

# Biological Assessment of Ecologically Important Areas for the Mammal Taxonomic Group of the Yellow Sea Ecoregion

## Korea Part

Author: WON Chang Man (Seal and otter)

Affiliation: Wildlife Biologist / Division of Wildlife, National Institute of Environmental Research

Mailing address: Gyeongseo-Dong, Seo-gu, Incheon, Republic of Korea (404-170)

Email address: wildlife@me.go.kr

Author: KIM Zang Geun (Cetaceans)

Affiliation: Director General / Cetacean Research Institute, National Fisheries Research and Development Institute

Mailing address: Cetacean Research Institute, 139-29, Maeam-dong, Nam-gu, Ulsan City, Republic of Korea

Email address: zgkim@nfrdi.re.kr

### Ecological Sub-regions

#### Definition of sub-regions

Sub-regions were defined by unique bio-geographical features such as oceanography, topography and pack ice that characterize feeding and breeding areas and migratory routes

#### Sub-region 1

Sub-region 1 is defined by the northern limit and semi-closed areas in the Bohai Sea that have pack ice in the winter.

#### Sub-region 2

Sub-region is defined by the area that covers both the Yellow Sea and East China Sea, including Korea and Tsushima Strait.

### Common Criteria for Identification of Ecologically Important Areas of the Yellow Sea Ecoregion

The Mammal Taxonomic Group adopted the following common criteria to identify Ecologically Important Areas for mammals in the Yellow Sea Ecoregion (YSE) (Table 1).

**Table 1 List of Adopted Common Criteria for the Mammal Taxonomic Group**

Adopted Common Criteria	Selected Indicator Species/ Species Groups	Definition of Indicator Species	Definition of Ecologically Important Areas
Criterion 1: representative species/habitat types	Minke whale ( <i>Balaenoptera acutorostrata</i> ),	Abundant species	Feeding and nursing grounds (northern boundary of migration)
	Finless porpoise ( <i>Neophocaena phocaenoides</i> )	Abundant species	Major area of distribution (feeding and breeding grounds)
Criterion 2: endemism and unique species assemblages (endemic to Bohai/ Yellow Sea / East China Sea)	Largha seal ( <i>Phoca largha</i> )	An isolated population and endemic subspecies to Bohai Sea and coastal waters of the Yellow Sea that needs for special attention	Southernmost breeding ground in the Bohai Sea and Baekryeong and Daecheong Island
Criterion 3: species richness	Not adopted	Not adopted	Not adopted

Adopted Common Criteria	Selected Indicator Species/ Species Groups	Definition of Indicator Species	Definition of Ecologically Important Areas
Criterion 4: species of special concern 1 (threatened and/or protected species) (depleted stocks)	Largha seal ( <i>Phoca largha</i> )	Species categorized as Endangered Species II and Natural Monument No. 331	Southernmost breeding ground in Bohai Sea and Baekryeong and Daecheong islands
	Eurasian otter ( <i>Lutra lutra</i> )	A top predator in the fresh water and marine ecosystems, and is listed as Endangered Species and Natural Monument No. 330 of Korea	Eurasian otter inhabits all types of freshwater ecosystems, as well as estuaries and marine coves
	Gray Whale ( <i>Eschrichtius robustus</i> )	A shallow water habitant and critically endangered	Migration routes for the Gray Whale
	Finless porpoise ( <i>Neophocaena phocaenoides</i> )	Species that are abundant yet high probability of accidental catch by fishing activities	Major area of distribution (feeding and breeding ground)
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	Largha seal ( <i>Phoca largha</i> )	Species whose major habitat has been preserved as pristine with no human disturbance for more than half a century	Waters off the Demilitarized Zone in the Korean Peninsula that are protected from fisheries and human activities

**Selected Indicator Species under Criterion 1: Representative Species/ Habitat Types**

**Definition of Indicator Species under Criterion 1:**

Representative species and/or habitat types are those species that are highly abundant in the YSE.

**Selected Indicator Species:**

**[Minke whale] [*Balaenoptera acutorostrata*] [밍크고래, Minke-gorae]**

Reason for Selection:

Minke whale is considered to be one of the most abundant cetacean species in the YSE.

**[Finless porpoise] [*Neophocaena phocaenoides*] [상괘이, Sangwaengi]**

Reason for Selection:

Finless porpoise is an abundant species playing a key stone species<sup>1</sup> in the coastal ecosystem of Yellow Sea.

