Biological Assessment of Ecologically Important Areas for Birds in the Yellow Sea Ecoregion

Korea Part

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Ecological sub-regions

Definition and description of sub-regions

The Yellow Sea is located in north of the East China Sea, which in turn is part of the Pacific Ocean. It is located between Korea and China. The name of The Yellow Sea comes from the sand particles that color its water, originating from the Yellow River. The innermost bay of the Yellow Sea is called the Bohai Sea. Into the Bohai Sea flows both the Yellow River and the Huai River. The West Korea Bay next to North Korea is also part of the Yellow Sea. The Bohai Sea and the West Korea Bay are separated by the Liaodong Peninsula, with Dalian, China at its southernmost point.
The west and southern coasts are mostly covered by mudflats, which support numerous living organisms. The tidal change exceeds 7-9 meters, especially in the west, and offers vast mudflats year-round on which waders can feed. Many rivers, lakes, and reservoirs in the vicinity of rice paddies support flocks of waterfowl.
These wetlands have tremendous global significance for conservation because they serve as breeding, resting and wintering sites for migratory and rare bird species in East Asian. Recognizing the importance of the wetlands, the South Korean government has introduced new policies, including the Wetlands Conservation Act, to protect threatened wetlands.
Sub-regions were defined as the Palaearctic and Oriental realms according to the geographical zones of fauna. The Palaearctic realm is the current distribution centre for animals in the cool-temperate zone of the past; the Oriental realm is the current distribution centre for animals in the tropical zone of Asia. The boundary of these two regions is the Huai River. With a temperate climate in the north and subtropical climate in the south, the Huai River is also the northern boundary of most animals in the tropical and subtropical zones.
Sub-region 1: Sub-region 1 is the Palaearctic realm, as defined by the regions north of the Huai River. This area includes the Bohai Sea and the north part of the East China Sea. Most birds in this region are migratory.
Sub-region 2: Sub-region 2 is the Oriental realm, as defined by the regions south of the Huai River. This area includes the southern part of the East China Sea. This region is wintering grounds for birds from the Palaearctic realm.

Common Criteria for identification of Ecologically Important Areas of the Yellow Sea Ecoregion

The Bird Taxonomic Group adopted the following common criteria to identify Ecologically Important Areas for birds in the Yellow Sea Eco-region (YSE) (Table 1).

Table 1. List of Commonly Adopted Criteria for Bird Taxonomic Group

Adopted Common Criteria	Proposed Indicator Species/ Species Groups	Definition of Indicator Species	Definition of Ecologically Important Areas
Criterion 1: representative species/habitat types	*Grus japonensis, Grus monacha, Grus vipio, Platalea minor, Ciconia boyciana, Egretta eulophotes, Anas formosa, Cygnus Cygnus, Larus saundersi, Haematopus ostralegus, Eurynorhynchus pygmeus, Numenius madagascariensis*	Threatened species that are mainly distributed in the YSE	Breeding grounds, Stopover sites or Wintering grounds
Criterion 2: endemism and unique species assemblages	Not adopted	Not adopted	Not adopted
Criterion 3: species richness	Not adopted	Not adopted	The top three sites with highest species richness
Criterion 4-A: Species of special concern (threatened and/or protected species)	*Grus japonensis*(E), *Grus monacha* (V), *Grus vipio*(V), *Platalea m*inor(E), *Ciconia boyciana*(E), *Egretta eulophotes*(V), *Anas formosa*(V), *Larus saundersi*(V), *Eurynorhynchus pygmeus*(V), *Tringa guttifer*(E)	Endangered (E) or Vulnerable (V) species in the region by IUCN Red List	Breeding grounds, Stopover sites or Wintering grounds
Criterion 4-B: Species. of special concern (depleted stocks)	Not adopted	Not adopted	Not adopted
Criterion 5-A: commercially important (Volume)	Not adopted	Not adopted	Not adopted
Criterion 5-B: commercially important (Value)	Not adopted	Not adopted	Not adopted
Criterion 6: intact habitat/ecological processes	Water off the demilitarised zone (DMZ) of the Korean Peninsula	No human disturbances	Wilderness area

Selected Indicator Species under Criterion 1: Representative species/ habitat types

Definition of Indicator Species under Criterion 1: Species that are highly abundant in the YSE

Selected Indicator Species

1) [Red-crowned crane] [*Grus japonensis*] [두루미, Durumi]

Reason for Selection: The red-crowned crane is endemic to Northeast Asia and has an estimated population of 2,200~2,400 in the world (Birdlife International 2001, Wetlands International 2002). In Korea, most of the wintering population gathers at Cheorwon basin which is not in the YSE, but is located in the center of the Korean Peninsula. Formerly a big wintering population could be seen near the Panmunjeom area, DMZ, but rapid environmental changes such as road construction, railways, agricultural changes and human interference are leading to a rapid decrease in the area's population.

In the Korean part of the YSE, the red-crowned crane has been recorded at: Jangdan, Ganghwa Island and Mangyeong Estuary.

2) [Hooded crane] [*Grus monacha*] [흑두루미, Heuk-durumi]

Reason for Selection: The population of the hooded crane is estimated at 11,000 worldwide. Most of them winter in Izumi, Japan. All of the wintering population in Izumi pass through the Korean Peninsula, mainly along the Nakdong River and across the Korean Strait.
In the Korean part of the YSE, the hooded crane has been recorded at Gimpo plain, Cheonsu Bay, Suncheon Bay, Junam Reservoir and Nakdong Estuary.

3) [White-naped crane] [*Grus vipio*] [재두루미, Jae-durumi]

Reason for Selection: The white-naped crane is endemic to Northeast Asia and has a population of 7,200 (Wetlands International 2002). The YSE has important stop-over sites for most white-naped cranes and there are wintering grounds for about 1,000 birds in China and South Korea.
In the Korean part of the YSE, the white-naped crane has been recorded at the Imjin River, the Han River, Gimpo plain, Daeseong-dong, Cheonsu Bay, Mangyeong Estuary, Suncheon Bay, Junam Reservoir and Nakdong Estuary.

4) [Black-faced spoonbill] [*Platalea minor*] 저어새, Jeo-eo-sae]

Reason for Selection: The black-faced spoonbill has a population of about 1,100 worldwide. The YSE holds breeding grounds and stop-over sites for almost all of these birds and is also an important wintering ground for a small population. The only known breeding grounds of the black-faced spoonbill are islands around the eastern and northern coasts of the Yellow Sea along the Korean Peninsula.
In the YSE in Korea, the lack-faced Spoonbill has been recorded at Yu Islet, Ganghwa Island, Mangyeong Estuary, Nakdong Estuary, Suncheon Bay and Jeju Island. Wintering population can be seen mainly at the Jeju Island.

5) [Oriental white stork] [*Ciconia boyciana*] 황새, Hwang-sae]

Reason for Selection: Oriental white storks breed numerously in Korea in the nineteenth century. The last breeding male was killed by poacher in 1974. The remaining female survived alone in the wild before getting poisoned by pesticide. After rescue, the female was reared in captivity and died in 1994 at the Seoul Grand Park Zoo. The breeding population of the Oriental white stork is now extinct in Korea. At most recent count, the Oriental white stork has a population of about 3,000 and most of them winter in China (Wetlands International 2002). Small wintering populations regularly visit Korean wetlands in the YSE.
In the YSE in Korea, Oriental white stork has been recorded at Jangdan, Cheonsu Bay, Mangyeong Estuary, Haenam, Suncheon Bay, Junam Reservoir, Nakdong Estuary and Jeju Island.

6) [Chinese egret] [*Egretta eulophotes*] 노랑부리백로, Norang-buri-baekro]

Reason for Selection: The Chinese egret has a population of about 2,600~3,400 in the world (Wetlands International 2002), more than two thirds of them breed in the YSE, especially in the Bohai Sea and the northern part of the YSE. A big breeding population of Chinese egret was found at Shin Island in 1988 but the island does not have Chinese egret any more due to increased human interest due to media attention.
In the YSE in Korea, the Chinese egret has been recorded at Ganghwa Island, Yeongheung Island, the Seonje Islands, Daebu Island and Cheonsu Bay.

7) [Baikal teal] [*Anas formosa*] 가창오리, Gachang-ori]

Reason for Selection: The baikal teal has a population of more than 400,000 worldwide. In recent decades, more than 95% of the world population has congregated in the YSE and formed immense flocks, especially on the South Korea side. In the early stage of this wintering, most flocks stay in Cheonsu Bay and move to the southern area for food after a freeze or big snow.
In the YSE in Korea, the baikal teal has been recorded at Cheonsu Bay, Geum River, Mangyeong River, Dongjin River, Haenam, Gangjin Bay, Junam Reservoir and Nakdong Estuary.

