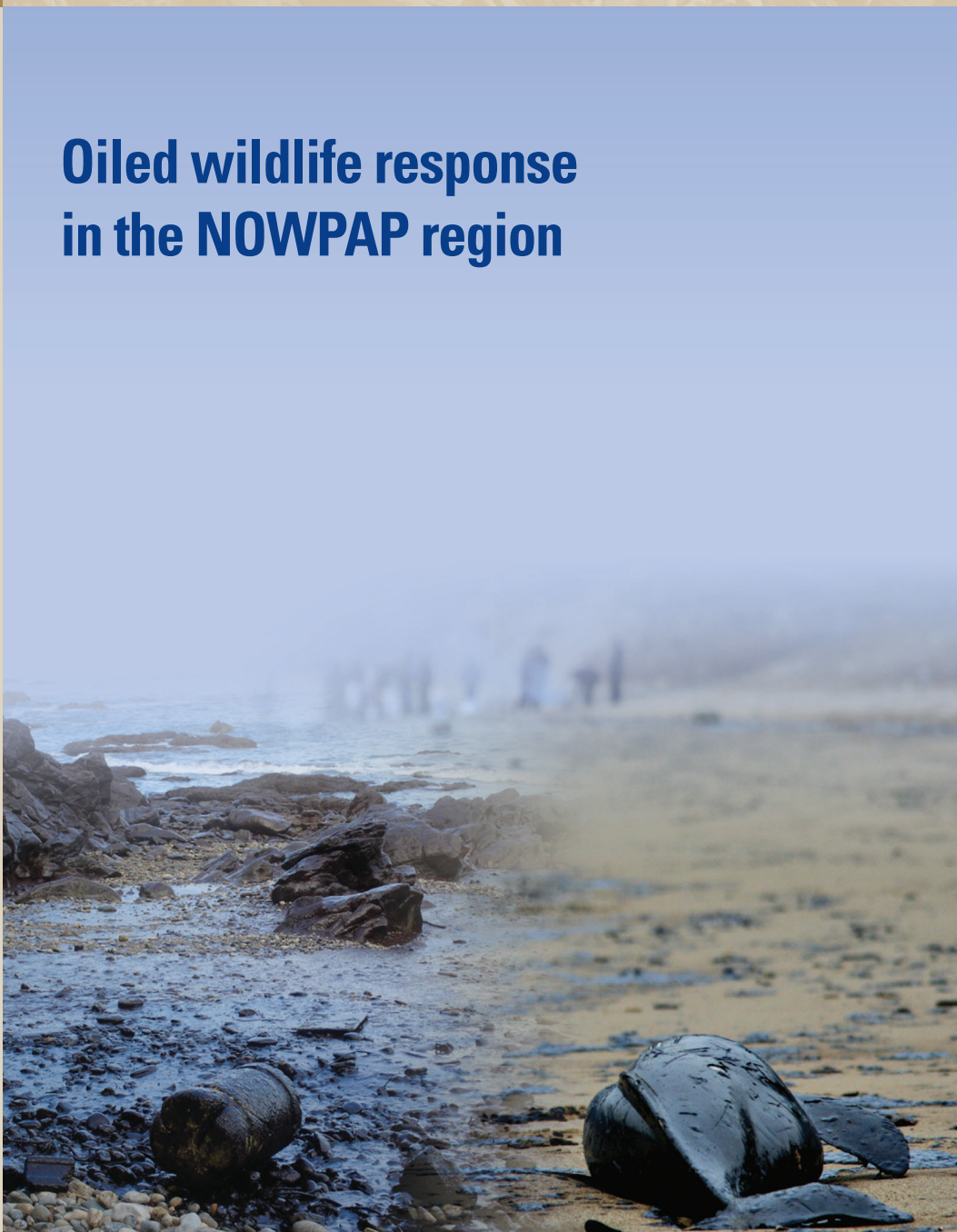


NOWPAP MERRAC

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Marine Environmental Emergency Preparedness and Response
Regional Activity Centre

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Oiled wildlife response in the NOWPAP region



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PREFACE

The shipping density has been growing greatly in the NOWPAP region due to the high level of industrial and economic development of the NOWPAP member states and consequently, the region has been severely exposed to oil spills. Oil spill incidents were identified as one of the threatening elements to the marine environment and coastal biota, especially, birds and marine mammals that live mostly near the coast. Indeed, spilled oil causes direct and devastating effects on wildlife with pathological (skin, toe skin lesion), physiological and biochemical damage (liver/kidney injury, malfunction), but also indirect long-term effects including decrease of the population and reproduction of the marine organism. As damages of the oiled wildlife were being reported steadily, the needs of effective response and systematic rescue structure on the oiled wildlife were brought up worldwide.

Following the circumstances, MERRAC member states (People's Republic of China, Japan, Republic of Korea and Russian Federation) discussed the oiled wildlife issue at the 17th NOWPAP MERRAC Focal Points Meeting (FPM, June 2014) and the issue was approved as a topic of the 2015 NOWPAP MERRAC Expert Meeting (Russia) at the 18th NOWPAP MERRAC FPM (August 2015). The main purpose of the 2015 NOWPAP MERRAC Expert Meeting was to share the existing expert knowledge on response to oiled wildlife and to consider the possible regional collaboration in the NOWPAP region for better preparation and response to oiled wildlife as well as minimization and mitigation of the consequences of the oil spills for the environment. Through a variety of presentations and in-depth informal group discussions during the meeting, the NOWPAP member states recommended potential tasks to be implemented in the NOWPAP region. Among the recommendations, conduction of a Specific Project on oiled wildlife response was suggested as a way to tackle the oiled wildlife issues under the MERRAC activities.

At the 19th Focal Points Meeting (May-June 2016), "Development of a technical report on oiled wildlife in the NOWPAP region" was adopted as a 2016/2017 Specific Project to start establishing efficient response and regional co-operation to oiled wildlife (mainly focusing on marine mammals and birds) for major oil spills that may occur in the NOWPAP region. The purpose of the project is to comprehensively understand the current situation of oiled wildlife response in the region, and identify the future activities to be taken in the NOWPAP region at the national and/or

regional levels by summarizing relevant information and data on oiled wildlife response in the NOWPAP region, to ultimately increase the public awareness and capacity of oiled wildlife response in the NOWPAP region.

It is believed that this publication would provide essential information to the global community in regards to the response and preparedness for the oiled wildlife in the NOWPAP region.

Dr. Seong-Gil Kang
Director of NOWPAP MERRAC

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The Marine Environmental Emergency Preparedness and Response Regional Activity Centre (MERRAC) is one of four Regional Activity Centres of the Northwest Pacific Action Plan (NOWPAP). It was adopted in 1994 as a Regional Seas Programme of the United Nations Environment Programme (UNEP) by the People's Republic of China, Japan, Republic of Korea and Russian Federation and is responsible for regional co-operation on marine pollution preparedness and response in the NOWPAP region.

Based on the decision of the 19th MERRAC FPM and the 11th Competent National Authorities (CNA) Meeting (June 2016), "Development of a technical report on oiled wildlife (mainly birds and marine mammals) response in the NOWPAP region" was carried out as one of the MERRAC 2016-2017 Specific Projects. The following nominated national experts of the NOWPAP member states contributed to the report: Mr. Baohua Yang (Hebei Maritime Safety Administration, People's Republic of China), Dr. Susumu Nakatsu, Dr. Tatsuo Minowa (Wildlife Rescue Veterinarian Association, Japan), Prof. Dr. Jong Seong Khim (Seoul National University, Republic of Korea) and Mr. Aleksey Knizhnikov (World Wildlife Fund Russia, Russian Federation). The MERRAC staffs (Dr. Seong Gil Kang, Dr. Jeong Hwan Oh, Ms. Siyeon Lee, Ms. Joung-yun Lee and Ms. Narae Yoon) also contributed in the production of the report. Also, this report was finalized with technical supports of the MERRAC Focal Points, NOWPAP Regional Coordinating Unit (RCU) and consultation of Ms. Yoon Young Back (former MERRAC staff).

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Chapter 1. Introduction

1.1. Background

Historically, large-scale oil spill incidents had caused serious damage to the wildlife globally. The Torrey Canyon incident (1967) which occurred off the south-west coast of the United Kingdom is one of the world's most serious oil spills with an estimated 25-36 million gallons of crude oil spilt. In consequence, more than 100,000 seabirds died (Bourne et al., 1967). The Exxon Valdez spill incident (1989) which occurred in Alaska spilled nearly 11 million gallons of crude oil into the environment and killed over 250 thousand seabirds and hundreds of marine mammals (Piatt and Ford, 1996). The worst part is that, even 18 years later, the remaining toxic of the spilled oil still continues to damage the marine environment and kill the marine species (Boehm et al., 2008). More recently, the Deepwater Horizon oil spill incident (2010) which has a record of being the worst oil spill incident in the US history spilled around 3.19 million barrels of crude oil into the Gulf of Mexico and killed thousands of seabirds, mammals and endangered species (Corn, 2010).

Indeed, crude oil spills cause direct and long-term damage to aquatic ecosystems. The physical properties and chemical composition of crude oil make its presence in the marine environment very disruptively. Due to its high viscosity, leaked oil can cause damage to waterbirds to lose insulation, waterproofing and buoyancy in the plumage (Burger and Fry, 1993). In the long term, waterbirds can experience a significant population decline, breeding success reduction and breeding phenology delay due to the ingestion of spilt oil (Wells et al., 1995). An oil spill at sea can also threaten marine mammals such as dolphins and whales, causing damage on the sensitive tissues by inhaling the gasses of volatile fraction from the oil, ionic regulation and water balance by approaching sensitive mucous membranes due to the skin contact with oil and gastrointestinal tract by ingesting oil (Geraci and Joseph, 2012). Over time, spilled oil spreads out, forming a thin film on the sea surface, and tarballs, can give long-term adverse impacts on intertidal and coastal zones.

In Asian countries, coastal and marine environment has a somehow dynamic ecosystem with a variety of coastal habitats including well-developed tidal flats and estuaries in China and Korea and widely distributed rocky shores in the East coast of Korea, Japan and Russia. The oceanographic conditions, coastal morphology and

basin characteristics all influence and play a role in highly variable environmental conditions and processes in water body of the Asian coastal areas (Hwang et al., 2014; Choi, 2014; Koh and Khim, 2014). Varying tidal conditions together with Asian monsoon system might bring a diverse aquatic marine life across the coastal regions of Asia, especially in the NOWPAP region.

One example of the coastal characteristics in the NOWPAP region is well developed tidal flats in the Yellow Sea that provide mid-route feedings and resting places for migrating waterbirds in East Asian – Australasian Flyway (Barter et al., 2002; Hua et al., 2015). In Figure 1, it is shown that the scale of migratory waterbirds along the flyway is over 50 million populations (annual), and the number of migratory species is 492 including 17 endangered species. Additionally, numerous protected species, including sea turtles, seals, dolphins, and cetaceans, inhabit or migrate along the coastal area of the Yellow Sea (Won and Yoo, 2014; Jung et al., 2012, Lee et al., 2014; Song et al., 2014).

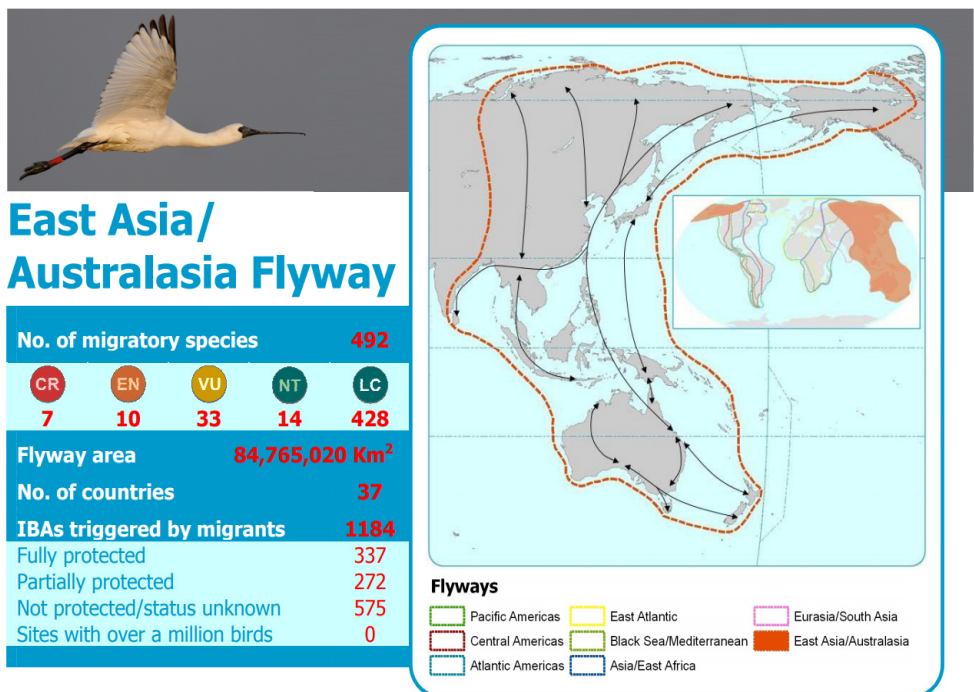


Figure 1. The East Asia/ Australasia Flyway (CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened, LC: Least Concern) (Available from: <http://www.birdlife.org/datazone>).

In addition, there has been a continual population growth in the coastal areas of the NOWPAP region followed by an increase of the human activities in the coastal areas of the region during the past half century. The coastal development and increasing shipping density with economic demands and prosperity in the NOWPAP region have resulted in an increase of the risk of oil spill incidents, environmental damage and ecosystem deterioration. Accordingly, the survival of wildlife in this region is under the threat of anthropogenic impacts due to direct and/or indirect effects of oil spills.

