

A Study on the Inter-Korean Cooperation for Establishing the Oriental Stork Ecology Network

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Abstract: The purpose of this study is to explore avenues for inter-Korean cooperation to establish an ecological network for Oriental Storks on the Korean Peninsula. There were no more Oriental Storks in ROK in about 25 years ago. However the reintroduction of Oriental Storks has been successful. Their release back into the wild is now at the experimental stage. In the DPRK, Oriental Storks are a rare bird. Subsequently, the DPRK has also recognized the need for their protection and is focusing upon the protection of the wetlands along its western coast.

Taking these individual efforts by the ROK and the DPRK as a common task to establish an ecological network for Oriental Storks on the Korean Peninsula, this study proposes a plan for cooperation in three stages such as EXPERT EXCHANGE AND BASIC RESEARCH, HABITAT RESTORATION AND DATA SHARING, and THE REINTRODUCTION OF THE SPECIES ON THE KOREAN PENINSULA.

To achieve this, the Korean government, local governments and private organizations will need to provide legal, political, and economic support to promote exchange, cooperation and active human interactions with experts.

Key Words: Oriental Stork Reintroduction, Oriental Stork Ecological Network, Inter-Korean Cooperation

I. Introduction

The ecosystems that have interrelationships are also connected spatially. Based on this, Korea is aware of the problem of the populations reduction due to habitat fragmentation and the consequent deterioration of species diversity and has a rising interest

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in habitat connectivity and wildlife movement (Jeon et al., 2008). Amid this issue, some of the Oriental Storks that have been successfully restored and released into the wild in ROK have stayed back in DPRK for the past four years (Eco-Institute for Oriental Stork: ECOIOS, 2019).

Restoring Oriental Stork means not only the restoration of the species but also the habitat for the Oriental Stork to live in. Furthermore, the restoration of Oriental Storks, located at the top of the ecological pyramid, means that all of the layers below have been restored (Bae and Kim, 2018). That is, it is a restoration of a healthy ecosystem and, moreover, a restoration of harmonious life between nature and man.

A total of seven Oriental Storks have been to the DPRK since 2015. In particular, the 'A81' Oriental Stork has been staying in DPRK for about two months since September 2018 (ECOIOS, 2019). The fact that the habitats along the migration route of the restored Oriental Stork continue not only to ROK but also to DPRK, shows the connectivity of the spatially continuous ecosystems. It also raises the need for the two Koreas to cooperate to secure a stable habitat for the restored Oriental Storks. However, previous research on Oriental Storks, which used to be the nation's resident bird, is mainly about the significance of the restoration of Oriental Storks in terms of its extinction and sustainable development. Since 2008, research has been conducted on the characteristics and habitat analysis of Oriental Stork habitats in ROK (Kim et al., 2008). Recently, however, the migration routes of the restored Oriental Stork have been expanding to DPRK, but related research is insufficient. To ensure the stable return to the wild of the Oriental Storks reintroduction in ROK,

research on the spatially connected habitats of DPRK is necessary. Moreover cooperation for the conservation and expansion of the Oriental Stork habitats in DPRK is essential.

Therefore, the purpose of this study is to explore the ways of how ROK and DPRK should cooperate in the future to establish an ecological network on the Korean Peninsula along the migration pathway of the Oriental Stork. The research questions were created to achieve the objectives of the study and are as follows.

First, it analyzes the history and the current status of Oriental Stork restoration in ROK.

Second, DPRK's environmental trends are analyzed through meaningful data related to Oriental Storks.

Third, based on the results of the analysis, it will draw up measures for inter-Korean cooperation to establish the Oriental Stork ecology network on the Korean Peninsula.

II. Theoretical Background

1. Overview of Endangered Species

Established to secure biodiversity and conserve nature and natural resources, the International Union for Conservation of Nature (IUCN) publishes the Red Data Book, which evaluates endangered species. Oriental Storks are classified as endangered species that is the fourth phase of the nine-stage category, which indicates a very high risk of extinction in the near future.