8) [Whooper swan] [*Cygnus Cygnus*] 큰고니, Keun-goni]

Reason for Selection: The Whooper swan has a population of about 4,000 in the Korean part of the YSE, especially in Nakdong Estuary, Junam Reservoir and the Geum River.
In the YSE in Korea, the whooper swan has been recorded at Asan Bay, Daeho Lake, Taean County, Cheonsu Bay, Janghang, Geum River, Muan Reservoir, Yeongam Lake, Gocheonam Lake, Gangjin Bay, Suncheon Bay, Gwangyang Galsa Bay, Junam Reservoir and Nakdong Estuary

9) [Saunders' gull] [*Larus saundersi*] 검은머리갈매기, Geomeunmeori-galmaegi]

Reason for Selection: Saunders' gull has a population of less than 10,000 worldwide, most of which are distributed in the YSE (Wetlands International 2002).
In Korea, the first breeding population was found in the salt marshes of Shihwa Lake. The Second was just in the vicinity of the international airport at Yeongjong Island and the third was at the Songdo reclamation area in Incheon. In migration and wintering periods, small and big flocks can be found along coastal wetlands in the YSE region in Korea.
In the YSE in Korea, Saunders's Gull has been recorded at Ganghwa Island, Yeongjong Island, Shihwa Lake, Asan Bay, Namyang Bay, Mangyeong Estuary, Dongjin Estuary, Suncheon Bay and Nakdong Estuary.

10) [Oystercatcher] [*Haematopus ostralegus*] 검은머리물떼새, Geomeunmeori-multaesae]

Reason for Selection: The YSE is extremely important for the subspecies of Oystercatcher (H. o. osculans) since the estimated population of that subspecies is about 10,000 in the world totally (Wetlands International 2002).
In the YSE in Korea, thousands of oystercatcher have been recorded at Geum Estuary and Yubu Island.

11) [Spoon-billed sandpiper] [*Eurynorhynchus pygmeus*] [넓적부리도요, Neobjeokburi-doyo]

Reason for Selection: Spoon-billed sandpiper is a rare passage migrant species, and can be found in coastal mudflats, estuaries, and saltpans. They are found in the flock of Red-necked Stint. The worldwide population was estimated at only 4,000 to 6,000 birds and a recent estimation is less than 3,000 birds and less than 1,000 pairs (Wetlands International 2002).
In the YSE in Korea, major stop-over areas of the species are the Mangyeong Estuary (the maximum count in September 1998 was 180, which is 3~4.5% of the world population), and the Dongjin Estuary. The Mangyeong Estuary is an internationally important site for the conservation of the Spoon-billed sandpiper.

12) [Far eastern curlew] [*Numenius madagascariensis*] [알락꼬리마도요, Alakori-madoyo]

Reason for Selection: Far eastern curlew is a common passage migrant species, found in western and southern coastal mudflats and estuaries. The worldwide population size of the Far eastern curlew is estimated at 38,000 birds (Wetlands International 2002).
In the YSE in Korea, a few numbers remain in the Nakdong Estuary and some southern coastal areas in winter. The minimum national population is estimated at 6,500 in Northward Migration Period (NMP) and at 3,800 in Southward Migration Period (SMP), which are 18 to 31% of the world population. Major migratory populations are found in most of the stop-over areas in April and September, while the largest populations are found in August, especially on the Ganghwa and Yeongjong Island.

Definition of Ecologically Important Areas for the Selected Indicator Species: Major areas of distribution of the above bird species are considered as ecologically important areas.

Selected Indicator Species under Criterion 4: Species of Special Concern

Definition of Indicator Species under Criterion 4: Species that are listed either nationally or internationally as threatened species.

1) [Red-crowned crane] [*Grus japonensis*] 두루미, Durumi]

Reason for Selection: With about 2,400 birds worldwide (Wetlands International 2002), the red-crowned

crane is a very endangered species. The species is listed as one of the 1st level endangered birds and is Natural Monument No. 202 in Korea because it has a very small, declining population due to loss and degradation of wetlands through conversion to agricultural land and industrial development. The migratory routes and wintering grounds for the majority of its migratory population are in the YSE.

2) [Hooded crane] [*Grus monacha*] 흑두루미, Heuk-durumi]

Reason for Selection: The hooded crane is a vulnerable species and is listed as a 2nd level endangered bird and Natural Monument No. 228 in Korea. About 10,000 birds that winter in Izumi, Japan, migrate through the Korean Peninsula. Suncheon Bay is the biggest wintering ground of this species in Korea. Habitat fragmentation in Korea and artificial feeding with long term conservation efforts in Japan have resulted in an increase in the wintering population in Japan. But the artificially high concentration at Izumi, as a result of supplementary feeding, risks a major population reduction from disease or other catastrophe.

3) [White-naped crane] [*Grus vipio*] [재두루미, Jae-durumi]

Reason for Selection: The White-naped crane is a vulnerable species in the world and is listed as a 2nd level endangered bird and Natural Monument No. 203 in Korea. The Cheorwon plain is the main wintering ground of this species and the Han River and the Imjin River estuaries are important wintering grounds in the YSE region.

4) [Black-faced spoonbill] [*Platalea minor*] 저어새, Jeo-eo-sae]

Reason for Selection: The Black-faced spoonbill is an endangered species in the world and listed as a 1st level protected bird and Natural Monument No. 205 in Korea. Remote and uninhabited islands in the YSE in Korea play an important role as breeding grounds. The southern tidal flat of Ganghwa Island provides good habitat for this species prior to its southern migration.

5) [Oriental white stork] [*Ciconia boyciana*] 황새, Hwang-sae]

Reason for Selection: The Oriental white stork is an endangered species in the world and is listed as a 1st level protected bird and Natural Monument No. 199 in Korea. Only about 3,000 birds total are recorded in the world (Wetlands International 2002). This species has a very small, declining population as a result of pesticides, wetland reclamation and drainage for agriculture, over-fishing and other disturbances. The YSE covers the major migratory routes of the Oriental white stork. Recently, 10 to 20 Oriental white storks migrate and winter in the YSE in Korea.

6) [Chinese egret] [*Egretta eulophotes*] 노랑부리백로, Norang-buri-baekro]

Reason for Selection: The Chinese egret is listed as a vulnerable species in the IUCN Red List and a 1st level protected bird and Natural Monument No. 361 in Korea. Only about 3,000 birds are left total. Remote and uninhabited islands in the YSE of South Korea play an important role as breeding grounds.

7) [Baikal teal] [*Anas formosa*] 가창오리, Gachang-ori]

Reason for Selection: Baikal teal is a vulnerable species and listed as a 2nd level protected bird in Korea. It has a population of more than 400,000 in the world, mainly winter in the YSE region in Korea. Cheonsu Bay, Geum River and inland wetlands at Haenam County are the main wintering grounds where numerous tourists are attracted by the flight performance of their immense flocks.

8) [Saunders' gull] [*Larus saundersi*] 검은머리갈매기, Geomeunmeori-galmaegi]

Reason for Selection: Saunders' gull is a vulnerable bird species in the world and their total population is estimated at 7,100~9,600 (Wetlands International 2002). Saunders' gull is listed as a 2nd level endangered bird Korea. Migration between Korea and Japan has been studied through colour flagging. Of 63 banded Saunders's Gulls, 11 were re-sighted in Japan showing a 17.5% recovery rate, meanwhile the rate between Korea and China was only 0.5% with eight re-sights among 1,538 birds (Kim *et al*. 2004, Ozaki 2004).

9) [Spoon-billed sandpiper] [*Eurynorhynchus pygmeus*] 넓적부리도요, Neobjeokburi-doyo]

Reason for Selection: The Spoon-billed sandpiper is a rare passage migrant species, and can be found in coastal mudflats, estuaries, and saltpans. They are found in the flock of Red-necked Stint. The worldwide population is estimated at only 4,000 to 6,000 birds, and the species is designated as a "vulnerable species" in the IUCN rare bird category (Collar *et al*. 1994). A recent estimation is less than 3,000 birds and less than 1,000 pairs (Wetlands International 2002). Major stop-over areas of the species are the Mangyeong Estuary (the biggest count was 180 in September 1998, which is 3~4.5% of the world population), and Dongjin Estuary. The Mangyeong Estuary is an internationally important site for the conservation of the Spoon-billed sandpiper.

10) [Nordmann's greenshank] [*Tringa guttifer*] [청다리도요사촌, Cheongdari-doyo-sachon]

Reason for Selection: The worldwide population of Nordmann's greenshank is known to be distributed over the East Asian region. This species has been designated as an "endangered species" in the IUCN red list since 1994 (Collar *et al*. 1994). The population is continuously declining mainly due to coastal wetlands development. Including Russia, there are several identified breeding grounds. Although rarely seen, they can be found around spring and autumn in the Nakdong Estuary, Incheon, and Ganghwa Island in Korea.

