Conservation of Wintering Hooded Cranes in Yashiro, Japan

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Abstract The wintering population of the Hooded Crane *Grus monacha* in Yashiro, Yamaguchi Prefecture, Japan, has declined from 250 to 41 individuals over the past 47 years. The cranes forage in harvested paddy fields during the daylight hours. Territories are defended by families in November and December and abandoned after January due to the decline in food supply. In January and February, cranes depend heavily on artificial food provisioning. During the nights, cranes communally roost on the top of terraced paddy fields, bare ground on hills, or ponds. When the temperature drops below 0°C, roosts on ponds are used frequently. Reduction of foraging areas, human disturbance and degradation of roosts are the major causes of the population decline. Conservation of the wintering area has recently been enhanced by the efforts of the municipal government, which has provided provisioning, rebuilt roosts and reduced human disturbance.

Key words: Hooded Crane, *Grus monacha*, conservation, feeding rate, roost.

Introduction

Although most species of cranes are endangered in the world, the numbers of the Hooded Cranes *Grus monacha* and White-naped Cranes *G. vipio* have been fairly stable or have increased (Archibald *et al.* 1981). Hooded Cranes breed in the wetlands of Siberia and migrate for wintering to China, Korea and Japan (Johnsgard 1983). Most wintering cranes, however, concentrate in Izumi, Kagoshima Prefecture, Japan, *e.g.*, 6990 individuals in 1987/88 (Abe *et al.* 1989), while only small populations have been observed in other wintering areas (Kawamura 1991, Ma 1991). This species suffers the two extremes of threat, overcrowding and local extinction due to the deterioration of habitats.

In Yashiro, cranes and their habitats have been protected by law as the Special Natural Monuments since 1921. In 1963, a crane observatory where a warden monitors the number and behavior of cranes and provides food to cranes was constructed. Nevertheless, the Hooded Crane population wintering in Yashiro has undergone a gradual decline to 41 in the 1991/92 winter. Researches on the number and behavior of wintering cranes have been carried out for conservation of cranes from 1973 to 1975 and from 1983 to 1986. Some of data collected in the researches have been published and management efforts for conservation have been conducted (Nishida 1981, Eguchi *et al.* 1991, Kawamura 1991). The aim of this paper is to describe the recent situation of the Hooded Crane population in Yashiro and management efforts for conservation made. Most part of data in this paper is based on the researches from 1983 to 1986 and unpublished data

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collected by Mr. Kazumi Hironaka, the warden of the crane observatory.

Methods

Yashiro is situated in a small basin, 320 m above sea level, primarily occupied by paddy fields. Cranes spent the daylight hours on paddy fields, about 35ha, in the center of the basin, and slept at communal roosts on terraced paddy fields, bare grounds on hills, or ponds at night.

Researches were carried out for 5 to 10 days every month from November to February, during the three winters, 1983/84, 1984/85 and 1985/86. We collected data on home range use, feeding rate, disturbance by human, and utilization rate of roosts. In order to measure the feeding rate, the number of swallows was counted for foraging individuals. The feeding rate is expressed by the number of swallows per minute. Because there were no significant difference between sexes or between the member of the territorial families and those of the non-territorial flock, data are shown separately only for adults and juveniles. Locations of territorial families and non-territorial flocks were mapped every 30 min. Every morning, the number of cranes departing roosts was counted at observation points near the roosts.

Results

Yearly changes in the number of cranes visiting

First cranes usually arrive in late October and last cranes depart there in early March every year. The earliest description of the number of the Hooded Cranes wintering in Yashiro appeared in 1877, when ten individuals were reported (Kawamura 1991). Regular counts of the number of wintering cranes started in 1945 (Fig. 1). Just after World War II, about 250 cranes visited. From 1946 to 1949, the number of cranes decreased dramatically; thereafter, the number of cranes began a gradual decline that has

Fig. 1. Yearly change in the number of the Hooded Cranes wintering in Yashiro. Data are supplied by the Government of Kumage town and Mr. K. Hironaka.

Fig. 2. Distribution of territories of the families and foraging range of the flock. Lines indicate main roads, stippled parts are hills, closed star is the location of the provisioning site and open one is the crane observatory.

Table 1. The utilization rate¹ (%) of the provisioning site.

	November	December	January	February
1983/1984				
Dominant family	11.1	9.6	—	—
Subordinate families	1.7	0.0	—	—
(mean)				
Flock	—	2.3	57.0	37.4
1984/1985				
Dominant family	15.8	27.0	—	—
Subordinate families	5.7	0.0	—	—
(mean)				
Flock	—	0.0	38.0	57.3
1985/1986				
Dominant family	9.1	—	—	—
Subordinate families	0.0	—	—	—
(mean)				
Flock	0.0	45.7	51.7	49.2

¹: the utilization rate is expressed as the frequency percentage that the family occurred in the provisioning site for territorial families, and the proportion of individuals occurring there against total number of flock members for the flock, based on mapping data of individual cranes every 30 min.

continued to the present. During the 1980s, the number dropped below 70 individuals, and, in the 1991/92 winter at last, reached 41.