In the NOWPAP region, the environmental issues generally include losses of biodiversity and habitats of coastal and marine lives caused by eutrophication, environmental contamination, and marine litter etc. (NOWPAP POMRAC, 2017). Among these, the coastal and marine pollution caused by the incidental oil spills is a significant issue of concern due to its catastrophic, widespread, and fairly persistent ecological damage. By taking the high biodiversity of marine life (Costello et al, 2010) and various productive and healthy coastal habitats across the Asian countries (Koh and Khim, 2014) into consideration, the issues on oiled wildlife should be much addressed and discussed to mitigate ecological and economic damages in the NOWPAP region.

The issue on oiled wildlife was first discussed during the NOWPAP MERRAC Expert meeting (October 2015, Russia). The experts from the member states and related international organization participated in the meeting to discuss and share the current status of the preparedness and experiences on oiled wildlife response in the NOWPAP region. In particular, experts from HELCOM (the Baltic Marine Environment Protection Commission), Sakhalin Energy and WWF (World Wildlife Fund) of Russia shared various experiences on oiled wildlife response with informative guidelines and international/regional cooperation frameworks. In the meeting, the NOWPAP members identified that all members are not sufficiently prepared to efficiently respond to oiled wildlife during oil spill incidents especially founding an effective legal system and establishing relevant response exercises and rescue training centers with training programs and guidelines/manuals. Accordingly, few potential tasks to be implemented in the NOWPAP region were recommended through in-depth discussions during the meeting which aim to enhance the oiled wildlife response capacity in the NOWPAP region, as follows:

- Strengthening the database for natural resources in the NOWPAP region
- Sharing and developing rescue methods and system for oiled birds

- Collaborating with other field of wildlife management
- Raising public awareness and education on oiled wildlife issues
- Developing a manual on oiled wildlife in the NOWPAP region under the MERRAC Specific Projects
- Building a platform for experts in the NOWPAP region to communicate and share experiences and information on oiled wildlife preparedness, response and management

1.2. Objectives

Marine pollution has been a common and significant environmental issue globally, particularly in the coastal areas where human activities are concentrated. Oil spills are a particularly dire source of pollution with catastrophic and long-term adverse impacts on marine ecosystems. Thus, accurate and prompt actions are required to minimize, and ideally prevent the effects of spilled oil on wildlife and the environment.

It is asserted that the oiled wildlife response (OWR) seems to be the most underestimated aspect of oil spill management and assessment (IPIECA, 2014). By contrast, it requires an integrated and long-term mitigation practices through multiple levels of organisms and populations. Marine mammals, waterbirds, and benthic and pelagic communities are all susceptible to oil spills. Also, un-identified direct correlations between oil quantity and impact on wildlife have made the assessments of risks of oil spills on wildlife difficult. Concerns on protection of wildlife from oil have been increasing in the NOWPAP region across various levels: public, industry, and inter and intra governments. Thus, guidelines for a systematic OWR should be developed and implemented.

Here, we would like to provide a review of the most up-to-date information and data on OWR in the NOWPAP member states and suggest recommendations. The goals and contents are summarized as below.

1. First, identify the potential risks of oil spills on wildlife (mainly, bird and marine mammals) and resources in the NOWPAP region, with a geographical feature, list of marine mammals and analysis of latest oil spill incidents.

2. Second, discuss on the current status of oiled wildlife response with an analysis of data collected within countries in the region. And also to summarize the impact cases, relevant response techniques for rescuing oiled wildlife and relevant national laws and regulations.
3. Third, highlight the challenges and/or weakness relating to these responses based on an analysis of previous cases and data.
4. Finally, provide recommendations for future directions and activities to enhance the oiled wildlife response capacity on both national and regional level in the NOWPAP region.

Chapter 2. Potential risks of the oil spills on wildlife and resources

Researchers have published the results of studies showing that the seabird population has decreased by 30% each year over the last 60 years approximately, and the seabirds account for the most of the rescued individual animals during oil pollution incidents.

According to the Red List of the International Union for Conservation of Nature (IUCN) and Natural Resources, 91 of 336 known seabird species (27%) are identified as endangered species worldwide, and approximately 40 species (10%) are identified as Near Threatened species. Overall, some 37% of seabird species are endangered or Near Threatened, highlighting a critical global situation. The NOWPAP region is also experiencing a decrease in the seabird population without exception.

2.1. People's Republic of China

In this report, information on the potential risks on the wildlife caused by oil spills in the Chinese sea and coastal areas of the NOWPAP region including portions of the Bohai Sea, the Yellow Sea and their coasts was collected and analyzed. Several major Chinese ports are located within the NOWPAP region, including ports in Dalian, Yingkou, Yantai and Weihai. The Chengshanjiao water area is a hub connecting the Bohai Sea and the Yellow Sea. Because these sea areas are heavily navigated by ships, including oil tankers, chemical tankers and large container ships, oil spills from vessels are a major marine pollution risk. While the aforementioned port cities are industrial cities and/or hubs for oil transport with oil storage facilities on land, land-sourced oil spills are another major marine pollution in the region. Notably, Xingang Port oil spill (2010) in Dalian had noticeable impacts on the fishery industry, aquaculture and benthic organisms.

Marine mammals including seals, whales, manatees, sea otters and polar bears are defined as aquatic mammals that rely on the ocean and other marine ecosystems for their existence and therefore they are vulnerable to oil spills in the seas. Species of marine mammal in China are listed in Table 1.

Table 1. Marine mammals in China

Order	Family	Species name
CETACEA	Balaenidae	<i>Eubalaena glacialis</i>
	Eschrichtiidae	<i>Eschrichtius robustus</i>
		<i>Balaenoptera musculus</i>
		<i>B. physalus</i>
		<i>B. edeni</i>
		<i>B. borealis</i>
		<i>B. acutorostrata</i>
		<i>Megaptera novaeangliae</i>
	Physeteridae	<i>Physeter macrocephalus</i>
	Ziphiidae	<i>M. ginkgodens</i>
	Globicephalidae	<i>Orcinus orca</i>
		<i>Pseudorca crassidens</i>
	Phocoenidae	<i>Neophocaena phocaenoides</i>
Delphinidae	<i>Delphinus delphis</i>	
	<i>Tursiops truncatus</i>	
	<i>Lagenorhynchus obliquidens</i>	
PINNIPEDIA	Phocidae	<i>Phoca largha</i>
		<i>P. hispida</i>
	Otaridae	<i>Eumetopias jubata</i>
		<i>Callorhinus ursinus</i>

Along the Chinese coastlines in the NOWPAP region, there are numerous saline marshes and tidal beaches. Covered by herbaceous plants, these saline marshes and tidal beaches provide habitats for many birds and form a swamp-grass-bird ecosystem. In the Panjin city region, for example, there are Asia's largest reed marshes and the spectacular Red Beach, which provide habitats for more than 137 birds, including the red crowned crane (*Grus japonensis*).

With such diverse habitats and wildlife, China is making efforts to protect ecosystem by designating nature reserves. As of May 2016, 2,740 nature reserves had been established in China, including 446 national nature reserves and 2,294 local nature reserves, which are protected areas set up to manage and research important flora and fauna with special values. In particular, China established 68 national marine reserves and marine special reserves additionally by the end of 2015, protecting more than 200 species of wildlife. There are seven marine and coastal nature reserves within the NOWPAP region of China within which marine mammals and birds are under conservation, as listed in Table 2.

Table 2. List of marine and coastal nature reserves in the NOWPAP region in China

No.	Name of Nature Reserves	Location	Object of protection	Level	Date assigned
1	Dalian Spotted Seals (<i>phoca largha</i>) National Nature Reserve	Dalian City, Liaoning Province	spotted seals (<i>phoca largha</i>) and their habitat	National	1992
2	Shedao, Laotieshan Mountain Nature Reserve	Dalian City, Liaoning Province	Viper, migratory birds and their habitat	National	1980
3	Yalu River Estuary and Coastal Wetlands Nature Reserve	Dandong City, Liaoning Province	Tidal flat wetland and rare waterfowl	National	1987
4	Liaohe River Estuary National Nature Reserve	Panjin City, Liaoning Province	Red-crowned cranes, white cranes, swans and other rare birds	National	1985
5	Rongcheng Whooper Swans Nature Reserve	Rongcheng City, Shandong Province	Whooper swans and other rare birds, wetland ecosystem	National	1992
6	Shicheng Black-faced Spoonbill Nature Reserve	Zhuanghe City, Liaoning Province	Black-faced spoonbill, yellow-billed egret, other rare birds and their habitat	Local	2006
7	Rongcheng Sanggou Bay Nature Reserve	Rongcheng City, Shandong Province	Rare marine animals and their habitats	Local	1987

2.2. Japan

Japan is an island country surrounded by water on all sides. Most of the seabirds that live or travel through or around Japan are endangered or vulnerable. In addition, Japan has many small affiliated islands with long coastlines, and therefore a heavy oil spill could affect a wide range of coasts. Thus, oil spill incidents near Japan could affect bio-systems that are rich in species such as tidelands, marshes, mangrove forests, coral reefs and marine forests. As the habitats become contaminated, birds are also greatly affected. Therefore, it is critical that Japanese conservation areas, particularly the most densely populated area in the south Japan, should be protected from heavy oil drifting with an extreme caution.

Notably, Japan's Pacific beach is an important spawning ground for some species of sea turtles that must be conserved. There are five species of sea turtles in the sea

area of Japan. Among them, Hawksbill turtle, Olive ridley turtle and Leatherback turtle don't nest in Japan by migrating a long distance around the southern waters. However, Loggerhead turtles, representative species of sea turtle in Japan, nest in Honshu, Shikoku, Kyushu and the Nansei Islands. Green turtles also nest in the Nansei and Ogasawara Islands and migrate around the southern waters. Fortunately, these turtles have been spared from substantial damage caused by oil spills but special care is still required.

Dozens species of marine mammals in Japan are also at risk from oil spills. In the sea area around Hokkaido, only Common (Harbor) seals are living all year round. Dugongs grazing on sea grasses are living in the coastal waters around Okinawa, and are an endangered species with a very few population in Japan. Whales and dolphins are very easily found in Japan with many species, however, many of them strand every year in the coasts of Japan by various causes. Cetacean conservation has been gaining attention in Japan because the mass stranding of these mostly decreased individuals. Thus, cetacean conservation efforts must take the relationship between oil spills and cetacean stranding into consideration.

Japan has many small islands beside the main four islands. Notably, the Ogasawara islands, Okinawa islands and islands near Hokkaido are habitats of endemic and endangered species. Moreover, Hokkaido is the most important area for breeding sites over the 12 species of seabirds. Among them, 300,000-400,000 breeding pairs of Rhinoceros auklet in Teuri Island and about 400,000 breeding pairs of Leach's storm petrel in Daikoku Island. Thus, an oil spill near these islands could decimate locally important species that rely on these habitats. Countermeasures against oil pollution in Japan are required to protect these remote island habitats and several protected marine animals.

2.3. Republic of Korea

Korea is also a country surrounded by sea on three sides. It has a well-developed trade industry, many ports, and relies entirely on crude oil imports. There are many oil companies in Korea and each has its own facilities on the coast. Since all Korean industrial facilities are located within the NOWPAP region, oil spills can cause serious oil pollution in the region, if occurred.

Annually, about 250 cases of large and small-scale oil spill incidents are occurring in the Korean seas. The number of oil spill incidents and amount of spilled oil had been decreasing in recent years, with Hebei Spirit Oil Spill (HSOS) incident of 2007 being a notable exception. In more recent years, however, the number of oil spill incidents has been increasing, with the incidents being attributed largely to small vessels because small and mid-sized incidents such as fishing vessels and aged cargo vessels are poorly managed compared to oil tankers. Figure 2 shows the location of the incidents which occurred in 2016. There were a total of 226 cases, and approximately 45% (102 cases) of oil spill incidents occurred near the southern coast of Korea, while about 32% (72 cases) occurred near the western coast; the rest of the incidents occurred near the Jeju Island (27 cases) and in the eastern coast (25 cases), respectively (Fig. 2) (MPSS, 2016).

In particular, local seas are likely to be affected by persistent oil chemicals in the event of an oil spill due to the coastal morphology and sedimentological features, i.e., dented coastal line and many islands (>3,000), soft bottom sediment, and macro-tidal environments. Such oceanographic and geological settings in the Korean coastal areas might have a slower ecological recovery than other common coasts. The level of physical exposures, deposition of oil components depending on sediment characteristics, restrictions upon control work, and clean-up activities can all affect the recovery rate. The variety of vessel operations and regional characteristics of Korean coast put it at a particularly great risk for negative impacts of oil spill incidents, resulting in a huge ecological and economic cost for the full recovery.

Moreover, given the diversity in the local marine environments, there are many creatures living on the Korean coast, including some of the world's most protected species. A total of 77 marine species has been listed and protected as threatened or ecologically important species, including 16 marine mammal species (e.g., whales and seals), 4 reptile species (e.g., turtles), and 14 seabird. Some of these protected species inhabit specific habitats, for example, a large number of various endangered species, Spoon-billed sandpiper (*Calidris pygmaea*), Black-faced spoonbill (*Platalea minor*), Oriental stork (*Ciconia boyciana*), etc., are found every year along the Chungnam coast in Korea (Korea National Park Service Research Institute, 2016). Thus, oil spills can have a tremendous negative impact on the ecology of those protected species.

