

BHUTAN

INTRODUCTION

based on the literature, principally Jackson (1981), Blower (1986), IUCN (in prep) and Mahat (1985), and information provided by David G. Long.

Area: 46,620 sq.km.

Population: 1,247,000 (1983).

The Kingdom of Bhutan is a small mountainous country in the Eastern Himalayas, similar in size to Switzerland, but with an average population density of only 26.7 persons per square kilometre. There has been almost no industrial development in the country, and about 90% of the population are dependent on subsistence agriculture. Bhutan's most valuable natural resources are its forests, which are still estimated to cover about 60% of the total land area, and its several major river systems. The country is wholly mountainous, rising within the space of 140 km from an elevation of about 100m near the Indian border to summits at over 7,500m in the main Himalayan axis. The climate is extremely varied, ranging from hot and humid subtropical conditions in the south to cold and dry alpine conditions in the north. From May to October, the Southwest Monsoon brings heavy rainfall (over 4,000 mm) to southern Bhutan, and there is a pronounced dry season in winter. Further north, the rainfall is generally much lower (600-700 mm), reaching a peak during the period June-August.

The enormous altitudinal range and varied climatic conditions are reflected in the country's great ecological diversity and rich fauna and flora. The vegetation ranges from tropical moist deciduous forest along the southern foothills through extensive temperate forests of oak, rhododendron, larch, bamboo, maple, spruce, fir, pine and birch, to alpine scrub and meadows above the treeline at 4,300m. The country can be divided into three broad physiographic zones extending across the country from east to west

a) the northern zone some 30-40 km in width including the main Himalayan range, consisting for the most part of perpetual snow, glaciers and barren rock at altitudes in excess of 4,000m;

b) the central zone about 70 km in width with altitudes ranging between 2,000m and 4,000m,

dominated by temperate coniferous and broad-leaved forests; c) the southern foothill zone about 50 km in width with altitudes ranging from 100m to 2,000m, originally covered with tropical and subtropical vegetation, but now extensively cleared for human settlement and agriculture.

With a high proportion of the original forest cover still remaining, Bhutan is in a much better position environmentally than any of its neighbours. There was extensive commercial exploitation of forest resources up until 1979, when logging operatives were nationalized and severe restrictions imposed on the export of timber in the interest of sound forestry management and ecological stability. However, steadily increasing human population combined with the associated increase in domestic livestock is resulting in some deforestation and degradation of natural ecosystems. The forests are grazed by excessive numbers of domestic livestock and are often burned, while the wildlife is declining as a result of habitat destruction, grazing competition with domestic livestock and, in some southern areas, organized poaching. Although the population is low, people are concentrated in the fertile valleys, and in the south-western foothills, the population density is now approaching its upper limit given present farming methods. As a consequence, soil erosion, disruption of water supplies and flood damage are rapidly becoming problems in parts of the central and southern zones.

External assistance in the promotion of conservation has been received from the World Wide Fund for Nature, particularly with respect to Manas Wildlife Sanctuary in the south. More recently, the Food and Agricultural Organization of the United Nations was invited to formulate a project on integrated forest management and conservation. Priority needs in relation to nature conservation and wildlife management were assessed for the development of an appropriate action programme. Some thirteen wildlife sanctuaries and reserves have been established, covering approximately 971,300 ha or just over 20% of the total land area. However, the protected areas are unevenly distributed, being concentrated in the north and south, and so do not provide representative coverage of all vegetation zones. Moreover, their relative conservation value varies enormously, as does the effectiveness of their protection.

Summary of Wetland Situation

Because of its extremely mountainous terrain, Bhutan possesses very few wetlands other than its river systems and a scattering of small, high altitude glacial lakes in the Himalayan range. There are three main groups of glacial lakes: a group of several lakes, the largest about 300 ha in extent, at 27°57'N, 89°24'E, in the northwestern part of the Jigme Dorji Wildlife Sanctuary; a group of eleven small lakes (all less than 100 ha in extent) at 4,000-4,500m elevation in western Bhutan (27°30'N, 89°08'E); and a group of six small lakes at similar altitudes a little further to the east (27°34'N, 89°30'E). Nothing seems to be known about these lakes, but they are likely to be of considerable limnological interest.