2. Designation of Endangered Wildlife in ROK

Endangered wildlife is a species that are protected, and managed by law. Endangered species of wildlife are classified into species 1 and species 2. Class 1 endangered wildlife¹⁾ refers to endangered wildlife whose populations are greatly reduced due to natural and artificial threats. Endangered wildlife class 2²⁾ refers to wildlife whose population is greatly reduced due to natural and artificial threats, and thus which is at risk of becoming endangered soon if current threats are not eliminated or mitigated (Article 2, Law on the Protection and Management of Wildlife). The designation of endangered wildlife by law is intended to promote biodiversity in order to balance ecosystems and to protect and manage them more efficiently.

3. Laws Related to Natural Monuments

Oriental Storks are designated as a Natural Monument in ROK and DPRK respectively³⁾, and are recognized for the need of protection. The legal basis for the conservation of Oriental Stork is shown in (Table 1).

1) Oriental Stork et al., 13 species.

2) Black-headed Gull et al., 48 species.

3) Natural Monument No. 99 in ROK and No. 303 in DPRK (nm.nktech.net/).

〈Table 1〉 Institutions related to natural monument

	ROK	DPRK
statute	1) Protection of Cultural Properties Act 2) Law on the Protection and Management of Wildlife	1) Environmental Protection Law
related content	1) ◦ Article 2, paragraph 3 Animals (including their habitats, breeding grounds, places of origin), plants (including their native lands), topography, geology, minerals, caves, biological products, or as a special natural phenomenon, historical, landscape or something of great academic value	◦ Article 14 Protection of scenic spots and natural monuments ◦ Article 16 Prohibition of destructive behavior of natural ecosystem

※ Source: Legal office and unification law database (Revision of the Local Property Protection Act 2015 and supplementing the Environmental Protection Act 2014)

III. Research Method

In order to achieve the purpose of this study, a literature survey was conducted as follows. First, the relevant contents are extracted mainly from thesis and academic journals searched by keywords such as 'Oriental Stork' and 'Inter-Korean Cooperation' from thesis search engines such as RISS and DBPIA. Second, Oriental Stork restoration data of 'ECOIOS' is analyzed. Third, the DPRK environmental trend data related to Oriental Storks is analyzed.

IV. Results and Discussion

1. Steps and Prospects of Oriental Stork Restoration in ROK

The Oriental Stork was a common bird in early 1900's, and lived mainly in Gyeonggido, Chungcheongdo, and Hwanghaedo, but

declined rapidly during the industrialization process (Park, 2004). Accordingly, the Cultural Heritage Administration designated Oriental Stork as Natural Monument No.199 in 1968 under the Protection of Cultural Properties Act. In 1971, the last Oriental Stork couple was found in Eumseonggun, Chungbuk. But the male Oriental Stork was shot by a hunter the female Oriental Stork lived alone until 1983 when she fell to pesticide poisoning and was moved to Seoul Grand Park. After her death in 1994, it was reported that the Oriental Stork, the resident bird of ROK, became extinct in the country (Park, 2004).

ECOIOS have started the reintroduction program for Oriental Storks breeding population disappeared in ROK since 1971 with importing captive Oriental Storks from Germany and Russia in 1996 and succeeded in artificial breeding for the first time in 2002. Oriental Storks were designated as endangered wildlife class 1 by the Ministry of Environment according to the 'Wildlife Protection and Management Act' (<https://species.nibr.go.kr/>). ECOIOS, ROK's only Oriental Stork restoration institute, was designated as a 'Habitat Exterior Protection Agency' in 2001 (Nam, 2018).

Following the restoration of the Oriental Stork species, the Cultural Heritage Administration established 'Yesan Stork Park' in Yesan district of Chungcheongnamdo in 2015. Eight Oriental Storks were released near the Yesan Stork Park in 2015, and first released breeding pair produced two chicks successfully in 2016. Three breeding pairs continued to breed successfully from 2017 to 2019. In addition, Oriental Storks released or born in Yesan, have widely inhabited mainly Gyeonggido, Chungcheongdo and Jeollado, and some of them have been confirmed to have traveled to DPRK, China and Japan.

