

The status of Ferruginous Duck *Aythya nyroca* breeding and wintering in China

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Abstract

Analysis of data published in the China Bird Report (CBR) and other literature between 1979 and 2013, along with our own field observations, found that the Ferruginous Duck *Aythya nyroca* now occurs throughout most of China. This contrasts with the situation in 1979, when the species was restricted to a few areas in the west of the country. Ferruginous Duck is predominately a winter visitor to China; up to 850 birds have been counted in Yunnan Province, 4,000 in Sichuan Province, and the wintering population is estimated at 6,000–8,000 individuals. In summer, the breeding population is estimated at 3,000–4,000 individuals (1,500–2,000 pairs), with highest concentrations in Xinjiang (*c.* 900–1,700 individuals) and Inner Mongolia (750–1,400 individuals). In China, females lay 6–11 eggs, which hatch in early June. The present population in China is likely to have spread from neighbouring central Asia (Kazakhstan, Kyrgyzstan or Mongolia). Since 1980, the climate had gradually changed from warm-dry conditions to a wetter climate in northwest China, making it a more suitable breeding area for this species and providing corridors for their expansion to the east. If the present trend continues, southern China could in the near future become an important wintering area for a duck species that is now increasingly common elsewhere in China.

Key words: *Aythya nyroca*, breeding, distribution, Ferruginous Duck, habitat, population size, range expansion, Xinjiang.

The Ferruginous Duck *Aythya nyroca* is listed as “Near Threatened” on the IUCN Red List and is also a priority species on three prominent international conservation treaties: the European Union Birds Directive, the Bern Convention and the Bonn Convention (under the African-Eurasian Migratory Waterbird Agreement;

AEWA) (BirdLife International 2012). There have been international concerns about population declines and range contraction in the western Palearctic, and an international species action plan has been developed to help to conserve the species (Robinson & Hughes 2006).

The Ferruginous Duck breeds principally

in southwest Asia (from the west to China and the south to Pakistan and India), central and eastern Europe, and North Africa (Callaghan 1999; Vinicombe 2000; Kear 2005). Four populations are currently recognised by Wetlands International and the one encompassing China is described as the “S, E and SE Asia” population. The wintering range of the East European population partly overlaps with the breeding range and extends to the Middle East, northeast and west Africa (mainly Mali and Nigeria) and southeast Asia (Kear 2005). Currently the global population is estimated at *c.* 177,400–252,600 individuals (Wetlands International 2014). The duck has undergone declines in its population size and changes in distribution over the past few decades (Ali & Ripley 1978; Perennou *et al.* 1994; Lopez & Mundkur 1997; Grimmett *et al.* 1999). Primary reasons for its decline are thought to be unsustainable levels of hunting, habitat degradation and loss (Callaghan 1997). Recent surveys have found high numbers,

perhaps into the tens of thousands, in Asia (Li *et al.* 2009). In China, it was known to be a summer visitor to the northwest and a migrant through the central provinces, with winter records from the middle reaches of Yangtze floodplain reported during the mid–late 20th century (Cheng 1987). More recently, Ferruginous Duck accounted for *c.* 0.13% of all wildfowl recorded as taken by hunters between 2009–2012 (MaMing *et al.* 2012), though recent photos of ducks recovered from hunters suggest that this proportion could be higher at around 5–10% (Fig. 1). There is much suitable habitat in the country, and this species is now thought to be common in China, although quantitative data are lacking. This study is the first review of the available data to assess the population, distribution and breeding ecology of this species in China.

