Information Sheet on Ramsar Wetlands (RIS) – 2006-2008 version

Available for download from http://www.ramsar.org/ris/key_ris_index.htm.

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

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1. Name and address of the compiler of this form:

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

□ Name: Byoung-Seol KOH
□ Position: Researcher
Tidal-flat Research Center,
National Fisheries Research & Development Institute
Ministry of Food, Agriculture, Forestry and Fisheries (MIFAFF)
1530-5, Soryoungdong, Gusan, Jeonbuk, (Post code: 573-882)
Republic of Korea
□ Tel: +82-63-468-2674
□ Fax: +82-63-467-2675
□ e-mail: bskoh@nfrdi.go.kr, byoungkoh@empal.com
/ redwoods@mltm.go.kr (Liaison of Ministry of Land, Transport and Maritime Affairs; MLTM)

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2. Date this sheet was completed/updated:

July 9, 2007

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3. Country:

Republic of Korea

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4. Name of the Ramsar site:

Muan Tidal Flat

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5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only)**:**

a) Designation of a new Ramsar site ■ ; or
b) Updated information on an existing Ramsar site ❑

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6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged: ❑

or
If the site boundary has changed:
i) the boundary has been delineated more accurately ❑; or
ii) the boundary has been extended ❑; or
iii) the boundary has been restricted** ❑

and/or

If the site area has changed:
i) the area has been measured more accurately ❑; or
ii) the area has been extended ❑; or
iii) the area has been reduced** ❑

** **Important note**: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

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7. Map of site:
Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i**) a hard copy** (required for inclusion of site in the Ramsar List): ■;

ii**) an electronic format** (e.g. a JPEG or ArcView image) ■;

iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** ■.

b) Describe briefly the type of boundary delineation applied:
e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The boundary is the same as an existing protected area: Muan Tidal-flat Wetland Protected Area designated in 28th December 2001 by MOMAF(Ministry of Maritime Affairs and Fisheries)

8. Geographical coordinates (latitude/longitude, in degrees and minutes):
Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

35°07'41.8"N-35°04'27.4"N / 126°20'19.4"E-126°25'19.2"**E**

9. General location:
Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

Muan tidal flat is located in the South-western coastal area in Korea. It belongs to Haeje-myeon, Muan-gun, Jeollanam-do in administrative district. The sea area in Muan tidal flat are facing the borderline with Hampyong, Youngkwang and Muan.

Mokpo is the nearest large city which is 25km away from Muan and the population is 240,000. Recently, Muan International Airport, Korea Train Express, and West Coast Express Highway have been constructed. Muan county has a plan for Muan industry city development as well.
542 Fishery families (1,587 people) live near the wetland protected area.

10. Elevation: (in metres: average and/or maximum & minimum)

Average 3.15m MSL (Maximum 4.25m)

11. Area: (in hectares)

3.589 ha

12. General overview of the site:
Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Muan tidal flat preserves the natural habitat, free of human disturbance such as land fill and dyke construction on the shore. Due to the complicated coastal line and sea current, different type of tidal flat, such as sand, mud or mixed tidal flats lies on the area. In particular, winter waterbirds have been observed (48 species, 29,000 and more) since 2000 (Simultaneous bird census by Ministry of Environment, Korea). 47 species of halophyte are distributed on Muan tidal flat.

13. Ramsar Criteria:
Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1	2	3	4	5	6	7	8	9
❑	■	❑	❑	❑	❑	❑	■	❑

14. Justification for the application of each Criterion listed in 13 above:
Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

■ Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

List of species supporting the criteria no 2.

Scientific name	Vernacular name	ME	NM Species	IUCN	CITES	CMS
Cygnus cygnus	Whooper Swan, Keun-Go-Ni	X	X	LC		X
Anser fabalis	Bean Goose, Keun-Gi-Reo-Gi	X		LC		X
Larus saundersi	Saunders's Gull, Geom-Uen-Meo-Ri-Gal-Mae-Gi	X		VU A3c		X
Buteo buteo	Common Buzzard, Mal-Dong-Ga-Ri	X		LC	X	X
Accipiter nisus	Eurasian Sparrowhawk, Sae-Mae		○	LC	X	X
Platalea minor	Black-faced Spoonbill, Jeo-Eo-Sae	X	○	EN C2a(i)		X
Egretta eulophotes	Chinese Egret, No-Rang-Bu-Ri-Baek-Ro	X	○	VU C2a(i)		X
Numenius madagascarensis	Australian Curlew, Al-Rak-Go-Ri-Ma-Do-Yo	X		LC		X
Numenius aquata	Eurasian Curlew,Ma-Do-Yo			LC		X
Tardorna tadorna	Common Shelduck, Hok-Bu-Ri-O-Ri			LC		X
Anas platyrhynchos	Mallard , Chung-Dung-O-Ri			LC		X