Table 2. List of selected Indicator Species

Selected Indicator Species	Criterion 1: Representative Species/Habitat Types	Criterion 4: Species of Special Concern
Grus japonensis	X	X
Grus vipio	X	X
Grus monacha	X	X
Platalea minor	X	X
Egretta eulophotes	X	X
Eurynorhynchus pygmeus	X	X
Larus saundersi	X	X
Ciconia boyciana	X	X
Haematopus ostralegus	X	
Cygnus Cygnus	X	X
Numenius madagascariensis	X	
Tringa guttifer		X
Anas formosa	X	X

Note: *X indicates that the species was selected under the corresponding criterion*

Maps and Descriptions of Ecologically Important Areas for Bird Taxonomic Group

Table 3. List of Maps and Area Names for Ecologically Important Bird Areas

Map Number	Indicator Species.	Area Names for Ecologically Important Bird Areas				
Map 1	*Grus japonensis*	Jangdan	Ganghwa Island	Mangyeong Estuary		
Map 2	*Grus vipio*	Han Estuary and Imjin Estuary	Cheonsu Bay	Mangyeong Estuary	Suncheon Bay	Junam Reservoir
		Nakdong Estuary				
Map 3	*Grus monacha*	Gimpo plain	Shihwa Lake	Cheonsu Bay	Suncheon Bay	Junam Reservoir
		Nakdong Estuary				
Map 4	*Platalea minor*	Yu Islet	Ganghwa Island	Mangyeong river	Suncheon Bay	Nakdong Estuary
		Jeju Island				

Map Number	Indicator Species.	Area Names for Ecologically Important Bird Areas				
Map 5	*Egretta eulophotes*	Ganghwa Island	Yeongheung Island	Seonje Island	Daebu Island	Cheonsu Bay
Map 6	*Eurynorhynchus pygmeus*	Mangyeong Estuary	Dongjin Estuary			
Map 7	*Larus saundersi*	Ganghwa Island	Namyang Bay	Asan Bay	Mangyeong Estuary	Suncheon Bay
Map 8	*Ciconia boyciana*	Cheonsu Bay	Mangyeong Estuary	Haenam	Suncheon Bay	Jeju Island
Map 9	*Haematopus ostralegus*	Songdo	Namyang Bay	Yubu island	Nakdong Estuary	
Map 10	*Cygnus cygnus*	Asan Bay	Cheonsu Bay	Geum river	Mangyeong Estuary	Dongjin Estuary
		Yeongam Lake, Geum Lake and Yeongsan Lake	Gocheonam-ho	Gangjin Bay	Junam Reservoir	Nakdong Estuary
Map 11	*Numenius madagascariensis*	Ganghwa Island	Yeongjong Island	Namyang Bay	Asan Bay	Mangyeong Estuary
		Dongjin Estuary				
Map 12	*Tringa guttifer*	Ganghwa Island	Namyang Bay	Asan Bay	Mangyeong Estuary	Dongjin Estuary
Map 13	*Anas formosa*	Namyang Bay	Asan Bay	Cheonsu Bay	Geum river	Mangyeong Estuary
		Dongjin Estuary	Haenam	Gangjin Bay	Junam Reservoir	Nakdong Estuary
		Yeongsan Lake	Gocheonnam-ho			

Bird Ecologically Important Areas (BEIA) for *Grus japonensis* (Map 1)

Area Name: Jangdan

Location: Paju, Gyeonggi-do, Korea, 37°57’ N, 126º41’ E
Area Description: The Jangdan area is an important wintering ground and stop-over sites for the Red-crowned crane. Its preferred habitat types are riverine marsh, rice paddy and inland wetlands.

Area Name: Ganghwa Island

Location: Ganghwa County, Incheon, Korea, 37°36’ N, 126º32’ E
Area Description: Tidal flats and rice paddies located at the southeast of the Ganghwa Island are an Ecologically Important Area because these are important wintering sites for the Red-crowned crane. Regularly, two family groups winter in the area, with a home range as far as the Gimpo area.

Area Name: Mangyeong Estuary

Location: Gimje, Jeollabuk-do, 35°52’ N, 126º47’ E
Area Description: Mangyeong Estuary is an Ecologically Important Area because it has been an important wintering ground for the Red-crowned crane since 2003. Huge tidal flats and rice paddies provide suitable habitat for the Red-crowned crane.
Knowledge gaps and specific studies needed: Information and the current status of the wintering population in North Korea, especially adjacent to Jangdan area are very limited.

Bird Ecologically Important Areas (BEIA) for *Grus vipio* (Map 2)

Area Name: Han and Imjin Estuaries

Location: Paju, Gyeonggi-do, 37°42'~ 37°54'N, 126º40'~126º47' E

The Han and Imjin estuaries are important stop-over and wintering sites for the White-naped crane. Fifty-six White-naped cranes were counted in the estuaries on February 1, 2004.

The estuarine system of the Han River from about 25 km downstream of Seoul to its confluence with the Imjin River is well protected. The river is 2-3 km wide and rather shallow with extensive salt marshes on both banks and large areas of mudflat are exposed at low tide. The adjacent alluvial plain and reclaimed land are largely under cultivation for rice. The tidal range is one of the highest in the world.

Part of the Han River Estuary in Gyoha-myeon, Paju, was designated Natural Monument (No. 250) for the White-naped cranes in 1975. The protected area was extended to include Haseong-myeon in Gimpo on the west side of the estuary in 1977.

Area Name: Cheonsu Bay (Seosan Reclaimed District)

Location: Seosan, Chungcheongnam-do, 36°35'~ 36°41'N, 126º17'~126º28' E

Area Description: Cheonsu Bay is an Ecologically Important Area because it is important stop-over sites for White-naped cranes. Part of Cheonsu Bay is a reclaimed area that is formed by two large reservoirs surrounded by vast agricultural fields where large-scale, mechanized farming takes place. The threats to biodiversity in the area include worsening water quality, fish exploitation and changes in land use.

Area Name: Mangyeong Estuary

Location: Gimje, Jeollabuk-do, 35°52' N, 126º40' E

Area Description: Mangyeong Estuary is an Ecologically Important Area because it is an important stop over site for the White-naped crane.

Area Name: Suncheon Bay

Location: Suncheon, Jeollanam-do, 34°52' N, 127º30' E

Area Description: Suncheon Bay is a wintering ground for the White-naped crane. The tidal flats serves as a safe and undisturbed roosting site and the surrounding rice paddies are a good feeding ground.

Area Name: Junam Reservoir

Location: Changwon, Gyeongsangnam-do, 35°18' N, 128º41' E

Area Description: Junam is a wintering ground and a stop-over site for the White-naped crane.

The Junam reservoir consists of three water storage reservoirs and marshes in close proximity on the cultivated plains south of the Nakdong River. Sannam, the smallest, was constructed in 1922; Junam/Chunsan, the biggest, in 1944 and Dongpan in the 1970s. The reservoirs receive inflow from the Nakdong River and the water levels remain relatively stable throughout the year. Junam and Dongpan have a maximum depth of four metres.

Main threats to this area are the expansion of Changwon and the reduction and conversion of rice paddies. Sewage from livestock flowing into the reservoirs causes severe problems, such as eutrophication. Human activities, mainly fishing, affect the roosting behaviour of waterbirds in the region. Poisoning by farmers to protect crops, directly affects the avian community.

Area Name: Nakdong Estuary
Location: Busan, 35°03' N, 128º56' E

Area Description: Nakdong Estuary is a wintering ground and a stop-over site for the White-naped crane. The White-naped and Hooded cranes can be observed in big flocks during their migration along the Nakdong river to Izumi, Japan.

The area of the Nakdong River and its estuary is composed of the Nakdong channels, Juklim channel, tidal flats, sand dunes and deltas. Part of this area was designated as Natural Monument No. 179 in 1966.

The delta and estuarine system of the Nakdong River includes numerous tidal channels, low-lying islands, sand bars, about 3,000 ha of intertidal mudflats, and extensive brackish to saline marshes. Large areas of former marsh and mudflats have been reclaimed for agriculture and many of these diked areas are subject to seasonal flooding. The western marshes and mudflats of this area are almost entirely surrounded by the steep hills of the mainland and the large island of Gadeok-do. The eastern marshes and mudflats are protected from the open sea by a chain of low sandy barrier islands which are covered with reed-beds, dunes and cultivated land.

The largest island, Eulsuk Island, lies between the two main branches of the Nakdong River. The main threats to this area are the expansion of Busan Metropolitan City, which needs more land for development, human dwellings, agriculture and factories. Salinity changes after the construction of an estuary dyke have affected the composition of flora and fauna of this area.

