

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

## Korea Part

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### Ecological sub-regions

#### Definition and description of sub-regions

Sub-regions were defined by vegetation area, which was over 10,000 m<sup>2</sup>

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

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

**Table 1. List of Proposed Common Criteria for Halophytes Taxonomic Group (Korea)**

Proposed Common Criteria	Proposed Indicator Species/Species groups	Definition of Indicator Species	Ecologically Important Areas	Major Sources of Reference	Major Knowledge Gaps
Criterion 1: representative species/habitat types	<i>Zostera marina</i>	Dominant species Abundant species	Goheung, Ui Island, Dolsan Island, Wan Island, Jin Island, Ok Island, Jawal Island, Seungbong Island, Baekryeong Island	Report of Ministry of Environment (1996-2001)	North Korea (Min)
	<i>Phragmites communis</i> , <i>Zoysia sinica</i> , <i>Carex scabrifolia</i> , <i>Suaeda japonica</i> , <i>Suaeda maritima</i>	Dominant species Inundation of sea water	Ganghwa Island (including Namyang Bay, Wolgot, Daebu Island and Yeongjong Island), Suncheon Bay, Gomso Bay, Hampyeong Bay, Saemangeum Area	Report of Ministry of Environment (1996-2001)	North Korea (Min)
Criterion 2: Endemism and unique species assembles)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Criterion 3 : Species richness	Not adopted	Not adopted	Not adopted	Not adopted	Not adopted
Criterion 4 : Spp. of special concern 1 (threatened and/or protected spp.)	<i>Limonium tetragonum</i> , <i>Salicornia herbacea</i> , <i>Triglochin maritimum</i> , <i>Artemisia scoparia</i> , <i>Aster tripolium</i> , <i>Scirpus triquetar</i>	Specific habitat Small area	Ganghwa Island (including Namyang Bay, Wolgot, Daebu Island and Yeongjong Island), Gomso Bay, Hampyeong Bay, Suncheon Bay, Saemangeum Area	Report of Ministry of Environment (1996-2001)	North Korea (Min)
Criterion 5-A : Commercially important (Volume)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Proposed Common Criteria	Proposed Indicator Species/Species groups	Definition of Indicator Species	Ecologically Important Areas	Major Sources of Reference	Major Knowledge Gaps
Criterion 5-B : Commercially important (Value)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Criterion 6 : Intact habitat/ ecologically process	Not adopted	Not adopted	Not adopted	Not adopted	Not adopted
Additional Criterion	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

**Proposed Indicator Species under Criterion 1: Representative species/ habitat types**

**Definition of Indicator Species under Criterion 1:** Representative species and/or habitat types are those that are highly abundant in subtidal and tidal flats in the Yellow Sea Ecoregion (YSE).

**Proposed Indicator Species:**

- 1) [Eelgrass] [*Zostera marina*] [거머리말, Geomeorimal]

Reason for selection: *Zostera marina* is an abundant and dominant species in the sub-tidal flats of the YSE. Many fish lay their eggs on this species.

- 2) [Reed] [*Phragmites communis*] [갈대, Galdae]

Reason for selection: *Phragmites communis* is an abundant and dominant species in YSE estuaries.

- 3) [Chinese lowgrass] [*Zoysia sinica*] [갯잔디, Gaetjandi]  
 4) [Scabrousleng sedge] [*Carex scabrifolia*] [천일사초, Cheonilsacho]  
 5) [*Suaeda maritima*] [해홍나물, Haehongnamul] (No information on English name)

Reason for selection: The above three species, *Zoysia sinica*, *Suaeda maritima* and *Carex scabrifolia*, are dominant species below the inter-tidal level in the YSE.

- 6) [*Suaeda japonica*] [칠면초, Chilmyeoncho] (No information on English name)

Reason for selection:  
*Suaeda japonica* is an abundant and dominant species in inter tidal-flat in YSE.

**Proposed Indicator Species under Criterion 4: Species of Special concern I (threatened and/or protected species) (depleted stocks)**

**Proposed Indicator Species:**

- 1) [Shore podgrass] [*Triglochin aritimum*] [지채, Jichae]  
 2) [Common bulrush] [*Scirpus tiqueter*] [세모고랭이, Semogoraengi]  
 3) [Marshfire glasswort] [*Salicornia herbacea*] [통통마디, Tungtungmadi]  
 4) [*Limonium tetragonum*] [갯질경, Gaetjilgyeong] (No information on English name)  
 5) [Virgate wormwood] [*Artemisia scoparia*] [비쭝, Bissuk]  
 6) [*Aster tripolium*] [갯개미취, Gaet-gaemichui] (No information on English name)

Reason for selection: These six species are threatened by habitat destruction and changes to their environment. Their habitats of mean high tide level require very specific conditions. Currently, they occupy only a small part of area of the YSE.

