SOUTH EAST ATLANTIC FISHERIES ORGANISATION (SEAFO)

REPORT OF THE 12th SEAFO SCIENTIFIC COMMITTEE

6 October – 14 October 2016
Windhoek, NAMIBIA

The Secretariat
Strand Street no. 1
Swakopmund, Namibia

Phone: +264-64-406885
Facsimile: +264-64-406884
Email: info@seafo.org
Website: www.seafo.org

Chairperson: Scientific Committee
Mr. Paulus Kainge
paulus.kainge@mfmr.gov.na

1. Opening and welcome remarks by the Chairperson

1.1 The 12th Annual Meeting of the SEAFO Scientific Committee (SC) was convened on 6 October to 14 October 2016 at the Safari Hotel & Court, Windhoek, Namibia. The Chairperson, Mr. Paulus Kainge, opened the meeting and welcomed delegates. He emphasized that it would be a discussion of scientific issues and that all delegates were expected to freely express their scientific views so that issues can be resolved and the best possible advice forwarded to the Commission.

2. Adoption of agenda and meeting arrangements

2.1. SC adopted the agenda (Appendix I) with the following points added:
Point 19.5: Participation in CECAF meeting on VME's 8-10 November 2016.
Point 19.6: (Japan) Scientific survey in closed area and protocol for reopening of closed areas.

Members were informed of practical arrangements of the meeting by the Executive Secretary.

3. Appointment of Rapporteur

3.1 After nomination and secondment, Dr Elizabeth Voges was appointed as rapporteur for the Scientific Committee meeting.

4. Introduction of Observers

4.1 An observer from the Food and Agriculture Organisation (FAO) attended part of the 12th SEAFO Scientific Committee (Appendix II).

5. Introduction of Delegates

5.1 A total of 10 Scientific Committee members representing five Contracting Parties, excluding the SEAFO Secretariat, attended the 12th SEAFO Scientific Committee meeting (Appendix II). No members from South Africa and Korea attended.

6. Review of submitted SEAFO working documents and any related presentations, allocation to the agenda items

6.1 A total of 16 contributions and working documents were considered during the 2016 SC meeting (Appendix III).

7. Review of the 2016 Work Program

SC listed in 2015 the following tasks for 2016:

7.1 Output from task (a): FAO ABNJ Deep-Sea Project activity
FAO ABNJ Deep-Sea Project activities are discussed under section 18 in this report.

7.2 Output from task (b): Independent review of the 2015 Patagonian toothfish assessment
The SC took note of the response from FAO and the independent reviewer, and expressed appreciation for the scientific opinion provided. The comments from the reviewer were useful to clarify the constraints of the approach applied given the limited data available. A longer time series of data of appropriate quality is needed for stock assessment. Until such data become available, stock assessments will be unlikely to form the basis for TAC advice. Exploratory stock assessment attempts are encouraged by the SC.

7.3 Output from task (c): SC to provide guidelines on assessments of exploratory fisheries and develop procedures and standards for SC evaluation of such assessment, pertinent to CM 29/14 Articles 7.2 and 7.3.
In accordance with CM30/15 the SC developed procedures and standards during this meeting for its handling and evaluation of applications for exploratory fisheries. The SC in its work on this issue benefited from procedures and standards developed by NEAFC. The document is included as (Appendix IV) and the secretariat will make it publically available on the SEAFO website.

7.4 Output from task (d): Small groups of scientists and compliance experts to review reporting forms.
The task was completed during the Commission meeting in December 2015. A report (which was adopted by the Commission, was submitted to the meeting ("Report of the ad-hoc meeting of scientists and compliance experts").

8. Report by the Executive Secretary presenting all landings, incidental bycatch and discard tables updated to September 2016.

8.1 The Executive Secretary presented updated landings, bycatch and discards data for the period up to September 2016. As of October, the only fishing conducted has been by one vessel fishing for Patagonian toothfish (Tables 1-5 of Appendix V).

8.2 SC members raised the issue of possible bycatch of SEAFO species by ICCAT Fisheries operating in the SEAFO CA.

9. Review landings, spatial and temporal distribution of fishing activity and biological data of non-benthic species

9.1 The SC reviewed all landings data on non-benthic species (Tables 6-22 of Appendix V). VMS data were presented by the Secretariat and demonstrated the special distribution of fishing activity in the past year.

10. Review the spatial distribution of reported catches of benthic organisms (corals, sponges etc.)

10.1 There were no recorded encounters over the period 2010-2016 of bycatches exceeding the current VME threshold levels – as per CM 30/15 and Table 23 -35 of Appendix VI.

11. Review data of the 2016 Japanese Exploratory Fishing and plan for 2017

11.1 Japan presented results for the 2015/2016 exploratory fishing conducted on the Discovery seamount complex in Sub-Area D, Discovery Area (Appendix XII). There was no request to open the areas for fishing because more exploration is needed.

11.2 The SC took note of the submission for exploratory fishing in new bottom fishing ground in the SEAFO convention area in 2017 by Japan (Appendix XIII). The contracting party was advised to follow the process as stipulated in CM 30/15 and submit a notice of intent to the Executive Secretary at least 60 days before the fishing activities commence. The SC will then evaluate and assess the application, using the developed procedures and standards as specified by articles 7.2 and 7.3 of CM 30/15.

It was noted that if the application for 2017 were approved by the SC through correspondence, the proposal could be submitted to the Commission for consideration either at the 2016 Commission meeting or through correspondence.

12. Review Stock Status Reports

12.1 Stock status reports for Patagonian toothfish, Deep-Sea Red Crab, Orange roughy, Alfonsino and Pelagic armourhead were reviewed and updated. The stock status reports are presented as follows:

- ⇨ Orange roughy - Appendix VII;
- ⇨ Deep-Sea Red Crab - Appendix VIII;
- ⇨ Patagonian toothfish - Appendix IX;
- ⇨ Alfonsino - Appendix X and
- ⇨ Pelagic armourhead - Appendix XI.

13. Review research activities in the SEAFO CA since October 2015 to date

No new notifications of research activities were received. SC reiterates the continued need for scientific research in the SEAFO CA and emphasised that the proposal for new cruises as prioritised in 2015 is still valid.

14. Examine, where appropriate, assessments and research done by neighbouring states and other organisations

14.1 Namibia reported that a biomass survey was conducted for Orange roughy within its EEZ during July 2016. Assessment and management recommendations for the Namibian stock are underway and should be available by April 2017. Since the Namibian and SEAFO fish are likely to belong to the same stock, results from the analysis of the Namibian stock shall be considered by SEAFO for future Orange roughy assessments.

14.2 South Africa submitted three reports on the annual assessment based on commercial data for *Dissostichus eleginoides*, conducted within the Prince Edward Islands South African EEZ (Subareas 58.6 and 58.7 and part of Area 51) which were distributed to the SC members for further study.

14.3 The SC discussed the population structure of Patagonian toothfish in the SEAFO CA in relation to its global distribution and took note of nuclei otolith chemical studies undertaken with specimens collected at different regions of its distribution area. The SC recommended that similar research be conducted with specimens from SEAFO CA. Japan showed willingness to cooperate by collecting otoliths. EU–Spain volunteered to retrieve otoliths collected during past surveys. SC will make an effort to find a laboratory to do the analysis, once the otoliths have been retrieved.

14.4 SC identified the models adopted by CCAMLR to assess the toothfish stock. In recent years WG-FSA accepted that C++ Algorithmic Stock Assessment Laboratory (CASAL) is the most appropriate method to assess stock status on a regional basis. CASAL is an integrated assessment tool for modelling population dynamics of marine species, including fishery stock assessments. It can implement either an age- or size-structured model, optionally also structuring the population by sex, maturity, and/or growth. The data used can be from many different sources of information, for example catch-at-age or catch-at-size data from commercial fishing, survey and other biomass indices, survey catch-at-age or catch-at-size data, and tag-release and tag-recapture data.

Furthermore, other method are used in CCAMLR as the Generalized Yield Model (GYM), that also satisfy the CCAMLR decision rules, as well as, intermediates approaches to get local estimation of biomass as the simple Petersen method.
CCAMLR mainly uses tag-release and tag-recapture data to assess stock status.

14.5 The first SIOFA Scientific Committee was held in March 2016 and a work plan of stock assessments was adopted, including 2017-2018 for orange roughy and 2018-2019 for alfonsino. As for Patagonian toothfish, a stock assessment will be collaboratively conducted between CCAMLR and SIOFA.

15. Review Total Allowable Catches and related management conditions for Patagonian toothfish, Alfonsino, Pelagic armourhead, Orange roughy and Deep-sea Red Crab

15.1 The SC reviewed the Total Allowable Catches (TAC) and related management rules for Patagonian toothfish, Alfonsino, Pelagic armourhead, Orange roughy and Deep-sea Red Crab for 2017 and 2018. Please see relevant Stock Status Reports (Appendices VIII -XI) or revert to Section 21 of this report for details on this topic.

15.2 Orange roughy

SC considered available data on orange roughy since the inception of the fisheries in SEAFO CA.

There is no fishery data available since 2005 for orange roughy within the SEAFO CA, as a result SC cannot conduct stock assessment of the orange roughy stock within the Convention Area.

SC recommends a status quo for Division B1, i.e. a moratorium on directed fishery in Division B1 and allowance for bycatch limit as proportion (10%) of the average of landings from the last five years with positive catches (i.e. 2001-2005), equivalent to 4 tonnes.

Due to a lack of new information, the SC did not review the current status quo of the 50 tonnes allowance in the remainder of the area.

A harvest control rule shall be developed for orange roughy in the future as data becomes available.

15.3 Deep-Sea Red Crab

The SC emphasize that the application of the HCR despite that there was no fishery in 2016, assumes that the CPUE trends derived in 2015 has been maintained. The validity of that assumption is uncertain. The TAC for 2016 year was not taken but the reasons for the interruption in the fishery are not known.

There was no fishery in 2016 hence no new catch or effort data which are data required to update the CPUE series forming the basis for the application of the HCR as adopted by the Commission in 2015. The SC resorted to applying the HCR based on pre 2016 CPUE trend (Figure 17).

The SC agreed to adopt the best estimate of the slope which is -0.1213. Under this scenario the HCR stipulates the use of "Rule 2" for setting the TAC.

However, the difference between the 2016 and proposed 2017 TAC is greater than the 5% limit stipulated by the HCR. **SC therefore recommends a TAC for 2017 and 2018 be set at 180 tons for Division B1, and 200 tons for the remainder of the SEAFO CA.**

15.4 Patagonian Toothfish

In 2015 the Commission adopted a TAC of 264 t in Sub-Area D applying the harvest control rule, and zero tonnes for the remainder of the SEAFO CA for 2016.

The SC notes that in both 2015 and 2016 about 22% of the TAC was taken (incl. the experimental fishery), hence the fishery is not constrained by the TAC.

The application of the HCR requires as input a 5-year time-series of recent CPUE data. The CPUE series applied in 2015 was derived by pooling all available data in the SEAFO CA. No analysis was made to determine if pooling was a valid approach. Also, the series first discussed in 2016 was not standardised as in 2015, and questions were asked about the consistency of the analysis between years.

The SC explored standardization using generalised linear models (GLM), but the explorations indicated that the variance explained was too low to extract meaningful results, hence further efforts would be required. There were, however, clear indications of significant area-effects, hence pooling of data from different fishing areas was probably not valid.

The SC then resorted to deriving CPUE series for separate fishing areas for which the more extensive continuous time-series of catch and effort data are available in the SEAFO database, i.e. the Meteor and Discovery seamounts. Data from the Western part were excluded from the assessment as the time series was not complete. Only Japanese data within the 2011 agreed footprint, i.e. from the party taking the bulk of the catch in all years, were used in order to retain consistency through the time series.

It is uncertain whether the two CPUE series reflects abundance, but in the absence of other alternatives, the series from Meteor and Discovery were considered valid for the derivation of TACs using the recommended and accepted HCR.
The CPUE series as derived both have best estimates of slope close to zero. For Discovery the best estimate is slightly negative, for Meteor the estimated slope was zero (Fig. 9).

Applying the HCR based on a weighted average of the CPUE slopes on Meteor and Discovery a TAC estimate of 266 t was derived. **The SC recommends a TAC for Subarea D of 266 t and a zero TAC for the remainder of the SEAFO CA for the years 2017 and 2018.**

15.5 Alfonsino
There have been no landings of alfonsino in the last 3 years (including 2016). The SC was therefore unable to apply the HCR previously proposed by the SC and accepted by the Commission.

Alfonsino is a seamount-associated species that form aggregations, and the experience worldwide is that serial depletion of aggregations at different seamounts can happen. In the recent fisheries for the species in SEAFO the fishery was concentrated on a single seamount summit, the Valdivia Bank, where it was mainly a bycatch in the target fishery for pelagic armourhead. The only information available from 2015 is the limited observations from the RV Dr Fridtjof Nansen survey noting that only scattered specimens of the species occurred in the main fishing area.

It is also recognized that the last three year’s interruption in the exploitation has provided potential for recovery of the resource in the main fishing area on Valdivia Bank. There is however not enough information from any source to determine with certainty whether recovery has happened or not happened.

The SC however recognised that without future fishery data nor survey information the basis for providing scientific advice will deteriorate. The SC therefore discussed what advisory option would be most appropriate while maintaining the potential for data provision from a fishery. It must also be taken into account that the alfonsino is mainly a bycatch and that the catches will depend on the activity level in the target fishery for armourhead.

The SC considered the TAC level advised in 2013 as precautionary at that time. Considering no fishing pressures last 3 years and development of the resource**, the SC recommends a TAC of 200 t (status quo) for the SEAFO CA, of which a maximum of 132 tonnes may be taken in Division B1.**

15.6 Pelagic armourhead

The TAC advised in 2014 was derived using the average of the catches in 2011 and 2012. This is a simplistic approach not based on stock assessments or stock trend indices, hence the resulting TAC advice will be uncertain. Currently, due to the interruption of the fishery, the recommended and accepted HCR cannot be applied, nor the average of recent catches as in 2014. Due to the lack of recent fishery data there is even greater uncertainty than in 2014.

Prior to the interruption of the fishery, the catch per unit of effort had declined to a low level. The survey in 2015 did not detect concentrations of armourhead in the previous fishing area at that time. It was expressed that the absence of a fishery has provided a potential for recovery. Despite the fishing opportunity available in the past 3 years, there was no fishery, and this lack of activity has not been explained.

Due to the uncertainties explained above, SC members expressed different views on the TAC advice for 2017-2018. **The agreed advice is a TAC of 135 tonnes**. This level is slightly lower than that derived in 2014, hence possibly more precautionary. It must be emphasized that the state of the stock is unknown.

16. The SC to conduct a scientific evaluation on the stock status of deep-water sharks in the SEAFO CA and to consider how the issue, pertaining to deep-water sharks, is dealt with in other RFMO's

16.1 The SC considered this request and acknowledges that the status of the deep-water sharks in the SEAFO CA is not known. Furthermore, the SC recognises that no assessment of the deep-water sharks in the SEAFO CA has ever been conducted, due to the lack or insufficient data available. Therefore, the SC is not in a position to conduct such an evaluation and subsequently is unable to provide scientific advice.

16.2 The SC considered how the issue of deep-water sharks is dealt with in NEAFC and CCAMLR. NEAFC have adopted a recommendation on a ban of directed fishing for deep sea sharks since 2012 (NEAFC Recommendation 7: 2012). CCAMLR adopted a conservation measure that bans directed fishing on shark species in the Convention Area, for purposes other than scientific research. Any by-catch of sharks, especially juveniles and gravid females, taken accidentally in other fisheries, shall, as far as possible, be released alive (CM 32-18 (2006).

17. The SC to evaluate the impact of possible gillnet fisheries in SEAFO CA in light of scientific information that became available since the adoption of the Recommendation 1/2010

No deep-water gillnet fisheries exist in SEAFO CA. The SC is not able to quantify the potential effect of deep-water gillnet fisheries on bottom resources and their habitats.

The SC noted however that the knowledge available on the effect of deep-water gillnet fisheries over probably similar habitats as in the SEAFO CA show that their use may have significant negative effects on those ecosystems. Issues of concern are that abandoned or lost nets become entangled on three-dimensional features, and can maintain high ghost fishing catch rates for relatively long periods (several months to several years) (FAO; 2016).

The SC noted that NEAFC has had a bottom gillnet ban beyond 200 metres since 2006 (REC. 03/2006).

SC noted that the technical basis for Recommendation 2/2009 regarding gillnet fishing is still valid.

Reference:
FAO. 2016. Abandoned, lost or otherwise discarded gillnets and trammel nets: methods to estimate ghost fishing mortality, and the status of regional monitoring and management, by Eric Gilman, Francis Chopin, Petri Suuronen and Blaise Kuemlangan. FAO Fisheries and Aquaculture Technical Paper No. 600. Rome. Italy.

18. ABJN project: activities for 2016 (Appendix XIV)

The FAO Coordinator of the ABNJ Deep Seas Project provided the Scientific Committee with an update on the Project. The Project has produced a range of publications that will be available later in 2016 including:

- a review of the international legal and policy instruments related to deep-sea fisheries and biodiversity conservation in the ABNJ;
- technical papers on the biology and assessment of alfonsino and orange roughy;
- the 2nd edition of the Worldwide Review of Bottom Fisheries in the High Seas and
- a report on best practices in VME encounter protocols and impact assessments.

Activities relevant to SEAFO that will be undertaken over the next 12 months include:

- a review of traceability in deep sea fisheries;
- a review of rights based management;
- an examination of monitoring control and surveillance practices and
- characterization of decent work practices related to deep sea fisheries.

The project will also trial the use of electronic monitoring systems on deep sea fishing vessels operating in the ABNJ to collect information on VMEs.

The Scientific Committee noted that several of the project's areas may have direct benefit to SEAFO. Potential links were identified in the Scientific Committee's 2017 work plan.

19. Any other matters

19.1 SEAFO SC Journal

SC agreed to explore publishing more of the working documents on the SEAFO website as Scientific Reports (SCR and SCS reports like NAFO).

19.2 Presentation by the World Meteorological Organization (WMO)

The SC noted the proposal from the WMO for collaborations on various issues. It was however found that there are no relevant data collection efforts and this will be reported by the Executive Secretary in his reply to WMO. The SC suggested that WMO approach the CP's directly in this regard and should any research emanate from collaboration between WMO and CP's the SC should be informed. SC reiterates the continued need for scientific research to be undertaken in the SEAFO CA.

