

Threatened Birds of Asia:

The BirdLife International Red Data Book

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CRESTED IBIS

Nipponia nippon

Critical —

Endangered D1

Vulnerable D2



This distinctive waterbird has now become extinct over most of its former range and is now limited to a single area, where it has an extremely small population, qualifying it as Endangered.

DISTRIBUTION The Crested Ibis was widespread and locally common in North-East Asia until the late nineteenth century, when it nested in the Russian Far East, Japan, and mainland China, and was a presumed non-breeding visitor to North Korea, South Korea and Taiwan. Its population crashed in the late nineteenth and early twentieth centuries, and it was feared to be extinct in the wild when the last wild birds in Japan were taken into captivity in 1981. However, in the same year a tiny wild population was discovered Shaanxi province in central China, which has subsequently gradually increased.

■ **RUSSIA** The species formerly occurred in the Russian Far East, in the valleys of the Ussuri, Amur and Tunguska rivers in Amur, Khabarovsk and Primorye, but the most recent records were two sightings in the 1970s (see Remarks 1) and it is probably now extinct in the country. Records (by province) are as follows:

■ **Khabarovsk** near **Troitskoye** village, Manchzhurka river mouth, June 1910 (Buturlin 1917 in Dement'ev and Gladkov 1951–1954); near **Yelabuga** (Elabuga on Amur), Amur river, 90 km downstream from Khabarovsk, one, August 1949 (V. A. Lebedev in Dement'ev and Gladkov 1951–1954); **Ussuri river mouth**, three collected and two nests with young found, before 1875 (Dybowski in Stegmann 1930, Taczanowski 1875 in Dement'ev and Gladkov 1951–1954); Bol'shoy Ussuriyskiy island, 5 km north of **Kazakevichevo** village, near Khabarovsk, one, August 1976, in an area of floodplain sedge and *Calamagrostis* meadow on the lakeshore (Voronov 1981);

■ **Amur** 25 km north of **Blagoveshchensk**, Zeya river, one collected, 1869 (Przheval'skiy 1876 in Dement'ev and Gladkov 1951–1954, Yasuda 1983); **Bibar-Tunguses**, near **Kasatkino** (Kasatkina, Kasatkina), middle reaches of the Amur river, three, April 1858 (Oustalet 1872, Dement'ev and Gladkov 1951–1954);

■ **Primorye** Bikin river, one seen near **Krasnyy Pereval** settlement, summer 1937, one collected by a local hunter, March 1940 (Shibnev 1976a); lower **Iman river** (Bol'shaya Ussurka river), one collected near Iman town, March 1908 ("old style") (Shul'pin 1936 in Dement'ev and Gladkov 1951–1954), one seen near Lukyanovka, May or July 1938 (Spangenberg 1940 in Dement'ev and Gladkov 1951–1954, Spangenberg 1965); **Khanka lake** plain, breeding near several of the rivers flowing into the lake (including the Sungacha, Lefu and Muren) in the second half of the nineteenth century, with one young bird collected near the Sungacha river, August 1859, and birds arriving at the mouth of the Sungacha river in March–April in 1868 and 1869 (Przheval'skiy 1877–1878, Przheval'skiy 1876 in Dement'ev and Gladkov 1951–1954, Shul'pin 1936), April (unspecified year) (male in NHMW), the last breeding record at Khanka lake (and in Russia) being near Novorusanovka settlement in 1917, although wandering birds were seen there in 1927 (Shul'pin 1936), and 1953 (Yasuda 1983); **Yevstafiya bay** (Evstafiya, Eustafiya bay), near Ol'ga bay, one, April 1977 (Labzyuk 1981); middle reaches of the **Suyfun river** (Razdol'naya river), breeding in 1869 (Przheval'skiy 1877–1878); **Peschanyy peninsula**, one collected, April 1927 (Shul'pin 1936 in Dement'ev and Gladkov 1951–1954); near **Vladivostok**, collected, December 1912 (Dement'ev and Gladkov 1951–1954); near **Sedimi**

(Sidemi), near Pos'yet bay, seen on migration, undated (Taczanowski 1893 in Dement'ev and Gladkov 1951–1954), small numbers occur on migration almost annually (unspecified years) (Dement'ev and Gladkov 1951–1954); Maloe Krugloe lake, near **Tumen river mouth** (Tumangan river), one, June 1963 (Labzyuk 1985).

■ **JAPAN** The species used to be widespread in Japan, probably breeding in southern Hokkaido, Honshu, the Oki islands and Sado island. Small breeding populations persisted well into the twentieth century on Sado island (Niigata prefecture), the Noto peninsula (Ishikawa prefecture) and possibly on the Oki islands (Shimane prefecture), but the last wild birds were taken into captivity on Sado island in 1981, and it is extinct in the wild in Japan.

Early history According to Yasuda (1983) (in which this paragraph is based, with additional citations at the end), in the book “*Yamato Honzo*” (*Medical herbs of Japan*) compiled by Atsunobu Kaibara in 1715, Crested Ibis was described as “abundant in Kanto [eastern Honshu, approximately the area of Tokyo and nearby counties nowadays] but not found in western Japan”. However, he noted that some feudal lords had attempted to introduce Crested Ibis, for example the lord at Kanazawa introduced Crested Ibis to Etchu (now Toyama prefecture) in the early seventeenth century, and there was a report of its introduction to Aki (now Hiroshima prefecture). In 1735 there was a nationwide study of animal and plant distribution in Japan, but unfortunately many of the records have now been lost. According to those that survive, the distribution of Crested Ibis in the early eighteenth century included the Oshima peninsula in south-western Hokkaido, northern Honshu, the Tokyo area, the Sea of Japan coast and western Honshu (the Chugoku area). The species was not found in the mountains of central Honshu and the Kii peninsula, nor on the islands of Shikoku and Kyushu. After 1735, there were more records of introductions of Crested Ibis, and in the nineteenth century it was recorded in Tokushima prefecture on Shikoku island, Wakayama prefecture on the Kii peninsula and Fukuoka prefecture in northern Kyushu. In the late nineteenth century the Crested Ibis was recorded from almost all parts of Japan, but there were no records on the Nansei Shoto (Ryukyu islands). After the Meiji Era (in the late nineteenth century) it declined almost to extinction (Yasuda 1983; also Yamashina 1930b, Niigata Education Committee 1974, Aomori Prefecture 1978, Ishihara 1982).

Recent range Records (by island and prefecture) are from:

Hokkaido foot of **Komaga-dake** mountain, chick collected, 1861 (Niigata Education Committee 1974, Yasuda 1983); near **Hakodate**, one collected, April 1874, collected, October 1883 and March 1884 (Austin and Kuroda 1953);