The river systems are extremely important and extensive, flowing southwards in steep-sided valleys and gorges through all the main vegetation zones from alpine snow and ice down to the subtropical forests of the foothills, and leaving Bhutan in broad alluvial beds on the plains of West Bengal and Assam. The major river systems are the Torsa, Raidak (Wong Chu), Sankosh (Mo Chu) and Manas. The rivers are generally rocky and fast-flowing, and reach their highest levels during the monsoon between mid

April and October. Only in the inner valleys, such as the Thimphu, Punakha and Boomthang, are there flat valley bottoms. Extensive bogs and marshes once existed in these broad valleys, but most have now been drained for agricultural purposes, and only in some of the more remote valleys, such as the Popshika and Khalong Chu, do any significant natural marshes remain.

Most of the rivers are tapped for irrigation, but this does not have a significant effect on their flow. There is minimal pollution because of the low population density and lack of industry, and with much of the natural forest cover still intact, most of the rivers are relatively free of silt. Fish are plentiful in rivers in the southern and central zones, and trout have been introduced in the Ha and Paro valleys. Throughout Bhutan, riverbanks and cliffs provide a very important habitat for plants and animals, the composition of the individual communities depending on the altitude, exposure, rainfall etc. Some of the rivers are used for hydro-electric schemes, but normally these are small, e.g. at Thimphu, and have little environmental impact. However, a major hydro-electric scheme at Chuhka has had considerable adverse effects on the Raidak Valley and its forests.

From a conservation point of view, the most important wetland species in Bhutan is the Black-necked Crane *Grus nigricollis*, for which the country has a great international responsibility. Clements & Bradbear (1981) have estimated that about 500-600 Black-necked Cranes are present in winter, representing about 30-40% of the world population of this species. The cranes, which breed on the Tibetan Plateau, arrive in Bhutan in October or November and leave in February and March, returning each year to the same valleys in the central zone, at altitudes between 2,400m and 3,400m. The cranes are not molested by the local people, but the valley bottoms are cultivated and many of the marshes where the birds once roosted have now been drained.

The endangered Gharial *Gavialis gangeticus* formerly occurred in Bhutan in the Manas River, but now seems to be extinct, although an apparently unsuccessful attempt was made to re-introduce the species in the late 1970s. The Swamp Deer *Cervus duvauceli* also once occurred in the Manas region, but is now believed to be extinct in Bhutan. The Ganges River Dolphin *Platanista gangetica* is still reported to occur in the Manas near the Indian border, and the Mahseer (*Tor* sp), a very popular sport fish, is abundant in the rivers in the lowlands.

Many of the high altitude glacial lakes and the headwaters of most of the major river systems are situated within the Jigme Dorji Wildlife Sanctuary (790,495 ha), established in 1974. This enormous sanctuary includes most of the high Himalayas of Bhutan in a strip averaging 27 km wide along the country's northern border. The lower portions of several of the major rivers are included in a chain of much smaller reserves along Bhutan's southern border, e.g. the lower portion of the Manas River flows through the Manas Wildlife Sanctuary (43,854 ha), Bhutan's second largest reserve established in 1966. Until recently, however, none of the broad marshy valleys at intermediate elevations in the central zone has been protected. Within the last few years, a sanctuary for Black-necked Cranes has been established at Bumdiling in the

Khalong Chu Valley, and other crane areas in the Khatekha and Popshika Valleys may be designated as sanctuaries in the near future.

Wetland Research

No research has been carried out specifically on the wetlands of Bhutan. The UNDP/FAO Forestry Development Project has produced vegetation maps of Bhutan based on Landsat imagery, and more recently, the University of Edinburgh has been conducting a detailed botanical survey of the country. As a result, basic information is available on the forest cover and flora of Bhutan. However, the fauna remains poorly known, and there is an almost total lack of quantitative data on wildlife populations. A few foreign scientists have visited the wintering areas of the Black-necked Cranes in recent years, and one Government official in Bhutan has been studying the cranes for some time.

