Ministry for Food, Agriculture, Forestry and Fisheries

# National Plan of Action for the Conservation and Management of Sharks

## The Republic of Korea

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MIFAFF
Ministry for Food, Agriculture, Forestry and Fisheries

# Contents

# Ⅰ. Introduction

A number of shark species are facing real threats of overexploitation due to high levels of direct and indirect fishing pressure on the species around the world's oceans. Accordingly, there are growing concerns over the upward trend in shark catch and its possible impacts on the related ecosystems. To address the situation, many improvements need to be done in terms of data and information on shark stocks, catches and trade; conservation and management measures; and the development and application of bycatch mitigation technologies. However, the current tools at hand--expertise, financial resources and the public's awareness--are not sufficient to make such improvements. Against this backdrop, this *National Plan of Action for the Conservation and Management of Sharks* has been designed to identify shortcomings and to set priorities for necessary changes.

International organizations including the Food and Agriculture Organization (FAO), Regional Fisheries Management Organizations or Arrangements (RFMO/As) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have conservation and management plans and measures in place to reduce negative impacts which various shark fishing activities may have on the targeted shark species and their related ecosystems and to promote the maximum utilization of sharks that have already been caught.

Along the same lines, it is worth noting that "*the United Nations Food and Agriculture Organization's International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks)"* was adopted at the 23rd Session of the Committee on Fisheries (COFI) of FAO, laying the foundation for ensuring the conservation and management of sharks and their long-term, sustainable use. The IPOA-Sharks calls on each state to voluntarily establish, implement and monitor their own national Shark-plans. Also, FAO, at the 29th Plenary Session of COFI in 2011, adopted *"the International Guidelines on Bycatch Management and Reduction of Discards,"* encouraging the members to manage bycatch and to mitigate discards.

Inspired by the initiatives taken by FAO and recognizing the need to manage and conserve sharks[1)] (sharks, rays and skates), the Republic of Korea established its *National Plan of Action for the Conservation and Management of Sharks (*NPOA-Sharks*)* in August, 2011. This NPOA-Sharks aims to set the general direction for the conservation and management of sharks and is subject to review at a regular interval and subsequent amendments.

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[1)] Paragraph 11 of FAO's IPOA-Sharks says the term "shark" is taken to include all species of sharks, skates and rays and chimeras (Class Chondrichthyes).

# II. Current State of Shark Management in Korea

## 2.1.Spatial Distribution of Sharks and Related Fisheries

### 2.1.1 Sharks

Korea's EEZ is home to around 40 shark species in 8 orders:16 are inhabiting in the eastern waters, 18 are in the western waters, 39 are in the southern waters including the waters around Jeju Island, and 12 are distributed around all three areas--east, west and south. This distribution pattern implies that most recorded shark species inhabit in the southern waters of Korea. These species include mako sharks (*Isurus oxyrinchus*), great white sharks (*Carcharodon carcharias*), blue sharks (*Prionace glauca*), hammerhead sharks (*Shpyrna zygaena*), banded houndsharks (*Triakis scyllium*), cloudy catsharks (*Scyliorhinus torazame*), starspotted sharks (*Mustelus manazo*), spiny dogfish (*Squalus acanthias*) and thresher sharks (*Alopias pelagicus*). <Refer to Figure 1, Appendix 1>

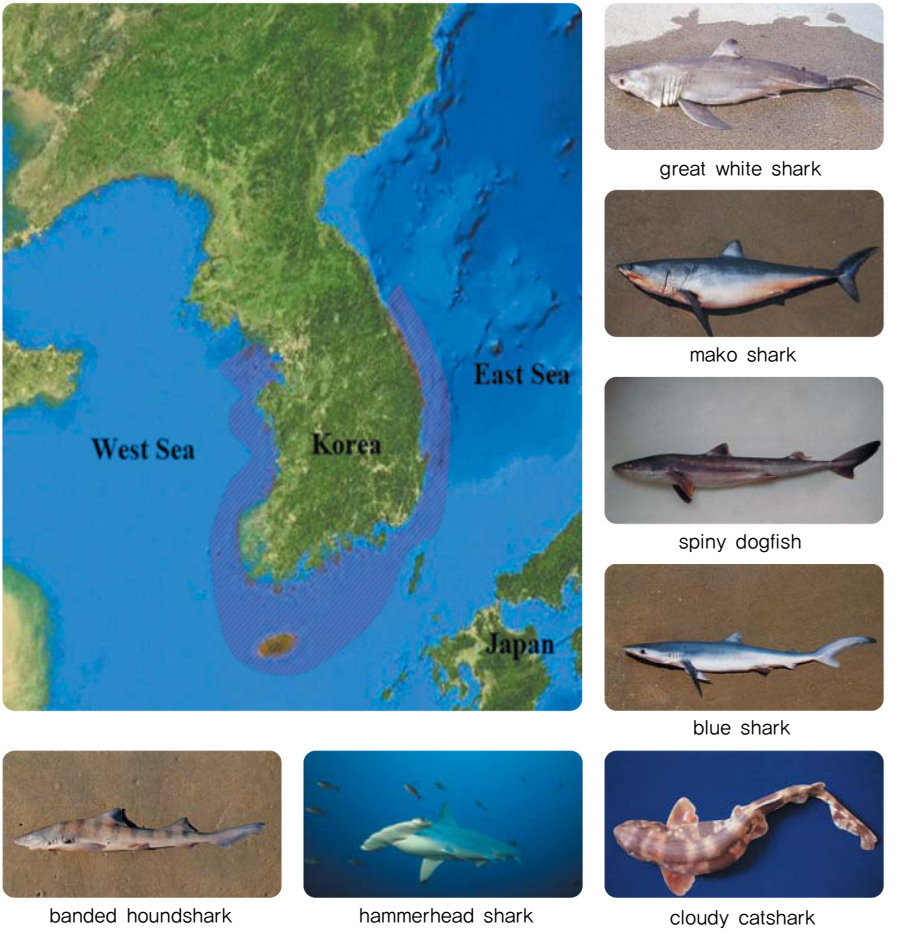
There is no fishery targeting sharks for both commercial (meat and fins) and non-commercial use in Korea's waters. In the past, some small-scale fishers used to target sharks for food, using reels and lines in the waters around Pohang in northern Gyeongsang province and Bogil Island in southern Joella province, but the impact of these subsistence fisheries on shark stocks was insignificant. The areas where shark bycatches occur relatively frequently are the waters near southern Jeolla province and northern and southern Gyeongsang province, usually by purse seiners, anchovy trawlers, small gill nets and large trawlers.

〈Table 1〉 Gear-specific Sharks Bycatch Rates (in tonnage and percentage) (EEZ)

| 2008 | | | 2009 | | | 2010 | | |
|---|---|---|---|---|---|---|---|---|
| gear type | catch (mt) | rates | gear type | catch (mt) | rates | gear type | catch (mt) | rates |
| purse seiner | 235 | 18% | purse seiner | 241 | 20% | purse seiner | 160 | 14% |
| anchovy trawler | 150 | 12% | anchovy trawl | 116 | 10% | anchovy trawler | 157 | 14% |
| small gill net | 69 | 6% | small gill net | 74 | 6% | small gill net | 71 | 6% |
| offshore pole and line | 61 | 5% | large trawler | 62 | 5% | large trawler | 60 | 5% |
| large trawler | 57 | 5% | large gill net | 60 | 5% | offshore gill net | 59 | 5% |

source: the Ministry for Food, Agriculture, Forestry and Fisheries (catch statistics)

Korea's distant water fisheries do not target shark species. However, sharks are sometimes caught by distant water tuna longliners and purse seiners as bycatch. In the Western and Central Pacific Ocean, blue sharks and porbeagle sharks are the major species incidentally caught by Korean-flagged longliners fishing for tuna. Thresher sharks and hammerhead sharks are also caught from time to time but not as often as blue sharks and porbeagle sharks. In the Indian Ocean, blue sharks are caught by tuna longliners as bycatch and in the Atlantic, blue sharks and mako sharks are incidentally caught.




〈Figure 1〉 Shark species known to inhabit in the EEZ of Korea

### 2.1.2 Skates

Korea's EEZ is home to around 27 species in 8 families of skates and rays. Among those rays and skates, the mottled skates (*Raja pulchra, Rajiformes*) are commercially sought-after species and are being sold at high prices in the market. This species is known to be widely distributed in Korea's southern and western waters, the East China Sea and the southern waters of Japan's mid-south region. The waters near Incheon in Gyeong-gi province and northern and southern Jeolla provinces are the areas where 99 percent of skates (mostly mottled skates) are caught <Figure 2>, usually by small gill nets, large gill nets and large pair bottom trawlers <Table 2>.

〈Table 2〉 Gear-specific Skates (*Rajiformes*) Bycatch Rates (in tonnage and percentage) (EEZ)

| 2008 | | | 2009 | | | 2010 | | |
|---|---|---|---|---|---|---|---|---|
| gear type | catch (mt) | rates | gear type | catch (mt) | rates | gear type | catch (mt) | rates |
| small gill net | 547 | 45% | large gill net | 912 | 28% | large gill net | 1,903 | 46% |
| large pair bottom trawler | 191 | 16% | small gill net | 876 | 27% | small gill net | 1,007 | 24% |
| large longliner | 139 | 12% | large longliner | 822 | 25% | coastal composite gears | 503 | 12% |
| large stow net | 92 | 8% | large pair bottom trawler | 182 | 6% | large stow net | 311 | 8% |
| improved small stow net | 85 | 7% | coastal composite gears | 182 | 6% | improved small stow net | 262 | 6% |

source: the Ministry for Food, Agriculture, Forestry and Fisheries (catch statistics)

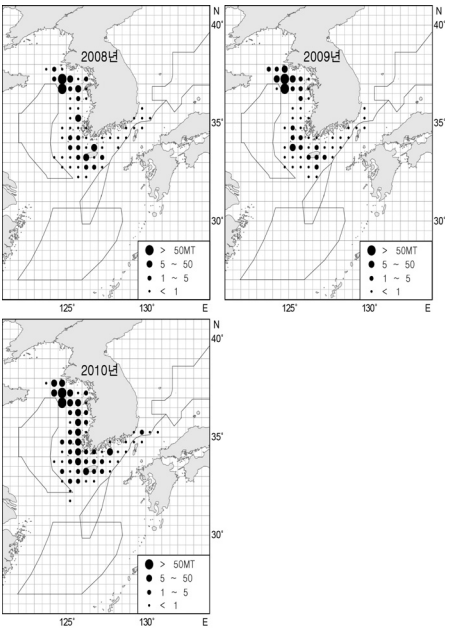
### 2.1.3 Rays

In the Korean EEZ, rays are often caught in the southern coastal waters <Figure 2>, usually by small gill nets, coastal composit gears and large danish seiners.