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

No.	Proposed Common Criteria Proposed Indicator Species	Criterion 1: Representative species/habitat types	Criterion 4 : Species of special concern 1 (threatened and/or protected species)
1	<i>Zostera marina</i>	X	
2	<i>Phragmites communis</i>	X	
3	<i>Zoysia sinica</i>	X	
4	<i>Carex scabrifolia</i>	X	
5	<i>Triglochin maritimum</i>		X
6	<i>Scirpus triqueter</i>		X
7	<i>Suaeda maritima</i>	X	
8	<i>Suaeda japonica</i>	X	
9	<i>Salicornia herbacea</i>		X
10	<i>Limonium tetragonum</i>		X
11	<i>Artemisia scoparia</i>		X
12	<i>Aster tripolium</i>		X

**Maps and Description of Ecologically Important Areas for Halophytic Taxonomic Group****Table 3. List of Maps and Area Names for Halophytes Ecologically Important Area**

Map No.	Indicator Species	Area Names of Halophytes Ecologically Important Area					
Map 1	<i>Zostera marina</i>	Baekryeong Island	Jawal Island, Seungbong Island	Ok Island	Ui Island	Jin Island, Wan Island, Dolsan Island	Goheung
Map 2	<i>Phragmites communis</i> , <i>Zoysia sinica</i> , <i>Carex scabrifolia</i>	Saemangeum Area	Suncheon Bay				
Map 3	<i>Triglochin maritimum</i> , <i>Scirpus triqueter</i> , <i>Suaeda maritima</i> , <i>Suaeda japonica</i> , <i>Salicornia herbacea</i> , <i>Limonium tetragonum</i> , <i>Artemisia scoparia</i> , <i>Aster tripolium</i>	Ganghwa Island (Namyang Bay, Wolgot) Daebu Island, Yeongjong Island	Saemangeum Area	Gomso Bay	Hampyeong Bay	Suncheon Bay	

**Halophytic Ecologically Important Areas (HEIA) for *Zostera marina* (Map 1)****Baekryeong Island**

Area Description: sandy sub-tidal flats

**Jawal Island and Seungbong Island**

Area Description: sandy sub-tidal and low-tidal flats

### Ok Island

Area Description: sandy and muddy sub-tidal and low-tidal flats

### Ui Island

Area Description: muddy and sandy low-tidal flats

### Jin Island, Wan Island, Dolsan Island

Area Description: muddy and sandy low-tidal flats

### Goheung

Area Description: muddy and sandy tidal flats

### Halophytic Ecologically Important Areas (HEIA) for *Phragmites communis*, *Zoysia sinica* and *Carex scabrifolia* (Map 2)

#### Saemangeum Area

Area Description: Until recently, the vegetation was formed along the dike and has an area of over 100,000 m<sup>2</sup>. But its status is now rapidly changing as the area is quickly being reclaimed. *Phragmites communis* and *Zoysia sinica* are currently distributed in the upper zone of the estuary. This is also a habitat for *Atriplex gmelini*.

#### Suncheon Bay

Area Description: *Phragmites communis*, *Zoysia sinica* and *Carex scabrifolia* inhabit in the area. The *Phragmites communis* population is well preserved along the brackish zones of the Bay because of the Suncheon Bay Ecosystem Reserve Restrictions. *Phragmites communis*'s vegetation area is over 500,000 m<sup>2</sup>, increasing year by year. This area is a routing site of international migratory birds. The area is also an important habitat for *Zoysia sinica*.

### Halophytic Ecologically Important Areas (HEIA) for *Triglochin maritimum*, *Scirpus triqueter*, *Suaeda maritima*, *Suaeda japonica*, *Salicornia herbacea*, *Limonium tetragonum*, *Artemisia scoparia* and *Aster tripolium* (Map 3)

#### Ganghwa Island (including Namyang Bay, Wolgot and Daebu Island)

Area Description: The sediments here mainly consist of mud and the area has weak wave conditions. The vegetation covers an area of 200,000 m<sup>2</sup>, the largest domestic vegetation coverage. Species diversity is high. *Suaeda japonica* widely inhabits salt marshes, and *Triglochin maritimum*, *Phragmites communis*, *Carex scabrifolia* is distributed along the coastline. This area will soon be protected by Natural Reserve restrictions. This area is a routing site of international migratory birds.