Wetland Area Legislation

There is no legislation relating specifically to wetlands. Environmental conservation in general is covered by the Bhutan Forest Act of 1969, the National Forest Policy of 1974, and the Wildlife Notification of 1974. River systems have further protection under the Fishery Rules of 1974. Under the Forest Act of 1969, all forested land to which no person has acquired a permanent, heritable and transferable right of use and occupancy is declared as Government Reserve Forest. Clearing of land for cultivation or other purposes, felling of trees, hunting, fishing and various other activities are prohibited within Reserve Forests, except with the written permission of an authorized Forest Officer. Concessions include the right to graze cattle and collect timber for domestic use. The Wildlife Notification of 1974 provided for the creation of wildlife sanctuaries, forest reserves and national parks. Additional restrictions imposed in these areas include a ban on the felling of trees or cutting of other vegetation, except under the provision of a Forest Department Working Plan, and a ban on grazing by domestic cattle without permission from the Forest Department.

New draft legislation entitled Bhutan Wildlife (Protection) Act 1985, based on the Indian Wildlife Act, has recently been prepared but it appears to be unnecessarily lengthy and complicated. It has been recommended that a Nature Conservation and National Parks Act be drafted to provide the basis for an effective conservation programme. This should take the form of a basic enabling act with more emphasis on the broader aspects of environmental conservation, rather than merely on the protection of wildlife and control of hunting as in the present draft (Blower, 1986).

Wetland Area Administration

Nature conservation is the general responsibility of the Forestry Department, established in 1969 and headed by the Director-General of Forests who is answerable to the Minister of Trade, Industry and Forests. Specific responsibility within the Department lies within the Wildlife Division, established in 1984 and headed by the

Director of Forests. The Division consists of Northern and Southern Wildlife Circles based at Thimphu and Sarbhang, respectively, and each under the charge of a Deputy Director.

Organizations involved with Wetlands

a) Governmental Organizations

- Forestry Department, Royal Government of Bhutan
Responsible for nature conservation and wildlife management.
- Planning Commission, Royal Government of Bhutan

b) Non-governmental Organizations

- Royal Society for the Protection of Nature

c) Individuals

- Dacho Paljor Dorji
- An amateur crane conservationist resident in Thimphu
- H.R.H. Namgyal Wangchuk
The Home Minister; a keen conservationist

WETLANDS

Site descriptions based on information provided by Prakash Gole and the literature.

Wetland name: Popshika and Khatekha Valleys

Country: Bhutan

Coordinates: 27°28'N, 90°11'E;

Location: Popshika Valley: east of Wangdi Phodrang and south of the main lateral road, 50 km east of Thimphu. Khatekha Valley: 27°27'N, 89°50'E; south of Wangdi Phodrang, 20 km ESE of Thimphu.

Area: Popshika c.2,500 ha; Khatekha c.1,000 ha.

Altitude: Popshika 2,600m; Khatekha 2,000m.

Biogeographical Province: 4.3.1./2.38.12.

Wetland type: 12, 15 & 20.

Description of site: Popshika Valley is a large marshy U-shaped valley in the upper reaches of the Mo Chu River, a small tributary of the Sankosh River rising in the highlands of central Bhutan. The whole of the valley floor is an extensive marsh, perhaps the largest in Bhutan, with many small watercourses and an abundant growth of grasses and herbaceous plants. In the centre of the valley there is a small hill on which is situated the seasonally occupied village and monastery of Gangte Gomba. Agricultural fields surround the village and line the western and northern sides of the valley; the southern and eastern sides of the valley and the surrounding mountain slopes are forested. Khatekha Valley is a similar but smaller valley about 30 km to the west, on the west bank of the Sankosh River. The shallow freshwater marsh in the valley bottom is surrounded by heavily grazed bamboo scrub and cultivated land; adjacent hillsides are forested.

Climatic conditions: Rather dry temperate climate with an average annual rainfall of 1,000 mm and temperatures ranging from -7°C to 20°C. Frosts, low cloud and fog are frequent in winter, and there is moderate snowfall. Strong winds are common in summer, and there is a rainy season from June to September.