Methods

In order to assess breeding and wintering abundance and distribution, and to describe



Figure 1. Eighty six Ferruginous Duck in *c.* 580 wild duck seized from poachers by the Xinjiang police on 9th July 2014. (Photograph by Roller MaMing).

the breeding ecology of the Ferruginous Duck in China, we reviewed about ten years of data published in the China Bird Report (CBR, checking *c.* 438 reports from across the country) along with reference literature from 1979 to 2013, including international waterbird census (IWC) data collated by Wetlands International and previously by the International Waterfowl & Wetlands Research Bureau and the Asian Wetland Bureau (Cheng 1979; Lopez & Mundkur 1997; Delany & Scott 2002; National Forestry Bureau, NFB 2009; Li *et al.* 2009; Ma 2011; Zhao *et al.* 2013). CBR data are collected by volunteers who differ in levels of skill in identifying species and making counts; therefore it is likely that, although Ferruginous Duck are relatively easy to identify in the field, there are some errors in the data, and an increased interest in ornithology within China has biased towards increased reporting rates in more recent years. In collating records, we have attempted to verify the data received from coordinators and observers, and have checked with coordinators the validity of some of the information. No information has been provided to the China Bird Report for Hong Kong and Taiwan, so literature searches and information from key researchers provided the best overview of the status of Ferruginous Duck in these two regions.

In addition, from 2011–2013 inclusive, we carried out field surveys of the breeding ecology, number of breeding pairs and migration of Ferruginous Duck in the Xinjiang Uygur Autonomous Region of China, using fixed route surveys, direct counts and interview surveys (Zhao *et al.* 2013).

The distribution of sites where Ferruginous Duck have been recorded in China since 1979 is shown in Fig. 2. Information on the location of each site was derived from the site forms submitted by observers. Although it was not feasible to check the accuracy of all information recorded, an attempt was made to check the location of all sites known to be important for the species. Some sites where only local names were recorded and numbers were relatively low could not be located precisely; sites illustrated in Fig. 2 therefore account for only *c.* 60% of all records of Ferruginous Duck sites from the review.

Results

Population size

From published winter count data (Rose & Scott 1994; China Bird Report 2001–2013; Delany & Scott 2002; National Forestry Bureau, NFB 2009; Li *et al.* 2009; Ma 2011) we estimated that there is a non-breeding population of 6,000–8,000 Ferruginous Duck in China (Table 1). In general, the species occurs at elevations ranging from 0–3,900 m above sea level, but is mostly found at 600–1,500 m. Maximum numbers occurred in January (about 6,000 individuals), although significant numbers (between 3,300–5,400) are also reported in February, November and December, with smaller numbers (380–1,700) in March–October (Fig. 3). From these data it appears that Ferruginous Duck is mainly a wintering species in southern China, where it occurs from early October to March.

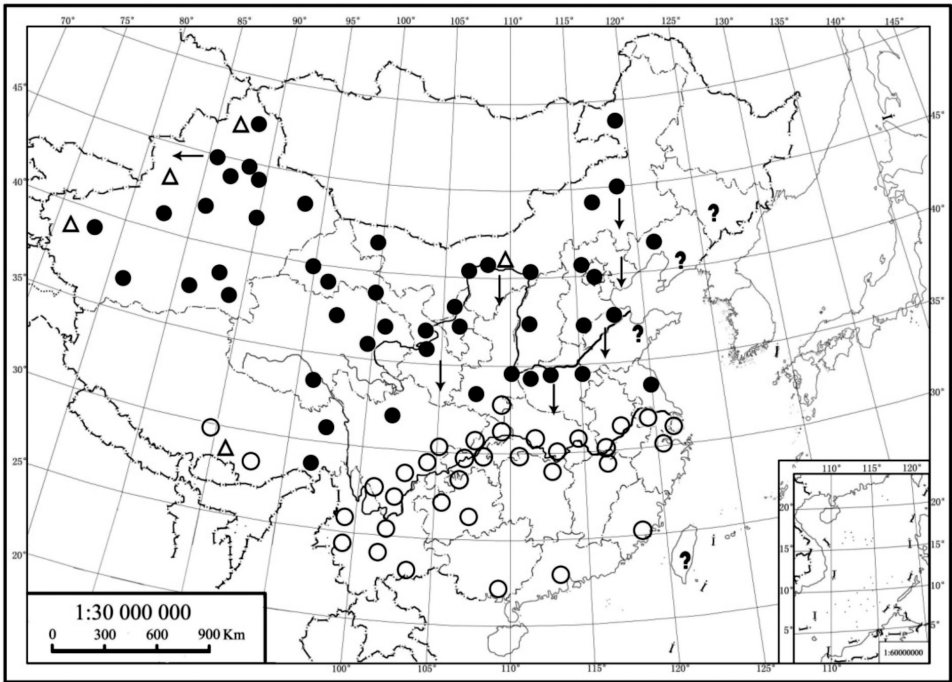


Figure 2. Distribution of Ferruginous Duck in China from 1979 to 2013. Note: ○ = wintering concentrations (recorded in the last ten years); ● = summer concentrations (recorded in the last ten years); △ = historical records (pre-1979); ↓ = migration route; ? = vagrant.