Honshu ■ **Aomori Hiraka-machi**, Minamitsugaru-gun, one collected, September 1939 (Aomori Prefecture 1978); ■ **Iwate Miyako**, one collected, 1900 (Niigata Education Committee 1974, Yasuda 1983; also Austin and Kuroda 1953); ■ **Ibaraki Ryugasaki**, reported in 1905, but not collected (Yasuda 1983); ■ **Saitama Nishitama**, one collected, before 1922 (Austin and Kuroda 1953); ■ **Chiba Tega-numa** lake, January 1884 (Niigata Education Committee 1974; also Austin and Kuroda 1953); ■ **Inba-numa**, one collected, 1914 (Niigata Education Committee 1974, Yasuda 1983); ■ **Shimosa** (old name for Chiba), three collected, January 1883, February 1895 and 1887 (Austin and Kuroda 1953, two specimens in AMNH and SNMS); ■ **Ichihara**, “seen very briefly at the paddies”, February 1948 and December 1953 (Yasuda 1983); ■ **Tokyo** western suburb of **Tokyo** city, January 1883 (WBSJ 1975); ■ **Kanagawa Yokohama**, 1882 (specimen in SNMS; also Austin and Kuroda 1953), “probably purchased” here, before 1897 (specimen in BMNH); ■ **Sagami** area (now Kanagawa prefecture), collected at the beginning of the twentieth century (Momiyama 1917); ■ **Niigata Sado island**, the last stronghold of wild Crested Ibis in Japan, where it was found in the northern and eastern parts before 1954, but thereafter was confined to two (consecutive) sites, (a) nesting regularly at the sanctuary in Kurodaki National Forest, Niibo village, until 1970, when the birds abandoned the area probably because of disturbance by visitors to the forest and because

the feeding grounds were no longer available in the paddies nearby, moving in 1971 to nest in (b) the mountains of Tatsuma, southern Ryotsu-shi, until the capture of the last five birds in 1981 (Yamashina and Nakanishi 1983); **Gosen** city, one collected, January 1961 (Yasuda 1983); **Echigo**, February 1893 (Austin and Kuroda 1953, two adults in YIO); **Shitada-machi**, Minamikanbara-gun, one found dead, January 1961 (Yasuda 1983); ■ **Ishikawa** Shuei, **Wajima-shi**, nesting reported, April of 1957, 1959 and 1960, two nestlings seen in May 1957 but none in 1959 and 1960, 30 birds at Wajima-shi in 1946, but only eight present in 1953, gradually decreasing to one in 1964, and extinct in 1970 (Muramoto 1982); **Anamizu-machi**, Fugeshi-gun, where two birds were raised at Anamizu-machi and five birds were seen migrating to Mt Bijo (where the birds bred at Anamizu-machi spent the summer) in June 1961, which was the last record of breeding on the Noto peninsula, after which the nesting birds moved to neighbouring Shuei (Muramoto 1982), while at Mt Bijo one was collected in December 1929 (specimen in YIO), five were seen in 1930 (Muramoto 1982), and birds were recorded summering (from late May), and wintering and breeding at an area c.40 km to the north (Yamashina and Nakanishi 1983); **Ochi-gata**, December 1930 (Niigata Education Committee 1974); **Ishikawa-gun**, 1902 (Niigata Education Committee 1974); **Yoshinodani**, 1901 (Niigata Education Committee 1974); Kajimaro (untraced), 1931 and 1954 (Niigata Education Committee 1974); Kanemaru (untraced), December 1924 (Niigata Education Committee 1974); unspecified locality, one collected, undated (Austin and Kuroda 1953); ■ **Fukui** unspecified locality, one collected, 1910 (Yasuda 1983); **Fukui-shi**, one found dead, January 1957, five seen nearby, February 1957 (Yasuda 1983); ■ **Nagano** Mima village, **Azumi-gun**, two collected, November 1917 and November 1919, and another collected in this prefecture at about the same time (Yasuda 1983; also Austin and Kuroda 1953); ■ **Gifu** **Mino**, one collected, January 1918 (Austin and Kuroda 1953); ■ **Mugi-gun** (untraced), 1917 (Niigata Education Committee 1974); ■ **Shimane** **Oki islands**, reported to “fairly plentiful” up to about 1920, one collected on **Nishino-shima** island in December 1937, four recorded in 1940 and one collected in 1950 when there were three sight records, and on **Chiburi-jima** island, single birds collected in December 1935 and December 1937 (Yamashina and Nakanishi 1983; also Austin and Kuroda 1953);

Miyake-jima island, recorded in the nineteenth century, but became extinct on this island after a volcanic eruption in July 1874, although it was still present in January 1883 on other (unspecified) islands in the Izu group (WBSJ 1975);

Hachijo-jima island, undated (OSJ 1974 in Brazil 1991);

Shikoku ■ **Tokushima** **Yoshino-gawa** river, November 1912 (Niigata Education Committee 1974; also Austin and Kuroda 1953);

Kyushu ■ **Fukuoka** unspecified localities, “said to be arriving in winter with cranes and geese”, 1870 (Yasuda 1983); ■ **Nagasaki** **Tsushima** island, October 1959, presumably a migrant from peninsular Korea (Takashima 1960 in Brazil 1991); **Iki island**, undated (OSJ 1974 in Brazil 1991).

An unconfirmed record is from an unspecified island in the Nansei Shoto (Ryukyu islands) in 1918 (Vaurie 1965 in Brazil 1991).

■ **KOREA** ■ **NORTH KOREA** The Crested Ibis was a “locally common” passage or winter visitor to the Korean Peninsula, but according to Austin (1948) it was “much rarer today” than formerly. The only record in North Korea since 1937 was a sighting of 10 birds in 1965, and it is presumably now extinct there. Records (by province) are as follows: ■ **North Hamgyong** unspecified locality, one collected, September 1912 (Niigata Education Committee 1974; also Austin 1948, Won 1963); ■ **South Hamgyong** **Yonghung-gun**, six seen, March 1940 (Won 1963); Taedon river (untraced), 10 seen, March 1965 (Yamashina and Nakanishi 1983); unspecified localities, March 1920, March/April 1929 (Niigata Education Committee 1974; also Austin 1948, Won 1963), one captured, April 1937 (Yamashina and Nakanishi 1983);

■ **North Pyongan** unspecified locality, “in North Pyongan or Chagang”, undated (Sowerby 1923 in Tomek 1999), one collected, February 1930 (Austin 1948, Won 1963); ■ **Kangwon Wonsan**, collected, October 1897 (Yankovskii 1898 in Tomek 1999), four collected, December 1887 and January 1888, when it was reported that “one begins to find it in winter and spring 50 km north of Seoul, commonest around Wonsan where one encounters flocks of about 50 individuals” (Taczanowski 1887, 1888 in Austin 1948, Tomek 1999; also Won 1963), March 1929 (adult male in YIO); ■ **South Hwanghae Haeju**, January 1912 (female in YIO); ■ **Taejon**, two collected, December 1917 (Y. Kuroda 1918); unspecified locality, November–December 1917 (Niigata Education Committee 1974); ■ **Hwanghae** unspecified localities, collected, November and December 1911, November 1913 (Austin 1948, Won 1963); *province unknown* Fuki (untraced), north-east Korea, July 1936 (female in NRM).

