



# Ecological Cooperation beyond the DMZ on the Korean Peninsula: *Birds Know No Man-made Borders*

Hyun-Ah CHOI\*, Bernhard SELIGER\*\*, and Woo-Kyun LEE\*

## Abstract

*For over 70 years, people have been excluded from the Korean Demilitarized Zone (DMZ). However, flora and fauna have been able to live within and surrounding the DMZ beyond the control of humans. Birds are highly mobile, and through their movements within and across the border region, they also have the potential to identify valuable ecosystem and conservation priorities shared between the two Koreas and the wider Asian region. Since 2018, plans for the peaceful use and development of the Han River Estuary (HRE) in the Neutral Zone between the two Koreas, have been the subjects of peaceful dialogue on the Korean Peninsula. Further, the HRE has international importance for birds during the migratory season as defined by the Ramsar Convention, which uses the number of waterbirds and the percentage of the population of a waterbird species counted at a given wetland in determining that wetland's international importance. The internationally endangered species on the IUCN Red List maintain wintering grounds in the HRE between two Koreas. This study suggests possible inter-Korean and wider regional cooperation regarding the ecological importance of the HRE for birds as well as other wildlife species and their habitats.*

**Keywords:** borderless, waterbirds, habitat conservation, cooperation, wetlands

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This study was supported by the Basic Science Research Program through the National Research Foundation of Korea funded by the Ministry of Education (NRF-2021R1A6A1A10045235) and a grant from Korea University.

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## Introduction

Conflict between the two Koreas has been ongoing for over 70 years, and various attempts at a resolution to this state of conflict have been attempted. However, ecology—birds and nature—knows no man-made borders and may serve as a vehicle toward conflict resolution and reconciliation between the Koreas. There are interacting species inhabiting ecological communities that include both the Republic of Korea (ROK; South Korea) and the Democratic People's Republic of Korea (DPRK; North Korea). Here we consider the possibility of using ecological cooperation between the two Korea as a vehicle for conflict transformation. Birds are migrants, and through their migration within and across national borders they can help us identify valuable ecosystem and conservation priorities shared at both the regional (inter-Korean) and international levels. Birds know nothing of human politics or the divisions between people. They are instead tied to their habitats shaped by climate and other natural forces. Birds are also recognized as bioindicators. According to BirdLife International (2008; 2010), as species at the top of the food web, the presence or absence, rarity or abundance, of birds is strongly indicative of the existence of other species and overall ecosystem health. Every year, seasonal changes on the Korean Peninsula and across northern Asia result in the seasonal migration of birds. To date, approximately 500 bird species have been identified on the Korean Peninsula, and more than 90 percent of these are migratory (Moore et al. 2014). Only a few species can remain in Korea year-round, while the others migrate considerable distances to find the conditions they need, visiting Korea seasonally. Since the two Koreas have essentially the same climate, they also share similar ecological characteristics. The more familiar year-round species in Korea, like the Eurasian Tree Sparrow (*Passer montanus*), or migratory species like the Barn Swallow (*Hirundo rustica*), are therefore equally familiar in both North and South Korea. However, with few exceptions, with accelerated climate change, ever more southern species, such as Black-crowned Night Heron (*Nycticorax nycticorax*), are spreading north.

Although the Han River Estuary (HRE) protected wetland, which

includes Janghang wetland in Goyang city, Siam-ri wetland in Gimpo city, and Sannam wetland in Paju city, lies within the Korean Demilitarized Zone (DMZ) and so is difficult for people to access, its importance to nesting waterbird species, including the globally endangered Swan Goose (*Anser cygnoides*), the White-naped Crane (*Antigone vipio*), and the Black-faced Spoonbill, (*Platalea minor*) is well-known (T. Kang et al. 2009; J. Kang et al. 2016; H. Choi et al. 2020). The Winter Waterbird Census taken of the ROK portion of the Han-Imjin Estuary has also identified the estuary as internationally crucial as defined by the Ramsar Convention. As a result of this, in 2021, the Janghang wetland along the HRE was designated a Ramsar site, or an internationally important wetland.

