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Regional and National Reports on Marine and Coastal Biodiversity Data and Information in the Northwest Pacific Region

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**Regional Overview on Marine and Coastal Biodiversity Data and Information
in the Northwest Pacific Region**

Executive Summary

NOWPAP region is characterized by a high diversity of marine and coastal species, from boreal to subtropical. Current status of health of marine and coastal ecosystems in NOWPAP region is unequal in different areas. It depends first of all on density of human population and intensity of industrial activities. The conditions of marine and coastal ecosystems in Japanese waters and the eastern part of NOWPAP region can be estimated as good. Strong anthropogenic impact on marine and coastal biota is observed only near big cities. Conditions of coastal ecosystems around Japan during the last decades have considerably improved due to strict government control. Low density of population and recession of economic activity in the Far East of Russia for the last decade provided insignificant anthropogenic influence on marine and coastal ecosystems. The most intense anthropogenic influence on marine and coastal ecosystems is observed off the Yellow Sea coast due to very high density of human population, rapid development of industry, very intense agriculture and aquaculture and over-exploitation of fish resources.

The principal threats to the marine and coastal biodiversity in the NOWPAP region are connected to the human activities. First of all it is pollution of sea waters by industrial and municipal waste water effluents. Aggressive landfill and reclamation works on seaside areas also represent significant threat to coastal ecosystems. Over-exploitation of fish resources is one of the main threats to the marine and coastal biodiversity as well. The problem of introduced alien species is well-known around the world.

There are three basic directions for prevention of existing and potential threats to a coastal and marine biodiversity:

- reduction of marine and coastal pollution and eutrophication;
- prevention of habitat destruction;
- reduction of overexploitation of fisheries resources.

The following research activities seem to be of priority for the region:

- identification of centers with high species and genetic diversity (biodiversity "hot spots") by integrated studies and inventories of the marine and coastal biota;
- selection of the biomonitoring zones for investigating the biodiversity at all levels;
- preparation of additional guides for biota of the study areas;
- establishment of the banks of genetic data about marine and coastal flora and fauna;
- preparation of proposals and making administrative decisions on the conservation of the coastal and marine biodiversity including the restriction or prohibition of the fishing of individual populations of commercial species.
- establishment of a regional node of the metadata base in the field of biodiversity.

The coasts of seas and oceans are attractive not only from the viewpoint of their further development by the people but also as the areas of the extraordinary natural riches and diversity. Significant efforts for marine and coastal biodiversity conservation are undertaken now in all countries of the NOWPAP region. Authorities understand the importance of this problem and nowadays the considerable amount of laws and regulations dedicated to marine pollution control, exotic species

prevention, marine and coastal resources exploitation and biodiversity conservation were issued. Besides, number of state natural reserves and marine parks, marine and coastal protected areas were established in NOWPAP member states. Their primary activities are aimed not only for protection of biodiversity but also for description of marine and island biocenoses and their changes as a result of natural processes and anthropogenic influence; development of scientific basis for preservation and restoration of biocenoses (ultimately, for gene pool preservation); promotion of the wise wildlife management by organizing museums and exhibitions and publishing scientific and popular articles.

All countries of NOWPAP region have developed (or developing) the system of monitoring of the marine and coastal biodiversity. The specialists of a number of academic and applied research institutes are engaged in the study and conservation of the unique marine and coastal biodiversity of the NOWPAP region. The studies are performed in accordance with the international, state and regional programs as well as using research grants. The results of the scientific activities are the collections of marine and coastal biological species; description of new species; diagnosis and forecast of the state of separate populations; recommendations for the sustainable wildlife management; new guides for the species identification; publications; software and ecosystem models. It appears that NOWPAP member states have ample expertise in marine biodiversity as there are many experts in the field who have been trained at the both in the domestic and foreign universities/institutions.

As weaknesses regarding expertise and capacity building in support of the marine biodiversity data and information research, three main issues are described below concerning all countries of the NOWPAP region.

The first and the biggest issue is the lack of linkages among databases. As mentioned above, there are many databases regarding biodiversity of marine and coastal organisms in NOWPAP member states. However, due to weak communication among these databases, they do not refer information to each other, and some overlapping of efforts can be seen. If databases are connected to each other, users of these databases will obtain more benefits from them. It concerns taxonomic and literature databases as well as information exchange between research institutes at a regional and international level.

The second weakness is limited resource of experienced taxonomists. Although many taxonomists are active in research institutions and museums of NOWPAP member states, they are biased toward economically important taxonomic groups such as fishes, mollusks, and crustaceans. On the other hand, taxonomists specialized for separate groups, such as Gastrotricha, Brachiopoda, Phoronida, are available in insufficient quantity. As a result, for example, taxonomy and systematics of some groups of invertebrates and some species of fishes are far from certain. Also, young specialists are rare, and the availability of good skilled taxonomists in the future is a big concern in marine biologists community.

The last, but not least, weakness is a funding problem. The marine biodiversity data and information researches suffer from lack of funding in all NOWPAP members to a greater or lesser extent. Especially it concerns field researches demanding greater financial expenses. Due to funding problems the regular cycle of monitoring of coastal and marine ecosystems is often broken. Except for that, traditionally main attention in researches is given to commercially important species and "secondary"

ones are often ignored. There is also other aspect of this problem; insufficient funding is directly connected with lack of good experts in marine biology.

NOWPAP members should definitely continue the comprehensive studies of marine and coastal biodiversity aiming to conserve and protect their precious resources. The establishment of the common metadata base in the field of biodiversity and exchange of the guides of biological species could be the further lines of activities of the NOWPAP member states. There are many initiatives to create database about marine and coastal biodiversity in the global scale.

1. Countries

People's Republic of China (referred to as China throughout the report), Japan, Republic of Korea (referred to as Korea) and Russian Federation (referred to as Russia)

2. Date of the Report

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4. Introduction to the Status of Marine and Coastal Biodiversity and Related Ecosystems

The Northwest Pacific region covers several climatic zones and it is one of the most representative regions in marine biodiversity with a great variety of coastal and marine species and ecosystems. The region is also one of the most densely populated parts of the world with rapid economic development, resulting in enormous pressures and increasing demands on the environment. It is also suffering an ever-greater deterioration on coastal ecosystems and habitats taken by the coastal development, industry, transport, and activities such as land reclamation and intensive mariculture. In some cases, chemical and industrial wastes, untreated municipal sewage, agricultural pesticides and nutrients flow directly into the ocean, causing widespread damage and stimulating eutrophication and harmful algal blooms.

4.1 Current Status of Marine and Coastal Species Diversity

As a whole, NOWPAP region is characterized by a high diversity of marine and coastal species. The Yellow Sea represents the shallow (shelf) part of the whole NOWPAP sea area located in the moderate latitudes between the mainland China and Korean peninsula. The species found here represent biota of boreal, subtropical and tropical zone. Over 1,000 species of marine organisms were described in the Yellow Sea, including corals, algae, mollusks, shrimps, crabs, fishes, sea cucumbers, sea turtles, cephalopods and marine mammals.

Approximately 260 species of fishes were reported in the waters around Korean peninsula, 321 shellfish and 29 species of shrimps as well as 59 species of seaweeds. The crustaceans are the most numerous among the benthic invertebrates with 35 species of Amphipoda, 14 species of Cumacea, 44 species of Decapoda, 15 species of Isopoda, 1 species of Panthropoda, 15 species of Stomatopoda, 2 species of Tanaidacea, and 2 species of Thoracia. Number of zooplankton species reported in Korean waters is 128 species; polychaetes - 181. Two hundred and ten species of phytoplankton were identified, approximately 336 species of sea birds, including migratory, and seven species of cetacean were observed in Korean waters.

The eastern part of the NOWPAP sea area is the richest area among all seas around Russia from the point of view of marine biodiversity. According to recent data, about 3,000 species of invertebrates were already described in the Russian waters of this region. 2,900 species of them were found in the Peter the Great Bay waters. On the whole, nearly 4,000 species of marine organisms were described in the Peter the Great Bay nowadays: algae, marine fungi, invertebrates, fishes, sea birds and mammals.

Because of the peculiarities of the geographical position of the Bay (within a zone of a confluence of cold and subtropical waters), the species composition is not only diverse but also unique in many respects. So, the thermal conditions in summer provide favourable conditions for the subtropical fauna and attract numerous southern migrants while, in winter, the optimum conditions are offered for the biota of the moderate and arctic latitudes.

4.2 Current Status of Marine and Coastal Genetic Resources

Genetic researches of coastal and marine organisms in NOWPAP region are developing rapidly in the recent days, but they are still not enough. The gene banks are established but the data only on a few species, mainly invertebrates and fishes, are available. It is planned in the future to intensify considerably researches in this direction in all NOWPAP member states.

As the biggest developing country which has population of 1.3 billion people, China has realized that genetic diversity conservation is important for sustainable natural resource use and national security. According to the 3rd *National Report of Convention of Biological Diversity*, several plans were proposed to achieve the targets of genetic biodiversity conservation. A plan called "China aquatic biological resources conservation compendium" is to be authorized in 2006. In this plan, the genetic and cellular banks are to be established to preserve genetic diversity of China. In another plan called "Mid-Long Term Development Plan of Marine Technology", the research of molecular biology is going to

be strengthened on the basis of the establishment of important genetic biodiversity bank for marine areas in China.

Genetic analyses of coastal and marine organisms around Japan are developing rapidly in the recent days, but they are still not enough. Researches on population genetics of marine organisms have been focused mainly on species that are important from fisheries point of view, e.g. fishes, snails, crabs, and shrimps. Thanks to the development of gene bank, all this information is stored in the database, and it is freely available. However, some quantitative information is not available at that site. For example, information that there are three haplotypes in a given species is available from the site, but information on the fraction of total population occupied by each haplotype is not available. Such information can be only accessed through the original paper, report or individual scientists.

Genetic diversity and its applications to marine biological resources has been studied in Korea for the following groups: 18 species of phytoplankton (*Chattonella antiqua*, *Cochlodinium polykrikoides*, *Gymnodinium sanguineum*, *Gymnodinium catenatum*, *Gymnodinium* sp., *Gyrodinium aureolum*, *Heterocapsa triquetra*, *Alexandrium tamarense*, *Alexandrium fraterculus*, *Alexandrium* sp., *Prorocentrum minimum*, *Prorocentrum micans*, *Protocentrum triestinum*, *Pseudo-nitzschia delicatissima*, *Pseudo-nitzschia multiseriata*, *Pseudonitzschia pungens*, *Pseudonitzschia subfraudulenta*, *Pseudo-nitzschia* sp.); 6 species of shellfish (*Haliotis discus discus*, *Haliotis madaka*, *Haliotis gigantea*, *Haliotis diversicolor supertexta*, *Haliotis diversicolor diversicolor*, *Scapharca broughtonii*); 2 species of starfish (*Asterias amurensis*, *Astropecten polyacanthus*), 1 sea cucumber (*Stichopus japonicus*); 5 species of polychaetes (*Stevnaspis scutata*, *Glycera chirori*, *Aphelochaeta mantitaris*, *Cirriforania tentaculata*, *Nectoneanthes latipoda*); 4 species of seaweed (*Porphyra tenera*, *Porphyra yezoensis*, *Porphyra yezoensis*, *Porphyra yezoensis*); and 3 species of marine fish iridovirus (RBIV-KOR-GJ, RBIV-KOR-YS, RBIV-KOR-CS from Korean virus collection).

In Russia, it is well understood that the biological diversity is not exhausted by the species list. The diversity at intra-specific levels (subspecies, population, etc.) is a necessary condition for the species existence (and is especially important in the dynamic environment) as well as a significant resource. The potential possibilities of this resource are used to only a small extent. As to the genetic diversity, fishes are now better understood. It is known that the species of salmon are divided into the great number of subspecies confined to the particular biotopes, migratory routes and migratory seasons as, for instance, races of Siberian salmon following to a spawning in summer or in winter. The complex of intra-specific subdivisions is known for herrings the populations of which confined to the particular bays differ in not only frequencies of gene alleles but also in their behavior and gustatory peculiarities. For the time being, there are no good reasons to assume the similar level of the intra-specific diversity in other groups of marine animals – none of them can be equal in its coverage of studies with salmon and herrings. These are tasks of the future studies.

4.3 Current Status of Health of Marine and Coastal Ecosystems

Current status of health of marine and coastal ecosystems in the NOWPAP region is unequal in different areas. It is determined first of all by density of human population and intensity of industrial activities. The conditions of marine and coastal ecosystems in Japanese waters and the eastern part of the NOWPAP region can be estimated as good. Strong anthropogenic impact on marine and coastal biota is observed only near big cities. Marine environmental conditions around Japan for the last decades have considerably improved due to strict government control. Low density of population and recession of economic activity in the Far East of Russia during the past decade resulted in insignificant anthropogenic influence on marine and coastal ecosystems. The most intense anthropogenic pressure on marine and coastal ecosystems is observed along the Yellow Sea coasts due to very high density of population, rapid development of industry and very intense agriculture, aquaculture as well as over-exploitation of fish resources.

China

Huaihe River is one of the largest rivers in the east part of China. The estuary of Huaihe River which located in the coastal line of Jiangsu Province has some unique ecosystems. However, the ecological conditions of the estuary declined significantly under anthropogenic disturbances, especially chronic pollution caused by industrial effluents and non-point pollutant sources in past several decades. Moreover, the overuse of fertilizers and the cities and towns sewage discharge in the basin also become an important source of pollution. According to the national reporting of Huaihe River Commission, Ministry of Water Resources, about 4.4 billion tons of sewage were discharged into Huaihe River in 2004. The large quantity of pollutant emission cause severe disturbance for downstream estuary and have chronic ecological effect on the species and their habitats.

With an area of 37,000 ha, Jiaozhou Bay is one of the largest wetlands in Shandong peninsula. It is an important winter ground and step stone for bird migrations. The species diversity of macrobenthic mollusk fauna in Jiaozhou Bay is also high; about 195 species were described since 1950's. According to recent researches, the ecosystems of the beaches and bays of the Yellow Sea, especially Jiaozhou Bay, are under chronic metal contamination and eutrophication caused by intensive human activities in the region.

Investigation of heavy metal concentration in mollusks *Ruditapes philippinarum* and seaweed *Codium* sampled in different sampling station in Jiaozhou Bay was carried out in 1996-1999. The results of the study demonstrated that the heavy metals accumulated in Jiaozhou Bay and contaminated the sediment habitat were possible source of high mortality of invertebrates and algae species and decrease of benthic species diversity in the region. Only 62 species were captured in Jiaozhou Bay according to the macrobenthic fauna surveys in 1998-2004. The species diversity of benthic community decreased rapidly in past decades according to these results.

The red tides caused by the blooming of phytoplankton are also a major threat to the ecosystems of Jiaozhou Bay. In the 1960's and 1990's, the concentration of nutrients such as $\text{PO}_4\text{-P}$, $\text{NO}_3\text{-N}$ and $\text{NH}_4\text{-N}$ in the seawater of Jiaozhou Bay increased 2.2, 7.3 and 7.1 times respectively. The concentration of $\text{NH}_4\text{-N}$ in surface water was as high as $100.5\mu\text{g/L}$ in 1997. The high concentration of

NH₄-N provided favorable conditions for blooming of phytoplankton. About 13 red tides were noted in Jiaozhou Bay in 1990's. The red tides severely damage the structure of food webs and threaten the species diversity of Jiaozhou Bay.

Japan

Status of the health of marine and coastal ecosystems has been evaluated using the HOTO (Health Of The Ocean) concept throughout the world. However such evaluation has not been done officially in the Japanese coastal areas because the responsible governmental body for each item listed in HOTO is different and unifying the data has not been done yet.

The marine and coastal ecosystems around Japan have been suffered severely in certain places, such as Seto Inland Sea, Mikawa Bay and Tokyo Bay (these areas are outside NOWPAP sea area). However, thanks to the effort of central and local governments and citizens the ecological condition of the sea waters off Japan is getting better recently; the number of occurrence of red tide decreased significantly in the past 10 years. The current status of health of marine and coastal ecosystems around Japan can be judged pristine in general.

