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IMPLEMENTING THE STRATEGIC ACTION PROGRAMME FOR THE YELLOW SEA LARGE
MARINE ECOSYSTEM: RESTORING ECOSYSTEM GOODS AND SERVICES AND
CONSOLIDATION OF A LONG-TERM REGIONAL ENVIRONMENTAL GOVERNANCE
FRAMEWORK

(UNDP/GEF YSLME Phase II Project)

Conservation and Management Planning of Spotted Seals (*Phoca largha*) in the Yellow Sea

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Introduction

The spotted seal (*Phoca largha*) is the Class II State Protected Species in China which belongs to the member of genus *Phoca*, family *Phocidae* and order *Carnivora*. The spotted seal mainly distributed in the coast of northern and western parts of the North Pacific Ocean and also its coastal areas and islands, including the Yellow Sea, Chukchi Sea, Bering Sea, Sea of Okhotsk, Seas of Japan and North Korea.



The Spotted Seal pups in Liaodong bay

In China, the spotted seals are mainly distributed along the coasts of Bohai Sea and Yellow Sea which have been considered as the most important species in the marine ecosystem. Occasionally the spotted seals can be found in the East and South Seas of China. So far, the spotted seals are the only pinniped species that can breed at the marine areas of China. The sea

ice zone at the Liaodong Bay of the Bohai Sea is the southernmost of the eight spotted seal breeding areas in the world. The results of genetic and ecological research have demonstrated that the spotted seals in Liaodong Bay lack of genetic communication with others and have reproductive isolation. Therefore, the spotted seals in Liaodong Bay belong to a branch that independent evolution worldwide and have its own unique genetic information which is of great importance for the conservation.

The spotted seal named “Ningning” was chosen as the mascot of the 12th National Games of the People’s Republic of China due to the acute appearance, special habitat and migratory waters. The mascot “Ningning” has aroused the public protective awareness of the marine environment and endangered species, building the harmonious co-existence between nature and mankind.

Development of conservation action planning and the promotion of the population and habitat protection for spotted seals are not only the necessary for effectively addressing the new problems and challenges against the spotted seals protection, but also the inevitable choice to promote the biodiversity conservation and ecological civilization construction in China.

1 Necessity and urgency of conservation

1.1 Current resources status and risk factors of the spotted seals

The current number of the wild spotted seals is about 450,000 in the world. In China the highest historical record was about 8,000, whereas the spotted seal population has been compromised severely, resulting in the number of the spotted seals is always maintaining at low level since 1980s. The lowest number of the spotted seals in China was about 1,200 and this number was increased to about 2,000 based on the results of investigation conducted in 2006 and 2007.

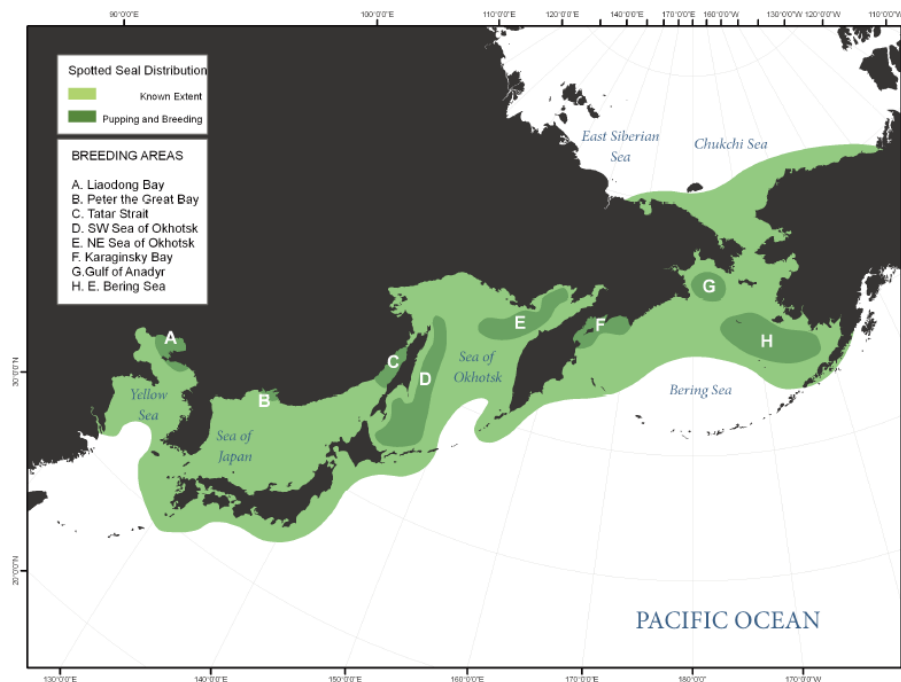


Figure 1-1. The breeding ground and distribution region of spotted seals

(Boveng et al. 2009)

Among the remaining spotted seals, the number of visitors to Baengnyeong-do, Korea has reached a maximum of 322 in 2008 since the survey began in 2006, and has remained at 200 to 300 per year (Figure 1-2).

The coastal development of reclamation, along with increased marine transport, are making the habitats of marine life, including spotted seals, worse and worsening. It's faster than ever. Therefore, the Korean government has designated it as the Marine protected Species to preserve spotted seals. In addition, the Korean government has designated endangered wildlife II and natural monument No. 331 to make efforts.