Principal vegetation: The marsh vegetation is dominated by *Arundinaria maling*, and includes a variety of other marsh grasses and herbs. The adjacent hills are covered in *Pinus wallichiana* forest. Other common plants include *Berberis asiatica*, *B. praecipua*, *Larix griffithiana*, *Taxus baccata*, *Rhododendron falconneri*, *Tsuga dumosa* and *Viburnum mullaha*.

Land tenure: Mostly state owned; there are private holdings scattered throughout the valleys and on the adjacent slopes.

Conservation measures taken: Both valleys are protected sites for the wintering flocks of Black-necked Cranes *Grus nigricollis*. Expansion of agricultural activities and drainage of marshes have been restricted, especially in Popshika Valley.

Conservation measures proposed: It has been proposed that both valleys be declared as sanctuaries for the cranes. The proposal is being promoted by the Royal Society for Protection of Nature in Bhutan, and is under consideration by the Government.

Land use: Grazing of domestic livestock, mainly yak, and a little subsistence agriculture, mainly maize and potatoes. There are several small villages on the slopes of Popshika Valley, and a school and dispensary are located near the marsh.

Possible changes in land use: No drastic changes are allowed, but there may be some expansion of agriculture as the local population increases.

Disturbances and threats: Earlier proposals to drain the marshes for agricultural purposes may no longer pose a serious threat to the wintering habitat of the cranes. However, the increasing human population and consequent increase in disturbance from people and livestock may eventually cause the cranes to move elsewhere.

Economic and social values: The Gangte Gompa (Gangtang) Monastery in Popshika Valley attracts a large number of devotees.

Fauna: One of three important wintering areas for the endangered Black-necked Crane *Grus nigricollis* in Bhutan. Clements and Bradbear observed 77 cranes in Popshika Valley in March 1986. After the onset of the spring migration, and Prakash Gole observed 101 cranes there in mid-February 1988. Local naturalists informed Clements and Bradbear that the area regularly supports 140 cranes in winter. Small groups of cranes are often seen in Khatekha Valley, and are believed to belong to the same wintering flock as the Popshika birds. The cranes are not molested by the local inhabitants, and are rather tame.

Special floral values: None known.

Research and facilities: Some research has been carried out on the wintering ecology of the Black-necked Cranes, particularly in Popshika Valley.

References: Clements & Bradbear (1986); Gole (1981); Jackson (1981).

Criteria for inclusion: 1b, 2a.

Source: Prakash Gole.

Wetland name: Boomthang Valley

Country: Bhutan

Coordinates: 27°36'N, 90°43'E;

Location: at Byakar Dzong, 105 km ENE of Thimphu.

Area: Unknown.

Altitude: 3,000-3,400m.

Biogeographical Province: 4.9.4./2.38.12.

Wetland type: 12, 15 & 20.

Description of site: A U-shaped valley running from west to east in the upper reaches of the Boomthang River, a small river rising on snow-capped peaks in the Himalayas and draining south via the Manas River into the Brahmaputra. There are some small marshy areas and sedge bogs in central low-lying parts of the valley, but most of the marshes have been reclaimed for agriculture and the valley floor is now almost entirely under cultivation for barley and other crops. To the west of Byakar Dzong, the land rises gently and the valley floor gets narrower, especially beyond the Kurje Monastery.

Climatic conditions: Rather dry temperate climate, with a pronounced dry season during the winter months and most rain falling during the period June-August. Temperatures range from about 0°C to 25°C.

Principal vegetation: Sedge marshes, wet meadows, barley fields and other agricultural land.

Land tenure: No information.

Conservation measures taken: No habitat protection, but the local authorities have excellent control on all forms of hunting and fishing, and local sentiments in favour of the wintering Black-necked Cranes are strong.

Conservation measures proposed: Jackson (1981) and Khacher (1981) have recommended that protection be given to the remaining bogs to ensure that some secure roosting sites are left for the cranes.

Land use: Subsistence agriculture. The valley is quite densely populated and under intensive cultivation. There has been a Swiss development programme in the valley for many years, and this includes a hospital and a workshop. There is also a farming and horticultural centre.