A total of seven Oriental Storks have been to DPRK since 2015, four of which have been there for two consecutive years. In 2016, an Oriental Stork stayed around Hwanghaedo for ten days. In particular, the 'A81' Oriental Stork stayed for about two months from September 26 to December 6, 2018, in Oncheoneup (Pyeongannamdo), Kwaksangun and Cheolsangun (Pyeonganbugdo), and Jangyeongun (Hwanghaenamdo). As of October 2018, the number of Oriental Storks is about 200, with 83 in ECOIOS, 77 in Yesan Stork Park, and 39 Oriental Storks being released and monitored (ECOIOS, 2019).

Captive breeding program, first step among the endangered Oriental Storks reintroduction program has been successful since the first breeding in captivity in 2002. The Oriental Stork is now in the process of expanding its wild habitats to ensure a stable reintroduction to the wild. To this end, the ECOIOS has established a 'Vision 2.0' plan to monitor the distribution of Oriental Storks nationwide, and based on the data, is implementing a mid- to long-term roadmap for habitat analysis, habitat assessment models, and international cooperation (ECOIOS, 2019).

Monitoring results so far show that the unique characteristics of the Oriental Storks looking for food in wetlands or farmland, and nesting on high trees are well represented, indicating that stable management and protection of wetlands, farmland, and forests are closely linked to the releasing to the wild of the Oriental Storks.

2. Environmental Trend Analysis for Oriental Storks in DPRK

DPRK's environmental trends related to Oriental Storks are as follows.

First, in DPRK, the Oriental Storks are protected under the

Environmental Protection Law as natural monument No. 303 (Park, 2003), and is responsible for environmental protection work at the Ministry of Land, Infrastructure and Transport (Lee, 2002). The Ibis and Seabird Habitats are designated as natural monuments in Pyongannamdo and Pyonganbukdo where the Oriental Stork 'A81', which was restored by the ECOIOS, resided (nm.nktech.net/).

Second, according to the '2003 Inter-Korean Environment Forum' Environmental Impact Assessment Survey of KEDO Nuclear Power Plants (Jung, 2003, p.96), One or two Oriental Storks were seen moving in Sinpo (Hamgyongnamdo).

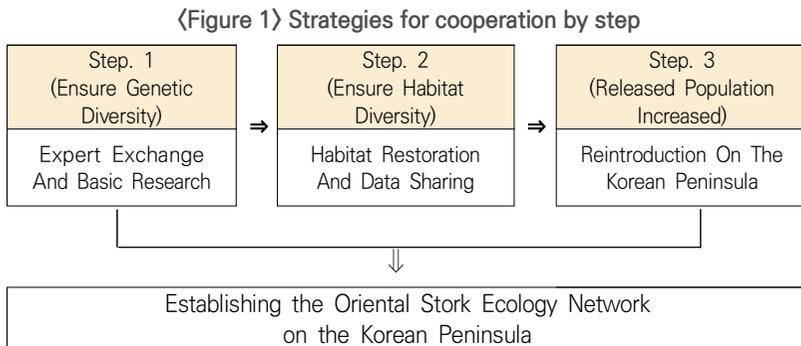
Third, according to the '2017 DPRK Environmental Trends' (Choo and Jung, 2017, p.143), DPRK's west coast is becoming a safe route habitat for many migratory birds, and is conducting joint research with the 'New Zealand Miranda Natural Fund Delegation'. It also emphasizes the need for international cooperation to protect migratory birds, that is closely linked to human survival and development.

Fourth, in April 2018, it joined the EAAFP (East Asia-Daeyang Migratory Bird Pathway Partnership), and Mundeok (Pyongannamdo) and Geumya (Hamgyongnamdo) Migratory Bird Sanctuary in were listed as International Migratory Habitats (<https://www.eaaflyway.net/>). In May, Mundeok and Rason (Hamgyongbukdo) Migratory Bird Protection Area in were registered as Ramsar Wetlands. In July, the ROK and the DPRK met at the East Asia Ramsar Regional Center and promised to share information on wetland management and conservation along the west coast and to cooperate through regular meetings. In addition, DPRK is actively engaged in international exchanges and cooperation by working with Suncheon City and the

International Crane Foundation to push for the restoration of the habitat of the cranes (KOEM, 2019).