Definition of Ecologically Important Areas for the Selected Indicator Species:

Major areas of distribution of Minke whale and Finless porpoise are ecologically important areas.

<sup>1</sup> The terminology was adopted from Park, K. J. Zhang, C. I. and Z. G. Kim et al., 2002 and Park, K. J. Zhang, C. I. and Z. G. Kim, 2004.

## **Selected Indicator Species under Criterion 2: Endemism and Unique Species Assemblages**

### **Definition of Indicator Species under Criterion 2:**

There are no endemic marine mammals at the species level in the YSE. However, an isolated population of Largha seal which is an endemic subspecies in the YSE was selected as an indicator species. This species has to be discussed under Criterion 4 because it is categorized as Natural Monument and Endangered Species of Korea.

### **Selected Indicator Species:**

#### **[Largha Seal/ Spotted seal] [*Phoca largha*] [점박이 물범, Jeombagi-mulbeom]**

##### Reason for Selection:

Largha seal in the YSE is an isolated population, endemic subspecies to the Yellow Sea, and needs special conservation measures. More than 350 individuals appear along the coasts of Baekryeong and Daecheong islands of Korea. They are seasonal migrants between the Bohai Sea and Baekryeong Island of Korea

##### Definition of Ecologically Important Areas for the Selected Indicator Species:

Highest numbers (more than 350 seals) have been seen from late spring to late summer along the coasts of Baekryeong Island and Daecheong Island of Korea.

## **Selected Indicator Species under Criterion 4: Species of Special Concern**

Definition of Indicator Species under Criterion 4: Species that are listed in either national or international list of threatened species were selected as indicator species.

### **Selected Indicator Species:**

#### **[Largha Seal/ Spotted seal] [*Phoca largha*] [점박이 물범, Jeombagi-mulbeom]**

##### Reason for Selection:

Largha seal is categorized as Endangered Species II and Natural Monument No. 331. Their habitats are exposed and at risk due to metropolitan development, which makes the Largha seal conservation effort particularly important.

#### **[Eurasian Otter] [*Lutra lutra*] [수달, Sudal]**

Reason for Selection: Eurasian otter is categorized as Endangered Species and Natural Monument No. 330 of Korea and the protection of their habitats should be the priority in protecting this species.

#### **[Gray Whale] [*Eschrichtius robustus*] [귀신고래, Gwisin-gorae]**

##### Reason for Selection:

Gray whale is a shallow water inhabitant and is critically endangered (Brownell, 1999; Brownell et al. 1997; Zhu and Yue, 1998; IWC, 2002; IWC, 2002; Weller et al. 2002). Gray whale is a priority species throughout the western north Pacific but its presence has not been reported since 1950's in Korean waters.

#### **[Finless porpoise] [*Neophocaena phocaenoides*] [상괘이, Sangwaengi]**

Reason for Selection: Finless porpoise is an abundant species in South Korea, yet it is frequently caught unintentionally by fishing activities and the probability of accidental catch is currently increasing.

## **Selected Indicator Species under Criterion 6: INTACT HABITAT / ECOLOGICAL PROCESSES**

Definition of Indicator Species under Criterion 6: Species whose habitats are recognized as intact habitat

were selected as indicator species.

**Selected Indicator Species:**

**[Largha Seal/ Spotted seal] [*Phoca largha*] [점박이 물범, Jeombagi-mulbeom]**

Reason for Selection: Largha seal in the YSE is an isolated population, endemic subspecies to the Yellow Sea, and needs special conservation measures. Waters off the Demilitarized Zone (DMZ) in the Korean Peninsula, including Baekryeong and Daecheong islands, have had no human disturbance for more than half a century whereas adjacent areas are exposed to high development pressure. The DMZ area located between the North and South Korean borders provide summering grounds and migration corridor to Largha seal. It is also an important habitat for some species of marine fauna and flora.