(ME- Endangered Species designated by Ministry of Environment of Rep. of Korea.
(**Natural Monument Species**- Republic of Korea made a Culture Heritage Protect Act in 1962 to conserve of Korean natural status including animal, flora and rock. "**Culture Heritage Administration of Korea**" designated Natural Monument Species to manage and conserve them.**)**

■ Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

□ Sea water surrounding Muan tidal flat is relatively shallow. Sand and mud fractions are abundant in sediment. Geographical type of Muan tidal flat is a rias coast and spawning ground for marine living organisms. The tidal flat in Muan is originated by the naturally eroded soil from the land and floating sediment from the sea water. There are plenty of phytoplankton and zooplankton in the sea near Muan tidal flat. Marcobenthos are plentiful, valuable food resource for migratory birds. A total of 367 species of marine living organisms appeared, namely, 153 species of macrobenthos such as mud mussel(Jong-mit, *Musculista senhousia*), crab(Kong-gae, *Ilyoplax deschampsi*) and Japanese ghost crab (Chil-gae, *Macrophthalmus japonicus*), 95 megabenthos such as opisthobranchia(Min-chaeng-yi, *Philine* sp.), bivalve(Som-teol-baek-hap, *Ventricoloidea foveolata*) and sea urchin(Bun-ji-sung-gae, *Temnopleurus toreumaticus*), 22 fishes such as gray mullet (Soong-eo, Mugil cephalus), croaker (Min-eo, *Miichthys miiuy*) and sea bass (Nong-eo, *Lateolabrax*

japonicus), and, 6 molluscans such as small octopus(Nak-ji**,** *Octopus monor*), manila clam(Ba-ji-rak, *Ruditapes philippinarum*), 5 crustaceans such as penaeid shrimp(Bo-ri-sae-woo, *Penaeus orientalis*) and blue crab(Min-kot-gae, *Charybdis japonica*), 38 algae such as laver(Gim*, Porphyra tenera*), and 48 waterbirds such as whooper swan (Keun-goni, *Cygnus Cygnus*), Red-necked Stint (Jom-doyo*, Calidris ruficollis*).

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15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Holarctic Region – Eastern Asiatic Region (Palearctic)

□ The site belongs to Yellow sea inter-tidal flat of the Temperate water in the northern hemisphere.

b) biogeographic regionalisation scheme (include reference citation):

- Lee, Y.C. and Yim, Y.J. (2002) *Plant Geography*, Kangwon National University Press, 412pp.
- Takhtajan, A. (1986) *Floristic Regions of the World*, University of California Press, 522pp.
- Udvardy, M. D. F. (1975). *A classification of the biogeographical provinces of the world.* IUCN Occasional Paper no. 18. Morges, Switzerland: IUCN.

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16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

□ Muan tidal flat is located in the mouth of semi-enclosed inner bay. The mouth part of bay is narrow and inner part (bay) is more spacious. The length of bay is 17km and the width is 12 km in maximum. The area of bay is 344km$^{2.}$

□ Surface sediments in Muan tidal flat are composed of 3 types. In the mouth and inner bay area gravelly muddy sand is dominant, and mud is dominant fraction in the tidal flat in the middle of bay, and gravelly sandy mud is relatively abundant in the water channel in the tidal flat (Ryu, 1998). The average coastal erosion rate was estimated as 1.5m/year and the coastal line was moved backwards during last 14 years (Lim *et al.*, 2002).

- Origin: Natural
- Soil (sediment) type: Mud
- Water depth: 0~3m
- Tidal range: 425 cm (maximum)
- Tidal current velocity: 138 cm/s (spring tide)
- Water permanence: impermanent Water quality

□ Water quality (Please see Annex. Table 1)

Temperature and salinity in surface seawater ranged from 2.47□ to 30.70□ (mean = 14.63□) and from 27.31 psu to 34.57 psu (mean = 32.16 psu), respectively. The concentration of dissolved oxygen (DO) in seawater ranged from 5.60 to 13.62 mg/L, which is sufficient to survive of organism and no hypoxic condition in this region during the summer season has been recorded. The concentration of chemical oxygen demand (COD) ranged from 0.19 mg/L to 2.57 mg/L, which are relatively low compared to other coastal area in Korea.