19.3 Patagonian toothfish tagging: Collaboration with CCAMLR

The SC considered and appreciated the request and recognises the value of the tagging program and the collaboration with CCAMLR. The SC encourages CCAMLR to approach Japan (only fishing CP for toothfish currently) with regards to this issue. The SC hopes that this will facilitates the expansion of the tagging program. The Japanese delegation indicated that they will assist with tag retrieval.

19.4 Collaboration with SIOFA Scientific Committee

The SC appreciate the interest in exploring common issues and nominated Luis López Abellán (EU) to represent SEAFO at the SIOFA SC meetings since he is a participant at that committee.

19.5 Participation in FAO/CECAF meeting – Dakar 8-10 November 2016

A request was received by the Executive Secretary to nominate a representative of SEAFO to attend the CECAF meeting and present on "Identification of habitats and potential VME indicators". Ivone Figueiredo (EU) was nominated to attend. Participation will be supported by the budget allocation to SC for activities in ABNJ project 2016.

19.6 Further considerations of guidelines and principles underlying evaluations of appropriateness of closures and possible protocols for revision of closures

Japan proposed an approach for surveying closed areas using a commercial vessel as well as a protocol for reopening closed areas. Japan decided to withdraw the proposal because there was not sufficient support from the SC.

The SC agreed that Odd Aksel Bergstad will draft guidelines and principles underlying evaluations of appropriateness of closures and possible protocols for revision of closures for the SC meeting in 2017.

20. Advice and recommendations to the Commission on issues emanating from the 2016 meeting

<u>Agenda Point 15:</u>

All TAC’s recommended are for the years 2017 and 2018

<u>Orange roughy:</u> SC recommends a status quo for Division B1, i.e. a moratorium on directed fishery in Division B1 and allowance for bycatch limit as proportion (10%) of the average of landings from the last five years with positive catches (i.e. 2001-2005), equivalent to 4 tonnes.

Due to a lack of new information, the SC did not review the current status quo of the 50 tonnes allowance in the remainder of the area.

<u>Deep-sea Crab:</u> SC recommends a TAC of 180 tons for Division B1, and 200 tons for the remainder of the SEAFO CA.

<u>Patagonian toothfish:</u> The SC recommends a TAC for Subarea D of 266 t and a zero TAC for the remainder of the SEAFO CA.

<u>Pelagic armourhead:</u> The SC recommends a TAC of 135 tonnes for the SEAFO CA. It must be emphasized that the state of the stock is unknown.

<u>Alfonsino:</u> The SC recommends a TAC of 200 t (status quo) for the SEAFO CA, of which a maximum of 132 tonnes may be taken in Division B1.

21. 2017 Work Program

21.1 Orange Roughy:

- Working document to be presented at 2017 meeting from Namibia on comparing historic catch positions and CPUE in Namibia and SEAFO CA. See how it changed over time (*Elizabeth Voges (Namibia)*).
- Report on Namibian survey of 2016 and assessment of the Namibian stock (*Elizabeth Voges (Namibia)*).
- Explore and report on the possibility of extending the Namibian biomass survey to former orange roughy fishing areas in the SEAFO CA (*Elizabeth Voges (Namibia)*).

21.2 Patagonian toothfish:

- Further exploration of the stock dynamics on the different fishing grounds and possible CPUE standardization methods as a group. (*Ivone Figueiredo (EU), John Kathena (Namibia), Tsutomu Tom Nishida (Japan), Elizabeth Voges (Namibia)*) *and other members).*

21.3 Further considerations of guidelines and principles underlying evaluations of appropriateness of closures and possible protocols for revision of closures:

- Draft document prepared for SC meeting 2017 (*Odd Aksel Bergstad (Norway)).*

21.4 FAO/ABNJ deep-sea project:

- Explore the possibility of convening an international workshop on deep-sea pot fisheries (*Secretariat*).
- Support the Namibian orange roughy assessment by arranging a meeting of experts (*Secretariat*).
- SC in collaboration with FAO/ABNJ to develop a checklist, application and evaluation template for exploratory fishing applications (*Secretariat*).
- SC Chair to send a letter to FAO/ABNJ indicating the need for additional research surveys in the SEAFO CA by the RV Dr. Fridjof Nansen (*Chair*).

21.5 Participation in FAO/CECAF meeting – Dakar 8-10 November 2016 (*Ivone Figueiredo (EU)*).

- Participation supported by the budget allocation to SC for activities in ABNJ project 2016, and report back at 2017 SC meeting.

21.6 Reporting on SIOFA SC meeting (Luis Lopez-Abellan (EU)).

21.7 Bycatch species that could be incidentally taken in the SEAFO CA by ICCAT Fisheries:

- Explore and report on possible bycatch of SEAFO species in the ICCAT. *(Beau M. Tjizoo (Namibia)).*

22. Budget for 2017

SEAFO SC participation in the FAO ABNJ project:- **Budget estimate: N$ 50 000**. The funding is requested in order to host the deep sea pot fishery workshop in Swakopmund, Namibia.

23. Adoption of the report

The report was adopted by the meeting.

24. Date and place of the next meeting

Date: 12-18 October 2017
Swakopmund
Namibia

25. Closure of the meeting

The meeting was closed at 13h45 on Friday, 14th October 2016.

APPENDIX I – Agenda for 12th SEAFO Scientific Committee Meeting

APPENDIX II – List of Participants

LIST OF THE 12th SCIENTIFIC COMMITTEE PARTICIPANTS

ANGOLA

Mr. Miguel Antonio (Head of Delegation)
Secretary of State of Affairs
Ministry of Agriculture Rural Development and Fisheries
Avenida 4 de Fevereiro No. 30
EdifficioAtlantico, Caixa Postal 83
Luanda, ANGOLA
Tel: +24 49 26270399
Fax: +24 49 26270399
E-mail: amiguelandre4@gmail.com

EUROPEAN UNION

Ivone Figueiredo (Head of Delegation)
Instituto do Mar eda Atmosfera (IPMA)
Av. Brasilia s/n
Portugal
Tel: +26 121 302 7131
Fax: +35 121 301 5948
Email: ifigueiredo@ipma.pr

Luis Lopez Abellan
Instituto Espanol de Oceanografia
Centro Oceanografico de Canarias
Via Espaldon Darsena Pesquera,PCL8
38120 Santa Cruz de Tenerife
Spain
Tel: +34 922 237797
+34 922 549400/001
Fax: +34 922 549554
E-mail: Luis.Lopez@ca.ieo.es

JAPAN

Tsutomu Nishida (Head of Delegation)
Associate Scientist
National Research Institute of Far Seas Fisheries
Fisheries Agency of Japan
5-7-1, Orido, Shimizu-Ward, Shizuoka-City
Shizuoka, Japan,424-86833
Tel/Fax: +8154 336 6052
Email: tnishida@affrc.go.jp

Takeshi Shibata
Team Leader
Overseas Operations Group
Fisheries Opertions Team
TOYOMISHINKO Bldg.,
4-5 Toyomi-Cho, Chuo-Ku, Tokyo, Japan, 104-0055
Tel: +81 33291 8508
Fax: +81 3 3233 3267
Email: kani@maaruha_nichiro.co.jp

NAMIBIA

Paulus Kainge (Chairperson)
National Marine Information & Research Centre
Ministry of Fisheries and Marine Resources
Private Bag 912
Swakopmund, Namibia
Tel: +264 64 410 1159
Fax: +264 64 404 385
Email: Paulus.Kainge@mfmr.gov.na

Beau Tjizoo (Head of Delegation)
National Marine Information & Research Centre
Ministry of Fisheries and Marine Resources
Private Bag 912
Swakopmund, Namibia
Tel: +264 64 410 1159
Fax: +264 64 404 385
Email: Beau.Tjizoo@mfmr.gov.na

Johannes Kathena
National Marine Information & Research Centre
Ministry of Fisheries and Marine Resources
Private Bag 912
Swakopmund, Namibia
Tel: +264 64 410 1159
Fax: +264 64 404 385
Email: John.Kathena@mfmr.gov.na

Hannes Holtzhausen
National Marine Information & Research Centre
Ministry of Fisheries and Marine Resources
Private Bag 912
Swakopmund, Namibia
Tel: +264 64 410 1159
Fax: +264 64 404 385
Email:Hannes.Holtzhausen@mfmr.gov.na

Elizabeth Voges
National Marine Information & Research Centre
Ministry of Fisheries and Marine Resources
Private Bag 912
Swakopmund, Namibia
Tel: +264 64 410 1159
Fax: +264 64 404 385

Email: Elizabeth.Voges@mfmr.gov.na

NORWAY

Odd Aksel Begstad (Head of Delegation)
Institute of Marine Research
Tel: +264 64 410 1159
Fax: +264 64 404 385
Email: odd.aksel.bergstad@imr.no

SECRETARIAT & SUPPORTING STAFF

Ben van Zyl
Executive Secretary
NATMIRC
Strand Street No. 1
P.O.Box 8462
Vineta, Swakopmund
Tel: +264 64 406885
Fax: +264 64 406884
Email: bvanzyl@seafo.org

George Campanis
Fisheries Compliance/Data Manager
NATMIRC
Strand Street No. 1
P.O.Box 8462
Vineta, Swakopmund
Tel: +264 64 406885
Fax: +264 64 406884
Email: gcampanis@seafo.org

Anna Snyders-Shaduka
Administrative Officer
NATMIRC
Strand Street No. 1
P.O.Box 8462
Vineta, Swakopmund
Tel: +264 64 406885
Fax: +264 64 406884
Email: asnyders@seafo.org

OBSERVERS

FAO
Chris O'Brien
Coordinator, ABNJ Deep Seas Project
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla, 00153 Rome, Italy
Tel: +39 06 5705 4851
Email: Chris.OBrien@fao.org

APPENDIX III – List of Working Documents submitted for the 12th SEAFO SC Meeting

Document Ref. Number	Agenda Item	Document Title	Provider	Availability of Document
DOC/SC/00/2016	All	List of documents	Secretariat	Available before the meeting
DOC/SC/01/2016	All	Provisional agenda of the 12th Annual Meeting of the Scientific Committee	Secretariat	Available before the meeting
DOC/SC/02/2016	All	Provisional Annotated Agenda of the 12th Annual Meeting of the Scientific Committee	Secretariat	Available before the meeting
DOC/SC/03/2016	8/9/10	2016 Landing tables	Secretariat	Available before the meeting
DOC/SC/04/2016	11	Working document on the Japanese 2016 and 2017 exploratory fishing survey	Japan	
DOC/SC/05/2016	12	Stock Status Report Dissostichus eleginoides	Secretariat	Available before the meeting
DOC/SC/06/2016	12	Stock Status Report Hoplostethus atlanticus	Secretariat	Available before the meeting
DOC/SC/07/2016	12	Stock Status *Chaceon erytheiae*	Secretariat	Available before the meeting
DOC/SC/08/2016	12	Stock Status Report of Southern Boarfish/pelagic amourhead	Secretariat	Available before the meeting
DOC/SC/09/2016	12	Stock Status Report of Alfonsino		
DOC/SC/10/2016	19	WMO INFORMATION	Secretariat	Available before the meeting
DOC/SC/11/2016	19	WMO fisheries Jul2016	Secretariat	Available before the meeting
DOC/SC/12/2016	19	WMO proposal	Secretariat	Available before the meeting
DOC/SC/13/2016	19	CAMMLR memo of tagging collaboration	Secretariat	Available before the meeting
DOC/SC/14/2016	19	Meeting Report (Adopted) with annexes	Secretariat	Available before the meeting
DOC/SC/15/2016	19	Signed letter to Mr Kainge	Secretariat	Available before the meeting
DOC/SC/16/2016	18	ABNJ Deep Seas Project Update	FAO	Available at the meeting

APPENDIX IV – **Procedures and standards for exploratory fishing in the SEAFO CA (Article 6, CM 30/15)**

12 October 2016

Procedures and standards for the SEAFO Scientific Committee's consideration of proposals for exploratory fishing pursuant to CM 30/2015

In the Articles 6 and 7 of the CM 30/2015 on **Bottom Fishing Activities and Vulnerable Marine Ecosystems in the SEAFO Convention Area** there are references to "procedures and standards developed by SC". The following procedures and standards were adopted by the SC as of 12 October 2016.

SC OBLIGATIONS

In accordance with Art. 6.3 and 7.2 of the CM 30/2015 SC will receive from the Secretariat the 'Notices of Intent' and the CP's preliminary assessment of a proposed exploratory fisheries. These documents are supposed to meet specified requirements in terms of content, i.e. as given in Art. 6.2, and 7.1 (Annex 3).

The task for SC is specified in Art. 7.3: 'SC shall, either at its next session or through correspondence, undertake an evaluation, in accordance with the precautionary approach, of the submitted documentation, taking account of the risks of significant adverse impact on VMEs. Such evaluation shall take place no later than 30 days following the date of submission of the Notice of Intent.' And further that SC shall 'use any other information required, including information from other fisheries in the region or similar fisheries elsewhere.'

And the overriding expectation is the following, given in Art. 7.4: 'SC shall subsequently provide advice to the Commission as to whether the proposed exploratory bottom fishing should be approved, or would have significant adverse impacts on VMEs and, if so, on whether proposed mitigation measures would prevent such impacts.

PROCEDURES

An SC procedure for handling exploratory fishing proposals must ensure that the required assessment of the specified documentation and a recommendation to the Commission can be generated, by correspondence or in a meeting, within 30 days after the date of submission of the Notice of Intent.

Procedure:

1. The Chair, upon receiving from the Secretariat a Notice of Intent and the CP's preliminary assessment, shall determine if the submitted documentation pertaining to the Notice of Intent contains the elements required in CM 30/2015 Art. 6.2. If elements are missing, requests should without delay be made to the relevant CP for supplementary material via the Executive Secretary.
2. When all the required documentation elements have been received, the documentation shall without delay be forwarded to SC members for evaluation. The date of submission of the Notice of Intent comprising all elements required in Art. 6.2 is the start date of the 30-day evaluation period in SC (CM 30/2015, Art. 7.3).
3. The Chair shall, via the Secretariat, without delay forward the complete submission to SC delegates from all CPs.

4. SC delegates shall carry out an independent evaluation of the submitted proposal in accordance with the SC standards.
5. SC delegate's evaluations and statements of opinions shall be forwarded to the Chair and other members of SC within 25 days after first receiving the completed Notice of Intent and the delegate's preliminary assessment.
6. In their responses to the Chair, SC delegates (one per CP) shall in writing comment on the submitted material and express whether the proposal should or should not be approved. Failure by delegates to respond within that 25 days deadline will be interpreted as meaning that the delegates assessment is that the exploratory fishing is unlikely to have significant adverse impacts (SAI) on VMEs.
7. If possible within the time-frame available, the evaluations shall be discussed in a SC meeting. Discussions in session shall complement rather than replace written evaluations by individual CPs. Decisions on recommendations to the Commission made in a meeting takes priority over decisions reached on the basis of statements received by correspondence.
8. Upon receiving the responses from SC members and comments received in session, the Chair shall summarise the evaluations and formulate a response to the Commission in accordance with Art. 7.3. If there are differing views on the recommendation, these views shall be reflected in the response.
9. The SC recommendation shall be forwarded to the Commission as soon as it is completed and at the latest within 30 days after the date of submission of the 'Notice of Intent'.

STANDARDS

Any standards used by SC should ensure that the requirements given in Art. 6.2. of the CM 30/2015 are satisfied and that a satisfactory preliminary assessment (Art. 7.1) has been conducted. Applying the precautionary approach, SC shall undertake an evaluation of all the submitted material ('Notice of Intent' and relevant accompanying documentation, and the CPs own preliminary assessment) in order to assess the risk of significant adverse impacts. If such risks exist, SC should propose mitigation measures, presumably if the CP proposing the fishing has not already done so. If risks of adverse impacts cannot be eliminated, the proposal should not be recommended for approval.

In its evaluation SC should use the following information:

1) The documentation submitted by the CP proposing the exploratory fishing.
2) Information from other fisheries in the region or similar fisheries elsewhere.

The submission from a CP should consist of two parts:

1) <u>The Notice of Intent</u> with documentation as specified in Art. 6.2. All the elements a) to g) are *required*.
2) <u>The CPs preliminary assessment</u> (Art. 7.1) with contents as requested in Annex 3. The annex contains a list of items that the assessment should *inter alia* address, i.e. expresses preferred content while recognising that not all items may be possible to provide.

The following standards reflect the above requirements and specifications, but also the instruction in CM 30/2015 for SC to adopt the precautionary approach. The SC interpretation of precaution in this regard is that if a shortage of information is recognised and hence that uncertainty of the assessment is high, then it is more precautionary to recommend rejection than approval the exploratory fishing. Without fully satisfactory documentation of either that the risk of SAI is low or nonexistent, or that mitigation measures are effective in reducing the risk, approval should not be expected.

Standards:

1. A <u>Notice of Intent</u> shall contain <u>all elements</u> specified in CM 30/2015 Art. 6.2, and SC shall determine if the documentation is sufficient to evaluate the risk of significant adverse impacts on VMEs. There are 5 mandatory elements:

   (a) harvesting plan, which outlines target species, proposed dates and areas and the type of bottom fishing gear to be used. Area and effort restrictions shall be considered to ensure that fishing occur on a gradual basis in a limited geographical area;
   (b) mitigation plan, including measures to prevent significant adverse impact to VMEs that may be encountered during the fishery;
   (c) catch monitoring plan, including recording/reporting of all species caught;
   (d) a sufficient system for recording/reporting of catch, detailed to conduct an assessment of activity, if required;
   (e) data collection plan to facilitate the identification of VMEs in the area fished;

   Furthermore, the CP should make every effort to also include the following information:

   (f) fine-scale data collection plan on the distribution of intended tows and sets (if appropriate, with reference to Annex 5), to the extent practicable on a tow-by-tow and set-by-set basis;
   (g) plans for monitoring of bottom fishing activities using gear monitoring technology, including cameras if practicable; and
   (h) monitoring data obtained pursuant to paragraph 1 of this Article.

<u>If SC finds that any of the 5 mandatory elements are missing, or found to be described in a manner not permitting evaluation, then the proposal should not be approved.</u>

The harvesting plan needs to comprise effort and effort limitation, also area restrictions, to ensure that the fishing is conducted on a gradual basis. A proposed experiment without such restrictions should not be approved.

In view of the CM 30/2015 instruction to SC to consider mitigation measures (if a risk of SAI exists), the item b) on mitigation is especially important. These would be measures providing additional effectiveness in terms of protection beyond the adherence to the generally applicable mandatory encounter protocol (CM 30/2015, Article 8).