**Table 2. List of selected Indicator Species**

Adopted Common Criteria Selected Indicator Spp.	Criterion 1 Representative species/ habitat types	Criterion 2 Endemism and unique species assemblages	Criterion 4 Species of Special Concern	Criterion 6 Intact habitat/ ecological processes
<i>Balaenoptera acutorostrata</i>	X			
<i>Neophocaena phocaenoides</i>	X		X	
<i>Phoca largha</i>		X	X	X
<i>Lutra lutra</i>			X	
<i>Eschrichtius robustus</i>			X	

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

**Maps and Description of Ecologically Important Areas for Mammal Taxonomic Group**

**Table 3 List of Maps and Area Numbers for Mammal Ecologically Important Areas (MEIA)**

Map Number	Indicator Species	Area Numbers for Mammal Ecologically Important Areas	
Map 1	<i>Phoca largha</i>	Baekryeong Island, Daecheong Island	Coastal waters and small islands of YSE
Map 2	<i>Lutra lutra</i>	The coastal waters and small islands of the Jeollanam-do and Gyeongsang-do	
No Map	<i>Eschrichtius robustus</i>	Yellow Sea	
No Map	<i>Balaenoptera acutorostrata</i>	Yellow Sea	
No Map	<i>Neophocaena phocaenoides</i>	Yellow Sea	

Note: Maps for *Balaenoptera acutorostrata* and *Neophocaena phocaenoides* are not included as these species are cosmopolitan species and move all along the coasts and offshore of the Yellow Sea.

**Mammal Ecologically Important Area (MEIA) for *Phoca largha* (Map 1)**

**Area Name: Baekryeong Island, Daecheong Island**

Location: Islands located 191.4 km off the coast of Incheon, Korea

Description of Area:

Baekryeong Island is located between 38° N. latitude and 125° E. longitude, and has an estimated area of 45.6 km<sup>2</sup>. It is a continental island 191.4 km off the coast of Incheon, western Korea. There are four distinct seasons in the region. Spring is warm, beginning in the middle of March, and is followed by a hot and humid summer with heavy rainfall during July and August. The autumn begins

in September and frost normally occurs in mid-November. Winter is windy and brisk, and temperature drops. The average summer and winter temperature is 25°C and -4.5°C respectively. The average annual precipitation is about 1,450 mm.

Lunar tides are strong along the coast of Baekryeong Island, with the daily tidal range generally over 3m. There are three areas which are known to be regularly used by the *Phoca largha*. Mulbeom Rock is located 1.2 km off the coast of the northeastern portion of the island. It consists of three rocks, two of which are washed over at high tide, but a large one is never washed over, even at high tide. The Dumu-Jin area is characterized by rugged exposed offshore rocks subjected to continuous turbulent waves from the northwest, and is located on the northwestern coast of the island. This is the area with high tide, steep, rugged and vertical sides. The Yunbong Rock is the exposed offshore rocks and is located 3 km off the coast of southwestern coast of the island (Won, 1998).

There is a clear seasonal pattern in the total number of seals hauled out along the coast of Baekryeong Island of Korea. The lowest and highest total counts along the coast of Baekryeong Island were in March (18) and July (307) 2000, and December (6) and August (205) 2001 respectively. There were three major haul-out areas where a total of 300 or more spotted seals were counted in July: Mulbeom Rock (250+), Dumu-Jin (8+) and Yunbong Rock (50+) on the Korean island of Baekryeong (Won and Yoo, 2004).