Disturbances and threats: Most of the marshes in the centre of the valley favoured by the cranes have already been drained and improved for agriculture. In 1978, the main roost of the cranes was in a small bog of about two ha in extent above the village of Khonkhar, two km southeast of Byakar Dzong. By 1981, this bog had been drained, and the cranes were more widely dispersed. There is a possibility that other patches of bog will suffer a similar fate, leaving the cranes without any secure roosting sites. The cranes are not as yet directly persecuted or molested, but as older values are slowly being eroded, this situation could change.

Economic and social values: Boomthang Valley is a hallowed place, and the Dzong and Kurje Monasteries are famous religious establishments.

Fauna: One of three important wintering areas for the endangered Black-necked Crane *Grus nigricollis* in Bhutan. Khacher (1981) estimated the wintering population at about 20 individuals in 1978, and Gole (1981) observed at least 13 in the area in February 1981, but local reports in 1986 suggested that there might be upwards of 40 birds still using the area. Small parties of cranes occasionally visit the nearby Gyetsa Valley, e.g. a party of five in February 1981. The cranes arrive in mid-November and depart in mid-March; the birds favour wet stubble fields and feed mainly on waste grain.

Special floral values: No information.

Research and facilities: Several ornithologists have visited the site and made observations on the cranes, but no detailed research has been carried out.

References: Archibald & Oesting (1981); Blower (1986); Clements & Bradbear (1986); Gole (1981); Jackson (1981); Khacher (1981).

Criteria for inclusion: 2a.

Source: See references.

Wetland name: Tashi Yangtshi and Bumdiling

Country: Bhutan

Coordinates: 27°41'N, 91°27'E;

Location: in the Khalong Chu Valley in extreme northeastern Bhutan near the Indian and Chinese borders, 40 km NNW of Tashigang.

Area: c.1,500 ha.

Altitude: c.2,000m.

Biogeographical Province: 4.9.4./2.38.12.

Wetland type: 12, 15 & 20.

Description of site: A large and very isolated marshy valley with patches of cultivated fields, in the upper reaches of the Khalong Chu River between the villages of Tashi Yangtshi and Bumdiling. The Khalong Chu is a small tributary of the Manas River rising in the Himalayas to the north; it drains southwest via the Manas River into the Brahmaputra River. Tashi Yangtshi village is situated on river terraces to the east of the river. The terraces are traversed by many small mountain streams, and are cultivated for rice. Ten km further upstream at Bumdiling, the valley broadens out and there are extensive shingle banks on both sides of the meandering river.

Climatic conditions: Subtropical to temperate climate with an average annual rainfall of about 2,000 mm and temperatures ranging from 0°C to 30°C. The summers are warm and humid with strong winds in the afternoon. The winters are mild, with some rainfall towards the end of winter.

Principal vegetation: Rice paddies and various marsh grasses and herbs. Nearby woodland includes species such as *Acer campbelli*, *Betula alnoides*, *Exbucklandia populnea*, *hex fragilis*, *Rosa moschata*, *Juglans regia*, *Quercus lamellosa*, *Rhododendron arboreum* and *Cupressus torulosa*.

Land tenure: The river is state owned; much of the valley bottom and the river terraces are under private ownership.

Conservation measures taken: The Bumdiling area has been designated as a sanctuary for Black-necked Cranes *Grus nigricollis*.

Conservation measures proposed: A proposal has been made to include the Tashi Yangtshi area in the crane sanctuary.

Land use: Cultivation of rice, maize and some potatoes, and grazing of domestic livestock.

Disturbances and threats: None at present.

Economic and social values: There is a famous monastery in the valley (Risum Monastery), which attracts many devotees.