The species also breeds in northern and northwest China. In spring (early March to late April) the species migrates to northern China and only small numbers remain in the wintering areas to which they return between late October and mid-November.

Distribution

The range of this species appears to have changed considerably over the last 40 years, although the extent to which it has done so is difficult to ascertain, as observer coverage and reporting has increased with the recent development of the CBR and bird-watching societies in China. In the 1970s, the species bred principally in northern and western

Xinjiang, at Wuliangshuai Lake in Inner Mongolia, and in southern Tibet. During migration, it was found at a few places such as Gansu, southern Shaanxi, northern Sichuan, Yunnan and southwest Guangxi. In winter it was occasionally reported from Shandong and Hunan provinces and less frequently elsewhere (Cheng 1979). More recently, the ornithological literature and the CBR indicate that ducks have extended their range to most of China, and the species has been recorded in *c.* 94% of all provinces over the past decade, including Xinjiang, Tibet, Qinghai, Gansu, Inner Mongolia, Liaoning, Hebei, Beijing, Tianjin, Ningxia, Shanxi, Shaanxi, Shandong, Jiangsu, Anhui,

Table 1. Maximum numbers of Ferruginous Duck recorded in various parts of China in a single year between 1979 and 2012, broken down by season. Estimated numbers present during the peak season are also given for each region.

Province	Site	Altitude (m)	Number of observation records (times)	Maximum number of ducks recorded (individuals)	Summer	Winter	Passage	Estimate	References
Anhui	Hefei	20–30	1	–	5	–	–	< 100	CBR
Beijing	Changping, Huairou, Miyun, Beijing & Yanqing	30–500	68	6	3	165	–	300–400	CBR
Fujian	Fuzhou	30–220	1	–	50	–	–	< 100	NFB 2009
Gansu	Baiyin, Dunhuang, Lanzhou, Subei, Luqu & Yongjing	1,000–2,000	24	218	1	124	–	400–500	CBR
Guangdong	Guangzhou	30–50	2	–	6	2	–	< 100	CBR
Guangxi	Beihai	10–20	1	–	3	–	–	< 100	CBR
Guizhou	Guiyang & Weining	1,000–2,300	15	–	274	50	–	500–600	CBR
Hebei	Hualai, Qinghuangdao, Huanghua & Hengshui	20–80	12	15	–	44	–	< 100	CBR
Henan	Kaifeng, Lingbao, Luoyang, Sanmenxia, Mengjin, & Zhongmou	60–500	15	6	118	2	–	200–300	CBR
Hubei	Honghu, Yangxin, Wuhan & Lingzihu	20–130	5	220	–	–	–	300–400	Ge <i>et al.</i> 2004