■ **SOUTH KOREA** The species was formerly a passage and winter visitor, but was last seen near the Demilitarised Zone (DMZ) in the 1970s, and it is now probably extinct in South Korea. Records (by province) are as follows: ■ **Kyonggi and Seoul Panmunjom** (Panmunchom), DMZ, one, February 1966, two pairs, December 1974, one pair, 1977–1978, one, 1978–1979 (Gore and Won 1971, Anon. 1979, Korea Association for Conservation of Nature Inc. 1981); ■ **Seoul**, December 1885 (Niigata Education Committee 1974), two collected, December 1888 and January 1889 (Campbell 1892), obtained in Seoul, before 1891 (specimen in BMNH), dead male purchased at Namdaemun market in Seoul, January 1954 (Gore and Won 1971); ■ **Palmi-do** (Hachibi) island, 20 seen, April 1934, one, May 1936 (Hashimoto 1937 in Austin 1948; also Yamashina and Nakanishi 1983); ■ **Pungdok** (Hyonjae Kaesong Chiku), collected, January and October 1923 (Won 1963); ■ **Han-Chon** river (Ryonchon-gun), near the Han river, one, February (unspecified year), birds usually being seen there from March to early April and from October to November (Kuroda and Miyakoda 1919); unspecified localities, collected, January and December 1889, May and November 1909, November 1910, October and December 1913, January 1921, October 1930 (Austin 1948, Won 1963), seen in paddyfields by the coast, November, March and April (unspecified years) (Y. Kuroda 1918); ■ **North Chungchong Umsong**, November 1917 (Niigata Education Committee 1974); unspecified locality, collected, November 1910 (Austin 1948, Won 1963); ■ **South Chungchong Yesan-gun** and Hongsong-gun, up to 100 birds seen in 1929 (Yamashina and Nakanishi 1983); ■ **Kongju-gun**, February 1930 (male in YIO); unspecified localities, December 1911 (Niigata Education Committee 1974), January 1928 (Austin 1948), several birds reported from the coast, winter 1932/1933 (Yamashina and Nakanishi 1983); ■ **North Kyongsang Yechon-gun**, January 1919 (adult in YIO); ■ **South Kyongsang Pusan**, collected, December 1883 (Niigata Education Committee 1974; also Austin 1948, Won 1963); ■ **North Cholla** unspecified locality on the South Chungchong–North Cholla boundary, flock of several thousand seen roosting in pine trees near a pond, from which several were collected, late December 1911 (Shimokoriyama 1913 in Austin 1948, Yamashina and Nakanishi 1983); ■ **South Cholla Mokpo** (Mokpu), January 1901 (Niigata Education Committee 1974), January in the 1920s (immature in YIO).

■ **CHINA** ■ **MAINLAND CHINA** The species was formerly widespread in mainland China, ranging from north-east China (Manchuria) to central and eastern China, but it is now only found in six counties (Yang Xian, Chenggu, Hanzhong, Mianxian, Xixiang and Foping) in southern Shaanxi province, within a range of c.3,000 km² (Zheng Guangmei and Wang Qishan 1998, Cao Yonghan *et al.* 1999).

Early history In the past, it was common and widespread in central China, and it was known as the *Zhu-lu* (crimson heron), *Hong-he* (red crane) or *Xuan-mu* (whirling eyes, because of the “whirling” crest behind its eyes) in ancient literature (for example, in *Shanglin Fu*, or the poem of Shanglin, a famous poem by Sima Xiangru in the Han Dynasty about 2,000 years ago) (SC). He Yeheng (1994) compiled records of this species from sixteenth century

district reports, and concluded that it had occurred in Gansu, Shaanxi, Shanxi, Hebei, southwestern Shandong, Henan, Hubei, Anhui, Jiangsu, Zhejiang, Jiangxi and Hunan. However, his report of its occurrence in Sichuan was probably based upon a misidentification of Chinese Pond-heron *Ardeola bacchus*, and his report from southern China is also unconvincing (SC), although it presumably occurred in the lower Yellow River and Yangtze River basins at that time, given the more recent records from there (see below).

Recent range Records (by province) are from:

■ **Heilongjiang** Songhua Jiang (Sungari river), near **Harbin**, one shot, October 1933 (Loukashkin in Piechocki 1956 and Yasuda 1983); **Xingkai Hu** lake, on the Chinese side of Khanka lake (Changa), undated (Piechocki 1956), not found there for 40–50 years (Wildlife Institute of Heilongjiang Province 1992);

■ **Jilin Changchun**, collected, October 1930 (Mizuno 1934);

■ **Liaoning Niuzhuang** (Niutschwang, Newchwang), near the Liao He river mouth, one collected, undated, the collector reporting a breeding colony further up the river (La Touche 1920–1921 in Meise 1934); **Yingkou**, collected, November 1928 (Mizuno 1934); **Liao He** river, undated (La Touche in Wilder and Hubbard 1924); Yalu Jiang (Jalu river), where several birds seen were thought to belong to this species (Sowerby 1923 in Meise 1934); **Pikou** (Pitzewo, Piziwo), north-east of Dalian, about a third of the distance to the Yalu river estuary, collected, November 1927 (Mizuno 1934); **Dalian bay**, six seen, summer 1860 (Swinhoe in Yasuda 1983); **Lüshun**, one collected, 1914 (Niigata Education Committee 1974);

■ **Gansu Lintao county**, undated (Wang Xiangting 1991); **Huating county** (Hoa T'ing), eastern Gansu, several seen, May 1919 (Seys and Licent 1933); **Wushan county**, May 1962 (specimen in LAUCN; also Wang Xiangting 1991); **Tianshui city**, undated (Wang Xiangting 1991); **Li Xian county** (Li Hien), southern Gansu, “many” seen, December 1918 (Seys and Licent 1933); **Huixian county** (Hoei Hien, Hoei-sian), south-eastern Gansu, February 1887 or 1897 (specimen in AMNH), two collected (one in grey breeding plumage), April 1919 (Seys and Licent 1933; also Wang Xiangting 1991); **Wudu county**, at the Bailong Jiang (Wutu river), one day north of Wudu (Kaichow), male collected, May 1925, two collected, February 1926, and nesting in trees along the river (Bangs and Peters 1928, three specimens in MCZ), undated (Wang Xiangting 1991); **Anmenkou**, Kang Xian county, one collected, June 1964, but with no suitable habitat remaining in 1981 (Liu Yinzeng 1981; also Wang Xiangting 1991); near “Koan P’ou Tchenn” (presumably Guanpouzhen, southern Gansu) (untraced), five seen, December 1918 (Seys and Licent 1933); “Li Tze Yuan” (presumably Liziyuan, southern Gansu) (untraced), one seen, March 1919 (Seys and Licent 1933); near “Tsinn Tcheou” (presumably Qinzhou, south-eastern Gansu) (untraced), pair seen, November 1918 (Seys and Licent 1933), at “Trinchow”, April 1921 (male in NRM);

■ **Shaanxi Wei He** (Weï-ho) valley, “one of the commonest birds”, 1904 (Blackwelder 1907); **Lintong county** (Lin-tung-hiën), two nests in a tree inside the walled city, 1904 (Blackwelder 1907); Qinling Shan (Tsin-ling or Sing-ling mountains), collected at **Xi’an city** (Sian Fu, Hsi an), Shantze (untraced) and **Taibai county** (Tai Pai Sheng), January, May and November 1905, September 1921 and October and December 1922 (24 specimens in AMNH, two in NRM), between Xi’an city (Hsi-ngan) and Qinling Shan, February (unspecified year) (female in ZMB); **Huxian county**, nesting in May (probably in the 1940s or 1950s) (Cheng Tso-hsin 1963); **Luonan** (Liu Nan Hsien), November 1896 (female in BMNH); **Foping county**, currently (Zheng Guangmei and Wang Qishan 1998); **Yang Xian county**, currently the main breeding grounds of this species, May 1915 and June 1957 (three specimens in ASCN), four adults and three chicks found at Jinjiahe and Yaojiagou, c.1,200–1,400 m, May 1981 (Liu Yinzeng 1981), during the 1980s and 1990s, nesting at Sanchahe, Guniuping, Waziping, Tuanshanhe, Liuchai, Baihuogou, Yujiagou, Guogou, Shijiawan and Nanchanggou, and (outside the breeding season) also using Liujiagou, Gaojiahe reservoir, Caoba, Longting, Balong, Qishi and Erlong (the only location south of Han Shui river), according to the map