2. The <u>CPs preliminary assessment</u> shall as a minimum demonstrate that every effort has been made to provide the information requested in Art. 7.1, Annex 3. The CP should address individual request point by point in order to facilitate SC evaluation:
   (a) type(s) of fishing conducted or contemplated, including vessels and gear types, fishing areas, target and potential by catch species, fishing effort levels and duration of fishing (harvesting plan);
   (b) best available scientific and technical information on the current state of fishery resources and baseline information on the ecosystems, habitats and communities in the fishing area, against which future changes are to be compared;
   (c) identification, description and mapping (geographical location and extent) of VMEs known or likely to occur in the fishing area;
   (d) identification, description and evaluation of the occurrence, character, scale and duration of likely impacts, including cumulative impacts of the proposed fishery on VMEs in the fishing area;
   (e) data and methods used to identify, describe and assess the impacts of the activity, the identification of gaps in knowledge, and an evaluation of uncertainties in the information presented in the assessment;
   (f) risk assessment of likely impacts by the fishing operations to determine which impacts on VMEs are likely to be significant adverse impacts; and

(g) mitigation and management measures to be used to prevent significant adverse impacts on VMEs and the measures to be used to monitor effects of the fishing operations.

SC shall require that information provided is documented with references to published sources or other sources that SC can access/consult.

If SC deems the contents of the submitted assessment, including the proposed mitigation measures (g), insufficiently rigorous and balanced to assess the risk of SAI, then the proposal shall not be approved.

3. Additional elements to be considered prior to SC' final evaluation of SAI.

The final evaluation and decision by SC rest in its judgement of the risk of significant adverse impacts to VMEs, or its judgement of the effectiveness of mitigation measures.

In addition to the information provided by the CP proposing the fishing, SC should consider the following:

a) Experience for other areas in the region or similar fishing elsewhere.
b) Potentially cumulative effects of several exploratory fishing experiments in the same or overlapping areas.

Both a) and b) are relevant for evaluating SAI. If it can be documented that relevant experiences from the same experiments elsewhere did not cause SAI, then that would favour approval of the proposed exploratory fishing. On the contrary, if SAIs in other similar areas caused SAI, then approval would be less likely.

If several experiments are proposed for the same area or conducted in succession, then the total effort level of all experiments should be taken into account in the SC evaluation of the likelihood of SAI.

4. Transparency of decision-making process and documentation.

SC should keep stakeholders (CPs) fully informed of the process and discussions leading to its recommendation to the Commission.

APPENDIX V – Landings, discards and bycatch tables - Retained & Discarded TAC species

Table 1: Catches (tons) of Patagonian toothfish (*Dissostichus eleginoides*) by South Africa, Spain, Japan and Korea.

Nation	**Spain**		**Japan**				**Korea**				**South Africa**			
Fishing method	**Longlines**		**Longlines**				**Longlines**				**Longlines**			
Management Area	**D0**		**D0**		**D1**		**D0**		**D1**		**D0**		**D1**	
Catch details (t)	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**
2002	18													
2003	101				47		245	0						
2004	6				124									
2005	N/F	N/F			158		15	0						
2006	11				152		7	0						
2007	N/F		151		15		247	0						
2008	N/F	N/F	19	0	104	0	79	0						
2009	N/F	N/F	82	0	4	0	16	0	46	0	N/F	N/F	N/F	N/F
2010	26	0	41	0	12	2	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	172	6	N/F	N/F	N/F	N/F	N/F	N/F	15	0	28	0
2012	N/F	N/F	86	3	N/F	N/F	N/F	N/F	N/F	N/F	24	0	12	0
2013	N/F	N/F	41	2	20	1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	67	6	12	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	7	<1	52	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	7	<1	53	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

N/F = No Fishing. Blank fields = No data available. *Provisional (September 2016). Ret. = Retained Disc. = Discarded

Table 2. Catches (tons) of Orange roughy (*Hoplostethus atlanticus*) made by Namibia, Norway and Republic of South Africa.

Nation	**Namibia**		**Norway**		**South Africa**	
Fishing method	**Bottom trawl**		**Bottom trawl**		**Bottom trawl**	
Management Area	**B1**		**A1**		**B1**	
Catch details (t)	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**
1995	40		N/F			
1996	8		N/F			
1997	5		22		27#**	
1998	N/F	N/F	12			
1999	<1		N/F	N/F		
2000	75		0			
2001	94		N/F	N/F		
2002	9		N/F	N/F		
2003	27		N/F	N/F		
2004	15		N/F	N/F		
2005	18		N/F	N/F		
2006	N/F	N/F	N/F	N/F		
2007	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F

N/F = No Fishing. Blank fields = No data available.
* Provisional (September 2016).
** Sum of Catches from 1993 to 1997.
#Values taken from the Japp (1999).

Table 3A: Catches (tons) of Alfonsino (*Beryx splendens*) made by various countries.

Flag State	**Namibia**		**Norway**		**Russia**		**Portugal**		**Ukraine**		**Korea**	
Fishing method	**Bottom trawl**		**Bottom trawl**		**Bottom trawl**		**Bottom trawl**		**UNK**		**Mid-water trawl**	
Management Area	**B1**		**A1**		**UNK**		**UNK**		**UNK**		**B1**	
Catch details (t)	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**
1976					252[#]							
1977					2972[#]							
1978					125[#]							
1993									172[§]			
1994												
1995	1[#]		N/F	N/F								
1996	368[#]		N/F	N/F					747[§]			
1997	208[#]		836		2800[#]				392[§]			
1998	N/F	N/F	1066		69[§]							
1999	1		N/F	N/F			3[§]					
2000	<1		242				1[§]					
2001	1		N/F	N/F			7[§]					
2002	0		N/F	N/F			1[§]					
2003	0		N/F	N/F			5[§]					
2004	6		N/F	N/F	210							
2005	1		N/F	N/F	54							
2006	N/F	N/F	N/F	N/F	N/F	N/F	<1					
2007	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	159	0
2011	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	165	0
2012	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	172	0
2013	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	13	0
2014	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016). N/F = No Fishing. Blank fields = No data available.
UNK = Unknown. # = Values taken from the Japp (1999). § = Values from FAO Two species targeted, however, *Beryx splendens* constitutes majority of the catch total.

Table 3B: Catches (tons) of Alfonsino (*Beryx spp.*) made by various countries.

Nation	Spain		Poland		Cook Island		Mauritius		Cyprus		South Africa	
Fishing method	Mid-water trawl and Longlines		UNK		Bottom trawl		Bottom trawl		Bottom trawl		Bottom trawl	
Management Area	UNK		UNK		UNK		UNK		UNK		B1	
Catch details (t)	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded
1976												
1977												
1978												
1993												
1994												
1995			1964§								60#	
1996											109#	
1997	186§										124#	
1998	402§											
1999												
2000												
2001	2											
2002												
2003	2											
2004	4				142		115		437			
2005	72											
2006	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2007	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016). N/F = No Fishing. Blank fields = No data available. UNK = Unknown.
# = Values taken from the Japp (1999). § = Values from FAO
Two species targeted: Beryx splendens represents majority of catch.

Table 4: Catches (tons) of Deep-sea red crab (*Chaceon spp*., considered to be mostly *Chaceon erytheiae*).

Nation	Japan		Korea		Namibia		Spain		Portugal	
Fishing method	Pots		Pots		Pots		Pots		Pots	
Management Area	B1		B1		B1		UNK		A	
Catch details (t)	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.
2001			N/F	N/F			<1			
2002			N/F	N/F						
2003			N/F	N/F			5			
2004			N/F	N/F			24			
2005	253	0	N/F	N/F	54					
2006	389		N/F	N/F						
2007	770		N/F	N/F	3	0			35	
2008	39		N/F	N/F						
2009	196		N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2010	200	0	N/F	N/F			N/F			
2011	N/F	N/F	N/F	N/F	175	0	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	198	0	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	196	0	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	135	0	N/F	N/F	N/F	N/F
2015	N/F	N/F	104	0	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016). Ret. = Retained Disc. = Discarded
N/F = No Fishing.
Blank fields = No data available.
UNK = Unknown.

Table 5a: Catches (tons) of Pelagic armourhead (*Pseudopentaceros richardsoni*).

Nation	Namibia		Russia		Ukraine		South Africa	
Fishing method	Bottom trawl		Bottom trawl		Bottom trawl		Bottom trawl	
Management Area	B1		B1		UNK		B1	
Catch details (t)	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded
1976			108					
1977			1273					
1978			53					
1993			1000		435§			
1994								
1995	8				49		530	
1996	284				281		201	
1997	559				18		12	
1998	N/F							
1999	N/F							
2000	20							
2001	N/F							
2002	N/F							
2003	4							
2004								

2005								
2006								
2007								
2008								
2009	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016).
N/F = No Fishing.
Blank fields = No Data Available.
UNK = Unknown.
§ = Values from FAO

Table 5b: Catches (tons) of Pelagic armourhead (*Pseudopentaceros richardsoni*).

Nation	**Spain**		**Cyprus**		**Korea**	
Fishing method	**Bottom trawl and Longline**		**Bottom trawl**		**Mid-water trawl**	
Management Area	**B1**		**UNK**		**B1**	
Catch details (t)	Retained	Discarded	Retained	Discarded	Retained	Discarded
1976						
1977						
1978						
1993						
1994						
1995						
1996						
1997						
1998						
1999						
2000						
2001	<1					
2002						
2003	3					
2004	3		22			
2005						
2006						
2007						
2008						
2009	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	688	0
2011	N/F	N/F	N/F	N/F	135	0
2012	N/F	N/F	N/F	N/F	152	<1

2013	N/F	N/F	N/F	N/F	13	0
2014	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016).
N/F = No Fishing.
Blank fields = No Data Available.
UNK = Unknown.
§ = Values from FAO

Retained & Discarded Bycatch species

Table 6: Catches (tons) of oreo dories (*Allocyttusverucossus, Neocyttusr hombiodalis, Allocyttus guineensis*). Smooth oreo dories- *Pseudocyttu smaculatus*

Nation	**Russia**		**Cyprus**		**Mauritius**		**Namibia**	
Fishing method	**UNK**		**UNK**		**UNK**		**Bottom trawl**	
Management Area	**UNK**		**UNK**		**UNK**		**UNK**	
Catch details (t)	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**
1995							<1	
1996							0	
1997							35	
1998							N/F	N/F
1999							3	
2000							33	
2001							14	
2002							1	
2003							1	
2004	<1		21		25		0	
2005							4	
2006								
2007								
2008								
2009								
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0
2014	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016).
N/F = No Fishing. Blank fields = No data available. UNK = Unknown.

Table 7: Catches (tons) of Wreckfish (*Polyprion americanus*). (WRF)

Nation	Portugal	
Fishing method	Longlines	
Management Area	A	
Catch details (t)	Retained	Discarded
2004	1	
2005		
2006	6	
2007	9	
2008		
2009	0	0
2010	0	0
2011	0	0
2012	0	0
2013	N/F	N/F
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).
N/F = No Fishing. Blank fields = No data available. UNK = Unknown.

Table 8: Catches (tons) of Blackbelly rosefish (*Helicolenus* spp.). (BRF)

Nation	Korea	
Fishing method	Mid-water trawl	
Management Area	B1	
Catch details (t)	Retained	Discarded
2010	161	0
2011	47	0
2012	44	0
2013	4	0
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 9: Catches (tons) of Imperial Blackfish (*Schedophilus ovalis*). (HDV)

Nation	Korea	
Fishing method	Mid-water trawl	
Management Area	B1	
Catch details (t)	Retained	Discarded
2010	24	0
2011	35	0
2012	24	0
2013	<1	0
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 10: Catches (tons) of Silver Scabbardfish (*Lepidotus caudatus*). (SVS)

Nation	**Korea**	
Fishing method	**Mid-water trawl**	
Management Area	**B1**	
Catch details (t)	**Retained**	**Discarded**
2010	30	0
2011	15	0
2012	2	0
2013	0	<1
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 11: Catches (tons) of Mackerel (*Scomber japonicus*). (MAZ)

Nation	**Korea**	
Fishing method	**Mid-water trawl**	
Management Area	**B1**	
Catch details (t)	**Retained**	**Discarded**
2010	50	0
2011	0	0
2012	0	0
2013	0	0
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 12: Catches (tons) of Cape Horse Mackerel (*Trachurus capensis*). (HMC)

Nation	**Korea**	
Fishing method	**Mid-water trawl**	
Management Area	**B1**	
Catch details (t)	**Retained**	**Discarded**
2010	1	0
2011	0	0
2012	0	0
2013	0	0
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 13: Catches (tons) of Cape Bonnetmouth (*Emmelichthys nitidus*). (EMM)

Nation	**Korea**
Fishing method	**Mid-water trawl**

Management Area	B1	
Catch details (t)	Retained	Discarded
2010	11	0
2011	2	0
2012	<1	0
2013	0	0
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 14: Catches (tons) of Oilfish (*Ruvettus pretiosus*). (OIL)

Nation	Korea	
Fishing method	Mid-water trawl	
Management Area	B1	
Catch details (t)	Retained	Discarded
2010	5	0
2011	13	0
2012	7	<1
2013	<1	0
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 15: Catches (tons) Gemfish (*Roudiescolar, Promethichthys prometheus*). (PRP)

Nation	Korea	
Fishing method	Mid-water trawl	
Management Area	B1	
Catch details (t)	Retained	Discarded
2010	0	0
2011	0	0
2012	<1	0
2013	0	0
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 16: Catches (tons) of Orange bellowfish (NPR)

Nation	Korea	
Fishing method	Mid-water trawl	
Management Area	B1	
Catch details (t)	Retained	Discarded
2010	0	0

2011	0	0
2012	0	<1
2013	0	<1
2014	N/F	N/F
2015	N/F	N/F
2016*	N/F	N/F

* Provisional (September 2016).

Table 17: Catches (tons) of Grenadiers nei (*Macrourus* spp.) (GRV)

Nation	**Spain**				**Japan**				**Korea**		**South Africa**			
Fishing method	**Longlines**				**Longlines**				**Longlines**		**Longlines**			
Management Area	**D0**		**D1**		**D0**		**D1**		**D0**		**D0**		**D1**	
Catch details (t)	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded	Retained	Discarded
2009	N/F	N/F	N/F	N/F	0	0	0	6	0	<1	N/F	N/F	N/F	N/F
2010	4	<1	2	0	0	0	0	3	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	0	22	0	0	N/F	N/F	0	0	0	0
2012	N/F	N/F	N/F	N/F	0	21	0	0	N/F	N/F	0	3	0	<1
2013	N/F	N/F	N/F	N/F	0	7	0	<1	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	0	6	0	<1	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	0	<1	0	2	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	1	1	0	2	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016).

Table 18: Catches (tons) of Blue antimora (*Antimora rostrata*). (ANT)

Nation	**Spain**				**Japan**				**Korea**				**South Africa**			
Fishing method	**Longlines**				**Longlines**				**Longlines**				**Longlines**			
Management Area	**D0**		**D1**		**D0**		**D1**		**D0**		**D1**		**D0**		**D1**	
Catches (t)	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis
2009	N/F	N/F	N/F	N/F	0	0	0	5	0	<1	0	<1	N/F	N/F	N/F	N/F
2010	0	<1	0	<1	0	0	0	1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	0	5	0	0	N/F	N/F	N/F	N/F	0	0	0	0
2012	N/F	N/F	N/F	N/F	0	4	0	0	N/F	N/F	N/F	N/F	0	<1	0	<1
2013	N/F	N/F	N/F	N/F	0	<1	0	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	0	2	0	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	0	<1	0	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	0	<1	0	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016). N/F = No Fishing Ret = Retained Dis = Discarded

Table 19: Catches (tons) of Antarctic toothfish (*Dissostichus mawsoni*). (TOA)

Nation	**Japan**			
Fishing method	**Longlines**			
Management Area	**D0**		**D1**	
Year	Ret..	Disc.	Ret..	Disc.
2014	< 1	0	0	0
2015	0	0	0	0
2016*	0	0	0	0

N/F = No Fishing.
Blank fields = No data available.
*Provisional (September 2016).
Ret. = Retained
Disc. = Discarded

Table 20: Catches (tons) of King crab (*Lithodidae spp., Lithodes ferox, Paralomis formosa*). (KCA, KCF, KCX)

Nation	**Spain**				**Japan**				**Korea**	
Fishing method	**Longlines**				**Longlines**				**Pots**	
Management Area	**D0**		**D1**		**D0**		**D1**		**B1**	
Year	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis
2009	N/F	N/F	N/F	N/F	0	0	0	<1	N/F	N/F
2010	0	<1	0	<1	0	0	0	<1	N/F	N/F
2011	N/F	N/F	N/F	N/F	0	0	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	0	0	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	0	<1	0	<1	N/F	N/F
2014	N/F	N/F	N/F	N/F	0	0	0	0	N/F	N/F
2015	N/F	N/F	N/F	N/F	0	0	0	0	1	0
2016*	N/F	N/F	N/F	N/F	<1	0	0	<1	N/F	N/F

N/F = No Fishing.
Blank fields = No data available.
*Provisional (September 2016).
Ret. = Retained
Disc. = Discarded

Table 21: Catches (tons) of Sharks (*Selachimorpha spp., Etmopterus lucifer, Prionace glauca*). (SKH, ETF, BSH)

Nation	**Japan**			
Fishing method	**Longlines**			
Management Area	**D0**		**D1**	
Year	Ret	Dis	Ret	Dis
2009	0	<1	0	0
2010	0	0	0	0
2011	0	0	N/F	N/F
2012	0	0	N/F	N/F
2013	0	<1	0	0

2014	0	0	0	0
2015	0	<1	0	0
2016*	0	0	0	0

N/F = No Fishing.
Blank fields = No data available.
*Provisional (September 2016).
Ret. = Retained
Disc. = Discarded

Table 22: Incidental mortality (seabirds: Black-browed Albatross (*Thalassarche melanophris*)-DIM; Wandering Albatross (*Diomedea exulans*)-DIX; Southern giant Petrel (*Macronectes giganteus*)-MAI; Great Shearwater (*Puffinus gravis*)-PUG)

Nation	**Japan**			
Fishing method	**Longlines**			
Management Area	**D**			
Year	DIM	DIX	MAI	PUG
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	1	0	0	2
2015	0	0	0	0
2016*	0	1	1	0

*Provisional (September 2016).

APPENDIX VI – Data on catches of VME indicator species within the SEAFO CA

Tables 23-35 contain data on VME indicators. The listed benthic taxa are not confirmed as VME indicators.