Number of oil spill accidents in 2016

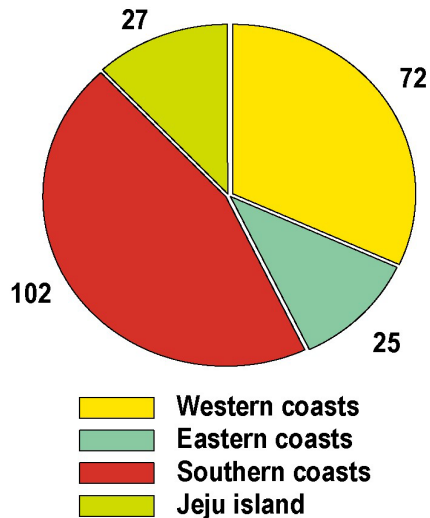


Figure 2. Oil spill incidents in sea areas around Korea in 2016.

Several large oil spills have had a major economic impact on Korean fisheries, aquaculture and tourism. For example, the Sea Prince oil spill incident (1995) leaked 5,035 ton of crude oil, causing damage to 3,826 ha of fish farms, resulting in about 73.6 billion Korean Won (\approx US\$65 million) in damage (Shin et al., 2008). More recently, the Wu Yi San oil spill incident (2014) which was relatively a much smaller incident compared to both HSOS and the Sea Prince incident, leaking 1,000 ton of crude oil contaminated a 1,218.3 ha in Korea (MOF, 2014).

Except the researches carried out during the HSOS, oil spill assessment and management efforts have not sufficiently covered research studies on oiled wildlife issues in general (Yim et al., 2017), or provided an acute OWR protocol. Although substantial water quality and benthic ecology data have been collected, there has been little research on the effect of the Wu Yi San incident on water birds and marine mammals. While the Wildlife Protection Act does not include provisions for protection and management of oiled wildlife, civic and nonprofit organizations had to lead the bird recovery, rehabilitation and release programs instead of the governmental authorities.

2.4. Russian Federation

Currently, more than 95% of Russian oil is produced onshore. Hydrocarbon production activities are carried at shelf fields in the Sea of Okhotsk, the Baltic Sea, and the Barents Sea. The long-term state strategy for oil and gas industry development includes provisions for future extension of oil and gas production at shelf fields. For example, almost 30% of the Russian shelf area within exclusive economic zones (EEZ) in the Arctic has already been handed over to oil and gas companies as license blocks (Fig. 3).

Sakhalin Island is located in the Russian Far East and within the NOWPAP region. It has abundant natural resources especially in the continental shelf. In addition, birds and other wildlife species (many are on federal and regional Red Lists) permanently or temporarily inhabit nearshore bays and lagoons as well as rivers and wetlands. Sakhalin Energy, a large-scale oil and gas company of Russia, has its main business on oil and gas platform, pipeline system, onshore processing facility, oil export terminal and LNG plant and is located on the southern shore of the island.

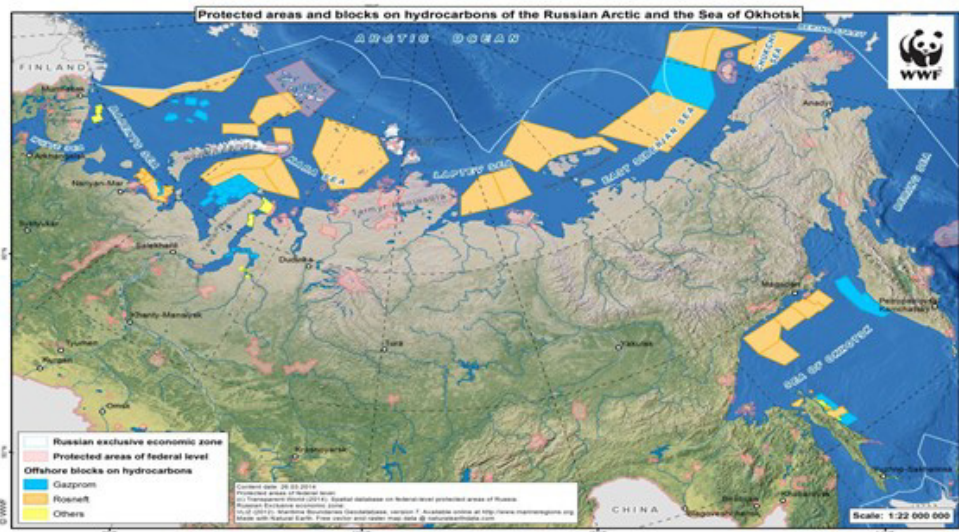


Figure 3. Schematic map of license blocks in the territorial seas and EEZ of Russia.

Another oil-related threat to wildlife is navigation: hydrocarbon export shipping and transportation along the Russia's extensive shorelines. In fact, a total of 228 million tons of oil and 141 million tons of hydrocarbons have been shipped from the Russian ports (almost 370 million tons in total; <http://portnews.ru/news/232561/>) in 2016, which amounts to more than a million tons per day. It is to say that where there are busy navigational channels, spill incidents are bound to be occurred.

Chapter 3. Current status on oiled wildlife response

3.1. Impacts on oiled wildlife: national cases

3.1.1. People's Republic of China

On July 16 2010, an oil pipeline was exploded in an oil storage depot near the Dalian Port. It has resulted in hundreds of tons of crude oil being spilled into the sea and also in serious contamination of the local water area and coastline over 1,000 square kilometers. In addition, the majority of wildlife inhabiting the area was exposed to oil, which could lead to the deaths or display long-term effects (Greenpeace, 2010). In order to conduct an oil spill response, the China Maritime Safety Administration (MSA) mobilized resources nationwide to provide assistance to the local government. The spill was quickly under control and an effective recovery strategy was implemented, to minimize its impact on the marine environment. By the September 7 2010, the oil content in the sea water of the incident area was reduced to the pre-incident levels. And fortunately, the Bohai Sea and the high seas appeared to be unaffected.

Consecutive marine environment monitoring were conducted from 2011 to 2014 revealing that the regional environment was improved gradually. However, some impacts of the oil spill could still be detected in the surrounding marine ecological environment, including abnormal fluctuations in the diversity indices of phytoplankton, zooplankton, and benthic organisms. As a countermeasure, recuperation of the protected marine environment areas was accompanied by a restoration of intertidal-zone bio-communities, for the local arthropod (*Balanus albicostatus*), mollusk (*Crassostrea gigas*, *Littorina brevicula*, and *Ruditapes philippinarum*), and algal (*Enteromorpha linza* and *Ulva pertusa*) species to return to their normal dominant population levels.

3.1.2. Japan

Wildlife Rescue Veterinarian Association of Japan (WRV) which is a nonprofit organization (NGO) with veterinarians who has skills and experiences on oiled wildlife rescue, conducts rescue activities for wildlife during oil spill incidents in Japan. WRV has been conducting waterfowl rescues since launching its Gulf war

field activity in 1991. Several oil spills have affected the natural environment and ecosystems of Japan, and drifted leaked fuel oil has damaged the local vegetation and animal life. Fortunately, there were not many oil spill incidents causing severe and irreparable damage to the environment. Nevertheless, sea birds have suffered the most during the oil spill incidents.

In Japanese sea, there were many oil spill incidents in the last 50 years. The numbers of sea birds affected by major oil spill incidents in surrounding seas and seashores in Japan are summarized in Table 3. Commonly, the seabird population degrades in the summer season, after which there is a mass migratory influx from the northern latitudes. Due to the seasonal migration, most sea birds suffer great damages from oil spills during the winter. It can be noted that damage levels are higher on the southern coast of Japan, where migratory seabird population is immense, compared to the Pacific coast. Rougher marine conditions in the winter months may be a secondary reason for greater bird mortality in the winter.

Table 3. Major oil spills with basic statistics including the number of suffered birds during the past 50 years



[Location of the major oil spills]

Date	Location	Source	Oil (kL)	No. of suffered birds
Jan. 1971	Kashiwazaki Niigata	Unknown	200; Unknown	73
Dec. 1974	Kurashiki Okayama	Mizushima oil refinery	10,000; Heavy oil	172
Jan. 1986	Shimane	Unknown	Unknown	1,761
Jan. 1990	Wakasa Kyoto	Maritime Gardenia	916; Heavy oil	50
Jan. 1993	Tomakomai Hokkaido	Node Hope	50; Heavy oil	306
Jan. 1997	Off the Oki Islands	Nakhodka	6,240; Heavy oil	1,315
Feb. 2006	Okhotsk Hokkaido	Unknown	Unknown	5,600

3.1.3. Republic of Korea

Approximately 300 cases of marine oil pollution incidents occurred in Korea annually, among these incidents, Table 4 shows the major oil spills over 1,000 kL (Jung et al., 2013, MERRAC). In Sea prince (1995) and Wu Yi San (2014), oil spills were the two major oil spill incidents occurred along the southern Korean coastline. Over 6,000 tons of crude oil was spilled during the two incidents, having a great impact on the marine ecosystem as well as on nearby fisheries and aquaculture. However, oiled wildlife effects were only evidenced by photographs of waterbirds and marine mammal casualties, with no quantitative analyses (Fig. 4).

Table 4. Major oil spill incidents that occurred in Korea (Jung et al., 2013, MERRAC)

Oil spill	Cause of an incident	Amount of spilled oil (kL)	Note	Year
Hebei spirit	Collide	12,547	Crude oil	2007
Frontier express	Strand	8,322	Naphtha	1993
Sea prince	Strand	5,035	Crude and fuel oil	1995
Korea venus	Strand	4,288	Diesel oil	1993
Stainless princess	Strand	1,900	Diesel oil	1992
Korea hope	Collide	1,500	Bunker C oil	1990
Honam sapphire No. 5	Collide	1,402	Crude oil	1995
Kumdong	Collide	1,228	Bunker C oil	1993
Wu Yi San	Collide	1,000	Bunker C oil	2014
Yuil No.1	Strand	Unknown	Unknown	1995



Figure 4. Oil-polluted waterbirds in the Wu Yi San oil spill.

HSOS of December 7, 2007, was the largest oil spill incident in Korea. According to the Korea Coast Guard, 12,547 kL of crude oil was discharged and a total of 35 km of shoreline compassing Hakam port to Pado-ri was covered with oil and major international bird community refuges were under threat within five days (Chan, 2004). In addition, tarballs were found in the Jeju coastal area in the southern sea 31 days after the incident. Because the incident was an unprecedented case, long-term ecological monitoring was proceeded, and investigations on effects on birds and marine mammals were also conducted.

12 days after the HSOS, a total of 333 individuals of 13 waterbirds species were found to be dead (Table 5), with *Larus crassirostris* species in majority (Moore et al., 2007). Fortunately, the number of waterbird species and individuals in the nearby area was monitored by the Korea National Park Research Institute (KNPRI) and a timely increase was indicated after the incident, from 2007 to 2013: the waterbird population was recovering. Recently, KNPRI discovered a hatching nest in the incident area, which means that the ecosystems are restoring to its normal stage (Fig. 5).



Figure 5. Little tern (*Sterna albifrons*) nest found post-oil spill near incident area in 2015.

Table 5. Number of species in oiled waterbirds in Dec. 19, 2007 (Moores et al., 2007)

Species name	Number of oiled birds (n)
<i>Tadorna tadorna</i>	6
<i>Anas platyrhynchos</i>	1
<i>Bucephala clangula</i>	1
<i>Podiceps cristatus</i>	1
<i>Haematopus (ostralegus) osculans</i>	3
<i>Calidris alpina</i>	1
<i>Larus crassirostris</i>	289
<i>Larus canus</i>	12
<i>Larus vegae</i>	10
<i>Larus schistisagus</i>	3
<i>Larus heuglini</i>	1
<i>Larus ridibundus</i>	2
<i>Larus saundersi</i>	2
Total	333

The Indo-Pacific finless porpoise (*N. phocaenoides*) is one of the smallest marine mammals found in Korea. Its habitat encompasses shallow waters from midwestern Japan to Korea and China (NFRDI, 2000). After HSOS, the Korea National Petroleum Research Institute at KNPRI reported basic data on the distribution, occurrence, and abundance of these porpoises based on sighting surveys. The reports documented 7 dead bodies on December 18, 2007. Although sightings of individuals have since been increasing, there is insufficient past data for an accurate comparative evaluation (Table 6).

Table 6. Monitoring data on population of the Indo-Pacific finless porpoise in Korean coast after the HSOS since 2008

	Monitoring of <i>Neophocaena phocaenoides</i>						
	2008	2009	2010	2011	2014	2015	2016
Individuals (n)	96	38	94	309	301	143	115
Frequency	27	6	-	6	69	49	23

3.1.4. Russian Federation

In November 2007, more than 2,000 tons of oil products reached the Kerch Strait which is located between the Black Sea and Sea of Azov due to a severe storm. Spilt oil killed a large number of seabirds with acute damages, whilst other estimations reported up to 30,000 seabirds being killed by the spill (Greenpeace, 2007).

This environmental disaster showed that the Russian state authorities, companies and non-governmental nature protection organizations were not ready to carry out wide-scale activities to rescue animals, including the birds smothered in oil. Ten years later, Russia still remains a major producer and exporter of oil.

In December 2015, an oil product was spilled from the Russian tanker vessel *Nadezhda* near the shores of Sakhalin. The response activities at that time showed some progress in terms of wildlife rescue capacity compared to 2007. Bird rescue operations were organized in accordance with best world practices owing to Sakhalin Energy for having developed specialized forces and means for bird rescue, and for providing a model for Russian oil companies. Additionally, regional environmental protection NGOs were ready and managed to organize oiled bird recovery operations, while a number of state search-and-rescue units demonstrated effective teamwork. During the oil spill in 2015 a few hundred birds were affected (mostly cormorants), about 80 were caught and brought to a rehabilitation center. Despite the efforts to mitigate the damage on the oiled wildlife, almost all birds died later due to lack of recovery system.