□ General climate (Please see Annex. Table 2 & Figure 1, 2)

The mean annual air temperature around Muan tidal flat ranged from 1.0□ to 26.1□, with the lowest and highest values in January and August, respectively. The mean annual precipitation around this region is 1340 mm, with most occurring in the summer monsoon season (from July to September). Mean annual wind velocity was 3.7 m/s. There are light snow fall with 7.4cm in average.

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17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

- 2nd grade stream: Kwangkak cheon(stream), Haeun cheon(stream)

- Small-sized stream: Hodong cheon, (1.56km), Simokdong cheon(1.40km), Woohyul cheon (1.33km), Koosan cheon (0.92km), Sapdarie cheon(1.39km), Wonmisan cheon(0.80km), Pyongsan cheon (2.97km)

- Climate: apparent four seasons. The highest temperature in August is 25.6C (five years' average tempt.) and the lowest in January is 1.3C (five years' average tempt). Mean precipitation during five years (2001-2005) is 1,256mm, with high precipitation in July and August, and low in January (monsoon). North wind predominate annually (average from 2001 to 2005).

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18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

In the Muan tidal flat, there is no large scale water channel connected with main land and is semi-enclosed bay with North western bay mouth. The main tidal channels lie from the mouth of bay toward South East coastal line, and inter-tidal flat are developed along the main tidal channel. There are no flood control facilities such as dam, resulting in keeping a natural integrity of the tidal flat.

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19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp Ts • U • Va • Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

G : Intertidal flat (largely muddy)

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20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Charybdis japonica occupy 47% of biomass in crustacean), Compared with other tidal flats in country , the number of living organisms and ecological indices are higher and more significant due to its pristine natural condition including various microhabitats.

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21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Phragmites communis (Gal-Dae), *Suaeda japonica* (Chil-Myon-Cho), *Zoysia sinica* (Gae-Chan-Di) are main halophyte flora in the Muan tidal flat and its surroundings. Halophyte plants are relatively well preserved with remained natural habitats. Reeds (*Phragmites communis*) have strong water purification capacities and their primary productivity is higher than other halophytes. Roots of reed bed also function as a protector of soil erosions (Min, 1998).

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

In the proposed Ramsar site, biodiversity of living organism can be explained as diversity indices in macrobenthos communities near Muan tidal flat ranged from 2.41 to 2.65 (MOMAF 1999; MOMAF 2002). In addition, *Uca arcuata* (Red-clawed fiddler crabs) are more abundant than other area. Some of the dominant species are Mussel (Jong-mit, *Musculista senhousia*), crab (Kong-gae, *Ilyoplax deschampsi*), opisthobranchia (Min-chaeng-yi, *Philine* sp.), bivalve(Som-teol-baek-hap, *Ventricoloidea foveolata*) and sea urchin (Bun-ji-sung-gae, *Temnopleurus toreumaticus*). The birds found in this area are Great Egret, Dae-Baek-Ro (*Casmerodius albus),* Intermediate Egret, Jung-Baek-Ro (*Mesophoyx intermedia),* Little Egret, Saoi-Baek-Ro (*Egretta garzetta)*

23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

- Historical value: Doripo is the Korean porcelain buried heritage. 21 different national and local government designated monuments are preserved.
- Landscape in the surrounding: Pine tree near tidal flat is the required for breeding habitat for *Casmerodius alba* (Dae-Beak-Ro), *Mesophoyx intermedia* (Jung-Baek-Ro), *Egretta garzetta* (Soi-Baek-Ro), and *Ardea cinerea* (egret and grey heron, Oi-Ga-Ri) in summer season. (Please see Annex, Table 3)
- Fishery products: *Marsupenaeus japonicus* (Bo-Ri-Sae-U), *Mugil cephalus* (Seung-Ea), *Clupanodon punctatus* (Jun-Ea), *Octopus minor* (Nak-Ji), *Porphyra tenera (Kim)*, *Batillus cornutus* (So-Ra), *Crassostrea gigas (*Cham-Gul).
- These biodiversity and wildness resulted in designating Fishery Resource Protection Area.
- Total fish catch in Muan-Gun is 11,782 M/T in 2004 and has been increase since 2001.