in Lu Baozhong *et al.* (1997), while additional nesting sites used during the 1990s were Mujiahe, Luojiliang, Laofenshan, Qingshipo, Guifeng, Xiaodenggou and Erdaoliang (Wang Zhongyu *et al.* 1999), three chicks fledged at Caoba village (475 m) in June 1996, the first recent record of successful breeding on the lower slopes of the Qinling Shan mountains, with up to 28 birds roosting at Caoba since October 1994 (Li Bin and Tian Qing 1998, Wang Zhongyu *et al.* 1999, Ding Changqing verbally 2001); Han Shui river valley, seen in the more open parts of the valley, May 1904 (Blackwelder 1907), the wetlands along this river valley, between **Longting** town in Yang Xian county and Changlin town in Mianxian county, having become main feeding areas for this species in recent years (Zhang Yaoming *et al.* 1999); **Chenggu county**, currently (Zheng Guangmei and Wang Qishan 1998); **Hanzhong county**, currently (Zheng Guangmei and Wang Qishan 1998); Hewan village, **Sidu** town, Xixiang county, northern slope of the Bashan mountains, one pair found nesting, April 1999, the first breeding record away from Yang Xian county since the rediscovery of the Chinese breeding population in 1981, one of the pair bearing a colour ring, proving it was reared at Liangmawan in Yang Xian in 1997 while the other bird had no colour ring (despite the fact that all wild chicks have been colour-ringed since 1987), and had therefore probably originated from an unknown population (Ding Changqing *et al.* 1999a); near Chutze Hsien (untraced), several in the swamps and paddyfields, winter 1872/1873 (Père David in La Touche 1925–1934);

■ **Shanxi** near “Kao Lou” (presumably **Gaolu**, south-east Shanxi), one seen, May 1916 (Seys and Licent 1933); “Koutch’eng Tchenn” (presumably Gouchengzhen, south-east Shanxi) (unmapped), two collected (one in grey breeding plumage), May 1916 (Seys and Licent 1933);

■ **Hebei Xuanhua county** (Suen-Hoa-Fou), reported to occur rarely, on the coldest days of winter, one seen, January (unspecified year) (David 1867);

■ **Beijing Beijing**, two collected, 1867 (Oustalet 1872);

■ **Shandong** unspecified localities, undated (Cheng Tso-hsin 1987);

■ **Henan Yellow River** (Huang He) in Henan, three collected, winter (unspecified year) (Gee *et al.* 1924); **Xiong’er Shan** mountain, western Henan, undated (Cheng Tso-hsin 1987);

■ **Anhui** near **Nanling**, one collected (in breeding plumage), April (unspecified year) (La Touche 1925–1934); **Yuewan** (Yuewan-kiai), near Choei-tong (Shui Tung), two young collected from a nest (unspecified year) (Père Heude in La Touche 1925–1934); **Jingde** (Tsingtehhsien, Tsingte Hsien), nests reported (unspecified years) (La Touche 1925–1934); **Tung-liu** (Tong-lieou), Dongzhi county, common in the swamps in winter (unspecified years) (Père Heude in La Touche 1925–1934); Ching-yang Hsien (untraced), Chiu-Hua Shan, April 1920 (specimen in NRM); unspecified localities, June 1901 (two specimens in BMNH and MCZ), one collected, November 1901 (Niigata Education Committee 1974);

■ **Shanghai** near **Shanghai**, found in small parties along the coast in winter (unspecified years) (Swinhoe 1863a), uncommon in the lower Yangtze valley (note that this could also include Jiangsu, Anhui and Hubei), found on the river in winter, and “no doubt breeds, for it nests at Ningpo”, undated (Styan 1891), before 1896 (Hartlaub 1898, specimen in MCML);

■ **Zhejiang Ningbo** (Ningpo), resident, with small parties seen at dusk flying towards the hills, December 1872, five eggs collected from two “crow-like” nests on the tops of high pines, mid-March 1872, live fledged bird obtained in mid-June, large parties seen in late August, and very large flocks in mid-November (when three were collected) at the Western Lake (Swinhoe 1873c, two specimens in BMNH), March 1898, March and June 1900, and undated (six specimens in AMNH, SMF, ZMB and ZSM); **Qiaotouhu**, Ninghai, April 1953 (female in WUCN); **Lishui** (Chuzhou-fu, Chuchowfu), nesting in tall pines sheltering certain graveyards, March and April 1872 (Père David in La Touche 1925–1934 and Yasuda 1983); **Rui’an county**, male collected, May 1951 (Zhuge Yang 1990); Shapooshan district (untraced), May 1875 (male in BMNH);

■ **Fujian Fuzhou**, undated (Cheng Tso-hsin 1987);

■ **Hainan** reportedly wintering “as far south as Hainan” (Gee *et al.* 1926–1927, Cheng Tso-hsin 1940), presumably based on the statement in Swinhoe (1871) that it occurs on the “China coast in winter, as far south as Hainan”, but not included in lists of the birds of Hainan by Swinhoe (1870b) or Styan (1893b), and records considered by Hachisuka (1948) to be unsubstantiated;

province unknown Hwei-tcheou Fou (Hui Chou Fu), several seen, May (unspecified year) (La Touche 1925–1934).

■ **TAIWAN** It was a rare visitor to Taiwan in the late nineteenth and early twentieth century, but probably did not breed there. The most recent confirmed record was in 1932,



The distribution of Crested Ibis *Nipponia nippon*: (1) Troitskoye; (2) Yelabuga; (3) Ussuri river mouth; (4) Kazakevichevo; (5) Blagoveshchensk; (6) Kasatkino; (7) Krasnyy Pereval; (8) Iman river; (9) Khanka lake; (10) Yevstafiya bay; (11) Suyfun river; (12) Peschanyy peninsula; (13) Vladivostok; (14) Sedimi; (15) Tumen river mouth; (16) Komaga-dake; (17) Hakodate; (18) Hiraka-machi; (19) Miyako; (20) Ryugasaki; (21) Nishitama; (22) Tega-numa; (23) Inba-numa; (24) Shimosa; (25) Ichihara; (26) Tokyo; (27) Yokohama; (28) Sagami; (29) Sado island; (30) Gosen; (31) Echigo; (32) Shitada-machi; (33) Wajima-shi; (34) Anamizu-machi; (35) Ochigata; (36) Ishikawa-gun; (37) Yoshinodani; (38) Fukui-shi; (39) Azumi-gun; (40) Mino; (41) Oki islands; (42) Nishino-shima; (43) Chiburi-jima; (44) Miyake-jima; (45) Hachijo-jima; (46) Yoshino-gawa; (47) Fukuoka; (48) Tsushima; (49) Iki island; (50) North Hamgyong; (51) Yonghung-gun; (52) North Pyongan; (53) Wonsan; (54) Haeju; (55) Taejon; (56) Panmunjom; (57) Seoul; (58) Palmi-do; (59) Pungdok; (60) Han-Chon; (61) Umsong; (62) Yesan-gun; (63) Kongju-gun; (64) Yechon-gun; (65) Pusan; (66) North Cholla; (67) Mokpo; (68) Harbin; (69) Xingkai Hu; (70) Changchun; (71) Niuzhuang; (72) Yingkou; (73) Liao He; (74) Pikou; (75) Dalian bay; (76) Lüshun; (77) Lintao county; (78) Huating county; (79) Wushan county; (80) Tianshi city; (81) Li Xian county; (82) Huixian county; (83) Wudu county; (84) Anmenkou; (85) Wei He; (86) Lintong county; (87) Xi'an city; (88) Huxian county; (89) Luonan; (90) Taibai county; (91) Foping county; (92) Yang Xian county; (93) Longting; (94) Chenggu county; (95) Hanzhong county; (96) Sidu; (97) Gaoluo; (98) Xuanhua county; (99) Beijing; (100) Shandong; (101) Yellow River; (102) Xiong'er Shan; (103) Nanling; (104) Yuewan; (105) Jingde; (106) Tung-liu; (107) Shanghai; (108) Ningbo; (109) Qiaotouhu; (110) Lishui; (111) Rui'an county; (112) Fuzhou; (113) Chinshan; (114) Tanshui river; (115) Yuanlin; (116) Kaohsiung.

