Reports on Identification of VMEs and Assessment of Impacts Caused by Bottom Trawl Fishing Activities on VMEs and/or Marine Species

Ministry for Food, Agriculture, Forestry and Fisheries, Republic of Korea
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1. Name of the Participating State
Republic of Korea

2. Name of the fishery
Bottom trawl

3. Status of the fishery
Existing fishery

4. Target species
Splendid alfonsino, *Beryx splendens* hereinafter alfonsino and North Pacific armorhead, *Pseudopentaceros wheeleri* hereinafter armorhead.

5. Bycatch species
Broad alfonsino (*Beryx decadactylus*), Japanese armorhead (*Pentaceros japonicus*), Japanese butterfish (*Hyperoglyphe japonica*), Giant skilfish (*Erilepis zonifer*), Scorpionfish

6. Recent level of fishing efforts

   Korea conducted scientific survey in 2004 by three vessels in the High Seas of the NWPO. Those vessels consisted of one scientific research vessel (Tamgu No.1/bottom trawler) and two commercial vessels (Oryong No.503/bottom trawler, and 9 Eunhae/bottom longliner) in which scientific observers on board respectively. Two trawlers are currently operating to fish in the Emperor Seamounts. Korea has been trying to limit fishing effort to this number of vessels to contribute to the recovery of the relevant stock as well as conservation of marine ecosystem.

<Fishing effort by year>

Year	Effort	Catch (ton)							
	Number of operation days	Armor head	Japanese armorhead	Slender amorhead	Japanese butterfish	Rock-fishes	Mirror dory	Splendid alfonsino	Board alfonsino
2004	90			185.44		2.43	3.06		
2005	146	121.29	0.00	19.41	2.91	0.00		512.73	3.76
2006	99	95.79	0.42	43.08	1.86	0.56		289.19	1.96
2007	164	60.99	0.00	27.72	0.48	9.72		324.58	1.19

Trawl

Year	Catch (ton)							
	Alfonsinos	Scorpionfish	Cods	Giantskilfish	Lanterfishes	Sharks	Others	Total
2004	15.67		4.06			0.51	2.73	213.90
2005		32.24	6.14	0.00	28.28		22.91	749.67
2006		27.47	0.00	0.00	0.00		0.05	460.38
2007		13.30	0.00	0.00	1.50		0.07	439.55

7. Fishing period

All the year round

8. Analysis of status of fishery resources

(1) Catch

Three vessels, Tamgu No. 1 (research vessel), Oryong No. 503 (trawler) and 9 Eunhae (longliner), caught 235 mt in 2004: Tamgu No. 1 (16 mt), Oryong No. 503 (198 mt) and 9 Eunhae (21 mt), respectively (SWG5/WP3 Revised Foot Print Data). The dominant species of Tamgu No. 1, Oryong No. 503 and 9 Eunhae were alfonsino (42%), armorhead (92%) and shark (65%), respectively. It indicates that the dominant species vary depending on a fishing area and a fishing gear.

Since 2005, Oryong No. 503 has been commercially fishing in Colahan (C), Milwaukee (D), Kimmei (E) and Koko (F) seamount. Total catch was 750mt (alfonsino 68%, armorhead 16%) in 2005, and 460mt (alfonsino 63%, armorhead 21%) in 2006. In 2007, total catch was 440mt (alfonsino 74%, armorhead 14%) by Oryong No. 503(SWG5/WP3 Revised Foot Print Data). alfonsino and armorhead were dominant by commercial fishing in the Emperor Seamounts

during 2005-2007.

(2) Biomass

1) Data and methods used for analysis

Biomass was estimated by the swept area method from trawl fishery data obtained in Colahan (C), Milwaukee (D), Kimmei (E), and Koko (F) seamounts from 2005 to 2007. The approach consists of fishing area size, catch per unit effort, and catchability. The catchability (gear efficiency) was assumed to be 0.5.

2) Results of analysis

a. alfonsino (*Beryx splendens*) "Bitgeumnundom" in Korean

Stock size estimation in Colahan (C), Milwaukee (D), Kimmei (E), and Koko (F) seamounts by a commercial vessel (Oryong 503) using the swept area method with a catchability (q) of 0.5 was 1,086 ton in 2005, 717 ton in 2006 and 570 ton in 2007, with a mean and the 95% confidence interval of 791±246 (SWG5/WP6/J1).

b. armorhead (*Pseudopentaceros wheeleri*) "Minsajagu" in Korean

Stock size estimation in Colahan (C), Milwaukee (D), Kimmei (E), and Koko (F) seamounts by a commercial vessel (Oryong 503) using the swept area method with a catchability (q) of 0.5 was 298 ton in 2005, 344 ton in 2006 and 156 ton in 2007, with a mean and the 95% confidence interval of 266±98 (SWG5/WP6/J1).