Korea

Evaluation with regard to biodiversity of marine and coastal ecosystems has not been undertaken in Korea yet. Chemical studies have been performed in coastal waters, especially in harbor areas, for the ecosystem's health, based on Chemical Oxygen Demand (COD) values (Table 1, NFRDI. 2006). Masan Bay and Sihwa Lake showed the highest value of COD in 2005. Some ports or harbors showed intermediate (<2 mg/L) values, but in other coastal and neritic areas COD values were lower than 1 mg/L.

Table 1. Results of the water quality survey in Korean waters, based on COD value.

Name of Survey Project	Area	Sum	Result		
			<1 mg/L	<2 mg/L	<3 mg/L
		346	124	179	43
Harbor Survey		40	10	19	11
	East coast	16	6	8	2
	West coast	6	-	4	2
	South coast	18	4	7	7
Coastal and Neritic Survey		237	105	121	11
	East coast	74	57	17	0
	West coast	73	7	58	8
	South coast	90	41	46	3
Intense Management Area		69	9	39	21
	East coast	-	-	-	-
	West coast	23	2	7	14
	South coast	46	7	32	7

Russia

The ecosystems of the coastal waters of the eastern part of the NOWPAP region, in particular, Peter the Great Bay, are under the influence of two powerful factors of the anthropogenic origin: progressive eutrophication and chronic pollution which adversely affect the state of marine ecosystems.

The long-term observations of sea water quality in the Peter the Great Bay showed that, for a period of 1990-2001, the statistically significant decrease of concentrations of individual pollutants took place. So, the statistically significant trends were revealed in the Amursky Bay for petroleum hydrocarbons and cadmium; while in the Ussuriysky Bay and Golden Horn Bight - for petroleum hydrocarbons, pesticides and cadmium. The reason of this reduction in the marine environment pollution level is, very likely, a recession of the industrial production connected with the general economic crisis in the region. However, the volume of waste waters discharged to the coastal zone remains considerable and, at the same time, about 40% of discharges are easily oxidable organic matters. Therefore, the basic negative influence on the Peter the Great Bay ecosystems, as 15-20 years ago, is exerted by the water eutrophication process. A decrease of the species diversity and riches of the benthic population, increase in cases of mass development of toxic micro-aquatic plants, arising of unfavorable conditions for invertebrates and fishes are direct results of the progressive eutrophication of the Bay's waters. These facts suggest once more a necessity to carry out the systematic ecological observations in the area of the Peter the Great Bay.

4.4 Threats to the Marine and Coastal Biodiversity

The principal threats to the marine and coastal biodiversity in the NOWPAP region are connected to the human activities. First of all, it is pollution of sea waters by industrial effluents and municipal sewage. Aggressive landfill and reclamation works on seaside areas represent significant threat to coastal ecosystems. Over-exploitation of fish resources is one of the main threats to the marine and coastal biodiversity too. A problem of appearance of species is also one of the most important ecological problems.

China

The water quality of the Yellow Sea is decreased significantly; pollutant concentrations exceed the national seawater quality standards due to land-based pollution, river-borne pollutants, marine dumping and oil spills. The principal pollutants of the Yellow Sea are nitrogen compounds, phosphates, COD, petroleum hydrocarbons and heavy metals, comprising around 95% of the total pollutants. The marine and coastal species, especially fishes and benthic invertebrates, suffer from the substantive discharge of organic and inorganic pollutants.

The fishery resources are partially exhausted in the Yellow Sea in consequence of over-exploitation and marine pollution. Due to increase of human population along the Yellow Sea

coasts, more food is demanded in the Yellow Sea coastal region. The economically important fish species are heavily over-exploited in recent years.

Because of the fast demographical and economical development in the coastal regions in the Eastern China, wetlands, beaches and shorelines are under heavy impact of aquaculture, recreation and industry along the Yellow Sea coastline. These anthropogenic disturbances severely change the coastline. The wetlands and other habitats are fragmented or even completely lost. The pollutants which accumulate in the bottom sediments and other kinds of shoreline development, such as sand extraction, also disturb the benthos of the Yellow Sea.

No integrated data and information are currently available for exotic species in the Yellow sea and its coastline. Some examples of exotic species, however, can be found. Kelp and Suringar (*Undaria pinnatifida*), which were introduced from Japan, are abundant along the Yellow Sea coastline, especially in Jiangsu Province. Scallops introduced from Japan and the United States have become important mariculture species and also are abundant along the Yellow Sea coastline.

Japan

Even though the human impact on marine and coastal biodiversity off Japan is not obvious there are many potential threats. The major threats to the marine and coastal ecosystems are associated with human activities.

According to the results of marine environment monitoring program carried out by the Ministry of Environment, Japan since 1970, some obvious input of materials that may harm the ecosystem and its biodiversity from land through rivers can be seen in areas close to large cities such as Tokyo and Osaka. The materials that need to be monitored carefully are heavy metals such as mercury and chemical substances such as PCBs. Eutrophication is also a potential threat to the biodiversity of marine and coastal ecosystem.

Other threat to the marine biodiversity is ocean dumping. Dumping into the ocean some materials at some places around Japan are under the control of the Ministry of Environment, Japan. Careful control has been carried out by the Ministry for monitoring of the environmental impacts associated with the dumping. According to the results, there is no sign of impacts on the biodiversity of marine organisms so far. However, the activity can be considered as a potential threat to the biodiversity of marine and coastal ecosystem around Japan.

Climate change associated with the increase of atmospheric concentration of green house gases can be threat to the biodiversity of marine and coastal ecosystem around Japan in the future. Increase of water temperature will damage growth of macro algae in the boreal and temperate regions. This will lead to decrease of animals feeding on these plants, and consequently the ecosystem itself may be affected seriously. In addition, macro algae provide an important habitat for the growth of juvenile fishes.

Ocean acidification is another potential threat to the biodiversity of marine and coastal ecosystems. Carbon dioxide, emitted into the air will be absorbed by the surface ocean eventually. The dissolved carbon dioxide will decrease pH of the seawater. It is reported that the pH of the seawater had been around 8.2 before the industrial revolution, but it is now very close to 8.0 due to the increase of

carbon dioxide in the air from 260 ppm to 380 ppm. The phenomenon (so called ocean acidification) has attracted keen attention of marine biologists in the recent years. Serious impacts are predicted at the concentration of 1000 ppm of carbon dioxide especially for coccolithophores (Riebbessel et al., 2002), sea urchins and snails (Shirayama and Thornton, 2006) and corals as reviewed by Kleypas (2005). If this potential threat to the calcareous organisms will grow, considerable fraction of biodiversity of marine and coastal ecosystem around Japan and in the whole NOWPAP region will be lost.

Korea

Biodiversity in the Korean waters have been altered and degraded in recent years primarily due to human activities. Increasing population in the coastal regions is especially significant, causing severe stress on the coastal marine ecosystems. Approximately 600 million people are living in the region that drains into the Yellow Sea. It is estimated about 33% of the total population of Korea live in the coastal regions. Various chemical agents related to human activities are transported to the sea via various routes: river discharge, air, oil spills, sewage, etc. Chemical agents include nutrients, heavy metals, synthetic organics, and volatile organic compounds. These chemicals have caused major degradation of water quality and eutrophication in some coastal areas around Korea and could affect the productivity, viability, and biodiversity of marine organisms.

Many years of aggressive landfill and reclamation work have filled out the curvatures and straightened the coastal line. Approximately 2,393 km² of the tidal flats exist in the western and southern coastal areas of Korea, and many of them are recognized as internationally important wetlands. During the last three decades, the total area of the coastal wetland has been continuously shrunk, particularly in the western coast of Korea, mainly due to intensive development for industrial, agricultural and commercial uses. Large areas of tidal flats existed near many rivers that flow into the Yellow Sea. If the Saemangeum Reclamation Project takes place as it is planned, the Han River estuary will be left as the only extensive estuarine tidal flat in its natural state.

Most commercial fisheries resources in Korean waters, particularly in the Yellow Sea, are overexploited and cannot be sustainable under the current level of fishing intensity. Due to the intense Korean and Chinese fishing activities since the 1980's, annual catches in the region have increased rapidly. For example, the Chinese catch in the Yellow Sea and the East China Sea was 1.5 million ton in 1970. But it had doubled by 1990 (Zhang & Kim, 1999). Furthermore, recent Chinese statistics indicates the total catch of pelagic fish was 5.8 million ton in 2000, which was about 40% of the total Chinese marine catch (Tong & Tang, 2002). Annual Korean catches in the Yellow Sea and the East China Sea have also increased significantly, from 210 thousand tons in the early 1960s to 1,537 thousand tons in 1986. But total catches started to decrease after mid-1980s, and recently settled at a level of 1,000 thousand tons. Shifts in species dominance due to overexploitation are outstanding in the Yellow Sea. Since 1960s, larger-size, high-trophic, and high-value species have been gradually replaced by small, low-value fish resulting in the decreased quality as well as the yields of fisheries of the Yellow Sea.

Russia

The sources of the pollution of the coastal environment in the eastern part of the NOWPAP region are municipal and industrial waste waters, polluted river flow and atmospheric transport of contaminants, dumping dredged material, discharges from ships. In the last years, one more source of pollution not considered earlier - transboundary transfer of pollutants from the adjacent to Russia countries along the channels of rivers flowing into the Russian territorial waters - was revealed in the Russian Far East. The construction and operation of the oil-producing complex objects as well as the planned construction of the oil-pipeline "Eastern Siberia - Pacific Ocean" are the real hazard to the coastal ecosystems of the Far Eastern seas. To a greatest extent, the technogenic influence on the shore was related to the hydroengineering construction. Within the limits of Vladivostok city, the natural geosystems were completely substituted by the technogenic ones along the 12% of the city coastline. The construction of piers, recreation zones, embankments, industrial structures, demanded the landfilling of the shallow water areas, cutting of capes, change of the coastline. The municipal garbage landfill on the shore of the Ussuriysky Bay is a source of pollution by solid domestic waste and toxic compounds coming directly to the sea.

A problem of appearance of alien species today is one of the most important ecological problems. For the last 50-60 years, in connection with the maritime transportation intensification in different regions of the World Ocean, the events of introduction of the exotic species became more frequent and sometimes result in the major changes of fauna composition. In the last years, 25 species (12 new species for the seas of Russia) of potentially toxic diatoms and dinoflagellates were found in the Peter the Great Bay. The major source of the invasion of toxic aquatic plants is the ballast waters of ships. The genetic methods showed that the toxic clones of the microalga *Alexandrium tamarense* found in Primorye belong to the Japanese culture.

The other problem is related to the invasion of small opportunistic species, expansion of their areals and substitution of mass benthos species by them. Since the 1970-80's, the ecologically-flexible species, earlier considered to be rare, have widely settled in the coastal zones near populated and industrial centers. The basic reason of this phenomenon is evidently related to the growth of the anthropogenic load on the marine environment as a result of which resulting in increase in the total pollution level and destruction of biotopes.

4.5 Status of Marine and Coastal Biodiversity Conservation

The coasts of seas and oceans are attractive not only from the viewpoint of their further development by the people but also as the territories of the extraordinary natural riches and diversity. Significant efforts for marine and coastal biodiversity conservation are undertaken now in all countries of NOWPAP region. Authorities understand importance of this problem and nowadays the considerable amount of laws and regulations dedicated to marine pollution control, exotic species prevention, marine and coastal resources exploitation and biodiversity conservation were issued. Besides, some state natural reserves and marine parks, marine and coastal protected areas were established in countries of

the NOWPAP region. Their primary activities are aimed not only for protection of biodiversity, but also for description of marine and island biocenoses and their changes as a result of natural processes and anthropogenic influence; development of scientific basis for preservation and restoration of biocenoses (ultimately, for gene pool preservation); promotion of the wildlife management by organizing museums and exhibitions, publishing scientific and popular articles, etc.

China

With its demands for massive marine and coasts development, Chinese government has issued a series of laws and regulations on marine and coastal protection and management in recent years. These documentations, such as the Outline of Marine Economy Development Plan, the Outline of China Aquatic Racecourses Conservation Action Plan, and Yangtze River and Abuttal Maritime Space Cleaning Action Plan, are important to marine biodiversity conservation, especially for fishing yield control. These documents provide a strong tool in marine pollution control, exotic species prevention, marine and coastal resources exploitation and biodiversity conservation.

Biodiversity monitoring is also an important part of marine biodiversity conservation in China. In 2002, specific survey of national typical marine ecosystems was implemented in China marine territory, aiming at typical ecosystems and related exploitation activities in offshore zone. State Oceanic Administration (SOA) and its partners in the field of environmental protection, such as State Environmental Protection Administration (SEPA), also set up national offshore ecological monitoring networks from 2004, covering estuaries, gulfs, wetlands, mangroves, sea grass and other marine and coastal ecosystems.

Since 2001, continuous fishery resource surveys and monitoring are being done in the marine realm of China. The environmental parameters of over 30 spawning grounds, feeding grounds, migrating corridors, natural reserves and mariculture grounds are monitored. China has strengthened the protection of fishery resources using variety of means since 1999. Fishery agencies also introduced fishing forbidding periods and forbidding areas in the Yellow Sea.

China strictly controls waste water discharges and marine dumping in recent years for prevention of pollution in Chinese marine and coastal areas, e.g., the Program of Marine Dumping Area Selection was published in 2004. The ports are required to construct waste reception facilities. These actions and measures protect benthos communities and reduce the anthropogenic impact on ecosystems.

The management of marine and coastal natural reserves is strengthened in recent years. The agencies which are concerned about marine and coastal biodiversity conservation make a distinct progress on conservation of marine species: 90 marine and coastal natural reserves were established in China coastal zone and marine territory in 2004 to protect the rare and endangered marine species. Marine fisheries industry is also under strict supervision in recent years: fishery permission management system is established in the coastal provinces.

Japan

Many efforts have been spent to conserve the marine and coastal biodiversity around Japan. The most distinct accomplishment as a result of such efforts can be seen in the Seto Inland Sea (located

outside the NOWPAP sea area). The marine ecosystem in the sea was under heavy threat by frequent red tides due to eutrophication in 1960's. However, as a result of strict state regulation of discharge of nutrients into the rivers and the sea, the environmental situation of the sea recovered recently, and the frequency of red tides was reduced in half comparing with the peak period.

Establishment of marine park areas around Japan also can be evaluated as an effort to conserve the marine and coastal biodiversity around Japan. A total of 88 marine park areas have been assigned until 2007, and the total area under protection is as large as 2795 km². In these protected areas, human activities such as building construction are limited, and the biodiversity within these areas is expected to be conserved better than in the other areas.

Korea

Korean government has been attempting to conserve marine and coastal biodiversity through designating Marine Protected Areas (MPAs), Ramsar sites, natural monument sites, and national marine parks. The laws and regulations related to marine environmental protection and natural reserves are Wetland Conservation Act, Natural Environment Preservation Act, Wildlife Preservation and Game Act, Marine Protected Area Act, Marine Pollution Protection Act, Coastal Zone Management Act, etc.

Marine and coastal protected areas designated by the government so far are as follows:

- 10 Fisheries Resources Protected Areas,
- 6 Wetland Protected Areas,
- 6 Ecosystem Conservation Areas,
- 4 Marine and Coastal Parks,
- 155 Special Islands (uninhabited islands),
- 476 Marine and Coastal Wildlife Protected Areas,
- 6 Marine Natural Heritage Protected Areas,
- 4 Marine Environment Protection Areas,
- 5 Specially Managed Marine Areas,
- 1 "Man and Biosphere" Protected Area of UNESCO.

