한국조류학회지
Kor. J. Orni. 27(1): 21-29 (2020)

pISSN 1225-9179, eISSN 2586-6893
https://doi.org/10.30980/kjo.2020.6.27.1.21

Development and Assessment of Strategies to Protect Cranes and their Habitats in Korea

Yong-Chang Jang[1]·Seung-Hwa Yoo[2*]·Ki-Sup Lee[3]·Sun-Mi Hwang[4]

[1]Kyung-Nam University, Chang-Won, Gyeongnam 51767, Korea
[2]National Institute of Ecology, Seo-Cheon, Chungnam 33657, Korea,
[3]Waterbird Network Korea, Seoul 03147, Korea,
[4]Suncheon Municipal Government, Sun-Cheon, Jeonnam 58027, Korea

한국의 두루미와 그 서식지를 보호하기 위한 전략의 개발과 평가

장용창[1]·유승화[2*]·이기섭[3]·황선미[4]

[1]경남대학교, [2]국립생태원, [3]한국물새네트워크, [4]순천시청

Abstract

Strategies to protect cranes and their habitats were assessed by 50 participants who attended a workshop held in Suncheon City, South Korea, 2019. They were a total of 15 strategies, including 5 for the central government, 5 for local governments, and 5 for non-governmental organizations (NGOs). The most effective strategy identified was increasing the number of crane habitat areas legally protected by local governments, and the most feasible strategy was monitoring of the crane population by NGOs. This study proposes an integrated set of policies for protecting cranes in Korea.

Keywords: Endangered Bird Species, Local Government, Conservation Policy, NGOs, Wetland

요약

두루미와 그 서식지를 보호하기 위한 전략이 2019년 한국 순천시에서 열린 워크숍에 참가한 50명의 참가자들에 의해 평가되었다. 그것은 중앙정부를 위한 5개의 전략, 지방정부를 위한 5개의 전략, 시민단체를 위한 5개의 전략을 포함하는, 전체 15개의 전략이었다. 효과성이 가장 높다고 확인된 전략은 지방 정부가 더 많은 두루미 서식지를 법적 보호지역으로 지정하는 것이며, 실행가능성이 가장 높은 것은 시민단체가 두루미 개체수를 모니터링하는 것이었다. 이 연구는 한국의 두루미를 보호하기 위한 통합된 정책 대안들을 제시하고 있다.

주요어: 멸종위기 조류, 지방정부, 보전 정책, 시민단체, 습지

Introduction

In Korea, seven species of cranes have been recorded (Ornithological Society of Korea 2009): Red-crowned Crane (*Grus japonensis*), White-naped Crane (*G. vipio*), Hooded Crane (*G. monacha*), Eurasian Crane (*G. grus*), Siberian crane (*G. leucogeranus*), Sandhill Crane (*G. canadensis*), and Demoiselle Crane (*Anthropoides virgo*). Among these species, Red-crowned, White-naped, Hooded and Eurasian Cranes are protected as endangered species by the Korean Government (Ministry of

Received January 14, 2020; Revised April 22, 2020; Accepted April 24, 2020
* Corresponding author: Yoo Seung-Hwa, E-mail: ecogrus@nie.re.kr , Tel:+82-41-950-5436, Fax: +82-41-950-6135

Environment 2017).

Although wild cranes are found in various areas of South Korea, their habitats are mainly limited to certain cities and counties, including Cherwon, Yeoncheon, Paju, Go-yang, Gimpo, Gang-hwa, Seosan, Gumi, Chang-won and Suncheon (Seoul National University, 2010; National Institute of Biological Resources, 2018). Thus, cranes can be well protected if better conservation strategies are implemented in these particular areas.

However, at present, cranes are not well protected in Korea for various reasons. For example, in Cherwon County, after the Civilian Control Zone (created for military purposes) was decreased, the construction of greenhouses and livestock farms in the vacated space displaced cranes from their original habitats (Yoo et al. 2015). About 40% of the 72 recorded accidents involving cranes in Cherwon County were due to collisions with electric wires (Yoo et al. 2019). Moreover, only a small proportion of crane habitats, such as Suncheon Bay (Kim et al. 2013), have been designated as legally protected areas, so that most of crane habitats are vulnerable to various human disturbances.