Furthermore, both the ROK and the DPRK have acceded to intergovernmental conventions, such as the United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD), Convention on Biological Diversity (CBD), and the Ramsar Convention, mainly because both nations recognize that the conservation of the environment is in their national interest. The view of cooperation in environmental conservation as being in the national interest derives from both the benefits that a maintained ecosystem can provide and the fact that such cooperation helps reduce the burden posed by the climate crisis (Ramsar Convention 2008; Duarte et al. 2005). Inter-Korean ecological cooperation under the umbrella of international regimes is important to the conservation of migratory species and habitats both on the Korean Peninsula and regionally.

The birds of the Korean Peninsula are part of the shared natural heritage both between the two Koreas and between Korea and the rest of the world. Like the habitats they depend on, birds are a wonderfully natural reminder of what connects place to place and people to people. Moreover, the population declines many species are now experiencing clearly indicate the ongoing degradation of the natural environment. Just as with the climate crisis, the complex environmental crisis facing migratory birds will require cooperation and action at the international, national, and regional levels if it is to be solved. Thus, this study focuses on ecological cooperation across borders—notably between the two Koreas. The key questions this study asks

are: can ecological cooperation concerning birds and their natural habitats contribute to the transformation of the state of conflict between the two Koreas, even possible reconciliation? And, further, what form will this cooperation take? Furthermore, since 2018, plans for the peaceful use and development of the HRE in the neutral zone between the two Koreas have been discussed by the governments of both Koreas, summit talks that have led to a peaceful mood on the Korean Peninsula. This study investigates HRE's ecological importance based on the previous analysis of Choi Hyun-Ah et al. (2019) and suggests possible directions for international and inter-Korean cooperation on the environment.

### **Importance of the HRE for Birds**

The HRE is an excellent ecological space for migratory birds due to its geographical specificity as a neutral zone, and thus protected from human interference. It is well-known as a year-round habitat for such internationally endangered species as the White-naped Crane (*Antigone vipio*), Black-faced Spoonbill, and Swan Goose, as well an overwintering and stopover site for other species.

As a wintering site for major migratory birds, as well as a stopover in the migratory routes of other birds, the HRE, including Yudo (islet), Siam-ri wetland, and Janghang wetland, has been registered as a base habitat on the East Asian-Australasian Flyway (EAAF), one of the international bird migration routes, and has also been designated an important bird and biodiversity area by BirdLife International. The Janghang wetland in the HRE was registered as a Ramsar site on May 21, 2021. Ecological research on wetlands should support local and national efforts to fulfill the obligations set forth by the Ramsar Convention, including the identification and conservation of Ramsar-designated internationally important wetlands (Ramsar Convention 2022). Wetlands identified as containing concentrations of 1 percent or more of the population of a given waterbird species are identified as internationally important wetlands for waterbirds. The study of Yoo and Han (2021) identified a total of 15 orders, 48 families,

and 234 bird species in the HRE between 2007 and 2019. The order Charadriiformes was the most dominant. Cranes and geese were also recorded in high numbers. This shows that tidal flats and farmland in the HRE are important resting and feeding sites for shorebirds and waterbirds.