Marine Protected Areas (MPAs) in Korean waters include tidal flat, sand dune, rock, uninhabited and inhabited island, and underwater area. There are 15 laws for the MPAs which are mainly administered by the four ministries. Ministry of Construction and Transportation has law concerning planning and uses of land, and designates and manages to protect fisheries resources. Ministry of Maritime Affairs and Fisheries (MOMAF) have laws on fisheries, mariculture, marine pollution, coastal zone management, etc. Ministry of Environment (ME) is responsible for the laws on wetland conservation, conservation of natural environment, natural parks including marine parks, protection of islands, wetland marine birds, etc.

Protected areas and territories of Republic of Korea are listed in Table 1, 2, 3, 4, 5, 6, 7 and 8 of the national report of Korea.

Russia

At present, the coasts of Russia have 15 existing state natural reserves and 2 national parks with total area of more than 12 million ha; 15 planned state natural reserves with total area of more than 7 million ha; network of the strictly protected natural territories coming under the protection in accordance with the Ramsar Convention. However, only three state natural reserves in the country were specially established for protection of the natural complexes of the sea coasts or species living in the sea: Far-Eastern Marine Reserve, Komandorskii and Vrangel Island (last two are located outside NOWPAP sea area).

Far Eastern State Marine Nature Biospheric Reserve was established in 1978 within the system of the Russian Academy of Sciences. It is located in the Peter the Great Bay. The management of the Reserve activity has been assigned to the Institute of Marine Biology. More than 3,300 species - both marine and terrestrial - are represented. The primary goals of the reserve are: protection of the reserved territory and water area; description of marine and island biocenoses and their changes as a result of natural processes and anthropogenous influence; development of scientific basis for preservation and restoration of biocenoses aimed at the gene pool preservation; promotion of the wildlife management by organization of a museum and exhibitions, publication of the scientific and popular articles and brochures about the sea nature and its preservation.

State Marine Partial Reserve "Vostok Bay" was established in 1989. It is located in the Peter the Great Bay, eastern area of the NOWPAP region. Partial Reserve was created by the initiative of the Institute of Marine Biology. It is aimed for preservation of the Vostok Bay natural complexes in their native-state conditions; for studying, preservation and reproduction of the water biological resources of the bay, valuable water objects and ecological systems; maintenance of the ecological balance and rational use of natural resources as a combination of the protected objects, mariculture plantations and a recreation zone within one water area. The security zone of the Partial Reserve represents a 500 m coastal area. The total number of marine and terrestrial organisms in the Reserve exceeds 2,600 species.

5. Current Status of Data and Information on Coastal and Marine Biodiversity

The monitoring of conditions of marine and coastal ecosystems, acquisition of data and their analysis are mainly carried out by the state organizations in the countries of the NOWPAP region. They are represented by great number of academic or research institutes, national centers, agencies, universities and museums. The biological investigations in the institutes are carried out by the scientists organized in the sections, laboratories and separate groups of the skilled specialists. The studies are performed in accordance with the state and regional programs and contracts with the interested organizations. The research ships are used for making most of observations. The processing of data acquired is performed in the specialized laboratories aboard ships or on the shore. The data systematization by individual lines of research (zooplankton, phytoplankton, benthos, nekton, marine mammals, birds etc.), formation and maintenance of biological data bases is being made by the leading specialists of the appropriate working groups in the institutes. The articles, monographs, reports and other information products are published as results of investigations. There are several taxonomic and

literature databases on marine species and biodiversity in research institutions and centers. Many international and national on-going projects, workshops and training courses concerning the investigations of the marine and coastal diversity are realized in the countries of the NOWPAP region.

5.1 Data Collection and Observation on Coastal and Marine Biodiversity

China

China National Environmental Monitoring Centre (CNEMC), SEPA

Address: No.1 Yuhuanlu, Chaoyang District, Beijing 100029, China

Tel: [86] (10) 8465-3808

Fax: [86] (10) 8465-4244

Email: webmaster@cnemc.cn

URL: <http://www.cnemc.cn>

Main activity: The Centre provides support and service for SEPA on environmental supervision and management, play roles as network centre, information centre and training centre in the national environmental monitoring system. CNEMC is responsible for collecting, archiving, managing, analyzing national environmental monitoring data, and publishing the State Environment in China annually.

Data observation system: monitoring

Data types and amounts: Environmental monitoring data

National Marine Data & Information Service (NMDIS), SOA

Address: No. 93, Liuwei Road, Hedong District, Tianjin 300171, China.

Tel: [86] (22) 2401-0802

Fax: [86] (22) 2401-0926

Email: zhxc@mail.nmdis.gov.cn

URL: http://www.nmdis.gov.cn/nmdis_e.html

Main activity: responsible for managing and distributing data and information concerning the marine environment. As a National Oceanographic Data Center, NMDIS maintains and develops the national marine database. Besides providing marine data and information services, NMDIS also providing technical support for national marine economic development, sea area management, marine environmental protection, and marine research community.

Data observation system: monitoring

Data types and amounts: Environmental monitoring data

National Marine Environmental Monitoring Centre (NMEMC), SOA

Address: No. 42, Linghe Road, Shahekou District, Dalian, Liaoning 116023, China

Tel: [86] (411) 467-1429

Fax: [86] (411) 467-2396

Email: nmemc_web@nmemc.gov.cn

URL: <http://www.nmemc.gov.cn>

Main activity: responsible mainly for both the professional and technological management for China marine environmental monitoring and the research on marine environmental protection.

Data observation system: monitoring

Data types and amounts: Environmental monitoring data

The First Institute of Oceanography (FIO), SOA

Address: No. 6, Xianxialing Road, Gaokeyuan, Qingdao, Shandong, 266061, China

Tel: [86] (532) 8896-3909

Fax: [86] (532) 8898-3909

Email: pingyin@fio.org.cn

URL: <http://www.fio.com.cn/>

Main activity: providing information and services for SOA in marine biology, marine ecology, marine chemistry and marine biotechnology and improving the decision-making ability of SOA.

Data observation system: monitoring

Data collection methods: field works

Data types and amounts: Marine environmental data; marine red tide hazards data.

China and Korea Jointly Oceanography Research Centre (JORC), SOA

Address: No. 6, Xianxialing Road, Gaokeyuan, Qingdao, Shandong, 266061, China

Tel: [86] (532) 8896-4987

Fax: [86] (532) 8896-4779

Email: postmaster@ckjorc.org

URL: <http://www.ckjorc.org>

Main activity: education, workshops, conferences and training services, ensuring the data and new settlement in marine and coastal sciences; promotes the Yellow Sea biodiversity survey of both China and Korea, and improves the resources exploitation and environmental protection management in the Yellow Sea.

Data observation system: monitoring

Data collection methods: field works

Data types and amounts: marine and coastal research data

The Second Institute Oceanography (SIO), SOA

Address: No. 36, Baoshubei Road, Hangzhou, Zhejiang, 310012, China.

Tel: [86] (571) 8806-4173

Fax: [86] (532) 8807-1539

Email: swl@sio.zj.edu.cn

URL: <http://www.sio.org.cn/html/en/>

Main activity: provides information and services to SOA and public with investigation, survey, forecast and basic applied research in resources and environment of the China oceans; research of the ecological process of the seas, especially in chlorophyll and primary productivity, the food chain, plankton, algae and ecological dynamics study.

Data observation system: monitoring

Data collection methods: field works

Data types and amounts: marine geological, hydrological and biological data

Institute of Oceanology, Chinese Academy of Sciences (IOCAS)

Address: No. 7, Nanhai Road, Qingda, Shandong, 266071, China.

Tel: [86] (532) 287-9062

Fax: [86] (532) 467-0882

Email: iocas@ms.qdio.ac.cn

URL: <http://www.qdio.ac.cn>

Main activity: research of marine biota, seaweed chemistry, experimental marine biology, mariculture biology, marine bio-technology, marine ecology, ocean circulation and atmosphere, marine chemistry, marine geochemistry, and chemical oceanography, etc.

Data observation system: monitoring

Data collection methods: field works

Data types and amounts: marine geological, hydrological and biological data

The Yellow Sea Fisheries Research Institute Chinese Academy of Fishery Sciences (YSFRI),

MOA

Address: No. 106, Najing Road, Qingdao, Shandong, 266071, China

Tel: [86] (532) 8584-4718

Fax: [86] (532) 8581-1514

Email: webmaster@ysfri.ac.cn

URL: <http://www.ysfri.ac.cn>

Main activity: providing information and services for MOA in marine biology, mariculture and fishery management and fishery diseases to improving the decision-making ability of MOA.

Data observation system: monitoring

Data collection methods: field works

Data types and amounts: fishery database

Ocean University of China (OUC)

Address: No. 5, Yushan Road, Qingdao, Shandong, 266003, China

Tel: [86] (532) 8203-2436

Fax: [86] (532) 8203-2805

Email: waishi@ouc.edu.cn

URL: <http://www.ouc.edu.cn/index.htm>

Main activity: education in marine and coastal sciences; participation in the projects of marine biology survey, marine medicine study, coastal zone management, aquaculture management.

Data observation system: monitoring

Data collection methods: field works

Data types and amounts: marine and coastal biodiversity data.

Institutions/Organizations collecting Data and Information on Coastal and Marine Biodiversity in People's Republic of China are listed in the table 2 of National Report of China.

Japan

There are two major governmental bodies that are doing monitoring of environmental condition of marine and coastal ecosystems around Japan. One is the Ministry of Environment and the other is the Japan Coast Guard.

The Ministry of Environment has carried out marine environment monitoring program for more than 30 years. Unfortunately the results of the monitoring are open to public only via document, and database is not prepared yet.

The Japan Coast Guard has been carried out monitoring of environmental condition of marine and coastal ecosystems. Major target of monitoring is physical-chemical parameters. They have been measuring not only temperature, salinity etc. but also contents of heavy metals etc in the sea water. The results of these measurements are uploaded to their own database named JODC (Japan Oceanographic Data Center). Also their data are sent to US NODC (National Oceanographic Data Center), and again data are open to public through their server, too. The JODC also has biological data. The major information came from biological surveys carried out for research purpose. The biological information also is open to public through US NODC.

The Fisheries Agency of Japan also has good information regarding the biodiversity of marine and coastal ecosystem around Japan. However, due to several reasons, the results are not open to public.

Japan Oceanographic Data Center (JODC)

Address: 5-3-1, Tsukiji, Chuo-ku, Tokyo 104-0045, Japan

Telephone: +81-3-3541-4295

Fax: +81-3-3545-2885

E-mail: mail@jodc.go.jp

Website URL: <http://www.jodc.go.jp/>

Main activity: synthetic marine data bank of Japan in acquisition of marine data obtained by various marine research institutes and organizations concerned in Japan and in providing users with these data.

Data collection methods: JODC collects observation data from Japanese research organizations and institutes. Marine organisms' observation data are submitted by Ministry of Agriculture, Forestry and Fisheries of Japan, Japan Meteorology Agency, Ministry of the Environment, Local Governments, and etc.

Data types and amounts: JODC sorts the data using their own taxonomic code that covers 8,088 marine organisms. The data stored in their database is as many as 47,000 stations approximately.

Fish Database of Japan (UODAS)

Nine institutions are working together to create UODAS.

The chief of this database is Prof. Keiichi Matsuura of National Science Museum Tokyo. The contact information is as follows:

Address: 3-23-1 Hyakunin-cho Shinjuku-ku, Tokyo 169-0073 Japan

Phone: +81-3-5332-7167

FAX: +81-3-3364-7104

E-mail: matsuura@kahaku.go.jp

<http://fishdb.kahaku.go.jp/cgi-bin/WebObjects/ichthy1.woa>

The main activity: UODAS creates a collection database of Japanese museums. It also has Map Database produced on the basis of information from the Collection Database; and the Type Specimen Database.

Data observation system: UODAS does not have its own data observation system.

Data collection methods: The data were collected through contribution of each museum. Recently most museums have its own collection database so as to help curators' management work of specimens. The UODAS initiative collects the information of these databases and modifies the data into united data structure.

Data types and amounts: The data consists of Collection Database and image database of each species. The Collection Database including fish specimen data from approximately 250,000 lots. UODAS also has type specimen database so as to facilitate loan of type materials from museums to facilitate taxonomic studies.

Ocean Biogeography Information System (OBIS)

The main office of OBIS is situated in Rutgers, The State University of New Jersey. The address is New Brunswick, New Jersey, USA. The contact should be done by e-mail: obissupport@marine.rutgers.edu.

The Ocean Biogeography Information System (OBIS) is the information component of the Census of Marine Life (CoML), a growing network of more than 1000 researchers in 73 nations engaged in a 10-year initiative to assess and explain the diversity, distribution, and abundance of life in the oceans - past, present, and future. OBIS is a web-based provider of global geo-referenced information on marine species.

The main activity: OBIS provides, on an 'open access' basis through the World Wide Web: taxonomically and geographically resolved data on marine life and the ocean environment; interactivity with similar databases; access to interactive physical oceanographic data at regional and global scales; software tools for biogeography analysis.

Data observation system: OBIS itself does not have its own data. It is a portal site that will search existing database that is recognized as OBIS data sources (table 1 of National Report of Japan).

Data collection methods: OBIS is structured as a federation of organizations and people sharing a vision to make marine biogeographic data, from all over the world, freely available over the World Wide Web through the OBIS Portal.

Data types and amounts: OBIS now has total records in cache of 10,111,509 from 146 data sources.

Korea

National Fisheries Research and Development Institute (NFRDI) is responsible for periodically collecting data and information from the Korean waters and disseminating to the public. Data and samples are gathered from the east, west and south coasts of Korea 6 times a year, and 4 times a year for the East China Sea. Other national and private centers or museums also collect biological data from the sea. Universities with Department of Biology are known to have data collection.

National Fisheries Research and Development Institute (NFRDI)

Address: 408-1 Sirang-ri, Gijang-eup, Gijang-gun, Busan

Telephone: 82-51-720-2210

Website URL: <http://www.nfrdi.re.kr>

Main activity: research

Data observation system: monitoring

Data collection methods: field work

Korea Marine Microalgae Culture Center

Address: Pukyong National University, Dept. of Aquaculture, 599-1 Daeyeon-3-dong, Nam-gu, Busan

Telephone: 82-51-620-6099

Fax: 82-51-623-8293

E-mail: service@kmcc.re.kr and algae@kmcc.re.kr

Website URL: <http://www.kmcc.re.kr>

Main activity: collection of microalgae, research

Data observation system: none

Data collection methods: donation and field work

Data types and amounts: about 1,000 species of microalage

Seoul Science Museum

Address: 2 Waryong-dong, Jongro-gu, Seoul

Telephone: 82- 2-3668-2200

Fax: 82-2-3668-2246

Website URL: <http://www.ssm.go.kr>

Main activity: Exhibition, education, research

Data collection methods: donation, field work

Data types and amounts: Coral and shellfish 292 species, fishes 93 species, crustaceans 34 species, echinodermata 9 species

National Science Museum

Address: 32-2 Gu Sung-Dong, Yusung-gu, Daejeon

Telephone: 82-42-601-7894

Website URL: <http://www.science.go.kr>

Main activity: Exhibition, education, research

Data observation system: none

Data collection methods: donation, field work

Data types and amounts: fishes - 174 species, crustaceans - 65 species

Hannam University Natural History Museum

Address: 133 Oijeong-dong, Daedeuk-gu, Daejeon

Telephone: 82-42-629-7114

Website URL: <http://www.hannam.ac.kr>

Main activity: Exhibition, education, research

Data observation system: none

Data collection methods: donation, field work

Data types and amounts: 1,482 species of invertebrates and 145 species of fishes including marine

Kyung Hee University National History Museum

Address: 1 Hoigi-dong, Dongdaemun-gu, Seoul

Telephone: 82-2-961-0143

Fax: 82-2-961-9321

Website URL: <http://nhm.kyunghee.ac.kr>

Main activity: Exhibition, education, research

Data observation system: none

Data collection methods: donation, field work

Data types and amounts: fishes 343 specimens, shellfish 1507 specimens, coral 23 specimens

Ewha Womans University National History Museum

Address: 11-2 Daehyun-dong, Seodaemun-gu, Seoul

Telephone: 82-2-3277-2114

Website URL: <http://nhm.ewha.ac.kr>

Main activity: Exhibition, education, research

Data observation system: none

Data collection methods: donation, field work

Data types and amounts: 1,577 species of invertebrates including marine

Ennam Museum

Address: 16-1 Gusu-dong, Mapo-gu, Seoul

Telephone: 82-2-716-5302, 82-2-714-5670

Fax: 82-2-703-5397

Website URL: <http://huniv.hongik.ac.kr>

Main activity: Exhibition

Data observation system: none

Data collection methods: donation

Data types and amounts: 200,000 specimens of shellfish including marine

Busan Marine Natural History Museum

Address: San 13-1, Oncheon-1-dong, Dongrae-gu, Busan

Telephone: 82-51-553-4944

Fax: 82-51-554-1552

Website URL: <http://sea.busan.go.kr>

Main activity: Exhibition

Data observation system: none

Data collection methods: donation

Data types and amounts:

Fisheries Science Museum

Address: 408-1 Sirang-ri, Gijang-eup, Gijang-gun, Busan

Telephone: 82-51-720-3061

Fax: 82-51-720-3069

Website URL: <http://fsm.nfrda.re.kr>

Main activity: Exhibition

Data observation system: none

Data collection methods: donation, field work

Data types and amounts: 7,384 items covering 1072 species

Russia

The observations of the state of the marine and coastal biota, acquisition of data and their analysis are carried out by the state organizations. They are represented by the institutes of the Academy of Sciences, Fishery Agency of the Ministry of Agriculture, Federal Service for Hydrometeorology and Environmental Monitoring, Ministry of the Science and Education. Pacific Scientific Research Fisheries Center (TINRO-Center) is responsible for periodically collecting data and information from the Russian waters of NOWPAP region. Data and samples are gathered from the eastern part of the NOWPAP region once a year.