Since 1973, the number of juveniles has been counted. The number of juveniles decreased from 25 in 1973/74 to 13 in 1991/92. The proportion of juveniles fluctuated around 0.20 and increased during the declines of total number from 1978/79 to 1982/83 and from 1989/90 to 1991/92 (Fig. 1). Because juveniles still depend on the parents during their first winter, it is likely that the decrease in the number of cranes was due to

the presence of fewer sub-adults and fewer adults not accompanying juveniles.

Range use and feeding rate

Families with one or two juveniles established territories and spaced out over the foraging area. Only four to five families occupied their territories while all other cranes aggregated in a flock in November and December (Fig. 2). Territories were maintained until December, and abandoned in January when the food supply became depleted. In January and February, all cranes aggregated in a flock and foraged in a small area around the provisioning site.

The provisioning site was little-used in November, when even dominant families spent only a short time there (Table 1). However, the utilization rate increased greatly in January and February.

Fig. 3. The seasonal changes in the feeding rates in (open symbols) and out of (closed symbols) the provisioning site. Circles and squares indicate adults and juveniles, respectively.

Table 2. The seasonal changes in the number of cranes using major roosts during the study periods.

roost	type ¹	1983/1984					1984/1985				1985/1986		
		Nov.	Dec.	Jan.	Feb.	Mar.	Nov.	Dec.	Jan.	Feb.	Nov.	Dec.	Jan.
A	BG	0	0	0	36	0	—	—	—	—	16	0	0
B	BG	0	0	0	8	0	—	—	—	—	—	—	—
C	PF	0	5	13	65	0	—	—	—	—	0	0	0
D	PF	0	0	2	4	0	9	17	0	0	0	0	0
E	PF	0	10	60	251	5	7	96	135	57	7	170	112
F	PF	9	23	0	0	0	9	0	0	0	12	71	209
G	PF	4	3	0	0	0	9	0	0	0	12	1	5
H	PF	8	0	0	0	0	40	34	16	13	104	0	6
I	PF	19	8	0	26	0	24	22	78	3	0	0	0
J	PO	0	155	575	226	119	0	0	433	323	5	6	6
Unknown	—	4	11	22	4	0	26	16	73	31	49	17	10
Total No. of cranes		44	215	672	620	124	124	185	735	427	205	265	348
No. of nights		4	5	11	10	2	5	5	12	7	7	5	6

¹: for abbreviation; BG = bare ground, PF = paddy field, PO = pond.

Fig. 4. The relationships between the utilization rate of roost and daily minimum temperature. (a) for the pond roost, $y = -0.06x + 0.27$, $r^2 = 0.14$, $P < 0.01$, (b) for the paddy roosts, $y = 0.05x + 0.66$, $r^2 = 0.14$, $P < 0.01$.

Table 3. The seasonal changes in reaction distance (mean with 95% confidence limit) when the cranes were disturbed. Data were combined for three winters.

Source of disturbance	November	December	January
humans	66.1±16.4m	69.8±26.6m	63m
n	16	8	1
cars/motor bikes	69.3±22.7	22.1±6.4	50.6±18.2
n	12	45	7

Out of the provisioning site, the feeding rate decreased as the season progressed every year ($P < 0.001$ for each case, ANOVA; Fig. 3). In the provisioning site, however, the tendencies were equivocal; increasing in 1983/84, decreasing in 1984/85, and decreasing in adults but constant in juveniles in 1985/86 (Fig. 3).

Roosting

Table 2 shows the seasonal change in the utilization rate of major roosts between 1983 and 1986. In November and December, the paddy roosts were mainly used; utilization of the pond roost increased after January. When cranes were disturbed at one roost they often moved to another roost during the night.

Cranes roosted in the water and avoided the places where ice covered the surface. When the ambient temperature went down below 0°C, most of the cranes roosted in the pond, probably because the paddy roosts were covered with ice (Fig.4).

Influences of human activities

The first group of cranes comes in late October every year. At this time, the harvesting of rice plants has been completed. However, the cranes are very sensitive and susceptible to disturbance by cars and humans. In early period of wintering, cranes are readily flushed by cars and humans and mass disappearances often occur after repeated disturbances. For example, nineteen cranes arrived on 23 October 1984 but disappeared on the next day, and 16 of 40 cranes disappeared on 12 December 1988 (Hironaka pers. comm.). The cranes that disappeared may have emigrated to Izumi. This possibility is supported by the fact that a banded crane that had overwintered in Izumi in the 1985/86 winter visited Yashiro in the following winter.

The seasonal changes in mean distance (mean reaction distance) between cranes and sources of disturbance when cranes were forced to move are shown in Table 3. The mean reaction distance against human was about 70m and did not change seasonally. On the other hand, the mean distance against cars and motor bikes became shorter from November to December because of the acclimation (Table 3). The increase in the mean reaction distance in January resulted from the increased use of the provisioning site, where disturbances on the cranes were rare.