Hunan	Yueyang	20–50	1	–	6	100–200	CBR
Hong Kong	Hong Kong	0–500	6	–	4	50	Carey <i>et al.</i> 2001
Jiangsu	Sheyang	10–50	4	–	3	< 100	CBR
Jiangxi	Xinjian	30–130	1	–	190	400–500	CBR
Liaoning	Dandong, Faku &	90–100	4	–	–	150–250	CBR, IWC
Inner Mongolia	Baotou, Chifeng, Gulinhe & Ejinaqi	600–1,100	10	1,238	–	1,500–2,800	NFB 2009
Ningxia	Qingrongxia, Shizuishan, Zhongwei & Yinchuan	1,000–2,000	4	14	–	150–200	NFB 2009
Qinghai	Delingha, Gonghe, Guide & Yushu	1,500–2,500	12	45	–	150–200	CBR
Shandong	Dongying, Kenli	20–90	2	–	–	10–20	CBR
Shanxi	Taiyuan	500–1,000	1	–	–	50–100	CBR
Shaanxi	Heyang, Huxian, Xian & Xianyang	300–1,100	10	5	355	400–500	CBR
Shanghai	Chongming & Nanhui	0–5	2	1	6	< 100	CBR
Sichuan	Throughout Sichuan	500–2,500	93	57	4,000	2,000–4,000	NFB 2009
Tianjin	Jinghai & Tianjin	0–5	2	–	–	< 100	CBR
Taiwan	Tainan	0–1000	8	–	8	8	Liu <i>et al.</i> 2010
Tibet	Changdou & Linzhi	3,000–3,900	1	2	–	< 100	CBR
Xinjiang	Throughout Xinjiang	50–3,900	97	1,032	141	1,800–3,400	Field survey
Yunnan	Throughout Yunnan	500–2,000	34	13	850	1,500–2,000	NFB 2009
Zhejiang	Haining & Hangzhou	0–100	2	5	10	< 100	CBR
Total			438	2,877	6,033	640	6,000–8,000

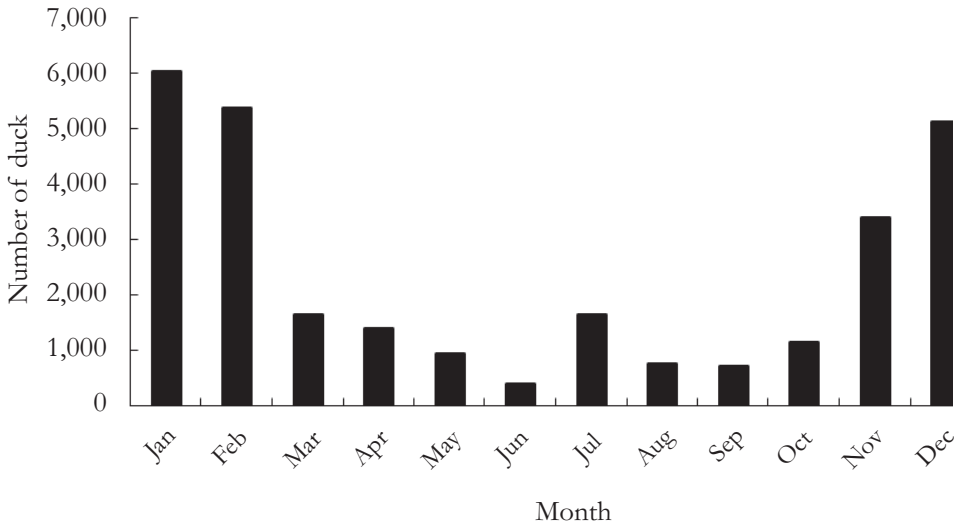


Figure 3. Maximum monthly counts of Ferruginous Duck reported to the China Bird Report and other ornithological publications.

Hubei, Hunan, Zhejiang, Shanghai, Jiangxi, Sichuan, Guizhou, Yunnan, Fujian and Guangdong. The breeding population is still mainly restricted to Xinjiang, Inner Mongolia and with scattered breeding in Gansu, Shanxi, Shaanxi, Hebei, Beijing, Henan and Tibet. In winter, the species appears to concentrate in Sichuan, Guizhou, Yunnan and Jiangxi, but also occurs regularly in Hunan and Hubei, with small numbers in Zhejiang, Fujian, Guangdong, Guangxi and Southern Anhui. Small numbers or vagrants occur on passage in Qinghai, Liaoning and Shandong. Despite the lack of early coverage and more limited reports before 1979, it would seem that the species has expanded from wintering in very few provinces 35 years ago to 30 provinces throughout the country at present, a range expansion of 2,000–3,000 km, or an average of 50–60 km per year (Ma 2010).