(3) Stock assessment

1) Data and methods used for analysis

Using catch data by Korea, Japan, and Russia, and fishing effort data by Japanese trawl fishery for alfonsino, two types of surplus production models (ASPIC and Excel) were applied to the two-types of the annual CPUE (catch in metric tons per one hour trawling), which were either non-adjusted or adjusted.

In the case of armorhead, only historical catch statistics were available for quantitative stock assessment. Episodic occurrences of strong year classes prevented application of standard assessment methods.

2) Results of analysis

Results of four combinations from the two production models and two CPUE time series suggested that current fishing mortality coefficient (*F*) during the past 10 years (1997-2006) was

20-28% higher than *Fmsy*. Therefore, the current *F* must be reduced by about 20-30% (SWG5/WP6/J1).

With absence of reliable biomass estimations and biological reference points such as *Fmsy*, it is needed to apply adaptive management measures to ensure spawning of this stock (SWG5/WP6/J1).

(4) Proposal of a common management measure for alfonsino and armorhead stocks in the Southern Emperor-Northern Hawaiian Ridge (SE-NHR) in face to uncertainties

In spite of the limited information, the assessment for alfonsino is scientifically acceptable (SWG5/WP6/J1). However, there are some potential questions to apply the same management measures to whole species (e.g., armorhead) caught by the same bottom trawl fisheries based on the only assessment for alfonsino.

Korea will propose 25% reduction in *F* for the bottom trawl fisheries as indicated in the most recent alfonsino assessment (SWG5/WP6/J1) by fishing closure from Oct. 1 to Dec. 31 including spawning season of alfonsino to rebuild its stock.

9. Analysis of status of bycatch species resources

(1) Catch

Bycatch was relatively small compared to target species in terms of the catch amount (SWG5/WP3 Revised Foot Print Data).

(2) Biomass

1) Data and methods used for analysis

Biomass was estimated by using the swept area method from trawl fishery data obtained in Colahan (C), Milwaukee (D), Kimmei (E), and Koko (F) seamounts from 2005 to 2007. The data and methods used for analysis are fishing area size, catch per unit effort, and catchability. The catchability was assumed to be 0.5.

2) Results of analysis

a. Broad alfonsino (*Beryx decadactylus*) "Geumnundom" in Korean

Stock size estimation of a commercial vessel (Oryong 503) in Colahan (C), Milwaukee (D), Kimmei (E), and Koko (F) seamounts by using the swept area method with a catchability (q) of 0.5 was 8 ton in 2005, 5 ton in 2006 and 2 ton in 2007, with a mean and the 95% confidence interval of 5±2.7.

(3) Stock assessment

Stock assessment for associated and dependent species cannot be fully developed due to data limitation.

10. Analysis of existence of VMEs in the fishing ground

(1) Marine species

To identify the vulnerable marine species, the risk to each species was analyzed using the ecosystem risk assessment (ERA) which was developed in Australia (CSIRO, 2005). ERA is separated as three levels, and then the second level which is the productivity and susceptibility analysis (PSA) based on the biological data was executed. PSA is to assess the risk of adverse impacts by fisheries upon species caught. The productivity is the recovery rate after potential depletion or damage by the fishing activity. The susceptibility is the extent of the impact due to fishing activity. Five biological attributes such as maximum age, annual fecundity, etc were used for the productivity analysis and six attributes such as fishing gear, overlap with fishery, global distribution, etc were used for the susceptibility.

The target species were alfonsino and armorhead, and bycatch species were scorpionfish, giant skilfish, broad alfonsino, Japanese butterfish and Japanese armorhead. alfonsino was ranked as the low risk and armorhead was the medium risk. However, most bycatch species were ranked as high risk according to ERA.

This analysis did not reflect the variation of stock status. Future study is needed for that with fishery status (e.g., catch, fishing effort and environmental factors etc.).

(2) VME

Korea deep-sea fisheries have been operated on the limited fishing ground which was already developed because bottom trawlers try to avoid the hang-up and/or net-loss, that is, Korean fishing activities have been carried out carefully to avoid VMEs.

Large-scale coral harvest had been conducted by certain country's coral harvesting vessels during 1960s-1980s. These coral harvests may have considerably damaged corals and ecosystems. Certain country coral fishing boats are considered to be currently operated.