○ Historical (pre-1950) ● Fairly recent (1950–1979) ● Recent (1980–present) □ Undated

but there was an unconfirmed report in 1997 (see Remarks 2). Records are as follows: **Chinshan** (Chinpaoli, King Pao Li), Taipei, one collected, August 1908 (Dien Zuh-Ming 1955; also Yasuda 1983); **Tanshui river**, Taipei, six seen, late April (unspecified year), but not thought to breed in Taiwan (Swinhoe 1863a); **Yuanlin**, Taichung, one collected, January 1932 (Niigata Education Committee 1974; also Yasuda 1983); **Kaohsiung** (Takao), collected, undated (Yasuda 1983).

POPULATION The Crested Ibis was locally common in parts of its range until the late nineteenth century, but it then rapidly declined in numbers to near extinction, and a single but scattered wild population is currently known to survive.

Russia In the mid-nineteenth century, Przheval'skiy (1877–1878) counted totals of 20–30 birds on migration and not more than 20 birds during the breeding season in the Khanka lake region in Primorye. Since then, only small numbers have been recorded in Primorye (Spangenberg 1965, Labzyuk 1981, 1985), and records from elsewhere in Russia have also only involved small numbers (see Distribution). However, the large numbers recorded on the Korean Peninsula on passage and in winter (see below) were presumably nesting either in eastern Russia or in north-east China, indicating that some large colonies may have existed in Russia in the past which were never documented.

Japan According to medieval accounts and drawings, the species was common and widespread in Japan during the Tokugawa Era (from the early seventeenth century to the late nineteenth century) (Austin and Kuroda 1953). However, during the Meiji Restoration (in the late nineteenth century), traditional protection measures were disregarded and rampant hunting rapidly reduced its numbers, and by the time that it was listed as a protected species on the hunting ordinances in 1908 it was almost extinct (Yasuda 1983). During the twentieth century, there were only scattered records of a few birds, mainly near the Sea of Japan coast (see Distribution). By the 1950s, only two wild populations survived in Japan: there were eight birds on the Noto peninsula and 23 birds on Sado island in 1953 (slightly different figures, with more detail, in Yamashina 1967), but their numbers declined to four birds on Noto and six birds on Sado in 1959, and the Noto population became extinct in 1971; the population on Sado briefly increased to 10–13 birds from 1964 to 1973, but then—despite three years (apparently 1972–1974) in each of which two young were fledged (Yoshii 1975)—declined again and by the late 1970s there were only 6–9 birds; in 1977–1979 only infertile eggs were laid and after 1979 no eggs at all, so in 1981 the five remaining birds were all captured in the hope of captive breeding (Yamashina and Nakanishi 1983). The last surviving male died in captivity in April 1995, and five eggs laid by a female from China (that had mated with the Japanese male) were found to be infertile; a single Japanese female survived, but was too old to breed, and the Japanese breeding population of Crested Ibis was therefore declared extinct (N. Ichida *in litt.* 1995).

Korea The species was a “locally common” passage or winter visitor to the Korean Peninsula in the past, but declined substantially during the early twentieth century (Austin 1948). Campbell (1892) found it common in Korea in winter and spring, and Taczanowski (1887, 1888 in Austin 1948 and Tomek 1999) reported that “one begins to find it in winter and spring 50 km north of Seoul, commonest around Wonsan where one encounters flocks of about 50 individuals”. The most remarkable record was by Shimokoriyama (1913 in Austin 1948), who encountered a flock of several thousand roosting in pine trees near a pond in autumn 1911. Other notable counts were of up to 100 birds in South Chungchong province in 1929, 20 birds on migration at Palmi-do island in Incheon in spring 1934, and c.10 birds at the zoological garden in Seoul in 1936 (Yamashina and Nakanishi 1983). The last record in North Korea was of 10 birds in South Pyongan province in March 1965 (Won Hong-koo in Yamashina and Nakanishi 1983). Two or three birds were seen in the Demilitarised Zone (DMZ) in February 1966, four birds were seen near there in December 1974, two in December

1977 and one in 1978, the last record of this species on the Korean Peninsula (Yamashina and Nakanishi 1983).

Mainland China There is little information available on the status of this species in north-east China (Manchuria), but it was considered to be rare there in the early twentieth century (Loukashkin in Yasuda 1983; see Distribution). However, the large numbers recorded on the Korean Peninsula on passage and in winter (see above) were presumably nesting either in eastern Russia or in north-east China, indicating that some large colonies may have existed in north-east China in the past which were never documented. Until 1958, Japanese businessmen imported Crested Ibis feathers (the equivalent of five birds annually) from north-east China, but no feathers were imported after 1960 (Yamashina and Nakanishi 1983), presumably indicating that its numbers were in rapid decline there at that time. In central China it was locally common until the early twentieth century. For example, it was common in Tianshui and Wushan in Gansu province before 1955, but it then rapidly declined and was almost extinct in Gansu by 1957 (Wang Xiangting 1991). It was regarded as “one of the commonest birds” in the Wei He valley in Shaanxi in 1904 by Blackwelder (1907). It also used to be common in the Qinling Shan mountains, and the elders in Yang Xian county in Shaanxi reported that prior to the 1940s several hundred Crested Ibises could be seen roosting in the same tree and that more than 30 nests could sometimes be found on the same tree (Li Bin and Tian Qing 1998). In south-east China, Swinhoe (1873c) found “large parties in late August and very large flocks in mid-November” at Ningbo in Zhejiang province, and Styan (1891) considered it uncommon in the lower Yangtze valley, but noted that it was “local rather than scarce”.

The single extant wild population was discovered in 1981 in central China, when four adult birds and three chicks were found (Liu Yinzeng 1981). Following the protection and management of this area (see Measures Taken), their numbers increased there and they spread to several new nesting sites: in 1993, a total of 28 eggs were laid in seven locations; in 1994, 20 eggs were laid in six locations; in 1995, 22 eggs were laid in seven locations; and in 1996, 24 eggs were laid in eight locations (Forest Department of Shaanxi Province in Muramoto 1997). After the 1998 breeding season there were estimated to be 66 wild birds (including 16 birds reared in that season), although the highest count in the wild by the end of 1998 was only 56 birds (Ma Zhijun *in litt.* 1999). In 1999, there were 18 breeding pairs, 15 of which bred successfully with a total of 51 eggs laid and 38 chicks fledged (Shi Dongchou *et al.* 1999). In 2000, 50 eggs were laid in 15 active nests, 45 of which hatched, and 33 chicks were fledged; there were 90 adults in the wild before the breeding season, so the estimated population at the end of the year was up to c.120 birds (Ding Changqing verbally 2001).

The fledging success of the wild population increased from only 11% in the early 1980s to 53% in the late 1990s (Shi Dongchou *et al.* 1999), and a high proportion of the wild population at Yang Xian are young birds that have not yet started to breed, so it is predicted that the numbers of Crested Ibis in the wild will continue to increase and that they will expand their breeding range (Lu Baozhong *et al.* 1999). The discovery of a nesting pair in Xixiang county in 1999 provided evidence for such an expansion, and the fact that one of the adults of this pair had no colour ring (despite the fact that all wild chicks have been colour-ringed since 1987) possibly indicated that it had originated from an unknown population (Ding Changqing *et al.* 1999a), and that the wild population may be larger than is currently known.