Table 23: Provisional list of benthic invertebrate VME indicator taxa for the SEAFO CA.

Group / Species code	Phylum / Order / Family	Common name
PFR	Porifera (Phylum)	Sponges
GGW	Gorgonacea (Order)	Gorgonian corals
AZN=> AXT (Stylasteridae)	Anthoathecatae (Family)	Hydrocorals
CSS	Scleractinia (Order)	Stony corals
AQZ	Anthipatharia (Order)	Black corals
ZOT	Zoantharia (Order)	Zoanthids
AJZ	Alcyonacea (Order)	Soft corals
NTW	Pennatulacea (Order)	Sea pens
BZN	Bryozoa (Phylum)	Erect bryozoans
CWD	Crinoidea (Class)	Sea lilies
OWP	Ophiuroidea (Class)	Basket stars
SZS	Serpulidae (Family)	Annelida
SSX	Ascidiacea (Class)	Sea squirts
ATX[#]	Ceriantharia (Order)	Tube-dwelling Sea anemones

[#]FAO code changed to Ceriantharia

Table 24: Catches (kg) of Gorgonians (VME indicators) (GGW).

Nation	Japan		Spain	Korea
Management Area	**D**		**D**	B
Fishing method	**LLS**		**LLS**	Pots
Catch details	**Bycatch (kg)**		**Bycatch (kg)**	Bycatch (kg)
	D0	**D1**		B1
2010	0	0	47.5	N/F
2011	3.8	0	N/F	N/F
2012	30.3	0	N/F	N/F
2013	1.2	0	N/F	N/F
2014	2.34	2.6	N/F	N/F
2015	0	0.35	N/F	11.5
2016*	0.01	9.54	N/F	N/F

***** Provisional (Sep 2016)
N/F = No Fishing. Blank fields = No data available.

Table 25: Catches (kg) of Black corals and thorny corals (VME indicators) (AQZ)

Nation	Japan	Spain	Korea
Management Area	**D**	**D**	B1
Fishing method	**LLS**	**LLS**	Pots
Catch details	**Bycatch (kg)**	**Bycatch (kg)**	Bycatch (kg)
2010	0	4.4	N/F
2011	0	N/F	N/F
2012	0.02	N/F	N/F
2013	0	N/F	0.4
2014	0	N/F	N/F
2015	0	N/F	0.25
2016*	0	0	0

***** Provisional (Sep 2016)
N/F = No Fishing. Blank fields = No data available.

Table 26: Catches (kg) of Scleractinia (VME indicators) (CSS)

Nation	Japan		Spain	Korea
Management Area	**D**		**D**	B
Fishing method	**LLS**		**LLS**	Pots
Catch details	**Bycatch (kg)**		**Bycatch (kg)**	Bycatch (kg)
	D0	**D1**		B1
2010	0	0	2.2	N/F
2011	15.4	0	N/F	N/F
2012	17.6	0	N/F	N/F
2013	0	0	N/F	N/F
2014	2.8	0.3	N/F	N/F
2015	0	0	N/F	29.5
2016*	0.68	3.88	N/F	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 27: Catches (kg) of sea pens (VME indicators) (NTW)

Nation	Japan	Spain	Korea
Management Area	**D**	**D**	B
Fishing method	**LLS**	**LLS**	Pots
Catch details	**Bycatch (kg)**	**Bycatch (kg)**	Bycatch (kg)
			B1
2010	0	1.3	N/F
2011	0	N/F	N/F
2012	0.02	N/F	N/F

2013	0	N/F	N/F
2014	0	N/F	N/F
2015	0	N/F	0.05
2016*	0	0	0

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 28: Catches (kg) of sponges (VME indicators) (PFR)

Nation	Japan	Spain	Korea
Management Area	**D**	**D**	B
Fishing method	**LLS**	**LLS**	Pots
Catch details	**Bycatch (kg)**	**Bycatch (kg)**	Bycatch (kg)
			B1
2010	0	29.7	N/F
2011	0	N/F	N/F
2012	0	N/F	N/F
2013	0	N/F	N/F
2014	0	N/F	N/F
2015	0.4	N/F	0.3
2016*	0.84	N/F	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 29: Catches (kg) of Zoanthids (VME indicators) (ZOT)

Nation	Japan	Spain
Management Area	**D**	D
Fishing method	**LLS**	LLS
Catch details	**Bycatch (kg)**	Bycatch (kg)
2010	0	0.3
2011	0	N/F
2012	0	N/F
2013	0	N/F
2014	0	N/F
2015	0	N/F
2016*	0	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 30: Catches (kg) of soft corals (VME indicators) (AJZ)

Nation	Japan	Spain
Management Area	**D**	D
Fishing method	**LLS**	LLS
Catch details	**Bycatch (kg)**	Bycatch (kg)

2010	0	0.3
2011	0	N/F
2012	0	N/F
2013	0	N/F
2014	0	N/F
2015	0	N/F
2016*	0	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 31: Catches (kg) of sea lilies (VME indicators) (CWD)

Nation	Japan	Spain
Management Area	**D**	D
Fishing method	**LLS**	LLS
Catch details	**Bycatch (kg)**	Bycatch (kg)
2010	0	1.0
2011	0	N/F
2012	0.02	N/F
2013	0	N/F
2014	0	N/F
2015	0	N/F
2016*	0	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 32: Catches (kg) of Hydrocorals (VME indicators) (AXT, AZN)

Nation	Japan	Spain
Management Area	**D**	D
Fishing method	**LLS**	LLS
Catch details	**Bycatch (kg)**	Bycatch (kg)
2010	0	0.1
2011	0	N/F
2012	0	N/F
2013	0	N/F
2014	0	N/F
2015	1	N/F
2016*	0.12	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 33: Catches (kg) of Basket stars (VME indicators) (OWP)

.Nation	Japan		Spain	Korea
Management Area	**D**		**D**	B
Fishing method	**LLS**		**LLS**	Pots
Catch details	**Bycatch (kg)**		**Bycatch (kg)**	Bycatch (kg)
	D0	D1		**B1**
2010	0	0	0	N/F
2011	0	0	N/F	N/F
2012	0	0	N/F	N/F
2013	0	0	N/F	N/F
2014	0.1	0	N/F	N/F
2015	0	4.9	N/F	0.3
2016*	0	0.6	N/F	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 34: Catches (kg) of Sea anemones (ATX).

Nation	Japan		Spain	Korea
Management Area	**D**		**D**	B
Fishing method	**LLS**		**LLS**	Pots
Catch details	**Bycatch (kg)**		**Bycatch (kg)**	**Bycatch (kg)**
	D0	**D1**		B1
2010	0	0	0	N/F
2011	0	0	N/F	N/F
2012	0	0	N/F	N/F
2013	0	0	N/F	N/F
2014	0.2	0	N/F	N/F
2015	0	0	N/F	0.7
2016*	0	0	N/F	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

Table 35: Catches (kg) of Gastropoda (GAS)

Nation	Japan		Spain	Korea
Management Area	**D**		**D**	B
Fishing method	**LLS**		**LLS**	Pots
Catch details	**Bycatch (kg)**		**Bycatch (kg)**	Bycatch (kg)
	D0	D1		**B1**
2010	0	0	0	N/F
2011	0	0	N/F	N/F
2012	0	0	N/F	N/F

2013	0	0	N/F	N/F
2014	0	0	N/F	N/F
2015	0	0	N/F	8.6
2016*	0	0	N/F	N/F

***** Provisional (Sep 2016)
N/F = No Fishing.

There were no recorded encounters in 2016 of individual set bycatches exceeding the current VME threshold values (60kg for corals and 800kg for sponges).

STATUS REPORT

Hoplostethus atlanticus

Common Name: Orange roughy - ORY

2016

Updated 12 October 2016

TABLE OF CONTENTS

Description of the fishery

1.1 Description of fishing vessels and fishing gear

Exploration for orange roughy first started in South Africa prior to 1994 but emphasis soon shifted to Namibia when an exploratory fishing license was given to a Namibian fishing company to search for commercial deep-water fish species. The fishery expanded, extending their fishing range into SEAFO CA. By 2008, a three year moratorium on orange roughy was enforced in Namibia and the fishery has not been re-opened yet.

Table 1 shows vessels that operated between 1995 and 2005 in the SEAFO CA. These vessels were also involved in the Alfonsino fishery during the same period.

Table 1: Orange roughy: Fleet information, SEAFO Division B1.

Flag	ID	Name	Length	GRT	Built	HP	IRCS
Nam	L737	Southern Aquarius	54		01/01/1974	3000	V5SH
Nam	L913	Emanguluko	31	483.00	01/01/1990	1850	V5SD
Nam	L892	Petersen	43	650.00	01/01/1979		V5RG
Nam	L861	Will Watch	69	1587.00	01/01/1972	2116	ZMWW
Nam	L918	Hurinis	37	784.00	01/01/1987	1680	V5SW
Maur	L1159	Bell Ocean II	57	1899.00	01/01/1990	3342	3BLG
Nam	L830	Seaflower	92	3179.75	01/01/1972	4800	V5HO

Seven Namibian vessels (Table 1) were involved for the period that the fishery occurred in the SEAFO CA. The vessels employed the standard New Zealand "Arrow" rough bottom trawl with cut-away lower wings. Sweep and bridle lengths were 100 meters and 50 meters respectively. A "rock hopper" bobbin rig was used. The net had a 5-6 meter headline height when towed at 3- 3.5 knots and had an estimated wingspread of 15 meters. The cod end had a mesh of 110 mm. Each vessel spends on average 12 days at sea.

1.2 **Spatial and temporal distribution of fishing**

Fishing mainly occurred on Ewing seamount and Valdivia Bank within the SEAFO CA. These operations started in 1995 and continued until 2005, with the exception of 1998 when no fishing took place. The fishing season usually extends from January to December and catches peak in winter months (May to July), which coincides with the spawning season of orange roughy.

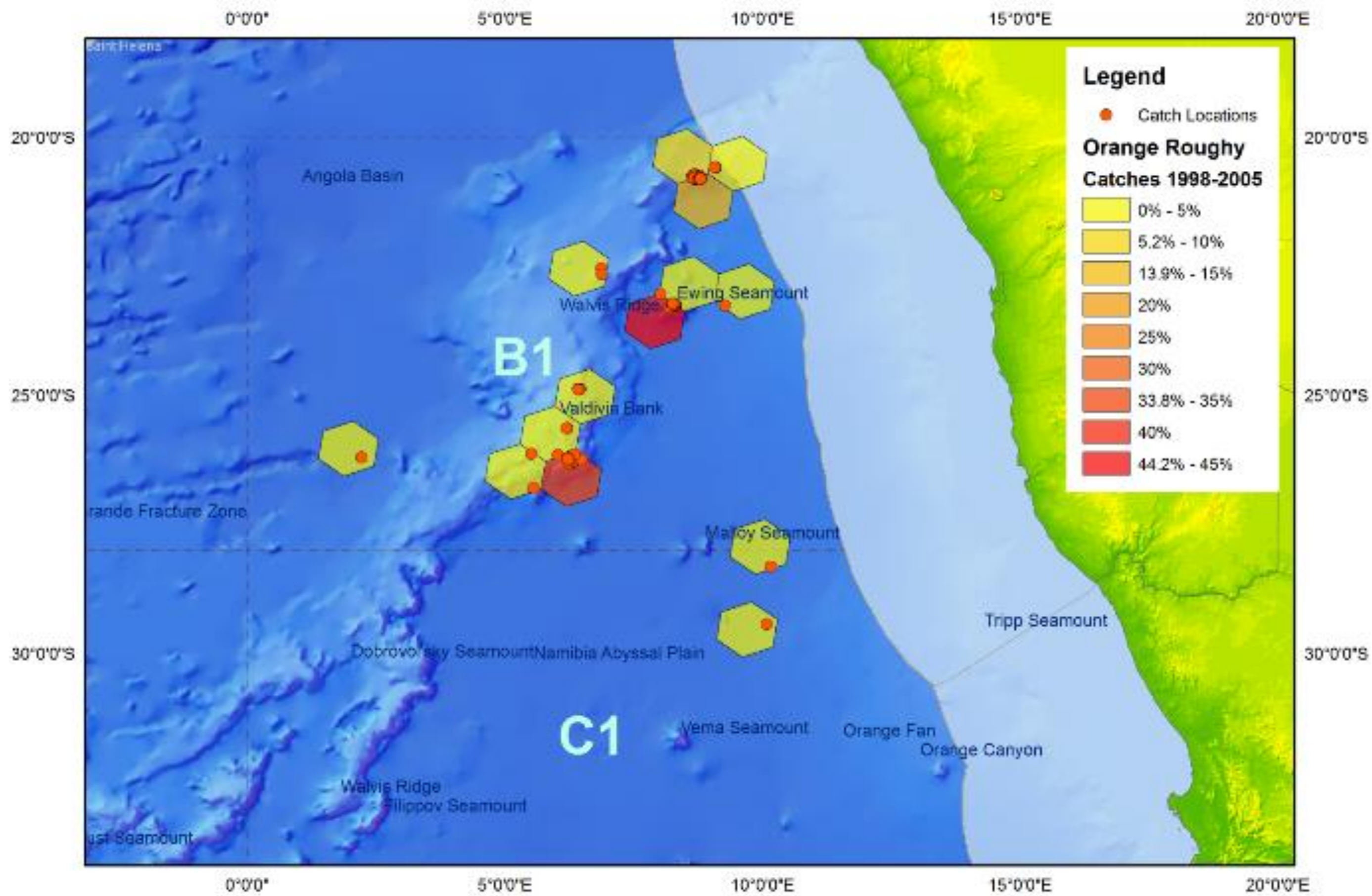


Figure 1: Geographical location of fishing activities in the SEAFO CA.

1.3 Reported retained catches and discards

For all the fishing grounds the home port is the same as the landing port, with Walvis Bay and Lüderitz the most important ports. All available landing information is presented in Table 2. However, the bulk of orange roughy catches were recorded within the Namibian EEZ (Table 3). A total of 1270 trawls were made landing about 290 tonnes of orange roughy.

Table 2: Catches of orange roughy in tonnes made by Namibia, Norway and RSA in the SEAFO CA

Nation	**Namibia**		**Norway**		**South Africa**	
Fishing method	**Bottom trawl**		**Bottom trawl**		**Bottom trawl**	
Management Area	**B1**		**A1**		**B1**	
Catch details (t)	**Retained**	**Discarded**	**Retained**	**Discarded**	**Retained**	**Discarded**
1995	40		N/F		1	
1996	8		N/F		0.04	
1997	5		22		27[#**]	
1998	N/F	N/F	12			
1999	<1		N/F	N/F		
2000	75		0			
2001	94		N/F	N/F		

2002	9		N/F	N/F		
2003	27		N/F	N/F		
2004	15		N/F	N/F		
2005	18		N/F	N/F		
2006	N/F	N/F	N/F	N/F		
2007	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	N/F	N/F
2014*	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F
2016	N/F	N/F	N/F	N/F	N/F	N/F

N/F = No Fishing. Blank fields = No data available.
* Provisional (Aug 2014)
** Sum of Catches from 1993 to 1997.
# Values taken from the Japp (1999).

Table 3: Orange roughy landings (tonnes) in SEAFO CA and Namibian EEZ

Year	**SEAFO CA**	**Namibian EEZ**
1994	N/F	1 872
1995	40	6 288
1996	8	17 381
1997	5	14 729
1998	N/F	10 040
1999	<1	2 699
2000	75	1 344
2001	94	874
2002	9	1 985
2003	27	1 730
2004	15	1 106
2005	18	297
2006	N/F	429
2007	N/F	288
2008	N/F	N/F
2009	N/F	N/F
2010	N/F	N/F
2011	N/F	N/F
2012	N/F	N/F
2013	N/F	N/F
2014	N/F	N/F
2015	N/F	N/F
2016	N/F	N/F

1.4 **Illegal, unreported and unregulated (IUU) catch**

IUU fishing activity in the SEAFO CA has been reported to the Secretariat latest in 2012, but the extent of IUU fishing is at present unknown.

Stock distribution and identity

Orange roughy (*Hoplostethus atlanticus*) is distributed globally (Fig. 3), but predominantly in the Southern Hemisphere. In the SE Atlantic orange roughy may most probably be regarded as a single stock (management unit). In the BCLME region the species occurs within the economic zones of each of the coastal states as well as in the SEAFO CA.

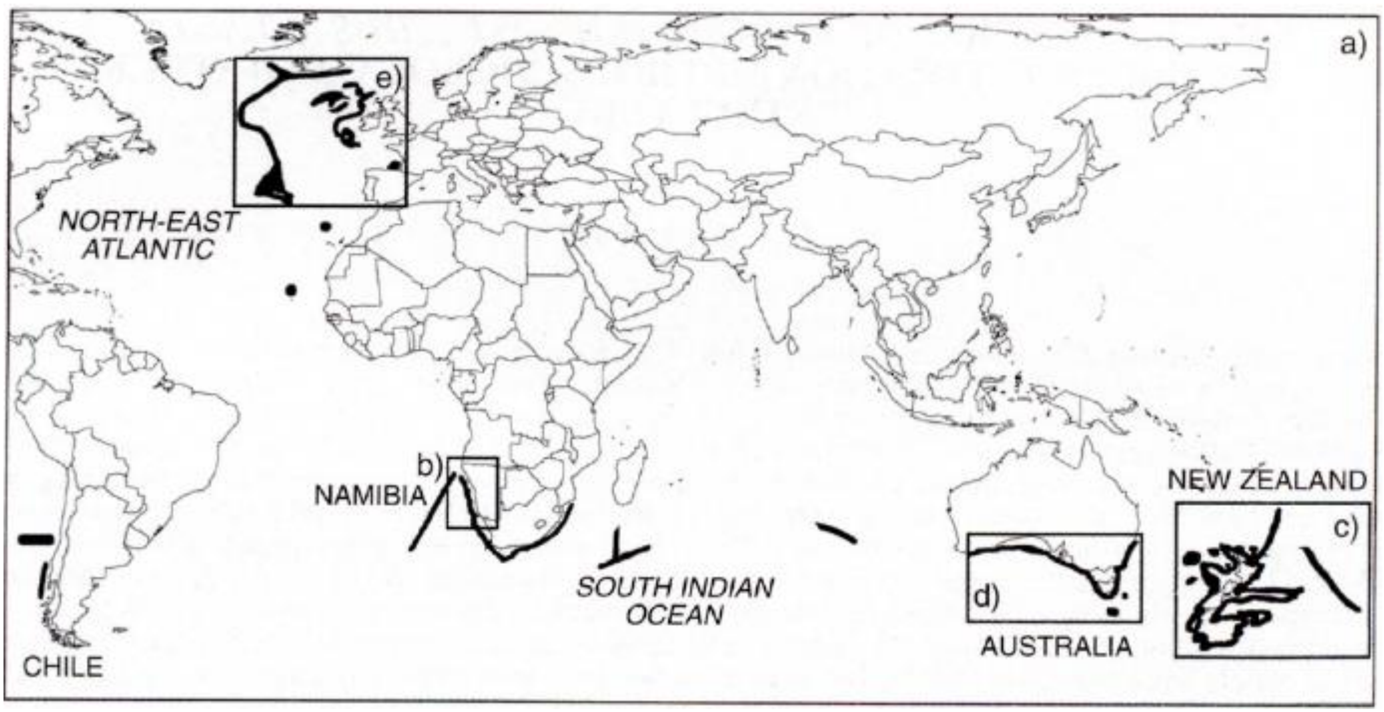


Figure 3: Global orange roughy distribution (Branch 2001).