3. Inter-Korean Cooperation for 'Establishing the Oriental Stork Ecology Network on the Korean Peninsula'

Oriental Storks breeding population disappeared in ROK since 1971, but its species reintroduction has succeeded, and its release to wild is under way. DPRK is also aware of the need for protection of rare birds, and thus paying attention to the protection of wetlands along the West Coast. Taking these individual efforts as a common task of 'Establishing the Oriental Stork Ecology Network on the Korean Peninsula', I would like to propose three stages of cooperation based on the history of the reintroduction of Oriental Storks in the ROK.



The first step is expert exchange and basic research between the two Koreas. ROK achieved success in reintroduction the Oriental Stork about 20 years after its disappeared. DPRK has a record of Oriental Stork being mentioned in the 2003 'Environmental Effects

Assessment Report of KEDO Nuclear Power Plant', but it is difficult to determine the existence of the Oriental Stork just by press releases and records related to the subsequent migratory birds.

Therefore, based on the accumulated experience of ROK, which successfully reintroduced the Oriental Stork, a basic survey should be conducted to determine the number of Oriental Storks at the site believed to be habitat to DPRK Oriental Storks. Before reunification, Germany engaged in various exchanges and cooperations to overcome environmental, economical, social and cultural differences, and problems derived from the different systems (Nam, 2008). ROK and DPRK, likewise, need time, cost and expert exchanges at the civilian and governmental levels to conduct a joint survey of the Oriental Storks.

In addition, the 'ROK and DPRK Forest Cooperation Research Center' of Kangwon National University will conduct a three-way joint study with the 'Urban and Environmental Ecology Research Institute' at Yanbian University in China and 'Kim Il Sung University' (Lee, 2016). And Suncheon City and the 'International Crane Foundation' will cooperate with DPRK to restore the habitat of black-crowned cranes (KOEM, 2019). In this way, with ECOIOS at the center, it could also push for three-way cooperation involving DPRK universities and organizations such as the Korean Federation for the Protection of Nature or international organizations such as the EAAFP.

The second step is habitate restoration and data sharing of the Oriental Stork. Currently, ROK has released the Oriental Stork into the wild since 2016 and is monitoring their natural adaptation (ECOIOS, 2019). In the process, seven Oriental Storks were confirmed

to have traveled to DPRK.

Therefore, after a joint survey of the Oriental Storks and habitats is conducted, we will be able to try to release the ROK Oriental Stork into the nature, especially around Jangyeongun (Hwanghaenamdo), Oncheoneup (Pyeongannamdo), and Gwaksan-gun and Cheolsangun (Pyonganbukdo), where the Oriental Stork ‘A81’ has stayed.

According to Lee et al. (2004), the area of Yeonbaek Plain in Hwanghaenamdo is located in the northern part of the Han River estuary in northern Gyeonggi Bay. Most of these are small streams flowing into the sea, and that habitats are suitable foraging site for Oriental Stork.

〈Map 1〉 Yeonbaek plain and ‘A81’ movement route



If the Oriental Stork restored in the ROK, can be naturally released and successfully inhabited in the DPRK, the reintroduction of the Oriental Stork on the Korean Peninsula can be effectively completed. Furthermore, sharing data on the migratory routes of Oriental Storks will be the basis for the establishment of an ecological network for Oriental Storks on the Korean Peninsula.

Finally, The third step is the reintroduction of the Oriental Stork on the Korean peninsula. Once a stable habitate has been secured through the first and second stages, the Oriental Stork can be successfully released into their natural habitate. The Oriental Stork ecological network can be established along the Oriental Stork's migration path on the west coast and plains of the Korean Peninsula and further to the east and south coasts.

Also, if the reintroduced Oriental Stork can reliably inhabit the two Koreas, the possibility of pairing with the Oriental Storks from Russia, China and Japan in order to secure genetic diversity will increase. To achieve this, the ROK and the DPRK could conclude a bilateral Oriental Stork protection agreement and further expand into multilateral Oriental Stork protection agreements with neighboring countries such as Russia, China, and Japan.

V. Conclusions

The purpose of the study is to explore ways of inter-Korean cooperation to establish Oriental Stork ecological network on the Korean Peninsula. To achieve this goal, it examined the status of the restoration of Oriental Storks in ROK, analyzed the DPRK environment related to Oriental Storks, and suggested three steps for inter-Korean cooperation: Expert exchange and Basic Research, Habitata Restoration and Data Sharing, Reintroduction on the Korean Peninsula.