ECOLOGY Habitat At Khanka lake in Russia, Crested Ibis were found nesting in trees on small islands in marshes near to rivers (Przheval'skiy 1870 in Yasuda 1983), indicating that the original habitat of this species was probably forested wetlands. In Japan, it seemed to prefer localities where there were freshwater ponds, swamps or paddyfields surrounded by low, well-forested hills where it could nest in pine or chestnut trees (Austin and Kuroda 1953). For example, in Niigata it nested in forest near rivers or paddyfields (Niigata Education

Committee 1974). In Zhejiang in China it was found nesting in tall trees in the lowlands (Père David in Yasuda 1983) and on the tops of high pine trees (Swinhoe 1873c). Tall trees are also used for roosting (Cheng Tso-hsin 1963, Li Bin and Tian Qing 1998), and the winter roosting areas in Niigata in Japan used to be close to human settlements (Niigata Education Committee 1974). Birds have been seen feeding in newly ploughed and irrigated fields (Blackwelder 1907), and near rice paddies (Cheng Tso-hsin 1963).

The breeding population in Shaanxi province is also found in areas with a combination of tall trees for nesting and roosting and wetlands or agricultural land for feeding. In winter, the main feeding habitats are paddyfields, riverbanks and reservoirs, mainly close to human settlements, and birds seem able to tolerate human activities in these areas (Ma Zhijun *et al.* 1999). The areas where they currently breed are at 470–1,300 m (Ma Zhijun *et al.* 1999), but the elders in Yang Xian county reported that, prior to the 1940s, they used mainly to be found at lower altitudes in areas with slow-flowing rivers (Li Bin and Tian Qing 1998). In recent years, they have tended to move into new nesting sites at lower altitudes in this area (Zhai Tianqing *et al.* 1999), presumably indicating that this relict population had become confined to suboptimal upland areas but is now expanding back into more typical lowland habitats.

Food It feeds on crabs, frogs, small fish (particularly loach), river snails, other molluscs and beetles (Cheng Tso-hsin 1963, Zheng Guangmei and Wang Qishan 1998). In the breeding season, its main foods are loach, eels and frogs (caught in paddyfields), and earthworms (from ploughed fields or ridges in paddyfields); on migration and in winter its main foods are fish, shrimps, riverine crabs and insects, which it captures in grassy fields or paddyfields (Ma Zhijun *in litt.* 1999). Swinhoe (1873c) observed a large party feeding (up to their knees) in the muddy shallows at the end of a lake: they assumed a crouching position after landing and remained still for a few minutes, then put their bills in the water and advanced, “brandishing their bills under water right and left, and thrusting them forward”. On Sado island, analysis of droppings collected from 1949 to the 1960s, found that the main food items were small river crabs and insects, with some bones (probably frog bones) and shells; from 1955 onwards, the number of insects in the droppings decreased, presumably because agrochemical use in the 1950s and 1960s had greatly reduced their availability (Satoh 1978). Stomach content analysis found the following remains: bones of loach, catfish and other freshwater fish, frogs, salamanders, crabs, American crayfish (introduced to Japan), leeches, freshwater snails, small shellfish, beetles, mole crickets, giant black ants and other insects, and some plant materials and small stones (Satoh 1978).

Breeding In Yang Xian county in Shaanxi the breeding season is currently from February to June (Lu Baozhong *et al.* 1997), somewhat earlier than some of the old breeding records; for example Cheng Tso-hsin (1963) recorded birds nesting in Shaanxi in May. The birds usually nest on the largest available trees in their territories: in mountains above 1,000 m, large oaks *Quercus variabilis* more than 100 years old are available, but lower down the mountains, at c.700 m, the largest trees are 20–30-year-old pine *Pinus massoniana* (Zhai Tianqing *et al.* 1999). In the tall oak trees the nests are 18–25 m above the ground, but in the smaller pine trees they are only 6–12 m above ground (Shi Dongchou *et al.* 1999). The nests are usually in forks near the main trunk (Shi Dongchou *et al.* 1999), and are usually built on shaded branches (Ma Zhijun *in litt.* 1999). The position of the nest sites is closely related to the availability of feeding grounds (Zhai Tianqing *et al.* 1999), and many nests are built close to human settlements, often less than 100 m away, and sometimes the nest tree is only a few metres away from a human settlement (Ma Zhijun *in litt.* 1999).

Birds usually start to breed when they are two or three years old, but first-year birds have also been observed to pair and nest (Lu Baozhong *et al.* 1997). They are territorial in the breeding season (in contrast to old records of nesting colonies, e.g. in Shaanxi: Li Bin and Tian Qing 1998), and usually each pair occupies a small river basin with a good water supply

in the mountains, or a section of river or a grove (Shi Dongchou *et al.* 1999). The nests are 1–10 km apart, and each pair occupies a territory of about 1–2 km²; after fledging, the young birds usually do not return to the nesting area, and they do not nest at the site where they were born (Lu Baozhong *et al.* 1997). Pairs will use the same nesting territory if not disturbed; the pair at Yaojiagou nested at the same site from 1981 to 1990 and the pair at Sanchahe nested at the same site from 1984 to 1995 (Lu Baozhong *et al.* 1997). In the past they were observed to re-use old nests but most pairs now build new nests every year (Shi Dongchou *et al.* 1999). Nesting birds are very sensitive, and they sometimes desert their nests because of human disturbance, if the base of the nest is not stable or if temperatures are unusually high (Xi Yongmei *et al.* 1997). Once deserted, a nest site is seldom re-used (Shi Dongchou *et al.* 1999). After the chicks have hatched, the parent birds become less sensitive to disturbance (Ma Zhijun *in litt.* 1999).

A single clutch of 1–5 eggs (usually three) is laid per year, usually between 14 March and 8 April; both the male and female birds incubate the eggs, and incubation takes 28 days (Lu Baozhong *et al.* 1997, Xi Yongmei *et al.* 1997, Zhai Tianqing *et al.* 1999). The eggs are laid at two-day intervals, so the chicks hatch at different times, and the later chicks often cannot compete with their siblings for food (Xi Yongmei *et al.* 1997). From 1981 to 1996, a total of 199 eggs were laid in the wild in Yang Xian, and 99 young birds fledged (an average fledging rate of 49.7%) (Forest Department of Shaanxi Province in Muramoto 1997). The fledging success of the wild population increased from only 11% in the early 1980s to 53% in the late 1990s (Shi Dongchou *et al.* 1999), presumably linked to a gradual improvement in the quality of the habitat there and the tendency for birds to nest at lower altitudes (which is presumably happening as young trees mature in the lower hills and become suitable for nesting). After the breeding season in August–October they cease to show territorial behaviour and form flocks, which provides an opportunity for single or widowed birds to find a mate (Lu Baozhong *et al.* 1997).

Migration This species used to be a winter visitor to Korea, arriving in October and departing in April (Won 1963), the birds in question presumably moving south from former breeding localities in Russia and north-east China (see Distribution). Some of the central Chinese population was also probably migratory, as the small breeding population at Shanghongmiao village near Xi'an in Shaanxi left the area outside the breeding season (Zheng Shengwu 1994). However, the surviving wild population in Shaanxi does not migrate, only making short altitudinal movements to feed in paddyfields below 800 m in winter, and moving to higher altitudes (up to 1,400 m) to nest in summer (Ma Zhijun *et al.* 1999).

