Crested Ibis Toki (Jpn) *Nipponia nippon*

Morphology and classification

Classification: Pelecaniformes Threskiornithidae

Total length:	♂ 772.1±33.4mm (N=8)	♀ 731.0±27.2mm (10)
Wing span:	♂ 1234.2±112.0mm (6)	♀ 1234.2±112.0mm (6)
Wing length:	♂ 411.5±21.2mm (8)	♀ 392.0±18.0mm (10)
Tail length:	♂ 172.4±8.3mm (8)	♀ 173.4±9.0mm (11)
Culmen length:	♂ 181.0±7.1mm (7)	♀ 163.7±6.2mm (11)
Tarsus length:	♂ 89.2±6.1mm (6)	♀ 86.3±4.9mm (6)
Weight:	♂ 1775.9±120.1g (49)	♀ 1545.3±107.2g (30)

All measurements after Sado Japanese Crested Ibis Conservation Center (2010).

Morphology:

Although Crested Ibises are not remarkable in sexual dimorphism, males are somewhat larger than females. Sexual identification in the field is possible when a breeding pair is together, but difficult when the bird is alone. Crested Ibises have a decurved black bill with a red tip. Incidentally, the decurved bill is the shared feature of the ibis subfamily, Threskiornithinae. They have a bare face with the vermilion skin exposed. A young bird has a paler face. The feet are also vermilion, but paler than the head. Crested Ibises can be easily distinguished from similar-sized Great Egrets by the features when flying such as the extended neck, the legs shorter than the tail, and the faster and more powerful wing beats.

Appearance:

The male and female are similar in plumage coloration. They look rosy white all over in the non-breeding period from September to January. The flight feathers are reddish orange in the rachis and become paler towards the periphery of the vane. The underpart of the wings looks salmon pink in flight (or when the birds fly overhead) (Photo 1). Crested Ibises turns the plumage charcoal gray from the nape to the back in the breeding period. However, they do not develop the breeding feathers by molting. They rub the black lipid that comes off from the skin of the nape on the feathers after they bathe (Photo 2). Since the lipid is not soluble in water, it is thinly applied to the feathers after it is emulsified by water (Uchida 1970). They look black immediately after bathing, but turn gray when they dry up. The gray of the feathers deepens in color every time they bathe from January to April. When the breeding period is over, however, Crested Ibises cease to rub the lipid on the feathers after bathing, and therefore the feathers become lighter in color until the back looks mottled in the molting period when the old feathers are replaced with new rosy white ones. Crested Ibises become rosy white all over again in September when the molting period is over. It is birds of over two years that rub the lipid on the back feathers in the breeding season, and one-year-old birds remain rosy white in most of its plumage.

Photo 1. Crested Ibis in flight. The underpart of the wings is brilliant salmon pink.

Photo 2. Male and female in the breeding period.

Vocalization:

Crested Ibises utter a loud voice that sounds like "Ta-a" or "Car", which is suggestive of Large-billed Crows. They also make a quiet sound like "Gwa, gwa" between male and female or when they urge the other members of a flock to take off.

Distribution and Habitat

Distribution:

Crested Ibises are an endemic species of Northeast Asia. They used to be widely distributed in Japan, Taiwan, China, the Korean Peninsula and Primorskii (Ussuri area), Russia. Presently the only wild population is breeding in China (primarily Yang County of Shanxi Province), but their reintroduction has been attempted in Sado Island, Niigata Prefecture, Japan under a captive breeding program.

Habitat:

Crested Ibises prefer to use as a breeding ground a "Yato" landscape with a mixture of paddy fields and secondary woodlands. They build a nest in a tall tree at the edge or in the interior of woodlands, and forage in a paddy field, on its levee and in a grassy area around a paddy field. The birds that have moved to Honshu (the main island of Japan) from Sado Island where they were released forage in rice fields away from woodlands. It is said that they used to forage in a terraced paddy field of a hilly area and a stream of a ravine as well in Sado Island. When Crested Ibises were rediscovered in Yang County, China, they foraged in the rice fields of a "Yato" landscape surrounded by hills. However, they have started to breed in the lowland as the population increased, and they occasionally nest in a tall tree in the residential areas.

