	0	0	0	0	0	NC	2	0	0	0	0	0	2

¹ Due to time restrictions, only Black-necked Cranes and Great Crested Grebes were counted.² Count made from 21 of 22 survey points only.³ Count made from the 11 survey points on the north side of the wetland only due to deep snow on the south side.