After World War II, the human activities changed drastically, particularly the abandonment of cultivation and the increase of the large-scale development. These

changes caused a reduction in the number of roosts. Before 1970, there were 22 roosts used by cranes, both in and out of Yashiro (Kawamura 1981, 1991). In the 1970s, two golf courses were constructed near Yashiro. Although these were situated out of the protected area, seven roosts were eliminated by them. Since 1970, a lot of terraced paddy fields have been abandoned because of the decrease in rice planting, which caused the roosts degraded. Consequently, only five roosts were used regularly in the early 1980s.

Efforts for Conservation

Provisioning

The municipal government acquired a land of 1 ha in the center of foraging area in 1964. Cereals, and fish if available, are supplied there. Provisioning is conducted from late November till the departure of cranes, usually in late February or early March. The amount of foods supplied and frequency of provisioning increased as the increase of the utilization rate of the provisioning site. For example, the amount of cereals supplied was 110, 210, 810 and 360 kg in November, December, January and February, respectively, during the 1983/84 winter (Hironaka pers. comm.). The utilization rate of the provisioning site was low in October and November, and increased so that the entire population foraged there over the daylight hours in January and February (Table 1). Even in January and February, however, substantial amounts of food were left uneaten (Hironaka pers. comm.).

Re-creation of roosts

In the early 1970s, many roosts disappeared due to the construction of golf courses and abandonment of cultivation. The research carried out from 1973 to 1975 clarified the utilization pattern and characteristics of preferred roosts, and suggested that the maintenance of roosts was important for cranes. In autumn 1974, two abandoned paddy roosts were mowed, plowed and filled with water, and trees and shrubs on a bare ground roost were cut by volunteers. Such efforts resulted in an increase in the number of cranes using these roosts. Now, the re-creating of roosts is carried out more systematically by the municipal government just before the first arrival of cranes every year. In 1990, a pond which had been used as a roost by cranes was purchased and managed for controlling its water level by the municipal government so as to be readily used by cranes.

Discussion

The population of the wintering Hooded Cranes in Yashiro has declined from 250 to 41 individuals over the past 47 years. This population has been exposed to three threats: reduction of foraging areas, human disturbance, and degradation of roosts.

Before the start of provisioning, foraging areas were scattered over a greater range (about 100km²) around Yashiro (referred to Fig. 1 in Kawamura, 1981). Each foraging area was occupied by a small group or family. In those days, each group or family used a roost near their foraging area, so a large flock was seldom observed. Human population

increased just after World War II, e.g., from 1688 in 1940 to 2246 in 1950, and, then, turned to a gradual decline (based on the National Population Census). A great decline in the crane population just after World War II is probably due to an increase of human population.

After the start of provisioning, most cranes concentrated their foraging areas in a small area around the provisioning site (ca. 35 ha). Several families acquired and defended territories, and other cranes joined a flock. Although the concentration into a small area has caused a local depletion of food resources, cranes could find enough food even out of the provisioning site until December. All territories were abandoned due to a depletion of food resources in January. Cranes maintained high feeding rate in January and February by aggregating in the provisioning site. In Yashiro, the daily food intake rate is two to four times that in Izumi (Eguchi unpubl. data). Artificial provisioning supports all cranes to survive the winter there.

Many tourists come near the crane observatory, and probably in response to these people cranes allocate more than one third of the daylight hours to standing in a vigilance position with their head up (Eguchi *et al.* 1991). Human disturbance was particularly frequent and severe in November and December. In this period, cranes were sensitive and dispersed over the foraging area, so human disturbance occurred frequently in the periphery of the foraging area. The municipal government is planning to control the traffic and construct hedges along heavily used roads in an attempt to prevent human disturbance.

Although each of the conservation efforts appeared to result in some short-term improvement, the long-term trend toward decreasing numbers of cranes is still continuing. The decline in the number of cranes wintering in Yashiro is due to that in sub-adult cranes. Those having spent their first winter in Yashiro might follow large flocks migrating to Izumi in next winter and spend their wintering life there after independence from their parents. The improvement of wintering habitat in Yashiro has been attained. The problem is whether the number of cranes preferring Yashiro to Izumi increase in future. The protection from human disturbance is the only effective means at present for the prevention of emigrating and facilitation of settling just after arrival.

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山口県八代のナベヅル越冬地の保護

山口県熊毛郡熊毛町八代地区に渡来し越冬するナベヅルは、戦後の47年間に250頭から41頭に減少した。減少の原因究明と越冬地保護策を検討するために、1983年～1985年の3年間現地での調査を行った。ナベヅルは日中は刈り入れ後の耕作地で採餌し、渡来初期には家族単位の採餌なわばりを防衛するが、1月以降は給餌場近辺に集中し群れを形成する。夜間は山あいの田、山腹の裸地、ため池の岸辺などで集団で就時する。気温が低下すると、ため池の利用率が上昇する。採餌場所の減少、人間による干渉、ねぐらの劣悪化などが越冬個体数減少の原因と考えられる。行政当局による給餌、ねぐらの改良、干渉の防止などが試みられているが、個体数の回復には至っていない。

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