Life history

Breeding system: Monogamy.

Life history:

Crested Ibises start to nest from March to April and lay eggs from late March to mid-May. They build a plate-shaped nest at the fork of a horizontal branch of trees, such as pine, oak and elm. The male chiefly supplies exterior materials for the nest, while the female collects materials for the inner lining, such as dry grass and branches with dead leaves. They continue to carry nest materials to the nest to complete it while they incubate their eggs. The median clutch size is three eggs (range 2-5 eggs). They lay an egg every other day and start to incubate the first egg, which results in non-simultaneous hatching. The male and female take turns incubating, but the female is mostly responsible for nighttime incubation in captivity. It takes about 27 days for an egg to hatch. Both male and female are engaged in rearing the young. They feed half-digested small animals to the chicks by regurgitating them. The nestlings fledge about 40-45 days after hatching, but they are fed by their parents for a while. The young grow up to be the same size as the adult bird in the autumn (five months after hatching) (Chikatsuji & Nagata 2009). In the breeding season, non-breeders roost in a communal flock at night, but they forage alone or in a small flock of several birds during the daytime. The birds that failed in their breeding attempt also join the foraging flock. Crested Ibises usually form a large flock in the wintering period from November to February, but some of them move around alone. In China, they come down to the lowlands in a large flock and forage in dam sites or riverside areas from late August to September. In the wintering period, however, they move from the lowlands to the nesting grounds in the hilly region (Ding 2004).

Daily behavior:

Reintroduced Crested Ibises feed in rice paddies and adjustment wet rice fields of a countryside "Yato" landscape and roost in trees adjacent to the feeding sites, such as Japanese ceder, *Cryptomeria japonica*, and *Quercus serrata*. Crested Ibises leave their roost and

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start to feed in paddy fields at sunrise. They basically spend a day alternating feeding with resting until they return to their roost site before sunset. Unless disturbed, they usually spend a day foraging for one or two hours and resting on a levee and a tree for one or two hours in spring and autumn. In summer and winter, however, they change their behavioral pattern drastically. During the coldest period of winter (January and February), they spend the most part of a day foraging. In summer (July and August), on the other hand, they spend the majority of a day resting on a tree (Nagata 2010).

Migration:

Crested Ibises used to be year-round residents in Sado Island, Japan and Shanxi province, China. Crested Ibises arrive in a large flock in the Korean Peninsula in winter. It is also historically recorded that they arrived with cranes in winter at the major moat of Fukuoka Castle of Fukuoka Domain, northern Kyushu, southern Japan. It is assumed, therefore, that the Russian population of Crested Ibises was migratory and moved to the Korean Peninsula, Kyushu and Taiwan.

Diet and foraging behavior

When foraging, Crested Ibises use contact-dependent method, in contrast to the egrets that use the sight-dependent method. Crested Ibises forage for their prey, inserting the bill shallowly into the soil, and when they sense their prey at the tip of a bill, they insert the bill deeply into the soil to pull out and gulp it. The analysis of wild Crested Ibis feces showed that their diet consisted of freshwater crabs, frogs, insects of Coleoptera (*Chrysolina aurichalcea*) and insects of Diptera (Stratiomyidae soldier flies, horse flies, crane flies) before their extinction in the wild (Sato 1983). The observation of released Crested Ibises revealed, on the other hand, that their diet included fish (Cobitidae loach and cyprinid fish), amphibians (*Hyla japonica*, *Rhacophorus arboreus*, *Rana rugosa*, *R. ornativentris*, *R. sususra*, *Lithobates catesbeianus* and *Cynops pyrrhogaster*), insects (adult and nymph of dragonflies, Coleoptera, Orthoptera and larvae of Diptera), crustaceans (freshwater crab and *Procambarus clarkii*) and annelids (earthworm). Loach fish represents only 11-16% of their diet, but earthworms account for 36% in summer when paddy fields are not available to them as a feeding site and 24% even in winter, which suggest that earthworms are their important food item (Nagata 2010).