Figure 1-2. Spotted seals on the haul-out site in Baengnyeong-do

Spotted seals with a long lifespan of more than 40 years, serving as the top predators of marine ecosystems, and with a wide range of distribution and excellent mobility, may look relatively resistant to ecological disturbances and environmental changes. However, it is very difficult to recover once the population size is declined and close to extinction because only one pup is born and it takes a long time to grow and join the reproduction.

For this reason, the Korean Government has adopted the “Act on the Conservation and Management of Marine Ecosystems (Law No. 8045)” in order to protect and manage the marine ecosystems from the disturbing increase of human activities and the changing marine environment to maintain a sustainable environment. In order to continue to maintain and expand “Marine protected Species” list under the law, various projects are underway. In order to maintain the sustainability of the Marine protected Species, protection measures have been taken for the species and habitat.

In addition, the Ministry of Oceans and Fisheries recognized that specific plans are needed to protect spotted seals, which are Marine protected Species. The plan includes the monitoring of population size change, cause of reduction, development of artificial breeding techniques, improvement of habitat environment, strengthening of rescue and treatment functions, the sharing of protection awareness through education and public relations, cooperation with neighboring countries and international organizations.

To protect spotted seals, the Ministry of Oceans and Fisheries has been maintaining the ecological monitoring project in Baengnyeong-do, a major habitat in Korea. In addition, in order to make actual rehabilitation efforts, the artificial haul-out site was established in the nearby main habitat in November 2018 (Figure. 1-3). It is expected to provide more space to take a rest. Also Bycaught or stranded animals are frequently rescued and released in to the original habitat.

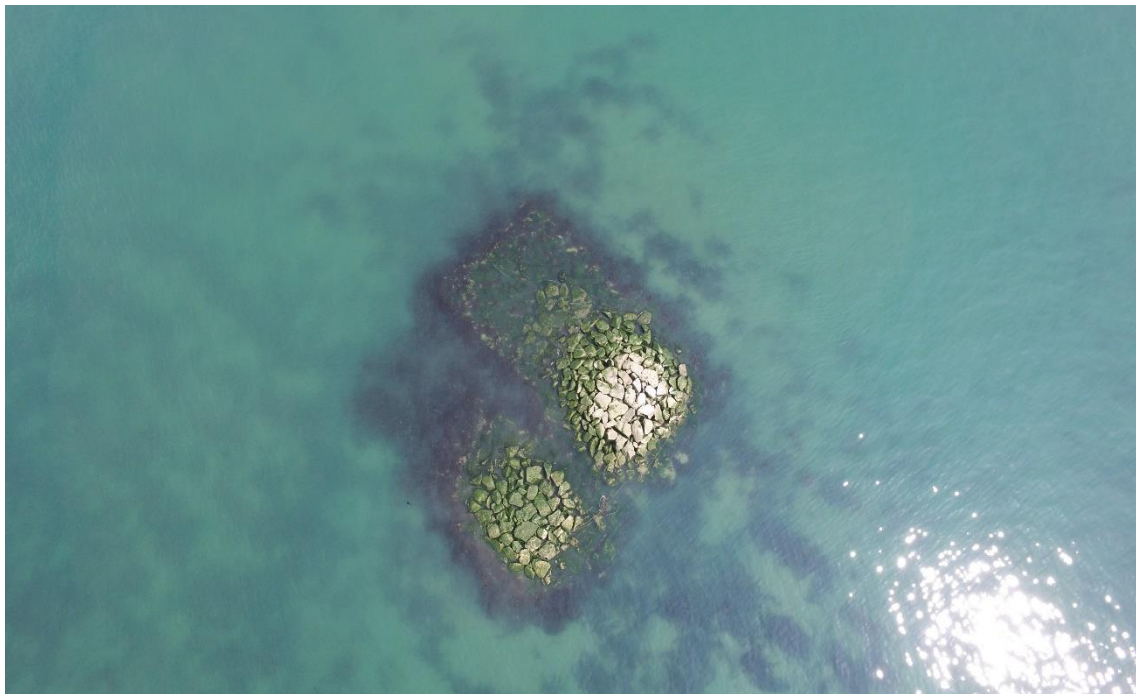


Figure1-3. Artificial haul-out site for spotted seals

The coastal development of reclamation, along with increased marine transport, are making the habitats of marine life, including spotted seals, worse and worsening. It's faster than ever. Therefore, the Korean government has designated it as the Marine protected Species to preserve

spotted seals. In addition, the Korean government has designated endangered wildlife II and natural monument No. 331 to make efforts.

The spotted seal has been categorized into Class II State Protected Species in the <The List of State Key Conservation Wildlife > of China.

In China, the risk factors faced by the spotted seals can be summarized into the following aspects:

The number of spotted seals was significantly decreased in terms of hunting and killing by fishermen before 1970s. In history, due to the high economic value, there was a tradition to hunt and kill spotted seals along the coast of Liaodong Bay. In the early of 1980s, the spotted seal has been classified into the protected species by the government of Liaoning Province and the protective regulation has been issued subsequently to prohibit hunting. Nevertheless, the population number of spotted seals is still maintained at a relatively low level for a longer time due to the previous massive hunting and killing.