THREATS The Crested Ibis declined dramatically throughout its range in the late nineteenth century and in the first half of the twentieth century (see Population). The reasons for its decline in Russia are poorly known, but it has been suggested that it may have been linked to the development of agricultural lands and hunting (Shul'pin in Yasuda 1983, N. M. Litvinenko *in litt.* 1997). In Japan, a dramatic collapse in its numbers appears to have taken place during the Meiji Restoration (in the late nineteenth century), when traditional protection measures were disregarded and rampant hunting decimated its population (Yasuda 1983). The small remnant populations that survived there were affected by disturbance, agricultural changes that caused paddies to dry up in winter, and agrochemical use in the 1950s and 1960s which greatly reduced the availability of their insect prey (Satoh 1978). One bird found dead at Mt Bijo on the Noto peninsula in 1957 had been poisoned by agrochemicals (Muramoto 1982), and two birds found dead on Sado island in 1966 and 1970 had been poisoned by mercury and agrochemicals (Satoh 1978). In Korea, Campbell (1892) described this species as “a stupid, unsuspecting bird that falls an easy prey to the gun”, and hunting was probably partially the cause of its decline there in the early twentieth century (Austin 1948). Its decline in central China was probably caused by logging of mature trees, the draining of rice paddies

in winter for other crops, the widespread application of fertilisers and other agrochemicals, hunting, reduction of its food supply, and industrial pollution (Shi Dongchou *et al.* 1991b, Li Bin and Tian Qing 1998). Human disturbance, the logging of tall trees (which are essential for nesting and roosting) and the conversion of rice paddies for other uses after 1955 caused it to decline rapidly in Gansu (Wang Xiangting 1991). In Huxian county in Shaanxi, local people reported that it used to nest in tall poplars *Populus* near their village, but once these trees had been felled it became rare (Cheng Tso-hsin 1963). Until 1958, Japanese businessmen imported Crested Ibis feathers (the equivalent of five birds annually) from north-east China, which were used to make fishing lures (Yamashina and Nakanishi 1983). Despite all these various factors, it remains very difficult to be confident about which was the most significant in causing the remarkable decline in the species, from being in places amongst the commonest of birds, to the point where it seemed already to be in serious trouble, in the first half of the twentieth century. In this regard it mirrors the seemingly unstoppable decline of the Northern Bald Ibis *Geronticus eremita* in the western Palearctic (for which see Collar and Stuart 1985). The current threats to the wild population in China are outlined below.

Habitat loss and modification There are still conflicts between economic development and conservation in the breeding grounds (Cao Yonghan *et al.* 1999). The area of winter paddies has been reduced on the breeding grounds since the early 1980s, as these paddies are now mainly converted into dry wheatfields in winter (Ma Zhijun *et al.* 1999, Ding Changqing verbally 2001). The decrease in the area of paddyfield and a decline in the area of wetland have forced parent birds to forage more widely (Cao Yonghan *et al.* 1999).

Food shortage Malnutrition of chicks has been noted in some areas linked to a shortage of food (Xi Yongmei *et al.* 1997). Dissection of birds found dead in the wild has shown that 80% had very little food in their stomachs, and that starvation (especially in winter) could be a significant cause of mortality (Zhang Yaoming *et al.* 1999).

Agrochemical use and pollution As the numbers and range of the Crested Ibises increases in this area, it will be difficult to prevent the use of agrochemicals in all of the paddyfields which they use for feeding (Cao Yonghan *et al.* 1999). Between December 1996 and January 1997, five birds were found to have been killed by the ingestion of poisoned materials (Zhang Yaoming *et al.* 1999). The main feeding areas on the wintering ground along the Han Shui river are being polluted by industrial effluents (Zhang Yaoming 1999).

Hunting and human disturbance Although the protected status of Crested Ibis is now well known in Shaanxi, there have still been some reports of birds being killed by hunters (Chen Zhiqiang 1993). Between 1981 and 1994 six birds were shot at Yang Xian, mainly at the feeding grounds along the Han Shui river (Zhang Yaoming *et al.* 1999).

Natural predators Several animal species may prey on Crested Ibises and their eggs and chicks, including birds of prey (which usually attack adult birds), crows, snakes (especially *Elaphe carinata*, which usually attack nestlings) and weasels (Xi Yongmei *et al.* 1997, Zhang Yaoming *et al.* 1999). In 1987, the pair nesting at Tuanshanhe was attacked by mammalian predators (probably martens), and they changed their nesting site to Guniuping, while in 1992 the nest of a pair at Mujiahe was raided by a snake, and they moved to Guogou (c.5 km from the original nesting area) in 1993 (Lu Baozhong *et al.* 1997). Because of the limited availability of large trees suitable for nesting, young breeding birds usually nest in relatively small trees, where their nests are vulnerable to predators (Cao Yonghan *et al.* 1999).

Disease and parasites Disease and parasites have been found to be the main causes of mortality in the wild Crested Ibis population (39 cases in 1981–1997) (Zhang Yaoming *et al.* 1999).

Overcrowding of captive birds By the end of 1998 there were 52 captive birds at the Yang Xian Protection and Rearing Centre, and the captive conditions there were becoming overcrowded (Cao Yonghan *et al.* 1999).

MEASURES TAKEN *Legislation* The Crested Ibis is listed on Appendix II of CITES. *Russia* It is included in the Russian Red Data Book (N. M. Litvinenko and B. A. Voronov *in litt.* 1997). *Japan* It was officially protected in Japan in 1908, and it was designated as a Special Bird in 1972 (Environment Agency of Japan 1976). It was designated as a Natural Monument in 1934 and a Special Natural Monument in 1952 (Kato *et al.* 1995). It has been protected as a National Endangered Species since 1993, and it is included on the Red List of Japan, which means that its conservation importance is recognised and it can be used as a reference species in environmental impact assessment for development projects (Environment Agency of Japan *in litt.* 1999). *South Korea* In South Korea, this species was designated as natural monument no. 198 on 30 May 1968 (Lee Woo-shin *in litt.* 1998). *Mainland China* It is listed as a National Protected Species (Category I) in China (Zheng Guangmei and Wang Qishan 1998). When the nesting birds were discovered in May 1981, the county government of Yang Xian immediately announced emergency regulations to prohibit logging, the use of agrochemicals in paddyfields and the use of firearms for hunting; in 1987, 51 large nesting trees were declared as state property and these trees were marked and protected (Cao Yonghan *et al.* 1999). Special compensation is given to farmers there for not using fertilisers and pesticides (Cao Yonghan *et al.* 1999).

Protected areas and habitat management *Russia* The Khanka State Reserve and Khasanskiy Nature Park have been established in the areas where this species formerly occurred in Russia (N. M. Litvinenko *in litt.* 1997). *Japan* A Non-Hunting Area was established on Sado island in 1955, and a Crested Ibis Conservation Centre was established at Niibo village on the island in 1966 (Yamashina and Nakanishi 1983). A non-hunting area was established at Mt Bijo in October 1930 (Muramoto 1982). Eastern Kosado (7.34 km², all included in the Special Protection Area) is a National Wildlife Protection Area established mainly for the conservation of the Crested Ibis (Environment Agency of Japan *in litt.* 1999). *Mainland China* A nature reserve has been established for Crested Ibis at Yang Xian (Cao Yonghan *et al.* 1999). Some of the trees which are now being used for nesting by Crested Ibises grew from seeds dispersed by aeroplane 20–30 years ago as part of a campaign to re-afforest the southern slopes of the Qinling Shan mountains (Ding Changqing verbally 1999).