Conservation activities should also be carried out to address the decreasing total populations of waterbirds along the migratory bird migration route. The Black-faced Spoonbill, which breeds in Yudo, and the White-naped Crane inhabiting the Siam-ri and Janghang wetlands are two such declining species (J. Kang et al. 2016a; Kim and Lee 2008; National Institute of Ecology 2021). The Black-faced Spoonbill, which is endangered worldwide, are found to inhabit the western coast of the Korean Peninsula and eastern China in large numbers. Although surveys have been conducted on Black-faced Spoonbill breeding sites on the west coast of Korea and in China, a large-scale survey of this bird's habitat has yet to be conducted. However, it is estimated that this species inhabits the DMZ area, to include the HRE, and Korea's northwestern coastline, where there are many uninhabited islands that see large tidal variations (Borzée et al. 2022). Black-faced Spoonbill-related research is not yet active in the DPRK. However, research conducted in 1997 and 1998 discovered nests of spoonbills on seven islands in the West Sea, and the island of Tokdo, 25 km from Kumsong-ri, Onchon county, South Pyongan Province, DPRK, was identified as the most important of these habitats (R. Kim et al. 2007). In addition, it is assumed that cranes, spoonbills, black geese, and giant geese that inhabit the Panmunbeol plain in Pyeonghwa-ri, Dongchang-ri, Daeryong-ri, Rimhan-ri, and Jogang-ri in Gaeseong-si in the DPRK will winter in Paju-si, Goyang-si, Gimpo-si within the HRE as they migrate from north to south and conversely. According to the Korean Central News Agency (2021), the DPRK is currently conducting waterbird surveys to identify new wetland protection points on its western coast, including surveys of Black-faced Spoonbill, White-naped Crane, and Swan Goose breeding in North and South Pyongan provinces. In the near future, inter-Korean discussions will need to be held, and international cooperation will be required, regarding the monitoring of the Korean West Sea, including the HRE, as a habitat for migratory birds. The HRE has become a shelter for rare

and endangered species both in Korea and globally. South Korea's Ministry of Environment (2019) selected the Black-faced Spoonbill, Swan Goose, White-naped Crane, and Taiga Bean Goose as key ecological species of the HRE wetland. North Korea's Ministry of Land and Environmental Protection also recognized the importance of supporting the natural habitat of the Swan Goose in the Korean West Sea area (EAAFP 2019b). Therefore, in this study, we focus on the Black-faced Spoonbill and Swan Goose, two key species of the HRE and which are the focus of intense concern by local governments and local citizen-scientists, who show an increased willingness to participate in conservation programs.

### *Two Key Species of the HRE*

#### 1) Swan Goose

Once considered abundant and widespread in East Asia, the world population of the Swan Goose is now estimated at only between 60,000 and 78,000, and it is assessed by BirdLife International (2022) as a globally threatened species, which it categorizes as "vulnerable." The 1,010 Swan Geese counted in the Jogang wetland in November 2018 represent more than 1 percent of the total world population of this species (H. Choi et al. 2019). According to the National Institute of Ecology (2021), 934 Swan Geese were recorded in the HRE in 2020 (this being the cumulative count for the species in the HRE throughout the year). Notably, this was the highest count for this species in South Korea in at least a decade, and confirms the continuing international importance of the HRE for the survival of the Swan Goose. The Swan Goose used to be found in concentrations of >1,000 quite regularly in November and again in March, feeding at freshwater tidal flats in the HRE close to Paju, with the highest count given by Park (2002) at 1,858 in March 1994. Subsequently, the increase in disturbances, such as mounting road traffic, construction in adjacent fields, and even the erection of billboards in the wetland, resulted in a change in site hydrology so that much of the sedge the birds depended on died off. As a result, only a few Swan Geese have used this area in more

**Table 1.** Key Habitats of the Swan Goose in the HRE and Korean West Sea Area

Name	Place	Highest number recorded
DPRK	Chongchon River estuary and Mundok	40,000
	Haechang River estuary	15,000
	Kunsong mudflats	800
	Onchon Plain	800
ROK	HRE	934
	Daebudo	1
	Daehoji Reservoir	2
	Janghang coast	74
	Suncheon Bay	12

Source: Authors' compilation based on Ministry of Environment (2019–2021), National Institute of Ecology (2021), and Ri et al. (2018).

recent years. On the other hand, the highest recorded number of Swan Geese in the DPRK was in 2018 (Ri et al. 2018).

The decreasing population of the Swan Goose may also be related to habitat changes or the degradation of stopover sites along the migration flyway (Batbayar 2013), in both the ROK and DPRK. Swan Geese prefer to use landscapes with lower human densities and less urbanization while exploiting areas rich in food supply (Batbayar 2013). Based on such preferences, the Anmok River estuary and the estuary of the Chongchon and Taeryong Rivers (Mundok Ramsar Site) in North Korea are the remaining habitats for the Swan Goose (Batbayar 2013).