Some important habitats, to some extent, have been invaded and destructed. There are about four months' ice period in every winter along the coast of Liaodong Bay and ice is one of the most important factors for the breeding and habitat of the spotted seals. The spotted seals give birth and caress the pup on ice, therefore, if the ice is destroyed, such as fragmentation and

contamination, the conditions for the spotted seal breeding and pup growth and survival will be deteriorated, resulting in the adverse influence on the population maintenance and growth, even the existence of the breeding areas. The ice zone and ice period in the Liaodong Bay are in accordance with the breeding areas of the spotted seals and the period of breeding. The ice will be cracked due to the requirement of navigation, leading to the part of the ice fragmentation. Moreover, with the number of vessel increase, the adverse influence on disturbance and breeding for the spotted seal will increase subsequently.

The distribution spaces for the spotted seals become smaller and the food supply maintains at low level. The large scale reclamation at the Bohai Sea reduced the scale and function of the important fishery areas. Moreover, the high intensity fishing production decreased the fisheries resources which would potentially reduce the food sources for spotted seals. Therefore, the spatial and temporal distribution and bearing capacity of the population in spotted seals are limited.

The survival of the spotted seals is threatened by the deterioration of ecological environment in part of marine areas. The survival crisis of the spotted seals is aggravated by the deterioration of ecological environment, quality reduction of marine biology and the pollution of seawater from the increasing oil pollution (the exploitation of offshore oil fields, drilling

platforms and shipping vessels) and wastewater (agricultural and living activities). This aggravated survival crisis further poses a serious threat to the existed fragile living environment for the spotted seals.

In Korea, no pouching of spotted seals has been reported. The biggest threat may be habitat disturbance caused by human activity like fishing and kelp (*Saccharina japonica*) harvesting. Baengnyeong-do maintains an average water temperature of 10°C and has a suitable environmental condition for the growth of kelp. In the island, all haul-out sites are rockery substrate which means good place to distribute kelp and fish inhabit the reefs.

Kelp harvesting is mainly done at low tide, which causes disturbances to the spotted seal habitat when they take a rest on the haul-out site. Kelp harvesting on the haul-out site have been seen frequently during the survey period. At that time, all the seals were escape from the haul-out site, roaming around near people from the water. There is also a potential risk of bycatch. Many fishing gears are set near habitat. In Baengnyeong-do, two dead seals were found last year.

Effort to decrease habitat disturbance and bycatch event are needed.

At least 10 cases of spotted seals trauma have been observed in 2019 (Figure 1-4). Trauma can range from abrasions to partial loss of one hind

leg. Most of the cases are difficult to ascertain the extent and cause of the original trauma Scarring of torn or torn cuts in the trunk may be caused by the attack of predators or other individuals, and the cuts are suspected of artifacts, but it is difficult to ascertain the cause unless they are fresh. In contrast, the traumatic cut-out surface of an individual whose left fever was cut was considerably clean, suggesting damage by artifacts like nets. In addition to wounds that occur in natural conditions, wounds wound on phrases such as ropes can also create long scars that seem to be cut.



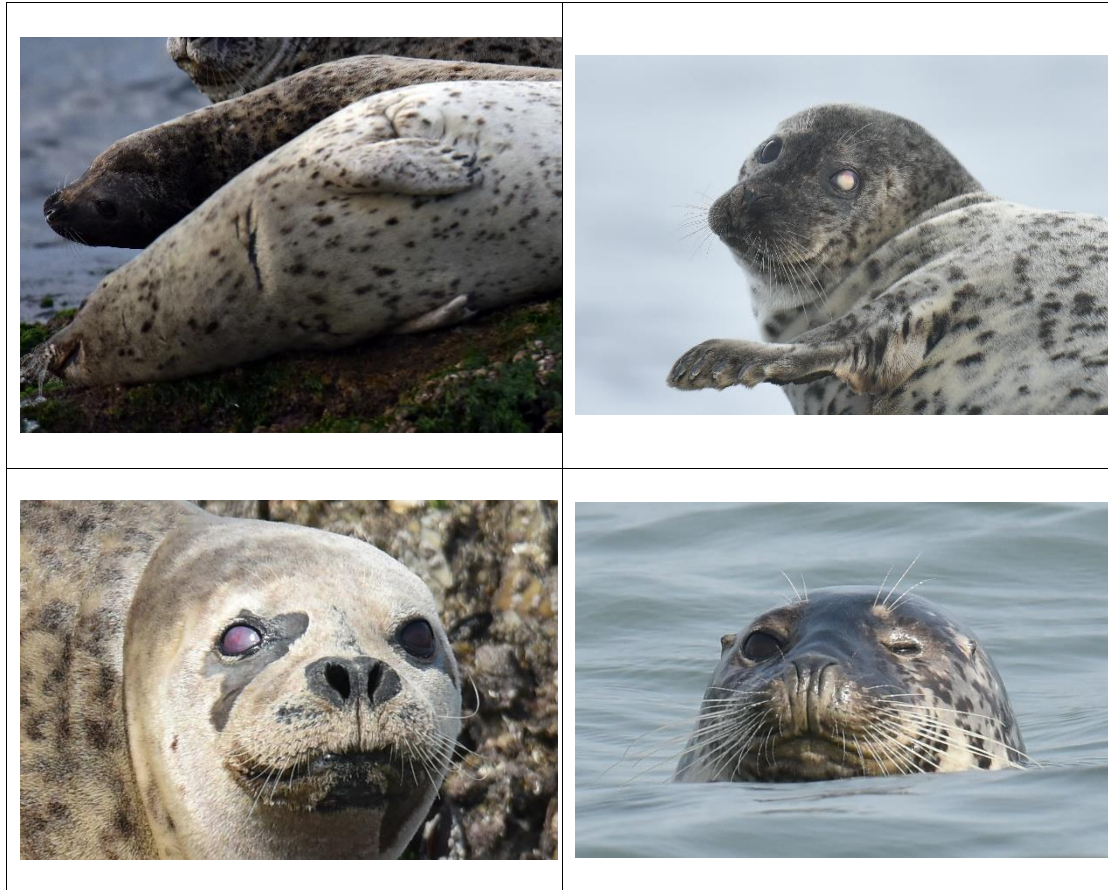


Figure1-4. Some cases of spotted seals trauma

Long-term survival rates, such as population identification in ongoing investigations, are needed for studies such as the effects of trauma on population survival. In addition, investigation of the frequency of trauma caused by artifacts should be considered as one item in the assessment of habitat environment.