The aggregating behaviour of orange roughy contributed to its vulnerability to overexploitation globally. Spawning aggregations of orange roughy have been targeted in Namibia during winter. Outside the spawning seasons catches were found to be lower due to a more dispersed resource. Orange roughy are also extremely slow-growing and estimates of maximum age are in excess of 100 years.

Recruitment to the fishery is poorly understood as juveniles are not found in significant quantities. Adults have been caught in small amounts in both Angolan and South African waters, but not in large spawning aggregations as in Namibia. Orange roughy distribution also extends beyond the economic zones of the BCLME countries with good catches reported for example on the Valdivia Bank on the South Atlantic Ridge as well as on the fringes of the Agulhas Bank and Walvis Ridge in the southern Benguela.

Data available for assessment, life history parameters and other population information

Fisheries and survey data

Catch records for the period 1995 to 2005 are available (see Table 2 above). The number of trawls made per year are depicted in table 4 and shows that more hauls were recorded in years when the catches were high.

Deep see fish surveys were conducted in the SEAFO CA by the Norwegian vessel, Dr Fridjof Nansen and by the Spanish vessel.

Table 4: Number of trawls observed per year

Year	Number of trawls
1995	20
1996	223
1997	188
1998	0
1999	16
2000	327
2001	295
2002	40
2003	63
2004	46
2005	61

Length data and frequencies distribution
No information available for SEAFO CA.

Length-weight relationships
No information available for SEAFO CA.

Age data and growth parameters
No information available for SEAFO CA.

Reproductive parameters
No information available for SEAFO CA.

Natural mortality
No information available for SEAFO CA.

Feeding and trophic relationships (including species interaction)
No information available for SEAFO CA.

Tagging and migration
No information available for SEAFO CA.

Stock assessment
Available abundance indices and estimates of biomass
The annual CPUE (total annual catch divided by number of trawls) are shown in figure 4. The CPUE was the highest in 1995 and thereafter decreased rapidly to reach the lowest CPUE in 1999. Since then the CPUE seems to have stabilized at a low level until 2005 after which there are no data. It has not been confirmed that this CPUE index reflects stock abundance for a highly aggregating species like orange roughy.

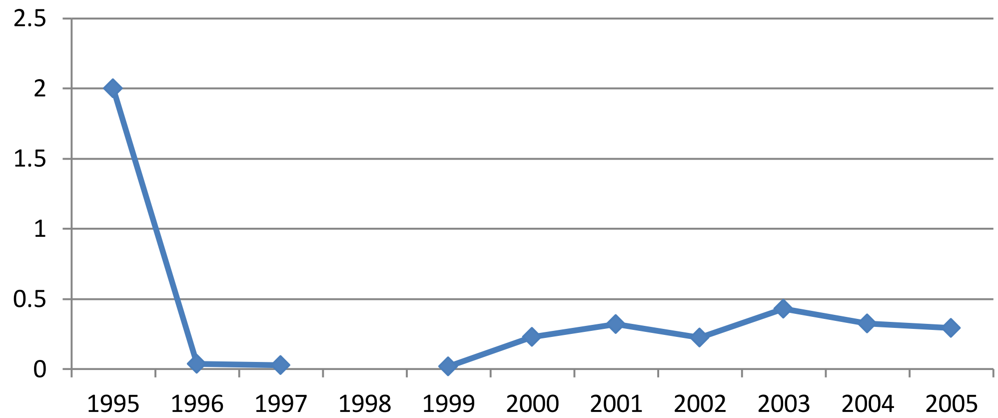


Figure 4: CPUE of orange roughy in tonnes per trawl in Division B1 (SEAFO SC Report 2006).

Data used
No data since 2005 available.

Methods used
No data since 2005 available.

Conclusion
Since there has been no fishery in recent years or no other fishery independent data available within the SEAFO CA, no assessment can be done at the moment.

Biological reference points and harvest control rules
No biological reference points and/or harvest control rules have been established for this stock as yet.

Incidental mortality and bycatch of fish and invertebrates
Incidental and bycatch statistics (seabirds, mammals and turtles)
No information available for the SEAFO CA.

Fish bycatch
Some of the bycatch species recorded are: Alfonsino (*Beryx splendens*), Black Oreo Dory (*Allocyttus niger*), Pelagic armourhead (*Pseudopentaceros richardsoni*), Black Cardinal fish (*Epigonus telescopus*), Smooth Oreo Dory (*Pseudocyttus maculatus*), Warty Oreo Dory (*Allocyttus verrucosus*) and various deep sea shark species.

Invertebrate bycatch including VME taxa
No information available for the SEAFO CA.

Incidental mortality and bycatch mitigation methods
No information available for the SEAFO CA.

Lost and abandoned gear
No lost and abandoned gear data was reported for orange roughy fishery in the SEAFO CA.

Ecosystem implications and effects
No Information available for the SEAFO CA

Current conservation measures and management advice

Current conservation measures

The 2016 management measure pertaining to orange roughy in the SEAFO CA (CM 31/15) has zero tonnes (moratorium on directed fishery) and a 4 tonnes bycatch allowance in Division B1, and 50 tonnes in the remainder of the SEAFO CA;

Table 5: Conservation measure relevant to orange roughy fishery

Conservation Measure 04/06	On the Conservation of Sharks Caught in Association with Fisheries Managed by SEAFO
Conservation Measure 14/09	To Reduce Sea Turtle Mortality in SEAFO Fishing Operations.
Conservation Measure 25/12	On Reducing Incidental Bycatch of Seabirds in the SEAFO Convention Area
Conservation Measure 30/15	On the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area
Conservation Measure 31/15	On Total Allowable Catches and related conditions for Patagonian Toothfish, orange roughy, Alfonsino and Deep-Sea Red Crab in the SEAFO Convention Area in 2014

Management advice

SC considered available data on orange roughy since the inception of the fisheries in SEAFO CA.

There is no fishery data available since 2005 for orange roughy within the SEAFO CA, as a result SC cannot conduct stock assessment of the orange roughy stock within the Convention Area.

SC recommends a moratorium for 2017 and 2018 on directed fishery in Division B1 and allowance for bycatch limit as proportion (10%) of the average of landings from the last five years with positive catches (i.e. 2001-2005), equivalent to 4 tonnes.

The SC did not consider the allowance of a 50 tonnes TAC in the remainder of the area and cannot review the current status quo, due to a lack of new information.

A harvest control rule shall be developed for orange roughy in the future as data becomes available.

References

Boyer, D.C., Kirchner, C.H., McAllister, M.K., Staby, A. & Staalesen, B.I. (2001). The orange roughy Fishery of Namibia: Lessons to be learned about managing a developing Fishery. *South African Journal of Marine Science*, 23, 205-221.

Branch, T.A. (2001). A Review of Orange roughy *(Hoplostethus atlanticus)* Fisheries, Estimation Methods, Biology and Stock Structure. Payne, A. I. L., S. C. Pillar & R. J. M. Crawford, eds. *A Decade of Namibian Fisheries Science. South African Journal of Marine Science*. 23:181 - 203.

Anon, 2010. Social economic studies. Deepfishman. Case Study 1A Report. Namibian Orange roughy. Instiute of Ecomics Studies. University of Iceland.

Anon, 2011. Capricon Fisheries Monitoring. State of Stock Review Report No. 2. In: Japp D.W., M. G. Purves and S. Wilkinson, *Status of the Fishery Resources in the Benguela Current Large Marine Ecosystem*. Cape Town.

Anon, 2008. Ministry of Fisheries and Marine Resources. State of the Resource TAC recommendations report; orange roughy. Namibia

APPENDIX VIII **– Stock Status Report – Deep-sea Red crab**

STATUS REPORT

Chaceon erytheiae

Common Name: Deep-sea red crab

FAO-ASFIS Code: GER

2016
Updated 14 October 2016

TABLE OF CONTENTS

1. Description of the fishery

1.1 Description of fishing vessels and fishing gear

There was no fishery in 2016, hence no new catch or effort data are available. In 2015 only one Korean flagged vessel fished deep-sea red crab (DSRC) in the SEAFO CA. The gear setup (set deployment & design) were very similar and known as Japanese beehive pots (Fig. 1). The beehive pots are conical metal frames covered in fishing net with an inlet shoot (trap entrance – Fig. 1) on the upper side of the structure and a catch retention bag on its underside. When settled on the seabed the upper side of the trap are roughly 50cm above the ground ensuring easy access to the entrance of the trap. The trap entrance leads to the kitchen area of the trap – which is sealed off by a plastic shoot that ensures all crabs end up in the bottom of the trap.

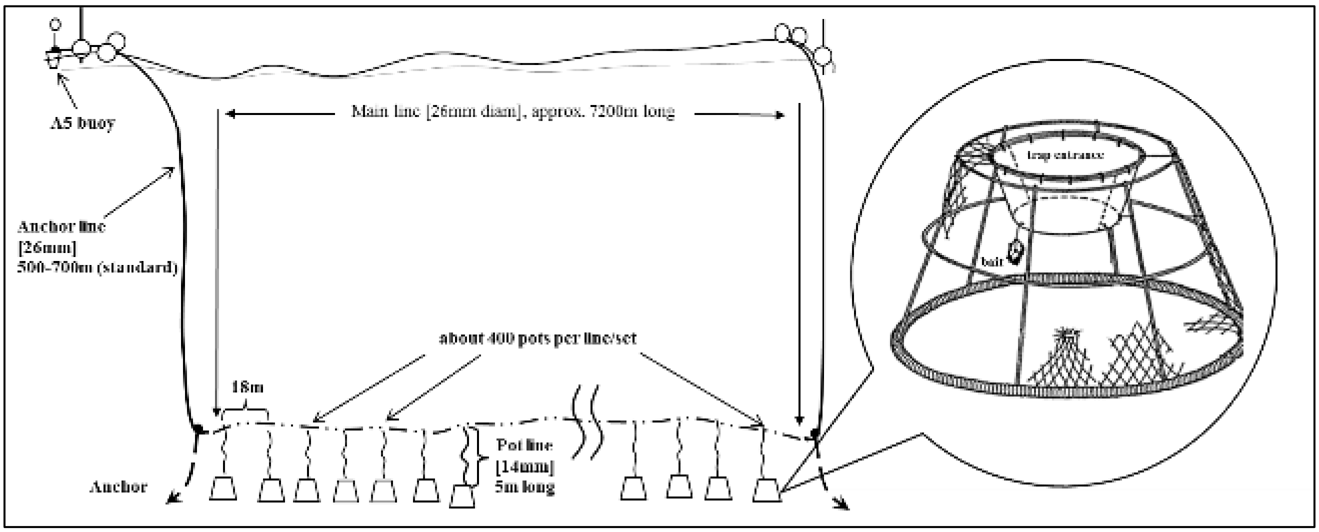


Figure 1: Deep-sea red crab fishing gear setup (set deployment and design) and illustration of a Japanese beehive pot (shown in enlarged form on the right).

One set or pot line consists of about 200-400 beehive pots, spaced roughly 18m apart, on a float line attached to two (start & end) anchors for keeping the gear in place on the seabed (Fig. 1). The start & end points of a set are clearly marked on the surface of the water with floats and one A5 buoy that denotes the start of a line. Under this setup (i.e. 400pots at 18m intervals) one crab fishing line covers a distance of roughly 7.2km (3.9nm) on the sea floor and sea surface.

1.2 Spatial and temporal distribution of fishing

In the SEAFO Convention Area fishing for deep-sea red crab has traditionally been focussed mainly on *Chaceon erytheiae* on Valdivia seamount complex – a fairly extensive sub-area of the Walvis Ridge (Fig. 2-7). This fishing area is located in Division B1 of the SEAFO CA and has been the main fishing area of the crab fishery since 2005 when the resource was accessed by Japan. Records from the SEAFO database indicate that fishing for crab in this area occurred over a depth range of 280-1150m.

Table 1: The total number of sets from which deep-sea red crab catches were derived for the period 2010-2015.

2010	2011	2012	2013	2014	2015
181	133	129	103	107	73

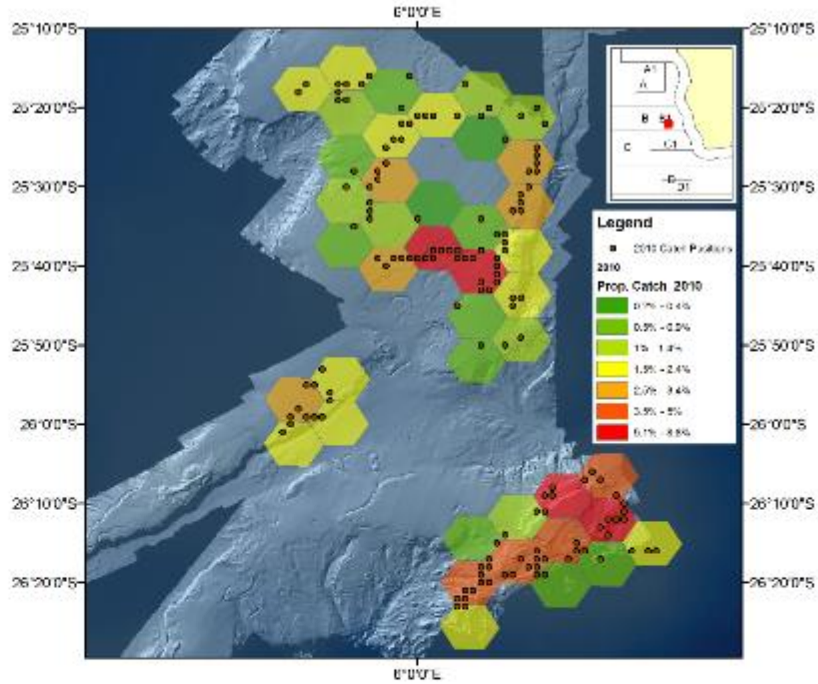


Figure 2: The 2010 catch distributions for deep-sea red crab in Division B1 aggregated to a 10 km^2 hexagonal area.

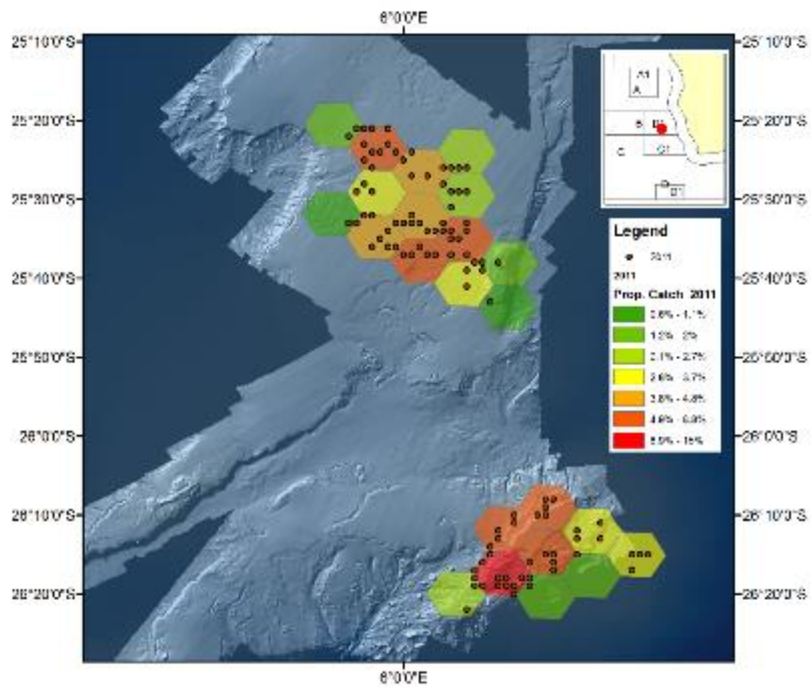


Figure 3: The 2011 catch distributions for deep-sea red crab in Division B1 aggregated to a 10 km^2 hexagonal area.

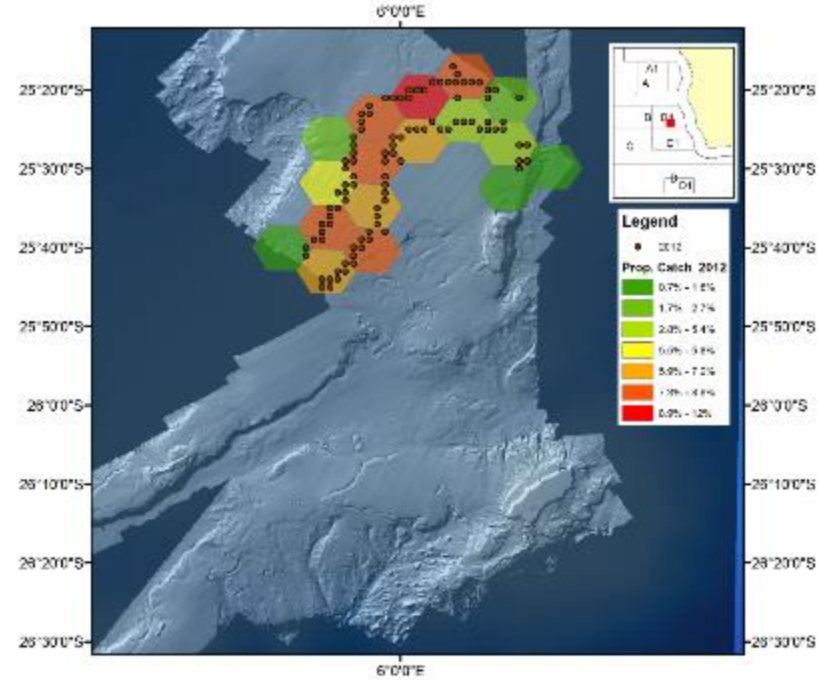


Figure 4: The 2012 catch distributions for deep-sea red crab in Division B1 aggregated to a 10 km^2 hexagonal area.