Knowledge gaps and specific studies needed: Habitat of the White-naped crane during its wintering period.

Bird Ecologically Important Areas (BEIA) for *Grus monacha* (Map 3)

Area Name: Gimpo plain

Location: Gimpo, Gyeonggi-do, 37°43' N, 126º39' E

Area Description: Gimpo plain is an important stop-over site for the Hooded crane during the northern and southern migration period.

Area Name: Shihwa Lake

Location: Ansan, Gyeonggi-do, 37°18' N, 126º42' E

Area Description: Shihwa Lake is one of the important stop-over sites for the Hooded crane.

Area Name: Cheonsu Bay (Seosan Reclaimed District)

Location: Seosan, Chungcheongnam-do, 36°35'~ 36°41'N, 126º17'~126º28' E

Area Description: Cheonsu Bay is an important stop-over site and wintering ground for the Hooded crane.

Area Name: Suncheon Bay

Location: Suncheon, Jeollanam-do, 34°52' N, 127º30' E

Area Description: Suncheon Bay is the biggest wintering ground for the Hooded crane in Korea. The tidal flats serve as a safe and undisturbed roosting site and the rice paddies serve as a feeding ground for the crane. The wintering population gradually increased from 85 birds in 1998 to 145 birds in 2002 and 216 birds in 2004 (Kim *et al*. 2004, MOE & NIER 2004).

Suncheon Bay is famous for its vast reed bed. The area was designated as a Wetland Conservation Area by the Ministry of Maritime Affairs and Fishery in 2004.

Area Name: Junam reservoir

Location: Changwon, Gyeongsangnam-do, 35°18' N, 128º41' E

Area Description: Junam reservoir is an important stop-over site for the Hooded crane.

Area Name: Nakdong Estuary
Location: Busan, 35°03' N, 128º56' E

Area Description: Nakdong Estuary is a stop-over site for the Hooded crane. Hooded cranes can be observed in big flocks during their migration along the Nakdong River to Izumi, Japan.

Knowledge gaps and specific studies needed: Key factors which control cranes in wintering site selection

Bird Ecologically Important Areas (BEIA) for *Platalea minor* (Map 4)

Area Name: Yu Islet

Location: Gimpo city, Gyeonggi-do, 37°45' N, 126º35' E

Area Description: Yu Islet is an important breeding ground for the Black-faced spoonbill. The Black-faced spoonbill is a globally threatened species with a total population of about 1,000 individuals. Yu Islet is located in the lower reaches of the Han River. Yu Islet rises to about 50 meters above sea level and covers an area of about seven hectares. This small islet has not been inhabited by civilians since it is located in the Korean Demilitarized Zone. For this reason, Yu Islet is well preserved and protected.

The Black-faced spoonbill nests on pine trees at the top of a hill. The exact number of breeding pairs could not be investigated due to limited access.

Area Name: Ganghwa Island (Seondu-ri tidal flat)
Location: Seondu-ri, Ganghwa County, Incheon, 37°35' N, 126º28' E

Area Description: The tidal flats and a small rock islet located at the south of Seondu-ri, Ganghwa Island has important staging sites for the Black-faced spoonbill. Up to 100 Black-faced spoonbills have been counted here, forming a big flock in September after breeding and before their southern migration.

Area Name: Mangyeong Estuary

Location: Gimje, Jeollabuk-do, 35°52' N, 126º40' E

Area Description: Mangyeong Estuary is an important stop-over site for the Black-faced spoonbill.

Area Name: Suncheon Bay

Location: Suncheon, Jeollanam-do, 34°52' N, 127º30' E

Area Description: Suncheon Bay is a wintering ground for the Black-faced spoonbill. Its tidal flat serves as a safe and undisturbed roosting and feeding site.

Area Name: Nakdong Estuary

Location: Busan, 35°03' N, 128º56' E

Area Description: Nakdong Estuary is a stop-over site for the Black-faced spoonbill.

Area Name: Jeju Island (Hado-ri & Seongsanpo Lake)

Location: Hado-ri, Seongsan, Jeju-do, 33°30' N, 126º53' E, 33°27' N, 126º55' E

Area Description: Hado-ri and Seongsanpo Lake, Jeju Island are the biggest wintering sites for the Black-

faced spoonbill in Korea. About 20 Black-faced spoonbills winter in these areas.

Knowledge gaps and specific studies needed: Remote breeding islands in the YSE need to be identified and investigated. Investigations on the breeding grounds of Black-faced spoonbills in North Korea are also needed.

Bird Ecologically Important Areas (BEIA) for *Egretta eulophotes* (Map 5)

Area Name: Ganghwa Island (Seondu-ri tidal flat)

Location: Seondu-ri, Ganghwa County, Incheon, 37°35' N, 126º28' E

Area Description: The tidal flats located south of Seondu-ri, Ganghwa Island is an important staging site for the Chinese Egret.

Area Name: Yeongheung Island

Location: Ongjin County, Incheon, 37°15' N, 126º25' E

Area Description: Yeongheung Island is an important stop-over site for the Chinese egret.

Area Name: Seonje Island

Location: Ongjin County, Incheon, 37°15' N, 126º30' E

Area Description: Seonje Island is an important stop-over site for the Chinese egret.

Area Name: Daebu Island

Location: Ansan, Gyeonggi-do, 37°14' N, 126º33' E

Area Description: Daebu Island is an important stop-over site for the Chinese egret.

Area Name: Cheonsu Bay (Seosan Reclaimed District)

Location: Seosan, Chungcheongnam-do, 36°35'~ 36°41'N, 126º17'~126º28' E

Area Description: Cheonsu Bay is an important stop-over site and wintering ground for the Chinese egret.

Knowledge gaps and specific studies needed: Remote breeding islands in the YSE need to be identified and investigated. Investigation on the breeding grounds of the Chinese egret in North Korea is also needed.

Bird Ecologically Important Areas (BEIA) for *Eurynorhynchus pygmeus* (Map 6)

Area Name: Mangyeong Estuary

Location: Gunsan, Jeollabuk-do, 35°53' N, 126º41' E

Area Description: Mangyeong Estuary is an important stop over site for the Spoon-billed sandpiper. The maximum count of Spoon-billed sandpipers recorded in the Republic of Korea is 180, during the southern migration.

The combined estuarine system of the Mangyeong and Dongjin Estuaries lies about 10 km southeast of the Geum Estuary. There is a large area of saltpans (2,700 ha) on the north shore of Mangyeong Estuary. River flow has been constructed by cannibalizing the head of the two estuaries.

Mangyeong Estuary is the second important stop-over area for the migratory shorebird population. Dominant shorebird species here are the Great Knot, the Dunlin, the Black-tailed Godwit, the Kentish Plover, and the Red-necked Stint. Internationally threatened species or subspecies include the Eurasian

Oystercatcher, the Spoon-billed sandpiper, Nordmann's Greenshank, and the Eastern Curlew.

The most serious threat to this area is the Saemangeum project, which will reclaim Mangyeong Estuary and Dongjin Estuary. The tidal flat will be lost if the proposed reclamation is implemented. This project is the world's largest ongoing reclamation: a 40,100 hectare reclamation project at the mouth of the Mangyeong and Dongjin Rivers, in Jeollabuk-do, western Republic of Korea. This reclamation project, part of the 1970s' long-term project of the reclamation of the west and south seashores, was planned in detail just before the 13th national election in 1986 and was launched in 1991. It was scheduled to be completed in 2004, but legal proceedings and lawsuits between NGOs and the Ministry of Agriculture are pending.

Area Name: Dongjin Estuary

Location: Gimje, Jeollabuk-do, 35°48' N, 126º42' E

Area Description: Dongjin Estuary is an important stop over site for the Spoon-billed sandpiper.

Knowledge gaps and specific studies needed: The ecology of the Spoon-billed sandpiper is still unknown.

Bird Ecologically Important Areas (BEIA) for *Larus saundersi* (Map 7)

Area Name: Ganghwa Island (Seondu-ri tidal flat)

Location: Seondu-ri, Ganghwa County, Incheon, 37°35' N, 126º28' E

Area Description: Tidal flats south of Seondu-ri, Ganghwa Island are an important staging site for Saunders' gull.

Area Name: Namyang Bay

Location: Hwaseong County, Gyeonggi-do, 37°03' N, 126º46' E

Area Description: Namyang Bay is an important staging site for the Saunders' gull. Namyang Bay is a large bay, about 13 km long and 10 km wide at the mouth, running northeast to southeast. At Yihwa-ri in the south a small river has been dammed with a coastal barrage to form Namyang Lake. There are large areas of tidal mudflats, especially along the south side of the bay. The tidal range varies from about 5.2 m at neap tides to 8.5 m at spring tides.