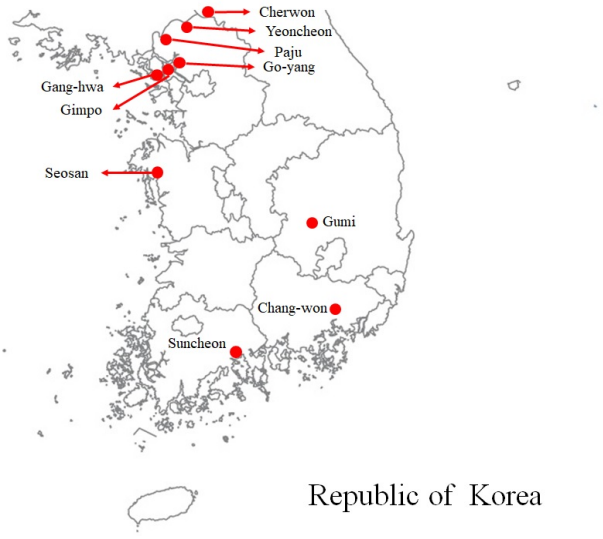

Fig. 1. Main crane habitats in Republic of Korea

Many former studies have been performed on cranes and their habitats: Cho and Won (1990), Pae et al. (1996), Cho et al. (2003), Yoon and Rho (2007), Kim and Lee (2008), Kang (2009), Lee et al. (2009), Yoo et al. (2010), and Lee and Kim (2015) studied White-naped Cranes, Hooded Cranes, and Red-crowned Cranes in Cherwon, Han River Estuary, and Suncheon Bay. Cranes in Cherwon County were studied for many years by Yoo et al. (2007; 2008; 2009; 2011; 2012; 2013; 2014; 2015; 2019).

However, there have been few studies concerning the protection of crane habitats in Korea. Rho et al. (2010) assessed the habitat areas of legally protected species of birds and suggested various conservation strategies. Lee et al. (2011) suggested policy measures to protect endangered species of birds including cranes. However, these two governmental studies did not specifically aim to formulate the best strategies for cranes; rather, they dealt with all of endangered species living in different habitats. Kim et al. (2011) suggested that governmental conservation measures might be undermined by local farmers, if there was not sufficient information provided to them regarding the habitat use of cranes. Even though Seoul National University (2010) surveyed cranes and suggested protection strategies, the research was limited to areas near the border between South and North Korea.

Fig. 2. A Red-crowned Crane in Cherwon County in January 2020. Electric wires and greenhouses are threatening cranes.

As in many other countries (Meine and Archibald 1996), cranes hold traditional cultural value in Korea, and are protected as sacred animals. Although a report by Austin et al. (2018) discussed many strategies for successfully sharing agricultural land with cranes around the world, strategies designed specifically for habitats in Korea are needed. In this situation, various efforts should be sought to protect cranes. Therefore, this study attempted to develop and assess an integrated set of strategies to protect cranes in Korea.

Materials and Methods

Five steps described in the Table 1 were used to develop and assess an integrated set of strategies to protect cranes in South Korea.

The draft strategies were prepared by considering opinions and information provided at previous meetings on crane conservation (e.g., KFEM, 2016). Laws, government policies, and best practices (e.g., Austin et al. 2018) were also considered.

The method of focus group interview, which is good for qualitative data collecting (McLafferty 2004), was used to refine the draft strategies. The draft was reviewed and revised by eight experts. Each of them had more than 20 years' experience in the field of bird conservation (4 of them), wetland ecology (2 of them), or environmental policy (2 of them). Firstly, the 8 experts gave their written opinion that some of the draft strategies should be changed or deleted from the list and that some new strategies should be added. Then, the experts shared their opinions of the draft strategies during several meetings, leading to a total of 15 strategies (5 each pertaining to central government, local governments, and non-governmental organizations [NGOs]) being selected for further analysis.

The 15 strategies were described in a presentation to 50 participants during a workshop held on August 22, 2019. They were 9 researchers, 6 school teachers, 5 ecology guides, 24 environmental activists, and 6 local government officials. The participants then assessed the strategies in terms of their feasibility and effectiveness by assigning them a Likert score (Boone and Boone 2012) from 1 (least feasible or effective) to 7 (most feasible or effective). Here, the effectiveness of a policy indicates how much we can expect to achieve its aim by the policy tool, while the feasibility indicates how easy it is to implement the policy tool (Jeong et al. 2003).

The scores of the strategies were reviewed after the workshop and the results were plotted on a quadrant graph, like the importance-performance analysis (Martilla and James 1977). By plotting the effectiveness and feasibility of different strategies on a quadrant graph, we tried to find out suggestions for further discussion.

Results

1. List of proposed strategies

The strategies proposed to protect cranes and their habitats are listed in Table 3. Five strategies each were developed for the central government, local governments, and NGOs, because these entities have the most important roles in the conservation of cranes. Moreover, as crane habitats are mainly limited to 10 cities/counties (Fig. 1), networking among these areas was emphasized in several strategies. Each strategy is explained below, in the same format as presented at the workshop.