3.2. Relevant response techniques for rescuing the oiled wildlife

3.2.1. People's Republic of China

In recent years, China has established several wildlife rescue centers, aquatic wildlife rescue centers and wild bird rescue stations within the NOWPAP region. In addition, there are some private oil spill response centers and also a non-profit conservation organization, called China Wildlife Conservation Association.

Two wildlife rescue stations were built in Dalian City of Liaoning Province for spotted seal research and rescue programs, and a third has been approved by the Ministry of Agriculture with the mission of protecting aquatic wildlife. The Weihai Aquatic Wildlife Rescue Center, which was established in May 2016, is the first aquatic wildlife rescue center in Shandong Province, and its main responsibility is to carry out rescue, release, and disposal of aquatic wildlife.

Wild bird rescue stations have been rebuilt and expanded with more medical equipment in Panjin City of Liaoning Province. Stores of personal protective equipment (protective suit, gloves, rubber boots, and masks) are now available in the equipment stockpiles of local maritime authorities, ports, and Ship Pollution Response Organization. Such equipment can be utilized by wildlife responders for personnel safety when handling aggressive species like divers, cormorants, herons, and raptors.

In addition to the government agencies, Chinese oil companies have also established several oil spill response centers. Terrestrial and marine wildlife conservation is administrated by several government agencies, including the Ministry of Environmental Protection, the State Forestry Administration, the Ministry of Agriculture, and the State Oceanic Administration.

The China Wildlife Conservation Association, which is the largest ecological conservation organization in China, was founded on December 22nd, 1983 in Beijing. It is a nonprofit national organization under the framework of China Science Association with the aim of promoting sustainable development of China's wildlife. Its major functions are to carry out educational and scientific activities, to promote academic communication and cooperation within China and internationally, and to conduct relevant international wildlife conservation projects.

3.2.2. Japan

In Japan, there are many organizations related to the oiled wildlife: the government agencies (Maritime Disaster Prevention Center, Oiled Water Birds Rescue Training Center), non-profit organizations (WRV), social organizations (Japanese Society for Preservation of Bird, Wild Bird Society of Japan, Veterinary Medical Association, and various nature conservation groups), research organizations, universities and others. When oil spill occurs, WRV takes the central role in clinical aspects of oiled bird

rescue activities. For example, WRV sent veterinarians to the oil spill sites in the Gulf War in 1991 and the tanker oil spill incident site in offshore of South Africa in 1994.

In the tanker stranding incident at Tomakomai, Hokkaido (1993), the WRV veterinarians shared clinical skills with local veterinary surgeons, not only with respect to oiled-bird collection, but also with respect to ongoing care, including physical checkups, washing, drying, feeding, and rehabilitation using a swimming pool.

WRV performed full-scale rescue activities during the large-scale Nakhodka Russian tanker oil spill (6,240 kL) in 1997. As they were keen to further improve their skills, WRV invited experts from the USA to come and teach them advanced techniques for collecting animals from polluted beaches and for washing and rehabilitating severely oiled birds. Consequently, WRV improved its skillset while obtaining good rescue outcomes after the Nakhodka incident. In addition, a private Japanese airline All Nippon Airways transported recovered birds from the oil contaminated Hokuriku region to the Tomakomai sanctuary in Hokkaido by free. Thus, the experiences and results associated with the Nakhodka incident set a new standard for rescue skills and activities. Moreover, small-scale WRV trainings of Japanese veterinarians have continued domestically and in foreign countries since the Nakhodka incident.

There are various nature conservation groups in Japan and researchers cooperating with Bureaus of Nature Conservation in the Ministry of the Environment as well as with local governments. In Japan, many such groups have been carrying out wildlife maintenance activities in the context of oil pollution incident measures. University and research organization researchers in each area have joined these efforts and promoted substantial activity.

In Japanese sea areas, there is a wide variety of wildlife. People who have been concerned with the rescue of oiled birds frequently noticed some remarkable species affected by pollution, such as seabirds and large sea mammals, most notably whales, but also sea lions and sea otters. Whales are being researched by the National Museum of Nature and Science and Institute of Cetacean Research. Some universities are also offering a specialized oceanography and sea mammal science courses. The sea turtles migrating through Japanese waters are being monitored by the Sea Turtle Association of Japan. There is potential for the local

universities and research organizations to advance oil-incident related conservation activities in Japan.

The rescue and preservation of oiled seabirds is very important in Japan. The Japan Seabird Group specializes in this field. In addition, there are many active groups in Japan that stand to contribute such as the Wild Bird Society of Japan and the Japanese Society for Preservation of Birds, which have many branch offices in every prefecture in Japan. Some local universities are offering an ornithology course. The Yamashina Institute for Ornithology is a very well-known active research group. They have been cooperating with bird-specialist nature groups for the conservation activities. These groups are expected to lead rescue activities in the event of an oil-spill incident in Japan.

Looking back on the past oil pollution incidents, great achievements can be seen. In the case of the Nakhodka oil spill incident of 1997 in particular, each branch office of the nature conservation groups mentioned above cooperated with many local governments. The cooperation system which was controlled by the Ministry of the Environment functioned efficiently.

All nature conservation groups related to Oiled Bird Information Committee (OBIC) founded an oil pollution seabird damage committee, and performed investigations at each polluted site. The collection work of seabird was conducted systematically and the accumulated data were submitted to the Ministry of the Environment and compiled into a database. The database was used to obtain estimates on damage and environmental impact, enabling people to identify what was needed in terms of damage recovery, monitoring, and restoration of seabird populations.

Exercise & Training

A "Comprehensive Training for Response to Oil Spills" program consigned to the Japanese Society for Preservation of Birds and in cooperation with the WRV was started by the Japanese Ministry of the Environment in March of 1997, following the Nakhodka incident. The program provided full-scale annual training sessions until 2007 (15 annual sessions), usually at the Maritime Disaster Prevention Center (Yokosuka Kanagawa), with three additional local workshop sessions in Kobe Hyogo, Osaka, and Hokkaido with 420 workers participated. This full-scale training encompassed trainings for various oil prevention work activities, oiled bird rescues, and eco-systemic maintenance activities. Attendees for this training included

firefighters, disaster prevention staffs of local governments, drinking water quality maintenance staffs, and environmental conservationists in charge of conservation of nature connection bureaus, in addition to, of course, veterinarians, veterinary technicians, and veterinary students. Thus, these efforts have involved many kinds of people, including people not directly involved with oiled bird rescue activities.

Some organizations have implemented regular exercises and trainings related to oiled wildlife rescue and treatment, and provided education programs for volunteers and related official/field workers. An Oiled Water Birds Rescue Training Center was built by the Ministry of the Environment in Hino city, Tokyo (Fig. 6). Oil pollution measures and waterfowl rescue training were started at this facility in 2000. A variety of people concerned with oiled bird rescue were trained at this facility, including staff of the conservation of nature connection bureaus of the local governments, Ministry of the Environment and zoos and aquarium veterinary workers, group members of conservation of nature and wildlife rehabilitators. The center provided trainings including lectures on the preparedness and basic knowledge of the oiled wildlife, setting the pool, physical examination, cleaning and forced feeding (Fig. 7).

WRV has been undertaking trainings three times a year with single annual local training sessions in cities throughout the country (i.e. Sendai Miyagi, Fukushima, Niigata, Shizuoka, Tsu Mie, Wakayama, Toyooka Hyogo, Okayama, Takamatsu Kagawa, Nagasaki, Kagoshima and Ogasawara/Chichijima). More than 1,000 people have participated in these trainings so far and a volunteer registration system has been created by Ministry of the Environment, with approximately 270 registrants as of 2010. When a severe oil spill incident happens, the Ministry emails the registered people to ask for their supports and participation in the OWR efforts.



Figure 6. Oiled Water Birds Rescue Training Center in Hino city, Tokyo



Figure 7. Training program on oiled wildlife in the Oiled Water birds Rescue Training Center (lecture - training cleaning – setting the pool - physical examination - cleaning - forced feeding)

In addition, WRV has been carrying out similar classes at their Osaka branch office. WRV has also been giving lectures and practicums to plural universities and veterinary technical college students every year since 1998, producing more than 1,000 qualified volunteers. In addition, the Wildlife Rescue Association and the Wildlife Rehabilitator Association carried out similar classes in Hokkaido almost every year. Furthermore, local governments in Chiba, Osaka and Tokyo have been given lectures and practicums related to oiled-bird rescue trainings. In addition, WRV has been cooperating with Veterinary Medical Association chapters in Aichi, Osaka and Shimane to hold additional training courses. WRV also invited European and American researchers to Japan and these efforts over the past 20 years raised the Japanese oiled-bird rescue capacity to a world standard.

The content of the training course includes information on seabird behaviors and habitats as well as information on sustainability of ecosystems and biodiversity. A lecturer gives a 3-hours slide show on oiled-bird rescue and then provides 2 hours of practical training of real-world clinical rescue skills, such as bird restraint, physical checks, estimation of body condition, detergent selection, washing water temperature, washing skills, checking for residual oil on feathers, the drying process, feedings, accommodation, and prevention of infectious diseases. The instructor leads the participants through their training with real rescue procedures being

performed on domestic ducks. The practical skills learned in the training course are as follows:

[Practical skills on a real rescue procedure]

- 1) *ID number tagging*: Attach plastic tape to a leg in substitution for a metal foot ring and write on it an ID number with a pen
- 2) *Make a medical record with its ID number*: Write every test result during the bird's stay in the record
- 3) *Anamnesis*: Ask the person who brought in the bird about the bird's condition when it was rescued
- 4) *Oral administration of activated carbon liquid*: Deliver prescribed amount of Ringer's solution with activated carbon using a catheter
- 5) *Photograph the bird*: The picture should include ID number
- 6) *Collect feather sample evidence*: Wrap a few oiled feathers in aluminum foil and place in a plastic pack; write its ID number on the pack and attach it to the medical record
- 7) *Measure body weight*: Use a cardboard box to calm the bird
- 8) *General physical checks*: Palpate muscle and bone; use a stethoscope to hear heartbeat and pulmonary sounds
- 9) *Take temperature*: Place a thermometer in the cloacae
- 10) *Wipe oil off the face*: Wipe off any excess oil from the face, including the beak, with cotton swabs and tissue papers
- 11) *Blood test*: Collect blood from a leg or wing vein with a syringe, and then analyze it for hematocrit (packed cell volume %), total protein (g/dl), and blood sugar (mg/dl).
- 12) *Feeding*: Provide supplementation via catheter intubation or nourishment infusion
- 13) *Wash*: Move an oiled bird to the washing process if a veterinarian confirms that its condition is suitable based on test results; because the washing process can be highly stressful, it is critical that birds be entirely healthy to reduce the tragedy of bird deaths

In a real incident scene, the individual animal covered with oil will be washed. But in the training course, it is washed without having oil on it. The washing procedure is as follows:

[Washing Procedure in a real incident scene]

- 1) Make wash solution: ~40 °C water in a pail with 1–3% density detergent dissolved in (i.e., JOY by Proctor and Gamble Ltd.). Soak to the neck of the oiled bird for a while and start washing.
- 2) Start washing the inside of the bill with a toothbrush and scrub the head and neck gently with cotton swabs or a toothbrush. Oil removal with a toothbrush is limited to the upper neck zone because rubbing with toothbrush might destroy water-repelling feather microstructures.
- 3) Wash body proceeding from the back to the abdomen, each surface starting from the neck. Change wash pail and solution whenever solution becomes brown.
- 4) Wash wings and tail. The wing feathers provide the most protection against seawater. Learn to wash by controlling strong water flow with palm strokes so that there is no direct touching of these feathers.
- 5) Continue washing until solution does not change to brown anymore. After repeated washes, confirmation of no further oil being removed must be made before advancing a bird to the rinsing stage.
- 6) Rinse the bird starting from the head with a stronger showerhead to remove washing detergents. Spend time rinsing deep into dense feathers.
- 7) To dry, move the bird to a cardboard box with soft mesh net 10 cm rise from the bottom. It is ideal to use a designated chamber (i.e. such as an infant incubator) for drying. Spend time applying gentle warm air with a hair dryer or futon dryer. Observe the bird's condition and whether there are any abnormalities of the feathers, limbs, or behavior. Maintain the bird in a drying chamber at a temperature of 40 °C with a thermometer until dry (~3 hours). Thereafter, give the bird ample food and water, and an opportunity to rest in a cardboard box at room temperature.
- 8) Move the bird to a rehabilitation pool filled with tap water. Put some birds in the swimming pool. If birds have completely dry feathers without any residual oil or detergent, they are likely to stay and swim for a long period. If a bird returns quickly to land, it may be cold from some water reaching the skin due to residual oil or detergent on its feathers. Such birds should be re-washed if and when a veterinarian can determine that they are physical strong enough to tolerate re-washing.

Indeed, development of rescue system requires human resources and it would be important to establish rescue system both in hardware and software. For now, the only available and exclusive training facility for the rescue of oiled birds in Japan is the Ministry of the Environment's Oiled Water Birds Rescue Training Center. Field training has frequently been held in borrowed training facilities elsewhere, such as universities or veterinary technical schools. In addition, WRV hold specialist training course on the oiled bird rescue twice so far. Several participants obtained an oiled bird-rescue specialist qualification from WRV.