#### Saemangeum Area

Area Description: Vegetation area is over 100,000 m<sup>2</sup>. *Suaeda japonica* is distributed as a pure stand in salt marshes of the lower zones of its estuary. Pure stand of *Aster tripolium* is distributed in the middle zones of the estuary. This vegetation is expected to disappear though by the Saemangeum Reclamation Project. This area is a routing site of international migratory birds.

#### Gomso Bay

Area Description: This area is a typical muddy tidal flat in South Korea. Vegetation area is over 100,000 m<sup>2</sup>. *Triglochin maritimum* in particular is widely distributed along the coastline, *Suaeda japonica*, *Suaeda asparagoides*, and *Phragmites communis* are distributed.

## Hampyeong Bay

Area Description: This area is a Nature Reserve. Vegetation area is about 100,000 m<sup>2</sup>. The area has diverse vegetation. *Suaeda maritime*, *Artemisia scoparia*, *Limonium tetragonum*, *Salicornia herbacea*, and *Zoysia sinica* are distributed on the sandbars created along the coastline. *Elymus mollis*, *Phragmites communis* and *Triglochin maritimum* are distributed towards the dike. This area is the routing site of international migratory birds.

## Suncheon Bay

Area Description: Salt marshes along the coastline are widely inhabited by pure stands of *Suaeda japonica*.

## Knowledge Gaps and specific studies needed

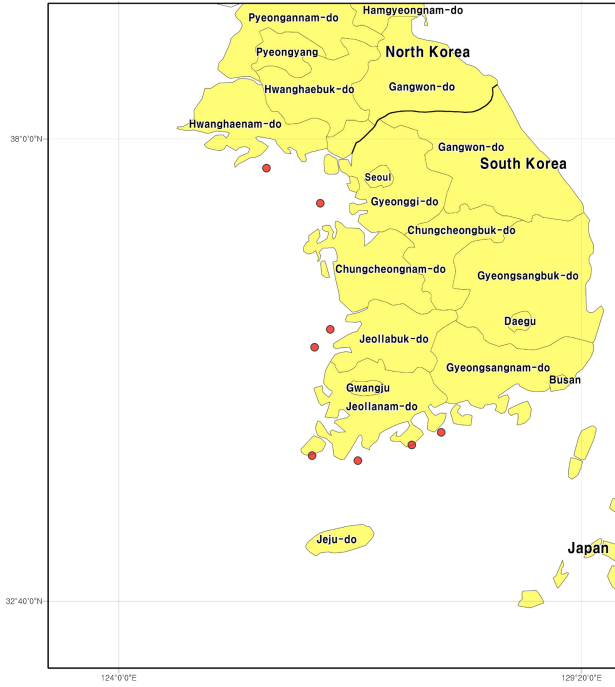
Lack of data is the biggest obstacle for the halophyte assessment. Although a number of academic works offer certain levels of knowledge, it is not easy to consolidate them into one comprehensive assessment, especially when the sources are from different time scales and distinct views and many of them are outdated. Since the coastal environment in Korea went through massive changes during modernization since about 40 years ago, we should be extremely careful when we refer to the species at rapidly changing regions, e.g., the Saemangeum area. In effect, we are observing that the once-endemic species in Saemangeum are either substituted by others or literally vanishing. The same applies to the analysis of GIS maps. The habitats pointed in the maps are susceptible to change and therefore should not be regarded as fully relevant and correct information.

In this report, we restrict the range of coastal plants to halophyte and we do not assess coastal plants inhabited in sand dunes. When selecting the species according to each criterion, we set a certain sub-criteria. For instance, in Criterion 4, we did consider the area of distribution and the habitat uniqueness yet did not consider the anthropogenic development pressure that is admittedly becoming a serious factor in determining threatened and protected species. Some species may be added as we add sub-criteria.