Breeding

Based on literature sources, the numbers breeding in China are estimated at 3,000–4,000 individuals (1,500–2,000 pairs), with most occurring in Xinjiang (900–1,700 individuals) followed by Inner Mongolia (750–1,400 individuals; from counts in Table 1). In the last 10 years, > 200 Ferruginous Duck have also been recorded in Gansu and Hubei during the summer, where they are likely to be breeding, with smaller numbers in other provinces of northern and central China including Qinghai and Sichuan (Table 1). The species is mainly migratory although little is known about its migratory routes. Spring migration begins as the birds leave their wintering grounds in mid-March. It breeds from early May to mid-June in single pairs or loose groups. It shows a preference for well-

vegetated, closed, small and comparatively shallow wetlands in arid regions, such as fishponds, sewage pools, artificial reservoirs, natural lakes, slow flowing rivers, paddy fields, seasonal wetlands and salt lakes with low salinity. The female lays 6–11 eggs, which hatch in early June in Xinjiang. Departure from the breeding grounds begins in early October with most birds gone by mid-November, although our observations showed that some individuals in southern Xinjiang may remain on the breeding grounds there throughout the year. During migration, the species is usually encountered in small groups of 20–50 individuals (Zhao *et al.* 2013).

Discussion

Given that the range of the Ferruginous Duck may fluctuate considerably with wetland availability from year to year, it is unclear what proportion of the Asian population is currently counted (Petkov *et al.* 2003). There have been declines in Europe, but evidence of a decline in the larger Asian populations is sparse, and sometimes contradictory (Collar *et al.* 2001; Cao *et al.* 2008; Li *et al.* 2009). For instance, according to Li *et al.* (2009), there has been substantial variation in winter numbers in southern Asia, with estimates ranging from 6,512–12,863 individuals in 1987–1997 and from 31,280–97,205 individuals in the years 1998–2007. During the 1970s, the species bred mainly in northern and western Xinjiang, at Wuliangshuai Lake (Inner Mongolia) and in southern Tibet, and these remain the main breeding areas within China. However, the species has been increasingly reported in a number of other

provinces in northern and central China during the summer over the past 10 years. Pre-1979 records indicated that the winter distribution was limited to Shandong and Hunan. Now, Ferruginous Duck have been observed at wintering sites across central and southern China, and the numbers present in mid-winter are estimated at *c.* 6,000–8,000 individuals. We consider this estimate to be very conservative, particularly in comparison with the *c.* 100,000 thought to be over-wintering in southern Asia (Li *et al.* 2009). The most likely potential explanation for this apparent range expansion is that there is now more suitable habitat in China than in former times. Furthermore, since strict gun controls were imposed in China in the 1990s, there has been a reduction in hunting pressure on this species, though this has been offset by the illegal trapping and poisoning of waterbirds within China in recent years. Some of China's wintering population is likely to come from neighbouring parts of central Asia (notably Kazakhstan and Kyrgyzstan) where there are large numbers of breeding pairs (Petkov *et al.* 2003). Since 1980, the climate has changed from relatively warm-dry to a wetter climate in northwest China providing this species with more suitable habitat and corridors for expansion to the east (Shi *et al.* 2002, 2003; Ma 2010). There is also some evidence for population declines in India and Kazakhstan in recent decades (BirdLife International 2012).

Traditionally it was thought that individuals from Central Asia wintered in the Middle East and northeast Africa (mainly Sudan and Ethiopia) and southeast Asia (Vinicombe 2000). In former times, the

Ferruginous Duck was mainly a wintering species in south China, where the population size in winter was always greater than in summer, as now. It remains chiefly a migratory winter visitor to China, although little is known about its migration routes. It is widely distributed and very rarely aggregates into large groups. Based on our studies, the Ferruginous Duck mainly winters in southern China from where it migrates to northern China or potentially to countries further north (e.g. western Mongolia; Kear 2005), leaving only small numbers in the Chinese wintering areas in spring. We also still know little about the migratory routes of birds breeding in Xinjiang, in the west of China, which may travel to India or central Asia in winter. Although more data is required to obtain a better understanding of the abundance, distribution and migration routes of the species in China, there is little doubt that wetlands in southern China that were once only used as migratory stopover sites have become important wintering grounds for Ferruginous Duck in Asia.

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