3.2.3. Republic of Korea

In Korea, some organizations on the wildlife, such as government research institutes (Korea National Park Service, Migratory Bird Research Center), incorporated associations (Korea Animal Rescue and Management Association, Korean Association of Wild Birds Protection), environmental organizations (Korea Federation for Environmental Movements) and several regional wildlife rescue centers have been established and organized.

The Migratory Bird Research Center (MBRC) of the Korea National Park Service (KNPS) is the first research center on migratory birds, established to study birds migrating in the Northeast Asia. The center monitors the maintenance of seabirds/seasonal birds, and treated and released oiled birds when oil spill occurs. For example, in HSOS incident, KNPS responded to the oiled birds by mobilizing workers from national park offices and Ministry of Environment and volunteers (total: 4,110) with budgetary supports, and also implemented post-oil spill researches and projects on ecosystem restoration and long-term monitoring.

The Korea Animal Rescue & Management Association (KARMA) is an incorporated association approved by the Ministry of the Environment, responsible for rescue of the oiled wildlife and endangered species and raising public awareness on the status of the wildlife. In addition, the KARMA rescued 2,000 animals per year with wildlife rescue, wildlife hospitals and protection centers (Figs. 8 and 9). The Korea Federation for Environmental Movements is the oldest organization with a 30 years history and the largest environmental organization in Asia promoting conservation of wildlife habitats and raising public awareness.



Figure 8. KARMA wildlife rescue center.



Figure 9. Rehabilitation of oiled birds at KARMA.

Few regional wildlife rescue centers are located on average about 1.5 hours away from the coast in some prefecture (Chungcheong province, Jeolla province, Gwangju, Busan, Ulsan, Jeju and Gyeongsang province). When oil spills occur, the center responds to oil spill by using the facilities of the nearby rescue center or installing facilities on the site. However, in areas without rescue center, it is difficult to rapidly and effectively respond to large-scale oil spill incidents. In addition, lack of research on waterbirds and marine mammals and the insufficient number of

well-trained rescue teams make the oiled wildlife response activities difficult and inefficient. Proper planning and organization are required to restore the health of oil-polluted animals.

3.2.4. Russian Federation

In the years, following the catastrophic oil spill in the Kerch Strait (2007), Russian non-governmental organizations have worked hard to review other countries' experiences, to prepare and publish guides in Russian language on the prevention of wildlife loss (especially loss of birds). In addition, cooperation framework with the state authorities has been established (primarily with the Russian Ministry of Emergency Situations, the Ministry of Environment, and the Marine Rescue Service under the Federal Agency of Sea and River Transport).

During a series of workshops and conferences on environmental safety conducted in Russia in recent years, environmental institutions and the largest Russian oil and gas companies attended to discuss and share on the issues of oil/oil product spill response and readiness to take effective wildlife rescue actions. The readiness were used to prepare the "Environmental responsibility rating of oil & gas companies" published in recent years (WWF Russia-Creon, 2014, 2015, 2016). Efforts to improve the readiness of Russian oil and gas companies to provide OWR are being made through UNDP/GEF/Russian Ministry of Environment projects.

World Wildlife Fund (WWF), which is one of the largest non-governmental nature conservation organizations in the world, began its work in Russia in 1988. In 2012, WWF Russia initiated the development of "Methodological approaches for mapping of ecologically vulnerable zones and regions of water areas and shorelines with priority protection against spills of oil and oil products in the Russian Federation", which were approved by an expert society. The work was carried out in collaboration with leading experts in marine environment protection against contamination and in proper consideration of advanced international practices. Thus far, all attempts to assign a regulatory status to this document have failed.

In 2013, oil/oil product spill response drills for protected area workers were conducted within the framework of the UNDP/GEF project "Strengthening the Marine and Coastal Protected Areas of Russia" under the direction of WWF Russia specialists. An employee manual for oil spill response in protected areas was

developed together with a private company “EcoService” and approved by the Russian Ministry of Natural Resources and the Environment.

3.2.5. Others

Successful OWRs have been reported in many developed countries. The International Bird Rescue Research Center (IBRRC) has been formally accredited to protect wildlife by the US federal and state governments (Fig. 10). IBRRC proposed several processes to safely treat and release oil-contaminated birds. They indicated that waterbirds should be stabilized before they are treated because they are subject to a lot of stress in the process of being transferred by people. And then, rehydration solutions should be provided and species characteristic-specific protections should be applied to enable them to restore their energy. In this process, it is important to prevent birds from preening their feathers because preening can involve oil consumption, and to monitor them closely for hypothermia or hyperthermia. The IBRRC cleaning process proceeds as follows:

[IBRRC cleaning process]

- 1) Remove oil from the feathers with wash solution (1% cleaner)
- 2) Rinse to remove the wash solution
- 3) Dry and allow recovery of waterproof function
- 4) Release rehabilitated waterbirds

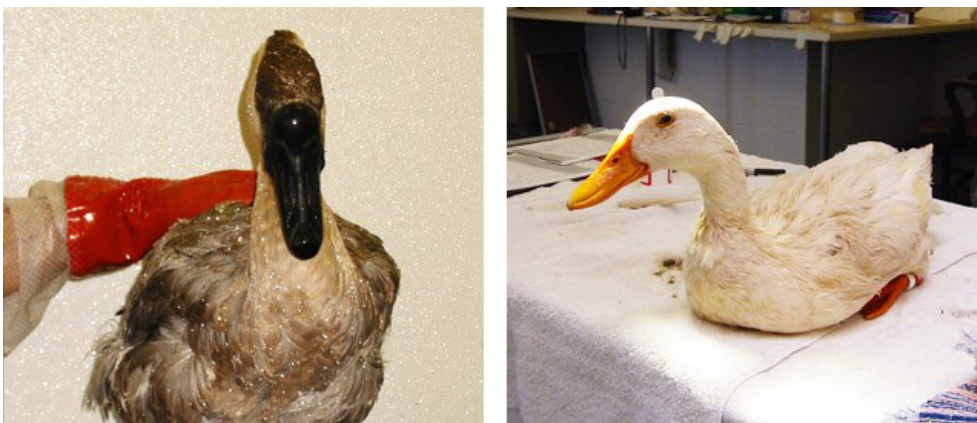


Figure 10. Orphaned ducks rescued from Auburn, CA pond oil spill (USA IBRRC).

Because birds cannot control their body temperature when they are wet, it is important to dilute detergent to a 1% concentration in warm water, similar temperature to the bird's body temperature, and to completely soak the bird's body. A variety of tools can be used to remove oil from the hair, around the eyes, and on bodily feathers. When the water becomes dirty, transfer the bird to another bucket and repeat until the oil is completely removed. Because the cleaning solution used to remove the oil impedes the natural waterproof function of feathers, it is necessary to remove the cleaning agent remaining on the feathers with a water nozzle.

Release requires veterinarian approval, including confirmation that the waterproof function of each bird's feather has been restored completely. Before release, a marker band is placed on the bird's leg for subsequent monitoring. Waterbirds should be released in morning during good weather to provide them the opportunity to re-adapt to the natural habitat during the day.

3.3. Relevant national laws, regulations, or guidelines

3.3.1. People's Republic of China

China is party to the international conventions for the pollution prevention from ships and wildlife protection. Domestically, China has formulated and implemented a number of environmental protection laws and regulations on the oil spill response, and legal bases of wildlife protections (Table 7). In addition, related contingency plans have been enacted, including the Contingency Plan for Onshore Exploration and Development, as well as marine pollution contingency plans developed and promulgated by provincial and municipal governments.

On July 2, 2016, a revised Law of PR China on the Protection of Wildlife was promulgated to be in effect from January 1, 2017. Some new provisions on the protection of wildlife habitats were added in the revised law. For example, the law restricts construction projects in nature reserves. According to the law, sites and routes for construction projects (i.e., airports, railways, roads, waterworks, etc.) shall avoid invading nature reserves and wildlife migration paths [Article 13 (2)]. When it is impossible to avoid invading nature reserves and migration paths, the projects must build corridors for wildlife and migratory fish facilities, and must institute "other measures to eliminate or mitigate the adverse impact on wildlife" [Article 13 (2)]. Additionally, Article 26 of the law stresses that wild animals shall not be mistreated.

Table 7. Relevant international/national laws and regulations in China

International convention		Domestic laws and regulations	
Oil spill response	Wildlife protection	Oil spill response	Wildlife protection
MARPOL 73/78	United Nations Convention on the Law of the Sea	Environmental Protection Law of the PR China	Environmental Protection Law of PR China
OPRC	Convention on International Trade in Endangered Species of Wild Fauna and Flora	Marine Environmental Protection Law of PR China	Marine Environmental Protection Law of PR China
OPRC-HNS Protocol	Convention on Biological Diversity	Law on the Prevention and Control of Water Pollution	Law of PR China on the Protection of Wildlife
CLC 92	Convention on Wetlands of International Importance, Especially Waterfowl Habitats	Regulations on the Prevention and Control of Pollution to the Marine Environment by Vessels	Fisheries Law of PR China
BUNKER		Regulations of PR China Concerning Environmental Protection in Offshore Oil Exploration and Exploitation	
FUND92 (applied to Hong Kong)		etc.	

On the basis of these laws, regulations are launched for wildlife protection practices, including the Regulations of PR China on Nature Reserves, the Regulations for the Implementation of PR China on the Protection of Terrestrial Wildlife, the Regulations of PR China for the Implementation of Wild Aquatic Animal Protection, the Measures on Supervision and Inspection of National Nature Reserves, and the Measures on Management of Coastal and Marine Nature Reserves. Local regulations on wildlife protections have also been issued by Chinese provinces in the NOWPAP region.

Some general strategies for wildlife rescue were formulated in the National Action Plan for Aquatic Resources Conservation, which was approved and promulgated by

the State Council in 2006. However, national laws and legislation related to OWR are still not available because the OWR concept is still new. Agencies related to oil spill response include (1) the China Maritime Safety Administration, (2) the State Oceanic Administration, (3) the Fisheries Management Bureau, and (4) the Ministry of Environmental Protection, as stipulated in the *Marine Environmental Protection Law of PR China*. The responsibilities of these agencies are as follows:

[Responsibilities of the agencies related oil spill response]

1) The China Maritime Safety Administration

- Supervision and prevention of marine pollution: non-military vessels in port waters, non-military vessels, non-fishery vessels beyond port waters
- Investigation and handling of any such incidents
- * Should a pollution incident caused by vessels results in fishery damage, the competent administrative department in charge of fisheries shall be invited to take part in the investigation and handling of the incident.

2) The State Oceanic Administration

- Supervision & administration: organizing surveys, surveillance, and supervision, performing assessments, scientific research of the marine environment
- Nationwide environment protection work: marine construction projects, dumping of waste into the sea

3) Ministry of Environmental Protection (unified supervisory department)

- Nationwide marine environment protection: land-based pollutants, coastal construction projects
- Renders guidance, coordination, supervision

4) Fisheries Management Bureau

- Supervision & administration: non-military vessels inside the waters of fishing ports, fishing vessels outside the waters of fishing ports
- Protection of ecological environment: fishing zones
- Investigation: fishery pollution cases beyond the pollution incidents
- * Note that the environmental protection department of the armed forces maintains responsibility for the supervision and administration of marine pollution caused by military vessels and for the investigation and handling of such pollution cases.

The functions and responsibilities of departments stipulated in the law, with the power to conduct marine environment supervision and administration of coastal local governments above the county level, are to be determined by the People's Governments of the Provinces, Autonomous Regions, and Municipalities directly under the Central Government in accordance with the Marine Environmental Protection Law of PR China and relevant State Council regulations.

In October 2012, a 'National Inter-ministerial Joint Meeting Arrangement' for marine oil spill responses was approved by the State Council. It was coordinated by the Ministry of Transport and consisted of 23 relevant competent authorities including the Ministry of Agriculture, the Ministry of Environmental Protection, and the State Oceanic Administration, as well as oil and shipping industry stakeholders. The system provided a special coordination mechanism for command and coordination at the national level. Currently, the national inter-ministerial joint meeting on major marine oil spill responses is being convened annually to make important arrangements.

The main responsibilities of the governmental agencies participating in the national inter-ministerial joint meeting are as follows:

**[Role of the agencies participating in the National
inter-ministerial joint meeting]**

- 1) Ministry of Environmental Protection, Department of Nature and Ecology Conservation
 - Coordination of overall nature conservation affairs with other governmental agencies
 - Organization and preparation of construction plans for national nature reserves, recommendations for approval of various nature reserves at the state level
 - Supervision and inspection of environmental protection (nature reserves, scenic spots, forest parks)
 - Supervision and inspection of biodiversity, wildlife, species conservation (wetland environmental protection, prevention of desertification)

* Nature reserves: 446 national nature reserves, 2,294 local nature reserves, 68 national marine reserves, marine special reserves (established by the end of 2015, protecting more than 200 species of wildlife)

2) State Forestry Administration

- Providing guidance on terrestrial wildlife conservation, breeding, habitat restoration and development
- Making proposals on adjustments to national lists of key protected terrestrial wild fauna and flora
- Supervision on the construction and management of nature reserves (forest, land-based wildlife, and wetlands types)

3) Ministry of Agriculture

- Development and implementation of regulations, policies, plans for conservation of aquatic resources
- Providing guidance on management and development of aquatic wild fauna and flora, formulation and revision of the list of national key protected aquatic wild fauna and flora
- Designation, construction and management of nature reserves for aquatic wild fauna and flora and protected areas of wetlands for aquatic organisms
- Performance of monitoring, assessment and claims of damages to marine wildlife resources and fisheries by oil spills, organization of oiled wildlife and fisheries protection, rescue and cleaning activities

4) State Oceanic Administration

- Supervision and administration on the sea area use, marine construction projects, offshore exploration and exploitation, and dumping of wastes
- Administration on marine environment surveys, monitoring, and assessment
- Organization, drafting, and implementation supervision of management systems and technical specifications for marine nature reserves and special protected areas
- Supervision on marine biodiversity and marine ecological protection
- Organization and implementation of major marine ecological restoration projects

Guidelines

Until present, China has not experienced many serious oiled wildlife incidents, except oil spill incidents that impacted mainly phytoplankton, zooplankton, and benthic organisms. Although an oiled wildlife response plan is not yet available in China, currently existing resources would be of assistance in the protection, rescue, and rehabilitation response actions for oil threatened and impacted marine mammals and birds.