Fauna: Probably the most important of the three wintering areas for Black-necked Cranes *Grus nigricollis* in Bhutan. A small flock of cranes was reported by a team from the Zoological Survey of India in 1978, and Prakash Gole observed 146 cranes in the area in late February 1988. However, reliable local reports indicate that over 300 individuals were present during the winters of 1984/85 and 1985/86 (Clements & Bradbear, 1986). The cranes feed in the terraced rice fields at Tashi Yangtshi, and roost on shingle banks and in flooded rice fields near Bumdiling. Other waterfowl observed by Gole in February 1988 included three Ibisbills *Ibidorhyncha struthersii* and small numbers of *Phalacrocorax carbo*, *Tadorna ferruginea*, *Anas crecca*, *A. platyrhynchos*, *Aythya nyroca* and *Mergus merganser*.

Special floral values: None known.

Research and facilities: Preliminary studies have been made of the wintering Black-necked Cranes. However, very few foreign scientists have visited the valley and the area remains poorly known. The only access road is unpaved and often cut-off by landslides.

References: Archibald & Oesting (1981); Clements & Bradbear (1986); Khacher (1981).

Criteria for inclusion: 1b, 2a.

Source: Prakash Gole.

Wetland name: Wetlands in Manas Wildlife Sanctuary

Country: Bhutan

Coordinates: 26°48'N, 90°58'E;

Location: on the Indian border, 80 km south of Shingkar.

Area: c.500 ha.

Altitude: c.200m.

Biogeographical Province: 4.9.4.

Wetland type: 11, 12, 13 & 18.

Description of site: The alluvial fan and associated floodplain marshes of the Manas River where it emerges from the foothills of southern Bhutan and debouches onto the plains of the Brahmaputra Valley. There are extensive boulder, shingle and sand banks along the river. During the rainy season in late summer and after snow-melt in spring, the river overflows its banks, spreading out over the floodplain and creating shallow pools, which remain as the water level recedes.

Climatic conditions: Tropical monsoonal climate with an average annual rainfall of about 3,000 mm. Mean monthly temperatures range from 4°C to 28°C. There is a pronounced rainy season from late May to mid-September.

Principal vegetation: Fresh alluvial deposits along the river are colonized by grasses such as *Saccharum spontaneum*, *S. munja*, *Imperata cylindrica*, *I. arundinacea* and *Erianthus filifolius*, and succeeded by woody pioneers such as *Acacia catechu* and *Dalbergia sissoo*. The drier plains support tall grasses such as *Phragmites karka*, *Brianthus ravanae* and *Typha elephantina*. The adjacent hillsides are covered with dense tropical semi-evergreen forests dominated by *Phoebe hainesiana*, *Eugenia spp*, *Castonopsis spp*, *Michelia spp*, *Eleocarpus spp*, *Tetrameles nudiflora*, *Ailanthus grandis*, *Quercus spp* and *Schima wallichii*.

Land tenure: State owned.

Conservation measures taken: The wetlands lie within the Manas Wildlife Sanctuary (43,854 ha), established in 1966. The area had previously been protected for many years as a Royal Hunting Reserve. To the south, the sanctuary abuts Manas Wildlife Sanctuary and World Heritage Site in India. Agreement was reached in 1974 between Bhutan and India for joint management of the adjacent Wildlife Sanctuaries, and a management plan was prepared for the Bhutanese sanctuary. However, this joint management agreement has since been allowed to lapse. More recently, a master development plan has been prepared under an FAO consultancy.

Conservation measures proposed: The master development plan recommends that Manas Wildlife Sanctuary and the adjoining Namgyal Wangchuk Wildlife Sanctuary be amalgamated and developed as a National Park.

Land use: None at the wetlands. About 100 people reside within the Wildlife Sanctuary, but rather few tourists visit the area because of the difficulty of access.

Disturbances and threats: None known at the wetlands. There has been some encroachment by settlers in the Wildlife Sanctuary, particularly in the north. A proposal by the Indian Government to build a dam in the upper reaches of the Manas River for flood control and electricity generation has been rejected. The dam would have had a

serious impact on the whole Manas ecosystem, completely altering the hydrology of the region to the detriment of the wildlife.

Economic and social values: No information.