A1. The central government should direct more effort toward designating crane habitats, such as Suncheon Bay, as legally protected areas, through the Law to Protect Wetlands (2016), Law to Protect Natural Environment (2018; applicable to ecological landscape and biosphere reserves), and Law to Protect Cultural Heritage (2019; applicable to natural monuments and world heritage sites).

A2. The central government should increase the subsidy for biodiversity management contracts under the Law on Conservation and Usage of Biodiversity (2019), which is paid under the Law to Protect Natural Environment (2018). Currently, the subsidy is only about $1,000 USD per year per hectare (Ministry of Environment 2016). The central government should also introduce and implement payments for ecosystem services (Chu et al. 2014).

Table 1. Steps in the process of developing and assessing crane conservation strategies

1. Draft strategies are prepared
2. Draft strategies are reviewed and revised by eight experts
3. List of strategies are created for assessment
4. Strategies are assessed by 50 participants at a workshop held in August 2019
5. Assessment results are reviewed

Table 2. Number of participants to the workshop

Researcher	School teacher	Ecology guide	Environmental activist	Local government official	Total
9	6	5	24	6	50

Table 3. Proposed strategies to protect cranes and their habitats in Korea

Categories	Strategies
A. Strategies for central government	A1. Designating crane habitats as legally protected areas A2. Subsidy for biodiversity management contracts or payments for ecosystem services A3. Subsidy for environmentally friendly agriculture A4. Regulate facilities (e.g., greenhouses, irrigation canals) A5. Special protection zone for wildlife
B. Strategies for local governments	B1. Local governmental network for cranes (e.g., annual workshops, policy development, joint monitoring, etc.) B2. Designating crane habitats as legally protected areas (A1 or A5) B3. Implementing protection measures (A2, A3, A4, etc.) B4. Supporting NGO activities (C1–C5, etc.) B5. Promoting ecotourism and public awareness
C. Strategies for NGOs	C1. NGO network for cranes (e.g., annual workshop, joint monitoring, etc.) C2. Monitoring of crane populations C3. Implementing ecotourism C4. Caring for cranes (e.g., feeding programs and rescue centers) C5. Public awareness campaigns targeting local citizens

NGO, non-governmental organization

A3. The central government should expand the subsidy for environmentally friendly agriculture (within the Special Law on Implementing the Agreement of World Trade Organization 2007) to the rice paddy habitats of cranes. Currently, most of the rice paddies inhabited by cranes are not eligible for the subsidy, of about $1,000 USD per hectare annually, because it is granted only to organic farms (Ministry of Agriculture and Food and Rural Affairs 2019).

A4. The central government should make efforts to regulate facilities (e.g., greenhouses, electric wires, and irrigation canals) present within the habitats of cranes. For the last several decades, the central government has constructed concrete irrigation canals for rice paddies, under the Law for Rural Development (2019), leading to a critical decrease in protein-rich foods for cranes, such as frogs and fishes. Moreover, the practice of building greenhouses on rice paddies is decreasing the habitat of cranes (Yoo et al. 2014).

A5. The central government needs to designate management zones for cranes, and should provide financial incentives to farmers within crane habitats not to restrict those habitat areas. The articles in the Special Protection Zones for Wildlife section of the Law to Protect and Manage Wildlife (2019) could be modified slightly for this purpose.

B1. Local governments should organize a local government network, and cooperate with each other according to the Administrative Cooperation Network within article 142 of the Law for Local Autonomy (2017) to promote crane conservation. Areas in which cranes reside include Suncheon City, Changwon City, Go-yang City, Yeonchun County, Paju City, Cherwon County, Seosan City, and Gang-hwa County, all of which could hold annual meetings to evaluate and develop crane conservation strategies.

B2. Local governments should designate crane habitats as legally protected areas (also referenced in strategies A1 and A5).

B3. Local governments should implement the protection measures developed (also referenced in strategies A2, A3, A4, etc.)

B4. Local governments should support NGO activities (C1–C5, etc.) through laws including the Law to Support Non-profit Non-Government Organizations (2017).

B5. Local governments should promote ecotourism and public awareness of cranes and their habitats, through article 41 (Promoting Ecotourism) of the Law to Protect Natural Environment (2018) and the Law to Promote Environmental Education (2018).

C1. NGOs nationwide should form a network for crane conservation and engage in activities including annual workshops, joint monitoring, and policy development. They should also cooperate with central and local governments (also referenced in strategy B1).