In 2014, China Wildlife Conservation Association carried out the “Technical Specifications for Rescue and Release of Rare and Endangered Wildlife” project under the guidance and support of the Wildlife Conservation and Nature Reserve Management Division of the State Forestry Administration. Systematic and scientific technical specifications were summarized based on the collection and analysis of model cases, methods, and operating procedures for the rescue and release of rare and endangered wild animals in China. On the basis of such research, some experts and scholars who had been engaged in wildlife rescue for many years were invited to compile a wildlife rescue manual.

On November 6, 2015, the release ceremony for The Handbook of Wildlife Rescue was held at the 2015 Wildlife Rescue Committee of China Wildlife Conservation Association annual meeting (Fig. 11). This handbook elaborated on the preparation, rescue, training, and release of rescued birds, mammals, amphibians, and reptiles. In addition, it also covered the rescue process, record-taking, and relevant laws and regulations.



Figure 11. The Handbook on Wildlife Rescue

The International Foundation of Animal Welfare (IFAW) compiled a procedure guide for the raptor rescue center in Beijing based on international wildlife rehabilitation standards and the clinical practice standards of experienced wildlife rehabilitation practitioners and veterinarians in Europe and North America. The guide considers the physical and mental health of raptors as a prerequisite for their survival in the wild. It also covers rescue, rehabilitation, and appointment of places for raptors.

Another book, *Manual on identification of Birds in China*, will be published in May 2017. Based on the taxonomy system used in *Taxonomy and Distribution List of Birds in China (Second Edition)* by an ornithologist Zheng Guangmei and the 2016 Annual Report of Bird Watching, this manual will introduce the morphological characteristics, life habits, and geographical distribution of 1,458 bird species in China with abundant illustrations.

3.3.2. Japan

In Japan, there is a legal system related to wildlife damage from oil pollution incidents. In October 1995, Japan acceded to the 1990 International Convention on Oil Pollution, Preparedness, Response, and Cooperation, which addresses preparation and response related to modifying oil pollution. Subsequently, Japan adopted its own National Contingency Plan on oil pollution, preparedness, and response policy based on the OPRC protocols.

Japan already had a Wildlife Protection, Control, and Hunting Management Act. Later, the Ministry of the Environment added to it a clause outlining preparations, the maintenance of communication systems, and the training of personnel for incidents involving large numbers of sick or injured birds and mammals (outlined in its Basic Guidelines to Implement Wildlife Protection and Control Program). The Ministry of the Environment also ordered each prefectural government to establish its own detailed action plan for the maintenance of wildlife areas.

During an oil spill response, Japan Coast Guard and the Maritime Disaster Prevention Center (MDPC) share primary responsibility for oil spill preparedness under the Marine Pollution and Disaster Prevention Law, and the Wildlife Division of the Nature Conservation Bureau of the Ministry of the Environment is responsible for associated problems affecting wildlife under the policy. It plays several roles such as coordination of task force, cooperation with many preservation groups in Japan.

However, each prefectural government are responsible for wildlife response to rehabilitate wildlife and assess natural resource damage if oil spill limits to one district or prefecture, and the Japan Environmental Disaster Information Center (JEDIC) serves as an independent advisor or provides guidance as requested by the government and is also involved in oil spill preparedness.

Wildlife rehabilitation is generally undertaken with the guidance of IFAW/ER and the WRV (both of which are members of JEDIC). In case of an oil spill, JEDIC contacts the Wild Bird Society of Japan for field studies and risk assessment, the prefectural government for assistance, and also the MDPC to obtain further accurate information on the incident. If the prefectural government needs assistance, JEDIC offer experts to the site, or holds responsibility as a coordinator agency for the IFAW/ER team dispatched.

3.3.3. Republic of Korea

In terms of regional cooperation, Korea is a party in two international organizations. Korea is a member of Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), which protects endangered mammals and seabirds, and NOWPAP, which is action plan for the protection, management and development of the marine and coastal environment of the Northwest Pacific Region. In particular, one of the NOWPAP's four regional activity centers, namely the Marine Emergency Preparedness and Response Regional Activity Center (MERRAC) is hosted in Daejeon, Korea.

Domestically, there are some national laws pertaining to wildlife protection and management (no. 13992) which purpose is to provide systematic protection and management of wildlife and their habitats, to prevent extinctions, and to promote biodiversity and ecosystem balance, and to secure a healthy natural environment. This legislation covers the protection of endangered wildlife, designation of special protected areas, and management of disease, but it does not address oiled wildlife. In accordance with current laws/policies, the main responsibilities related to oiled wildlife response of the governmental agencies are as follows:

[Roles of the agencies related oil spill and oiled wildlife response]

1) Korea Coast Guard (mainly oil spill response)

- Implementation of National Contingency Plan for marine pollution incident
- Establishment of Headquarter for Pollution Response Countermeasure and Central Disaster and Safety Countermeasure
- Control and command for marine emergencies
- Analysis and evaluation of incident situations and consideration of the pollution countermeasure
- Mobilization of domestic and foreign resources to respond to marine pollution
- Management of technical experts: an advising group to prepare an appropriate response strategy and tactics
- Information circulation to related organizations, adjacent countries and international organizations
- Cooperation with NOWPAP MERRAC
- Offer technical guidance on pollution response

2) Ministry of Environment (related to oiled wildlife)

- Establishment of a disposal management plan on collected contaminated water
- Implementation of damage investigation, restoration of environment and post monitoring for HNS involved marine pollution incident
- Establishment of wildlife rescue centers and rehabilitation of the oiled wildlife including birds and marine mammals

3) Ministry of Ocean and Fisheries

- Offer assistance for convenient usage of port to support the pollution response
- Protection of fishing area and aquaculture
- Monitoring of marine environment at post incident stage

4) Others

- Ministry of Foreign Affairs: diplomatic channel for decision making and negotiation on the international offers of assistance
- Ministry of Employment and Labor: inspection of safety of the working condition at sea and shoreline cleanup operation

- Custom service: support for quick pass of customs for resources and equipment assisted from foreign countries
- Ministry of Justice: support for quick entry of the international experts and man-power from foreign countries
- Ministry of the Interior: establishment of volunteer management guidelines including cleanup activities and working safety

Korea is a party to several international organizations and has a national regulation on wildlife. However, there are no specific laws, policies, regulation or guidelines for oiled wildlife yet. Korea has experienced several large-scale oil spills, but most of action plan focused on human, social and economic aspects more than marine ecosystem aspects of oil spill damage. In the case of HSOS, there was also not a proper national-level oiled wildlife response, despite these circumstances, with the help of over a million volunteers, the polluted areas could have been cleaned efficiently (Sea Alarm, 2009). Thus, law/policies, regulations, guidelines related to OWR, formalized OWR plan and sufficient trainings are needed in Korea.

Guidelines

Even without a formalized OWR in Korea, there are several researcher-led activities. Some 16% of all birds rescued by the Migratory Bird Research Center (MBRC) of the Korea National Park Service from 2006 to 2012 were oil-exposed birds; these rescues were performed according to the organization's self-constructed guidelines, as follows (Fig. 12):

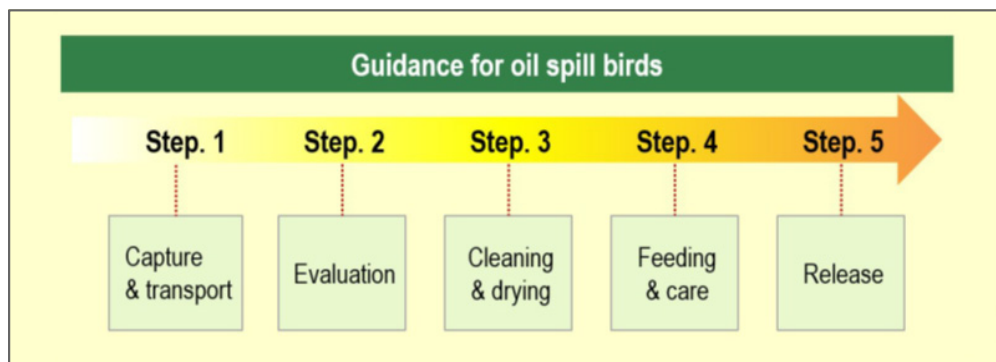


Figure 12. Guidance for oil spill birds made by MBRC, KNPS

- 1) Put each individual in one container to minimize bird stress
- 2) Conduct basic medical examination, including wound assessments and blood tests
- 3) Rinse them with warm water at 32–42 °C at least 10 times, and let them dry at 32–35 °C for 3-4 hours (continue this process until birds are stabilized)
- 4) Provide a place for feeding and swimming in fresh water
- 5) Check each bird's condition before release and choose a day with good weather conditions for release

3.3.4. Russia

Overall, there is a significant gap in the development of a state OWR system in Russia. However, in recent years, there have been several positive changes in the state environmental policy in this respect. Notably, there has been a push to develop statutory regulations on preservation of biological diversity, including prevention of wildlife loss due to oil and oil product spills in the Arctic region of the Russian Federation.

Based on the findings of the meeting held on efficient and safe development of the Arctic under the direction of the President of Russia on June 5, 2014, a List of Instructions of the Russian Federation President was adopted (No. Pr-1530, June 29, 2014). These instructions include three crucial items for wildlife preservation:

- Item-3a) Develop a set of measures aimed at preserving biological diversity, including the prevention of wildlife loss due to oil and oil product spills in the Arctic region of the Russian Federation
- Item-3b) Draw up a list of flora and fauna species that serve as indicators of sustainability of marine ecosystems in the Russian Arctic region
- Item-4) Recommend oil and gas companies involved in hydrocarbon field development projects on the Arctic continental shelf of the Russian Federation, in inland sea waters, territorial seas, and the contiguous zone of the Russian Federation to develop and adopt programs to preserve biological diversity on the basis of the above-mentioned list of flora and fauna species that serve as indicators of sustainability of marine ecosystems in the Russian Arctic region

Pursuant to Presidential Instruction 3a, the Russian Government approved a set of measures aimed at preserving biological diversity, including prevention of wildlife loss due to oil and oil product spills in the Russian Arctic region. This set of measures was jointly developed by the Russian Ministry of Agriculture, the Russian Ministry of Transport, the Russian Ministry of Emergency Situations, the Federal Agency for Fishery, the Federal Service for Supervision of Natural Resources, the Federal Service for Supervision of Transport, and executive authorities of Russian Federation subjects. The set of measures, which was approved by A.G. Khloponin, the Deputy Prime Minister of the Russian Federation on July 22, 2015, includes three sections as follows:

- 1) Measures to ensure environmental safety and biodiversity preservation.
- 2) Measures to improve legal and methodological framework for regulating oil production and preventing oil spills at sea.
- 3) Measures to prevent wildlife losses due to oil and oil product spills.

A notable contribution to the formation of a legal framework for addressing these problems was made by Russian Federation Government Resolution No. 1189 "On the arrangement of oil and oil product spill prevention and response on the continental shelf of the Russian Federation, in the internal sea waters, the territorial sea and the contiguous zone of the Russian Federation" in November 14, 2014.

This Resolution introduced the "Rules of arranging oil and oil product spill prevention and response measures on the continental shelf of the Russian Federation, in the internal sea waters, the territorial sea and the contiguous zone of the Russian Federation" that established the requirements to the content of the plan to focus on oil and oil product spill prevention and response on the continental shelf of the Russian Federation, in the internal sea waters, territorial sea and contiguous zone of the Russian Federation.

The Russian OWR plan shall indicate anticipated oil/oil product spill areas under adverse hydro-meteorological conditions and describe possible negative effects of such spills on the environment, population and normal functioning of life support systems. It must also contain recovery measures for contaminated land areas and

water bodies in accordance with land remediation and disturbed water body and water bio-resource restoration programs. However, there is no requirement for a separate entry related to wildlife loss prevention. Also, there is no objective requiring development of vulnerability or priority protection maps, as was included in a similar resolution in 2002 (No. 240 "On the procedure of arranging oil and oil product spill prevention and response measures in the Russian Federation").

The text of the Rules clearly states that the international commitments of the Russian Federation to preserve wildlife and the Russian law requirements to protect rare and endangered species have not been duly considered in the preparation of the document ("Rules of arranging oil and oil product spill prevention and response measures on the continental shelf of the Russian Federation, in the internal sea waters, the territorial sea and the contiguous zone of the Russian Federation", mentioned above). Moreover, there is a need to supplement this regulatory document with approaches on marine spatial planning and identification of areas that are particularly vulnerable to oil spills, as has been widely implemented in other countries.

Besides developing its OWR state system, Russia has gained experiences in its corporate policies and practices. This experience is the result of active implementation of shelf projects in Sakhalin which started at the beginning of the 21st century under the Product Sharing Agreement (PSA) with western companies, namely Exxon-Mobil (Sakhalin I) and Shell (Sakhalin II).