Photo 3. Crested Ibis carrying a loach and capturing an earthworm.

Topics of ecology, behavior and conservation

History of extinction of wild Crested Ibises

The product records of feudal clans in the Edo period (17th to mid-19th C) suggest that Crested Ibises were distributed in the area east of Shimane Prefecture, western Japan on Japan Sea side and in the area north of the Kanto region on the Pacific Ocean side in the 18th century. It is assumed, on the other hand, that they occurred throughout Japan at the end of the Edo period (19th C) because they were recorded to be released in the feudal domains of western Japan. However, they were originally a breeder in eastern Japan and a winter visitor in western Japan. Approximately 100 Crested Ibises remained in Oki Island, the Noto Peninsula and Sado Island in the 1940s, but they sharply declined in the 1960s with only 10 birds or so remaining in the Noto Peninsula and Sado Island. Eventually only five birds survived in Sado Island in 1979. The five birds were captured for their captive breeding in 1981, when the wild population became extinct in Japan. The extinction of Crested Ibises can be attributed to the hunting pressure in the Meiji era, the loss of the nesting grounds due to deforestation during World War II and land development and the use of pesticides after the war.

Reintroduction program of Crested Ibises

The Japanese population of Crested Ibises went extinct with the death of the last female "Kin" in 2003. Since the descendants of two Crested Ibises presented by China in 1998 and another three birds provided afterwards have been breeding successfully in captivity, the Ministry of the Environment decided to reintroduce Crested Ibises to eastern Kosado area of Sado Island in 2005. The genetic difference between Japanese and Chinese Crested Ibises is only 11 bases (0.06 %) out of 16,793 base pairs of the whole mtDNA, which is a level within individual variation (Yamamoto 2009). Since the captive-raised Crested Ibises of Japan exceeded 100 birds in 2008, 10 of them were released in Sado Island, followed by another 19 birds in 2009. Of the released birds, only females dispersed from Sado Island to Honshu (the main island of Japan). The survival rates of the released Crested Ibises during the first six months were 80% for the first release and 78.9% for the second one (Nagata 2010). As of the end of December 2013, a total of 142 birds have been released in Sado Island. The Ministry of the Environment aims at establishing a population of 60 Crested Ibises in Sado Island including eastern Kosado wildlife reserve by 2015.

Present population of Crested Ibises

As of the end of December 2009, there are approximately 760 birds in Yang and Ningshan Counties of Shanxi Province, China. In addition, about 530 captive-reared birds are in six breeding facilities of China. Also four Crested Ibises provided by China are kept in Changnyeong, South Korea. As of December 2013, there are a total of 187 birds in the Sado Crested Ibis Conservation Center, the Reintroduction Station, and Observatory Facility of Sado City in Sado Island, Izumo and Nagaoka Captive Breeding Centers, Tama Zoo and Ishikawa Zoo in Japan. As of the end of December 2013, a total of 86 released and 12 newly born Crested Ibises are confirmed in the wild in Japan, with 96 birds in Sado Island and two in Honshu.

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Three and a half years have passed since I was involved in Crested Ibises and it is almost two years since I moved to Niigata. The latitude of my house increases every time I move. The next time, where ? Since I was born and raised in southern Japan, it is hard to get acclimated to the snow. But in Kagoshima I encountered the heavy snow I had not experienced in Niigata on this New Year's Eve when I was back home. I hope that this year Crested Ibises will hatch their young in the wild. hnagata@gs.niigata-u.ac.jp