International Cooperation and Joint Research for the Preservation of Spotted Seals

The Cetacean Research Institute and the Marine Ecology Division of the Ministry of Oceans and Fisheries in order to establish a management plan of spotted seals designated as Marine protected Species under the Law on Conservation and Management of Marine Ecosystems, Korea-Russia bilateral cooperation was proposed and submitted to the 10th Korea-Russia Environmental Cooperation Committee held in Seoul in February 2016. Spotted seals are protected as designated Marine protected Species by the Ministry, but they are not resident animals in Korea. In order to investigate the distribution situation, some of the individuals were captured in the Russian Primoriye habitat, and satellite tracking tags were applied to examine the migration route. The Russian side for bilateral cooperation was the POI (V.I.Ilichev Pacific Oceanological Institute, Russian Academy of Science).

After the project was approved, the satellite tracking tag (SPOT-293A, Wildlife Computers) to be used for the distribution study of the seal was carried out. In accordance with the Korea-Russia Environmental Cooperation Agreement, three spotted seals in Posyet Bay in 2017 and five spotted seals in Verkhovskie Island in 2019 were successfully released after attaching satellite tracking tags.

Ultimately, it is necessary to live capture seals in Baengnyeong-do and release them after attaching satellite tracking tag to figure out migration

pattern of spotted seals distributed in Korea. To this purpose, the technique of capturing spotted seals should be secured, and the method of inviting Russian experts should be considered. Russia's active preservation policies have tended to increase the number of inhabitants in the coastal seas, and thus, the number of spotted seals found on the coast of the East Sea is expected to increase in the future. Spotted seals in the Yellow Sea steadily due to excessive coastal development and congestion in the sea area. It is expected to increase the population through research on conservation policy in Russia.

In addition, information on Russian spotted seals (population size, breeding ecology, environmental pollution, illegal capture, etc.) will be collected and applied to research on the status of spotted seals in Baengnyeong-do.

1.2 The achievement of the spotted seals protection

The implementation of the protective work has been promoted with the support of the development of the law and regulation systems and the conservation planning. In order to effectively protect the endangered aquatic wild animals, including the spotted seals, a serious of laws and regulations have been issued from the administrations in China which provide the strong legal ways to safeguard the endangered aquatic wild animals. The State Council also issued the <Outlines for the Conservation

of Aquatic Biological Resources in China> (2006-2020), <Chinese Biodiversity Conservation Strategy and Action Plan> (2011-2030) that strongly promote the implementation of protective work in aquatic animals. At the same time, some provinces and local governments have also developed the rules, regulations and protocols.

The establishment of the conservation reserves builds the foundation for the protective work in spotted seals. In order to strength the protective work for the spotted seals, Dalian Spotted Seal National Natural Conservation Reserve and Miaodaoqundao Provincial Spotted Seal Natural Conservation Reserve in Shandong have been established. Furthermore, the Shuangtaihekou National Natural Conservation Reserve in Liaoning also takes responsibility to protect the spotted seals, providing the important foundation for strengthening the spotted seals protection. So far, the total protective aquatic areas for the spotted seals have exceeded 1.56 million hectares. Approximate 200 spotted seal pups have been rescued and/or cured by the conservation reserve organizations authorized by the fishery administrative departments. Moreover, the fishery administrative departments have organized six times large-scale spotted seals release activities with more than 150 animals have been released, generating a positive social impact.

Improvement of resources investigation, research and rescue capability in spotted seals. The protective research work has been carried out for the habitats investigation around the northern of Shuangtaihekou in Liaoning Bay, Huping and Mayi Islands in Dalian and Miaodaoqundao in Shandong, and breeding areas in Bohai Bay by the domestic scientific research institutions and aquaria. The results have preliminarily mastered the distribution, population change patterns and migratory shifting path of the spotted seals. At the same time, breeding, rescue and population restoration work in spotted seals have been involved in the research by the scientific research institutions and aquaria. The spotted seals can be successfully artificial bred and animals from the artificial breeding can be released to the wild for research work after scientific training.

Baengnyong-do is the most well-known island as the main habitat of spotted seals between spring and autumn in Korean peninsula. Since 2006, the Cetacean Research Institute of the National Institute of Fisheries Research has conducted spotted seal surveys in the island. The seals mostly appear haul-out sites; Mulbeum-rock, Yeonbong-rock, Dumujin, which are the main habitats of spotted seals in Baeknyeong-do.

Field surveys are carried out using small fishing boats and accessing the haul-out site where the spotted seals are resting. Researchers attempt to count when the number of seals are maximum on the haul-out site. At the

same time, photographs for identification and video clips for observing behavior are simultaneously taken. In addition, the weather, wind speed, wind direction, sea level, time, temperature, and depth and surface water temperature are measured and recorded in the log book.