Following these commitments to preserve biodiversity and make use of the advanced international experiences, Sakhalin Energy (Sakhalin II operator) implemented a program of personnel trainings on the rehabilitation of animals covered in oil and oil products. The program was developed together with the IFAW and the IBRRC, considering the particular features of the flora and fauna in the extreme Sakhalin climate. In 2009, an official OWR plan was developed to prevent and respond to oil and oil product contamination of wild animals in Russia. This plan outlines the necessary resources and procedures for coordination of actions between corporate units and external authorities (Fig. 13).

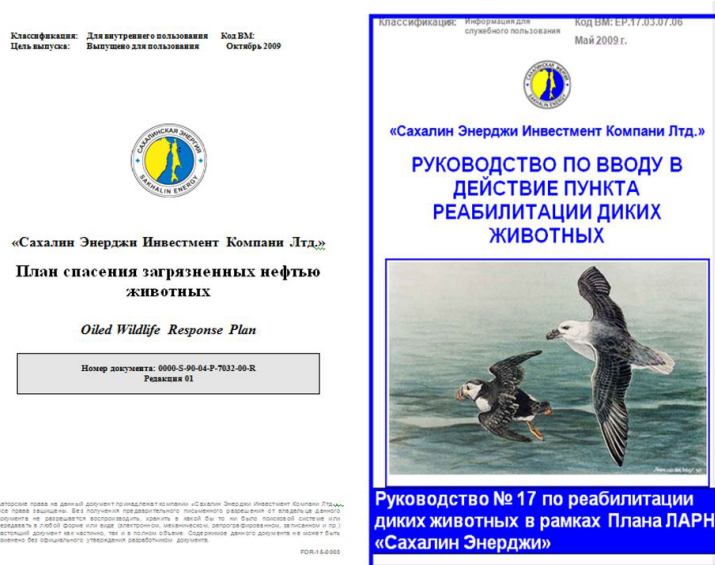


Figure 13. Sakhalin Energy corporate standards for oiled wildlife response.

Within the framework of the comprehensive Oil and Oil Product Spill Prevention and Response Plan (OSRP), which specifies measures and actions required to prevent and respond to mitigate potential emergency situations at facilities damaged by oil spills, a Wildlife Rehabilitation Site Implementation Manual was developed, which includes the following key activities:

[Key activities of the Wildlife Rehabilitation Site Implementation Manual]

- 1) Hazing and capturing of uncontaminated and healthy animals to prevent them from reaching oiled areas
- 2) Searching and capturing oiled animals
- 3) Preliminary stabilization of animals before transporting them to a rehabilitation site
- 4) Cleaning, rehabilitating, and releasing of healthy animals
- 5) Keeping records, making reviews, and drawing up reports
- 6) Interacting with representatives of state authorities and other companies.

The manual contains general recommendations and guidelines for deployment and application of equipment, facilities, and infrastructure necessary for wildlife rehabilitation site activation at the Prigorodnoye Production Complex. In 2011, a rehabilitation site for oiled wildlife was organized at the Prigorodnoye Production Complex, which remains the only rehabilitation site in Sakhalin and Russia as of the end of 2016 (Fig. 14).

In order to implement the program in the central and northern parts of Sakhalin Island, Sakhalin Energy installed specialized equipment at its onshore processing facility near Lunsky bay and at its pipeline maintenance depot in the Gastello settlement. The company is conducting regular large-scale oil spill-response drills. There is a drill section devoted to forecasting the potential impact of spills on seabirds and mammals, outlining the decision-making sequence in the course of rescue operations, and evaluating the scope of labor and material resources needed. Within the framework of the scheduled OSR drill, company employees take part in an annual training course in the capture, transport, and rehabilitation of animals injured by oil spills. The company has created a database of trained specialists ready to provide assistance in case an emergency occurs on Sakhalin.

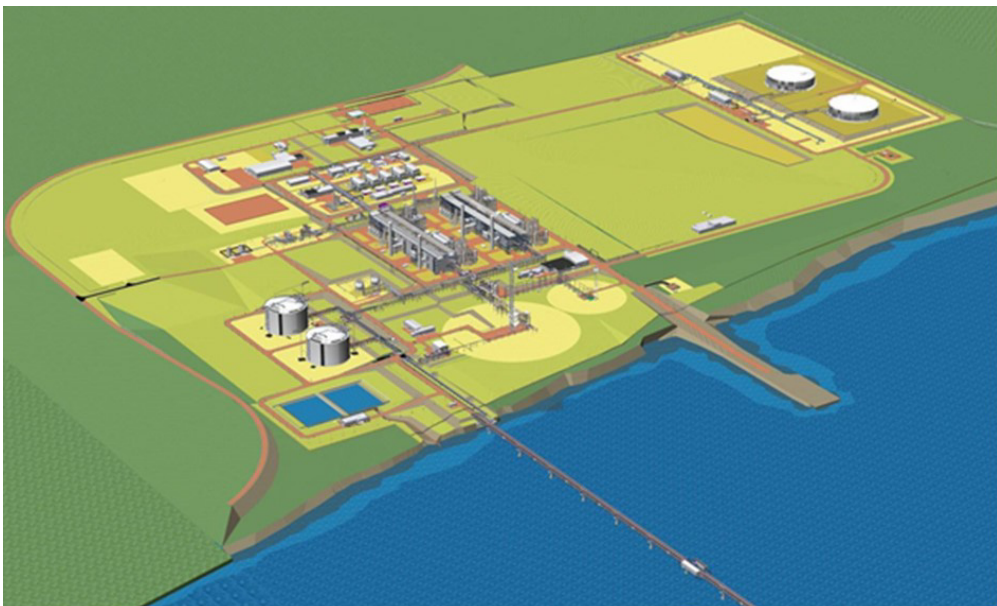


Figure 14. Location of the rehabilitation site at the Prigorodnoye Production Complex.

In 2016, another company, Lukoil PAO (energy company in Moscow), formed a corporate policy and practices to prevent wildlife loss due to oil spills. The Lukoil initiative was included in the Main Action Plan for the Year of Ecology in the Russian Federation in 2017 (No. 1082-r, June 2, 2016). As part of this initiative, the corporate practices of the limited liability company Varandey Terminal (a subsidiary of PAO Lukoil) will be supplemented in 2017 with an OWR component. The implementation of this project is supported through a joint UNDP/GEF/Russian Ministry of Environment project, "Objectives of preserving biodiversity in the Russian energy sector development policy and programs", and by the WWF Russia.

3.3.5. Others

Below are some relevant laws/policies, regulations and guidelines from countries outside the NOWPAP region.

USA-California

The US Federal Oil Pollution Act of 1990 (OPA-90), in consultation with the US Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA), requires that a sensitive environmental plan be developed into a National Contingency Plan that includes state fish and wildlife agencies (DFW, 2016). Additionally, the California Oil Spill Prevention and Response Act (OSPRA), provides OPA-90–like regulations for fish and wildlife protection during a spill response. The OSPRA managers have the following obligations with respect to biological and natural resources:

- Developing contingency plans for the protection of fish and wildlife
- Assessing damage to natural resources
- Establishing rescue and rehabilitation stations for oiled wildlife
- Requiring restoration plans for wildlife resources, including habitat, following spills

The OSPRA and subsequent laws provide for the establishment and financing of the Oiled Wildlife Care Network (OWCN) as an integral part of California's wildlife response capabilities. Facilities within the OWCN are to be maintained and ready to

provide the best achievable treatment for waterbirds and marine mammals affected by oil spills. The OSPRA administrators also set out legislation to provide biologists and other personnel with appropriate funds and support for assessing damage to natural resources as part of their response to a major spill.

Canada

A publication produced by the Canadian government entitled “Protecting Wild Species at Risk of Canada” (Bourdages and Labelle, 2003) outlines a national policy for oiled birds and oiled species at risk. In January of 2000, the Canadian Wildlife Service adopted a national policy on oiled birds and at-risk species that indicates the actions and roles to be taken by federal, provincial, and territorial jurisdictions for oiled birds and species. This policy includes all kinds of migratory birds and associated lands as well as freshwater, marine, and tidal habitats. This policy can promote combined actions from other organizations equipped to handle all wild species affected by oil spills.

Australia

The Australian Government Department of Environment has implemented the Environmental Protection and Biodiversity Conservation Act of 1999 (DPW, 2014), which specifies a legal framework for the protection and management of the federal maritime area. The Department of Parks and Wildlife, which has the responsibility and legal authority to treat, protect, and destroy wildlife as specified in the Wildlife Conservation Act of 1950, is the response agency for oiled wildlife in Western Australia. Legislative requirements ensure humanitarian treatment, housing, and release or euthanasia of animals in protected areas under the Animal Welfare Act of 2002.

Chapter 4. Challenges and/or weakness on oiled wildlife response

Table 8 summarizes the weakness on oiled wildlife response in the NOWPAP region, and makes easy to overview each country's preparedness, response & rehabilitation, and monitoring & restoration capability on oiled wildlife.

Table 8. Summary table of the weakness on oiled wildlife in the NOWPAP region
(O: Fully, △: Not enough/experienced, X: Not yet, blank: unconfirmed)

	Item	Contents	China	Japan	Korea	Russia
Preparedness	Potential risk	Environmental Sensitivity Index map for wildlife	X	△	X	
		Cases study of oiled wildlife	O	O	O	O
		Basic information on wildlife resources (distribution, species list, Red Lists, etc.)	△	△	△	△
	Enhancing capacity	Specialist training course	X	O	X	O
		Regular training and exercise	X	O	X	O
Response & rehabilitation	Institutional aspect	National authorities responsible for oiled wildlife	O	O	O	X
		National Contingency Plan for oiled wildlife	X	O	X	X
		National guidance on oiled wildlife response	X	△	X	O
		Lines of command	O	O	O	
	Operational aspect	Wildlife rescue center	O	O	O	O
		Rehabilitation facility	△	O		O
		Response Technique (guidelines, medical equipment, storage, personal protective equipment)	△	△	△	△
		Local government capacity to response oiled wildlife	△	O		
	Man-power	Expertise	△	△	△	△
		Volunteer management/ education	△	O		
Monitoring & restoration	Restoration process	△	△	X		
	Long-term monitoring	△	△	O		
Others	Financial support	△	△	△	△	
	Public interest on oiled wildlife response	X	△		△	

4.1. People's Republic of China

China has several OWR challenges. The first challenge is lack of a legal mandate concerning the competent national authority responsible for OWRs. However, in recently, China has successfully completed this challenge. In March 2018, the National Major Marine Oil Spill Contingency Plan was adopted by “National Inter-ministerial Joint Meeting Arrangement” that monitoring, assessment, and claims of damages to marine wildlife resources and fisheries by oil spills, organization of oiled wildlife and fisheries protection, and rescue and cleaning activities should be performed by the Ministry of Agriculture.

The second challenge is lack of expertise in OWR. OWR requires a wide range of knowledge involving wildlife protection, veterinary medicine, ornithology, and ecological protection. Currently, China needs more in-depth research in these specific fields.

The third challenge is the funding. OWR requires considerable facilities and equipment, medical treatments and feed for wildlife, as well as fieldwork. A dedicated budget for OWR has not yet been established. Lack of budget creates difficulties in conducting scientific research and effective wildlife rescue.

4.2. Japan

In Japan, some local governments have been voluntarily running classes or trainings on OWR, while some others have never experienced any outbreaks of oil pollution incidents. In these areas, people are not very interested in oil spill incidents and there are no sufficient activities to promote incident response training. Therefore, it will be important to promote improvements in rescue training systems in all municipalities and districts equally, especially those with shorelines.

In addition, level of attendance in the training course tends to decrease as time passes. Because there has not been a serious oil pollution threat to wildlife in Japan since the Nakhodka oil spill incident in 1997, public concern on oil pollution incidents has faded much, and there is no sense of impending crisis especially the younger generation, who may not remember the Nakhodka incident. Meanwhile, another oil pollution incident on the scale of the Nakhodka incident could cause major damage

to wildlife at any time and place, and people may not comprehend how miserable the consequence could be. Many of those who have participated in the Nakhodka incident might have retired. Thus, it is important to convey the oil spill response experiences and continue to train experts who may continue to raise public awareness in each area.

Training experts is critical. It is also important to keep good relations among preservation groups and to clarify the roles and responsibilities of each in the event of an oil pollution incident. It is also crucial to provide trainings as activities in rescue facilities can be intense.

Furthermore, the wild animal medicine is still very underdeveloped in Japan. There are extremely few nature zoology laboratories in universities and it is quite rare to have a wild animal medicine laboratory in Japan. If a veterinarian would like to be an oiled bird rescue specialist, he or she should get a job as a clinician in a small animal or avian clinic where ordinary injured and sick wildlife rescue is carried out regularly and the chief veterinarian is an oiled bird rescue specialist belonging to WRV.

There are many outstanding problems to improve oiled wildlife response capacity. First of all, there is a need to develop a rescue system and to train experts and secondly, there is a need to establish systems designed to promptly investigate effects of oil spill incidents on wildlife at the time of incident. Studies and researches should also be carried out to examine how to reconstruct natural environments, how to maintain biodiversity, and how to best evaluate damage caused by oil spillage. Clinical specialists from WRV might not be able to inquire into these problems, therefore it is necessary to pursue advances in resolving each of these problems, and also to receive help through cooperation with universities or research organizations in Japan. It is important to assign roles and responsibilities among different players and to set cooperation channels with universities or research organizations in Japan.