Conservation of the Swan Goose, therefore, is dependent on the maintenance of natural or almost natural estuarine and floodplain wetlands, including those in the HRE. Conservation of such wetlands will result in the conservation of a large number of other dependent plant and animal species, some of which are important to fisheries. Moreover, coastal marshes, especially vegetated coastal marshes, are among the most efficient sinks for atmospheric and water-borne carbon. Their conservation and restoration is an economical and sustainable response to help curb climate change (Duarte et al. 2005).

## 2) Black-faced Spoonbill

This species is near-endemic as a breeding species to the Yellow/West Sea and is currently assessed as globally “endangered” in the International Union for Conservation of Nature’s (IUCN Asia) Red List (BirdLife International 2022). The Black-faced Spoonbill breeds in colonies, almost entirely on uninhabited islands surrounded by or close to tidal flats (Hancock et al. 2010). This large migratory waterbird specializes in catching fish in tidal habitats. Even though the species has been the focus of sustained international conservation efforts, and its population has increased moderately from a historic low of only a few hundred individuals (EAAFP 2019a; 2022), many of the major threats to the species remain. These threats include habitat loss due to industrial development and land reclamation, pollution, and disturbance from human activities such as fisheries and tourism (Y. Sung et al. 2018). According to C. Choi et al. (2015) human disturbance can trigger strong behavioral responses by the Black-faced Spoonbill, and associated energy expenditures, may in turn affect their survival or fecundity. Evidence for this includes the fact that population increases have been more pronounced in protected sites and sites with low levels of human disturbance, indicating that reducing and controlling human disturbances is crucial for the conservation of this species (Y. Sung et al. 2018).

Most of the known breeding sites of the species can be found along the west coast of the Korean Peninsula (EAAFP 2022). The vast majority of nesting pairs have been found in Gyeonggi Bay, where more than a third of the known total population was counted in 2006, while at least 562 nests were counted in 2013, including in the HRE (Kang et al. 2016). However, the number of breeding nests has decreased in both Gyeonggi Bay and the HRE. For example, Yudo (in the HRE) recorded 70 nests in 2006 (I. Kim 2006) but only 30 nests in 2007 (Ji 2008).

Research on this species has been less extensive in the DPRK, with the most extensive effort during 1997 and 1998, in which more than 60 islands were surveyed, with nests found on seven of these. The most important known sites were Tokdo (Chong and Pak 2000), Cheongdan, and



**Table 2.** Key Habitats and Breeding Places of the Black-Faced Spoonbill in the HRE

Name	Place	Highest recorded
DPRK	Pansong Archipelago	10 pairs
	Hamseong Archipelago	5 pairs
	Tokdo	5–7 pairs
	Ongjin	40–50
	Cheongdan, South Hwanghae	180–230
	Kangryong Reservoir, South Hwanghae	100
ROK	Baengnyongdo, Incheon	8
	Gujido, Incheon	294
	Bido, Incheon	210
	Yodo	104
	HRE	127
	Sangyeobawi, Incheon	22
	Gyeonggi Bay	652
	Seomando, Incheon	120
	Gaksiam, Incheon	38
	Suhaam, Incheon	34
	Maedo, Incheon	114

Source: Authors' compilation based on Institute for Peace Affairs and Science Encyclopedia Publisher (2003), EAAFP (2019a), National Institute of Ecology (2021), and Ri et al. (2018).

Kangryong Reservoir (Ri et al. 2018) in the DPRK and Gyeonggi Bay in the ROK (Table 2). However, there has been a substantial decrease in breeding birds on Tokdo in recent years, including the Black-faced Spoonbill, which is attributed to an increase in disturbances caused by visiting fishermen (Ri et al. 2018).