It has a potential resource for tidal flat ecotourism, which means tidal flat could be a significant resource for socio-economic value.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box ❑ and describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

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24. Land tenure/ownership:
a) within the Ramsar site:

state-owned

b) in the surrounding area:

state-owned

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25. Current land (including water) use:
a) within the Ramsar site:

- 383 fishing boats are reported, in particular 65.0% are under 1 ton boat, 24.3% are 1~2 ton boat, 9.1 % are 2~5 ton boat and 1.6% are 5~10 ton boat.
- Fishery license are 375 in total. Coastal complex fishing permits are 222 cases, resulting in 59.2% of fishing permits.
- Permitted fishery permits are 514 in total, which are all bare hand fishery.
- 100 Mariculture permits are reported, occupying 3022.0ha. The main culture fisheries are *Crassostrea gigas, Ruditapes philippinarum*, *Tegillarca granosa*, *Laminaria* sp., *Nos(r)dotis discus*, *Porphyra tenera*, *Fenneropenaeus chinensis*.
- Fishermen collect the lugworm with hand for fishing bait, and small octopuses burrowing mudflat are a special indigenous fishery product in the Muan tidalflat.

b) in the surroundings/catchment:
- Land area in Hyeongyeong-myeon and Haeje-myeon: 119.6km^2
- Land use in the surroundings: rice paddies 35.7km^2(29.9%), field 23.8km^2(19.9%), farm 6.2km^2(5.2%), forests 32.9km^2(27.5%), saltpan 1.1km^2(0.9%), bare land 2.9km^2(2.4%), road 3.9km^2(3.2%), river and stream 0.1km^2(0.1%), dyke 0.3km^2(0.2%)

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26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site:

The reclamation was carried so as to make a development of Woldoo village fishing port. Small scaled sea dyke constructions are often made for prevention coastal line erosion and loss of rice paddies.
Many natural coastal plants and halophytes are disappeared due to reclamation. However, nothing has been revealed about the detrimental effects on the ecosystem of the wetland after the development of Woldoo village fishing port at present.

b) in the surrounding area:

- Sewer system: carrying capacity- 780 people, coverage - 11.2%
- Living waste filled-in land: 1,4453m^2, height of filled land: 5m, total land filled volume: 22,600m^2

27. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ❑;Ib ❑; II ❑; III ❑; IV ❑; V ❑; VI ❑

c) Does an officially approved management plan exist; and is it being implemented?:

Muan Tidal-flat Wetland Protected Area designated in 28 December 2001 by MOMAF. After designation, the management plans* were established for the preservation and restoration of the ecosystem in Muan Wetland Protected Area. For example, Muan Tidal-flat Wetland Protected Area was divided to three zones (Absolute Preservation zone, Buffer zone, and Relative Preservation zone) by MOMAF and the management monitoring for water quality and the diversity and density of population has been continuously conducting. Citizen Ecosystem Monitoring has been carried in 2006, 2007. Expert monitoring planning will be carried up from 2008.

* MOMAF, 2002. Muan tidal flat Wetland Protected Area management Plan. BSPM 16100-1465-3.

d) Describe any other current management practices:

Surrounding sea area is also designated as Hampyeong Bay Fishery Resource Conservation Area which is located in the mouth and its outer part of the bay. It would be very favourable circumstance to provide diverse marine resource and fisheries.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

Consequently, long term conservation management of halophytes would be helpful to keep the wildness in the region.

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

MOMAF, 2006. Muan tidal flat volunteer monitoring planning : Muan tidal flat volunteer monitoring program has been started since 2006. Five monitoring programs have been conducted including water bird, macrobenthos, wetland plants (halophytes), human culture living in fishing village, marine solid wastes on the shore. In the first year of 2006, about 30 volunteers were educated for their sophisticated monitoring by the experts and field manuals for the five monitoring items were also developed for the volunteers. In the second year of 2007, the program has been continuing.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

- Eco exhibition hall (Lotus flower exhibition hall, tidal flat exhibition hall, aqua plant exhibition, wild flower park)
- Doripo Marine underwater cultural heritage exhibition hall

- Tidal flat visitor center: 3,277m² (1 basement, 2 storied building) including tidal flat exhibition hall, seminar room, cinema hall, recreation observatory.
- Migratory bird watching, egret breeding sites

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

- Muan sports park complex (2009. 12 completion of construction work) : size 252,993 ㎡, main facilities: sport arena (38,710 ㎡), indoor gymnasium(5,979 ㎡), swimming pool(4,245 ㎡), the youth training dormitory(2,663 ㎡), public sports park(20,000 ㎡)
- Holtong recreation area
- Doripo fishing pond
- Ecotoruing programme and theme tour
- Tourist guide leaflet will be prepared by Muan county.
- Eco hall exhibition hall, museum
- Average annual number of visiting tourist 2,364,952 persons (foreigner 0.4%)