C2. NGOs should begin monitoring crane populations again. Cranes are found in many areas, especially during the migration season, and NGOs and citizens have important roles in their monitoring, which provides abundant information on cranes. For example, monitoring revealed the impact of the Four Major Rivers Development Project on the migratory patterns of cranes (Kyung Hyang News, 2015).

C3. NGOs should promote ecotourism as it pertains to crane

habitats. Because NGOs have field knowledge of the habitats, they can help local governments (also referenced in strategy B5).

C4. NGOs should be involved in the care of cranes, for example by feeding them. They can also monitor the impact of artificial facilities, such as greenhouses, electric wires and irrigation canals, on cranes (also referenced in strategy A4).

C5. NGOs should be involved in the public outreach activities targeting local citizens (also referenced in strategy B5). NGOs have considerably more field knowledge of crane ecology than governments.

2. Assessment of the strategies

The feasibility and effectiveness scores of 15 strategies to protect cranes and their habitats, as generated by the 50 participants in the workshop held in 2019, are shown in Figure 3. Strategies B1 (local government network), C1 (NGO network), C2 (population monitoring), and C5 (environmental education) are within the first quadrant (Q1), indicating higher than average feasibility and effectiveness. Strategies C3 (develop ecotourism), C4 (caring for cranes), and B5 (ecotourism) are within the second quadrant (Q2). Strategies A3 (agricultural subsidy), A4 (regulate facilities), and B4 (support NGOs) are within the third quadrant (Q3). Lastly, strategies A1 (designate protected areas), A2 (biodiversity contracts), A5 (management zones), B2 (designate protected areas), and B3 (implement protection measures) are within the fourth quadrant (Q4). The feasibility and effectiveness scores of each strategy are shown in Appendix Table 1.

Discussion

1. Difficulties in implementing the central government strategies

Interestingly, the feasibility of all five central government strategies was below average. However, the effectiveness of strategies A1, A2, and A5 was higher than average; thus, the central government strategies were considered very effective for protecting cranes and their habitats but difficult to implement.

The most difficult hurdle to overcome seems to be the conflict between the Ministry of Environment and the Ministry of Agriculture (e.g., Jeong 2002). While the responsibility to protect the crane lies with the Ministry of Environment, the power to manage rice paddies, i.e., the major habitat of cranes in Korea, resides with the Ministry of Agriculture. For example, the feasibility of A1 (designating crane habitats as protected areas) was considered to be the lowest among all 15 strategies, because many farmers think that protected areas may result in financial losses. Although the government could develop rational economic incentives for protected areas, the Ministry of Agriculture has not paid much attention to this issue.