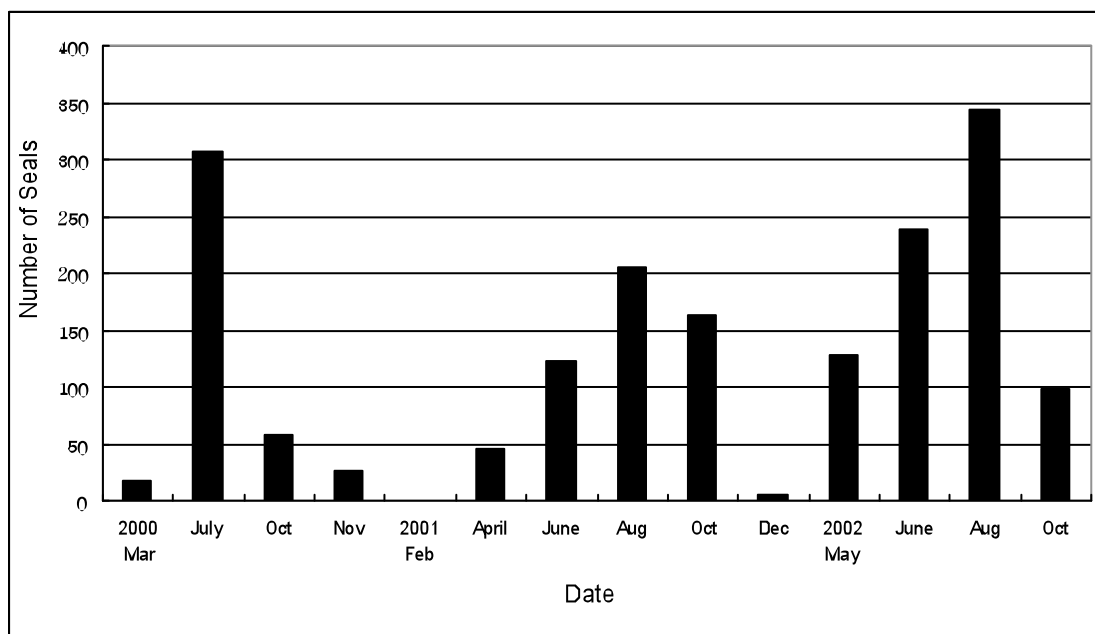


Figure 1. Number of seals along the coast of the Korean island of Baekryeong (2000-2002).

Note: Numbers indicate the maximum number of seals found in each survey.

Knowledge gaps and specific studies needed:

Movements and seasonal dispersion of *Phoca largha* are poorly known. A present study only indicated that *Phoca largha* spend the spring, summer and autumn feeding along the coast of Baekryeong Island and return to their breeding grounds in Liaodong Bay of China. Because the *Phoca largha* populations of China and Korea are relatively small and become highly dispersed seasonally, the establishment of an international network for research cooperation between China and Korea is urgently required to protect the endangered seal populations (Won and Yoo, 2004).

**Mammal Ecologically Important Area for *Lutra lutra* (Map 2)**

**Area Name: The coastal waters and small islands of the Jeollanam-do and Gyeongsang-do**

Location: See distribution map of *Lutra lutra*

Description of Area:

There are more than 3,000 island and islets along the western and southern coasts of the Korean Peninsula and four major rivers in Korea flow into the Yellow Sea. These include the Han, Geum, Yeongsan and Nakdong Rivers. *Lutra lutra* formerly occurred in all of these rivers as well as most estuaries and marine ecosystems in Korea and was fairly common throughout its range. The species however, has declined drastically in Korea and has become extremely rare in most of its former range because of habitat destruction, water pollution and over-exploitation (Won and Smith, 1999). As a result, *Lutra lutra* has been listed as a Natural Monument in 1982 and an Endangered Species of Korea in 1990. The coastal waters and small islands off the coasts of the Jeollanam-do and Gyeongsang-do are Ecologically Important Areas because they provide food resources and suitable habitats for *Lutra lutra*. Surveys indicate that they occur around these habitats but since their population size is very small they are easily threatened and almost all populations have been fragmented into groups of few individuals (Won and Smith, 1999). Other surveys of South Korea also show that populations had been reduced to fragmented and isolated populations in some places (Won, 2004).

Knowledge gaps and specific studies needed:

Extensive fieldwork is required to understand the otter and its distribution, abundance and movements. However, no such studies have been attempted for *Lutra lutra* in Korea and important habitat for the species in Korea has not yet been identified throughout the country. As a result, the ecology of *Lutra lutra* in the Korean Peninsula is among the most poorly known in the world. Only a few studies are available on the food habits, distribution and home range of the species in Korea. Therefore, seasonal movement patterns and home range studies are urgently required to protect this endangered species.

**Mammal Ecologically Important Area for *Eschrichtius robustus* (No Map)**

**Area Name: *Eschrichtius robustus* migration route**

Location: *Eschrichtius robustus* migration route along Yellow Sea coastal waters

Description of Area:

Coastal waters of the Yellow Sea are Ecologically Important Areas because *Eschrichtius robustus* migrates along shallow coastal waters where it digs up bottom mud to feed on small crustaceans.

Knowledge gaps and specific studies needed:

Habitat disturbances throughout the migration route threatens its survival. Neither opportunistic nor systematic observations of their range and status in the Yellow Sea have been conducted recently. Both systematic and opportunistic sighting surveys are needed to measure its recovery at a ecosystem level.

**Mammal Ecologically Important Area (MEIA) for *Balaenoptera acutorostrata* (No Map)**

**Area Name: Offshore of Yellow Sea**

Location: Yellow Sea offshore areas

Description of Area:

Yellow Sea offshore areas are Ecologically Important Areas because *Balaenoptera acutorostrata* migrates north to the Yellow Sea for nursing and feeding for some period of the year (Spring to Autumn).