Area Name: Asan Bay

Location: Asan city, Gyeonggi-do, 36°53' N, 126º54' E

Area Description: The Asan Bay is an important staging site for Saunders' gull. Asan Bay is large, about 15 km long and up to 15 km wide, adjoining Namyang Bay to the north. Two rivers have been dammed with barrages at the head of the bay to form large freshwater lakes: the Asan Lake in the east and Sapkyo Lake in the south. The tidal range varies from 5.2 m at neap tides to 8.5 m at spring tides.

Area Name: Mangyeong Estuary

Location: Gunsan, Jeollabuk-do, 35°53' N, 126º41' E

Area Description: Mangyeong Estuary is an Ecologically Important Area because it is an important stop-over site for Saunders' gull.

Area Name: Suncheon Bay

Location: Suncheon, Jeollanam-do, 34°52' N, 127º30' E

Area Description: Suncheon Bay is an Ecologically Important Area because it is a wintering ground for the Saunders' gull.

Knowledge gaps and specific studies needed: Migration flyway of Saunders' gull in the Northeast Asian region

Bird Ecologically Important Areas (BEIA) for *Ciconia boyciana* (Map 8)

Area Name: Cheonsu Bay (Seosan Reclaimed District)

Location: Seosan, Chungcheongnam-do, 36°35'~ 36°41'N, 126º17'~126º28' E

Area Description: Cheonsu Bay is an important wintering ground for the Oriental White Stork.

Area Name: Mangyeong Estuary

Location: Gimje, Jeollabuk-do, 35°52' N, 126º40' E

Area Description: Mangyeong Estuary is an important stop-over site for the Oriental White Stork.

Area Name: Suncheon Bay

Location: Suncheon, Jeollanam-do, 34°52' N, 127º30' E

Area Description: Suncheon Bay is an important wintering ground for the Oriental White Stork.

Area Name: Jeju Island (Hado-ri & Seongsanpo Lake)

Location: Hado-ri, Seongsan, Jeju-do, 33°30' N, 126º53' E, 33°27' N, 126º55' E

Area Description: Hado-ri and Seongsanpo Lake, Jeju Island are important wintering sites for the Oriental White Stork.

Knowledge gaps and specific studies needed: Migration flyway and stop-over sites of the Oriental white stork.

Bird Ecologically Important Areas (BEIA) for *Haemantopus ostralegus* (Map 9)

Since the first breeding population on the Daesong Islet was found in 1971, breeding populations have been found on small islets along the west coast of the Korean Peninsula ranging from northern Gyeonggi-do to Mokpo, Jeollanam-do. Recently a wintering population of 2,700 birds was observed on Yubu Island in Geum Estuary. Although breeding pairs have been limitedly observed on Daesong Islet near Ganghwa Island and Unkyum Islet off the northern coast of Yeongjong Island, the breeding population is estimated at 300-700 pairs based on the wintering population size in the Republic of Korea. More detailed research is required to calculate a reliable breeding population size.

Namyang Bay and Yubu Island at the mouth of Geum Estuary are the two most important areas for conservation of the Oystercatcher. More than 1% of the flyway population of this species arrives in these areas (220 birds at Namyang Bay, September 1998, and 5,502 birds at Geum Estuary including Yubu Island in February 2004: MoE & NIER 2004). The wintering population of Oystercatchers at Yubu Island in Geum Estuary is the largest in East Asia, and the migratory population was recorded as the largest among the major stop-over sites along the western coast of the Korean Peninsula.

Area Name: Song-do

Location: Song-do, Incheon, 37°22' N, 126º42' E

Area Description: Song-do is an important staging site for the Eurasian Oystercatcher.

Area Name: Namyang Bay

Location: Hwaseong County, Gyeonggi-do, 37°03' N, 126º46' E

Area Description: Namyang Bay is an important staging site for the Eurasian Oystercatcher.

Area Name: Yubu Island

Location: Janghang-eup, Seocheon County, Chungcheongnam-do, 35°59' N, 126º36' E

Area Description: Yubu Island is an Ecologically Important Area because it is important wintering sites for the Eurasian Oystercatcher.

Area Name: Nakdong Estuary

Location: Busan, 35°03' N, 128º56' E

Area Description: Nakdong Estuary is a stop-over site and wintering ground for the Eurasian Oystercatcher.

Knowledge gaps and specific studies needed: Breeding ecology of the Eurasian Oystercatcher

Bird Ecologically Important Areas (BEIA) for *Cygnus cygnus* (Map 10)

Area Name: Asan Bay

Location: Asan city, Gyeonggi-do, 36°53' N, 126º54' E

Area Description: Asan Bay is an important staging site for the Whooper swan.

Area Name: Cheonsu Bay (Seosan Reclaimed District)

Location: Seosan, Chungcheongnam-do, 36°35'~ 36°41'N, 126º17'~126º28' E

Area Description: Cheonsu Bay is an important wintering ground for the Whooper swan.

Area Name: Geum River

Location: Gunsan, Jeollabuk-do, 36°00'~ 36°07'N, 126º44'~126º53' E

Area Description: Geum River is an important wintering ground for the Whooper swan. Geum River is located adjacent to Gunsan. Vast cultivated fields expand from the river. Huge populations of Baikal teal, Bean Geese, White-fronted Geese, and Mallards migrate to this area. Snow geese, Swans, Pintails and Pochards are the dominant species that regularly migrate to this area.

Area Name: Mangyeong Estuary

Location: Gunsan, Jeollabuk-do, 35°53' N, 126º41' E

Area Description: Mangyeong Estuary is an important stop over site for the Whooper swan.

Area Name: Dongjin Estuary

Location: Gimje, Jeollabuk-do, 35°48' N, 126º42' E

Area Description: Dongjin Estuary is an important stop over site for the Whooper swan.

Area Name: Yeongsan Lake, Youngam Lake and Geumho Lake

Location: Mokpo and Haenam County, Jeollanam-do, 34°46'~34°34' N, 126º22'~126º27' E

Area Description: Yeongsan Lake, Yeongam Lake and Geumho Lake are important wintering grounds for the Whooper swan.

Area Name: Gocheonam Lake

Location: Haenam County, Jeollanam-do, 34°30' N, 126º28' E

Area Description: Gocheonam Lake is an important wintering ground for the Whooper swan.

Area Name: Gangjin Bay

Location: Gangjin County, Jeollanam-do, 34°35' N, 126º46' E

Area Description: Gangjin Bay is an important wintering ground for the Whooper swan.

Area Name: Junam Reservoir

Location: Changwon, Gyeongsangnam-do, 35°18' N, 128º41' E

Area Description: Junam Reservoir is an important stop-over site for the Whooper swan.

Area Name: Nakdong Estuary

Location: Busan, 35°03' N, 128º56' E

Area Description: Nakdong Estuary is a stop-over sites for the Whooper swan.

Knowledge gaps and specific studies needed: Habitat selection and movement during the wintering period of the Whooper swan.

Bird Ecologically Important Areas (BEIA) for *Numenius madagascariensis* (Map 11)

The Far eastern curlew is a common passage migrant species, found in western and southern coastal mudflats and estuaries. A few remain in the Nakdong Estuary and some southern coastal areas in the winter. The minimum national population is estimated at 6,500 during the Northward Migration Period (NMP) and 3,800 during the Southward Migration Period (SMP), which are 18-31% of the world population.

In April and September, major migratory populations are found in most of the stop-over areas. The largest populations are found in August, especially on Ganghwa and Yeongjong Islands.

The worldwide population of the Far eastern curlew is estimated at 38,000 birds (Wetlands International 2002), and this species is designated as a "least-concerned species" (IUCN, 2004).

Area Name: Ganghwa Island (Seondu-ri tidal flat)

Location: Seondu-ri, Ganghwa County, Incheon, 37°35' N, 126º28' E

Area Description: The tidal flat located south of Seondu-ri, Ganghwa Island has important staging sites for the Far Eastern Curlew.

Area Name: Namyang Bay

Location: Hwaseong County, Gyeonggi-do, 37°03' N, 126º46' E

Area Description: Namyang Bay is an important staging site for the Far Eastern Curlew.

Area Name: Asan Bay

Location: Asan city, Gyeonggi-do, 36°53' N, 126º54' E

Area Description: Asan Bay is an important staging site for the Far Eastern Curlew.

Area Name: Mangyeong Estuary

Location: Gunsan, Jeollabuk-do, 35°53' N, 126º41' E

Area Description: Mangyeong Estuary is an important stop over site for the Far Eastern Curlew.

Area Name: Dongjin Estuary

Location: Gimje, Jeollabuk-do, 35°48' N, 126º42' E

Area Description: Dongjin Estuary is an important stop over site for the Far Eastern Curlew.