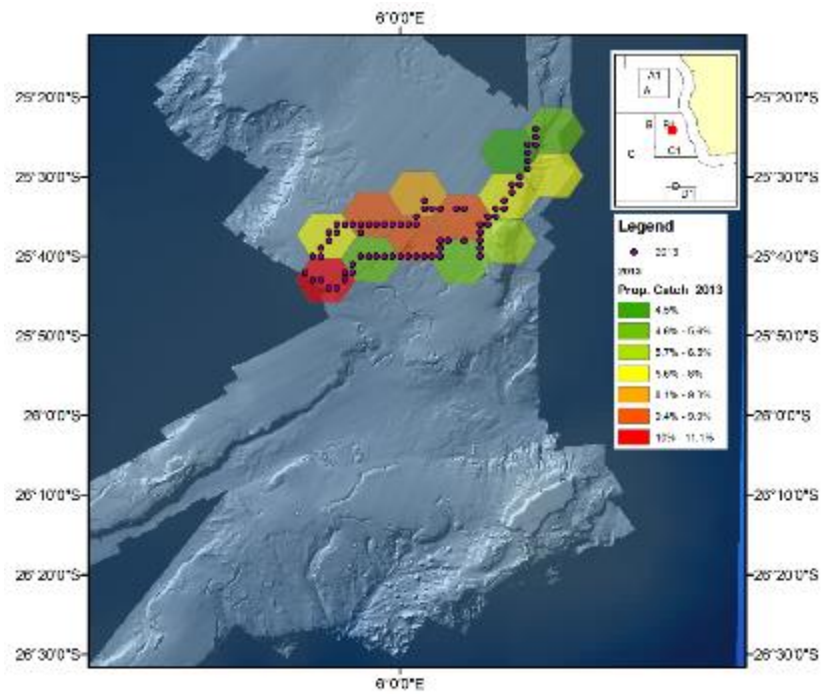


Figure 5: The 2013 catch distributions for deep-sea red crab in Division B1 aggregated to a 10 km^2 hexagonal area.

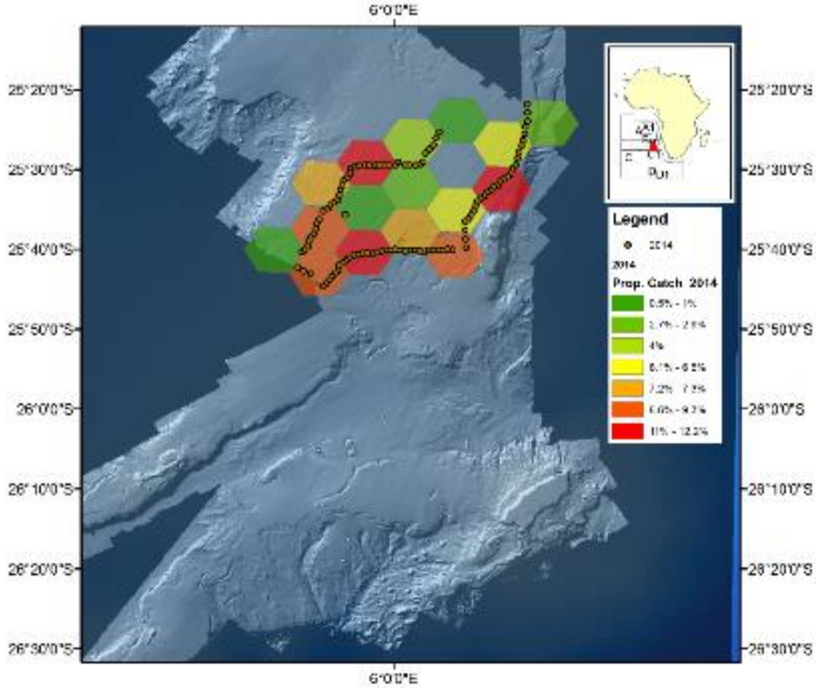


Figure 6: The 2014 catch distributions for deep-sea red crab in Division B1 aggregated to a 10 km^2 hexagonal area.

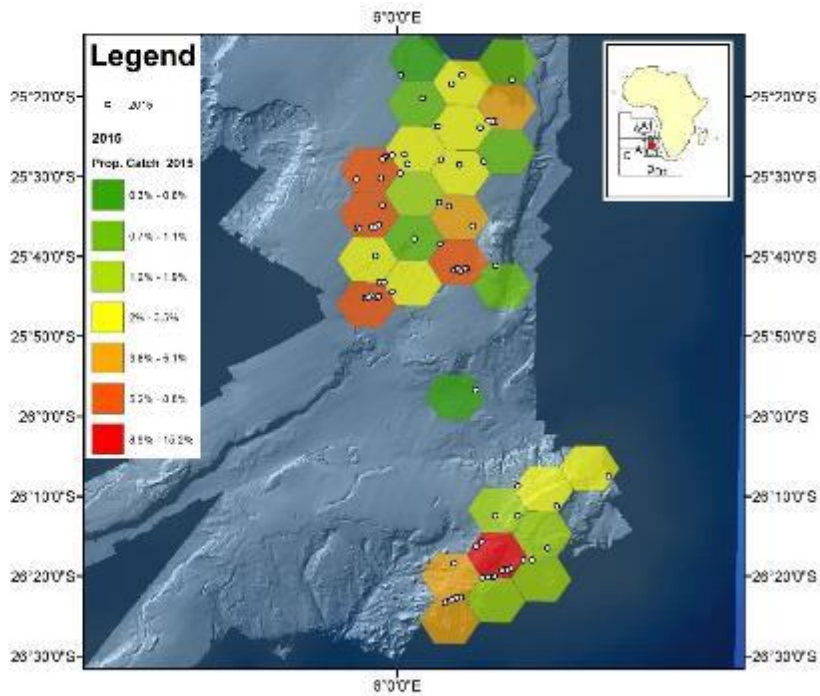


Figure 7: The 2015 catch distributions for deep-sea red crab in Division B1 aggregated to a 10 km^2 hexagonal area.

1.3 Reported landings and discards

In 2015 only a Korean vessel reported landings and in 2016 there was no fishing. Reported landings (Table 2) comprise catches made by Japanese, Namibian, Spanish, Portuguese and Korean-flagged vessels over the period 2001-2015. As is evident from Table 2, the two main players in the SEAFO crab fishery were Japan and Namibia, respectively, with Spanish and Portuguese vessels having only sporadically fished for crab in the SEAFO CA over the period 2003 to 2007. Spanish-flagged vessels actively fished for crab in the SEAFO

CA during 2003 and 2004, whereas Portuguese-flagged vessels only fished for crab once during the 2007 season (Table 2).

Table 2: Catches (tonnes) of deep-sea red crab (*Chaceon spp.* – considered to be mostly *Chaceon erytheiae*).

Nation	**Japan**		**Korea**		**Namibia**		**Spain**		**Portugal**	
Fishing method	**Pots**		**Pots**		**Pots**		**Pots**		**Pots**	
Management Area	**B1**		**B1**		**B1**		**UNK**		**A**	
Catch details (t)	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**	**Ret.**	**Disc.**
2001			N/F	N/F			<1			
2002			N/F	N/F						
2003			N/F	N/F			5			
2004			N/F	N/F			24			
2005	253	0	N/F	N/F	54					
2006	389		N/F	N/F						
2007	770		N/F	N/F	3	0			35	
2008	39		N/F	N/F						
2009	196		N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2010	200	0	N/F	N/F			N/F			
2011	N/F	N/F	N/F	N/F	175	0	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	198	0	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	196	0	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	135	0	N/F	N/F	N/F	N/F
2015	N/F	N/F	104	0	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

[*] Provisional (September 2016) Ret. = Retained Disc. = Discarded
N/F = No Fishing.
Blank fields = No data available.
UNK = Unknown.

Being a pot fishery, the deep-sea red crab fishery has an almost negligible bycatch impact. To date only 5kg of teleost fish discards have been recorded, during 2010, from this fishery. As of 2010, however, minimal to moderate bycatches of king crabs have also been recorded from this fishery (see Section 5.3 for additional information).

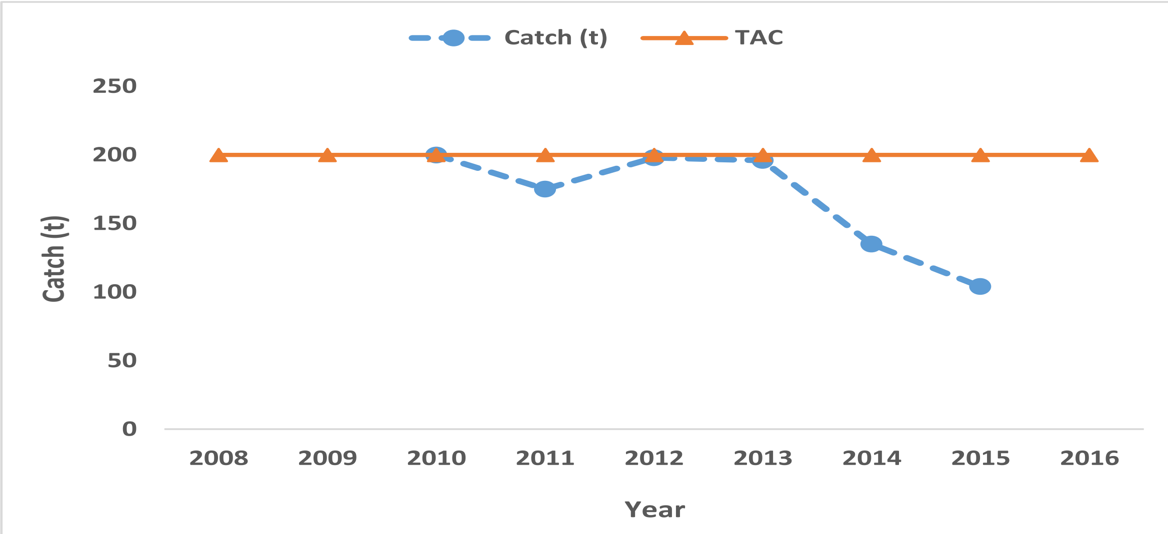


Figure 8: Annual catches in relation to TAC for Deep-Sea Red Crab in Division B1. No catches were taken elsewhere in the SEAFO CA.

1.4 IUU catch

IUU fishing activity in the SEAFO CA has been reported to the Secretariat latest in 2012, after which no IUU fishing was reported.

2. Stock distribution and identity

One species of deep-sea red crab has been recorded in Division B1, namely *Chaceon erytheiae* (López-Abellán *et al*. 2008), and is thus considered the target species of this fishery. Aside from the areas recorded in catch records the overall distribution of *Chaceon erytheiae* within the SEAFO CA is still unknown. Further encounter records documented through video footage during the 2015 FAO-Nansen VME survey (FAO, 2016) in the SEAFO CA indicate that deep-sea red crab are distributed across a major part of the Valdivia seamount range, as well as the Ewing and Vema seamounts (DOC/SC/22/2015).

Preliminary results from genetics studies, based on Mitochondrial DNA, indicate that the deep-sea red crab targeted by the pot fishery on the Valdivia Bank is confirmed as *C. erytheiae* (López-Abellán *pers. comm.*).

3. Data available for assessments, life history parameters and other population information

3.1 Fisheries and surveys data

Fishery-dependent data exist only for more recent years (2010-2015) of the SEAFO deep-sea red crab fishery (Fig. 8). Samples were collected from the fishery (Table 3). Data collected comprise gender-specific length-frequency, weight-at-length, female maturity and berry state data.

Table3: Illustration of sampling frequencies (2010-2015) from the deep-sea red crab commercial fleet within the SEAFO CA.

	2010	2011	2012	2013	2014	2015
Total Number of Sets	181	133	120	103	107	74
Crabs Sampled per Set	30	30	30	30	100	136
Total Crabs Sampled	5430	3990	3600	3077	10654	32500

Very limited fisheries-independent data on deep-sea red crabs exists for the SEAFO CA. A total of 479 deep-sea red crabs were sampled during the 2008 Spanish-Namibia survey on Valdivia Bank. The data was collected over a depth range of 867-1660m. Additionally 127 deep-sea red crab samples were collected onboard the *RV Fridtjof Nansen* (FAO, 2016) during the SEAFO VME mapping survey conducted at the start of 2015.

3.2 Length data and frequency distribution

Available length-frequency data for crabs caught in the SEAFO CA over the period 2010-2015 are presented in Figure 9. Length-frequency data from all areas sampled in Division B1 were pooled as no significant differences were detected between areas.

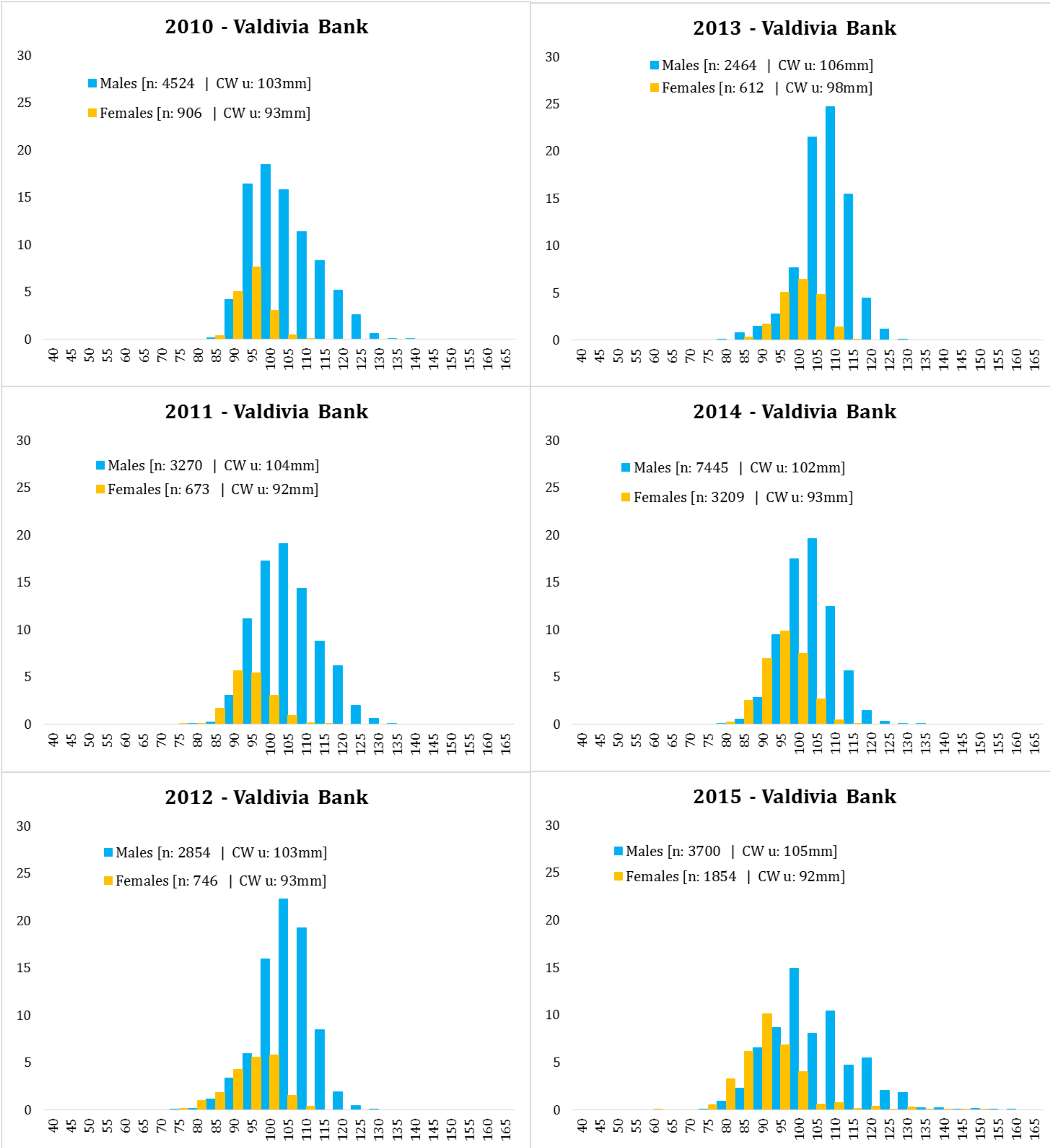


Figure 9: Carapace width (mm) frequencies (in percentages) of crabs sampled from commercial catches [2010-2015]. Notes: “n” refers to sample size; “u” refers to the carapace width arithmetic mean for each sample as indicated.

For the period 2010-2014 there have been no significant changes in the female crab size distribution (Fig. 9. The male crab size distribution changed from a wider size distribution in 2010 and 2011, where larger male crabs were recorded, to a slightly narrowed size distribution in 2012-2014 of smaller crabs. During 2015 a lot more female crabs larger than 110mm were recorded than any preceding years since 2010 (Fig. 9). Sex ratio from crab commercial samples fluctuated around 4:1 in favour of male crabs – a well-known bias of the commercial traps used in this fishery.

3.3 *Length-weight relationships*

Length-weight relationship derived from catches on Valdivia Bank reveal the length-weight disparity (Fig. 10). Male crabs attain much larger sizes than female crabs. This species attribute, however, is not unique to *Chaceon erytheiae* and has been recorded for other crab species in the *Chaceon* genus (Le Roux 1997). Data from the 2008 survey show a much more coherent length-weight relation for both male and female crabs (Fig. 11).

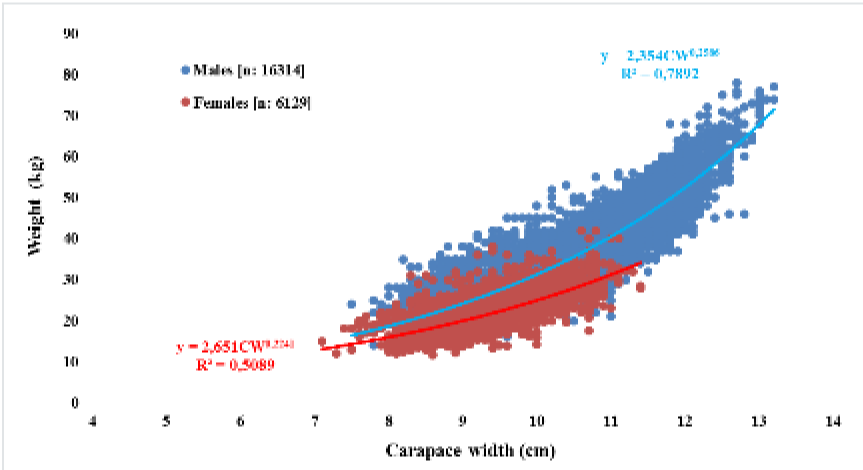


Figure 10: Length-at-weight data for *Chaceon erytheiae* as recorded from catches on Valdivia Bank (2008-2015). Red text show female length-weight relationship, blue text show male length-weight relationship.