ROK has now reached the second stage of monitoring the Oriental Stork after releasing them into their natural habitats, but DPRK must

first confirm their existence. In particular, the severe deforestation in DPRK is expected to damage Oriental Stork habitats. However, due to the limited data on the DPRK Oriental Storks, it is difficult to understand the situation.

As the Oriental Storks reintroduced in ROK are already expanding their route to DPRK, the two Koreas should actively cooperate to release the Oriental Stork back into the wild through the conservation and expansion of its habitats, and to create a healthy ecosystem in which humans and Oriental Storks coexist through the establishment of an ecological network.

Therefore, the government, local governments and private organizations should first provide legal, political and economical support so that they can pursue exchanges and cooperation in various ways. And, active human exchanges focusing on experts should be started.

Furthermore, multilateral exchanges with Russia, China, and Japan will be necessary, including various cooperation between the ROK and DPRK, and the establishment of an 'East Asian Oriental Stork Ecological Network' that will lead through Russia, China, the Korean Peninsula, and Japan in the future. Also, sharing awareness among the locals for the conservation of wetlands, farmland, and forests, which are the foundation of the Oriental Stork's life, should be extended.

■ References ■

- Bae, M. S. and E. H. Kim, 2018, "Interview with Park Si-ryong," *CHUNGBUK ISSUE&TREND*, 31, pp.73-79.

- Choo, J. M. and S. W. Jung, 2017, *2017 DPRK environment trends*, (KEI business report: 2017-14-05), Sejong: Korea Environment Institute.
- Jeon, S. W., S. J. Myung, and M. Y. Shin, 2008, *A study on the establishment of ecological network in Northeast Asia*, (KEI research report: 2008-RE-15), Seoul: Korea Environment Institute.
- Jung, H. S., 2003, *2003 Inter-Korean environment forum*, (KEI policy report: WO-08), Seoul: Korea Environment Institute.
- Kim, S. K., S. H. Jung, J. H. Kim, and S. R. Park, 2008, "A case study on Oriental Stork eating behavior and habitat selection in nature," *Journal of the Korean Society of Environmental Biology*, 26(2), pp.121-127.
- Lee, D. H., 2016, "Rehabilitation of deforestation in North Korea and ecological peaceful reunification of the Korean peninsula," *THE UNIFIED KOREA*, 2016(1), pp.56-59.
- Lee, M. B., N. S. Kim, and K. R. Lee, 2004, "Reclamation and coastal changes of North Korea's west coast," *Journal of The Korean Geomorphological Association*, 12(3), pp.99-110.
- Lee, J. M., 2002, *Agricultural management and agricultural mechanization in North Korea*, Seoul: Korean Sharing Movement.
- Nam, Y. S., 2008, "A study on the integration of environmental education in the South and North Korea for unification," *Korean Journal of Environmental Education*, 21(2), pp.1-10.
- _____, 2018, "Oriental Stork restoration performance and experience in Korea," *Korea Environmental Policy and Administration Society-Korea Planning Association Joint Conference*, Jeju, JejuLaborWelfareCenter, pp.25-26.
- Park, J. M., 2003, "North Korea's natural monument related system and current situation," *Journal of the Korean Institute of Traditional Landscape Architecture*, 21(2), pp.40-51.
- Park, S. R., 2004, *After the widow Oriental Stork*, Seoul: Minumsa.
- Cultural Heritage Administration, 2019, <http://www.cha.go.kr>.
- East Asia-Daeyang Migratory Bird Pathway Partnership, 2019, <https://www.eaaflyway.net/>.
- Eco-Institute for Oriental Stork, 2019, <http://www.stork.or.kr>.
- Hankyoreh Environmental Ecology Webzine-Water Wind Forest, 2019, <http://ecotopia.hani.co.kr>.
- KOEM, 2019, <https://post.naver.com/viewer/postView>.

National Institute of Biological Resources, 2019, <https://species.nibr.go.kr>.

Natural Monument in North and South Korea, 2019, nm.nktech.net/.

Yesan Stork Park, 2019, <http://www.yesanstork.net/>.

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