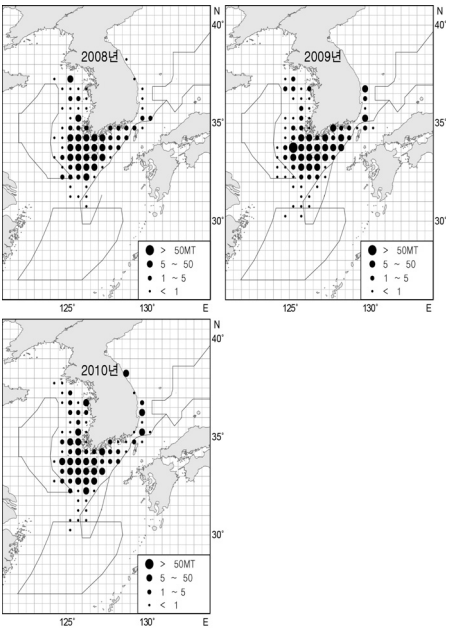
〈Table 3〉 Gear-specific Rays (*Batiformes*) Bycatch Rates (in tonnage and percentage) (EEZ)

| 2008 | | | 2009 | | | 2010 | | |
|---|---|---|---|---|---|---|---|---|
| gear type | catch (mt) | rates | gear type | catch (mt) | rates | gear type | catch (mt) | rates |
| small gill net | 713 | 32% | coastal composite gears | 686 | 26% | coastal composite gears | 538 | 27% |
| coastal composite gears | 494 | 22% | small gill net | 666 | 26% | small gill net | 470 | 23% |
| large gill net | 323 | 14% | large gill net | 261 | 10% | large gill net | 329 | 16% |
| large danish seiner | 145 | 6% | large stow net | 181 | 7% | large danish seiner | 168 | 8% |

source: the Ministry for Food, Agriculture, Forestry and Fisheries (catch statistics)




〈Figure 2〉 Fishing Grounds for Skates




〈Figure 3〉 Fishing Grounds for Rays

## 2.2. Shark Catch Statistics(mt)

〈Table 4〉 Shark Bycatch in Tonnage per Annum

| Species | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|
| Sharks | Distant Waters | 917 | 1,054 | 949 | 904 | 974 | 1,330 |
| | EEZ | 259 | 208 | 227 | 245 | 341 | 525 |
| Skates | Distant Waters | 1,173 | 907 | 1,301 | 797 | 1,142 | 952 |
| | EEZ | 255 | 392 | 375 | 1,208[2)] | 3,254 | 4,854 |
| Rays | Distant Waters | 5,058 | 5,154 | 4,778 | 3,450 | 4,459 | 4,081 |
| | EEZ | 2,446 | 3,126 | 3,996 | 2,236 | 2,593 | 2,021 |
| Total | | 10,108 | 10,841 | 11,626 | 8,840 | 12,763 | 13,763 |

source: the Ministry for Food, Agriculture, Forestry and Fisheries (catch statistics)

[2)] Skate catches have sharply risen since 2008 but it does not mean that the actual catches saw such a great increase. Rather, it was because skates had been classified as rays and thus their catches had been included in ray catches until 2008.

## 2.3. Domestic and International Trade of Sharks

〈Table 5〉 Shark Export and Import per Annum

| Species | Year | Export | | Import | |
|---|---|---|---|---|---|
| | | amount (mt) | value (USD 1,000) | amount (mt) | value (USD 1,000) |
| Sharks* | 2006 | 99 | 585 | 4,073 | 7,570 |
| | 2007 | 543 | 787 | 3,432 | 7,166 |
| | 2008 | 605 | 1,660 | 3,497 | 10,381 |
| | 2009 | 1,605 | 3,897 | 3,550 | 8,950 |
| | 2010 | 1,259 | 4,883 | 2,626 | 7,348 |
| Skates | 2006 | -* | - | 11,201 | 26,386 |
| | 2007 | - | - | 10,914 | 35,421 |
| | 2008 | - | - | 8,903 | 31,904 |
| | 2009 | - | - | 8,737 | 24,204 |
| | 2010 | 8 | 25 | 9,151 | 28,831 |
| Rays | 2006 | 149 | 196 | 9,200 | 16,377 |
| | 2007 | 60 | 83 | 10,318 | 22,652 |
| | 2008 | 4 | 11 | 8,040 | 19,356 |
| | 2009 | 9 | 8 | 8,779 | 19,200 |
| | 2010 | 55 | 101 | 8,706 | 21,180 |

source: the Ministry for Food, Agriculture, Forestry and Fisheries (catch statistics)

- : less than one ton in catch weight, less than USD1,000 in value
* sharks include spiny dogfish and others (refrigerated, frozen), shark fins and shark liver oil under HSK Code.

Sharks incidentally caught in the EEZ waters are usually sold in markets in Pohang in northern Gyeongsang province, Wando in southern Jeolla province, Seoguipo City and Jeju City in Jeju Island.

Most sharks caught as bycatch by Korea's distant water fishing fleets are exported and only a small portion of those catches is sold in the domestic market. These sharks are mainly consumed in northern Gyeongsang province as a traditional floured and pan-fried dish locally called "*Jeon*" and are seldom enjoyed as sashimi.

## 2.4. Management of Sharks

### 2.4.1 EEZ Fisheries

In accordance with the Fishery Resources Management Act, the Minister for Food, Agriculture, Forestry and Fisheries (the Minister) sets up Total Allowable Catches (TACs)[3] and relevant plans for certain species and/or areas when he or she deems that the stocks and/or areas need to be rebuilt and conserved. TACs and the relevant plans are subject to constant monitoring. Mayors and governors also have the authorities to establish TAC plans for species other than the ones that the Minister has already designated, considering the status and characteristics of the fisheries in the areas of their competence. However, before setting up any TAC plans, the Minister, mayors and governors should consult with stakeholders from relevant organizations and institutions and any such plans are subject to approval by the Fishery Resources Management Committee prior to implementation.

The president of the National Fisheries Research and Development Institute (NFRDI), mayors or governors are required to establish and implement plans for detailed stock/area research and assessments on a yearly basis. Authorized government officials and fishery resource monitoring agents are conducting enforcement activities including catch monitoring and boarding and inspections. Fishers, individually or collectively, are managing fishery resources in their areas of interest through various agreements and arrangements, whose objectives include the efficient management of fishery resources. Among shark species, the mottled skate is currently being managed under a TAC system.

### 2.4.2 Distant Water Fisheries

Korea is a member of a number of regional fisheries management organizations. The Distant Water Fisheries Development Act makes it mandatory for Korean citizens to comply with conservation and management measures for sharks adopted by those organizations. The Ministry for Food, Agriculture, Forestry and Fisheries (MIFAFF) delivers the decisions adopted by RFMOs to domestic stakeholders and conducts monitoring, control and surveillance activities to ensure Korean vessels and fishers abide by conservation and management measures adopted by RFMOs. The NFRDI collects and analyzes data necessary for shark management; trains and retains observers; develops, tries and applies bycatch mitigation technologies and undertakes stock assessments. The Animal, Plant and Fisheries Quarantine

[3] Total Allowable Catches (TACs): A cap placed on a species limiting the number of fish that are caught within a specific period of time

and Inspection Agency (QIA) oversees the implementation of catch documentation schemes and port state measures and runs sanitation and safety tests on fish and fishery products coming into Korea's ports and airports from abroad. The Korea Overseas Fisheries Association (KOFA) collects fishery-related operational data and statistics and disseminates information regarding conservation and management measures to vessel operators so that they can be aware of what to comply with at sea and in ports. International observers go on board vessels to observe and record the vessel's fishing practices, to check their compliance with conservation and management measures and to conduct scientific research.

# III. National Plan of Action for the Conservation and Management of Sharks

## 3.1. Objectives and Scope of National Plan of Action for Sharks

### 3.1.1 Objectives of Korea's NPOA-Sharks

Korea has established its National Plan of Action for Sharks to ensure shark resources are conserved, properly managed and sustainably used in a long term. The NPOA-Sharks also aims to mitigate negative impacts that shark catches and discards may inflict on marine ecosystems.

### 3.1.2 Scope of Korea's NPOA-Sharks

For the purpose of Korea's National Plan of Action for the Conservation and Management of Sharks, "Shark" is taken to include sharks (*Lamniformes*), rays (*Batiformes*) and skates (*Rajiformes*) in the class of *Chondrichthye*. However, this NPOA-Sharks mainly focuses on sharks (*Lamniformes*) since skates and rays are commercially popular species in Korea and are currently being managed under various fisheries management systems including a TAC system.

"Shark catches" mean both directed and non-directed catches of sharks. The spatial scope of this NPOA-Sharks encompasses all areas (EEZ and waters outside Korea's jurisdiction) where sharks are caught by Korean-flagged vessels.

## 3.2. Data Collection, Analysis and Assessment

### 3.2.1 Current State of Play

Shark catch data are currently being collected in accordance with the "Regulations on the Reporting of Fishing Operations in the Korean EEZ and Distant Waters (Ministerial Decree No.119)." Distant water fishing vessels provide their catch statistics on a regular basis to the NFRDI and KOFA, which then analyze those raw data and submit relevant statistics to RFMOs as required and at their request. Scientific observers are placed on board vessels to assist the crew in identifying shark species; to measure the quantity, length and weight of catches; to observe the spatial distribution and habitats of sharks; to check the effectiveness of shark bycatch mitigation devices and vessels' compliance with conservation and management measures of RFMOs. The government also requires Korean-flagged distant water purse seiners and longliners to submit their bycatch data and has provided them with a field guide book on bycatch species (published in 2008) to help them identify species on board more easily.

### 3.2.2 Plans and Tasks for Improvement

MIFAFF has set up plans to improve shark catch-related data collected both from the distant water fisheries and EEZ fisheries. The following plans will initially be applied to the distant water fisheries and then will be subsequently extended to the EEZ fisheries.

#### 1. Improving data collection for distant water fisheries

To improve data collection from Korean-flagged distant water fishing fleets and to maintain those data more properly, the government is planning to update fishery data-related regulations and KOFA will have better data management and maintenance systems in place.

#### 2. Promoting timely provision of data from distant water fishing fleets

RFMOs are requiring their members that they provide accurate fishery-related data in a timely fashion. However, in Korea, some of the current domestic data submission regulations have yet to be updated to keep up with these requirements and thus are making it difficult for the government to provide certain data to RFMOs in a timely manner. To address this problem, the government will put shorter intervals in place for data provision.

#### 3. Improving data reporting forms

The current formats and forms for data reporting are not well-suited to extract more

detailed fishery data. To collect more accurate and finer-scale data on shark by species, the government will come up with a more improved version of reporting forms initially for the distant water fisheries and then gradually for EEZ fisheries.

### 4. Training and retaining observers

Well-trained observers are pivotal when it comes to collecting, analyzing, assessing and monitoring shark-related data for the conservation and management purposes and checking the compliance with conservation and management measures adopted by RFMOs. With this in mind, the government has plans to enhance the current observer training programs and is finding ways to better support in retaining observers (e.g. an observer retention and training center). To collect shark-related data by species from the EEZ fisheries, fishery resource monitoring agents will be dispatched to major landing ports. Shark experts and scientists will also be tasked to identify and monitor the trends in and the distribution of shark catches by species in the EEZ waters.

### 5. Establishing database on bycatch species

The NFRDI is planning to create a comprehensive database containing information on bycatch species including sharks, in order to obtain and utilize data on various bycatch species.

### 6. Conducting stock and impact assessments on major shark bycatch

Using accumulated data, the government is planning to conduct stock assessments on major shark species frequently caught as bycatch by Korean-flagged distant water fishing fleets and to undertake research to identify how fishing activities are affecting individual shark species.