Knowledge gaps and specific studies needed: Breeding and wintering ecology of the Far eastern curlew

Bird Ecologically Important Areas (BEIA) for *Tringa guttifer* (Map 12)

Nordmann's Greenshank is a very rare species, occurring in mudflats, saltpans, and rice-fields. The worldwide population is estimated at only 1,000 birds, and it is categorized as an "endangered species" in the IUCN rare bird category (Collar *et al*. 1994, Wetlands International 2002). The migratory populations in South Korea number 54 during the northern migration period and 144 during the southern migration period. Their peak migration periods are in April and October. Major stop-over areas are Ganghwa Island (five observations between 1993 and 1998; maximum counts were 2 in NMP and 40 in SMP), Yeongjong Island (three observations; one bird in NMP and 9 in SMP), Namyang Bay (nine observations; 38 in NMP and 28 in SMP), Asan Bay (seven observations; 12 in NMP and 2 in SMP), Mangyeong Estuary (two observations; one in NMP and 52 in SMP), and Dongjin Estuary (two observations; eight birds in SMP). Most of the observations occurred in SMP, except those in Namyang Bay.

Yearly variations in NMP were small (About 40 to 50 birds were found in major stop-over areas), but the total number in SMP decreased in most sites from year to year: the biggest count (70 birds) occurred in October 1994 and numbered 8 in October 1997 and two in September 1998. The population decreased remarkably in Namyang Bay (from 28 in October 1993 to one bird in October 1998) and in Mangyeong Estuary (there has been no sightngs since eight birds were recorded in October 1994 in the Dongjin Estuary).

All of the known breeding populations were found in Sakhalin, Russia, and the size of migratory populations in East Asia is 2-8 birds in Japan (Fujioka *et al*. 1998) and four birds at three sites on the east coast of China (Barter 2002). The wintering population of the East Asian-Australasian flyway was 10 birds in 1994 (six in the Philippines and four in Thailand; Lopez and Mundkur 1997).

Internationally important areas in South Korea for the conservation of Nordmann's Greenshank are the Mangyeong Estuary (maximum counts during the survey period was 52; 5.2% of known worldwide population), Ganghwa Island (40; 4%), Namyang Bay (38; 3.8%), and Asan Bay (12; 1.2%). Although the maximum counts in Namyang Bay and Asan Bay are relatively fewer than in other areas, their conservation priorities are higher, because of the regular observations in NMP and SMP since 1993 and the overall numbers during the survey period.

Area Name: Ganghwa Island (Seondu-ri tidal flat)

Location: Seondu-ri, Ganghwa County, Incheon, 37°35' N, 126º28' E

Area Description: This Tidal flat located south of Seondu-ri, Ganghwa Island is important staging sites for the Nordmann's Greenshank.

Area Name: Namyang Bay

Location: Hwaseong city, Gyeonggi-do, 37°03' N, 126º46' E

Area Description: Namyang Bay is an important staging site for Nordmann's Greenshank.

Area Name: Asan Bay

Location: Asan city, Gyeonggi-do, 36°53’ N, 126º54’ E

Area Description: Asan Bay is an important staging site for Nordmann's Greenshank.

Area Name: Mangyeong Estuary

Location: Gunsan City, Jeollabuk-do, 35°53’ N, 126º41’ E

Area Description: Mangyeong Estuary is an important stop over site for Nordmann's Greenshank.

Area Name: Dongjin Estuary

Location: Gimje City, Jeollabuk-do, 35°48’ N, 126º42’ E

Area Description: Dongjin Estuary is an important stop over site for Nordmann's Greenshank.

Knowledge gaps and specific studies needed: Little is known about Nordmann’s Greenshank.

Bird Ecologically Important Areas (BEIA) for *Anas Formosa* (Map 13)

Area Name: Namyang Bay

Location: Hwaseong city, Gyeonggi-do, 37°03’ N, 126º46’ E

Area Description: Namyang Bay is an important staging site for the Baikal teal.

Area Name: Asan Bay

Location: Asan city, Gyeonggi-do, 36°53’ N, 126º54’ E

Area Description: Asan Bay is an important staging site for the Baikal teal.

Area Name: Cheonsu Bay (Seosan Reclaimed District)

Location: Seosan, Chungcheongnam-do, 36°35’~ 36°41’N, 126º17’~126º28’ E

Area Description: Cheonsu Bay is an important wintering ground for the Baikal teal.

Area Name: Geum River

Location: Gunsan, Jeollabuk-do, 36°00’~ 36°07’N, 126º44’~126º53’ E

Area Description: Geum River is an important wintering ground for the Baikal teal.

Area Name: Mangyeong Estuary

Location: Gunsan, Jeollabuk-do, 35°53’ N, 126º41’ E

Area Description: Mangyeong Estuary is an important stop over site for the Baikal teal.

Area Name: Dongjin Estuary

Location: Gimje, Jeollabuk-do, 35°48’ N, 126º42’ E

Area Description: Dongjin Estuary is an important stop over site for the Far eastern curlew.

Area Name: Yeongsan Lake, Yeongam Lake and Geumho Lake

Location: Mokpo and Haenam County, Jeollanam-do, 34°46'~34°34' N, 126º22'~126º27' E

Area Description: Yeongsan Lake, Yeongam Lake and Geumho Lake is an important wintering ground for the Baikal teal.

Area Name: Gocheonam Lake

Location: Haenam County, Jeollanam-do, 34°30' N, 126º28' E

Area Description: Gocheonam Lake is an important wintering ground for the Baikal teal.

Area Name: Gangjin Bay

Location: Gangjin County, Jeollanam-do, 34°35' N, 126º46' E

Area Description: Gangjin Bay is an important wintering ground for the Baikal teal.

Area Name: Junam Reservoir

Location: Changwon, Gyeongsangnam-do, 35°18' N, 128º41' E

Area Description: Junam Reservoir is an important stop-over site for the Baikal teal. This area was famous as a representative wintering ground for the Baikal teal in the 1980's. Huge flocks had been recorded on migration in the past, the last of which was one of at least 10,000 birds. Some 5,000 Baikal teals were reported in February 1984 and in January 1988, about 20,000 Baikal teals were again reported, mostly at the Dongpan Reservoir. The birds roosted on the reservoirs and flew out to feed in rice paddies around the Daepyeong, Jilnal, and Yujeon Marshes some 30 km to the west. But due to urban expansion and habitat degradation, the Baikal teal changed their wintering ground to western areas like the Seosan Reclaimed area, Yeongsan Lake and Gocheonam Lake.

Area Name: Nakdong Estuary

Location: Busan, 35°03' N, 128º56' E

Area Description: Nakdong Estuary is an Ecologically Important Area because it is wintering site for the Baikal teal.

Knowledge gaps and specific studies needed:
Most Baikal teal, estimated at 95% of the world population, winter in the YSE, especially in Korea. The Baikal teals roost and feed themselves in rivers, lakes and rice paddies along the coast. The reason for rapid increase in population has not been adequately investigated and intensive and further researches are highly requested.

Knowledge gaps and specific studies needed for Birds

Nakdong is in a straight line about 650 km from the Yalu River, the northernmost area of the YSE in the Korean Peninsula, to Haenam, the southernmost area, but actual shoreline distance is 4,719 km. There are 3,418 islands along the Korean Peninsula. Seabirds and some bird species which breed on remote islands in the YSE need investigation.

The Saemangeum project, a very extensive reclamation project connecting the Mangyeong Estuary and the Dongjin Estuary, has been in progress since 1991. Loss in biological diversity is expected but long term ecological impact assessments, comparative research and economic assessments are insufficient.

Another knowledge gap is that we have very limited information on the YSE of North Korea. The Yalu Estuary and many other tidal wetlands are supposed to host numerous water birds but information is currently scant.