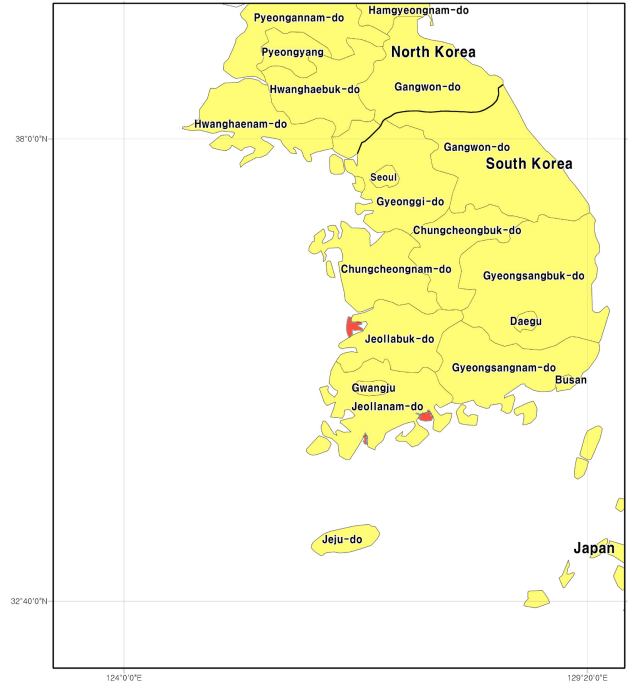
As in any other taxonomic groups, there may be disagreement in some species descriptions. We admit that this assessment is based on limited but best available data and information accumulated so far. Further studies in the field of halophyte in general are desperately needed to advance the assessment of Korean halophyte and selection of their Ecologically Important Areas.

## References

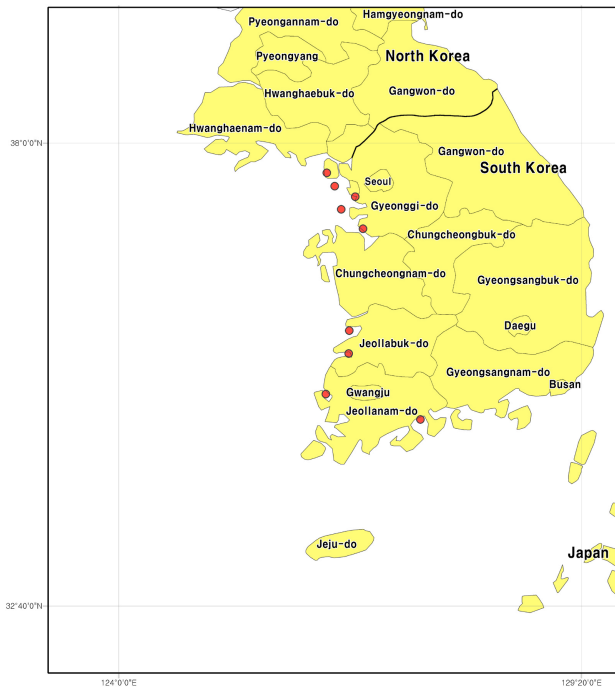
- Ihm, B. S. and Lee, J. S. 1998. Soil factors affecting the plant communities of wetland on southwestern coast of Korea. Korean J. Ecol. 21:321-328
- Ihm, B. s., Lee, J. S., Kim, J. W. and Kim J. H. 2006. Effect of Soil Factors on Vegetation Values of Salt Marsh Plant communities. J. Ecol. Field Biol. 29(4):361-364
- Lee, J. S., Ihm, B. S. and Lee, W. J. 2006. Determination on the Minimum Area for Conservation of Four Halophyte Species from the Southwestern Coast of Korea Based on AFLP. J. Ecol. Field Biol, 29(6):503-509
- Lee, S. Y., C. J. Kwon, K. S. Lee and C. I. Choi. 2002. Distribution of Eelgrass, *Zostera marina* L. on coasts of Korean Peninsula: Preliminary study for eelgrass restoration. Ocean and Polar Res. 24: 55-77.
- Min, B. M. and J. G. Je. 2002. Typical coastal vegetation of Korea. Ocean and Polar Res. 24: 79-86.
- Ministry of Environment. 1996-2001. National survey for basic natural environment.



Map 1 *Zostera marina*



Map 2 *Phragmites communis*, *Zoysia sinica*,  
*Carex scabrifolia*



Map 3 left *Triglochin maritimum*, *Scirpus triqueter*,  
*Suaeda maritima*, *Suaeda japonica*, *Salicornia*  
*herbacea*, *Limonium tetragonum*, *Artemisia*  
*scoparia*, *Aster tripolium*