However, Korean Government has not issued a commercial coral drag fisheries permission. When a fishing vessel encounters a vulnerable marine ecosystem, report on encountering VMEs is not required so far in Korea. Therefore, there is no record on VMEs in a fishing logbook in Korea.

Korean experts of coral will participate in work for identification of coral and assess whether each species has characteristics of vulnerability in accordance with the Science-based Standard

and Criteria for Identification of VMEs and Assessment of Significant Adverse Impacts on VMEs and Marine Species.

11. Impact assessment of fishing activities on VMEs or marine species including cumulative impacts, and identification of SAIs on VMEs or marine species, as detailed in Section 5 above, Assessment of SAIs on VMEs or marine species

Korean deep-sea fisheries have no commercial interest in using VMEs and coral reefs. In addition, contacting the seabed causes impairing catch efficiency and damage to fishing gears. Therefore, it is hard to say that Korean deep-sea fisheries bring intentionally significant adverse impact on VMEs.

12. Other points to be addressed
Korea suggests restraining current coral harvest since protecting VMEs and/or Marine species is needed.

13. Conclusion
According to Korean fishing logbook, the research results so far do not support the existence of serious adverse impacts on VMEs and marine species by Korean trawl fishing activities. However, taking into account the discussion during the Fifth Scientific Working Group meeting, Korea will take the following measures in 2009 and thereafter by which Korean trawl fishing activities can be continued in the Colahan (C), Milwaukee (D), Kimmei (E), and Koko (F) area beyond December 31, 2008.

(1) Fishery status
   Seven commercial vessels are authorized to operate to fish with each fishing license in the Emperor Seamount area. In 2004, three vessels (two bottom trawlers and one longliner) operated in that area and one of the bottom trawlers has been operating since then. And the other bottom trawler tried to operate in 2006, but the vessel was sunken on fire at sea. Then the sunken vessel was replaced with a new one, and it has been operating to fish since 2008.

(2) Marine species
   1) Korea proposed 25% reduction in F for the bottom trawl fishery as indicated in the most recent alfonsino assessment (SWG5/WP6/J1) by fishing closure from Oct. 1 to Dec. 31 including spawning season of alfonsino to rebuild its stock.
   2) Korea will temporarily close fishing over the C-H seamount to rebuild armorhead stock.

(3) VME

  1) Korean deep-sea fisheries have been operated on the limited fishing grounds which were already developed because bottom trawlers have tried to escape from the hang-up and/or net-loss.

  2) Korean deep-sea fisheries have no interest in commercial use of coral reefs and there is no coral reef catch record.

  3) To avoid causing additional negative impact on VMEs in the Emperor Seamount area, Korea suggests prohibition of fishing expansion to new areas and provisionally prohibit bottom fisheries in areas of north of 40 degrees North until appropriate management measures including the observer program are in place.

  4) Introduction of tentative closed area in the southeastern part of Koko Seamount around the point where *Corallium* spp. was found (south of 34 degrees 57 minutes North, east of the 400m isobath, east of 171 degrees 54 minutes East, north of 34 degrees 50 minutes North(New Measure)

(4) Future Research

  1) Korea will make its best effort to collect scientific information on catch data and existence of VMEs by the observer program.

  2)In order to identify the potential significant adverse impact on vulnerable marine ecosystem in the future, a 100 percent observer coverage will be deployed on all Korean bottom trawl vessels from late 2009 because Korea needs enough time to prepare proper observers deployment.

  3) Korea will participate in work for identification of coral and assess whether each species has characteristics of vulnerability in accordance with the Science-based Standard and Criteria for Identification of VMEs and Assessment of Significant Adverse Impacts on VMEs and Marine Species.

  4) If VMEs are detected, Korea will report to the SWG for the subsequent discussion and its advice to the Inter-Governmental meetings on the possible management measures of the areas.

Reference

1. SWG5/WP3 Revised Foot Print Data

2. SWG5/WP6/J1 Information describing alfonsino (*Beryx splendens*) fisheries relating to the North Western Pacific Regional Fishery Management Organization.

3. SWG5/WP6/J2 Information describing armorhead (*Pseudopentaceros wheeleri*) fisheries relating to the North Western Pacific Regional Fishery Management Organization.

4. CSIRO (Commonwealth Scientific and Industrial Research), 2005. Ecological risk assessment for effects of fishing: case study instructions (19/3/05) vol.8, pp.95. CSIRO Marine Research. Australia.