### 7. Research on the trends in shark trade designating separate tariff codes for each species

The government is planning to conduct research on the trends on shark trade based on shark import statistics by species and will designate separate tariff codes (HSK codes) for each shark species.

| Plans and Tasks | short term | | long term | |
|---|---|---|---|---|
| 1. Improving data collection for distant water fisheries | | | | |
| 2. Promoting timely provision of data from distant water fishing fleets | | | | |
| 3. Improving data reporting forms | | | | |
| 4. training and retaining observers | | | | |
| 5. Establishing database on bycatch species | | | | |
| 6. Conducting stock and impact assessments on major shark bycatch | | | | |
| 7. Undertaking research on the trends in shark trade and designating separate tariff codes for each species | | | | |

## 3.3. Conservation and Management Measures

### 3.3.1 Current State of Play

The Distant Water Fisheries Development Act provides the legal ground for conservation and management of shark species which inhabit outside the Korean EEZ. Article 13 of the Act stipulates that those who conduct fishing activities outside the judicial waters of Korea must comply with fishery resources conservation measures adopted by relevant RFMOs and international institutions that govern fishing activities on high seas. Korea is a member of all five tuna RFMOs--the Inter-American Tropical Tuna Commission (IATTC), the Western and Central Pacific Fisheries Commission (WCPFC), the International Commission for the Conservation of Atlantic Tuna (ICCAT) and the Commission for Conservation of Southern Bluefin Tuna (CCSBT)--and is striving to comply with the shark conservation and management measures[4] taken by those Commissions and imposing corrective sanctions on offenders of the measures pursuant to the Act.

[4] WCPFC CMM 2009-04; IATTC Resolution 2005-03;ICCAT Resolution 2004-10; IOTC Resolution 2005-05, 2010-12, etc

Sharks in Korea's EEZ waters are not one of the targeted species and they are only caught as bycatch. Therefore, there are not sufficient data and statistics on their biomass, distribution patterns and individual species. The government is planning to bridge this data gap by conducting stock assessments and establishing proper management plans accordingly. Mottled skates (*Raja pulchra)* in Korea's EEZ are currently being managed under a TAC system, where the TACs were set at 200 tonnes in 2009 and 2010 respectively and 230 tonnes in 2011.

Shark species listed in the Appendices of the CITES are also listed in Ministerial Directive No. 2010-71 (June 30, 2010) of the Ministry of Environment so that the list can be publicly informed. The Wild Fauna and Flora Protection Act of Korea and its Enforcement Regulations provide that the trade of the listed sharks should be governed by the relevant provisions of the CITES Convention. Also, Article 35 of the Fishery Resources Management Act and paragraph 19 of its Enforcement Regulations give the Minister for Food, Agriculture, Forestry and Fisheries the authorities to declare certain species endangered and to prohibit the capture and harvest of those species or to make it mandatory for fishers to release the species when captured alive.

### 3.3.2 Plans and Tasks for Improvement

Most RFMOs have shark conservation and management measures in place, with which Korean-flagged distant water fishing fleets should comply pursuant to the Distant Water Fisheries Development Act. For issues the Act is not currently covering, the government is planning to establish Ministerial Directives that deal in detail with relevant data reporting procedures, crew and observer training, checklists for monitoring and surveillance activities, the use of bycatch mitigation devices, and input/output control. Also, the government intends to establish more concrete management plans for bycatch species including sharks. It will also conduct comprehensive surveys on the trade of sharks and the management of the CITES-listed shark species[5] to take additional legal and institutional measures as needed.

[5] Appendix I-listed (general prohibition on commercial international trade) species include all species under the family of Pristiophoridae and Appendix II-listed (international trade is allowed under certain regulations) species include *Cetorhinus maximus, Carcharodon carcharias, Rhincodon typus, Pristiophorus japonicas.*

| Plans and Tasks | short term | | medium term | |
|---|---|---|---|---|
| 1. Identifying the need to amend or complement domestic laws and regulations | | | | |
| 2. Establishing fishery management plans for sharks | | | | |
| 3. Conducting surveys on shark trade and amending or complementing relevant regulations | | | | |

## 3.4. Monitoring, Control and Surveillance

### 3.4.1 Current State of Play

MIFAFF is employing a wide range of tools such as vessel monitoring systems, catch reporting, onboard observers, port state measures, high seas boarding and inspections and market measures to ensure Korean-flagged vessels' compliance with shark conservation and management measures adopted by RFMOs. When violations occur, the government takes corrective measures against offenders, including revocation and cancellation of fishing licenses, penalties, fines and confiscation of catches. Also, Korea is extending international cooperation to ensure the full compliance with conservation and management measures for sharks through RFMOs and bilateral arrangements with other states.

In the EEZ fisheries, skates are being managed and controlled in various ways pursuant to the Fishery Resources Management Act: Fishery resource monitoring agents examine catches for legitimacy; fishers make arrangements for community-based management; the implementation of allocated TACs are reported and monitored; designated government officials conduct surveillance and monitoring activities; and penalties are imposed on offenders.

### 3.4.2 Plans and Tasks for Improvement

For more sustainable monitoring, control and surveillance (MCS) activities, the government will be tasked to do the following:

#### 1. Strengthening port state measures and improving relevant policy tools

Korea has been implementing port state measures in accordance with the Distant Water Fisheries Development Act, which incorporates relevant provisions of the 1995 UN Fish Stocks Agreement and Korea's National Plan of Action for Preventing IUU Fishing. The government is planning to train port inspectors and to supplement the Act so that

shark-related regulations can be more effectively followed and enforced. In implementing port state measures, collaboration with other states will also be more vigorously employed to step up MCS activities.

### 2. Strengthening high seas on-board inspection

As one of the contracting parties to the UN Fish Stocks Agreement and a member of many RFMOs, Korea is intended to join the efforts in watching other vessels' compliance with internationally and regionally agreed shark conservation measures through high seas boarding and inspection. To facilitate these activities, the government is considering publishing a handbook for conducting and responding to boarding and inspection to facilitate seamless communications between inspectors and the crew.

### 3. Strengthening monitoring, control and surveillance through Vessel Monitoring Systems

The Distant Water Fisheries Development Act provides that vessels, which operate in the areas under the purview of RFMOs or fish for species managed under regional/international Conventions and Agreements, must be equipped with vessel monitoring systems.

### 4. Strengthening monitoring, control and surveillance through observers

The government is planning to gradually increase observer coverage for Korea's distant water fishing fleets to better monitor the vessels' compliance with shark conservation and management measures and to ensure their proper implementation. Observers will be given stronger authorities by law in conducting their observation missions. To enhance MCS activities to manage the EEZ fisheries, fishery resource monitoring agents will be given more power in conducting monitoring and surveillance activities.

| Plans and Tasks | short term | | medium term | |
|---|---|---|---|---|
| 1. Strengthening port state measures and improving relevant institutions | | | | |
| 2. Strengthening high seas on-board inspection | | | | |
| 3. Strengthening monitoring, control and surveillance through Vessel Monitoring Systems | | | | |
| 4. Strengthening monitoring, control and surveillance through observers | | | | |

## 3.5. Maximizing the Utilization of Sharks Caught

### 3.5.1 Current State of Play

In Korea, shark meat has long been a part of the country's culinary tradition and most small-sized sharks caught in the EEZ waters are not discarded but used for human consumption.

Some RFMOs are prohibiting the discard of dead sharks and requiring the weight of retained shark fins to be less than 5 percent of the weight of the carcasses on board, encouraging the full utilization of retained sharks. Korean-flagged distant waster fishing vessels are following these rules and all sharks brought to Korean ports are either exported or domestically consumed.

### 3.5.2 Plans and Tasks for Improvement

When it comes to the full utilization of retained sharks, Korea is keeping a good record. Sharks caught as bycatch are used for human consumption and relevant conservation and management measures are being properly followed. However, there is still room for improvement in terms of public information and awareness regarding relevant regulations. Also, more and better ways to utilize retained sharks need to be explored.

| Plans and Tasks | short term | medium term |
|---|---|---|
| Stepping up public information and awareness enhancement efforts regarding relevant regulations and exploring more ways to utilize retained sharks | | |

## 3.6. Research and Development

### 3.6.1 Current State of Play

The NFRDI is putting much effort into research and development activities to improve data collection and analyses, stock assessments, development and application of new technologies such as bycatch mitigation technologies. The institute is also exploring ways to better utilize retained sharks.

### 3.6.2 Plans and Tasks for Improvement

**1. Creating an expert group and recruiting and retaining dedicated workforce**

The government is intended to create an expert group comprising shark taxonomists, biologists, ecologists, stock assessment experts, fishing gear engineers, data managers, policy makers, MCS managers and fishers. This group will be tasked to identify needs in shark-related research and development and take necessary steps. Also, researchers dedicated to shark-related fields will be recruited and retained to collect relevant biological data, to undertake research and to analyze the trade and market distribution of sharks.

**2. Technological development**

The government is continuously encouraging the development of bycatch mitigation technologies. Other technologies, such as more selective gears and modified gears designed to increase the survival rates of captured sharks; biodegradable gears; and discard mitigation technologies, will also be developed and applied.

| Plans and Tasks | short term | | medium term | |
|---|---|---|---|---|
| 1. Creating a group of experts and recruiting and retaining dedicated workforce | | | | |
| 2. Technological development (e.g. bycatch mitigation technologies) | | | | |

## 3.7. Public Information and Promotion

### 3.7.1 Current State of Play

The government is carrying out a wide spectrum of promotion activities to raise the public's awareness on the need for the conservation and management of sharks and to assist fishers to better comply with shark-related conservation and management measures. A case in point is the publication of a field guide book on bycatch species for distant water fishing fleets (2008) by the NFRDI. This pocket-sized field guide illustrates and describes species frequently caught as bycatch by Korea's distant water fishing fleets in detail thereby assisting fishers to identify various species more easily. The field guide has also been circulated around government offices, schools and public establishments with the view to enabling the general public to access to and better understand this information.

### 3.7.2. Plans and Tasks for Improvement

The government will step up its efforts to enhance the public's awareness on this NPOA-Sharks and help fishers to follow relevant conservation and management measures without confusion and keep them updated with new or amended measures. The field guide will be revised from time to time to include newly adopted conservation and management measures and will be used to educate and train the crew and observers. New education programs will also be developed to educate public officials and the general public so that they can be fully aware of the need for the conservation, management and long-term and sustainable use of sharks.

| Plans and Tasks | short term | | medium term | |
|---|---|---|---|---|
| 1. Revising the field guide | | | | |
| 2. Developing new programs | | | | |
| 3. Enhancing the public's awareness | | | | |

## 3.8. International Cooperation

### 3.8.1 Current State of Play

So far, Korea has acceded to 11 regional fisheries management organizations, including the five tuna RFMOs and currently is sitting at the discussion tables of the South Pacific Regional Fisheries Management Organization(SPRFMO) and the North Pacific Fisheries Commission (NPFC), both of which are at their nascent stages. As a responsible member of these organizations and arrangements, Korea is encouraging its vessels to fully comply with shark-related conservation and management measures and to meet data requirements. Also, the government is cooperating with other states in terms of monitoring, control and surveillance to ensure the effectiveness of those conservation and management measures.