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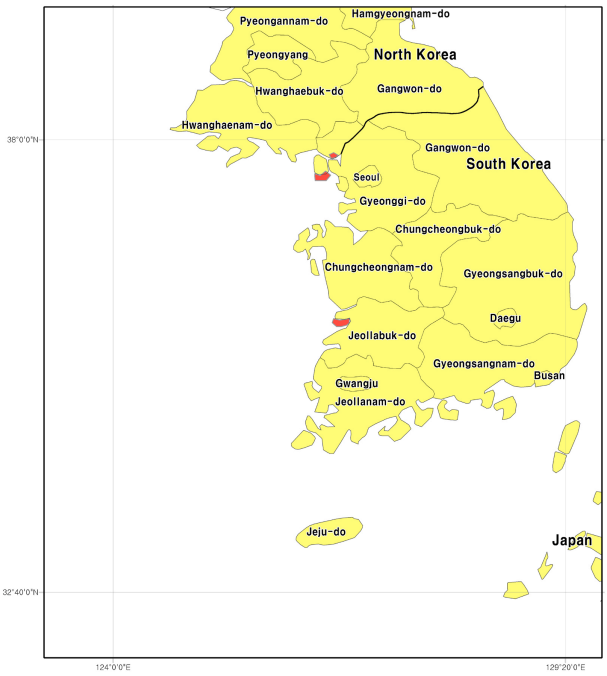
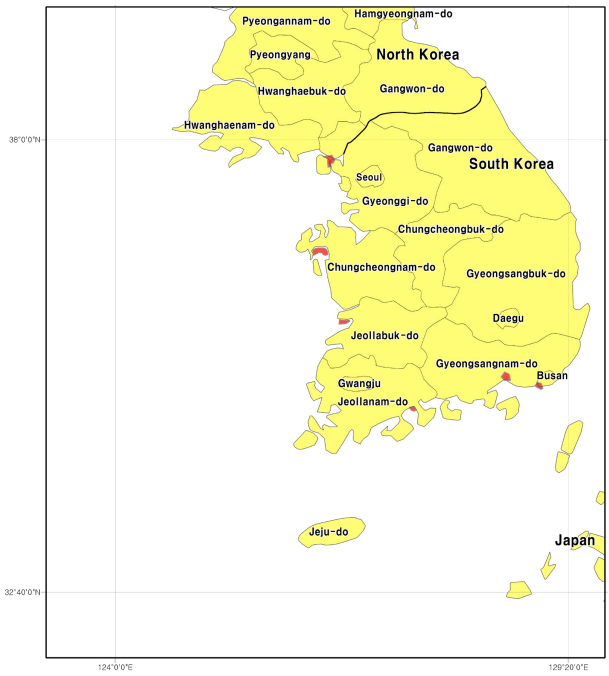
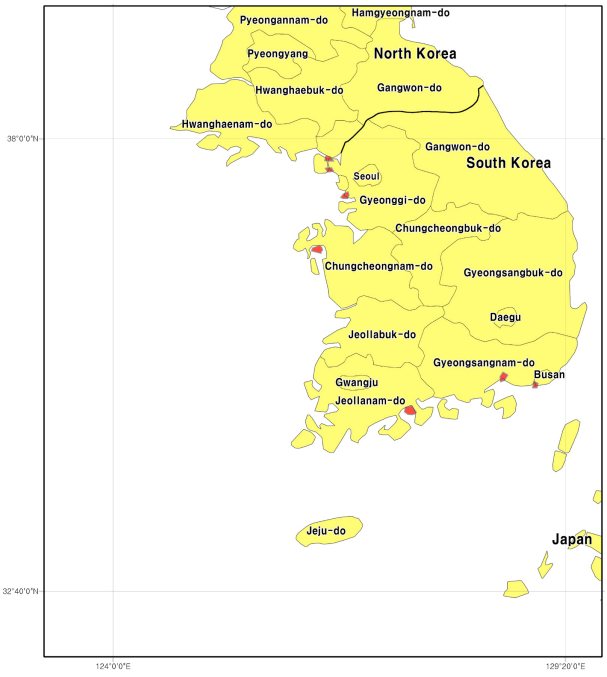