In 2019, surveys conducted every month between April to November. The number of seals were 205 individual in maximum in August. However ship-based survey do not provide accurate number of counting because of avoidance from noise and physical approach. To compensate for the disadvantage, drone survey have been attempted. In result, compare to ship based survey, the number of animals counted in the same haul-out site increased up to 30%. In addition, when the ship was difficult to access due to shallow water, drone was possible to approach. However, due to drone flight time (less than 20 minutes) and flight distance (less than 2 km), there was some limitation to cover whole survey area.

Progress in international cooperation and exchange. The international cooperation for the spotted seal protection and research has been conducted with Korean and Japan. For example, in 2008, the marked release research has been performed between China and Korean. The results have preliminarily found the migration pattern of the spotted seals and concluded that the Bailing Island in Korea is not the only migratory endpoint for spotted seals population in Liaodong Bay. This can explain

the reason why the number of spotted seals in Liaodong Bay is not the same as that inhabited in Bailing Island.

With the support of the YSLME project, Chinese and Korean scientists have jointly carried out a number of cooperative studies on spotted seals.

With the help of satellite beacons and environmental DNA, the relationship between the populations of spotted seals in the yellow sea and the migration route were studied.

Although lots of protective work has been carried out for the spotted seals in China, the spotted seal protection still has many difficulties and problems, and faces many severe challenges due to lack of continuous and specific management plans, measurements and techniques, which results in the amount of the spotted seals is not significantly increased. Therefore, it is extremely necessary and urgent to develop a national conservation action planning for the spotted seals and implement it quickly.

2 Objectives

2.1 Guiding regulations

In accordance with the requirements of the 18th National Congress of the Communist Party of China, the building of the ecological civilization has been accelerated and the concept of the development in innovation, coordination, green development, opening up and sharing has been firmly established. Moreover, the Central Committee of the Communist Party of China has issued the some rules, regulations and laws, such as <Opinions on Speeding Up the Ecological Civilization Construction>, <Some Opinions of the State Council on Sustainable and Healthy Development of Marine Fisheries Promotion >, <Outlines for Action on Conservation of Aquatic Living Resources in China>, <Biodiversity Conservation Strategy and Action Plan in China> and <Wildlife Protection Law of the People's Republic of China>. To fully implement above rules, regulations and laws, this Conservation Action Planning is developed and implemented in order to strengthen the habitats protection of the spotted seals, standardize the artificial breeding, strictly manage and utilize, support the resources monitoring, encourage social assistance, increase public education, effectively protect marine species biodiversity, build the ecological civilization and promote the harmonious development between human beings and nature.

2.2 principles

2.2.1 Persistence *in situ* conservation

The important spotted seal habitats, such as breeding areas and landing sites, should be strengthened to protect and manage. For other spotted seal habitats with still not being built, the effective management is to establish the special conservation reserve and protection periods. The purpose of the *in situ* conservation of the wild spotted seal population is to minimize the disturbance and adverse effects of human activities on the spotted seal populations and habitats. Furthermore, the current protective capability of the spotted seals should be improved and ecological function of the existed conservation reserves should be maintained and optimized.

2.2.2 Persistence scientific management

The basic data for protective management on resources status, distribution pattern and habitat selection of the wild spotted seal population should be received by the application of the new scientific techniques and methods. The identification and pedigree construction of the captive spotted seals and promotion of the artificial breeding technique optimization should be performed in terms of the effectively professional rescue system. Subsequently, the relevant industrial standards, technical protocols and

control indicators should be developed for the purpose of achieving synergy between wild spotted seals conservation and captive spotted seals management.

2.2.3 Persistence social participation

The communication and cooperation between the management agencies of the spotted seal conservation reserve and the relevant fishery authorities should be strengthened. Moreover, various investigations on the wild spotted seals population conducted by the scientific research institutions should be supported and the artificial breeding and wild training work on the spotted seals carried out by the qualified organizations should be encouraged. The publicity and education of protection on the spotted seals need to be further strengthened which would guide the social groups and general public to actively participate, forming the atmosphere and mechanism of participation jointing from the whole society.

2.3 Objectives of action

Objectives between 2020 and 2025:

Establishment of the dynamic monitoring system covering the major habitat of the spotted seals; proposal of the specific management measures

of the habitat protection and partial completion of the habitat ecological restoration.

Acquirement of the basic information on the population size, distribution and migratory patterns of the spotted seals.

Establishment of 4-6 rescue centers for the spotted seals and other marine mammals with professional equipment and personnel along the coasts in Liaoning, Shandong and Hebei Provinces, in order to improve the survival rates of the rescue.

Development and completion of the standards and protocols, such as <Industrial Standard for Domestication and Breeding of spotted seals>, <Industrial Standard for the Effects of Noise on Marine Mammals> and <Protocol of Rescue and Release on Spotted Seals>.

Medium and long term objectives (2026-2030)

Conduct the protective activities to maintain the number stable and growth trend of the spotted seals in terms of habitat conservation and restoration, special investigation, rescue, scientific research, breeding center construction, combating the illegal capture and publicity and education.

Establishment of 3-4 breeding centers and finish the pedigree construction of the captive spotted seals throughout the country.

Establishment and optimization of the in situ and ex situ conservative systems for the spotted seals. Forming the system of field population monitoring, artificial breeding, wild training and technical release. Gradually recovery of the spotted seal population in terms of habitat conservation and release techniques from the artificial breeding.