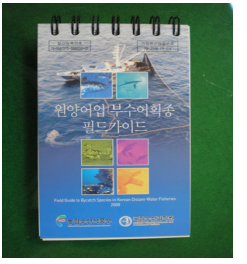



Figure 2. Field guide on bycatch species for distant water fishing fleets

### 3.8.2 Plans and Tasks for Improvement

The Korean government is exploring ways to reinforce international cooperation for the conservation and management of sharks. At the global level, the government is considering the implementation of capacity building projects for developing countries on shark-related conservation and management measures in collaboration with international organizations including FAO. At the regional level, the government is looking to step up cooperation with regional fisheries management organizations in terms of shark-related information exchange, scientific analyses of relevant data, and evaluation of the effectiveness of shark bycatch mitigation technologies. Cooperation with other states will also be expanded to increase the level of monitoring, control and surveillance. Joint research on shark bycatch mitigation technologies through bilateral arrangements is also on the government's to-do list.

| Plans and Tasks | short term | | medium term | |
|---|---|---|---|---|
| 1. Carrying out joint projects with international fisheries organizations | | | | |
| 2. Strengthening cooperation with RFMOs | | | | |
| 3. Joint MCS activities and research on shark bycatch mitigation technologies through bilateral arrangements | | | | |

## 3.9. Other Issues

The Minister for Food, Agriculture, Forestry and Fisheries is responsible for overseeing the establishment and implementation of this NPOA-Sharks, which is subject to amendments through regular reviews. An amended version of this NPOA-Sharks will be transmitted to the UN FAO and will be made available to the public to keep them updated. The review will be undertaken every two years by officials from relevant organizations, ministries and external experts, who will make recommendations on the amendment of NPOA-Sharks. A 'distant water sharks management committee' will also be formed for better management of sharks subject to non-directed fishing by Korean-flagged distant water fishing vessels.

〈Appendix 1〉 Distribution of Sharks in Korea's EEZ at a Glance

| Latin Name | west sea | south sea | east sea | east, west, south seas |
|---|---|---|---|---|
| Heterodontiformes | | | | |
| Heterodontidae | | | | |
| *Heterodontus japonicus* | ● | ● | | |
| *Heterodontus zebra* | | ●* | | |
| Orectolobiformes | | | | |
| Orectolobidae | | | | |
| *Orectolobus japonicus* | | ●* | | |
| Hemiscylliidae | | | | |
| *Chiloscyllium plagiosum* | | ●* | | |
| Rhincodontidae | | | | |
| *Rhincodon typus* | ● | ● | ● | ● |
| Scyliorhinidae | | | | |
| Scyliorhinidae | | | | |
| *Cephaloscyllium umbratile* | | ● | | |
| *Halaelurus buergeri* | | ●* | | |
| *Scyliorhinus torazame* | ● | ● | | |
| Proscylliidae | | | | |
| *Proscyllium habereri* | | ●* | | |
| Triakidae | | | | |
| *Hemitriakis japonica* | | ● | | |
| *Mustelus griseus* | | ● | | |
| *Mustelus manazo* | ● | ● | | |
| *Triakis scyllium* | ● | ● | ● | ● |
| Carcharhinidae | | | | |
| *Carcharhinus brachyrus* | ● | ● | ● | ● |
| *Carcharhinus dussumieri* | | ● | | |
| *Carcharhinus plumbeus* | | ●* | | |
| *Carcharhinus sorrah* | | ● | | |
| *Galeocerdo cuvier* | ●* | ●* | | |
| *Prionace glauca* | | ● | ● | |
| *Rhizoprionodon acutus* | | ●* | | |
| *Rhizoprionodon ologolinx* | | ●* | | |
| Sphyrnidae | | | | |

| Latin Name | west sea | south sea | east sea | east, west, south seas |
|---|---|---|---|---|
| *Sphyrna lewini* | ● | ● | ● | ● |
| *Shpyrna zygaena* | ● | ● | ● | ● |
| Lamniformes | | | | |
| Pseudocarchariidae | | | | |
| *Pseudocarcharias kamoharai* | | ●* | | |
| Alopiidae | | | | |
| *Alopias pelagicus* | | ● | ● | |
| *Alopias vulprnuis* | ● | ● | ● | ● |
| Cetorhinidae | | | | |
| *Cetorhinus maximus* | ● | ● | ● | ● |
| Lamnidae | | | | |
| *Carcharodon carcharias* | ● | ● | ● | ● |
| *Isurus oxyrinchus* | ● | ● | ● | ● |
| *Lamna ditropis* | | | ●* | |
| Hexanchiformes | | | | |
| Hexanchidae | | | | |
| *Heptranchias perlo* | | ● | | |
| *Notorynchus cepedianus* | ● | ● | | |
| Squaliformes | | | | |
| Squalidae | | | | |
| *Etmoperus lucifer* | | ● | | |
| *Squalus acanthias* | ● | ● | ● | ● |
| *Squalus japonicus* | | ● | | |
| *Squalus megalops* | ● | ● | ● | ● |
| *Squalus mitsukurii* | | ● | | |
| Squathniformes | | | | |
| *Squatinidae* | | | | |
| *Squatina japonicus* | ● | ● | ● | ● |
| *Squatina nebulosa* | ● | ● | | |
| Pristiophoriformes | | | | |
| Pristiophoridae | | | | |
| *Pristiophorus japonicus* | | ● | ● | |
| total number of species | 18 | 39 | 16 | 12 |

*: species that are recorded in *Jasaneobo* (1814)[6], but have not been officially verified by researchers

[6] *Jasaneobo* (trans:Encyclopedia of indigenous fishes) is the first Korean ichthyology book written by Jeong, Yak-yong in 1814 and translated into the modern Korean language by a Korean ichthyologist, Jeong, Mun-gi, in 1977.

# National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries

Republic of Korea

January 2014

MINISTRY OF
OCEANS AND FISHERIES

National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries

# Contents

# I Introduction

Seabirds are being incidentally caught in longline fisheries operating on the world's oceans, and concerns are rising about the negative impact of the seabird bycatch on their conservation status. The seabird bycatch may also have adverse impact on fishing productivity and profitability. Thus, there is an increasing need for conservation and management of seabird populations, resulting in more petitions for mitigation measures to reduce the incidental mortality of seabirds in longline fisheries.

Noting the increased concern on the incidental catch of seabirds in longline fisheries and its potential negative impact on seabird populations, a proposal was formulated at the Twenty-second Session of the Committee on Fisheries (COFI) in March 1997 that the Food and Agriculture Organization (FAO) organize an expert consultation to develop guidelines leading to a plan of action for reducing the incidental catch of seabirds. The *"International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds)"* was developed through the meeting of a Technical Working Group in Tokyo in March 1988 and the Consultation on the Management of Fishing Capacity, Shark Fisheries and Incidental Catch of Seabirds in Longline Fisheries held October 1998 and its preparatory meeting held in Rome July 1998.

According to the IPOA-Seabirds recommendations, States in the waters of which longline fisheries are being conducted by their own or foreign vessels, and states that conduct longline fisheries on the high seas and in the exclusive economic zones (EEZ) of other States are encouraged to establish and implement *National Plan of Action for Reducing Incidental Catch of Seabirds (NPOA-Seabirds)* in efforts to scientifically analyse impacts of longline fisheries on seabirds and to develop mitigation measures suited for each specific fishery.

Consequently, the Republic of Korea established the *"National Plan of Action for Reducing Incidental Catch of Seabirds"* in January, 2014. The NPOA-Seabirds provides guidelines for reducing incidental catch of seabirds to all longline fisheries operating in the exclusive economic zone of Korea and to all Korean longline fisheries operating in waters outside the State.

Korea will sincerely implement its NPOA-Seabirds through efforts to develop effective mitigation measures for reducing incidental catch of seabirds and, to this end, ensure support for implementation of NPOA-Seabirds as well as stronger activity in education, training and publicity.

Ⅱ

# Current Status of Korean Fisheries Related to Incidental Catch of Seabirds

## 2.1. Fisheries Related to Incidental Catch of Seabirds

Korean longline fisheries are classified into coastal, offshore and distant water fisheries, with the distant water and offshore fisheries managed by the central government and the coastal fisheries by local governments. Depending upon target species and fishing methods, there are several types of the distant water tuna longline fishery (hereafter referred to as "tuna longline fishery"), distant water bottom longline fishery (hereafter referred to as "bottom longline fishery") and so on. And domestic longline fisheries in Korean waters are classified into costal and offshore fisheries, and costal longline fishery belongs to the coastal composite fishery[1] under the Fisheries Act at present. Accordingly, *National Plan of Action for Reducing Incidental Catch of Seabirds* applies to tuna longline fishery, bottom longline fishery, coastal and offshore longline fishery, etc.

### 2.1.1. Tuna Longline Fishery

Korean tuna longliners are large, being greater than 200 ton of total tonnage, about 150 vessels of which are currently operating in the Pacific, Indian and Atlantic Ocean. Of them, about 85% conduct fishery primarily targeting bigeye tuna *(Thunnus obesus)* and yellowfin tuna *(T. albacares)* in the waters between 20°N~20°S latitude of the Pacific Ocean. Korean longliners rarely conduct fishery in waters where seabird species mostly occur (north of 23°N, south of 30°S in the Pacific Ocean). In the Indian Ocean, Korean longliners mainly target southern bluefin tuna *(T. maccoyii)*, bigeye tuna, yellowfin tuna and albacore tuna *(T. alalunga)* in latitudes of 30°~45°S. These latitudes are regulated by IOTC[2] Resolution on Reducing the Incidental Bycatch of Seabird in Longline Fisheries (south of 25°S in the Indian Ocean). In the Atlantic Ocean, longliners target bigeye tuna and yellowfin tuna in the waters of 20°N~20°S while a few vessels targeting southern bluefin tuna conduct fishery in waters regulated by ICCAT[3] Recommendation on Reducing Incidental Bycatch of Seabird in Longline Fisheries (south of 25°S in the Atlantic Ocean).

1) Coastal composite fishery refers to longline fishery, octopus pot, fishery of saury by hand, shell fishery, etc. conducted by nonpower vessels or by power vessels less than 10 ton of total tonnage.
2) IOTC: Indian Ocean Tuna Commission
3) ICCAT: International Commission for the Conservation of Atlantic Tuna

### 2.1.2. Bottom Longline Fishery

Bottom longline fishery mainly targets cods and toothfishes (Antarctic toothfish, *Dissostichus mawsoni* as well as Patagonian toothfish, *D. eleginoides*). Depending upon target species, the fishing grounds are divided into the northern Pacific Ocean, the Indian Ocean, the Atlantic Ocean and the Antarctic Ocean. Currently the bottom longline fishery fishing for cod is operated by vessels of 400-500 ton in the Bering Sea of the northern Pacific Ocean. As for the bottom longline fishery fishing for toothfishes, vessels of 400-800 ton operate in the waters of the Antarctic Ocean, the southwestern Atlantic Ocean and the southern Indian Ocean.

### 2.1.3. Coastal and Offshore Longline Fishery

Coastal and offshore longline fisheries mainly catch flatfishes, cods and rockfishes in the EEZ of Korea, though the target species and fishing methods vary within the EEZ.

## 2.2. Status of Incidental Catch of Seabirds

In recent, it was reported that the world's seabirds are more threatened than any other group of birds. Of about 350 seabird species, 29% are globally threaten and a further 10% near threatened, while nearly half are known or suspected to be experiencing declines in their populations. The albatross family is especially imperilled, with 17 of 22 species threatened with extinction. Thus urgent measures for protecting and managing these species are required.