Institute of Marine Biology (IMB) is involved into the Far Eastern Branch, Russian Academy of Sciences (FEB RAS):

17 Palchevskogo Street, Vladivostok, 690041, Russia

Tel: [7] (4232) 310 905

Fax: [7] (4232) 310 900

E-mail: inmarbio@mail.primorye.ru

URL: <http://www.imb.dvo.ru>

Main activity: studying of flora and fauna, ecology and bioproductivity of shelf of the Far Eastern Seas and adjacent areas of the Pacific Ocean; development of scientific bases of protection, reproduction and rational use of alive resources of the shelf zones; research of adaptation and evolution of marine organisms.

Data observation system: monitoring

Data collection methods: field work

Data types and amounts: collections of biological samples and base of data about species composition.

V.I. Il'ichev Pacific Oceanological Institute (POI) is involved into the Far Eastern Branch, Russian Academy of Sciences (FEB RAS):

43 Baltiyskaya Street, Vladivostok, 690041, Russia

Tel: [7] (4232) 311-400

Fax: [7] (4232) 312-573

URL: <http://www.poi.dvo.ru>

Main activity: complex hydro-physical, hydro-chemical and hydro-biological studies of the ocean and sea water masses, their physical fields, some parameters, energy and mass exchange and interaction of the ocean and atmosphere, marine ecosystem state; studies of geology, geophysics and mineral resources of the Pacific Ocean.

Data observation system: monitoring

Data collection methods: field work

Data types and amounts: oceanographic data bases.

Pacific Scientific Research Fisheries Center (TINRO-Center), Federal Agency on Fisheries:

4 Shevchenko Alley, Vladivostok, 690950, Russia

Tel: [7] (4232) 400-921

Fax: [7] (423) 300-751

E-mail: tinro@tinro.ru

URL: <http://www.tinro-center.ru>

Main activity: monitoring of state and dynamics of marine ecosystems, climatic processes, and anthropogenic impact on marine bioresources.

Data observation system: monitoring

Data collection methods: field work

Data types and amounts: collections of biological samples, base of data about species composition and oceanographic data bases

Far Eastern Regional Hydrometeorological Research Institute (FERHRI), Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet):

24 Fontannaya Street, Vladivostok, 690091, Russia

Tel: [7] (4232) 269-788

Fax: [7] (4232) 227-754

E-mail: hydromet@ferhri.ru

URL: <http://rus.ferhri.ru>

Main activity: researches on meteorology, oceanography, land hydrology, climate and ecology (including measurements of the pollutant content in the sea water and bottom sediments, plankton and benthos characteristics) of the Russian Far East, Northwest Pacific Ocean and its marginal seas.

Data observation system: monitoring

Data collection methods: field work

Data types and amounts: meteorology, oceanographic and ecology data bases

Far Eastern National University (FENU), Ministry of Science and Education

8 Sukhanova Street, Vladivostok, 690950, Russia

Тел:[7] (4232) 433-280

Факс: [7] (4232) 432-315

E-mail: rektorat@dvgu.ru

URL: [http:// www.dvgu.ru](http://www.dvgu.ru)

Main activity: wide range of investigations in the natural and social sciences. In the cooperation with the IMB (Institute of Marine Biology) and TINRO-Center, the scientific-educational center "Marine Biota" performing not only educational but also research functions acts.

Data observation system: monitoring

Data collection methods: field work

Data types and amounts: collections of biological samples and base of data about species composition.

Pacific Institute of Geography (PIG), Far Eastern Branch, Russian Academy of Sciences (FEB RAS):

7 Radio Street, Vladivostok, 690041, Russia

Tel: [7] (4232) 320-672

Fax: [7] (4232) 312-159

E-mail: geogr@tig.dvo.ru

URL: <http://www.tig.dvo.ru>

Main activity: studying of structure and geosystems dynamics of different types; estimation of natural resources and their territorial combinations; decision of regional problems of rational nature management; studying of territorial structures of economy; creation of geoinformation systems.

Data observation system: monitoring

Data collection methods: field work

Data types and amounts: ecology data bases

All-Russian Research Institute of Fisheries and Oceanography (VNIRO), Federal Agency for Fisheries, Ministry of Agriculture:

17 V.Krasnosel'skaya, Moscow, 107140, Russia

Тел: [7] (495) 264-93-87

Факс: [7] (495) 264-91-87

E-mail: vniro@vniro.ru

URL: <http://www.vniro.ru>

Main activity: improvement of the methodic principles of the resource and fundamental investigations in the field of biology, fishery theory, theory of the functioning of the ecosystems, biotechnology and industrial aqua- and mariculture; complex study of the marine ecosystems and coastal zones of the Russian seas; ecologo-toxicological study of the fishery water bodies, working out of standards and measures directed to the pollution prevention;

Data observation system: monitoring

Data collection methods: field work

Data types and amounts: collections of biological samples, base of data about species composition and oceanographic data bases

5.2 Data and Information Products Related to Coastal and Marine Biodiversity

China

• Database for marine functional ecosystems (title, time period and update frequency, coverage, storage location, accessibility and access method, URL, etc.)

Biodiversity Clearing-House Mechanism of China—Marine Node is a website designed and established by National Marine Data & Information Service (NMDIS), State Oceanic Administration (SOA) in 2003 to implement Convention of Biological Diversity (CBD), for sharing biodiversity data and information between CBD implementation countries, and making these data available to the public. The database of the website includes the following data and information:

- Introduction of the History and Background of CBD;
- Introduction of Conventions of Parties (COP);
- Introduction of National Biodiversity Clearing-House;
- Strategies and Action Plans of Biodiversity;
- Status, Threats and Trends of marine and coastal biodiversity;
- Marine Database System, including marine resources, environment parameters, marine economy statistics, legislations and ARGO database;
- Introduction of Marine and Coastal Natural Reserves;
- Laws, Legislations and regulations;
- Marine Biology Introduction, including the animals classified into National Grade I & II Protected animals, marine mammals, the Red Tide biology, etc.

China Oceanography Scientific Database is an online data and information acquiring system which managed by China Academy of Sciences. The database is comprised of the hydrological, geological and biological data of China offshore and Northwest Pacific Ocean. The contents of the database are shown as following:

- Marine plant species data, including plant taxonomy information, common & scientific name, sampling date and location, etc;
- Benthos data of the Yellow Sea and the East China Sea, including the information of key fauna which represent benthos species diversity of the Yellow Sea and the East China Sea;
- Fauna and samples data of the Yellow Sea and the Bohai Sea, including the information of key fauna which represent species diversity of the Yellow Sea and the Bohai Sea. The database also provide the pictures of samples;
- Rare and endangered marine species data, the information of the distribution and conservation;
- Economically important species (i.e. fishes, shrimps, mollusks, algae), the information of species, distribution, exploitation status, yield, etc.
- Mariculture fishes and other species resource data, including exotic species data. The database consists of the feeding parameters and image data of mariculture species;

- Marine biology sample data, the database lists the taxonomy and related information of over 1000 samples.

Marine Science Data Sharing Platform is an online marine data and information database which supported by National scientific data sharing project of Ministry of Sciences and Technology (MOST). The database collects data and information related to coastal and marine biodiversity from Institute of Oceanology, Chinese Academy of Sciences (IOCAS), The Yellow Sea Fisheries Research Institute Chinese Academy of Fishery Sciences (YSFRI), Ocean University of China (OUC) and other related institutes. The contents of marine biology database of the platform include the most data and information which are comprised in the biological database of China Oceanography Scientific Database. The exotic species which introduced for aquiculture use and the national and provincial legislation and technical standards for aquiculture production and trading are also listed in the platform.

Marine Sciences Database is a database which developed and managed by YSFRI, MOA. It is a professional database provides data and information on marine mariculture and related standards & legislations, germplasm resources, aquiculture trading and exotic species.

The database consists of five sub-databases: the Official Evaluation & Discussion Database of Fishery Technical Trading; the Mariculture Technique Database; the Germplasm Resources Database; the Marine Biology Basic Information Database; and the Exotic Species of Aquiculture Database. The database have the basic information of over 70 exotic species for aquiculture production.

Inventory of Data and Information Products Related to Coastal and Marine Biodiversity is quoted in the table 3 of National Report of China.

Japan

- Reports, atlas, CD-ROM and other publications or brochures in electronic and printed visions

As a report, Japan Oceanographic Data Center (JODC) publishes JODC Taxonomic Code of Marine Organisms (Plankton) (electronic and printed version). It does not have atlas and CD-ROM.

- Software's and their application

In the OBIS WEB site, several applications are prepared. CMAR C-Squares Mapper provided by the CSIRO Marine and Atmospheric Research is a web utility which plots dataset extent on a range of base maps, according to a string of c-squares (unique identifiers for global grid squares) passed to it via the web. The Environmental Analysis System (EASy) is an advanced, PC-based Geographical Information System designed for the storage, dissemination, integration, analysis and dynamic display, of spatially referenced series of diverse oceanographic and biogeographic data. Syngraph is a relational database application that allows linkage of any published name to any other using a lexicon of modifiers that are conventional in taxonomy, anchoring each use to its bibliographic reference. The LoiczView web-based geospatial cluster analysis, statistical, and visualization tool is available to OBIS users via the partnering arrangements between the Hexacoral project, IGBP-LOICZ, and the developers.

- Taxonomic database for species (title, time period and update frequency, coverage, storage location, accessibility and access method, URL, etc.)

Title: JODC Taxonomic Code of Marine Organisms

Time period and update frequency: irregular

Coverage: plankton in the adjacent seas of Japan

Storage Location: JODC's database

Accessibility and access method: via the internet.

URL : http://jdoss1.jodc.go.jp/2001/organism_taxonomic/index.html

JODC Taxonomic Code of Marine Organisms contains 8088 species (including eggs and larvae) in the sea areas around Japan.

Taxonomic information accessible in OBIS exceeds 10 million records now. It covers whole globe. OBIS is a portal, that let users to access all databases contributing data to it. The URL of OBIS is <http://www.iobis.com/>

• Database for marine functional ecosystems (title, time period and update frequency, coverage, storage location, accessibility and access method, URL, etc.)

Fish Database of Japan UODAS

UODAS has three databases. The Collection Database including fish specimen data from approximately 250,000 lots; the Map Database produced on the basis of information from the Collection Database; and the Type Specimen Database.

Russia

• Reports, atlas, CD-ROM and other publications or brochures in electronic and printed visions

The most known periodic Russian Journals in the area of NOWPAP are "Okeanologiya (Oceanology)", "Izvestiya TINRO (Proceedings of TINRO)" and "Biologiya morya (Marine Biology)". Since 1988, the last journal is published in two languages (Russian and English). The journal is available through the site of Institute of Marine Biology (IMB). The large generalizations related to the biological diversity are presented in such monographs as, for example, "Biota of the Russian waters of the Far-Eastern seas". Volumes 1-3. Vladivostok: Dalnauka, 2004-2005 (further volumes are prepared to publication).

Information of CD-ROM has not received for the moment wide acceptance. At present, there is an access to the "Field guide of the species of marine mammals of the Pacific waters of Russia". The copy of CD-ROM is placed in Internet on the pages of site <http://pacificinfo.ru/cdrom/>.

• Software and their application

At present, the maximum development of the software is noted in VNIRO and TINRO-center. There, the programs for recording data in the electronic form for different groups of organisms (fishes, invertebrates, plankton) are developed. Among them are the program "Zooplankton" developed in the TINRO-center and program "CardMaster" generated in the VNIRO. GIS ChartMaster is up to date cartographic software designed for the processing of data provided by the fisheries oceanographic surveys. In the processing and interpreting the data, the modern information technologies are widely used: packages of the statistical processing, geographical information systems. For the Far-Eastern seas and coastal zone of Primorsky Krai, the digital maps (base thematic layers) were prepared which were transferred to the interested organizations by requests. In GIS, the facilities of ArcView, ARC/INFO and the vectorizer Easy Trace are generally used. For the visualization of the processing results, the software Excel and Surfer is also found wide use.

- Taxonomic database for species (title, time period and update frequency, coverage, storage location, accessibility and access method, URL, etc.)

There are several taxonomic databases for species in research institutions listed in the table 1 of National Report of Russian federation.

- Database for literature on marine species and biodiversity

The special site with collected database on literature regarding of biological disciplines does not yet exist. Literature on coastal and marine biodiversity is kept both in public libraries and libraries of different organizations. Each scientific and education organization has its own library. Tens of libraries are located in Vladivostok. The fullest information on them is presented on the next websites:

- The Central Scientific Library of FEB RAS, <http://www.cnb.dvo.ru/> ;
- The State Public Library of Primorye, <http://www.pgpb.ru/> ;
- Scientific-technical Information Center, Marine State University, <http://www.msun.ru/div/subdiv/>.

The most publications regarding of marine and coastal biological objects are in such marine organizations as Institute of Marine Biology (IMB) and TINRO-Center. There are renewing and adding electronic catalogues in the leading libraries. The popular journal "Marine Biology" edited by IBM is accessible through Internet (<http://bm.dvo.ru/>).

5.3 Projects and Their Implementation Related to Data and Information on Coastal and Marine Biodiversity

China

- On-going projects

Ecosystem Dynamics and Sustainable Use of Biological resource in the East China Sea and the Yellow Sea. This project is financed by National Key Basic Research Development Plan. The overall objective of the project is investigating the critical ecosystem dynamics process and biological resource supplement mechanisms of the East China Sea and the Yellow Sea. To achieve the research targets, the research fellows of the project did biological surveys in coastal zone and offshore area several times to collect the species diversity data and information in the area, analysis the species composition, population size and community structure in the ecosystems.

The Yellow Sea Ecoregion Initiative is an international cooperation project financed by World Wildlife Fund (WWF). China, Japan and Korea work together on project. The project is aim at protecting the biodiversity and the habitats along the coast and in the offshore. The governments of China, Japan and Korea realize that it is an urgent need to manage the biodiversity of the Yellow Sea beyond national boundary.

UNDP/GEF Yellow Sea Large Marine Ecosystem Project. The Yellow Sea Large Marine Ecosystem Project is financed by Global Environmental Funding (GEF), and directed by United Nations Development Programme (UNDP) and is implemented by SOA in 1998. The objective of the project is

ecosystem-based, environmentally-sustainable management and use of the YSLME and its watershed by reducing development stress and promoting sustainable exploitation of the ecosystem.