To date, therefore, the majority of the breeding population has yet to be found. It is currently assumed that most Black-faced Spoonbill breed in the DMZ or along the inter-Korean border as well as along the DPRK coast, where there is a combination of large tidal ranges, uninhabited islands, and very low levels of human disturbance, conditions preferred by the species.

## **Ecological Cooperation beyond Borders**

### *Potential Threats to Habitats in the HRE*

Habitat disturbance includes any reversible change in land use by humans that reduces the capacity of an ecosystem to maintain its natural functions. If habitat disturbance is repeated, persistent, or widespread, it will likely have negative impacts on species and on overall ecosystem function, and will over time result in habitat degradation and habitat loss, which has been assessed by the CBD as one of the five main drivers of species decline and extinction (CBD 2011). Examples of observed habitat disturbance include the cutting and burning of stream and field edges and the digging out of streams or irrigation channels. The replacement of soft-edged drainage channels with concrete drains is an example of habitat loss. In addition, various features of modern land use and conservation of species are now known to be directly incompatible with each other (Bregnballe et al. 2017). For instance, even surveying or recreational activities, such as strolling through a wetland, can put waterbirds on increased vigilance, causing loss of feeding, enhanced energy expenditure through elevated heart rates and increased flight, or a combination of these to the extent that they desert a site or suffer reductions in reproductive success or survival (Madsen and Fox 1995; 1997; Burger and Gochfeld 1998; Livezey et al. 2016). Although a few widespread bird species can become quite tolerant of disturbances, many other species cannot. As a result, relatively undisturbed areas tend to support a higher diversity of scarce and sensitive species, while a substantial increase in levels of human disturbance in areas that previously had few such disturbances can and often does result in the decline and loss of many of the more sensitive species in the affected areas (Samia et al. 2015). Of importance to the present study, increased disturbance to birds at certain times of the year, e.g. when they are establishing breeding territories, has also been shown to have a negative effect on the population of birds that breed at a site (Bötsch et al. 2017). As responses to disturbance are species-specific, any proposed buffer zones or seasonal access restrictions aimed at conserving species need to be properly formulated based on each species' specific response to human disturbances

(Martinez-Abraín et al. 2008; Beale and Monaghan 2004).

Habitat disturbance in the inter-Korean border area is generally related to the erection of man-made structures, often related to agriculture or the small-scale agroindustry. According to Sung (2015), despite its promising economic and political benefits, Korean reunification will negatively affect birds and other wildlife species in the DMZ and the border region because accelerated land development will destroy their habitats. This can be incredibly intense in some places, including areas of sensitive habitats. For example, ginseng culture in the border area near Paju has reached a level where it has greatly disturbed the Red-crowned Crane (*Grus japonensis*) and White-naped Crane, which traditionally fed in rice fields now being used as ginseng fields. Similarly, hot houses and other agroindustry structures in the Cheorwon area have become an increasing source of disturbance for wildlife. In several places along the DMZ, the growth of such industries and expected land development can be seen. Even more problematic than agriculture is the spread of other human structures in the countryside, such as livestock farms, containers used to store materials or as makeshift resting places for farmers, small mills, and other structures. Straw covered by plastic vinyl is very efficient for farmers, but also adds to the human-induced transformation of the landscape.

This kind of habitat disturbance is done in the name of improving agricultural efficiency. But the positives are offset by many negative consequences for the ecology of the area. A typical case in point is the increasing number of precast concrete trenches replacing naturally dug trenches. Often the sides of these trenches are completely vertical, and so very difficult for an animal to escape if they find themselves within them (Muir 2011; 2012). They become effective death traps for small mammals and amphibians. Water flows very rapidly through these trenches, unlike the slower current found in natural trenches. While this would seem optimal in cases of heavy rain, particularly during the summer monsoon season, problems of flooding are in fact often exacerbated by these structures, since water collects much faster at a few points along the trenches. In addition, the eradication of a slow, natural flow of water means that the habitat for many animals, as well as insects and amphibians, is changed and areas dry out

faster. This in turn contributes to the local rise of dust levels. In the winter months, dust coverage from the extremely dry weather and lack of water is clearly observable. The retention of water in trenches through slower flow will not completely alleviate this problem but could be part of a solution. While an occasional trench might not be considered too harmful, the proliferation of concrete structures means that overall much fewer amphibians can migrate into rice fields and therefore the balance between amphibians and insects, some of them potentially harmful for rice cultivation, can be disturbed.