### 2.2.1 Distant Water Fishery

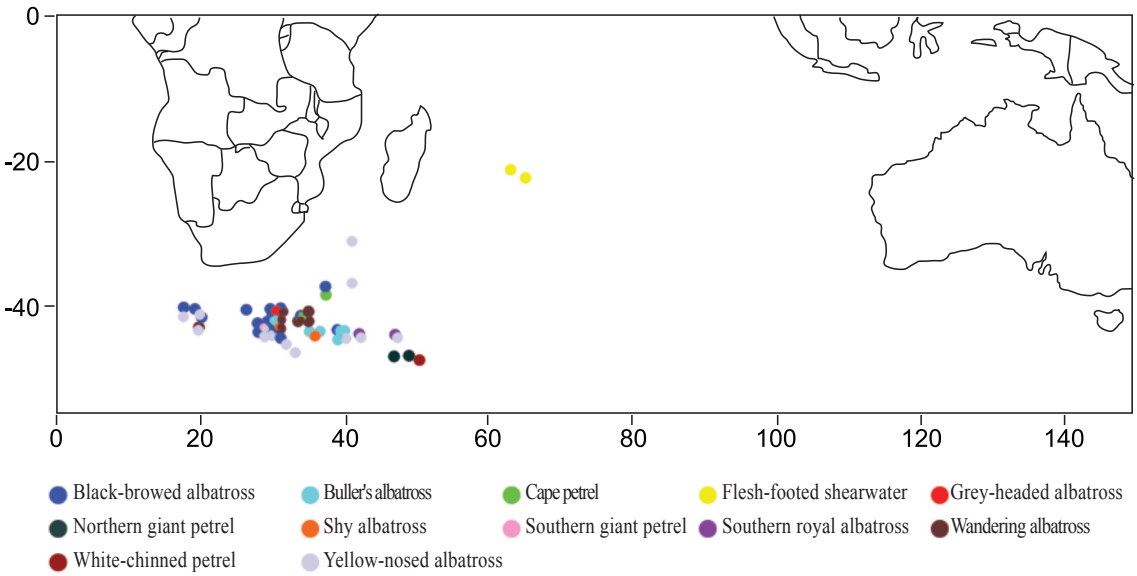
As a result of observer trips, a total of 13 seabird species has been recorded bycaught incidentally by Korean tuna longliners and bottom longliners fishing for toothfishes, and 2 species (black-browed albatross and yellow-nosed albatross) of which are listed as Endangered (EN) on the IUCN[4)]'s Red List <Table 1>.

4) IUCN: International Union for Conservation of Nature

Seabirds bycaught by Korean distant water longline fisheries were mostly found in the waters of 40°S and 20°- 40°E, and major species of them were black-browed albatross, wandering albatross and yellow-nosed albatross <Figure 1>.

<Table 1> List of seabird species incidentally bycaught by Korean tuna longline fisheries and bottom longline fisheries fishing for toothfishes

| English name | Scientific name | IUCN conservation status | Ocean where it occurred |
|---|---|---|---|
| Black-browed albatross | *Thalassarche melanophrys* | Endangered (EN) | Indian, Atlantic |
| Buller's albatross | *Thalassarche bulleri* | Vulnerable (VU) | Indian |
| Cape petrel | *Daption capense* | Least Concern (LC) | Indian |
| Flesh-footed shearwater | *Puffinus carneipes* | Least Concern (LC) | Indian |
| Grey-headed albatross | *Thalassarche chrysostoma* | Vulnerable (VU) | Indian |
| Grey petrel | *Procellaria cinerea* | Near Threatened (NT) | Atlantic |
| Northern giant petrel | *Macronectes halli* | Least Concern (LC) | Indian |
| Shy albatross | *Thalassarche cauta* | Near Threatened (NT) | Indian |
| Southern giant petrel | *Macronectes giganteus* | Least Concern (LC) | Indian |
| Southern royal albatross | *Diomedea epomophora* | Vulnerable (VU) | Southern Pacific, Indian |
| Wandering albatross | *Diomedea exulans* | Vulnerable (VU) | Indian, Atlantic |
| White-chinned petrel | *Procellaria aequinoctialis* | Vulnerable (VU) | Indian |
| Yellow-nosed albatross | *Thalassarche carteri* | Endangered (EN) | Indian, Atlantic |




<Figure 1> Distributions of seabirds incidentally bycaught by Korean tuna longline fisheries and bottom longline fisheries fishing for toothfishes.

### 2.2.2 Coastal and Offshore Fisheries

It was found that seabirds were incidentally bycaught in drift nets, pots, set nets, etc. in the Korean coastal and offshore fisheries (Park et al., 2012), though it is hard to obtain accurate information on the seabird bycatch status due to lack of comprehensive researches and related studies.

# Ⅲ National Plan of Action for Reducing Incidental Catch of Seabirds

## 3.1. Objective and Scope

### 3.1.1. Objective

Taking into account the IPOA-seabirds provided by FAO, the "*National Plan of Action for Reducing Incidental Catch of Seabirds (NPOA-seabirds)*" has been developed to enhance conservation and management measures on seabirds in terms of promoting international cooperation for reducing the mortality of seabirds.

### 3.1.2. Scope

The NPOA-Seabirds applies to all Korean vessels which conduct longline fisheries in the waters under jurisdiction of Regional Fisheries Management Organizations (RFMOs) and the high seas, as well as Korean and foreign vessels which conduct longline fisheries in the EEZ of Korea.

## 3.2. Mitigation Measures for Reducing Incidental Catch of Seabirds

Implementation of mitigation measures for reducing incidental catch of seabirds in distant water fisheries is regulated by the "Distant Water Fisheries Development Act", and fishers are fined for breeching the regulations. Under Article 13[5)] of the act, longliners, operating in the waters under jurisdiction of RFMOs, should sincerely implement mitigation measures for reducing incidental catch of seabirds in accordance with resolutions of the competent RFMOs. For those operating in the waters outside of jurisdiction of RFMOs, they are also encouraged to take appropriate measures to minimize incidental catch of seabirds.

Basic policies for reducing incidental catch of seabirds are as follows;

5) Article 13 ① Distant water fishery operators shall duly conduct fishery within the extent to which they are allowed and comply with RFMOs resolutions on resources conservation measures and international regulations related to fisheries in the high seas.

i) For a seabird bycaught alive in the process of longline operation, fishers should make their best effort to remove the hook in a way as not to risk the bird's life and to release it alive (see Appendix 1).

ii) Longliners, which operate in the waters under jurisdiction of RFMOs, should implement mitigation measures for reducing incidental catch of seabirds in accordance with resolutions of the competent RFMOs.

iii) Longliners, which operate in the waters outside of jurisdiction of RFMOs, are also encouraged to voluntarily improve and implement appropriate mitigation measures for reducing bycatch of seabirds.

iv) In implementing and improving the mitigation measures, it is advised to make considerations respecting extensive experience of fishers for long years, minimizing their economic burden and maximizing their safety.

### 3.2.1. Western and Central Pacific Fisheries Commission (WCPFC[6]) Area

(1) South of 30°S

Longliners fishing south of 30°S shall use at least two of the three measures below (See Appendix 2 for specification of these measures).

- Weighted branch lines
- Night setting
- Tori line

(2) North of 23°N

Longliners fishing north of 23°N shall use at least two of the mitigation measures listed in Table 2, including at least one of measures from Column A (See Appendix 2 for specifications of these measures).

6) Western and Central Pacific Fisheries Commission CMM 2012-07: Conservation and management measure to mitigate the impact of fishing for highly migratory fish stocks on seabirds

<Table 2> WCPFC mitigation measures for reducing seabird bycatch

| Column A | Column B |
|---|---|
| •Side setting with a bird curtain and weighted branch lines*<br>•Night setting with minimum deck lighting<br>•Tori line<br>•Weighted branch lines | •Tori line**<br>•Blue-dyed bait<br>•Deep setting line shooter<br>•Management of offal discharge |

* If using side setting with a bird curtain and weighted branch lines from Column A, this will be counted as two mitigation measures.

** If tori line is selected from both Column A and Column B, this equates simultaneously using two (i.e. paired) tori lines.

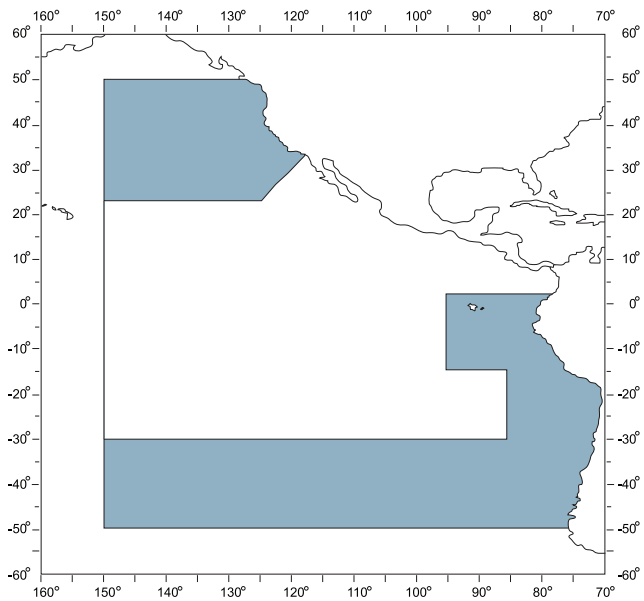
(3) Other areas

Longliners fishing in other waters between 30°S and 23°N are encouraged to use one or more of the mitigation measure listed in Table 2, as appropriate.

### 3.2.2. Inter-American Tropical Tuna Commission (IATTC[7]) Area

Longliners of greater than 20 m length overall that use hydraulic, mechanical or electrical systems and that fish in the area managed by the IATTC resolution on seabirds shall use at least two of the mitigation measures listed in Table 3, including at least one of measures from Column A. The areas requiring these measures in the eastern Pacific Ocean are as follows: north of 23°N (except in Mexico waters as described in the minutes of the 81th IATTC meeting) and south of 30°S, plus the area bounded by the coastline at 2°N, west to 2°N 95°W, south to 15°S 95°W, east to 15°S 85°W, and south to 30°S <Figure 2>. Longliners shall not use the same measures from Column A and Column B (See Appendix 3 for specifications of these measures).

7) Inter-American Tropical Tuna Commission C-11-02: Resolution to mitigate the impact on seabirds of fishing for species covered by the IATTC




<Figure 2> The areas within the IATTC in which use of at least two mitigation measures for reducing seabird bycatch is required (shaded area).

<Table 3> IATTC mitigation measures for reducing seabird bycatch

| Column A | Column B |
|---|---|
| •Side setting with a bird curtain and weighted branch lines*<br>•Night setting with minimum deck lighting<br>•Tori line<br>•Weighted branch lines | •Tori line**<br>•Weighted branch lines<br>•Blue-dyed bait<br>•Deep setting line shooter<br>•Underwater setting chute<br>•Management of offal discharge |

* This measure can only be applied in the area north of 23°N until research establishes the utility of this measure in waters south of 30°S. If using side setting with a bird curtain and weighted

branch lines from column A, this will be counted as two mitigation measures.

** If tori line is selected from both Column A and Column B, this equates to simultaneously using two (i.e. paired) tori lines.

Longliners operating in other waters outside of the areas shown in <Figure 2> are encouraged to voluntarily use at least one of mitigation measures listed in <Table 3>.

### 3.2.3. Indian Ocean Tuna Commission (IOTC[8]) and International Commission for the Conservation of Atlantic Tuna (ICCAT[9]) Areas

Longliners which fishing south of 25°S in the Indian and the Atlantic Ocean shall use at least two of the three mitigation measures below (See Appendix 4 for specifications of these measures). These measures should be considered for implementation in other areas, as appropirate, consistent with scientific advice.