East Asian-Australian Shorebirds Site Network was an initiative of the Asia-Pacific Migratory Waterbird Conservation Strategy: 1996-2000. It was launched in 1996 at the Sixth Conference of Contracting Parties of the Convention on Wetlands (Ramsar, Iran 1971), in Brisbane, with 19 sites from eight countries. The aim of the East Asian-Australian Shorebird Site Network is to promote the conservation and wise use of sites which are of international importance to migratory shorebirds.

Global Ballast Water Management Programme – China. Global Ballast Water Management Programme (GloBallast) is an international cooperative which promoted and financed by International Maritime Organization (IMO), UNDP and GEF, and undertaken by Maritime Safety Administration People's Republic of China (MSA). The objectives of this programme are:

- Developing practical techniques and related equipments for ballast disposal;
- Compiling an integrated standard for ballast disposal;
- Providing assistance to developing countries to overcome the difficulties on implementing resolutions of IMO.

The Survey of pathogens & phytoplankton exotic species in Importing Vessels' Ballast project is a key scientific project of Shandong Province which undertaken by Shandong Inspection and Quarantine Bureau. The project investigates the community structures of pathogens & phytoplankton in importing vessel ballast and the local seawater, discussing the potential impacts of exotic species in ballast to local marine ecosystem. The outcomes of this project provide the directive evidence for hygiene management of importing vessels' ballast and marine biodiversity conservation.

Japan

- On-going projects

The International Oceanographic Data and Information Exchange (IODE) is a project of Intergovernmental Oceanographic Commission (IOC) which was established in UNESCO. IODE was established in accordance with the following recommendations that were made at the first General Assembly in 1961:

- To promote data exchange in the framework of World Data Center (WDC) system under the guidance of the International Council of Scientific Unions (ICSU).
- To promulgate the concept of Declared National Programs (DNP) and National Oceanographic Data Center (NODC) as national activities being carried out with the intention to exchange the data.
 - To standard the format for international exchange of marine scientific data
 - To assist the development of NODC.

The Census of Marine Life (CoML) is a growing global network of researchers in more than 70 nations engaged in a ten-year initiative to assess and explain the diversity, distribution, and abundance of marine life in the oceans - past, present, and future.

Through 2010, scientists worldwide will work to quantify what is known, unknown, and what may never be known about the world's oceans-which comprise more than 70 percent of the Earth's surface

and more than 90 percent of its biosphere. Their answers will help identify threatened species and important breeding areas, helping authorities develop effective strategies for the sustainable management of marine resources.

- Workshops

International Workshop for GODAR-WESTPAC:

The Global Oceanographic Data Archaeology and Rescue project in the Western Pacific (GODAR-WESTPAC) is one of regional project in the Global Oceanographic Data Archaeology and Rescue (GODAR) project which is promoting by IODE. The International Workshop for GODAR-WESTPAC is the workshop to promote GODAR-WESTPAC project. The workshop had been held at JODC, Tokyo (Japan) in March, 2002 and November, 2004.

- Trainings

IOC/WESTPAC training course on NEAR-GOOS data management. JODC has organized IOC/WESTPAC Training Course on NEAR-GOOS Data Management, under the auspices of the UNESCO-Japan Funds-in-Trust. The objective of the training course was to provide personnel involved in the oceanographic management in the region with basic concepts of the IODE system and its function, and the way of acquisition, procession and compilation of oceanographic data. Training for the WESTPAC countries is one important aspect for the NEAR-GOOS operation, so that one of the aims of the training course is to expand the NEAR-GOOS operational system to the entire WESTPAC area. From such view, some lectures were added to the training course, on data flow of NEAR-GOOS and the management of the Regional Real Time DataBase (RRTDB) and the Regional Delayed Mode Database (RDMDDB). 51 trainees participated in 'Short term training course on Oceanographic Data Management', from the year 1982 to 1996. And, 49 trainees participated in the IOC/WESTPAC Training Course on NEAR-GOOS Data Management from 1997 to 2006.

Korea

- On-going projects:

Korean government launched two scientific projects, one since 2005 and the other since 2006, aimed to evaluate the status of marine and coastal biodiversity.

The first is "Korean Marine Ecosystem Survey". Its objectives are i) to evaluate the long-term change in marine ecosystem, ii) to maintain the biodiversity and sustainable marine resources, and iii) to identify ecosystem and select for further study, if necessary, for designation of the marine protected areas.

The second project is "Convention on Biological Diversity". The goals of the project are i) establishment of biogeographical information system of Korean biodiversity, ii) inventory of specific marine and coastal bio-organisms, and iii) establishment of protection policy for biodiversity.

To reduce marine and coastal contamination and eutrophication, three survey programs "Harbor Survey Program", "Coastal and Neritic Area Survey Program" and "Intense Survey programs" are being carried out by NFRDI as a part of MPA monitoring programs of Marine Environmental Protection Areas and Specially Maanaged Marine Areas. Habitat destruction is being managed by imposing sound and

strict Environmental Impact Analysis (EIA), and overexploitation via setting up of sound and reasonable fisheries management policy and scientific programs.

- Workshops:

Recently “The first International Symposium on the Bio-invasion of Non-indigenous Species” was held at the Korea Inter-University Institute of Ocean Science, Pukyong National University, Busan, Korea, 31 July– 2 August 2006.

Russia

- On-going projects

The project “Monitoring of biological diversity of the Far-Eastern seas” is the greatest national project in the Far East. It is performed within the framework of the Federal Target Program “World Ocean” and suggests a carrying out of works concerning the inventory of marine biological resources and integrated study of the marine biological diversity of the Far-Eastern seas as well as the complex analysis and monitoring of all levels of the marine biological diversity in the water areas with the highest diversity of marine organisms.

The TINRO-Center and other fishery research institutes execute the complex 5-year (2001-2006) program of the investigation of bioresources of the Far-Eastern seas, open waters of the Pacific Ocean and coastal waters of the Far-Eastern seas. The similar program will be performed in the next five-year period.

On request of the Primorskii Krai Administration, the program “Basic lines of the development and improvement of the production-economic activity of the Primorsky Krai fishery till 2015” was developed and is performed since 2005.

Since May of 2005, the Scientific-educational center of FENU “Marine Biota” has started to work within the framework of the new research project “Study of the ecological state of the environment and bottom communities in the Kievka Bight (Peter the Great Bay)“.

The greatest international projects with participation of the Russian scientists are below given:

- International Geosphere-Biosphere Programme (IGBP), URL: <http://www.igbp.kva.se>
- Asia-Pacific Network for Global Change Research (APN), URL: <http://www.apn-gcr.org>

- Workshops

More than 20 regional, national and international workshops devoted to different aspects of the research and harvesting of marine biological objects were carried out during the recent five years in Vladivostok.

- Trainings

The Training Course for Young Scientists was held at the Institute of Marine Biology, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, October 24-28, 2005. A total of about 30 persons, consisting of Russian participants from the IBM, Pacific Institute of Geography, Pacific Oceanological Institute (FEB RAS) and Far Eastern National University, 2 overseas participants from China and Korea, and a representative of APN attended.

The extensive experience of the research work is gained by the students and young scientists in the Scientific-educational center (SEC) of FENU “Marine Biota”. On September 14-19, 2001, in this

center, the 5th meeting of the Far-Eastern youth school on the urgent problems of chemistry and biology was held.

From January 20 to 27, 2006, the scientific-educational expedition in which 11 students of the chair of bioorganic chemistry and biotechnology took place in the Marine Experimental station of the Pacific Institute of the Bioorganic Chemistry (PIBOC) of FEB RAS was conducted.

On September 16-23, 2005, at the Marine Experimental station of Pacific Institute of the Bioorganic Chemistry with the support of the Scientific-educational center "Marine Biota", the IX Youth school-conference on urgent problems of chemistry and biology was held.

At present, the field school "Reserved islands of Primorye" is arranged with the support of the Federal Target Program "Integration" within the Far-Eastern state marine reserve.

On the base of the Marine biological station "Zapovednoye" (Primorsky Krai), it planned to establish the research center for carrying out of regional, All-Russian and international scientific studies in the field of marine biology, ecology, biochemistry, botany and zoology as well as integrated studies on the estimation of the biological diversity of the Lazovskiy State Nature Reserve territory and adjacent sea area.

- Metadata

Basic metadata, i.e. information about the data bases and related information, research organizations, methods of observations and data processing, projects, publications etc. are presented in the above sections. The additional information can be found on the pages of the following sites: <http://www.iobis.org> , <http://www.gbif.org> , <http://gcmd.nasa.gov>,[http:// www.nfr.ru/db_detail.htm](http://www.nfr.ru/db_detail.htm), [http://www.pml.ac.uk/globec/.](http://www.pml.ac.uk/globec/)

5.4 Priority Research Fields Related to Existing and Potential Threats to Coastal and Marine Biodiversity

There are three basic directions for prevention of existing and potential threats to coastal and marine biodiversity:

- Reduction of marine and coastal pollution and eutrophication;
- prevention of habitat destruction;
- reduction of overexploitation of fisheries resources.

The following lines of research activities seem to be of priority in the region:

- identification of centers with high species and genetic diversity (biodiversity "hot spots") by integrated studies and inventories of the marine and coastal biota;
- selection of the biomonitoring zones for investigating the biodiversity at all levels;
- preparation of additional guides for biota of the study areas;
- establishment of the banks of genetic data about marine and coastal flora and fauna;
- preparation of proposals and making administrative decisions on the conservation of the coastal and marine biodiversity including the restriction or prohibition of the fishing of individual populations of commercial species.

- Establishment of a regional node of the metadata base in the field of biodiversity.

6. Status of Expertise and Capacity Building in Support of the Marine Diversity Data and Information Research

Strengths

All NOWPAP members have developed (or developing) the system of monitoring of the marine and coastal biodiversity. The specialists of a number of academic and applied research institutes are engaged in studies and conservation of the unique biodiversity of the NOWPAP region. These studies are performed in accordance with the international, state and regional programs as well as using research grants. In the NOWPAP member states, the biological investigations are carried out by the skilled specialists; while making most of observations, the research vessels are being used. The processing of data acquired is performed in the specialized laboratories aboard ships or on the shore. The data systematization by individual lines of research (zooplankton, phytoplankton, benthos, nekton, marine mammals, birds, etc.), formation and maintenance of biological data bases is being performed by the leading specialists of the appropriate institutes. The results of the science activities are the collections of marine and coastal biological species; description of new species; diagnosis and forecast of the state of separate populations; recommendations for the sustainable wildlife management; new guides for the species identification; publications; software and ecosystem model. It appears that NOWPAP member states have ample expertise in marine biodiversity as there are many experts in the field who have been trained at both domestic and foreign universities/institutions.

Weaknesses

As weaknesses regarding expertise and capacity building in support of the marine biodiversity data and information research, three main issues are described below, concerning all NOWPAP members.

The first and the biggest issue is the lack of linkages among databases. As mentioned above, there are many databases regarding biodiversity of marine and coastal organisms in NOWPAP member states. However, due to weak communication among these databases, they do not refer information to each other, and some overlapping of efforts can be seen. If databases are connected to each other, users of these databases could obtain more benefits from them. It concerns taxonomic and literature databases as well as information exchange between research institutes at a regional and international level.

The second weakness is limited resource of experienced taxonomists. Although many taxonomists are active in research institutions and museums of NOWPAP member states, they are biased toward economically important taxonomic groups such as fishes, mollusks, and crustaceans. On the other hand, taxonomists specialized in separate groups, e.g. Gastrotricha, Brachiopoda, Phoronida, etc., are available in insufficient quantity. Currently, there is a set of invertebrate's groups, taxonomic belongings of which is not certain. Further more, there is confusion with systematic state of separate

species of fishes. Also, young specialists are rare, and the availability of good skilled taxonomists in the future is a big concern in marine biologist's community.

The last, but not least, weakness is a lack of funding. The marine biodiversity data and information researches suffer from funding problem in the countries of the NOWPAP region at all levels (from international to regional) to a greater or lesser extent. Especially it concerns field researches demanding greater financial expenses. Due to funding problems, the regular cycle of monitoring of coastal and marine ecosystems is often broken. Traditionally, main attention in researches is given to commercially important species and "secondary" ones are often ignored. There is also other aspect of this problem; lack of funding is directly connected with lack of good experts in marine biology.

7. Conclusions and Recommendations for the Future Actions

All countries of NOWPAP region have developed (or developing) the system of monitoring on the marine and coastal biodiversity. A number of specialists from fundamental and applied research institutes of each country is engaged with studying the marine and coastal biodiversity. Most of these initiatives have been carried out beyond the NOWPAP framework so far. Therefore, there has been no opportunity to exchange information on the current status of the health and conservation of marine and coastal ecosystems between the NOWPAP members. To overcome this barrier, close cooperation between the NOWPAP members is needed where the framework of NOWPAP DINRAC will be of great use as a mechanism to deal with marine wildlife conservation in the NOWPAP region.

This NOWPAP DINRAC report on marine and coastal biodiversity is based on the national reports prepared by each of the NOWPAP members, as a baseline work of dealing with the biodiversity issues. This activity should be further enhanced through the establishment of the metadatabase on biodiversity and the exchange of the guides for biological species. In fact, there are many initiatives to establish database about marine and coastal biodiversity on a global scale. It is recommended that DINRAC should pay more efforts to share and exchange information with a wide range of regional and global communities in this field to avoid any duplication as well as to find and fill gaps between the global and regional efforts.

One of future activities to be taken by DINRAC is to establish a regional node of Ocean Biogeography Information System (OBIS). As mentioned above, OBIS is the most powerful portal and becoming "default standard" system. Therefore, the metadatabase to be developed by DINRAC should be compatible with OBIS standard system.

There are several requirements to be OBIS node but they are not very difficult to fulfill because the OBIS system is widely applied by many biodiversity database such as Global Biodiversity Information Facility (GBIF). OBIS is also anxious to keep the quality of data. For example, the species are expected to be identified by an authority of each taxonomic group, and thus there is a flag that

indicates who identified the specimen. It is the major difficulty for DINRAC because taxonomic authorities are not enough for marine species in the region. Thus it is important to educate the specialists and it would be even more important to promote the taxonomic work of the region. To realize capacity building of the taxonomy about marine organisms that Global Taxonomy Initiative (GTI) is working on, DINRAC can be one of strongest supporting body for this demand, because without good taxonomic support, it is impossible to establish a high quality database of biodiversity of marine and coastal organisms.

**National Report of the People's Republic of China on Marine and Coastal
Biodiversity Data and Information in the Northwest Pacific Region**

1. Country

People's Republic of China

2. Issued Date of the Report

31st August, 2006

3. NOWPAP DINRAC Focal Point

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URL:<http://www.sepa.gov.cn>

4. The Status of Marine and Coastal Biodiversity and Related Ecosystems

The Yellow Sea is one of the shelf seas in fringe of NOWPAP which locates in the moderate latitudes and half encircled by mainland of China and peninsula of Korea. The Yellow Sea is also the confluent zone of "black tide" from Taiwan and cold current from Japan. The species composition of a biota of frigid zone, subtropical zone and tropical zone is relative diverse and unique in this area due to its special geographical position. On the whole, over 1,000 species of marine organisms were described in the Yellow Sea, including coral reefs, algae mollusks, shrimps, crabs, fishes, sea cucumbers, sea turtles, cephalopods and marine mammals.

Because of its abundant species composition and special geographical position, the biota of the Yellow Sea were highly utilized historically, and scientific researches are also carried out at the middle of 20 century. The fauna and flora surveys of the Yellow Sea were carried out historically, but the results were very limited, and some species were still not discovered and described. In 1992, an international cooperative project called "the Yellow Sea Ecoregion Planning Programme" was carried out by South Korea and China. Several detailed field surveys and literature review has been done for the Yellow Sea biota taxonomic description and related ecosystem evaluation. The results not only provide the detailed information fauna & flora inventory and related habitats, but also identified ecologically important zone and conservation measurements and strategies of the Yellow Sea.