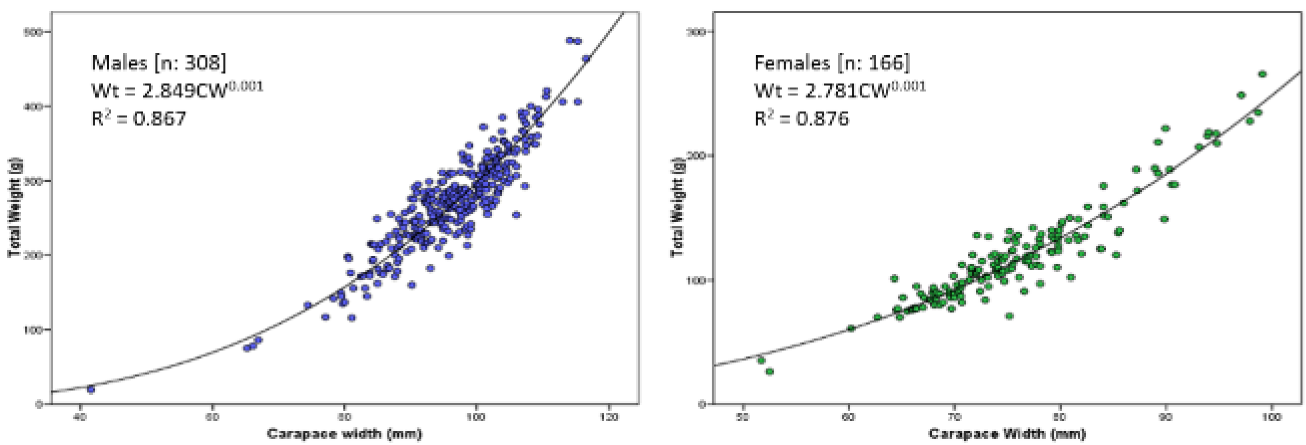


Figure 11: Length-at-weight data for *Chaceon erytheiae* as recorded from the 2008 Spain-Namibia survey (López-Abellán *et al*. 2008).

3.4 *Age data and growth parameters*

No information exists on the age and growth attributes of *Chaceon erytheiae*.

3.5 *Reproductive parameters*

Very limited reproductive data exist for Chaceon erytheiae from commercial samples. This dataset constitute female maturity and berry data collected during 2010-2015. However, the mating and spawning seasons for C. erytheiae within the SEAFO CA are still unknown.

3.6 *Natural mortality*

No natural mortality data exist for *Chaceon erytheiae*.

3.7 *Feeding and trophic relationships (including species interaction)*

No data exist for *Chaceon erytheiae*.

3.8 *Tagging and migration*

No data on migration exist for *Chaceon erytheiae* in the SEAFO CA.

4. Stock assessment status

Since there has been no fishing or sampling in 2016, and the time series of data has now been interrupted, the SC could not update the stock status. The following text section 4.1 - 4.7 is the same as provided in 2015.

4.1 *Available abundance indices and estimates of biomass*

Currently the only data available for the assessment for *C. erytheiae* abundance within the SEAFO CA are the catch and effort data from which a limited catch-per-unit effort (CPUE) series from 2005-2015 can be constructed.

4.2 *Data used*

The available SEAFO data (2005-2015) for purposes of considering possible assessment strategies are presented in Table 4.

Table 4: Description of the entire deep-sea red crab database highlighting important datasets.

Year	Flag State	Data Type - Source	Brief Description [NB Data Groups only]
2005	JPN	Catch Data – Observer Report	Set-by-Set data (vessel ID, set-haul positions & dates), Depth, Catch, Effort - (157 records).
2007	NAM	Catch Data – Observer Report	Set-by-Set data (vessel ID, set-haul positions & dates), Depth, Catch, Effort - (10 records - sets).
2010	JPN	Catch & Biological Data – Observer Report	Set data (vessel ID, set-haul positions & dates), Depth, Length, Weight, Catch, Effort - (Catch: 181 records, Biological: 5430 records).
2011	NAM	Catch & Biol. Data – Observer Report	Set-by-Set data (vessel ID, set-haul positions & dates), Depth, Length, Weight, Catch, Effort - (Catch: 133 records, Biological: 3990 records).
2012	NAM	Catch & Biol. Data – Obs. Report & Captain’s Logbook [log sheet data]	Set-by-Set data (vessel ID, set-haul positions & dates), Depth, Length, Weight, Catch, Effort - (Catch: 129 records, Biological: 3600 records).
2013	NAM	Catch Data – Captain’s Logbook [log sheet data]	Set-by-Set data (vessel ID, set-haul positions & dates), Depth, Catch, Effort - (Catch: 103 records, Biological: 3090 records).
2014	NAM	Catch Data – Captain’s Logbook [log sheet data]	Set-by-Set data (vessel ID, set-haul positions and dates), Depth, Length, Weight, Catch, Effort – (Catch: 107 records, Biological: 10660 records)
2015	KOR	Catch Data – Fishing Logbook data	Set-by-Set data (vessel ID, set-haul positions and dates), Depth, Length, Weight, Catch, Effort – (Catch: 73 records, Biological: 5554 records)

4.3 Methods used

CPUE Standardization:

As part of the annual updating of the deep-sea red crab abundance index another attempt was made during 2015 at standardizing the CPUE index. With the agreement made in 2014 to use all available catch and effort data in the CPUE model, a problem was encountered with the soak time data recorded during 2015. Prior to 2015 the duration of time for which baited crab pots were left in the water during fishing operations (i.e. soaking time of baited crab pots), ranged between 11.7 and 99.5 hours with a mean of 25.1 hours (Table 5). However, during 2015 the soak time of baited traps during fishing operations changed drastically to a range of 93.7 and 233.5 hours with a mean of 120.8 hours. Out of the 73 sets recorded for 2015 only one set had a soak time of 93.5 hours, while 88% of the sets had soak times ranging between 100 and 117 hours; and the remaining 11% recorded soak times greater than 200 hours. This increase in the soak time during 2015 greatly reduces the annual CPUE when compared with other years as illustrated in Figure 12.

Table5: Comparison of "Soak Time" in hours as reported from the deep-sea red crab fishery for the period 2010 to 2015.

	2010-2014	2015
Minimum	11.7	93.7
1st Quantile	22.3	105.0
Median	23.0	108.3
Mean	25.1	120.8
3rd Quantile	23.6	113.5
Maximum	99.5	233.5

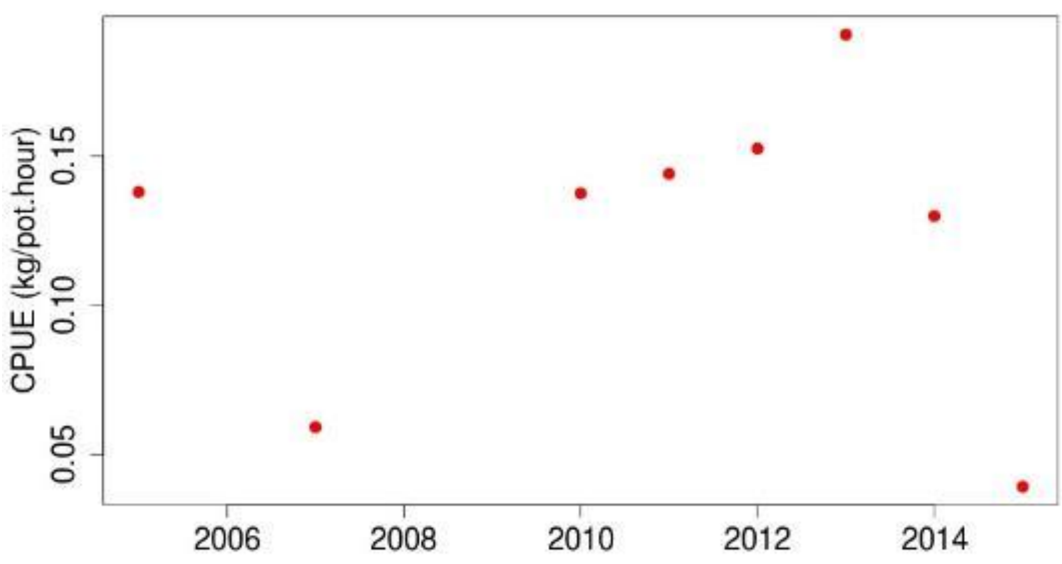


Figure 12: Nominal CPUE (base on "Soak Time") from the SEAFO deep-sea red fishery for the period 2005 to 2015.

To solve this problem one option would be to keep the range of soak times the same as that recorded during the pre-2015 years, which means removing all sets with soak times greater than 100 hours from the 2015 dataset. This option, however, was not feasible as it would mean removing 99% of the 2015 CPUE data – since all but one set had a soak time less than 100 hours. The second option was to define a normal distribution of soak times on the average soak time for which bait used in the fishery remains viable (i.e. the average amount of time bait remains in the trap before being consumed and/or disintegrating). From other crustacean fisheries it is known that bait usually only last for roughly 24 hours, and thus the defined soak time distribution would be similar to that recorded from the SEAFO crab fishery during the pre-2015 years. The final option was to exclude soak time from the calculation of CPUE, and to only consider the number of pots used during fishing operations. This was the approach used during the 2015 standardization of the annual CPUE from the SEAFO deep-sea red crab fishery.

Table 6: Description of the sets for which catch and effort data are available for the CPUE standardization.

2005	2007	2010	2011	2012	2013	2014	2015
157	10	181	133	129	103	107	73

The records from 2007 were excluded from the analysis as they were derived from an area not exploited in the remaining years and, constituting only 10 sets, were not comparable to datasets from the rest of the data series.

The following variables from each record were considered in the model:

- Year - A 12-month period – explanatory variable (covariate).
- Semester - A calendar semester in a fishing year – explanatory variable (covariate).
- VesselID - Identification code for a participating vessel – explanatory variable (covariate).
- Zone - Identification code for a fishing area – explanatory variable (covariate). Co-ordinates where categorized into three smaller fishing zones reflecting the fishing records within Division B1.
- Depth - Fishing depth – explanatory variable (covariate). Depth was categorized into 50 metre intervals covering the entire range of depths recorded by the fishery.
- Pots - The number of baited pots used per set during fishing operations – explanatory variable (co-variate).
- CPUE - Catch/number of pots – response variable.

4.4 Results

Results from the CPUE standardization are presented below to illustrate some of the more important outputs and methods applied.

The maximum set of model parameters offered to the stepwise selection procedure was:

$$CPUE = \beta_0 + \beta_1 \text{ Year} + \beta_2 \text{ VesselID} + \beta_3 \text{ Depth} + \beta_4 \text{ Zone} + \beta_5 \text{ Semester} + \beta_6 \text{Pots} + \varepsilon$$

A stepwise backward model selection procedure was deployed in selecting the covariates, to the model. The model with lowest Akaike value (AIC - Akaike Information Criterion) was selected as the best model, since it has a better predictive power. The best model (outlined below) was then used for further analysis.

$$CPUE = \beta_0 + \beta_1 \text{ Year} + \beta_3 \text{ Depth} + \beta_4 \text{ Zone} + \beta_5 \text{ Semester} + \beta_6 \text{Pots} + \varepsilon$$

Table 7 presents the estimates of the coefficients, standard error and *t* values for different levels of the factors entered into the selected model. Model, covariate year, depth, semester and pots are very significant with p-values of $2.2*10^{-16}$, $1.546*10^{-9}$,$4.831*10^{-4}$and $4.138*10^{-8}$indicating strong covariance with deep-sea red crab catch rates. Zone, as a covariate, was also significant but to a lesser degree than the aforementioned variables.

Table 7: ANOVA results for the CPUE model.

Covariates	Df	Deviance	Residual Df	Residual Deviance	Pr(>Chi)
NULL			859	913.42	

Year	6	277.864	853	635.56	< 2.2e-16 ***
Depth	16	48.552	837	587.01	1.546e-09 ***
Zone	2	3.980	835	587.03	0.0470093 *
as.factor(SEMESTER)	1	7.928	834	575.10	0.0004831 ***
Pots	15	42.000	819	533.10	4.138e-08 ***

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

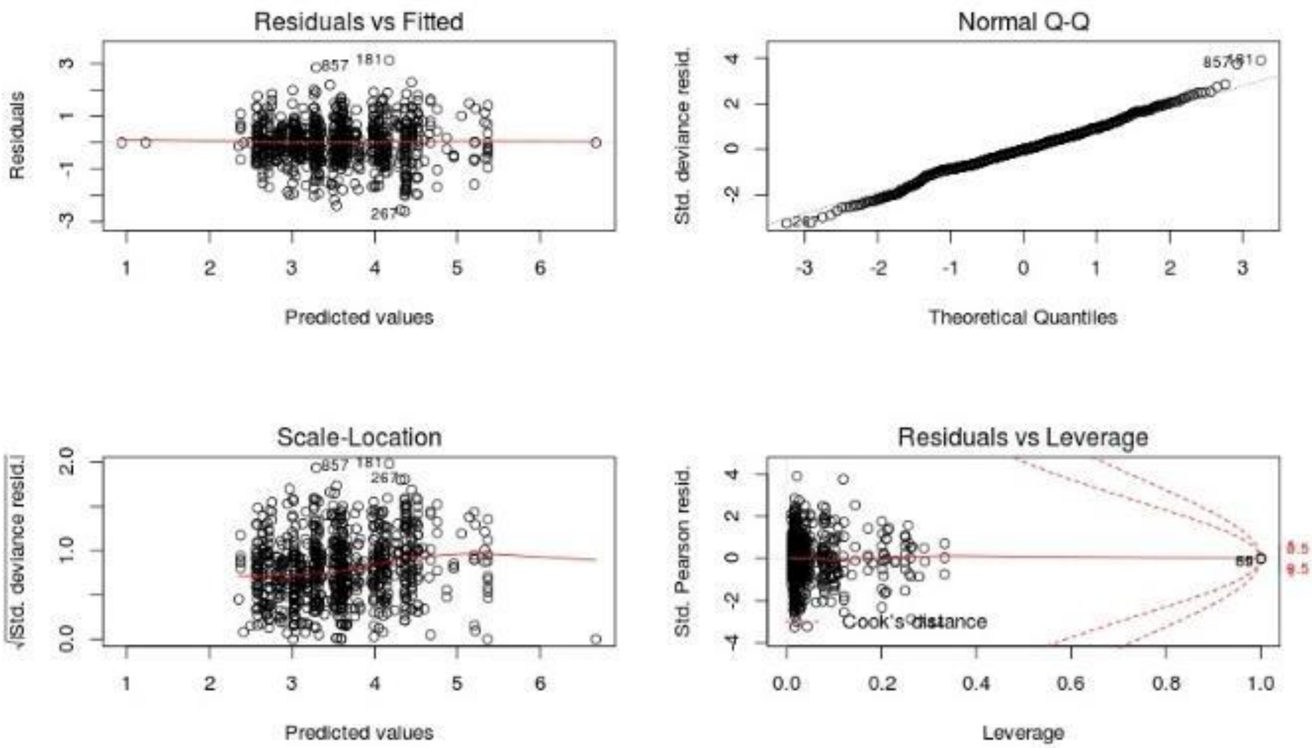


Figure 13: QQ and studentized residual plots of the best lognormal fit model for retained catch CPUE (kg/pot).

Model diagnostics of the best model were assessed. This involved checking for normality of the residuals and the spread of the residuals across the fitted values. A total of 23 outliers were removed (out of a total of 883 data points – i.e. outliers removed equates to 2.7% of entire dataset) on the basis of residual skewness and Cook’s Distance disparity. After the removal of the outliers diagnostic plots revealed improve distributions thus indicating that model assumptions were not violated. QQplots of the residuals indicated that the model residuals were well within the excepted limits for data skewness (Fig. 13). Plots of the residuals versus fitted values indicated evenly distributed data points, no overridingly skewed patterns in the plot (Fig. 13). Therefore there is no evidence of non-constant error variance in the residual plot and independence assumption also appeared reasonable.

Results from the standardized CPUE exercise suggest that CPUE has fluctuated over a moderate range (of 0.248 and 5.108) during the period 2005 to 2015. However, the confidence margins are fairly wide for the main part of the CPUE series – which indicates that the CPUE hasn’t change significantly over the period 2011-2015, with the exception of 2010 and 2014 undoubtedly (Fig. 14).

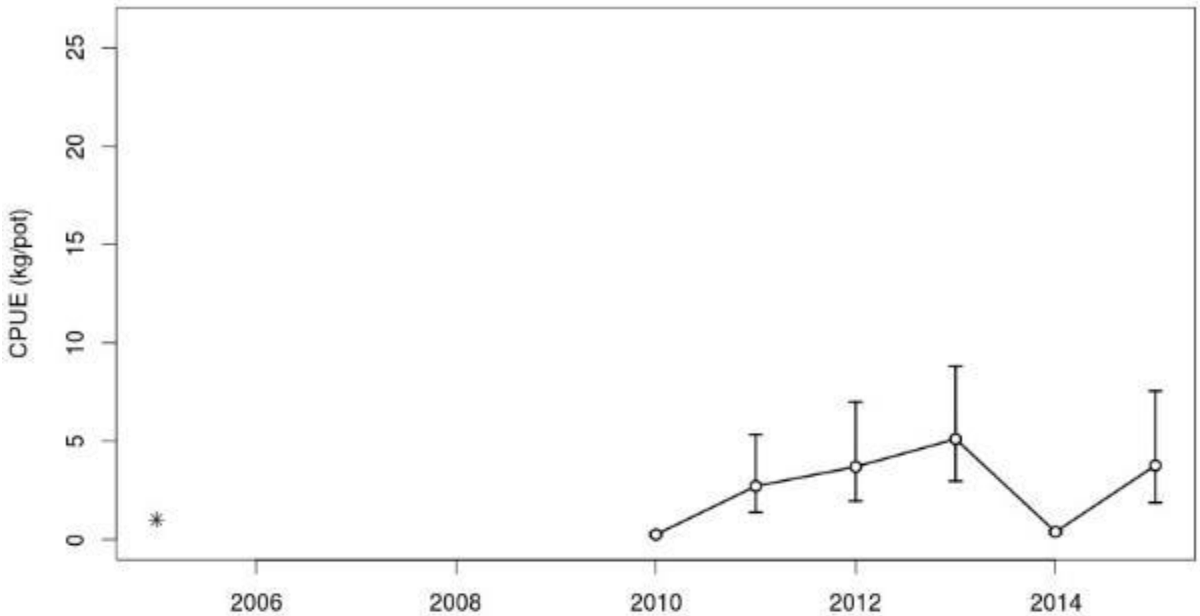


Figure 14: Trends in catch CPUE indexes for catches per pot-hour of crabs – with soak time as a categorical variable (factor). Standardized Index: black line with standard deviation (error bars).