- •Night setting with minimum deck lighting
- •Bird-scaring lines (Tori lines)
- •Line weighting

### 3.2.4. Commission for the Conservation of Southern Bluefin Tuna (CCSBT[10]) Area

Longliners fishing for southern bluefin tuna shall implement the conservation and management measures for reducing bycatch of seabirds adopted by the competent RFMO which has jurisdiction over their fishing grounds (for example, SBT vessels fishing in the IOTC convention area shall comply with IOTC resolutions).

8) Indian Ocean Tuna Commission Resolution 12/06: Resolution on reducing the incidental bycatch of seabirds in longline fisheries

9) International Commission for the Conservation of Atlantic Tuna Recommendation 11-09: Supplemental recommendation by ICCAT on reducing incidental bycatch of seabirds in ICCAT longline fisheries

10) Commission for the Conservation of Southern Bluefin Tuna Recommendation: Recommendation to mitigate the impact on ecologically related species of fishing for southern bluefin tuna

### 3.2.5. Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR[11]) Area

Longliners fishing in the CCAMLR convention area[12] shall be required to take the measures listed below to reduce incidental bycatch of seabirds.

i) Fishing operations shall be conducted in such a way that hooklines[13] sink beyond the reach of seabirds as soon as possible after they are put in the water.

ii) Vessels using autoline systems should add weights to the hookline or use integrated weight (IW) hooklines while deploying longlines. IW longlines of a minimum of 50 g/m or attachment to non-IW longlines of 5 kg weights at 50 to 60 m intervals are recommended.

iii) Vessels using the Spanish method of longline fishing should release weights before line tension occurs; traditional weights[14] of at least 8.5 kg mass shall be used, spaced at intervals of no more than 40 m, or traditional weights of at least 6 kg mass shall be used, spaced at intervals of no more than 20 m, or solid steel weights[15] of at least 5 kg mass shall be used, spaced at intervals of no more than 40 m.

iv) Vessels using the trotline system exclusively (not a mix of trotlines and the Spanish system within the same longline) shall deploy weights only at the distal end of the droppers in the trotline. Weights shall be traditional weights of at least 6 kg or solid steel weights of at least 5 kg. Vessels alternating between the use of the Spanish system and trotline method shall use; (i) for the Spanish system: line weighting shall conform to the provisions in paragraph 3, (ii) for the trotline method: line weighting shall be either 8.5 kg traditional weights or 5 kg steel weights attached

11) Commission for the Conservation of Antarctic Marine Living Resources Conservation Measure 25-02: Minimisation of the incidental mortality of seabirds in the course of longline fishing or longline fishing research in the Convention Area
12) Except for waters adjacent to the Kerguelen, Crozet and Prince Edward Islands
13) Hookline is defined as the groundline or mainline to which the baited hooks are attached by snoods.
14) Traditional weights are those made from rocks or concrete.
15) Solid steel weights shall not be made from chain links. They should be made in a hydrodynamic shape designed to sink rapidly.

on the hook-end of all droppers in the trotline at no more than 80 m intervals[16].

v) Longlines shall be set at night only (i.e. during the hours of darkness between the times of nautical twilight[17])[18]. During longline fishing at night, only the minimum ship's lights necessary for safety shall be used.

vi) The dumping of offal[19] and discards[20] is prohibited while longlines are being set. The dumping of offal during the haul shall be avoided. Any such discharge shall take place only on the opposite side of the vessel to that where longlines are hauled. For vessels or fisheries where there is not a requirement to retain offal on board the vessel, a system shall be implemented to remove fish hooks from offal prior to discharge.

vii) Vessels which are so configured that they lack on-board processing facilities or adequate capacity to retain offal on board, or the ability to discharge offal on the opposite side of the vessel to that where longlines are hauled, shall not be authorised to fish in the Convention Area.

viii) A streamer line shall be deployed during longline setting to deter birds from approaching the hookline (see Appendix 5 for specifications of the streamer line and its method of deployment).

ix) A bird exclusion device (BED) designed to discourage birds from accessing baits during the hauling of longlines shall be employed to the extent allowed by prevailing weather conditions

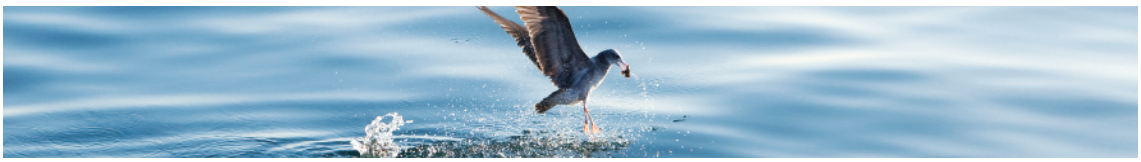
16) Recognizing that Spanish system longlines with weights at 40 m intervals are typically configured with lines at 80 m intervals that connect hauling and hook lines (see <Figure 6> in Appendix). These connecting lines form the dropper lines of the trotline method.

17) The exact times of nautical twilight are set forth in the Nautical Almanac tables for the relevant latitude, local time and date. A copy of the algorithm for calculating these times is available from the CCAMLR Secretariat. All times, whether for ship operations or observer reporting, shall be referenced to GMT.

18) Wherever possible, setting of lines should be completed at least three hours before sunrise.

19) Offal is defined as bait and by-products from the processing of fish and other organisms, including parts or sections of fish or organisms which are by-products of processing.

20) For the purpose of this conservation measure, discards are defined as whole fish or other organisms, except elasmobranchs and invertebrates where the vessel is fishing north of 60°S, returned to the sea dead or with low expectation of survival.



in those areas[21] defined by CCAMLR as average-to-high or high (Level of Risk 4 or 5) in terms of risk of seabird bycatch (see Appendix 5 for guidelines for a BED). Vessels operating in low- to medium-risk areas (Level of Risk 1 to 3) are encouraged to use BEDs during the haul of longlines.

#### 3.2.6. Other Areas

As for longliners which operate in the waters outside of jurisdiction of RFMOs, within wasters managed by RFMOs but not yet officially established, or within the EEZ of Korea, they are encouraged to voluntarily implement and improve mitigation measures for reducing seabird bycatch.

## 3.3. Data Collection and Analysis

Data on seabirds incidentally bycaught by distant water longline fisheries should be reported in the bycatch logbook[22] in accordance with the "*Regulations on Reporting of Fishing Operations in the Korean EEZ and Distant Waters (Ministerial Decree No. 1)*". This logbook should be submitted monthly to the Ministry of Oceans and Fisheries (MOF), along with the tuna and tuna-like species logbook. Data reported by fishers are collected and analyzed by National Fisheries Research and Development Institute (NFRDI) and submitted to the competent RFMOs as requested.

As for incidental bycatch of seabirds by the coastal and offshore fisheries in the EEZ of Korea, it is hard to understand accurate status due to lack of information, and concrete plan for data collection on seabird bycatch has not been developed up to date. However, in an effort to enhance conservation of seabirds in those waters, Korea is planning to monitor incidental catch of seabirds by coastal and offshore fisheries in the EEZ of Korea.

To improve data on seabird bycatch, NFRDI has published and distributed the *"Field Guide to*

21) These areas are currently Statistical Subareas 48.3, 58.6 and 58.7 and Statistical Divisions 58.5.1 and 58.5.2.

22) There are two types of logbook which captains of distant waters fisheries shall record and report. One is for tuna and tuna-like species and the other is for bycatch species including sharks, seabirds, sea turtles, etc.

*Bycatch Species in Korean Distant Water Fisheries"* <Figure 3> to longliners. However, there is a limit to collect accurate data on seabird bycatch. Because fishers are not experts on seabirds, the data may have an uncertainty on species identification. To overcome this problem, Korea is implementing scientific observer programs to improve the quality of data.

For assessing the status of incidental mortality of seabirds and the effectiveness of mitigation measures, it is required to collect correct and reliable data. Hence, longline vessels are encouraged to make the following efforts for collection of the best data.

i) Fishers are encouraged to record and report the detailed data, including name of species, the number of bycatch, the fate (dead/alive), whether released alive or not, etc.

ii) Longliners fishing in the waters of jurisdiction of RFMOs shall record and report relevant data in a logbook in accordance with resolutions of the competent RFMOs.

iii) If it is impossible to identify the species of seabirds, fishers should take pictures of the seabirds and send them to NFRDI.

iv) Scientific observers onboard should collect as much relevant data on seabirds bycaught incidentally as possible and make efforts to collect data on seabirds observed near the fishing vessel as well.

## 3.4. Research and Development

Korea is carrying out researches to develop mitigation measures best suited for Korean longline vessels to reduce incidental catch of seabirds. Korea acknowledges the urgent need for an effective conservation and management plan for seabirds. Although Korea is presently in the early stages of developing the research system on seabirds, Korea will establish the infrastructure of Research and Development (R&D) and promote its medium-to-longterm plan.

The R&D plan for reducing incidental catch of seabirds will be developed taking into account the following objectives.

i) To develop the most effective and practical seabird deterrent devices
ii) To develop devices that respect extensive experience of fishers for long years
iii) To develop devices with the cost minimized but safety maximized

## 3.5. Assessment

The purpose of assessment of the NPOA-Seabirds is to monitor the status of seabird bycatch by Korean longline fisheries and to assess the progress of implementation, effectiveness and development of the NPOA-Seabirds.

To assess the NPOA-Seabirds, Korea will regularly monitor longline fisheries to determine if a problem exists with respect to incidental catch of seabirds. If a problem exists, Korea will adopt a revised edition of the NPOA-Seabirds and continue its effort to reduce incidental catch of seabirds.

According to paragraph 21 of IPOA-Seabirds, Korea will report on the progress of the implementation, assessment and development of its NPOA-Seabirds as part of its biennial reporting to FAO on the Code of Conduct for Responsible Fisheries.

## 3.6. Education, Training and Publicity

In an effort to raise awareness regarding conservation and management of seabirds and to disseminate mitigation measures regulated by regional fisheries management organizations (RFMOs) to fishers, the National Fisheries Research and Development Institute (NFRDI) of Korea conducts education/training for operators of fishing vessels prior to departure of their trip. In addition, the NFRDI carries out a variety of publicity activities including international workshops participated by both Korean and international experts on seabirds.

To help fishers for better understanding on bycatch, the NFRDI has published and distributed the *"Field Guide on Bycatch Species in Korean Distant Water Fisheries"* <Figure 3> being able to use easily and conveniently on board, which is also offered to governmental and educational organizations and the general public.


<Figure 3> Field guide on bycatch species in Korean distant water fisheries.

To effectively implement the NPOA-Seabirds, the following activities will be taken:

i) Development and improvement of education/training programs for fishers
ii) Revision of the field guide on bycatch species, and publication and dissemination of its pamphlets
iii) Strengthening of public relations

## 3.7. International Cooperation

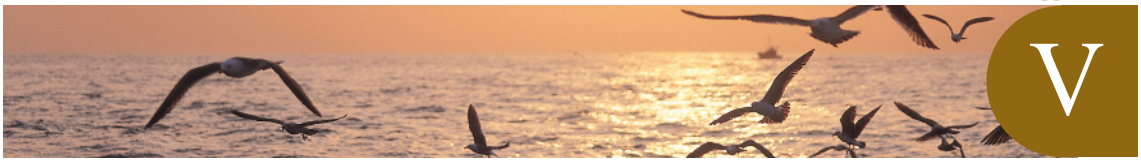
Korea will completely implement its NPOA-Seabirds for reducing incidental catch of seabirds in longline fisheries and make efforts to develop and disseminate effective and practical mitigation measures. In addition, Korea will actively cooperate with the other states and the international special organzations with much technical knowledge and experience on seabirds.