Fauna: An important staging and wintering area for a wide variety of waterfowl including *Phalacrocorax carbo*, *Egretta alba*, *Ardea cinerea*, *Ciconia nigra*, *Tadorna ferruginea*, *Anas crecca*, *A. platyrhynchos* and *Mergus merganser*. The Ibisbill *Ibidorhyncha struthersii* is a regular winter visitor in small numbers. Black-necked Storks *Ephippiorhynchus asiaticus* and Lesser Adjutant Storks *Leptoptilos javanicus* are resident in the area. Other breeding species include *Gallicrex cinerea*, *Esacus recurvirostris* and *Vanellus spinosus*.

The Wildlife Sanctuary supports a rich mammalian fauna including the Golden Langur *Presbytis geei* (endemic to the Bhutan/India border region), Tiger, Asian Elephant, Indian One-horned Rhinoceros, Water Buffalo, Gaur and Hispid Hare (*Panthera tigris*, *Elephas maximus*, *Rhinoceros unicornis*, *Bubalus bubalis*, *Bos gaurus* and *Caprolagus hispidus*). The Swamp Deer *Cervus duvaucelli* and Oharial *Gavialis gangeticus* formerly occurred in the Wildlife Sanctuary, but are now extinct in the area. An unsuccessful attempt was made to reintroduce the Gharial in the mid-1970s. The Ganges River Dolphin *Platanista gangetica* is still reported to occur, and the Mahseer (*Tor* sp) is abundant.

Special floral values: None known.

Research and facilities: Preliminary faunal and floral surveys have been carried out in the Wildlife Sanctuary. The Bhutan Tourist Corporation maintains a guesthouse by the Manas River near the Indian border.

References: Blower (1986); IUCN (in prep); Jackson (1981); Mahat (1985). **Criteria for inclusion:** lb, ld, 2b.

Source: Prakash Gole.

Wetland name: Alluvial Fan of the Sankosh River

Country: Bhutan

Coordinates: 26°43'N, 89°51'E;

Location: on the Indian border, 90 km SSE of Thimphu.

Area: c.1,000 ha.

Altitude: c.150m.

Biogeographical Province: 4.3.1./4.9.4.

Wetland type: 11, 12, 13 & 18.

Description of site: The alluvial fan and associated floodplain marshes of the Sankosh (Mo Chu) River where it emerges from the foothills of southern Bhutan and debouches onto the plains of the Brahmaputra Valley. As the river slows down, it begins to meander across the plain, depositing extensive boulder, shingle and sand banks on both sides of the meanders. During the rainy season in late summer and after snow-melt in spring, the river overflows its banks, spreading out onto the plains and creating shallow pools, which remain as the water level recedes.

Climatic conditions: Tropical monsoonal climate with an average annual rainfall of about 2,000 mm and temperatures ranging from 10°C to 30°C. There is a pronounced rainy season in summer, and also some rainfall in winter.

Principal vegetation: No information is available on the aquatic vegetation. The adjacent plains are covered with tall grasses and scrub, and the nearby hillsides with dense subtropical forests of *Acrocarpus fraxinifolius*, *Ailanthus grandis*, *Bombax ceiba*, *Dillenia pentagyna*, *Gmelina arborea*, *Pandanus sp*, *Duabanga grandiflora* etc.

Land tenure: The floodplain is state owned; patches of land on the river terraces and adjacent hillsides are under private ownership.

Conservation measures taken: The wetland lies within the Phipsoo (Mochu) Reserve Forest (27,843 ha), established in 1974. Hunting and fishing are prohibited, as is the case throughout Bhutan.

Land use: Some subsistence agriculture on the river terraces.

Disturbances and threats: None known.

Economic and social values: No information.

Fauna: An important staging and wintering area for a wide variety of waterfowl including *Phalacrocorax carbo*, *Egretta alba*, *Ardea cinerea*, *Ciconia nigra*, *Tadorna ferruginea*, *Anas crecca*, *A. platyrhynchos* and *Mergus merganser*. Resident waterbirds include *Ephippiorhynchus asiaticus*, *Leptoptilos javanicus*, *Gallicrex cinerea*, *Esacus recurvirostris* and *Vanellus spinosus*.

Special floral values: None known.

Criteria for inclusion: 1b, 2b.

Source: Prakash Gole.

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