The main achievements of this international programme were series of publications, including The Yellow Sea Ecoregion Plan and some booklets and pictures. These publications evaluated the historical

records and current status of marine mammals, fishes, mollusks, seaweeds and water fowls of the Yellow Sea, including species composition, distribution, population size, ecologically important habitats. Major threats in the area, Ecologically Important Areas (EIAs) and Potential Priority Areas (PPAs) were also assessed and analyzed. Furthermore, the programme also well cooperated with “the Yellow Sea Large Marine Ecosystem Project”, which was another international project supported by UNDP&UNEP and financed by the World Bank. With the interactions between these projects, the outputs of “the Yellow Sea Ecoregion Planning Programme” became more integrated, having series of practical strategies, policies and measures to achieve the goals of biological conservation.

4.1 Current Status of Marine and Coastal Species Diversity

The main source of data and information in this section is the survey results of the Yellow Sea Ecoregion Project. According to the survey of Yellow Sea Ecoregion, the species diversity status of the marine and coasts of the Yellow Sea is demonstrated as following:

4.1.1 Nekton cephalopoda and crustacea

30 species of nekton crustacean and 29 species of cephalopoda are found in the Yellow Sea region and many of them are economically important species. There also have many endemic species in the region, such as *Acetes chinensis*, *Penaeus chinensis*, *Palaemon gravieri*, *Alpheus japonicus* and *Eriocheir sinensis*, etc.

The total nekton species density of crustacean and cephalopoda is 23.9% and 12.7% respectively, compare with 74.1% of fish species density in the region. Dominant species are *Loligo japonica*, *Trachypenaeus curvirostris*, *Oratosquilla oratoria*, *Penaeus chinensis*, *Charybdis japonica*, *Portunus trituberculatus*, *Metapenaeus joyneri*, *Sepiella maindroni*, *Sepia esculenta* and *Octopus ocellatus*, etc.

4.1.2 Benthic invertebrates

Benthic invertebrates in the Yellow Sea are polychaeta, mollusca, crustacean and echinodermata. Dominant species are *Nassarius succinctus*, *Nassarius succinctus*, *Nassarius variciferus*, *Scapharca subcrenata*, *Amphiura vadicla*, *Ophiophragmus japonicus*, *Xenophthalmus pinnotheroides* and *Branchiostoma belcheri*. Because its importance in evolution research, *Branchiostoma belcheri* is a scientifically important species in this region, this species is also identified as Grade II in National Protection Category.

The sediments of the Yellow Sea have lower organic matters because of lacking of large river input. It is the important reason for the relative low benthic biomass in the Yellow Sea, about 10 g/m² compare with other region. Echinodermata is the dominant taxon in the Yellow Sea and its average biomass is relative high (8.52%) and contributing 40% of the total biomass. Biomass of either polychaeta or crustacean is only around 1 g/m².

4.1.3 Fishes

According to national coastal zone survey in 1980s, a total number of 199 species are founded in the Yellow Sea coastal zone. According to the data from Biodiversity Clearing-House Mechanism of China—Marine Node (<http://biodiv.coi.gov.cn>), 444 nekton species are discovered in the Yellow Sea, (219 in the north part of the Yellow Sea and 225 in the south part of the Yellow Sea) , mostly are fishes. The average biomass of fish is 1,202kg/km² annually, with a peak value of 2,381kg/km² in October. The dominant species are *Clupanodon punctatus*, *Liza so-iuy*, *Harenglua zunasi*, *Paralichthys olivaceus*, *Setipinna taty*, *Argyrosomus argentatus*, *Apogonichthys lineatus*, *Pampus argenteus*, *Navodon modestus*, *Lateolabrax japonicus*, *Thrissa kammalensis*, *Cynoglossus abbreviatus*, *Muraenesox cinereus* and *Pleuronichthys cornutus*. Each of these species accounts for over 1% of the total nekton biomass in the Yellow Sea. The seasonal difference can be found in species composition. *Paralichthys olivaceus*, *Harenglua zunasi*, *Engraulis japonicus*, *Setipinna taty* and *Trichiurus japonicus* are the dominant species in spring; *Clupanodon punctatus*, *Argyrosomus argentatus* and *Apogonichthys lineatus* in summer; *Clupanodon punctatus*, *Setipinna taty* and *Trichiurus japonicus* in autumn; and *Liza so-iuy*, *Raja porosa* and *Enchelyopus elongates* in winter.

Because considerable fishery resources, the Yellow Sea is important in fishery production. The species *Clupanodon punctatus*, *Setipinna taty*, *Liza so-iuy*, *Engraulis japonicus*, *Pampus argenteus*, *Lateolabrax japonicus*, *Paralichthys olivaceus*, *Harenglua zunasi*, *Trichiurus japonicus*, *Scombermorus niphonius* and *Pseudosciaena crocea* are economically important species in the region.

The Yellow Sea also has relative high conservation value since it is the habitat of several endemic fish species such as *Carcharhinus latistomus*, *Dasyatis gerrardi*, *Dasyatis navarrae*, *Dasyatis sinensis*, *Acipenser sinensis*, *Psephurus gladius*, *Protosalanx hyalocranius*, *Hemisanx prognathus*, *Collichthys lucidus*, *Pseudosciaena polyactis*, *Magalonibea fusca*, *Cynoglossus gracillis*, *Cynoglossus abbreviatus* and *Fugu Pseudormus*, etc.

4.1.4 Sea turtles

A total number of 5 sea turtle species are found in China coastal zone, 4 species under Cheloniidae and 1 under Dermochelyidae. Sea turtles can only generally be found in East China Sea and South China Sea and frequently observed in Yellow Sea in summer. For feeding reason, *Dermochelys coriacea* often observed in Lusi Fishing Ground in Jiangsu Province in mid-autumn. Other species such as *Caretta caretta*, *Chelonia mydas* and *Eretmochelys imbricate* and *Lepidochelys olivacea* distribute in the coastal zone of Shandong and Jiangsu provinces and Yangtze River Mouth.

4.1.5 Sea mammals

The several species of cetaceans were observed in the Yellow Sea, including *Lipotes vexillifer*, *Neophocaena phocaenoides*, *Megaptera novaeangliae*, *Balaenoptera musculus*, *Eschrichtius Robustus*, *Balaena glacialis*, *Balaenoptera physalus*, *Physeter catodon*, *Balaenoptera borealis* and *Tursiops truncatus*, etc. Of these species, *Lipotes vexillifer* and *Neophocaena phocaenoides* are endemic species

which only live in Yangtze River Basin and its estuary. Due to reasons of habitat loss, over-exploitation, both of them become endangered in the Yellow Sea. Because they have high conservation values as large predators in marine ecosystem and are threatened by over-exploitation, habitat loss and marine pollution, all of these cetaceans species are National Grade II protected Animals.

Beside the cetaceans species, there also have several pinnipedia species, *Phoca largha*, *Eumetopias jubata* and *Callorhinus ursinus* in the Yellow Sea coastal zone. According to the historical documentation, Juvenile individuals of *Phoca largha* are generally observed in the coastal zone of Donggou, Zhuanghe and Xinjin Counties of Liaoning Province in north Yellow Sea from March to May. Juvenile individuals were also found in Penglai and Yantai of Shandong Province from April to May, and from June to September in the coastal form Qingdao, Shandong Province to Chongming Island, Shanghai Municipality. *Phoca largha* populations reduce significantly because capture of Juvenile individuals and habitat loss, it becomes endangered in the Yellow Sea and identified as National Grade II protected Animals. Compared with *Phoca largha*, *Eumetopias jubata* and *Callorhinus ursinus* are only occasionally observed in the Yellow Sea and also identified as National Grade II protected Animals.

4.1.6 Intertidal organisms in the Yellow Sea

The species biodiversity of intertidal zone of the Yellow Sea has been considerably rich, including 9 Coelenterata, 100 Polychaeta, 171 Mollusca, 107 Crustace, 22 Echinodermata, 16 fishes, and 144 algae.

Intertidal biomass and densities in different substrates are shown in **Table 1**. Algae have well developed on rocky beaches and their biomass contributes to nearly 78% of the total benthic biomass. Periphyton Species such as *Mytilus edulis*, *Vignadula atrata* and *Ostrea plicatula* have relative high biomass, compared with other species. Species of sand intertidal zone are highly complicated with no obvious dominant species, their biomass, however, are generally lower than 100 g/m². With complicated species composition and high productivity, sand-mud beaches are habitats for commercial mussels but the biomass is relative low due to over-exploitation.

Table 1: Biomass and Density Compositions in Different Substrates of Intertidal Zone of the Yellow Sea (Biomass: g/m²; Density: individual/m²)

Substrate	polychaeta		mollusca		crustacea		Echinodermata		algae		others		Total biomass	Total density
	biomass	density	biomass	density	biomass	density	biomass	density	biomass	density	biomass	density		
Mud	1.9	17.3	42.0	78.4	7.4	4.7	-	-	-	-	1.5	2.0	52.8	102.4
Sand	1.3	7.9	72.5	572.7	5.4	8.8	0.3	0.4	0.1	-	1.2	7.9	80.8	597.7
Sand-Mud	2.7	14.7	112.9	182.2	10.7	11.1	0.1	0.1	16.8	-	0.9	2.1	154.1	210.2
Rock	4.4	11.8	343.7	272.7	28.3	485.7	1.3	1.2	1351	-	5.5	4.0	1733.9	775.4

Compilation Group of Coastal Organisms in China, 1996

Intertidal organisms of the Yellow Sea include many commercial species such as Sipunculus nudus, Ruditapes philippinarum, Macra veneriformis, Meretrix meretrix, Cyclina sinensis, Sinonovacula constricta, Ostrea plicatula, Patomocorbula laevis, Tegillarca granosa, Musculista senhousia, Scylla serrata, nitidotellina iridella and Anthocidaris crassis pina.

4.1.7 Waterfowls

The populations of waterfowls in the Yellow Sea coastal zone are extremely high because extensive wetlands which distribute along the coastline of the Yellow Sea, providing habitats, breeding sites, feeding grounds and migrating stepping-stone for them. The waterfowl surveys indicate that millions of waterfowls that belong to about 200 species in Ciconiiformes, Gruiformes, Charadriiformes, Podicipediformes, Pelacaniformes, Anseriformes, Lariformes, Gaviiformes, Procellariiformes and Falconiformes breeding, staging or wintering along the Yellow Sea coastline each year.

The wetlands of the Yellow Sea are important integral parts of the migratory flyways in Southwestern Pacific Ocean. The migratory waterfowls which breeding in Russian Far East, Northeast China and North China can either migrate along the coastline and winter in middle and lower Yangtze River or South China, or migrate to the winter habitats of Southeast Asia, Australia and New Zealand. According to existing data and information, most of the wetlands of the Yellow Sea are probably the final staging posts for many shorebird species before they fly into their breeding ground.

4.1.8 Seaweeds

Many surveys and works have been done on seaweeds in the Yellow Sea. According to *Marine Species and Distributions of Chinese Ocean* (1994), about 200 species (97 Rhodophyta, 67 Phaeophyta, and 36 Chlorophyta) are found in the area of west coast of the Yellow Sea (including the Bohai Sea). Seawater temperature is the most important factor that affecting the distribution of seaweeds. Most Seaweeds in this area are temperate-water species, occupying 82% of species composition. It demonstrates that the seaweeds in this area is a part of temperate-water seaweeds flora of northern west Pacific Ocean. 29 endemic genus are found in the Yellow Sea and the Bohai Sea, mostly subfrigid species and cold temperate species, such as *Camphylaephora hypnaeoides*, *Ceramium boydenii*, *C. kondoii*, *Heterosiphonia japonica*, *Symphycladia latiuscula*, *Enteromorpha spiralis*, and *Bryopsis hyponides*, etc.

4.2 Current Status of Marine and Coastal Genetic Diversity

Compared with biological diversity on the species level, genetic diversity is invisible and more difficult to understand. However, gene is important in evolutionary progress of each species. A species which has lower genetic variation potentially has higher risk to go to extinction. Moreover, gene variation can be used as a key of a treasures, genetic variation can be used to cultivate crops which have high productivity to appease the demands of food, medicine and other resources.

As the biggest developing country which has 1.3 billions populations in the world, China has realized that genetic diversity conservation is important for sustainable natural resource use and national security. According to the 3rd *National Report of Convention of Biological Diversity*, several plans were proposed to achieve the targets of genetic biodiversity conservation. A plan called "China aquatic biological resources conservation compendium" is to be authorized in 2006. In this plan, the genic and cellular banks are to be established to preserve genetic diversity of China. In another plan called "Mid-Long Term Development Plan of Marine Technology", the research of molecular biology is going to be strengthened on the base of the establishment of important genetic biodiversity bank for marine areas in China.

4.3 Current Status of Marine and Coastal Ecosystem Diversity

4.3.1 Estuaries

Huaihe River is one of the large rivers in the east part of China, which is not only an important water replenishment for the Yellow Sea, but also a ecologically important zone for the east part of China. The estuary of Huaihe River, which locates in the coastal line of Jiangsu Province, had unique ecosystems (salt marsh, wetlands, beaches, etc) and many species (marine mammals, water fowls, mollusks, fishes, etc) in history. In past several decades, however, the ecological conditions of the estuary declined significantly under anthropogenic disturbances, especially the chronic contamination caused by industries and non-point source pollutant emission. Huaihe River basin has a large number of populations in the east part of China. Industry has been developed in the basin. Coal mine, power plant and other type of industries centralize in the basin and cause serious pollution problems. Moreover, the overuse of fertilization and the cities & towns sewage discharge in the basin also becomes an important source of non-point source pollution. According to the national reporting of Huaihe River Commission, Ministry of Water Resources (HRC, MWR), about 4.4 billion of sewage were discharged into Huaihe River in 2004. The large quantity of pollutant emission cause severe disturbance for downstream estuary and have chronic ecological effect on the species and their habitats. Unfortunately, there has no survey data available to show the status of species composition, abundance, species richness in Huaihe River estuary. However, one thing is clear that chronic contamination has caused threats to estuary ecosystems, and the species biodiversity should decreased significantly after the ecological conditions of habitats were severely damaged by the input of large concentration polluted water.

4.3.2 Beaches and Bays

With an area of 37,000 ha, Jiaozhou Bay is one of the largest wetlands in Shandong peninsula. It is an important winter ground and step stone in far-east region for bird migrations. The species diversity of macrobenthic mollusk fauna in Jiaozhou Bay is also high, about 195 species were described since 1950s. According to recent researches, the ecosystems of the beaches and bays of the Yellow Sea, especially Jiaozhou bay, are under chronic metal contamination and eutrophication which cause by intensive human activities in this region.

The sources of chronic metal contamination are complex, mostly caused by the development of industries and agriculture of Shandong peninsula. Shandong Province had surprisingly economic growth rate in past several decades, and industries and Agriculture were highly developed in this economic booming time. However, because lack of sewage disposal plants, large quantity of sewage with high concentration of heavy metal, such as Cu, Hg, Pb, Cd, were discharged into rivers without treatment. Thereby, these land-based heavy metals entered marine environment with water flow and distributed in the sediment of Jiaozhou Bay. The biota of Jiaozhou Bay, particularly invertebrates and algae were severely affected by this heavy metals discharge. Heavy metals were absorbed by algae or marine invertebrates, making accurate or chronic poisonous damages to these organisms. Other marine

organisms such as fishes and marine mammals are also poisoned because the heavy metals can transfer and accumulate in their tissues through the food web.

