A call to action

The results provided key data for developing a regional conservation strategy and monitoring its successes. In particular, the results will help to:

1) Establish a network of representative marine protected areas at the ecoregional scale;
2) Evaluate effectiveness of existing protected areas;
3) Monitor status of biodiversity.

In order to conserve coastal mollusk biodiversity, in particular, these sets of globally significant species and their globally significant areas, various stakeholders need to take concerted actions. Community-based organisations, the scientific community, national and local government agencies, legislative bodies, non-government organisations including religious groups, the general public, the media, donor communities, industries, consumers, and youth groups all have important roles to play. For example, national and local government agencies can contribute by strengthening cross-sectoral coordination in the establishment and improvement of the management of marine protected areas (MPAs). Filling major knowledge gaps in ecology and human impacts on indicator species is also an important action to take.

Globally Significant Coastal Mollusks in Yellow Sea Ecoregion

Table of coastal mollusk indicator species and their global significance

Indicator Species		Criteria for habitat and vulnerable species of global significance		
Scientific names	**Common English names**	**Criterion 1: Endemism**	**Criterion 2: Vulnerable Species**	**Criterion 3: Commercially Important Species**
Mactra veneriformis	Surf clam			Cuva Kvo Kuva
Ruditapes philippinarum	Shortnecked clam			Cvo Cva Cuva Kvo Kva, K
Meretrix spp.	Hard clams			Kuva, K
Rapana venosa	Top shell			Kvo Kva Kuva
Mactra chinensis	Hen clam			Cuva Kvo Kva Kuva
Haliotidae spp	Abalones			Cvo Cva Cuva Kva Kuva
Atrina pectinata	Fun musse			Kva Kuva
Fulvia mutica	Cockle shell			Kva Kuva
Cyclina sinensis	Ciclina clam			Kuva

Notes to the table

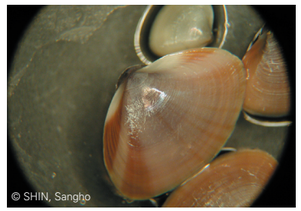
Each indicator species were assessed against Criterion 1, 2 and 3. When an indicator species meets Criterion 1 according to data available in China, then it is indicated by C (China).

Note 1:In Criterion 1,2 and 3 columns, C indicates that a criterion is applicable to the corresponding species according to data from China, K: South Korea.

Note 2:Kvo: commercially important by volume in South Korea, Kva: commercially important by value in South Korea, and Kuva: commercially important by unit value in South Korea

Shortnecked clam

Surf clam



Hen clam

Hard clam

Photos by:
JE, Jonggeel, SHIN, Sangho, GeoEye and NASA SeaWiFS Project

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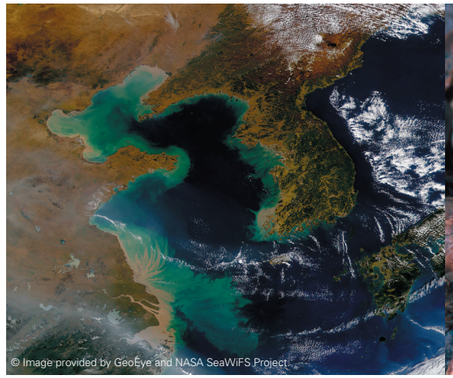
Coastal Mollusks of the Yellow Sea Ecoregion and their habitats



Satellite photo of Yellow Sea Ecoregion

Ruditapes philippinarum Shortnecked clam

Coastal Mollusks of the Yellow Sea Ecoregion

About the area

The Yellow Sea Ecoregion is one of the world's largest areas of continental shelf. The Yellow Sea Ecoregion encompasses the Bohai Sea, the Yellow Sea and the East China Sea. It is a transboundary area, and extends from the coastlines of China, North Korea, and South Korea to a depth of 200m.

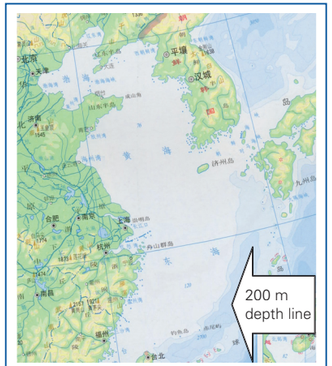
Valuable nutrients flow from the Yangtze and Yellow rivers and combine with sunlight and shallow waters to create an area that teems with abundant marine life.