4.3. Republic of Korea

In Korea, environmental impact assessment of oil spill incidents is an emerging issue (e.g., residual oil distribution in marine environments, identification of ecological toxicity, characterization of ecosystem changes, alterations in major

ecological groups, and assessment of performance of microbial cleaning preparations) (MLTM, 2013). Environment restoration technology is being addressed, but this issue does not include oiled wildlife. Currently, there is no system dedicated to OWR policy in Korea, therefore, a systematic management for OWR is urgently needed.

Several oil pollution incidents have affected Korea, but there is no technically formalized OWR yet. The biggest problem is that there is no proper database to be able to compare the status of wildlife before and after the incident. Furthermore, there are not enough wildlife protection and rehabilitation specialists in Korea. For instance, in case of HSOS, KARMA, which is a professional pet association and a non-wildlife specialized group, participated in the oiled wildlife response activities (Sea Alarm, 2009).

Korea has expertise in wild birds and has expended efforts, such as drawing upon the expertise of other countries (Sea Alarm, 2009), however, its access to resources and experts is limited. There is also a lack of manuals to guide safe recovery, rehabilitation and release of wildlife. Manuals are an important technical tool to help volunteers to learn how to conduct response activities under the supervision of trained specialists.

4.4. Russian Federation

In the context of current world oil market industry (buyer's market), public attention in importing countries is growing not only with respect to price, but also with respect to environmental and social factors of oil production and transportation. Therefore, readiness to respond to oil spills, including animal rescue, is going to take on even more importance. The results of NGO activities, practical experiences, and understanding of the significance of the issue by oil & gas companies should accelerate development and improvement of oil spill response system, including oiled animal rescue.

At the current stage, until the government-level approaches to the organization of OWR are formalized in legislation, active cooperation of all interested parties is essential, including cooperation among the related NGOs and representatives of oil & gas and transportation companies.

Chapter 5. Recommendations for future directions and activities

5.1. National level

5.1.1. Preparedness

Response system for OWR

Currently, there is no formalized response system for OWR in China, Korea and Russia. There is a need to elucidate how a step-by-step plan should be evaluated and what an OWR plan should be composed of. IPIECA (2014) has provided an example as below.

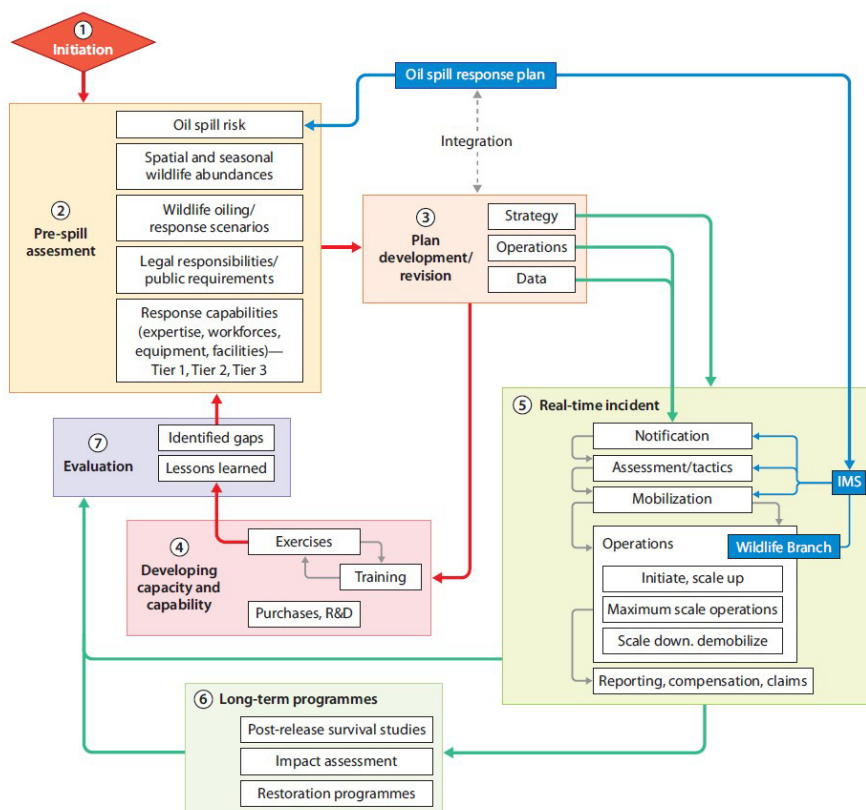


Figure 15. Cycle for developing oiled wildlife response preparedness (IPIECA, 2014).

There are two forms of preparation: regular activities leading to comprehensive preparation; and activities to be developed immediately after events that threaten wildlife (Fig. 15). A response plan should provide step-wise guidance in the event of an oil-spill incident. In addition, by evaluating these responses and results, the preparatory stage can be improved and advanced in the future.

This process should be completed with an assumption that there are accurate environmental analyses with which oil spill impacts and related environmental sensitivities are assessed. In some parts of the NOWPAP region, research is focusing on environmental assessment and restoration technology development in regards to oil spill incidents. In the future, oiled wildlife guidelines may be developed on the basis of these environmental evaluation results.

Risk assessment on oil spills

Resources must be assessed both before and after oil spill incidents to reduce damage to wild animals. With respect to oil pollution risk, there is a need to gather as much information as possible, including information about the migratory pathways, species, their characteristics and the natural environments along the coasts and in surrounding seas where damage may occur. The data on the wildlife and environment conditions before the incident can be used to compared to those after the incident, and provide opportunities for other countries to prepare response for oil-exposed animals, which might cross borders. In the NOWPAP region, each member has gathered data on natural vegetation and intertidal organisms including breeding places, seasonal migration and habitat areas. Collecting such data is difficult given how greatly living conditions vary throughout a year, and the fact that the surveyed sea areas are very large. Accordingly, cooperation is needed on a national level to enable habitation data for wildlife to be updated spatiotemporally. It is also important to prepare both local and domestic wildlife response equipment and professional man-power and to keep a record of their status to be able to use the resources as promptly as possible.

Guidelines and manuals on oiled wildlife

Currently, there is no formal manual on oiled wildlife in some member states. Therefore, it is necessary to develop guidelines as a basic manual based on other reference cases and characteristics of the each region. In fact, Preparedness for oil-polluted Shoreline cleanup and Oiled Wildlife interventions (POSOW) is supporting establishment of a regional cooperation synergy in the field of marine

pollution, and is providing guidelines that can be applied uniformly to oil spill incidents in any areas. POSOW is providing methods for catching wild animals exposed to oil, constructing a rescue center near incident areas, and rehabilitating wild animals (Fig. 16). If a formal and unified manual, like POSOW's, is established, it could alleviate not only the shortage of professional staff by educating volunteers, but also reduce wildlife damage caused by uneducated/unexperienced volunteers.

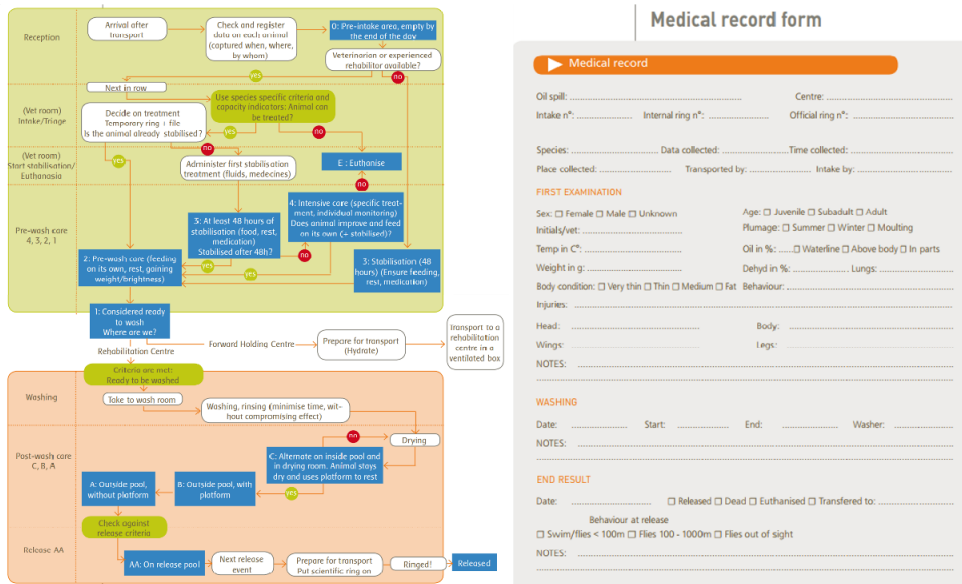


Figure 16. POSOW's rehabilitation diagram and medical record form (POSOW, 2013).

5.1.2. Legal framework

Before assigning authority for operational and decision-making rights in OWR, policymakers should be aware of the requirements of the local legislation (IPIECA, 2014). The OWR system should include conservation and species protection (licenses for contact and handling, protection of priority species), animal welfare, food safety, worker safety, environmental protection, and public access laws/regulations. If the system is successfully established, particular agencies, ministries, or departments will have legal authority in various aspects of wildlife responses. The institutional roles and responsibilities of various authorities should be respected and recognized in the planning process. The greater the stakeholder involvement in the planning process, the better the plan will be reflected in acceptable and appropriate command systems and approaches.

5.1.3. Political decisions

A difficult aspect of the planning process is to ensure that the planning and primary preparation systems have broad political supports (IPIECA, 2014). This support will be a starting point for specialized training and social investment, and will ultimately lead to the best possible OWR. Once the political decisions are completed, the process of creating the plans can begin. Also, financial support can be provided and social interest can be garnered. Because it is difficult to create a budget that addresses coordinating responses to oil pollution incidents affecting certain areas, and the challenge of preparing for such cases with limited budgets can be seen. In addition, social interest can instigate the co-operation with various people from institutions concerned with oil spill incidents, such as veterinarian medical associations, zoos, aquariums, nature conservation groups and universities. Through building close relationship with each other, they can provide a training and education to enhance oiled wildlife response capacity and can support in the rescue of oiled wildlife immediately by sending rescue technical specialists to the oil spill scene when large-scale oil spill incident occurs. It is important to always be able to provide demonstrations so that oiled wildlife can be rescued at minimum expense and to build and maintain collaborative relationships among the related people nationwide. In this context, political support is important in establishing systematic management.

5.2. Regional level

International cooperation is needed to prepare for unexpected oil spills. The Baltic marine environmental protection commission-Helsinki Commission (HELCOM) was established about four decades ago to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental cooperation. HELCOM has provided an example of the framework for cooperation on oiled wildlife response including the integrated wildlife response planning and the ministerial level commitments among the Contracting Parties (HELCOM, 2010). The Contracting Parties are to develop a wildlife response plan integrated into oil pollution contingency plan either on a national/local level and to apply commonly agreed guidelines. In addition, an Expert Working Group on OWR has worked to strengthen the cooperation between the Contracting Parties through the forum for the exchange of information on progress and best practices, creation of joint standards and

training courses (HELCOM, 2013). The Baltic Sea countries are currently developing their national wildlife response plan and HELCOM is providing operational procedures for joint OWR operations including requesting assistance and best practices from other countries and setting standards to be uniformly applied in the whole Baltic Sea.

Each NOWPAP member needs to continue to share information on oiled wildlife response activities. Furthermore, sharing of mobile oiled wildlife response units among the members or sending trained volunteers during spill incidents could be a good way of regional cooperation. Training programs for veterinaries and volunteers can be planned and a regional guidance on oiled wildlife response can also be developed. In conjunction with this, it is important to conduct joint exercises which may include participation of observers from other member states, and to cooperate for visa and custom issues in advance.

In addition, regional sensitivity mapping and transboundary modelling of oil spill incidents are required through exchange of DB on wildlife. Information related to OWR should also be shared among the member states through workshops and expert meetings. Through such information sharing, local and national networks will be formed and expanded, and cooperation will become stronger if actions are legally enforced.

Chapter 6. Conclusions

This report introduces the current status of OWR in the NOWPAP region and suggests recommendations for future improvements. Since the 1970s, several small and large oil spills have occurred in the NOWPAP region and the recent oil spill incidents triggered various action plans on OWR including revision or development of relevant laws, regulations, or guidelines. Throughout these incidents, socio-economic aspects, such as damage scale and economic loss, were highlighted which require solid and systematic investigations. Of note, ecological studies on water quality and benthic community responses have been assessed, but less specific structural activities and environmental health studies have been conducted in relation to oiled wildlife. There are still no consistent laws/policies, regulations, and guidelines for national OWR system; some regions show a low level of countermeasure capability compared to other countries that are already acquiring a cohesive system. Also, the importance of inter-governmental cooperation at national level has not been fully recognized or emphasized in the NOWPAP region until now.

Currently, oil spill studies in the NOWPAP region are evaluating the environmental impacts of incidents and for the establishment of restoration technologies. The region seems to lack expertise on wildlife and OWR. Thus, it is necessary to prepare the planning and establishment of OWR framework and evaluation of such responses in the future. The OWR process requires political cooperation, legal preparation, accurate analysis of the incident, collection of data on wildlife, and a standardized manual. It is also necessary to share information among the neighbouring countries through workshops and meetings to foster regional cooperation, especially within the NOWPAP region that shares international waters, and also to enable sharing of experiences with member states where there are no specific plans yet but a lot of potential in the future. Overall, it is proposed to continuously discuss possibilities of regional cooperation on oiled wildlife among the NOWPAP member states at the regional level as well as to consider newly adding additional words and/or phrases to the NOWPAP RCP regarding the OWR to encourage the capacity building on the oiled wildlife response at the national level.

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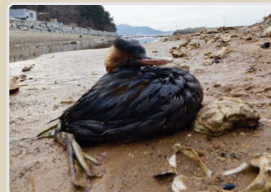
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