Establishment of ecological compensation mechanism for the conservation reserve regarding the developmental and constructive projects which will be specifically used for the spotted seals protection.

3 Strategic tasks for the spotted seal protection

3.1 Optimization of policies, laws and regulations for the spotted seal protection

Development of the policies to promote environment-friendly industries development surrounding the conservation reserves, exploration of the encouraging policies to promote the conservation and sustainable use of spotted seals. Optimization of the cooperative mechanism of spotted seal protection and biological resources management.

3.2 Promotion of the spotted seal protection into the relevant planning

Incorporation of the spotted seal protection into the economic and social developments and plans in Liaoning, Hebei and Shandong provinces which would promote these three provinces to compile the strategic and active plans for the spotted seal protection, respectively. Establishment of the evaluation and monitoring mechanism to promote the relative regulations and plans to effectively implement.

3.3 Strengthening the development of spotted seal protective capacity

Strengthen the development of the protective infrastructures and development of the spotted seals population investigation and evaluation. Strengthen the development of scientific research capability of the spotted seal protection and the professional personnel training. Conducting the innovative research on the methods of protection and application in the spotted seals. Further strengthen the development of the spotted seal monitoring capability, improvement of the warning and management level.

3.4 Enhancement of public participation awareness and strengthen the international cooperation and exchange

Carry out various types of the public education activities on the spotted seals protection, guide the public to actively participate in the spotted seals protection, strengthen the general science education of spotted seals at schools. Establishment and improvement of the public supervision and reporting system for the spotted seals protection, optimization of the public participation mechanism. Establishment of the partnership for spotted seal protection, extensively mobilize the enthusiasm of domestic and international personnel to participate in the spotted seals protection, fully

develop the function of non-governmental public welfare and charitable organizations, jointly promote the protection and sustainable use of spotted seals. Further deepen international exchanges and cooperation, and introduce advanced foreign technology and experience to China.

4 Actions

14 key actions are selected for the spotted seal protection according to the overall objectives and strategic tasks of the conservation action plan.

4.1 Action 1: Investigation of the resources status and distribution pattern of the spotted seals

Target: Basically master the spotted seal population resources along the coasts in China; obtain the relationship between the total number of the spotted seal resources and the amount of the spotted seals on the landing sites; clarify the spatial distribution pattern and migratory trajectory of the spotted seals in Bohai and Yellow Seas with the protection performed for the specific target.

(1) Carry out the comprehensive investigation on the spotted seal resources. To determine the boundary and investigate the resources along the breeding zone in Liaodong Bay by the application of the ice-break vessels and drones at every January and February (the period of ice form along the coasts in Liaodong Bay) for three consecutive years after the conservation action plan initiated with the purpose of determination of the total population of the spotted seals. The further investigation will be conducted after the period of the action.

(2) The distribution of the spotted seals on landing sites will be continuously monitored between March and May every year. Determination of the trend of the spotted seal resources in China through the distribution pattern and change on the number of the spotted seals on landing sites.

(3) Conduct the investigation on the migration and distribution patterns on the spotted seals. Application of satellite marker technique to precisely acquire the data on the location, speed movement, and diving depth on the spotted seals with the beacon which would determine the migratory pattern and habitat utilization.

(4) More experimental work, such as eDNA, is needed to address population differences and migration paths of the spotted seals.

4.2 Action 2: Status investigation and protection of the important habitat for spotted seals

Target: Master the status of the important habitats and ecological environment of the spotted seals; complete establishment the dynamic monitoring system for the important habitat of the spotted seals; reduce and eliminate all types of encroachment and destructive behaviors on the habitat.

(1) Establishment of dynamic monitoring system covering the important habitats of the spotted seals. Implementation of the effective and real-time dynamic monitoring and management on the important habitats of the spotted seals by the application of “3S” technique.

(2) Comprehensive investigation of the ecological and environmental factors of the important habitats for spotted seals. Collect, extract and calculate the specific quantitative values of some important factors, complete the superposition and correlation analysis of the habitat factors using the GIS spatial analysis function, propose the specific management measures on the habitat protection.

4.3 Action 3: Promotion of the effective protection on the spotted seals habitats

Target: Achievement of enhancement on the marine ecological function for the habitats and upgrade conservation reserve level.

(1) Carry out the repair and ecological restoration on the compromised habitat. The marine ecological condition will be improved along the coast in terms of island shoreline restoration, ecological reef release and fisheries resources proliferation and release, creating the suitable marine space for the spotted seals.

(2) Expand the regional scope of the spotted seals key habitats, promote the designation of provincial special conservation reserve for the breeding areas of the spotted seals in Liaodong Bay; upgrade the level of provincial conservation reserve for the spotted seals in Miao Island, Shandong.

4.4 Action 4: Scientific assessment of the effects of human activities on the spotted seals and its habitat

Target: Obtain the results on the suitable size of the spotted seals population based on the fisheries resources; development of the industrial standard or protocol for the assessment of the effects of noise on the spotted seals and other marine animals, reduce the adverse effects of human activities on the spotted seals and habitats.

(1) Conduct the relative investigation and research on the fisheries resources and habitat selection of the spotted seals. Determination the effects of fisheries resources and fisheries capture intensity on the distribution, migration and habitat selection of the spotted seals and the bearing capacity of the fisheries resources on the spotted seal population through the investigation of the fisheries resources in Bohai and Yellow Seas combined with the characteristics of the spotted seals distribution at different periods.