Diversity of coastal invertebrates including mollusk species

In the Yellow Sea Ecoregion, major taxonomic groups among the marine invertebrate species are Polychaeta (marine worms), Mollusca (clams, oysters, squids, octopus), Crustacea (shrimp and crabs), Echinodermata (sea urchins, sea stars, and sea cucumbers).

In the Chinese part of the intertidal area, species group compositions of invertebrates are 9 species of Cnidaria (sea anemones, corals, jellyfish, and hydroids), 100 Plychaeta, 171 Mollusca, 107 Crustacea, and 22 Echinodermata. Mollusks form the most dominant taxonomic group in both the Bohai Sea and the Yellow Sea by accounting for about 50% of biomass among benthic biomass.

In the South Korean part of the Yellow Sea, about 500 species of marine invertebrate species have been recorded. There are 135 species of Mollusks, 106 Arthropoda (crustaceans), 87 Annelida (marine worms), 24 Echinoderms, 34 Cnidaria (sea anemones, corals, jellyfish, and hydroids), and 7 Porifera (sponges). Mollusks are one of the most dominant taxonomic groups in terms of biomass in subtidal and intertidal areas.



Borders of the Yellow Sea Ecoregion

What is an ecoregion?

Biodiversity is not spread evenly across the Earth but follows complex patterns determined by climate, geology and the evolutionary history of the planet. These patterns are called ecoregions. WWF defines an ecoregion as a large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions.

The boundaries of an ecoregion are not fixed and sharp, but rather encompass an area within which important ecological and evolutionary processes most strongly interact.

Coastal Mollusks and People

Coastal mollusks provide a significant source of income and food supply for local communities and regional economies both in China and South Korea.

In China, mariculture of coastal mollusks occupies a large portion of coastal area. The shellfish mariculture area in five provinces in the Yellow Sea Ecoregion was 371,100 ha in 1997, which accounts for about 70% of mariculture areas. The volume of shellfish mariculture production from the Yellow Sea Ecoregion is equally significant at 3 million tons in 1997, which accounts for about 80% of the total mariculture production and also nearly 50% of the China´ s national shellfish production. In South Korea, a major part of fishing activities on tidal flats are for mollusks. Each year, about 50,000-90,000 tons of clams are harvested, and another 1,000 tons of mud octopus and 500 tons of polychaetes are caught as main products from mud flats.

Threats to Coastal Mollusks

Expansion of mariculture, reclamation and loss of wetlands, and marine pollution are affecting coastal habitat on which coastal mollusks depend for their survival.

In China, mariculture has brought negative impacts as well as economic achievements, including polluted discharge from shrimp and fishponds.

Reclamation poses a serious threat to coastal mollusks in South Korea. Estuarine tidal flats are the preferred habitat for the hard clam. Most of the production of this mollusk species comes from the Saemangeum estuary area on the Yellow Sea coast. However, the area is the site of the Saemangeum reclamation project and with the completion of this project, most of the hard clams will disappear from this area.

The Yellow Sea Ecoregion - a Global Treasure, a Global Concern

Global Treasure

The Yellow Sea Ecoregion (203) has been selected by WWF as one of the Global 200 ecoregions, areas that are key to global biodiversity conservation. This marine ecosystem is also one of the Large Marine Ecosystems (LME) of the world.

Global Concern

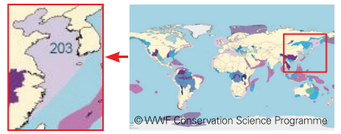
The global importance of the Yellow Sea Ecoregion has been recognised by governments and the international community in recent years. Starting in 1992, the Chinese and South Korean governments together developed a transboundary approach to the management of the Yellow Sea area with the assistance of UNDP, UNEP, the World Bank, and NOAA. In 2005, a UNDP/GEF project, the Yellow Sea Large Marine Ecosystem project, was officially launched with participation of the Chinese and South Korean governments.