In 1996~1999, a study investigated the heavy metal concentration in mollusks *Ruditapes philippinarum* and seaweed *Codium* sampled in different sampling station in Jiaozhou Bay. The results shows that the range of concentration of Hg in *Ruditapes philippinarum* tissue is 0.0313~0.212 $\mu\text{g/g}$, Cd in *Ruditapes philippinarum* tissue is 1.30~2.19 $\mu\text{g/g}$, Cu 9.5~11.6 $\mu\text{g/g}$, Zn 142~294 $\mu\text{g/g}$. The As and Pb concentration in seaweed *Codium* tissue is also superisingly high. The heavy metal concentration in mollusks and seaweed tissue also rapidly increased from 1996 to 1999. In 1996, the As concentration in *Ruditapes philippinarum* tissue is 2.11 $\mu\text{g/g}$, and increased in 16.65 $\mu\text{g/g}$ in 1997; Cd is 1.07 $\mu\text{g/g}$ in 1996, and 1.30 $\mu\text{g/g}$ in 1997, and concentration of other heavy metals in mollusks and seaweed tissue are also high in 1996-1999.

This study demonstrated that the heavy metals has accumulated in Jiaozhou Bay and contaminated the sediment habitat, possibly causing high mortality of invertebrates and algae species and decreasing benthic species diversity in the region. According to the macrobenthic fauna survey in 1998-2004, only 62 species were captured in Jiaozhou Bay. This result showed the species richness of benthic community decreased rapidly in past decades.

The red tide which caused by the blooming of phytoplankton is also a major threat to the ecosystems of Jiaozhou Bay. The red tide was first discovered in onshore of Qingdao City. During the 1990s, the red tides were frequent occurred in Jiaozhou Bay because of the eutrophication of seawater.

In the 1960s-90s, the concentration of nutrient such as $\text{PO}_4\text{-P}$, $\text{NO}_3\text{-N}$ and $\text{NH}_4\text{-N}$ in the seawater of Jiaozhou Bay increased 2.2, 7.3 and 7.1 times respectively. In 1997, the concentration of $\text{NH}_4\text{-N}$ in surface water as high as 100.5 $\mu\text{g/L}$. The richness of $\text{NH}_4\text{-N}$ provided condition for blooming of phytoplankton. In 1990s, about 13 red tides were reported in Jiaozhou Bay. The occurrence of red tide severely damages the structure of food chains and threatens the species richness of Jiaozhou Bay.

4.4 Threats to the Marine and Coastal Biodiversity Conservation

4.4.1 Marine Pollution

The water quality of the Yellow Sea is decreased significantly and exceeds the national seawater quality standards because of land-based pollution, river pollutants, marine dumping and oil spilling. The important pollutants of the Yellow Sea are N, $\text{PO}_4\text{-}^2$, COD, Oils and heavy metals, comprising around 95% of the total pollutants. The species of marine and coastal, especially fishes and benthic invertebrates are heavily suffered from the substantive discharge of organic and inorganic matters.

4.4.2 Over-exploitation

The fishery resources are surprisingly exhausted in the Yellow Sea because of over-exploitation and marine pollution. Due to increasing human population along the Yellow Sea coastal, more foods are demanded in cities in the Yellow Sea coastal city. The economically important fish species are heavily over-catched in recent years. Because the over-exploitation of fish resources and other threats such as

marine pollution, there is no fishing seasons for many commercial fishes such as *Gadus*, *Cybiidae* and *Pseudosciaena polyactis* Bleeker.

4.4.3 Habitat loss

Because of the surprisingly social and economical development in the coastal regions in the Eastern China, wetlands, beaches and shorelines have under heavily developed for aquaculture, recreation and industry along the Yellow Sea coastline. These anthropogenic disturbances make severely changes for the landscapes of the coastline. The wetlands and other habitats fragmented, or even completely loss. The pollutants which arrive to the bottom sediments and the developments such as sands extraction also disturb the benthos of the Yellow Sea.

4.4.4 Biological invasions

No integrated data and information are currently available for exotic species in the Yellow sea and its coastline. Some examples of exotic species, however, can still be found along the Yellow Sea coastline. Kelp and Suringar (*Undaria pinnatifida*) which introduced from Japan abundant along the Yellow Sea coastline, especially in Jiangsu Province. Scallops introduced from Japan and the United States have become an importance mariculture species, and also abundant along the Yellow Sea coastline. These information of exotic species demonstrate that introducing massive aquaculture production is one of the most important reasons for exotic species introduction.

4.5 Status of Marine and Coastal Biodiversity Conservation

With its demands of massive marine and coasts development, China government has issued a series of laws, legislations and regulations on marine and coasts protection and managements in recent years. These documentations provide a strong tool in marine pollution control, exotic species prevention, marine and coastal resources exploitation and in-situ biodiversity conservation.

Biodiversity monitoring is also an important part of marine biodiversity conservation in China. In 2002, Specific survey of national typical marine ecosystem was implemented in China marine territory, aiming at typical ecosystems and related exploitation activities in offshore zone. State Oceanic Administration (SOA) and its stakeholders in the field of environmental protection, such as State Environmental Protection Administration (SEPA) also setup national offshore ecological monitoring networks from 2004, covering estuaries, gulfs, wetlands, mangroves, sea grass and other marine and coastal ecosystems. It is the most detailed marine biodiversity and ecosystem survey in recent years. Chinese authorities also think much of the monitoring of emergencies on oil and chemical spilling, the red tide, and resources & landuse development in the Yellow Sea coastal zones.

To solve the marine pollution problems in the Yellow Sea, SEPA improves the supervision on land-based pollutants discharge along the Yellow Sea coastline. SEPA monitors the pollutant discharge quantities from each emission site to achieve the water receiving capacity requirement of Marine Functional Zone.

Chinese authorities also make progress in the struggle of exotic species. A series of laws and legislations is passed to control the abundance of exotic species. Other specific legislations such as *The Byelaw of Prevention and Cure of Exotic Species* are also under constituting. The exotic species which imported for recreation and mariculture are under restrict supervision. Several exotic species database are available for scientific research to provide data and information on exotic species. Some projects such as *Global Ballast Management Project (Globallast)* are also processed in China.

The agencies and NGOs which concern about marine and coasts biodiversity conservation make a distinct progress on in-situ conservation of marine species, 90 marine and coasts natural reserves are established in China coastal zone and marine territory in 2004. These natural reserves protect the rare & endangered marine species effectively. Marine fishery is also under strict supervision in recent years. Fishery permission management system is established in the coastal provinces.

Fishery agencies also constitute fishing forbidding period and forbidding area in the Yellow Sea. In the regions which fishery resources are declined, the number of fishing boats are reduced, fishery industry replacement plans is also carried out to improve the living conditions and reduce the poverty of fishermen. These measurements improve the sustainable use of fishery resources and the resilience of marine species biodiversity.

4.6 Actions and Measurements of Marine and Coastal Biodiversity Conservation

China authorities recognize marine and coastal biodiversity is important to national security and livelihood of domestics, and do lots of works on biodiversity conservation in marine and coastal realm.

Several marine laws, legislations, regulations and standards relate to marine environmental protection were published to express marine biodiversity conservation and sustainable use policies of China. These documentations such as *the Outline of Marine Economy Development Plan*, *the Outline of China Aquatic Racecourses Conservation Action Plan*, and *Yangtze River and Abuttal Maritime Space Cleaning Action Plan* are important to marine biodiversity conservation, especially for fishing yield control. Since 2001 continuous fishery resource surveys and monitoring are done in the marine realm of China. The environmental parameters of over 30 spawning grounds, feeding grounds, migrating corridors, natural reserves and mariculture grounds are monitored and protected.

China has strengthened the protection of fishery resources using variety measurements since 1999. As a result, fishery resources are protected effectively.

The management of marine and coastal natural reserves is strengthened in recent years. New marine and coastal natural reserves have been established, providing sanctuaries to marine species such as *Lipotes vexillifer*, *Neophocaena phocaenoides*, etc. 90 natural reserves have been established at the end of 2004.

To prevent pollutions in China marine territory, China strictly controls waste water discharge and marine dumping in recent years. Land-based pollutants are monitored to protect seawater quality. *The Program of Marine Dumping Area Selection* was published in 2004. According to the program, the quantities of dumping area are controlled. Vessels are strictly forbidden to discharge sewage or dump

solid wastes at will when sailing offshore. The ports are required to construct waste recycling system. These actions and measurements protect benthos communities and reduce the pressure of ecosystems.

5. Current Status of Data and information on Coastal and Marine Biodiversity

5.1 Institutions/Organizations Collecting Data and Information on Coastal and Marine Biodiversity

China National Environmental Monitoring Centre (CNEMC), SEPA

Address: No.1 Yuhuanlu, Chaoyang District, Beijing 100029, China
Tel: [86] (10) 8465-3808
Fax: [86] (10) 8465-4244
Email: webmaster@cnemc.cn
URL: <http://www.cnemc.cn>

China Environmental Monitoring Centre (CNEMC) is set up in 1980. It is an institution directly affiliated to SEPA. It provides support and service for SEPA on environmental supervision and management, play roles as network centre, information centre and training centre in the national environmental monitoring system. It also provides professional management and guidance for the national environmental monitoring system.

CNEMC is responsible for collecting, archiving, managing, analyzing national environmental monitoring data, and publishing the State Environment in China annually.

National Marine Data & Information Service (NMDIS), SOA

Address: No. 93, Liuwei Road, Hedong District, Tianjin 300171, China.
Tel: [86] (22) 2401-0802
Fax: [86] (22) 2401-0926
Email: zhxc@mail.nmdis.gov.cn
URL: http://www.nmdis.gov.cn/nmdis_e.html

National Marine Data and Information Service (NMDIS) is a national facility under the State Oceanic Administration (SOA) of China responsible for managing and distributing data and information concerning the marine environment. As a National Oceanographic Data Center, NMDIS maintains and develops the national marine database. This is a collection of marine data sets originating mainly from China marine observation establishments. Besides providing marine data and information services, NMDIS also providing technical support for national marine economic development, sea area management, marine environmental protection, and marine research community.

National Marine Environmental Monitoring Centre (NMEMC), SOA

Address: No. 42, Linghe Road, Shahekou District, Dalian, Liaoning 116023, China

Tel: [86] (411) 467-1429

Fax: [86] (411) 467-2396

Email: nmemc_web@nmemc.gov.cn

URL: <http://www.nmemc.gov.cn>

The National Marine Environmental Monitoring Centre (NMEMC) (i.e Institute of Marine Environmental Protection) is founded in 1979. It is a nonprofit public welfare institution responsible mainly for both the professional and technological management for China marine environmental monitoring and the research on marine environmental protection. The main responsibilities on marine and coastal conservation of NMEMC are:

- Technical services, support and management on marine ecological & environmental monitoring of China;
- Organizing marine environmental standards & plans for marine ecological conservation;
- Developing standards of pollutant discharging and dumping in key ocean territory, and ensuring its implementation.
- Responsible for technical services of ocean territory use;
- Developing emergency working plans for oil spilling;
- Responsible for monitoring and evaluation the marine hazards such as the Red tide and sea ice, etc;
- Providing technical supports and services on coastal and sea island resources development;
- International cooperation on marine environmental monitoring and protection;
- Technological management and professional training.

The First Institute of Oceanography (FIO), SOA

Address: No. 6, Xianxialing Road, Gaokeyuan, Qingdao, Shandong, 266061, China

Tel: [86] (532) 8896-3909

Fax: [86] (532) 8898-3909

Email: pingyin@fio.org.cn

URL: <http://www.fio.com.cn/>

The First Institute of Oceanography is built up in 1958. It is a nonprofit public welfare institution responsible mainly for providing information and services for SOA in marine biology, marine ecology, marine chemistry and marine biotechnology and improving the decision-making ability of SOA. The importance is:

- Investigating the distribution of environment factors and its transformation;
- Investigating the development and management of marine resources;
- Marine hazards mechanism and forecasting research;
- Marine environment dynamics and controlling research;
- Marine environmental assessment, protection and rehabilitation.

More recently, the research fellows of FIO give their attention to plankton dynamics. They investigate the ecology, mechanism and related controlling techniques of red tide to promote the health and services of marine ecosystem and meet the management demands of SOA.

China and Korea Jointly Oceanography Research Centre (JORC), SOA

Address: No. 6, Xianxialing Road, Gaokeyuan, Qingdao, Shandong, 266061, China

Tel: [86] (532) 8896-4987

Fax: [86] (532) 8896-4779

Email: postmaster@ckjorc.org

URL: <http://www.ckjorc.org>

China and Korea Jointly Oceanography Research Centre is the department which set up recently for promoting the international cooperation between China and Korea in the Yellow Sea. The centre mainly provides education, workshops, conferences and training services, ensuring the data and new settlement in marine and coastal sciences can be shared between marine experts and scientists of both countries. It also promotes the Yellow Sea biodiversity survey of both China and Korea, and improves the resources exploitation and environmental protection management in the Yellow Sea.

The Second Institute Oceanography (SIO), SOA

Address: No. 36, Baoshubei Road, Hangzhou, Zhejiang, 310012, China.

Tel: [86] (571) 8806-4173

Fax: [86] (532) 8807-1539

Email: swl@sio.zj.edu.cn

URL: <http://www.sio.org.cn/html/en/>

The Institute was set up in 1966. It is a comprehensive research institute which provides information and services to SOA and public with investigation, survey, forecast and basic applied research in resources and environment of the China oceans. The research field of the institute includes the ecological process of the seas, especially in chlorophyll and primary productivity, the food chain, plankton, algae and ecological dynamics study. The institute also interested in marine biology exploitation and application study.

Institute of Oceanology, Chinese Academy of Sciences (IOCAS)

Address: No. 7, Nanhai Road, Qingda, Shandong, 266071, China.

Tel: [86] (532) 287-9062

Fax: [86] (532) 467-0882

Email: iocas@ms.qdio.ac.cn

URL: <http://www.qdio.ac.cn>

The Institute of Oceanology, Chinese Academy of Sciences (IOCAS) is built up in 1950. It is the largest and most comprehensive multidisciplinary marine research institution in China. Since its establishment, the institute always pay extensively attention to the research fields such as marine biota, seaweed chemistry, experimental marine biology, mariculture biology, marine bio-technology, marine ecology, ocean circulation and atmosphere, marine chemistry, marine geochemistry, and chemical oceanography, etc., and makes remarkable progress in these scientific realms. For the concerning of the threats of biodiversity and the conservation tasks in China. The institute provides integrated taxonomy information and services for marine and coastal species identification. The employees of institute discuss the scientific topics such as marine ecosystem dynamics and global change, population dynamics of marine physical phenomenon; investigate the succession of disturbed offshore ecosystem and its rehabilitation; and investigate the occurrence and disappearance of hazardous red tide, and its forecasting and abating.

The Yellow Sea Fisheries Research Institute Chinese Academy of Fishery Sciences (YSFRI), MOA

Address: No. 106, Najing Road, Qingdao, Shandong, 266071, China

Tel: [86] (532) 8584-4718

Fax: [86] (532) 8581-1514

Email: webmaster@ysfri.ac.cn

URL: <http://www.ysfri.ac.cn>

Yellow Sea Fisheries Research Institute is established in 1947. It is a nonprofit public welfare institution responsible mainly for providing information and services for MOA in marine biology, mariculture management, fishery management and fishery diseases to improving the decision-making ability of MOA. The main tasks of the institute are:

- Sustainable exploitation and utilization of marine biological resources study, including mariculture technique development, fishery resource survey and fishery technique development;
- Germplasms Storage and artificial seedling technique study;
- Marine molecular pathological and mariculture diseases control study;
- Marine production and enzyme research;

Marine fishery management researches and fishery technique development make the institute has abundant experience in marine fishery biodiversity in genetic and species level.

Ocean University of China (OUC)

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Ocean University of China is built up in 1924. It is a comprehensive university which provides high education in marine and coastal sciences, including marine biology, aquaculture, marine biotechnology and marine ecology courses. The university also extensively cooperates with other marine and coastal research institutes in China and participates in the projects of marine biology survey, marine medicine study, coastal zone management, aquaculture management.