(2) Carry out research on the effects of noise pollution on the spotted seals and its habitats. Assessment of the effects of noise on the spotted seals and its habitat based on the characteristics of the acoustic signals, hearing threshold, sensitivity and tolerance limit to noise at different frequencies and the various noise sources monitoring.

(3) Investigate the effects of fishery operation and other marine related activities on the survival, distribution and habitat utilization of spotted seals, and subsequently propose the management and control suggestions. Establish the reporting system for the bycatch of spotted seal.

4.5 Action 5: Establishment of artificial breeding population of spotted seal and exploration of the wild population restoration

Target: Construction of 3-4 breeding centers for spotted seals based on the aquaria and aquatic wildlife rescue centers. Wild training and release for the artificial breeding spotted seals are successful.

(1) Optimize the artificial breeding technique and improve its survival of the spotted seals. Reproductive regulation and breeding management will be conducted on the captive spotted seals through the investigation of the changes of endocrine related factors such as serum sex hormone content, combined with artificial milk powder formulation, artificial lactation and

the use of imaging equipment such as B-ultrasound, developing a complete breeding technique for the spotted seals.

(2) Establishment of 3-4 breeding centers for the spotted seals. The spotted seal breeding centers will be gradually established based on the existed aquaria or rescue centers which have the large number of the spotted seals, certified animal archives and strong techniques. At the same time, the animal pedigree should be constructed in advance and in each year the number of artificial bred spotted seal should reach above 40.

(3) Perform the scientific evaluation on the breeding centers, rationally plan the breeding center construction, standardize commercial activities within the breeding centers, and protect intellectual property rights.

(4) Establishment of cell and gene bank of genetic resources for spotted seals. The genetic materials for spotted seals and other endangered species for collection, conservation, research and development will be carried out.

(5) The wild training of artificial breeding spotted seals and the selection and evaluation of health index of released spotted seals will be carried out which will develop a comprehensive technique to wildly train the captive spotted seal and evaluate the effects of releasing. Each year a certain number of artificially bred spotted seals will be released.

4.6 Action 6 Strengthen the management of the captive spotted seals

Target: Achieve the scientific and comprehensive management for the spotted seals under the artificial breeding conditions and finish the national pedigree construction for the captive spotted seals.

(1) Establish the national captive marine mammal animal information platform, including the spotted seals. Determination of the number and dynamic changes of the captive spotted seals in China through the comprehensive investigation of the aquaria and zoos.

(2) Research, develop and issue the <Industrial Standard for the Breeding on the Spotted Seals>. Optimization of archives management of the spotted seals, gradually promote the identification system for the captive spotted seals in order to achieve the scientific and effective management on the spotted seals.

(3) Establish the pedigree construction for the captive spotted seals. Establish the unified regional pedigree of the spotted seals, evaluation of the genetic structure and diversity of the spotted seal population from the non-artificial breeding individuals; application of the microsatellite fingerprinting technique to identify the paternity of the artificial breeding individuals; conduct the artificial breeding plan based on the legal animal

exchange under the guidance of the pedigree which maximally maintain the population genetic diversity of the captive spotted seals in order to make sure that the captive population can be stable and healthy growth. If the captive population is not enough, use the wild population as a supplement.

4.7 Action 7: Potential habitat selection for the spotted seals

Target: Selection of 1-2 potential habitat for the spotted seals and finish the corresponding protective strategies and technical explorations in order to avoid the environmental risk.

(1) Selection of 1-2 suitable semi-enclosed waters in Yellow and Bohai Seas, respectively. Carry out the potential habitat selection based on the spotted seals habitats utilization, including the landing sites, and combination of the characteristics of the marine ecological environment.

(2) Carry out the corresponding protective strategies and technical research, such as the construction of the landing site and application exploration.

4.8 Action 8: Improve the spotted seal protective level and optimize the protective mechanism

Target: Improve the influence and management capability of the conservation reserves at all levels and fully play the protective role of the conservation reserves.

(1) Improve the spotted seal protective level. The spotted seals protective level will be upgraded into Class I state key protective wild animals in the newly revised <State Key Protective Wild Animal List>. This will be reported to the State Council for approval.

(2) Establish and optimize the coordination mechanism between national spotted seal conservation reserve management agencies and local governments, strengthen the capacity of the management institutions. Exploration of the community condominium mode of different levels of conservation reserves, and carry out pilot and promotion of community co-management.

(3) Training to improve the management capability and technical skills of the staff.

(4) Coordinate the implementation of the developmental plans of the conservation reserves for the spotted seals, improve the connectivity and overall conservative capacity between the conservation reserves, periodically assess the implementation effects and, ecological functions and effects of the conservation reserves, and strengthen the experience exchange and cooperation between the conservation reserves.

(5) Establishment of information management system; establish a website on the theme of spotted seal protection, report the work and achievement

on the spotted seals and habitat protection which expand the spotted seal protective action to the whole society.

4.9 Action 9 Strengthen the management and control of the spotted seal protection

Target: Reduction and elimination of illegal activities, such as spotted seal poaching

(1) Strengthen communication and coordination between national and local authorities and establish different apartment collaboration mechanism to combat the violation of the law on spotted seals

(2) Fisheries authorities should organize publicity and popularize the protective knowledge on the spotted seals, enhance the public protective awareness and understand the legal responsibility for illegal wildlife hunting.