## 3.8. Others

The Republic of Korea will continue to develop and implements its *"National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries"*, which will be revised, if necessary, based upon regular assesment.

# IV References

Park, H.-W., S.-K. Choi, J.-M. Jung, J.-H. Kim and H.-C. Kim. 2012. An assessment of seabird by-catch in coastal fisheries in the East Sea. Kor. J. Orni. Vol. 19(2), 151-161.



V

# Appendices

## 1. Care for live seabirds on hooks

Often hooks can be easily removed from wings, legs or bill tips but if the hook has been swallowed the bird may not survive long unless the hook is removed. The following procedure is recommended when the position of the hook can be found.

1) Get the bird aboard as gently as possible and hold it by the bill immediately.
2) Restrain the bird for not allowing it moves, then open its bill with two hands. A second person can now find the hook position externally by feeling along the neck or internally by following the line to the hook.
3) Reach down the bird's throat and hold the hook. Gently force the tip of the hook so that it bulges under the skin of the bird then make a small cut to allow the hook to pass through the skin and be removed.

※ Important

- Never try and extract a hook backwards as considerably more damage will be caused.
- If removing an internally embedded hook will cause further damage to the bird, just cut the line as close as possible to the hook, and leave it in place

## 2. Guideline for mitigation measures on reducing incidental catch of seabirds of WCPFC

### 1) Tori lines (South of 30° South)

1a) For vessels >=35 m total length

- Deploy at least 1 tori line. Where practical, vessels are encouraged to use a second tori line at times of high bird abundance or activity; both tori lines shall be deployed

simultaneously, one on each side of the line being set. If two tori lines are used baited hooks shall be deployed within the area bounded by the two tori lines.

- A tori line using long and short streamers shall be used. Streamers shall be: brightly coloured, a mix of long and short streamers.
  - Long streamers shall be placed at intervals of no more than 5 m, and long streamers must be attached to the line with swivels that prevent streamers from wrapping around the line. Long streamers of sufficient length to reach the sea surface in calm conditions must be used.
  - Short streamers (greater than 1 m in length) shall be placed no more than 1 m apart.
- Vessels shall deploy the tori line to achieve a desired aerial extent greater than or equal to 100 m. To achieve this aerial extent the tori line shall have a minimum length of 200 m, and shall be attached to a tori pole >7 m above the sea surface located as close to the stern as practical.
- If vessels use only one tori line, the tori line shall be deployed windward of sinking baits.

1b) For vessels < 35 m total length

- A single tori line using either long and short streamers, or short steamers only shall be used.
- Streamers shall be: brightly coloured long and/or short (but greater than 1 m in length) streamers must be used and placed at intervals as follows:
  - Long streamers placed at intervals of no more than 5 m for the first 55 m of tori line.
  - Short streamers placed at intervals of no more than 1 m.
- Long streamers shall be attached to the line with swivels that prevent streamers from wrapping around the line. All long streamers shall reach the sea surface in calm conditions.
- Vessels shall deploy the tori line to achieve a desired aerial extent of 75 m. To achieve this aerial extent the tori line shall have a minimum length of 100 m, and shall be attached

to a tori pole >6 m above the sea surface located as close to the stern as practical. If the tori line is less than 150 m in length, it must have a towed object attached to the end so that the aerial extent is maintained over the sinking baited hooks.

- If two tori lines are used, the two lines must be deployed on opposing sides of the main line.

### 2) Tori lines (North of 23° North)

2a) Long Streamer

- Minimum length: 100 m
- Must be attached to the vessels such that it is suspended from a point a minimum of 5 m above the water at the stern on the windward side of the point where the hookline enters the water.
- Must be attached so that the aerial extent is maintained over the sinking baited hooks.
- Streamers must be less than 5 m apart, be using swivels and long enough so that they are as close to the water as possible.
- If two (i.e. paired) tori lines are used, the two lines must be deployed on opposing sides of the main line.

2b) Short Streamer

- Must be attached to the vessel such that it is suspended from a point a minimum of 5 m above the water at the stern on the windward side of a point where the hookline enters the water.
- Must be attached so that the aerial extent is maintained over the sinking baited hooks.
- Streamers must be less than 1 m apart and be 30 cm in minimum length.
- If two (i.e. paired) tori lines are used, the two lines must be deployed on opposing sides of the main line.

### 3) Side setting with bird curtain and weighted branch lines

- Mainline deployed from port or starboard side as far from stern as practicable (at least 1 m), and if mainline shooter is used, must be mounted at least 1 m forward of the stern.
- When seabirds are present, the gear must ensure mainline is deployed slack so that baited hooks remain submerged.
- Bird curtain must be employed:
  - Pole aft of line shooter at least 3 m long;
  - Minimum of 3 main streamers attached to upper 2 m of pole;
  - Main streamer diameter minimum 20 mm;
  - Branch streamers attached to end of each main streamer long enough to drag on water (no wind) : minimum diameter 10 mm.

### 4) Night setting

- No setting between nautical dawn and before nautical dusk.
- Nautical dusk and nautical dawn are defined as set out in the Nautical Almanac tables for relevant latitude, local time and date.
- Deck lighting to be kept to a minimum. Minimum deck lighting should not breach minimum standards for safety and navigation.

### 5) Weighted branch lines

- Following minimum weight specifications are required:
  - one weight greater than or equal to 40 g within 50 cm of the hook; or
  - greater than or equal to a total of 45 g attached to within 1 m of the hook; or
  - greater than or equal to a total of 60 g attached to within 3.5 m of the hook; or
  - greater than or equal to a total of 98 g attached to within 4 m of the hook.

### 6) Management of offal discharge

- Either no offal discharge during setting or hauling;
- Or strategic offal discharge from the opposite side of the boat to setting/hauling to actively encourage birds away from baited hooks.

### 7) Blue-dyed bait

- If using blue-dyed bait it must be fully thawed when dyed.
- The Commission Secretariat shall distribute a standardized colour placard.
- All bait must be dyed to the shade shown in the placard.

### 8) Deep setting line shooter

- Line shooters must be deployed in a manner such that the hooks are set substantially deeper than they would be lacking the use of the line shooter, and such that the majority of hooks reach depths of at least 100 m.

## 3. Guideline for mitigation measures on reducing incidental catch of seabirds of IATTC

### 1) Specifications for Column A mitigation measures of Table 3

1a) Tori lines

- Minimum length: 100 m
- Must be attached to the vessel such that it is suspended from a point a minimum of 5 m above the water at the stern on the windward side of the point where the hookline enters the water.
- Must be attached so that the aerial extent is maintained over the sinking baited hooks.
- Streamers must be less than 5 m apart, be using swivels and long enough so that they are as close to the water as possible.
- If the tori line is less than 150 m in length, must have a towed object attached to the end so that the aerial extent is maintained over the sinking baited hooks.
- If two (i.e. paired) tori lines are used, the two lines must be deployed on opposing sides of the main line.

1b) Tori line (light streamer)

- Minimum length of tori line: 100 m or three times the total length of the vessel.
- Must be attached to the vessel such that it is suspended from a point a minimum of 5 m above the water at the stern on the windward side of a point where the hookline enters the water.
- Must be attached so that the aerial extent is maintained over the sinking baited hooks.
- Streamers must be less than 1 m apart and be 30 cm in minimum length.
- If two (i.e. paired) tori lines are used, the two lines must be deployed on opposing sides of the main line.

### 2) Side setting with bird curtain and weighted branch lines

- Mainline deployed from port or starboard side as far from stern as practicable (at least 1 m), and if mainline shooter is used, must be mounted at least 1 m forward of the stern.
- When seabirds are present, the gear must ensure mainline is deployed slack so that baited hooks remain submerged.
- Bird curtain must be employed:
  - Pole aft of line shooter at least 3 m long;
  - Minimum of 3 main streamers attached to upper 2 m of pole;
  - Main streamer diameter minimum 20 mm;
  - Branch streamers attached to end of each main streamer long enough to drag on water (no wind) : minimum diameter 10 mm.

### 3) Night setting

- No setting between local sunrise and one hour after local sunset.
- Deck lighting to be kept to a minimum, noting requirements for safety and navigation.

### 4) Weighted branch lines

- Following minimum weight specifications are required:
- Minimum weights attached to all branch lines is 45 g, with the following options:
  - less than 60 g weight attached to within 1 m of the hook; or
  - greater than 60 g and less than 98 g weight attached to within 3.5 m of the hook; or
  - greater than 98 g weight attached to within 4 m of the hook.

☐ Specifications for Column B of Table 3 mitigation measures

### 1) Weighted branch lines

- Following minimum weight specifications are required:

• Minimum weights attached to all branch lines is 45 g, with the following options:
- less than 60 g weight attached to within 1 m of the hook; or
- greater than 60 g and less than 98 g weight attached to within 3.5 m of the hook; or
- greater than 98 g weight attached to within 4 m of the hook.

### 2) Blue dyed bait

• The IATTC Secretariat shall distribute a standardized color placard.
• All bait must be dyed to the shade shown in the placard.

### 3) Management of offal discharge

• Either:
- No offal discharge during setting or hauling; or
- Strategic offal discharge from the opposite side of the boat to setting/hauling to actively encourage birds away from baited hooks.

## 4. Guideline for mitigation measures on reducing incidental catch of seabirds of IOTC and ICCAT

### 1) Night setting with minimum deck lighting

☐ Description

• No setting between nautical dawn and before nautical dusk.
• Deck lighting to be kept to a minimum.

☐ Specification

• Nautical dusk and nautical dawn are defined as set out in the Nautical Almanac tables for relevant latitude, local time and date.
• Minimum deck lighting should not breach minimum standards for safety and navigation.

## 2) Bird-scaring lines (Tori lines)

☐ Description

• Bird-scaring lines shall be deployed during the entire longline setting to deter birds from approaching the branch line.

☐ Specification

For vessels greater than or equal to 35 m:

• Deploy at least 1 bird-scaring line. Where practical, vessels are encouraged to use a second tori pole and bird-scaring line at times of high bird abundance or activity; both tori lines should be deployed simultaneously, one on each side of the line being set.
• Aerial extent of bird-scaring lines must be greater than or equal to 100 m.
• Long streamers of sufficient length to reach the sea surface in calm conditions must be used.
• Long streamers must be at intervals of no more than 5 m.