While the proliferation of trenches is harmful to the migration of small species, there is another disturbing trend in the management of trenches and small waterways. The beautification and tidying up of waterways is often called environmental ecological restoration. Vegetation, in particular in the very valuable habitat of the reed bed, is cut down, and water-based plants are removed from waterways, all to increase the flow of water and present a tidier view, which leads to a loss of feeding, coverage for animals (particularly birds), and also diminishes the capacity for coping with the intake of soil into the water, thereby increasing erosion and creating eutrophic problems in waterways.

Habitat disturbance is a serious problem since it is long-lasting; if we measure it by migration circles for migratory birds, it lasts for several years in a row, preventing birds from using their habitual roosting or feeding sides. Besides the human disturbance of habitats, there is also direct harm to species. The problem of large crowds disturbing birds is not yet present due to the relatively sparse population of the inter-Korean border area. But in some places, human disturbance can become a problem.

### *Ecological Cooperation with Birds*

While the amelioration of some problems can be realized through raising awareness and some rather simple measures, other ecological conflicts in the border area will persist. In particular, some forms of development, like building roads and bridges, will forever change the natural environment. For example, a planned bridge on Yudo to foster cooperation and exchange

between Gimpo city in South Korea and Kaepung county in North Korea (Lee 2019) would certainly bring an end to the colony of breeding birds there. However, a balance of interests between various stakeholders must be found. Certainly, economic considerations—particularly in view of the development of more peaceful inter-Korean relations—are important. With every passing year, local governments increase the development of land along the HRE by constructing new dams, streets, and bridges, and in particular, by canalizing agricultural waterways, thereby decreasing natural habitat and biodiversity. An alternative, presented in model projects, is to have environmentalists directly manage ecologically sensitive areas as revealed by surveys. One of the great advantages of this is the inclusion of such environmentalists and civil society elements directly as stakeholders in decision-making processes, which would also increase their understanding of competing uses of the border area. Financially, *buying up* selected land in the area might be achieved by exchanging land in the border area with land owned by the state outside the DMZ, and also using the Inter-Korean Cooperation Fund since this fund is directly connected with reunification preparations.

A balance has to be found between national, regional, and local administrative and private interests. Private land ownership is an important principle in a market economy. At the same time, core areas for environmental protection cannot simply be neglected but should be protected at the appropriate administrative level. A stakeholder discussion process should be initiated, beginning with a discussion of land ownership issues and moving on to the question of land management.

According to Leung et al. (2018), tourism can promote the value of a protected area and visitor connections to it and can have a potentially positive impact on conservation. In addition, this same study found that visitor experiences can help raise awareness of the value of protected areas. Tourists visiting the HRE can appreciate the rice paddies, fields, and lush mountains often seen in Korea's traditional agricultural society, as well as the river and the surrounding wetlands that flow naturally between the North and the South. The Black-faced Spoonbill, Swan Goose, and White-naped Crane can be linked to the ecological and cultural values that the HRE

symbolizes. Although birdwatching tours are not yet included as major outdoor activities in Korea, birdwatching tourism in Korea targeting international birdwatchers is a rapidly growing industry. Overseas birders want to visit diverse landscapes and experience bird diversity in places where there is little human interference. Observing the migration of birds from country to country helps us better understand the connection between migratory flyways and people. However, we also must keep in mind the potential human disturbance of species. Many facets and features of land use are now known to be directly incompatible with species conservation (Bregnballe et al. 2017).