4.10 Action 10: Improve the rescue capability on the spotted seals

Target: Establishment 4-6 spotted seals and other marine mammal animal rescue centers along the Liaoning, Shandong and Hebei, forming the rescue network for spotted seal.

(1) Establishment of the emergency rescue technical protocol and technical index system for releasing the rescued spotted seals which would scientifically guide the release work on the spotted seals.

(2) Effectively carry out the rescue work through the rescue work. Optimization of the current rescue system, and establishment of new rescue organizations based on the aquarium, zoon and research institute, achieving the standardization on the rescue instrument, equipment and facility. Effectively carry out the rescue work on the spotted seal and other marine mammals and then release them when recovery or reach the releasing conditions.

4.11 Action 11: Strengthen the scientific research

Target: Provide the scientific support on the spotted seal protective work through the popularization and application of scientific research results.

(1) Strengthen the research on new theories, techniques and methods for the marine endangered species, including the spotted seals, and familiarization and population of them.

(2) Carry out the research on the new organic pollution on the effects of the spotted seals and marine ecology. Development of the monitoring technique on the environmental pollution and climate change on the effects

of the spotted seals and marine ecology, construct the monitoring network, operate the key monitoring and propose the corresponding policy.

(3) Conduct the cutting-edge research on the effects of climate change on the spotted seals. Sea ice is an indispensable environmental factor in the reproductive processes of spotted seals. Study on the effects of ice shortening and melting of floating ice caused by climate warming on the reproduction of the mature spotted seals and survival rate of spotted seal pup at Liaodong Bay.

4.12 Action 12: Strengthen the professional training of the talents

Target: Establishment of highly qualified personnel team on the marine endangered species protection, including the spotted seal.

(1) Take measures to attract talented scientific and technical personnel, especially the outstanding young scientists, to engage in research on the marine mammal animal protection.

(2) Strengthen the training and improve the technical level and decision-making ability for the current professionals and administrative staff.

4.13 Action 13: Promote the partnership for the spotted seal protection

Target: Introduce the foreign advanced management, conservative experience and technique to promote the international cooperation on spotted seals protection.

(1) Gradually establish the partnership between international multilateral organizations, bilateral organizations and non-governmental organizations on the spotted seals protection and other marine endangered species.

(2) Expand the cooperation with the overseas conservation reserves

(3) Conduct the exchange with other research and protective organizations in North Korea, South Korea and Russia on the basic research, population restoration technology and habitat protection of the spotted seal. Carry out the specific protective work for the spotted seals.

(4) Conduct the link between the domestic administration and immigration of law enforcement, develop the effective punishment measures, strengthen the entry and exit supervision. Make the statistical analysis on the variety and quantity of imported seal products, carry out the relevant international protection and related policy research.

4.14 Action 14: Strengthen the publicity and education to guide the wide public participation

Target: Develop a sound and multiform publicity mechanism; fully play a protective role of public for the spotted seals.

(1) Widely give publicity to the spotted seal protection and improve the public protective awareness through public and new media, conservation reserve, aquarium, zoo, specimen hall and natural museum.

(2) Optimization of the effective mechanism on the public participation in the protection of the spotted seals and from various forms of public participation models, such as reporting, hearing and discussion.

(3) Establishment of public and media supervision mechanisms to monitor the relative policies implementation.

5 Supporting measure

5.1 Strengthen the communication and collaboration

Strengthening the communication and cooperation is the basis for the effective implementation of the spotted seal conservation action plan. It is necessary to strengthen the overall view of the spotted seals protection. The fisheries authorities of relevant provinces and cities, as well as the management agencies of conservation reserves, scientific research institutions, rescue centers, aquaria and the protective organizations should strengthen the communication and cooperation, jointly carry out the protection, law enforcement, publicity and rescue work. The meetings for the spotted seal protection and management should be periodically held to, exchange information, study and solve the relevant problems. At the same time, in order to ensure the effective implementation of the spotted seals conservation action plan, the local fishery authorities should earnestly carry out their duties seriously, strengthen effective cooperation with various departments, and develop a joint effort.

5.2 Increase capital input

Capital input is an important guarantee for the effective implementation of the spotted seal conservation action plan. In addition to direct support from the central finance, local governments should increase the protection of

spotted seal resources and support the construction and management of the conservation reserves, and put the protective funds into budget. Capital input for spotted seal conservation and research should be increased in terms of broaden the investment channels, strive for the financial support from all kinds of protection funds and organizations, and integrate and make good use of the ecological compensation funds related to the construction projects of the conservation reserve. Extensive absorption and utilization of non-funded support such as equipment, technology, volunteers, etc. for the spotted seal protection.

5.3 Strengthen the capacity-building

Local governments and relevant departments should actively support the conservation action plans, develop detailed local policies while responding to national policies. Promote the development of local incentive policies to motivate front-line law enforcement personnel, basic scientific research personnel and the general public to actively pay attention to and participate in the spotted seal protection.

5.4 Strengthen the supporting system

The effective implementation of the spotted seal conservation action plan cannot be separated from the joint efforts of management institutions, scientific research institutions and law enforcement departments. It is

important to raise the awareness of the importance of the spotted seals protection at the whole society, especially the local governments, through publicity, training, education and other forms. The research capability of the scientists and the responsibility and ability of law enforcement personnel should be improved to make sure that the spotted seal conservation action plan can be successfully implemented and achieve the desired results.