Meanwhile, in 2002, WWF and other research institutes in China, South Korea and Japan began an assessment of Yellow Sea Ecoregion biodiversity. The objective of this regional partnership was to prioritise conservation actions based on scientific data.

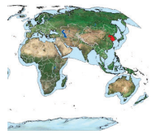
An urgent need: Identifying conservation priorities at a transboundary ecoregional scale

In order to conserve the full array of biodiversity and ensure the use of its services by people are sustainable, it is necessary to conduct assessments beyond political boundaries and at an ecoregional scale.

An ecoregional approach helps ensure that we do not overlook areas that are particularly unique or threatened, allowing for smarter trade-offs and greater positive impacts that are more likely to endure over time.



Yellow Sea Ecoregion (203)



LME #48 Yellow Sea in Large Marine Ecosystem

UNDP China — Yellow Sea

UNDP/GEF Yellow Sea Project

WWF — KORDI — KEI Korea Environment Institute

WWF/KORDI/KEI Yellow Sea Ecoregion Planning Programme

Methodology - finding priority coastal mollusk species and their Ecologically Important Areas

Cooperation among scientific experts from China and South Korea

Scientists from universities and ocean research institutes in China and South Korea have worked together to review and identify priority coastal mollusk species and their habitats of global significance. Together they have set a common methodology and reached an agreement on priorities.

Biological Assessment

Using a set of mutually agreed criteria, scientists developed a set of criteria for indicator species that are key for biodiversity conservation. Among many of the marine invertebrate species groups, the scientists selected coastal mollusks, and more specifically coastal Bivalvia and Gastropoda groups (clams and sea snails groups) as indicator species. The scientists chose representative habitat types, endemism, species richness, threatened status, and commercial importance as a set of criteria. According to these common criteria, each scientist has analysed nationally available data to select appropriate indicator species and ecologically important areas and they compiled national Biological Assessment papers for China and South Korea.

Priority Area Analysis

Using a further set of criteria, experts then prioritised the previously selected indicator species and their habitat. Scientists adopted endemism, threatened status, and commercial importance as a set of criteria for the Priority Area Analysis.

Thirdly, the scientists overlaid important areas for each indicator species. This allowed scientists to visualise overlapping areas that are important for more than one species.

Results

Coastal Mollusk Ecologically Important Areas (CMEIAs) are the areas that are important for coastal mollusk species. Twelve indicator species were assessed under the Priority Area Analysis criteria to identify globally significant species and their habitat. Of these indicator species, no species met the endemism criterion and venerable species criterion, and nine species were applicable under the commercial importance criterion. Those indicator species that met any of these criteria were identified as globally significant species. Then habitat areas of these globally significant species, where those areas are critical for the survial of the species, were identified as indicator species ecologically important areas. In total, 20 Coastal CMEIAs were identified.

The Yellow Sea Ecoregion Planning Programme will publish the full results of biodiversity assessment and priority area analysis, so that they become accessible by scientists and government agencies in the future.

Scientific experts from China, South Korea, Japan and other countries cooperate to analyse priority areas

Distribution of hard clams in South Korea

High mollusk and other species diversity (>60 species) sites in South Korea

Globally Siginificant Areas for Coastal Mollusks in Yellow Sea Ecoregion (China and South Korea)

- Yellow Sea Ecoregion Planning Programme -

WWF — KORDI — KEI

Geographic Coordinate System : WGS-84
Projection : Lambert Conformal Conic

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Bathymetry

- Under 200m
- 200m - 100m
- 100m - 90m
- 90m - 70m
- 70m - 50m
- 50m - 30m
- 30m - 10m
- 10m - 0m

Coastal Mollusk EIA

No	Coastal Mollusk EIA	No	Coastal Mollusk EIA	No	Coastal Mollusk EIA
1	Lianyungang	8	Changdao	15	Jeollabuk-do
2	Rizhao	9	Tanggu	16	West Jeollanam-do
3	Qingdao	10	Qinghuangdao	17	Chujado Island
4	Rushan	11	Huludao	18	Cheongsando Island
5	Roncheng	12	Dalian	19	Yeoja Bay
6	Weihai	13	Gyeonggi Bay	20	Jejudo Island
7	Yantai	14	Chungcheongnam-do		