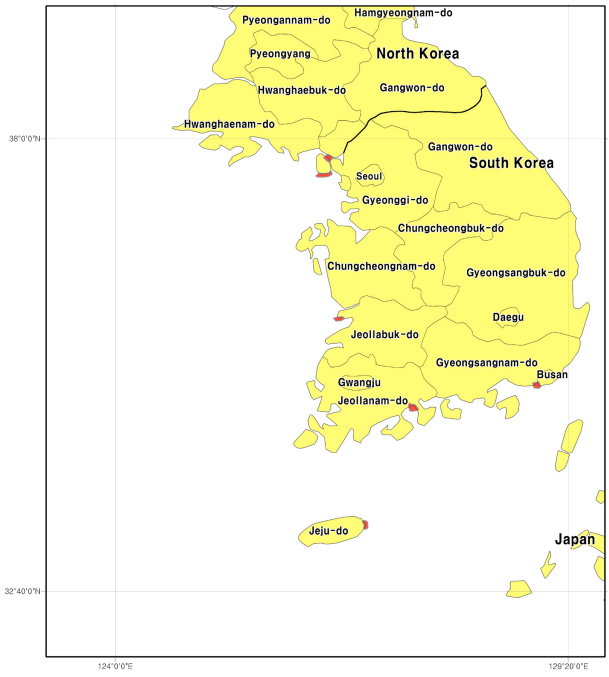
Map 1 *Grus japonensis*



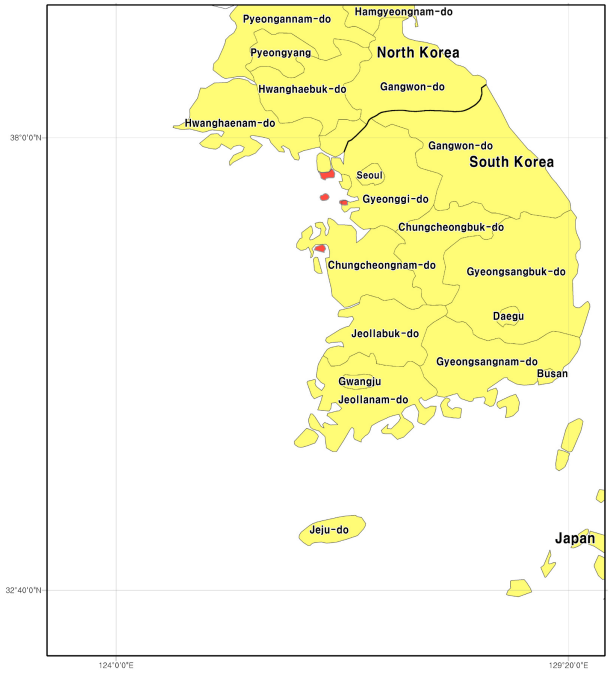
Map 2 *Grus vipio*



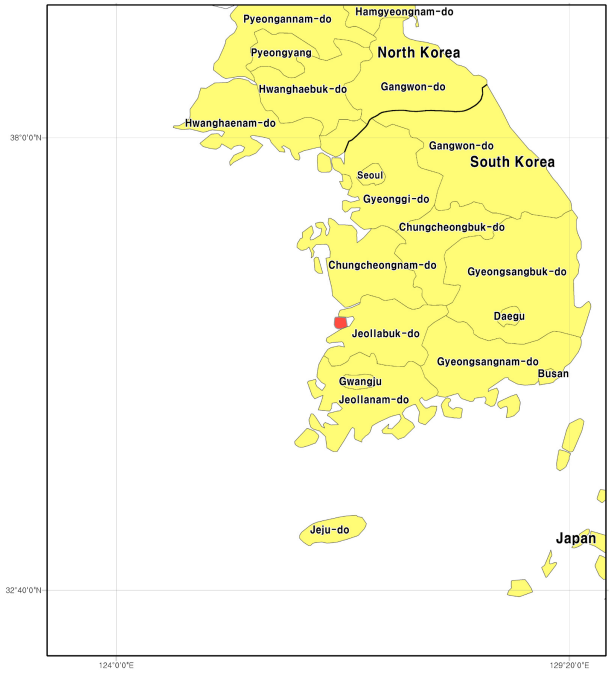
Map 3 *Grus monacha*



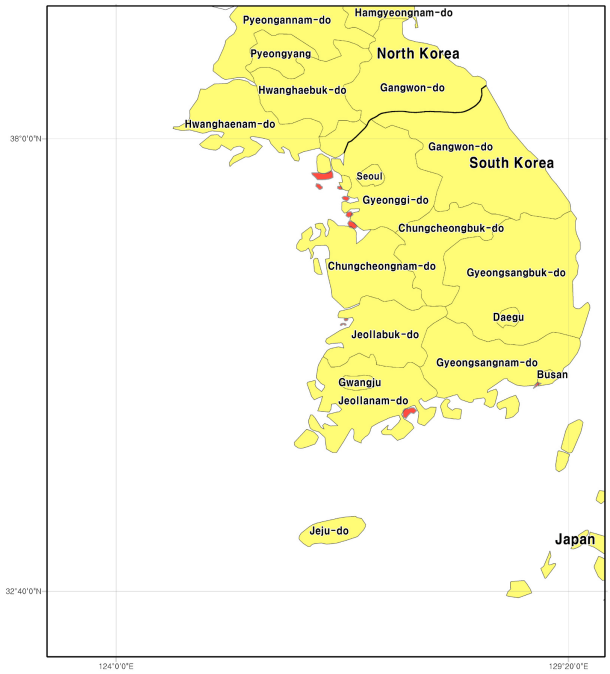
Map 4 *Platalea minor*



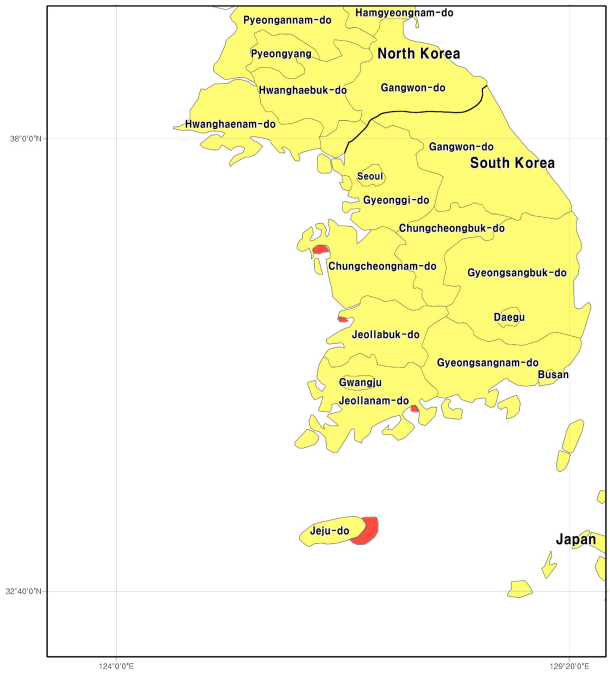
Map 5 *Egretta eulophotes*



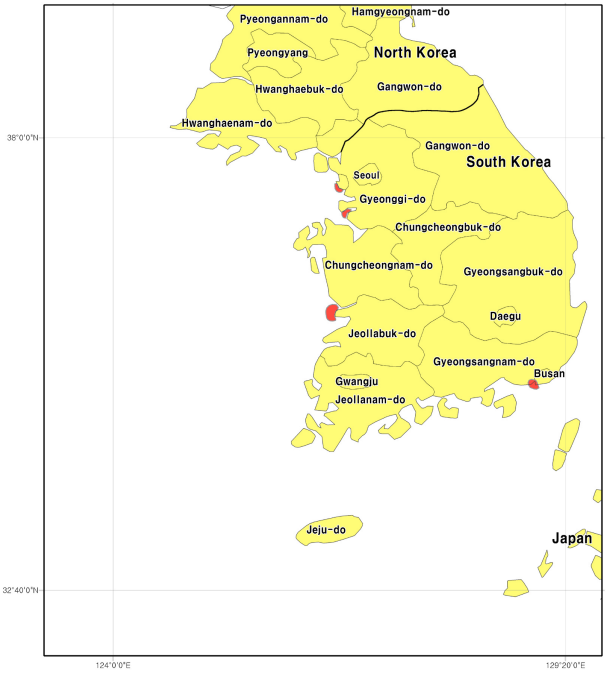
Map 6 *Eurynorhynchus pygmeus*



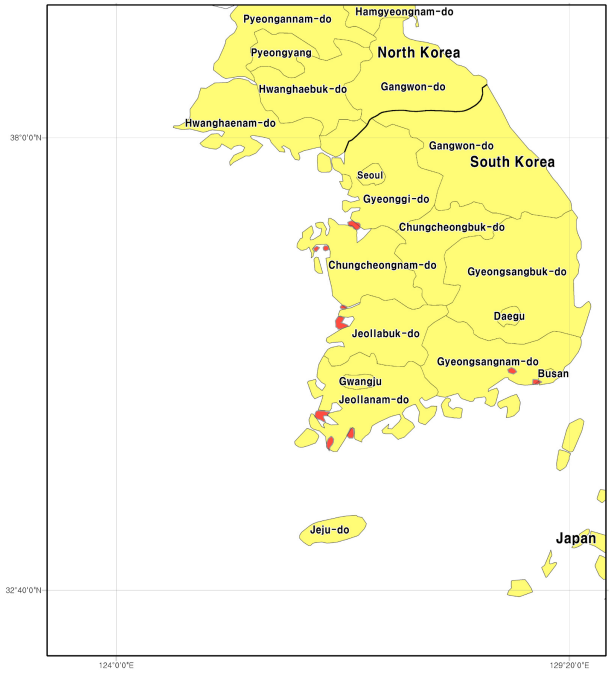
Map 7 *Larus saundersi*



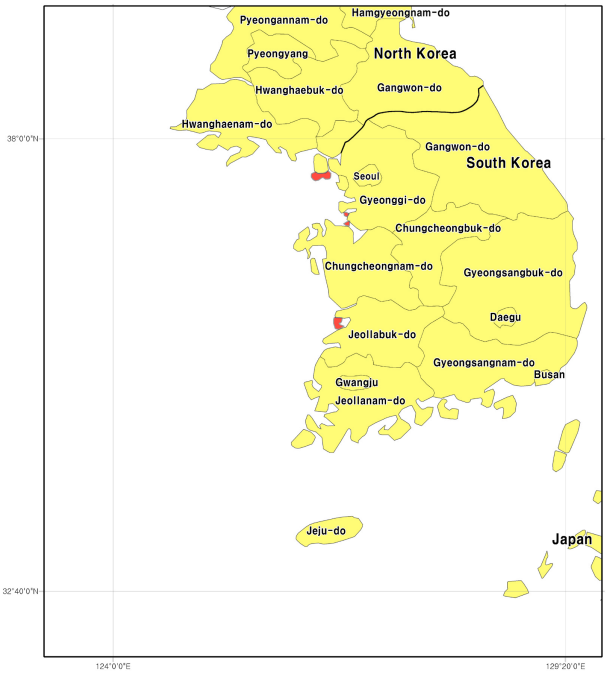
Map 8 *Ciconia boyciana*



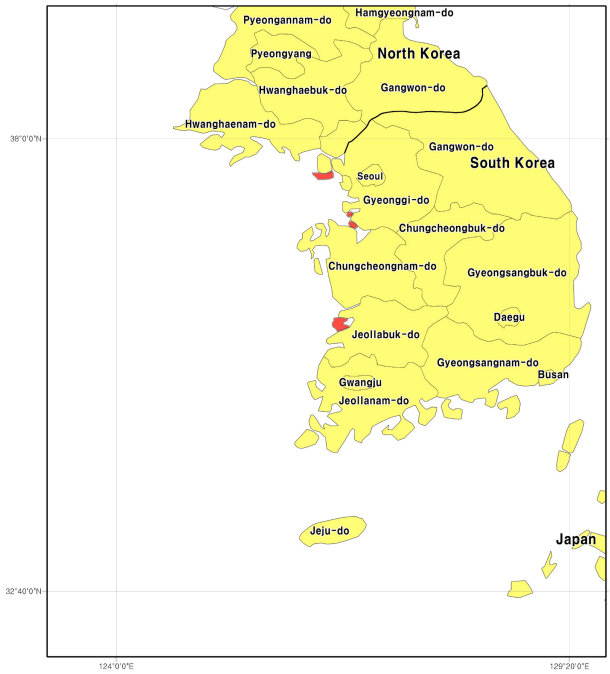
Map 9 *Haematopus ostralegus*



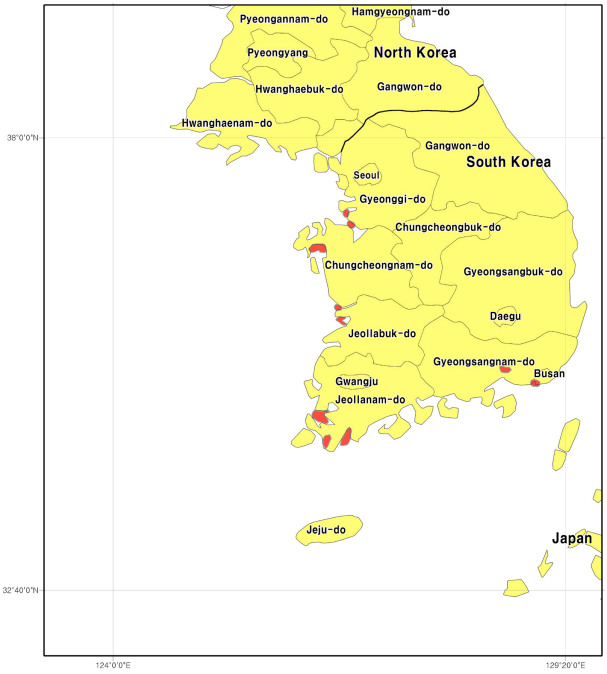
Map 10 *Cygnus cygnus*



Map 11 *Numenius madagascariensis*



Map 12 *Tringa guttifer*



Map 13 *Anas formosa*