Protection of nest sites At Yang Xian, the nesting sites are patrolled and guarded during the breeding season, until the young birds have fledged (Cao Yonghan *et al.* 1999, Ma Zhijun *in litt.* 1999). The trunks of nest trees (and adjacent trees) are covered with plastic cloth to prevent snakes climbing up them, and nets are placed under the nests to catch any chicks that fall out (Ma Zhijun *in litt.* 1999).

Maintenance of feeding habitat Some paddyfields are maintained in winter as feeding grounds for Crested Ibis, and loach are introduced to them during winter and in the breeding season (Cao Yonghan *et al.* 1999). Staff from the Crested Ibis Conservation and Observation Station at Yang Xian break the ice in frozen paddies on cold days to maintain feeding areas for the birds (Zhang Yaoming *et al.* 1999).

Surveys and monitoring The wild population at Yang Xian was discovered at the end of a three-year Crested Ibis survey in 1978–1981 by the Academia Sinica, which covered sites in the provinces of Liaoning, Gansu, Shaanxi, Hebei, Shandong, Henan, Anhui, Jiangsu and Zhejiang (Liu Yinzeng 1981). Two censuses are held annually at Yang Xian, during the breeding season and in autumn or winter, and many nearby counties and cities have also been visited to look for new nesting or wintering sites (Cao Yonghan *et al.* 1999).

Conservation education Local communities in Yang Xian county have been well informed about wildlife conservation and the importance of the Crested Ibis, and have been asked to take responsibility for its conservation; the nature reserve staff provide help to the local people in their daily lives and have won their support for the conservation of the ibis—for example local communities at Yaojiagou and Sanchahe were helped to cultivate edible mushrooms in the forest to improve their livelihood (Cao Yonghan *et al.* 1999). The local

people at Caoba are reported to be delighted to have Crested Ibis back, and the village has established new regulations on grass-cutting and farming to minimise disturbance to the breeding birds (Li Bin and Tian Qing 1998).

Captive breeding Japan All wild Crested Ibis on Sado island were captured for a captive breeding programme in 1981 (Yamashina and Nakanishi 1983). Attempts to breed from these birds were unsuccessful until the last surviving Japanese male mated with a female brought from China in 1995, but the five eggs laid were infertile; after the death of the male, the only surviving Japanese bird was a female that was too old to breed (N. Ichida *in litt.* 1995). **Mainland China** A Protection and Rearing Centre was established in Yang Xian county in 1990, and 25 weak or injured chicks (of which 12 survived) were taken into captivity and used to breed 23 birds (of which 20 survived), and by 1997 there were 32 Crested Ibises at the centre (Xi Yongmei *et al.* 1997). By the end of 1998, there were 52 captive birds at the centre, and the captive conditions there were becoming overcrowded (Cao Yonghan *et al.* 1999). Six young birds were sent to Beijing Zoo between 1981 and 1988 to establish a breeding centre, and two chicks were born there in 1989, the first successful captive breeding of this species (Xi Yongmei *et al.* 1997). In 1997, there were 22 birds at Beijing Zoo (Shi Dongchou *et al.* 1999), and in 2000 there were 105 captive birds in Yang Xian Protection and Rearing Centre (one of which was sent to Japan), 23 in Beijing Zoo and seven in Japan (Ding Changqing verbally 2001).

MEASURES PROPOSED Legislation Mainland China As accidental killing of this species sometimes occurs, it has been proposed that all of Yang Xian county should be designated as a Non-Hunting Area (Chen Zhiqiang 1993).

Protected areas and habitat conservation Mainland China Nature reserves should be established in the wetlands along the Han Shui river, as the wetlands at Han Jiang have become an important feeding ground for Crested Ibis in recent years (Zhang Yaoming *et al.* 1999). It has also been proposed that supplementary food should be provided to the wild Crested Ibis there (Zhang Yaoming *et al.* 1999), and that more public education and promotion is required (Xi Yongmei 1997).

Re-introduction to former range Russia A re-introduction programme could be considered in Russia in the future (B. A. Voronov *in litt.* 1997). **Japan** When the captive population in Japan has increased sufficiently, a re-introduction programme at carefully selected sites could also be considered there; the establishment of populations in several parts of its former range would be of benefit to the long-term survival of the species (SC). **Mainland China** It has been proposed that birds from the population in Shaanxi should gradually be dispersed to other parts of the former range of Crested Ibis in China, as the wild population is currently vulnerable to extinction through a chance catastrophe within its limited range (Shi Dongchou *et al.* 1999). However, the captive birds do not seem to be well adapted for re-introduction into the wild (Cao Yonghan *et al.* 1999). Great care should be taken if captive birds are released, to avoid introducing the diseases that are often present in captive birds into the wild population; it may be most appropriate to release captive birds in areas that are remote from any wild birds, to eliminate any possibility of transmission of disease (see IUCN/SSC 1998). An alternative strategy could be to translocate surplus young birds from the wild population into new areas, as this would reduce potential problems with disease, and these birds are likely to be much better able to survive in the wild than the captive birds. When translocation of wild birds or the release of captive birds are being considered, it will be necessary to determine whether the release sites have sufficient areas of suitable habitats to support a self-sustaining population; it will also be necessary to determine whether the pressures which caused the Crested Ibis to disappear from most of its former range have now been removed from the release sites (see IUCN/SSC 1998).

Research Russia Surveys should be conducted in the areas where this species was recorded in the past, with the aim of discovering if any birds remain in the wild (N. M. Litvinenko *in*

litt. 1997). *North Korea* Similar surveys would also be worthwhile in North Korea and in the DMZ area. *Mainland China* Further field surveys should be conducted in parts of its former range in mainland China, particularly in remoter regions where low-intensity agriculture is still practised and may be providing suitable habitat for this species. Ma Zhijun *et al.* (1999) proposed that further studies need to be conducted on the availability of food for the Crested Ibis in winter, because it has been suggested that a shortage of food at that time of year was one of the major causes of its decline. Indeed, it appears that there is still scope for a major ecological study of the population, using such techniques as faecal analysis to determine seasonal food use, and evaluating breeding success against foraging efficiency and other factors. The long-term management of the species will depend on the highest-quality scientific information, and every effort should be made to determine as soon as possible the optimal ecological conditions for this last population.

Management of captive populations Some of the captive birds at the Yang Xian Protection and Rearing Centre have shown signs of abnormality probably due to inbreeding, so it has been proposed that captive birds should be exchanged between the Shaanxi Centre and Beijing Zoo and that attempts should be made to mate captive-bred birds with wild birds (Xi Yongmei 1997). However, extreme care should be exercised in implementing the latter proposal, because of the danger of the transmission of disease from captive birds to the wild population.

REMARKS (1) A report that a bird of this species was seen near Khingansky Nature Reserve in 1983 (see e.g. Hancock *et al.* 1992), was in fact based upon a misidentification of a Black-headed Ibis *Threskiornis melanocephalus* (Yu. A. Darman verbally 1999). (2) The unconfirmed sighting of this species behind Huayu National Primary School, Huayu island, in the Penghu islands off Taiwan, April 1997, was originally by three novice birdwatchers, who observed it for only one minute, and described it as a white bird which was black (or dark) from the head and neck to the middle of the wings, flew with a straight neck like a spoonbill or ibis, and had some reddish coloration on the underwing (Anon. 1997). It was reported to have been seen again five days later (Fang Woei-horng 1997), but the record is considered to be unreliable by Taiwanese ornithologists (SC).