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Hyeongyeong-myeon and Haeje-myeon Muan-gun Jeollanam-do

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Management Jurisdiction: Muan-gun, Jeollanam-do, Korea
□ Name: Sam-Seog SEO
□ Position: Magistrate of county
□ Adrress: Muan county, 2000, Muan-ro, Muan-eup, Muan-gun, Jeollanam-do, 534-804
Republic of Korea
□ Tel: +82-61-450-5201
□ Fax: +82-61-453-3241

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

Kim J.-N., J.-H. Choi, Y.-J. Im, K.-H. Choi, C.-W. Ma, 2005. Species composition and seasonal variation of decapod crustacean assemblage in Hampyeong Bay, Korea. J. Korean Fish. Soc. 38(1), 20-28

Ministry of Environment, 2000-2007. Winter migratory birds Census. Ecological investigation report.

MOMAF, 1999. Studies for sustainable use of tidal flats in Korea (1st year). BSPM 99035-00-1228-3. pp. 875.

MOMAF, 2002. Muan tidal flat Wetland Protected Area management plan. BSPM 16100-1465-3. pp. 75.

Muan county, 2005. Muan statistical yearbook.

Muan county, 2006. Muan statistical data of fisheries.

Muan county, Jeonnam, 2006. Muan tidal flat Wetland Protected Area management project.

National Geography Institute, 1983. Basic research report on near-shore environments of Korea. Seoul. Korea. pp. 60

Ryu S.O., 2003. Seasonal variation patterns of tidal flat sediments in semi-enclosed Hampyong and Kwangyang Bays, west and south coast of Korea. Jour. Korean Earth Science Society, v. 24, no. 6, 578-591.

Lim, D.-I., H.-S. Jung, Y.-S. Chu, K.-S. Park, S.-H. Kang, and S.-Y. Yang, 2002. A study on shoreline change in Hampyung bay, southwestern coast of Korea. I. Sea-cliff erosion and retreat. The Sea, 7(3): 148-156 (in Korean).

Ryu, S.O., 1998. Sedimentary environments and stratigraphy of Hampyung Bay, southwest coast of Korea. Ph. D. Thesis, Cheonnam National University, Korea, 247 pp.

Min, B.M., 1998. Vegetation on the west coast of Korea. Ocean Research, 20(2) (special): 167-178 (in Korean).

Please return to: **Ramsar Convention Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
Telephone**: +41 22 999 0170** • Fax: **+41 22 999 0169** • e-mail: **ramsar@ramsar.org**

Annex

Table 1. Water permanence: impermanent Water quality

	Tem.(□)	Sal.(psu)	pH	DO (mg/L)	COD (mg/L)	SS (mg/L)
Mean	14.63	32.16	8.07	8.78	1.11	35.17
Max.	30.70	34.57	8.34	13.62	2.57	195.50
Min.	2.47	27.31	7.59	5.60	0.19	1.50

Table 2. General climate

	Temperature (□)	Air press (hpa)	Precipitation (mm)	Wind velocity (m/s)	Daylight hours (hr)	Snowfall (cm)
Mean	13.9	1016.2	1340.9	3.7	2107.8	7.4
Max.	34.6	1016.5	1686.0	29.1	2258.3	17.2
Min.	-7.8	1016.0	945.9		1881.1	4.1