Knowledge gaps and specific studies needed:

It is defined by the International Convention on the Regulation of Whaling that *Balaenoptera acutorostrata* in the Yellow Sea are the East Sea-Yellow Sea and East China Sea stock. The role of the Yellow Sea ecosystem as an integral part of migration range of this stock needs to be studied. The population and biology of *Balaenoptera acutorostrata* in the region were poorly studied during the past commercial whaling period.

**Mammal Ecologically Important Area (MEIA) for *Neophocaena phocaenoides* (No Map)**

## Area Name: Coastal waters of Yellow Sea

Location: The coastal waters of Yellow Sea

Description of Area:

The coastal waters of the Yellow Sea are an Ecologically Important Area because *Neophocaena phocaenoides* breeds here and feeds in limited coastal that are full of fisheries and human activity.

Knowledge gaps and specific studies needed:

This species has been reported since the prehistoric era of Korea and can be found chasing schools of fish. Recent systematic surveys have revealed abundant distribution and interaction with fisheries. However, the status of the species is defined as endangered due to lack of data. Population, sub-stocks, distribution and migration, abundance, role of ecosystem and their interaction with humans need to be studied.

## Knowledge Gaps and Specific Studies Needed for Mammals

In addition to the knowledge gaps specific to each Indicator Species, at the ecosystem level there is a knowledge gap about socio-economic implications each species has and human induced mortalities. Lack of resources and personnel for research is another important challenge.

As final analysis with available data, the threats to marine mammal conservation and priority species can be listed as below.

List of Threats to Marine Mammal Conservation

- A. Mitigation of habitat disturbance (vessel traffic, sonar and noise, etc.)
- B. Pollution
- C. Stranding
- D. Bycatch
- E. Population
- F. Marine mammal biodiversity

List of priority species

- A. Largha seal
- B. Finless porpoise
- C. Minke whale

## References

- Berzin, A. A., Blokhin, S. A., Minakuchi, H., et al. 1995. Bowhead and gray whale populations I the Okhotsk Sea. Abstracts, North Pacific Marine Science Organization. Workshop on the Okhotsk Sea and adjacent areas, Vladivostok, Russia, June 19-24.
- Brownell, R. L. Jr., 1999. Okhotsk gray whales: One of the most endangered whale populations. Sphere Square 13:2-3. cetus Newsletter, Tokyo, Japan. (in Japanese)
- Brownell, R. L. Jr. and Chun C. 1977. Probable existence of the Korean stock of the gray whale (*Eschrichtius robustus*). J. Mamm. 58: 237-239.
- Brownell, R. L. Jr., Blokhin S. A., Burdin A. M., et al. 1997. Observations on the Okhotsk-Korea gray whales on their feeding grounds off Sakhalin Island. Rep. Int. Whal. Commn. 47:161-162.
- Brownell, R. L. Jr., Blokhin S. A., Burdin A. M. and Minakuchi H. 1997. Okhotsk-Korean gray whale population: past exploitation, current status and new threats. Abstract of Ninth Annual International Symposium of International Marine Biological Research Institute. Kamogawa, Japan. February 1997. 2pp.
- Gong, Y. 1980. Republic of Korea, Progress report on cetaceans research 1965-May 1979. Rep. int. Whal.

Commn., 30: 161.

Gong, Y. 1981. Minke whales in the waters off Korea. Rep. int. Whal. Commn., 31: 241-244.

Gong, Y. 1982. Note on the distribution of minke whales in Korean waters. Rep. int. Whal. Commn., 32: 279-282.

Gong, Y. and B.N. Hwang. 1983. Abundance of minke whales in Korean waters. Rep. int. Whal. Commn., 33: 413-418.

Gong, Y. and B.N. Hwang. 1984. Effort, catch and sightings data for the minke whale fishery in Korean waters. Rep. int. Whal. Commn., 34: 334-337. International Whaling Commission. 2002. Report of the scientific committee. J. Cetacean Res. Manage. (Suppl.) 4:1-78.

International Whaling Commission. 2002. Report of the scientific committee. J. Cetacean Res. Manage. (Suppl.) 4:1-78

Kato, H and Tokuhiko Y. 1997. A sighting of gray whale off Kochi, southwest Japan in July, 1997, with some notes on its possible migration in adjacent waters of Japan. Document submitted to the IWC/SC meeting in 1997, United Kingdom. SC/49/AS17, 1-8 pp.