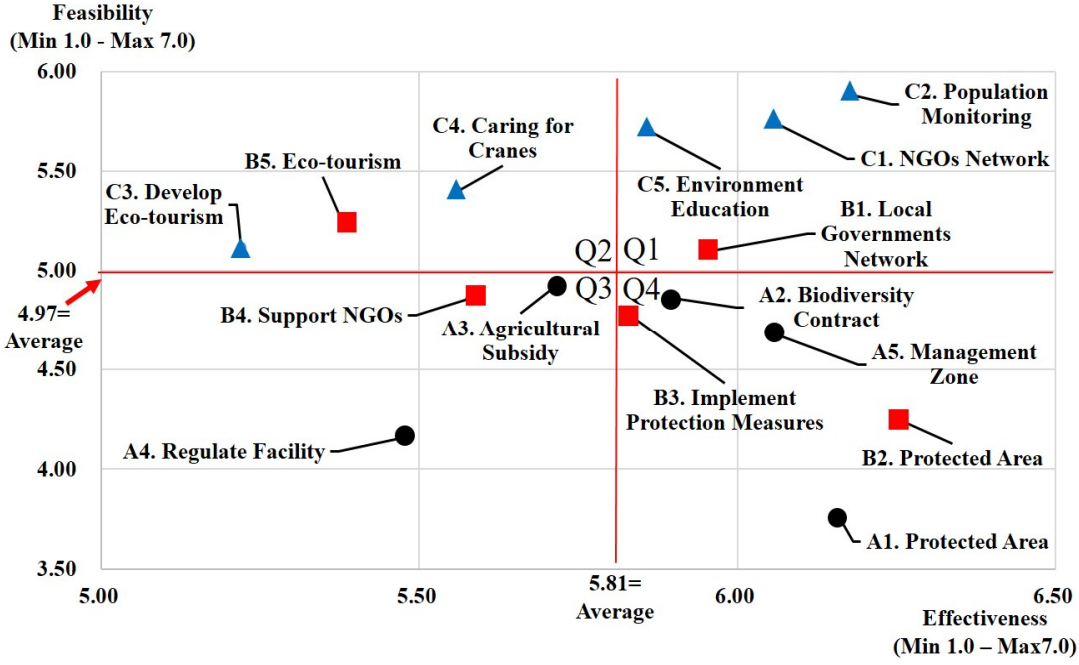

Fig. 3. The feasibility and effectiveness of 15 strategies proposed to protect cranes, as assessed by 50 workshop participants. Strategies A1–A5 (marked with black dots ●) pertain to central government, strategies B1–B5 (marked with red squares ■) to local governments, and strategies C1–C5 (marked with blue triangles ▲) to NGOs.

2. The importance of a local government network

While the central government was playing minor role in protecting cranes, the most important role has been played by local governments. For example, the municipal government of Suncheon City has succeeded in protecting hooded cranes and generating income via ecotourism (Kim 2008). However, this success was not transferred to other crane habitats. For example, in Cherwon County, the conflict between the desire to both develop and preserve rice paddies still remains (John et al. 2003; Kim et al. 2011). Moreover, as explained above, the central government, who should be setting a best practice example for local governments, does not appear to be particularly interested in crane conservation.

The participants in this study were aware of this situation, and they considered the local government network strategy to be higher than average in terms of both feasibility and effectiveness. Local governments could create a network to carry out positive work that could eventually influence the policy of the central government and support NGOs. Annual meetings held by local governments could provide a platform to periodically assess and improve conservation strategies, similar to the Ramsar Convention for wetlands (Hails 1997).

3. The role of NGOs in promoting conservation strategies

A local government network would be important, but they must first be persuaded to create it. NGOs are critical in promoting international environmental conventions (e.g., McCormick 1999; Ibrahim and Aziz 2012), and could be similarly crucial to the protection of cranes in Korea. Korean NGOs have already led the way in the protection of cranes and their habitats (e.g., Lee 2014), and have monitored crane populations in South Korea for more than 10 years (e.g., KFEM 2016).

However, recently, the activities of NGOs in Korea have been reduced, for many complex reasons (Ku and Hong 2013; Kim et al. 2015). Thus, it is important to support NGOs at this time so that they can continue to protect cranes in Korea.

4. Policy implications and limitation of this study

An integrated policy is always emphasized for an environmental issue (Barrett 1994). Especially when the issue involves interaction between human activities and natural ecology, such integrated approach is critical (Keiter 1998). So, it seems certain that an integrated set of policies is needed to protect the cranes and their habitats in Korea. This study is meaningful in the sense that a set of policies for crane conservation was developed for the first time in Korea.

The 15 strategies developed in this study might not be the best, as the opinions of only 50 participants were reflected in assessing the strategies. However, the strategies need to be implemented sooner or later, because the strategies can be improved only from implementation, as the principle of adaptive management (Plummer and Armitage 2007) tells us.

Acknowledgments

We appreciate the contribution of the 50 workshop participants who completed our questionnaire, and the financial support provided by the municipal government of Suncheon City, South Korea. We appreciate support of National Institute of Ecology, Republic of Korea (Project number: NIE-C-2019-04).

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Appendix 1. Effectiveness and feasibility scores (range: 1–7) of the proposed crane conservation strategies

Actor	Strategy	Effectiveness (mean ± standard deviation)	Feasibility (mean ± standard deviation)
Central government	A1. Designating protected areas	6.16±1.25	3.76±1.72
	A2. Biodiversity contracts	5.90±1.04	4.86±1.55
	A3. Agricultural subsidy	5.72±1.23	4.94±1.46
	A4. Regulate facilities	5.48±1.18	4.16±1.38
	A5. Management zones	6.06±1.17	4.68±1.58
Local governments	B1. Local government network	5.96±1.09	5.10±1.46
	B2. Protected areas	6.26±0.85	4.24±1.52
	B3. Implement protection measures	5.82±1.12	4.80±1.32
	B4. Support NGOs	5.58±1.23	4.86±1.26
	B5. Ecotourism	5.38±1.32	5.24±1.25
NGOs	C1. NGO network	6.06±1.08	5.74±1.27
	C2. Population monitoring	6.18±0.92	5.88±1.17
	C3. Implement ecotourism	5.22±1.53	5.12±1.39
	C4. Caring for cranes	5.56±1.07	5.40±1.25
	C5. Environmental education	5.86±1.39	5.70±1.23
	Mean score (50 respondents)	5.81±1.16	4.97±1.39

NGO, non-governmental organization