

Habitat Use of Cranes in Cheolwon Basin, Korea

Lee, Woo-Shin*, Shin-Jae Rhim and Chan-Ryul Park

Department of Forest Resources, Seoul National University, Suwon 441-744, Korea

ABSTRACT: We investigated the habitat use of cranes, and suggested the proper way to protect and manage the cranes in Cheolwon Basin, which is the most important wintering ground of cranes in Korea. Field surveys were conducted in the wintering seasons from Nov. 1994 to Feb. 1995, and from Nov. 1997 to Feb. 1998. The habitat loss and environmental changes by the road construction and agricultural field rearrangement might have affected the distribution of the cranes. The distribution of cranes seemed to be related with the density of rice grains remained in rice paddies.

Key Words: Cheolwon Basin, Cranes, Korea, Management, Rice paddy, Wintering ground

INTRODUCTION

Among the fifteen species of cranes in the family Gruidae, order Gruiformes (Howard and Moore 1980), eight species have been known to migrate to Korea. They are white-naped crane (*Grus vipio*), red-crowned crane (*G. japonensis*), hooded crane (*G. monacha*), common crane (*G. grus*), the demoiselle (*Anthropoides virgo*), the siberian white (*G. leucogeranus*), sand-hill crane (*G. canadensis*), and hybrids of common and hooded cranes (Won 1981, 1988, Lee *et al.* 2000).

The cranes that regularly migrate to Korea for wintering are imperiled, and their wintering ground is recently threatened by habitat loss and environmental changes. Density decline of cranes as large birds of the wetlands is closely related to wetland destruction and degradation in Korea. Protection and appropriate management of the wintering grounds was found to be effective to conserve them (Chan 1999).

As the environment are changing rapidly due to the development and urbanization, wintering ground of cranes is almost disturbed and disappeared in Korea. In such respects, Cheolwon Basin is so much important as a stable wintering ground for the cranes (Lee and Rhim 1999).

This study was conducted to investigate the habitat use of cranes and to suggest the proper way to protect and manage the cranes and their wintering grounds in Cheolwon Basin, Korea.

MATERIALS AND METHODS

Study area

Cheolwon Basin is located around the DMZ (demilitarized zone) in central Korean Peninsula in N 38°15', E 127°13'. This area consists of about 5,000 ha of lower reaches of streams and basins with scattered villages. Most of the lower area of Cheolwon Basin is rice paddy, which is the most important feeding site of cranes (Lee and Kaliher 1995). Wintering cranes were surveyed at observation points, such as ICM (Ice cream mount), WHM (White horse monument), and DMR (Daema-ri).

Methods

The number of wintering cranes was counted and recorded at all observation points simultaneously every hour from 07:00 to 17:00. Also, the direction of flying, location of the feeding sites, and the number of individuals of each species were recorded (Lee and Kaliher 1996).

Roost observations were made from one-half hour before sunrise until all roosts were vacated and in the afternoon until darkness prevented further observation. In the DMZ, morning observations of roost existence were usually maintained until one-half hour after the last cranes left (Lee and Rhim 1999).

Survey was conducted by field scope (Nikon ED, 25-45 x), binocular (Nikon, 8 x 30), and counter in the wintering season of cranes from Nov. 1994 to Feb. 1995, and from Nov. 1997 to Feb. 1998. Distribution of cranes was recorded by subareas within each wintering ground.

The number of rice grains was surveyed at the feeding and distribution sites in Cheolwon Basin. We divided the major crane

* Author for correspondence; Phone: 82-31-290-2329, Fax: 82-31-293-1797, e-mail: krane@snu.ac.kr

distribution area into ICM, WHM and DMR according to the results of crane distribution survey.

100 sampling square (1 m²) was selected randomly in each site. All materials including soil in sampling square were collected and transported to laboratory. We sorted out and counted rice grains from each sample in laboratory.

RESULTS AND DISCUSSION

Fig. 1 shows the distribution of red-crowned and white-naped cranes in Cheolwon Basin on 16 Feb., 1995. Red-crowned and white-naped cranes were distributed at all subareas in the basin. The cranes were distributed in most of the area between Ice Cream Mount (ICM) and Gangsan reservoir (Lee and Kaliher 1995, 1996, Lee and Rhim 1999).

Rearrangement of agricultural field was done around the road. The rice paddies around ICM were good foraging sites of cranes in wintering season of 1995 (Fig. 1). But surface of the rice pad-



Fig. 1. Distribution of red-crowned (□) and white-naped (○) crane in Cheolwon Basin (16 Feb., 1995).