Table 2. Inventory of Institutions/Organizations collecting Data and Information on Coastal and Marine Biodiversity

No.	Name	Main Directions of Research	Evaluation of Research level	Main Outcomes
1	CNEMC, SEPA	Providing support and service on environmental supervision and management; Providing professional management and guidance for the national environmental monitoring system; Collection, archiving, managing, analyzing national environmental monitoring data, and publishing the State Environment in China.	Medium	Environmental monitoring data; Publication of the State of Environment in China.
2	NMDIS, SOA	Managing and distributing data and information concerning the marine environment; Maintaining and developing the national marine database; Providing technical support for national marine economic development, sea area management, marine environmental protection, and marine research.	Medium	National Marine Information System ; Biodiversity Clearing-House Mechanism of China—Marine Node.
3	NMEMC, SOA	Technical support and management on marine ecological & environmental monitoring; Organizing marine environmental standards & plans;	Medium	Marine environmental data.

		<p>Developing standards of pollutant discharging and dumping;</p> <p>Developing emergency working plans;</p> <p>Monitoring and evaluation the marine hazards such as the red tide and sea ice, etc;</p> <p>Providing technical services on coastal and sea island resources development;</p> <p>International cooperation on marine environmental monitoring and protection;</p> <p>Professional training.</p>		
4	FIO, SOA	<p>Investigating the distribution of environment factors and its transformation;</p> <p>Investigating the development and management of marine resources;</p> <p>Marine hazards mechanism and forecasting research;</p> <p>Marine environment dynamics and controlling research;</p> <p>Marine environmental assessment, protection and rehabilitation.</p> <p>Investigating the ecology, mechanism and related controlling techniques of red tide.</p>	High	<p>Marine environmental data;</p> <p>Marine red tide hazards data.</p>
5	JORC, SOA	<p>Providing education, workshops, conferences and training services on marine and coastal sciences in the Yellow Sea for experts and scientists of both countries;</p> <p>Promoting the Yellow Sea biodiversity survey;</p> <p>Improving the resources</p>	Medium	<p>Marine and coastal research data</p>

		exploitation and environmental protection management.		
6	SIO, SOA	<p>Researching on marine biota, experimental marine biology, mariculture biology, marine bio-technology, marine ecology, ocean circulation and atmosphere, marine chemistry, marine geochemistry, and chemical oceanography, etc., and makes remarkable progress in these scientific realms;</p> <p>Providing integrated taxonomy information and services for marine and coastal species identification; Researching on marine ecosystem dynamics and global change, population dynamics of marine physical phenomenon; investigate the succession of disturbed offshore ecosystem and its rehabilitation; Investigating the occurrence and disappearance of hazardous red tide, and its forecasting and abating.</p>	High	Marine geological data, hydrological data and biological data
7	YSFRI, MOA	<p>Sustainable exploitation and utilization of marine biological resources study, including mariculture technique development, fishery resource survey and fishery technique development;</p> <p>Germplasm Storage and artificial seedling technique study;</p> <p>Marine molecular pathological and mariculture diseases control study;</p> <p>Marine production and enzyme</p>	High	Fishery Database

		research.		
8	OUC	Provides high education in marine and coastal sciences, including marine biology, aquaculture, marine biotechnology and marine ecology courses; Cooperating with other marine and coastal research institutes and participating in the projects of marine biology survey, marine medicine study, coastal zone management, aquaculture management.	High	Ecological survey of the marine and coastal biodiversity data.

5.2 Data and Information Products Related to Coastal and Marine Biodiversity

Biodiversity Clearing-House Mechanism of China—Marine Node

Biodiversity Clearing-House Mechanism of China—Marine Node is a website designed and established by NMDIS, SOA in 2003 to implement Convention of Biological Diversity (CBD), for sharing biodiversity data and information between CBD implementation countries, and making these data available to the public. The website is an important part of Biodiversity Clearing-House Mechanism of China, which is one of the content of CBD implementation. It publicizes policies and legislations of marine and coastal administration agencies related to marine and coastal biodiversity conservation. The Information Node also provides marine biodiversity information querying services for scientific research. The Node is one of the key supporting information systems for implementing CBD information sharing programme. The database of the website includes the following data and information:

- Introduction of the History and Background of CBD;
- Introduction of Conventions of Parties (COP);
- Introduction of National Biodiversity Clearing-House;
- Strategies and Action Plans of Biodiversity;
- Status, Threats and Trends of marine and coastal biodiversity;
- Marine Database System, including marine resources, environment parameters, marine economy statistics, legislations and ARGO database;
- Introduction of Marine and Coastal Natural Reserves;
- Laws, Legislations and regulations;
- Marine Biology Introduction, including the animals classified into National Grade I & II Protected animals, marine mammals, the Red Tide biology, etc.

China Oceanography Scientific Database

China Oceanography Scientific Database is an online data and information acquiring system which managed by China Academy of Sciences. The database are comprised of the hydrological, geological and biological data of China offshore and Northwest Pacific Ocean.

The biological database of this system provides services in marine taxonomy and sampling, especially for species identification of the Yellow Sea and the Bohai Sea. The contents of the database are shown as following:

- Marine plant species data, including plant taxonomy information, common & scientific name, sampling date and location, etc;
- Benthos data of the Yellow Sea and the Eastern area of NOWPAP Region, including the information of key fauna which represent benthos species diversity of the Yellow Sea and the Eastern area of NOWPAP Region;
- Fauna and samples data of the Yellow Sea and the Bohai Sea, including the information of key fauna which represent species diversity of the Yellow Sea and the Bohai Sea. The database also provide the pictures of samples;
- Rare and endangered marine species data, the information of the distribution and conservation;
- Economically important species (i.e. fishes, shrimps, mollusks, algae), the information of species, distribution, exploitation status, yield, etc.
- Mariculture fishes and other species germplasm resource data, including exotic species data. The database consists of the feeding parameters and image data of mariculture species;
- Marine biology sample data, the database lists the taxonomy and related information of over 1000 samples.

Marine Science Data Sharing Platform

Marine Science Data Sharing Platform is an online marine data and information database which supported by National scientific data sharing project of Ministry of Sciences and Technology (MOST). The database collects data and information related to coastal and marine biodiversity from IOCAS, YSFRI, OUC and other related institutes. The users of the database are mainly research fellows of marine and coastal zone. The data and information about marine biology, physical oceanography, oceanographic geology and oceanographic chemistry can be founded in the database.

The contents of marine biology database of the platform include the most data and information which are comprised in the biological database of China Oceanography Scientific Database. The exotic species which introduced for aquiculture use and the national and provincial legislation and technical standards for aquiculture production and trading are also listed in the platform.

Marine Sciences Database

Marine Sciences Database is a database which developed and managed by YSFRI, MOA. It is a professional database provides data and information on marine mariculture and related standards & legislations, germplasm resources, aquiculture trading and exotic species.

The database consists of five sub-databases, namely are the *Official Evaluation & Discussion Database of Fishery Technical Trading*, the *Mariculture Technique Database*, the *Germplasm Resources Database*, the *Marine Biology Basic Information Database*, and the *Exotic Species of Aquiculture Database*. These data contains plentiful data and information on:

- *Official Evaluation & Discussion Database of Fishery Technical Trading*

The official legislations, standards and technical documents on national, sectional and local level of China and other countries for aquiculture production & processing, fishery trading regulation, and hygiene security. The information is collected from the legislations and standards of Ministry of Agriculture, Ministry of Health, Ministry of Commerce, etc.

- *Mariculture Technique Database*

This database consists of data and information on artificial breeding, commercial production, the fishery diseases controlling, and other related agriculture breeding and production techniques.

- *Germplasm Resources Database*

The data of biology, genetics, biochemistry genetics, cell genetics, molecular biology, population composition, commercial value of aquatic species can be found in this database. The data are collected from the institutes and universities which develop researches and projects of aquatic biodiversity in China.

- *Marine Biology Basic Information Database*

The Database collects the data and information on the taxonomy, nature and biology of fish, mollusks, shrimps, algae and other benthic invertebrate, plankton and nekton species which are observed in China aquatic ecosystems. The information of exotic species which imported for aquiculture production can also be found in the database. The database also has 88 records about the information of threatened and endangered species in aquatic ecosystems, including the nature, biology, distribution, habitats of *Phoca largha*, *Neophocaena phocaenoides*, *Lipotes vexillifer*, *Balaenoptera physalus*, *Dermockelys corlacea* and *Eretmochetys imbricate*, etc.

- *Exotic Species for Aquiculture Database*

The database records the basic information of over 70 exotic species for aquiculture production.

Table 3. Inventory of Data and Information Products Related to Coastal and Marine Biodiversity

No.	Institutions/ Organizations	Data and Information Products	Main Outcomes
1	NMDIS, SOA	National Biodiversity Information Clearing-House—Marine Node	Introduction of the History and Background of CBD; Introduction of Conventions of Parties (COP); Introduction of National Biodiversity Information Clearing-House; Strategies and Action Plans of Biodiversity; Status, Threats and Trends of marine and

			<p>coastal biodiversity;</p> <p>Marine Database System, including marine resources, environment parameters, marine economy statistics, legislations and ARGO database;</p> <p>Introduction of Marine and Coastal Natural Reserves;</p> <p>Laws, Legislations and regulations;</p> <p>Marine Biology Introduction, including the animals classified into National Grade I & II Protected animals, marine mammals, the Red Tide biology, etc.</p>
2	CAS	China Oceanography Scientific Database	<p>Marine plant species data;</p> <p>Benthos data of the Yellow Sea and the East China Sea;</p> <p>Fauna and samples data of the Yellow Sea and the Bohai Sea.</p> <p>Rare and endangered marine species data;</p> <p>Economically important species, distribution, exploitation status, yield, etc;</p> <p>Mariculture fishes and other species germplasms resources data</p> <p>exotic species data;</p> <p>Over 1000 marine biology sample data.</p>
3	MOST	Marine Science Data Shared Platform	<p>The contents of marine biology database of the platform include the most data and information which comprises in the biological database of China Oceanography Scientific Database. The exotic species which introduced for aquiculture use and the national and provincial legislation and technical standards for aquiculture production and trading are also listed in the platform.</p>
4	YSFRI, MOA	Marine Sciences Database	<p>Official legislations, standards and technical documents for aquiculture production & processing, fishery trading, and hygiene security;</p> <p>Fishery artificial breeding, fry rearing, commercial production, the fishery diseases controlling, etc;</p>

			<p>Aquatic species biology, genetics, biochemistry genetics, cell genetics, molecular biology, population composition, commercial value; Fishes, mollusks, shrimps, algae and other benthic invertebrate, plankton and nekton species taxonomy, nature and biology; 88 records about the information of threatened and endangered species, etc; Over 70 exotic species for aquaculture production.</p>
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5.3 Projects and Their Implementation Related to Data and Information on Coastal and Marine Biodiversity

Ecosystem Dynamics and Sustainable Use of Biological resource in the Eastern area of NOWPAP Region and the Yellow Sea

This project is financed by National Key Basic Research Development Plan (i.e. 973 Plan). The overall objective of the project is investigating the critical ecosystem dynamics process and biological resource supplement mechanisms of the Eastern area of NOWPAP Region and the Yellow Sea. To achieve the research targets, the research fellows of the project did biological surveys in coastal zone and offshore area several times to collect the species diversity data and information in the area, analysis the species composition, population size and community structure in the ecosystems. The project also identified the ecological process (i.e. energy flow, organic matter cycling and interaction of environment and biosphere, etc.) and the keystone species in food chain and food web, and the fishery yields of the commercially important species for sustainable use.

Besides providing scientific supports on Chinese marine biological resource management towards sustainable use, plenty of biodiversity data and information are collected in the project surveys. The results of the project assist the establishment of advanced fishery management system to ensure sustainable use of offshore ecosystem. The project also improves the development of offshore ecosystem dynamics research in China.

At present, several scientific papers, dissertations, and reports are published to demonstrate the results and findings of the project. These results and findings promote to understand the ecological importance of sustainable use of biological resources in the Yellow Sea. Chinese administrative agencies of environmental protection and fishery are thinking about utilizing these results and findings in their management system.

The Yellow Sea Ecoregion Initiative

The Yellow Sea Ecoregion Initiative is an international cooperation project financed by World Wildlife Fund (WWF). China, Japan and Korea work together on project. The project is aim at protecting the

biodiversity and the habitats along the coast and in the offshore. Because of intense human activity disturbance and unplanned exploitation, the fishes in the Yellow Sea and their habitats are heavily threatened. The fishery yields of China, Korea and Japan decrease significantly. The loss of fish's biodiversity and anthropogenic disturbances also threat mammals, waterfowls, sea turtles, and plant diversity in the Yellow Sea. The governments of China, Japan and Korea realize that it is an urgent need to manage the biodiversity of the Yellow Sea beyond national boundary.

Biodiversity assessment for coast, estuary, and sea is done jointly by institutes of China, Japan and Korea. The project evaluates the biodiversity resources and their habitats in the Yellow Sea Ecoregion, and analyzes the social & economical status of coastal zone of the Yellow Sea ecoregion.

The project also lists and evaluates the primary threats of the Yellow Sea ecoregion, and the laws, legislations and regulations in the countries, the management system of the marine and coastal wetlands administration, the fishery management system, and the management of the nature reserves in the coastal zone.

UNDP/GEF Yellow Sea Large Marine Ecosystem Project

The Yellow Sea Large Marine Ecosystem Project is financed by Global Environmental Funding (GEF), and directed by United Nations Development Programme (UNDP) and is implemented by SOA in 1998. The objective of the project is ecosystem-based, environmentally-sustainable management and use of the YSLME and its watershed by reducing development stress and promoting sustainable exploitation of the ecosystem.

The focus of the YSLME project on sustainable fishery management and reducing stress to the ecosystem provides an opportunity for exploring how this GEF project can further national and regional commitments to certain international conventions and agreements.

East Asian-Australian Shorebirds Site Network

East Asian-Australian Shorebirds Site Network was an initiative of the Asia-Pacific Migratory Waterbird Conservation Strategy: 1996-2000. It was launched in 1996 at the Sixth Conference of Contracting Parties of the Convention on Wetlands (Ramsar, Iran 1971), in Brisbane, with 19 sites from eight countries. The aim of the East Asian-Australian Shorebird Site Network is to promote the conservation and wise use of sites which are of international importance to migratory shorebirds.

Yancheng Birds National Natural Reserve, Jiangsu Province and Dongtan National Natural Reserve are the most important wetlands for shorebirds along the Yellow Sea coastline. These two sites are also the members of The Shorebird Site Network to strength the researches and in-situ conservation of shorebirds and their habitats.

Global Ballast Water Management Programme - China

Global Ballast Water Management Programme (GloBallast) is an international cooperative which promoted and financed by International Maritime Organization (IMO), UNDP and GEF, and undertaken

by Maritime Safety Administration People's Republic of China (MSA). The objectives of this programme are:

- Developing practical techniques and related equipments for ballast disposal;
- Compiling an integrated standard for ballast disposal;
- Providing assistance to developing countries to overcome the difficulties on implementing resolutions of IMO.

As one of the six demonstration countries, MSA and related agencies (such as SEPA, SOA, etc.) choose Dalian as the demonstration location, and promote the implementation of plans such as port baseline survey, risk assessment and evaluation, training & education on ballast management and legislations & regulations research. The project has been finished and gains excellent appraises from UNDP. All targets of the project are considered well achieved.

Survey of Pathogens & Phytoplankton Exotic Species in Importing Vessels' Ballast

The Survey of Pathogens & phytoplankton exotic species in Importing Vessels' Ballast project is a key scientific project of Shandong Province which undertaken by Shandong Inspection and Quarantine Bureau. The project investigates the community structures of pathogens & phytoplankton in importing vessel ballast and the local seawater, discussing the potential impacts of exotic species in ballast to local marine ecosystem. The outcomes of this project provide the directive evidence for hygiene management of importing vessels' ballast and marine biodiversity conservation.

6. Comments

Main Sources of the report are:

- Web sites of Agencies/Institutions/Organizations.
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- Yellow Sea Ecoregion: Reconnaissance Report on Identification of Important Wetland and Marine Areas for Biodiversity Conservation. Wetlands International. Beijing, March, 2001.