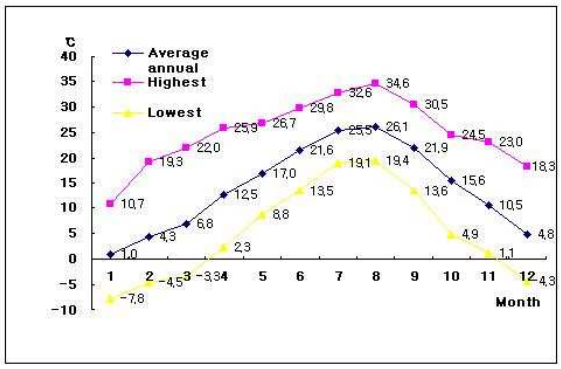

Figure 1. Temperature

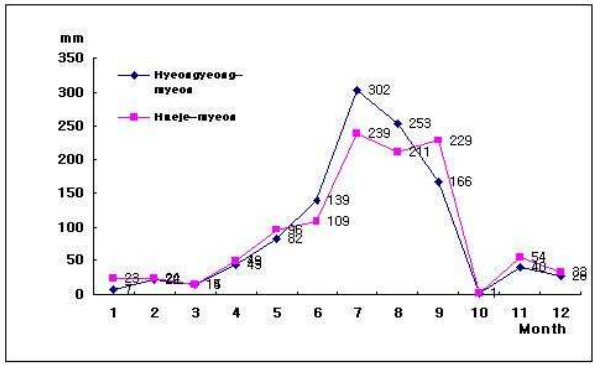

Figure 2. Precipitation

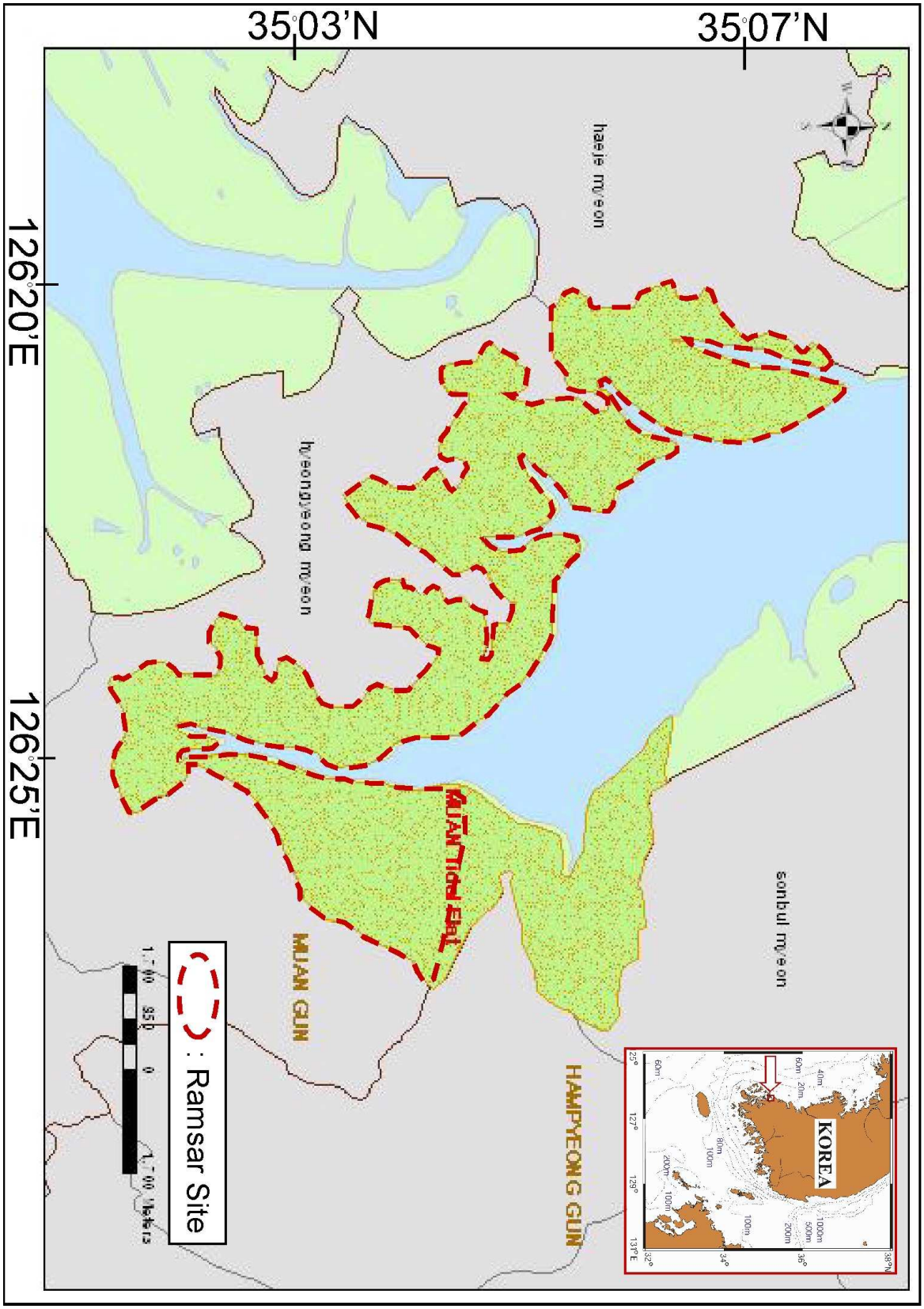

Figure 3. The map of Muan Tidal-flat Ramsar site