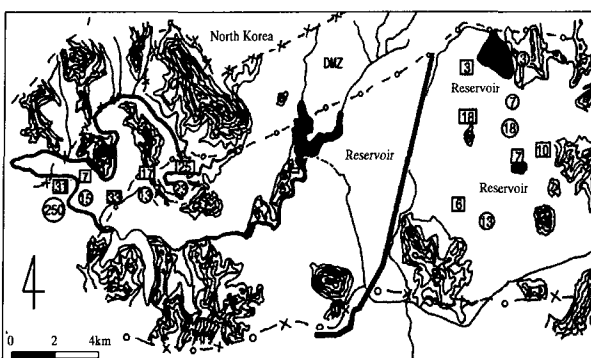


Fig. 2. Distribution of red-crowned (□) and white-naped (○) crane in Cheolwon Basin (14 Jan., 1998) (Bold line indicates a road built newly).

dies was turned over by the agricultural field rearrangement. In consequence, cranes had to spend more energy to find rice grains. The difficulties for finding foods would affect the distribution of cranes.

After the road construction, the distribution of cranes was changed. Most of the cranes moved to another area. The number of the cranes between ICM and Gangsan reservoir decreased in wintering season of 1998 (Fig. 2). By the road construction, disturbances by the vehicles running with high speed occurred there frequently.

There were no cranes around the road newly built. The number of cranes decreased dramatically in the area between ICM and Gangsan reservoir (Fig. 2). The habitat loss and environmental changes by road construction and agricultural field rearrangement might have affected the distribution of the cranes.

There was close relationship between rice grain density (no. of rice grains per m²) and the number of cranes in each site of Cheolwon Basin (Table 1). Each site showed different rice grain density. The density was highest in DMR (37 ± 7.3) and lowest in WHM (5 ± 3.8).

The number of cranes was highest in DMR (173 individuals of red-crowned crane, 239 individuals of white-naped crane) and lowest in WHM (21 individuals of red-crowned crane, 57 individuals of white-naped crane).

Red-crowned and white-naped cranes showed similar habitat use patterns in Cheolwon Basin. Most of the cranes distributed in rice paddies (dry, wet, and ploughed rice paddies). More than 80% of cranes used dry rice paddies as their habitat. Wet rice paddies, irrigation canal, corn field, and reservoirs were used less as habitat (Tables 2 and 3).

This result indicates that the distribution of cranes was closely related to the distribution of food resources, i.e. rice grains. For the management of wintering crane populations, the supply of food resources is very important. Rice grains, therefore, should be remained at rice paddies of Cheolwon Basin for the wintering cranes.

Red-crowned, white-naped, and hooded cranes were designated as natural monuments in Korea. These species have been protected by law, but practical legal protection including the protection of habitat should be strengthened.

In Korea, two wetland reserves are proposed for the interna-

Table 1. The number of red-crowned and white-naped cranes, and rice grain density in Cheolwon Basin

	ICM	WHM	DMR
Rice grain density (mean ± SE)	28 ± 5.0	5 ± 3.8	37 ± 7.3
No. of red-crowned crane	84	21	173
No. of white-naped crane	197	57	239

Table 2. Habitat use pattern (%) of red-crowned cranes in Cheolwon Basin

	Dried rice paddy	Wet rice paddy	Ploughed rice paddy	Irrigation canal	Corn field	Reservoir
ICM	81.6	2.3	12.6	1.1	1.1	1.1
WHM	88.9	-	11.1	-	-	-
DMR	100.0	-	-	-	-	-

Table 3. Habitat use pattern (%) of white-naped cranes in Cheolwon Basin

	Dried rice paddy	Wet rice paddy	Ploughed rice paddy	Irrigation canal	Corn field
ICM	81.8	3.0	12.1	-	3.0
WHM	91.9	7.1	1.0	-	-
DMR	100.0	-	-	-	-

tional network. Both are within the DMZ. The Han River Estuary and the Cheolwon Basin are revealed to be important areas for migratory cranes from population census and satellite data in Korea (Chong *et al.* 1994, Chong and Morisita 1996).

Rice paddies in the buffer zone stretched southward from the DMZ play an important role for wintering cranes in Cheolwon Basin. Cranes often roost on wetlands in the DMZ and then at dawn fly southward to the rice paddies to forage remaining grains. Also, hot springs and reservoirs in that area offer resting sites, and narrow deep furrow bordered on fields provide hiding places for wintering cranes (Korea Forestry Research Institute 2000). In this basin, human disturbance was the predominant disturbance type, including sound and tremor of vehicles, sight-seers, and photographers. But there were more critical human disturbances, i.e. road construction and agricultural field rearrangement in the Cheolwon Basin. Rearrangement of agricultural field could change the wintering ground of cranes to even ground, which does not provide the shelter, roosting site, and feeding site for cranes. So, the distribution of cranes are changed by human disturbances. The planners of development and governors should listen to the advice of crane biologists and ecologists when they plan and carry out development action.

Every possible government unit, which is interested in post-unification development, should be involved in a coordinated planning effort to insure protection of at least some parts of the DMZ as reserves or refuges for cranes. These areas should be established as special management areas in order to integrate continued agricultural practices, carefully planned historical and ecological tourism, and protection of wildlife values.

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