Kim. Z. G. 1998. Korea (Rep. of). Progress report on cetacean research, January to December 1997, with statistical data for the calendar year 1997, submitted to the 50th annual meeting of the International Whaling Commission

Kim. Z. G. 1999. Korea (Rep. of). Progress report on cetacean research, January 1998 to May 1999, with statistical data for the calendar year 1998, submitted to the 51st annual meeting of the International Whaling Commission

Kim. Z. G. 2000. Korea (Rep. of). Progress report on cetacean research, January 1999 to May 2000, with statistical data for the calendar year 1999, submitted to the 52nd annual meeting of the International Whaling Commission

Kim. Z. G. 2001. Korea (Rep. of). Progress report on cetacean research, January 2000 to May 2001, with statistical data for the calendar year 2000, submitted to the 53rd annual meeting of the International Whaling Commission

Kim. Z. G., Y. R. An, and H. Sohn et al. 2004. Characteristics of minke whales (*Balaenoptera acutorostrata*) by-catch in Korean waters. J. Korean Soc. Fish., 6(2), 173~182

Sohn H. and Z. G. Kim. 2002. Korea (Rep. of). Progress report on cetacean research, January 2001 to March 2002, with statistical data for the calendar year 2001, submitted to the 54th annual meeting of the International Whaling Commission

Sohn. H. and Z. G. Kim. 2003. Korea (Rep. of). Progress report on cetacean research, January 2002 to May 2003, with statistical data for the calendar year 2002, submitted to the 55th annual meeting of the International Whaling Commission

Sohn. H., Z. G. Kim and Y. R. An. 2004. Korea (Rep. of). Progress report on cetacean research, January 2003 to May 2004, with statistical data for the calendar year 2003, submitted to the 56th annual meeting of the International Whaling Commission

Mizue, K. 1951. Gray whales in the east sea area of Korea. Sci. Rep. Whales Res. Inst. 5: 71-79.

Omura, H. 1988. Distribution and migration of the western Pacific stock of the gray whale. Sci. Rep. Whales Res. Inst. 39: 1-9.

Park, K. J. Zhang, C. I. and Z. G. Kim et al. 2002. Feeding habits and trophic level of finless porpoise, *Neophocaena phocaenoides* in the Yellow Sea. J. Korean Soc. Fish. Res., 5, 52~63



- Park, K. J., C. I. Zhang and Z. G. Kim. 2004. Distribution and abundance of finless porpoise (*Neophocaena phocaenoides*) in the west coast of Korea. J. Kor. Fish. Soc. 37(2), 129~136
- Rice, D. W. and Wolman A. A. 1971. The life history of the gray whale (*Eschrichtius robustus*). Spec. Publ. Am. Soc. Mamm. 3: 1-142. Sohn. H. Z. G. Kim and T. Miyashita. 2001. Abundance estimate of minke whale, *Balaenoptera acutorostrata*, by sighting survey in the Yellow Sea, Spring 2001. J. Korean Soc. Fish. Res., 4, 51~63
- Tadasu.K. Yamada, Qian Zhu, and Peilie Wang. 2004. Collections of marine Mammals specimens in China. National Science Museum Monographs, 24:149-161.
- Weller, D. W., Burdin, A. M., Würsig B., et al. 2002. The western gray whale: a review of past exploitation, current status and potential threats. J. Cetacean Res. Manage. 4(1):7-12
- Won, C. M. 1998. Mammals of Bak-ryoung and Dae-chung islands. In Ecological Survey of DMZ (Demilitarized Zone) and the adjacent areas. Forestry Research Institute Report IV (in Korean)
- Won, C. M. 2004. Ecology and Conservation of Eurasian otter, *Lutra lutra* in freshwater and marine ecosystems of Korea. Korea-Japan workshop for habitat assessment techniques for wetland animals in Dam construction, 1-8.
- Won, C. M., Smith, K. G. 1999. History and current status of mammals of the Korean Peninsula. Mammal Review, 29:3-33
- Won, C. M., and Yoo. B. H. 2004. Abundance, seasonal haul-out patterns and conservation of spotted seals *Phoca largha* along the coast of the Bak-ryoung island, South Korea. Oryx, 38:109-112
- Zhu Qian and Yue Haidong, 1998. Strandings and sightings of the gray whale in Chinese coastal waters, Report of the International Whaling Commission, Muscat, Oman, 1-4.



Map1 *Phoca largha*



Map2 *Lutra lutra*