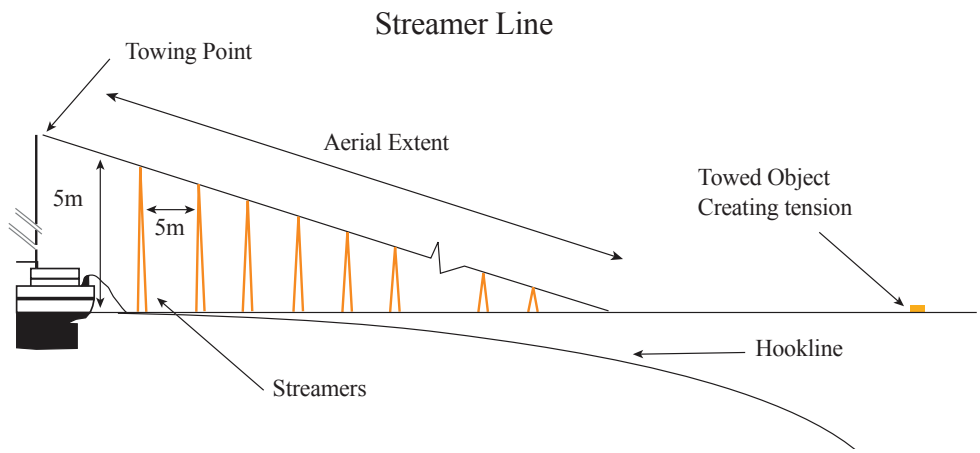
For vessels less than 35 m:

• Deploy at least 1 bird-scaring line.
• Aerial extent must be greater than or equal to 75 m.
• Long and/or short (but greater than 1 m in length) streamers must be used and placed at intervals as follows:
  - Short: intervals of no more than 2 m.
  - Long: intervals of no more than 5 m for the first 55 m of bird scaring line.

☐ Tori line design <see Figure 4>

• An appropriate towed device on the section of the tori line in the water can improve the aerial extension.
• The above water section of the line should be sufficiently light that its movement is unpredictable to avoid habituation by birds and sufficiently heavy to avoid deflection of the line by wind.

- The line is best attached to the vessel with a robust barrel swivel to reduce tangling of the line.
- The streamers should be made of material that is conspicuous and produces an unpredictable lively action (e.g. strong fine line sheathed in red polyurethane tubing) suspended from a robust three-way swivel (that again reduces tangles) attached to the tori line.
- Each streamer should consist of two or more strands.
- Each streamer pair should be detachable by means of a clip so that line stowage is more efficient.




<Figure 4> Diagram of bird scaring streamer line in the IOTC and ICCAT convention area.

□ Deployment of tori lines

- The line should be suspended from a pole affixed to the vessel. The tori pole should be set as high as possible so that the line protects bait a good distant astern of the vessel and will not tangle with fishing gear. Greater pole height provides greater bait protection. For example, a height of around 7m above the water line can give about 100 m of bait protection.
- If vessels use only one tori line, it should be set to windward of sinking baits. If baited hooks are set outboard of the wake, the streamer line attachment point to the vessel should

be positioned several meters outboard of the side of the vessel that baits are deployed. If vessels use two tori lines, baited hooks should be deployed within the area bounded by the two tori lines.

- Deployment of multiple tori lines is encouraged to provide even greater protection of baits from birds.
- Because there is the potential for line breakage and tangling, spare tori lines should be carried onboard to replace damaged lines and to ensure fishing operations can continue uninterrupted. Breakaways can be incorporated into the tori line to minimize safety and operational problems should a longline float foul or tangle with the in-water extent of a streamer line.
- When fishers use a bait casting machine (BCM), they must ensure coordination of tori line and machine by: i) ensuring the BCM throws directly under the tori line protection, and ii) when using a BCM (or multiple BCMs) that allows throwing to both port and starboard, two tori lines should be used.
- When casting branchline by hand, fishers should ensure that the baited hooks and coiled branchline sections are cast under the tori line protection, avoiding the propeller turbulence which may slow the sink rate.
- Fishers are encouraged to install manual, electric or hydraulic winches to improve ease of deployment and retrieval of tori lines.

### 3) Line weighting

□ Description

- Line weights to be deployed on the snood prior to setting.

□ Specification

- Greater than a total of 45 g attached within 1 m of the hook; or
- Greater than a total of 60 g attached within 3.5 m of the hook; or
- Greater than a total of 98 g attached within 4 m of the hook.

## 5. Guideline for mitigation measures on reducing incidental catch of seabirds of CCAMLR

### 1) Design and deployment of streamer line

- The aerial extent of the streamer line, which is the part of the line supporting the streamers, is the effective seabird deterrent component of a streamer line. Vessels are encouraged to optimise the aerial extent and ensure that it protects the hookline as far astern of the vessel as possible, even in crosswinds.

- The streamer line shall be attached to the vessel such that it is suspended from a point a minimum of 7 m above the water at the stern on the windward side of the point where the hookline enters the water.

- The streamer line shall be a minimum of 150 m in length and include an object towed at the seaward end to create tension to maximise aerial coverage. The object towed should be maintained directly behind the attachment point to the vessel such that in crosswinds the aerial extent of the streamer line is over the hookline.

- Branched streamers, each comprising two strands of a minimum of 3 mm diameter brightly coloured plastic tubing[23)] or cord, shall be attached no more than 5 m apart commencing 5 m from the point of attachment of the streamer line to the vessel and thereafter along the aerial extent of the line. Streamer length shall range between minimums of 6.5 m from the stern to 1 m for the seaward end. When a streamer line is fully deployed, the branched streamers should reach the sea surface in the absence of wind and swell. Swivels or a similar device should be placed in the streamer line in such a way as to prevent streamers being twisted around the streamer line. Each branched streamer may also have

23) Plastic tubing should be of a type that is manufactured to be protected from ultraviolet radiation.

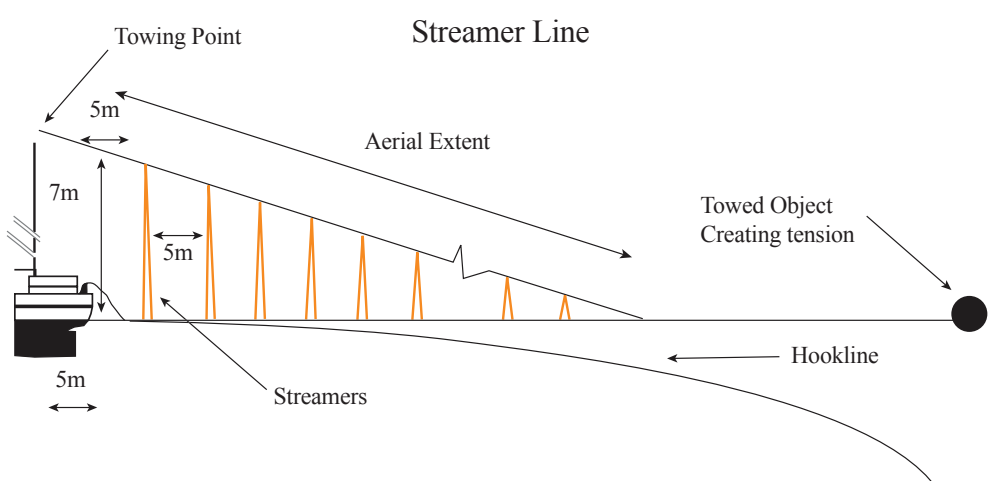
a swivel or other device at its attachment point to the streamer line to prevent fouling of individual streamers.

• Vessels are encouraged to deploy a second streamer line such that streamer lines are towed from the point of attachment each side of the hookline. The leeward streamer line should be of similar specifications (in order to avoid entanglement the leeward streamer line may need to be shorter) and deployed from the leeward side of the hookline.

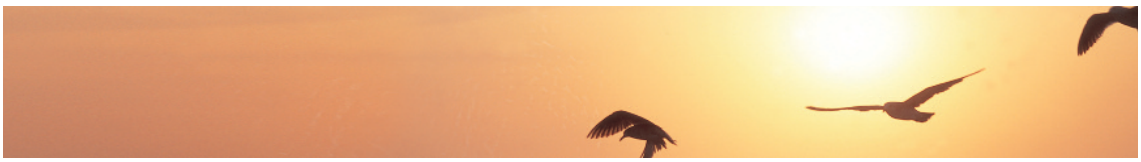
### 2) Bird exclusion device, BED

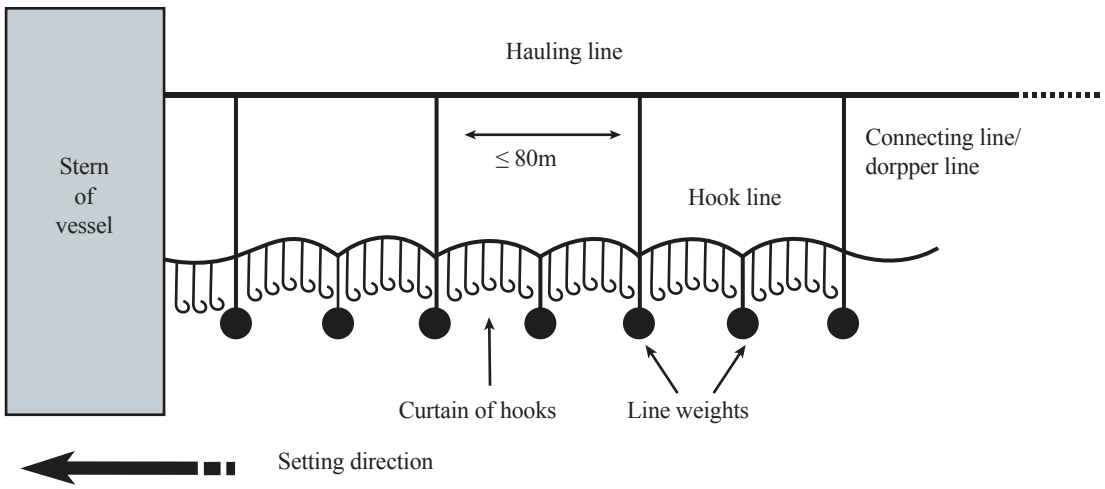
• Effective BEDs have been demonstrated to have two main operational characteristics:
  - deterrence of birds from flying directly into the area where the line is being hauled;
  - prevention of birds that are sitting on the surface from swimming into the hauling bay area.

• Thus, vessels are encouraged to use BEDs that demonstrate these two characteristics.

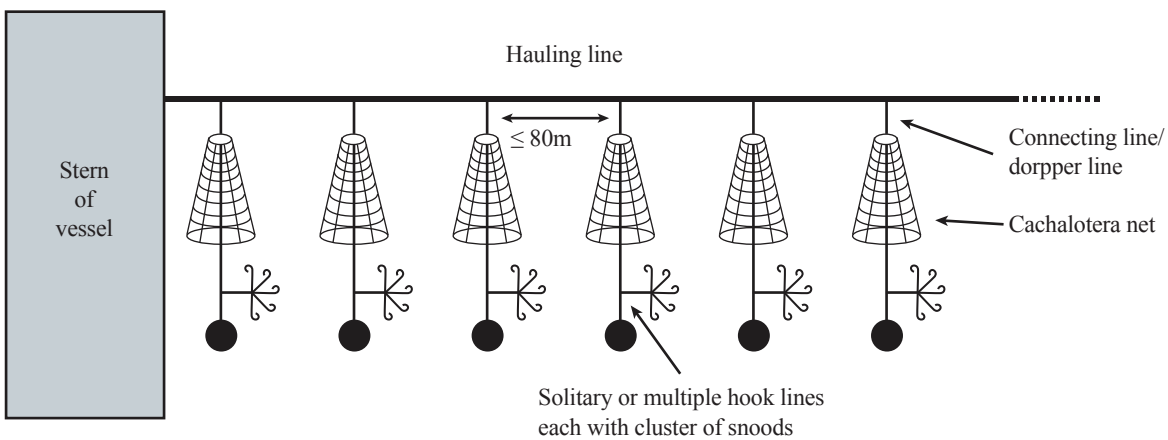



<Figure 5> Diagram of bird scaring streamer line in the CCAMLR convention area.






<Figure 6> Typical configuration of Spanish system.




<Figure 7> Typical configuration of trotline system.

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