On the other hand, the fact that environmental protection can only work if it is based on transborder cooperation is accepted, and can be seen in the fact that political focus on the environmental sector is increasing in the DPRK (H. Choi 2019). The international importance of wetlands for ecology, biodiversity, the climate, and human livelihoods is increasingly understood in North Korea. A German organization, the Hanns Seidel Foundation (HSF Korea), carried out a project concerned with the conservation of North Korean wetlands in cooperation with international environmental networks, such as the IUCN, EAAF Partnership, WWF (World Wildlife Federation) Hong Kong, Hong Kong Bird Watching Society (HKBWS), and local partners in North Korea, including that country's Ministry of Land and Environmental Protection (MoLEP). One of the main purposes of the project was to train for sustainable wetland management, including bird habitats. From 2010, the HSF, together with BirdLife Asia and the International Crane Foundation, supported a pilot project for the restoration of a crane habitat in Anbyon (Motylińska 2022; North Korean Economy Watch 2013; Kudláčová 2017). Since that time, research on the state of nature conservation in the DMZ border area, and support for it, has taken center stage in the work of the HSF within the framework of the larger environmental regime, including the IUCN, EAAF partnership, Ramsar Convention, UNFCCC (United Nations Framework Convention on Climate Change), and UNCCD (United Nations Convention to Combat Desertification). The HSF has supported the wise utilization of wetland areas and has been increasingly active with North Korea's MoLEP. Simultaneously,

the HSF has supported conservation training programs in North Korea and elsewhere, conferences, and practical environmental surveys in North Korea to improve the expertise of decision-makers in the environmental sector. In 2018, the DPRK acceded to the Ramsar Convention and joined the EAAF partnership. The Mundok Migratory Bird Reserve (Ramsar Sites Information Service 2018a) and Rason Migratory Bird Reserve (Ramsar Sites Information Service 2018b) became the first two Ramsar Sites of International Importance and Mundok Migratory Bird Reserve and Kumya Migratory Bird Reserve became the first two EAAF sites (EAAFP 2018). These sites are now officially recognized as protected areas at the international level. HSF Korea has been supporting this process and increasing collaboration with international organizations to identify priority areas for the conservation of migratory waterbirds through surveys and monitoring projects along the coastal and inland wetlands of the DPRK. North Korea has updated its National Wetland Inventory, which provides important information on the biodiversity of its wetlands and the services they provide to people. Notably, in 2019, the first Swan Goose Festival in the Mundok Migratory Bird Reserve was held, hosted by the MoLEP, HSF, and other international organizations (HSF Korea 2019). A total of 160 participants, including international visitors, diplomatic representatives from Russia and Mongolia, UN agency representatives, site managers, and local residents, attended this event. Participants conducted field surveys and recorded flocks of Swan Geese and other waterbirds at the Mundok Ramsar Site (EAAFP 2019b).

Awareness of the climate crisis and the reduction of species diversity has been increasing, and with this, the importance of preserving biodiversity is increasingly recognized. The inter-Korean border area is known for its ecologically significant habitats, wintering habitats, and as part of the migration route for such endangered species as the Black-faced Spoonbill and Swan Goose. The HRE provides a habitat for birds, which stop to feed in the area while migrating north and south. A long-term monitoring of current threats to these environments is required if we are to conserve the natural habitats in the HRE. It is also necessary to collect data at regular intervals. In addition, for migratory birds, the protection of wetlands along

**Table 3.** Multilateral Cooperation with Birds as Focal Point

Starting year	Issues	Implementing bodies
2010	Restoration of Red-crowned Cranes as winter residents, crane habitat on the Anbyon Plain, DPRK	International Crane Foundation, Bird Life International, HSF
2014	Migratory bird reserve project in Rason, DPRK	NEASPEC/UNESCO, Birds Korea, HSF, Russian and Chinese scientists
2015	Supporting the conservation and wise use of wetlands in the DPRK	IUCN, HSE, MoLEP, EAAFP
2018	Conservation of wetlands in the DPRK - Introducing the Rapid Assessment of Wetland Ecosystem Services	RRC-EA, HSE, HKBWS, EAAFP, IUCN
2019	Training, surveying, and celebration of the first Swan Goose Festival in Mundok Migratory Bird Reserve	EAAFP, IUCN, WWF Hong Kong, HKBWS, HSF

Source: Authors' compilation.

the entire EAAF is necessary: even if birds are protected in their summering or wintering grounds, they will be unable to safely complete their migrations without the preservation of their stop-over sites. In this sense, international cooperation is the key for the protection of wetlands and migratory birds on the Korean Peninsula. This should include the inter-Korean exchange of data and meetings as part of larger international conferences where possible. Ornithologists often remind us that birds do not know national borders, as is evident when they fly over the heavily fortified DMZ. Yet birds can play a part in bringing North and South Koreans closer. Naturally, this kind of cooperation is not entirely independent from more significant political developments, and when the two Koreas are in political conflict, such as when missile or nuclear tests raise tensions, cooperation on nature conservation becomes much more difficult. However, bird habitats are shared by many nations, and North Korea has a very high responsibility for its habitats, particularly those along the West/Yellow Sea coast, where growing reclaimed coastal land in China and the two Koreas poses a threat to the area's bird population as well as other wildlife. Ideally, environmental cooperation will become increasingly important and the HRE area will



develop into one where, despite political conflict, at least limited cooperation is possible.

## **Conclusion**

Birds are highly mobile, and by their movements within and across the inter-Korean border region they have the potential to identify valuable ecosystems and conservation priorities shared by the two Koreas as well as the larger region. In addition, the presence or absence, rarity or abundance of birds often provide valuable insights into the health and biological productivity of the places where such birds are found, thereby helping to identify national and international biodiversity hotspots and suggesting management strategies for sustainable development.

The tidal flat is of extreme value for biodiversity, not only for the Korean Peninsula but indeed for the whole West/Yellow Sea area and, moreover, the entire Asia-Pacific flyway of migratory birds. Ironically, North Korea is the only country still carrying out large-scale land reclamation along the West/Yellow Sea coast. While China stopped the practice three years ago, South Korea has even begun small-scale re-naturalization of formerly reclaimed areas. However, while in South Korea over the last hundred years, a staggering half percent of the original coastline has disappeared due to reclamation, the share of reclaimed coastline in North Korea is much smaller. The fact that in North Korea machines are scarce and reclamation is largely the result of massive labor mobilizations, mostly of soldiers, has made reclamation so slow that today much of the country's tidal flats remain. In addition, here are found very important ecological sites, such as the Mundok Ramsar Site, which is the world's major Swan Goose resting and habitat area during the migratory season. While human interference through fishing and gathering activities is sometimes quite serious, the small boats and old-fashioned aquacultural techniques of North Korea cannot compare in their impact with South Korea's huge coastal industries. The wetlands of North Korea have become for many migratory species an essential stopover during migration, all the more important that we protect

them. For example, according to Cho (2013), the wetlands of Ganghwa-do in the HRE, where in the past the great Bustard and White-naped Crane were regular winter visitors, are about to disappear. How we might allow people to develop and escape economic backwardness without destroying the natural environment is an important question. South Korea well knows the problems related to rapid development. North Korea should, with international assistance, try to avoid the problems encountered by the South and to develop in a way that addresses poverty, livelihoods, and biodiversity. Sustainable tourism is another important possibility for combining development with natural preservation in a soft development approach.

This study has brought attention to the borderless nature of the HRE between the two Koreas. In addition, we suggest here possible ways for cooperation between and beyond the two Koreas. Discussing inter-Korean cooperation is not easy since one cannot project the trajectory of future relations between the two Koreas. However, birds can become a focal point of inter-Korean cooperation. As shown by the work of the Hanns Seidel Foundation, sustainable conservation can be an important means of collaboration under the umbrella of the larger international environmental framework. Therefore, building networks between the Koreas through environmental partnerships, including surveys, monitoring and conducting various information exchanges, and taking a step-wise approach to work in the HRE, is necessary. Although this study analyzed the HRE's ecological characteristics, follow-up studies are needed to evaluate the implementation of linked policies elsewhere.

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