4.5 Discussion

In light of new catch and effort data received from the deep-sea red crab fishery in 2015 another run on the standardization of crab CPUE series was conducted in 2015. In contrast to the CPUE standardization of 2014, soak time was not considered as a predictive variable or covariate in the GLM implemented during 2015. The reason for this were twofold:- firstly, the soak times recorded for the 2015 crab fishing operations were far in excess of those calculated for years prior to 2015; and secondly, there doesn't seem to be any correlation between the viability of bait and catch rates in the crab fishery that would necessitate the inclusion of soak time as a predictive variable in the CPUE standardization. For these reasons the CPUE calculated in 2015 for the crab fishery is referenced as "Kg/Pot" and not "Kg/Pot Hour" as was the case in 2014. The CPUE standardization revealed that, although the data series is very short, there was no severe changes in the CPUE trend since 2010 and that it is well within range of the 2005 CPUE.

In 2014 an exploratory Length Cohort Analysis (LCA) was conducted, and was found to be inconclusive but nevertheless indicated that the SEAFO deep-sea red crab resource is not in any risk of over-exploitation. This exploratory exercise was not repeated in 2015.

SC also noted that sampling on deep-sea red crab is quite good, but not all valuable data are available hence it is affecting our choice of an assessment method.

SC discussed in 2014 the possibility of applying the harvest rule and it was decided that the Greenland Halibut harvest control rule used in NAFO may be the most appropriate option for deep-sea red crab. This was adopted by the Commission in 2014.

In 2014 only near 50% of the TAC was caught. The reason for this is unknown to the SC.

4.6 Conclusion

The biological data series obtained from the SEAFO deep-sea red crab fishery, although short, is of relatively good quality. Nevertheless, important data such as growth parameter for the *C. erytheiae* stock, which will enhance the cohort analyses of the resource, was not available for the SEAFO CA and emphasis needs to be given in collecting this data for future assessments.

4.7 Biological reference points and harvest control rules

At this point in time it should be noted that no biological reference points exist for this stock in the SEAFO CA.

However, it is worthwhile to note that the *C. erytheiae* stock, based on the grounds of it being a long-lived and relatively stable stock, is a good candidate for an empirical Harvest Control Rule (HCR) similar to that applied to the Greenland halibut stock by the North Atlantic Fisheries Organization (NAFO). This is a simple HCR that merely considers that slope of an abundance index such as the CPUE and applies a catch limit to future years based in the current year's TAC. The concept is as follows:

$$TAC_{y+1} = \begin{cases} TAC_y \times \left(1 + \lambda_u \times slope\right) & if \quad slope \geq 0 \quad \textbf{...rule 1} \\ TAC_y \times \left(1 + \lambda_d \times slope\right) & if \quad slope < 0 \quad \textbf{...rule 2} \end{cases}$$

Slope: average slope of the Biomass Indicator (CPUE, Survey) in recent 5 years.

- λ_u :TAC control coefficient if slope > 0 (Stock seems to be growing) : λ_u=1
- λ_d :TAC control coefficient if slope < 0 (Stock seems to be decreasing) : λ_d=2
- TAC generated by the HCR is constrained to ± 5% of the TAC in the preceding year.

For the interim this is considered to be a fairly good starting point, given the current status of the *C. erytheiae* resource, until such time that additional data are available for more advance stock assessment approaches.

5. Incidental mortality and bycatch of fish and invertebrates

5.1 Incidental mortality (seabirds, mammals and turtles)

No incidental catches of seabirds, mammals and turtles have been recorded from the deep-sea red crab fishery to date.

5.2 Fish bycatch

There was a single record of 5.2kg on an unidentified fish specie in B1, 2010

5.3 Invertebrate bycatch including VME taxa

Very limited bycatches of invertebrate and VME taxa have been reported from the SEAFO deep-sea red crab fishery. To date roughly 1343kg of King crab (*Lithodesferox* – KCA) bycatches been recorded from the deep-sea red crab fishery in Division B1 (Fig. 15 & 16). All these bycatches were made during 2015 only.

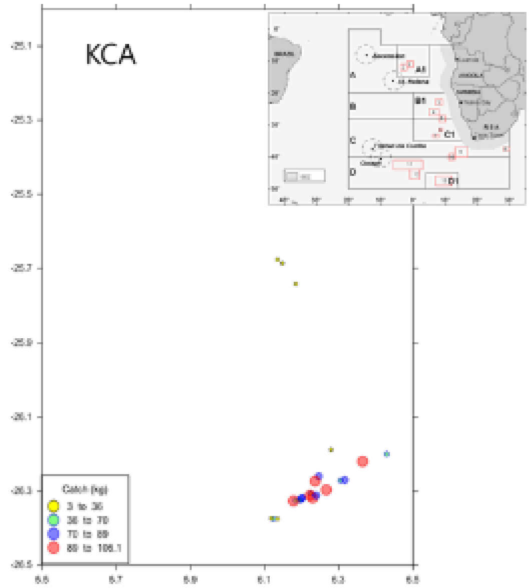


Figure 15: Spatial reference of King crab (*Lithodes ferox*) bycatches recorded from the deep-sea red crab fishery in Division B1 during 2015.

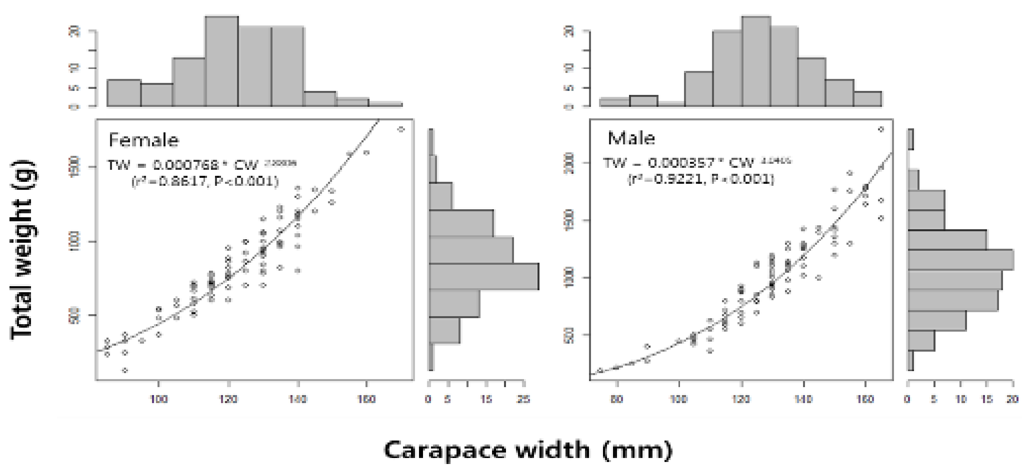


Figure 16: Sample statistics of King crab bycatches recorded by the deep-sea red crab fishery in Division B1 during 2015.

Incidental bycatches of VME indicator species have been minimal, and to date no bycatches exceeding the encounter thresholds have been recorded from the SEAFO deep-sea red crab fishery.

5.4 Incidental mortality and bycatch mitigation methods

There are no incidental and bycatch mitigation measures for the deep-sea red crab fishery in the SEAFO CA.

5.5 Lost and abandoned gear

No lost and abandoned gear data have been reported for the deep-sea red crab fishery in the SEAFO CA.

5.6 Ecosystem implications and effects

Negative ecosystem impact of crab fishing are assumed to be limited due to the character of pot fishing. This includes impact on benthic fauna. Depletion of the crab resource would however possibly a significant ecosystem effect constitute.

6. Current conservation measures and management advice

There was no fishery in 2016 hence no new catch or effort data which are data required to update the CPUE series forming the basis for the application of the HCR as adopted by the Commission in 2015. The SC resorted to applying the HCR based on pre 2016 CPUE trend (Figure 17).

The SC agreed to adopt the best estimate of the slope which is -0.1213. Under this scenario the HCR stipulates the use of "Rule 2" for setting the TAC.

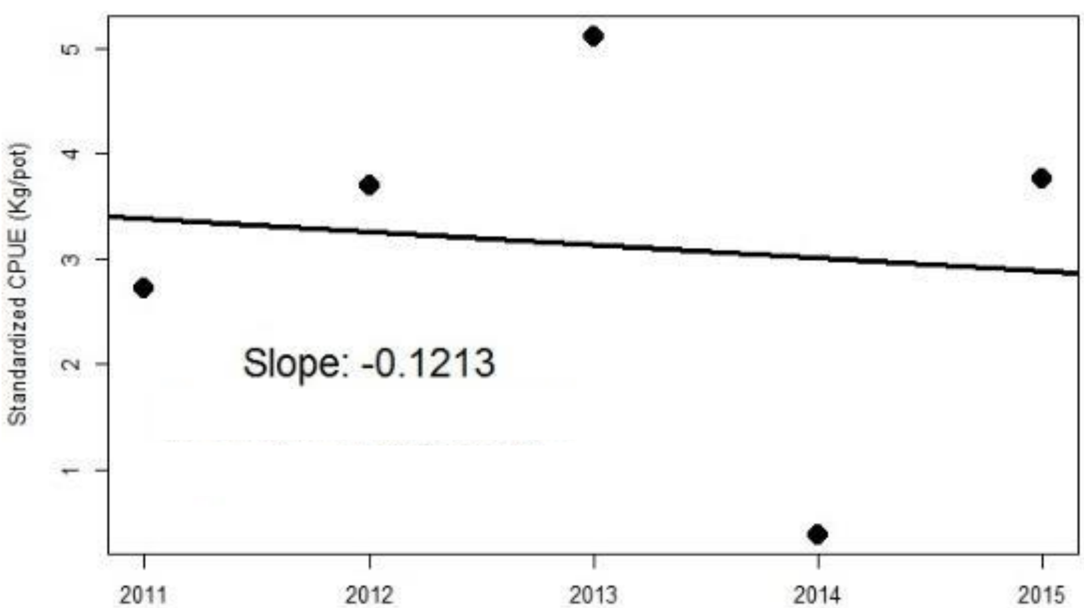


Figure 17: Regression line fitted to average annual CPUEs (2011-2015) for use in Harvest Control Rule.

Considering that no catches were recorded outside Division B1 the 2017 TAC recommendations are only applied to Division B1.

$$TAC_{2017} = TAC_{2016} * (1 + (2 * slope))$$

$$TAC_{2017} = 190 \text{ tons} * (1 + (2 * -0.1213))$$

$$TAC_{2017} = 144 \text{ tons}$$

However, the difference between the 2016 and proposed 2017 TAC is greater than the 5% limit stipulated by the HCR. **SC therefore recommends a TAC for 2017 and 2018 be set at 180 tons for Division B1, and 200 tons for the remainder of the SEAFO CA.**

The SC emphasize that the application of the HCR despite that there was no fishery in 2016, assumes that the CPUE trends derived in 2015 has been maintained. The validity of that assumption is uncertain. The TAC for 2016 year was not taken but the reasons for the interruption in the fishery are not known.

Table 8: Other Conservation Measures that are applicable to this fishery.

Conservation Measure 04/06	On the Conservation of Sharks Caught in Association with Fisheries Managed by SEAFO
Conservation Measure 14/09	To Reduce Sea Turtle Mortality in SEAFO Fishing Operations.
Conservation Measure 25/12	On Reducing Incidental Bycatch of Seabirds in the SEAFO Convention Area
Conservation Measure 30/15	On the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area
Conservation Measure 31/15	On Total Allowable Catches and related conditions for Patagonian Toothfish, orange roughy, Alfonsino and Deep-Sea Red Crab in the SEAFO Convention Area in 2014

7. References

FAO. 2016. Investigation of vulnerable marine ecosystems (VMEs), fisheries resources and biodiversity in the convention area of the South East Atlantic Fisheries Organisation (SEAFO) 15 January– 12 February 2015. FAO-NORAD Project No: GCP/INT/003/NOR, Cruise Report “Dr. Fridtjof Nansen” EAF – N/2015/2, 86p.

Le Roux L. 1997 – Stock assessment and population dynamics of the deep-sea red crab *Chaceon maritae* (Brachyura, Geryonidae) off the Namibian Coast. M.Sc. thesis, University of Iceland, Department of Biology. 88 pp.

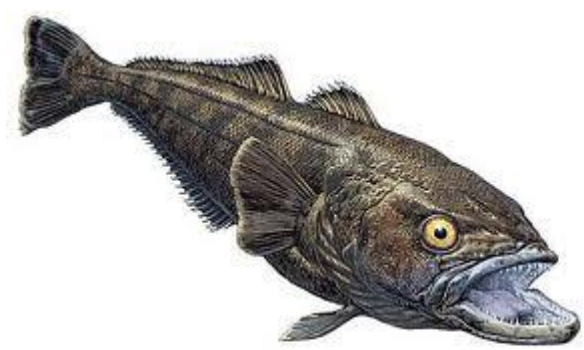
López-Abellán, L.J., J.A. Holtzhausen, L.M. Agudo, P. Jiménez, J. L. Sanz, M. González-Porto, S. Jiménez, P. Pascual, J. F. González, C. Presas, E. Fraile and M. Ferrer. 2008. Preliminary report of the multidisciplinary research cruise on the Walvis Ridge seamounts (Atlantic Southeast-SEAFO). http://hdl.handle.net/10508/370, Part I-II: 191 pp.

<u>STATUS REPORT</u>

Dissostichus eleginoides

Common Name: Patagonian toothfish

FAO-ASFIS Code: TOP



2016

Updated 14 October 2016

TABLE OF CONTENTS

1. Description of the fishery

1.1 Description of fishing vessels and fishing gear

Fishing for Patagonian toothfish in the SEAFO CA started around 2002. The main fishing countries working in the area include vessels from Japan, the Republic of Korea, Spain and South Africa. Historically a maximum of four vessels per year fished in the SEAFO CA. The Spanish longline system and the Trotline (Fig. 1) are the fishing gears commonly used.

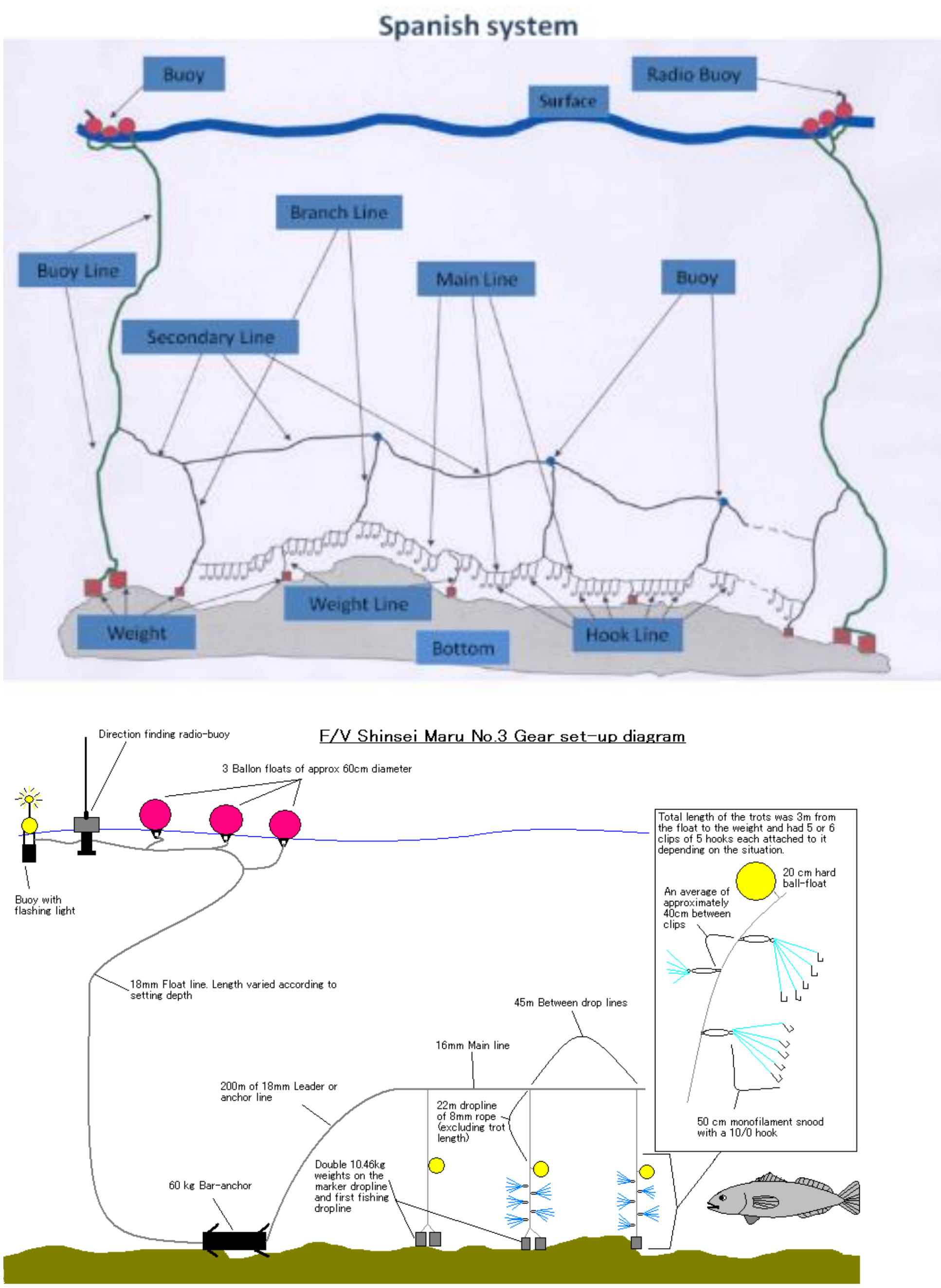
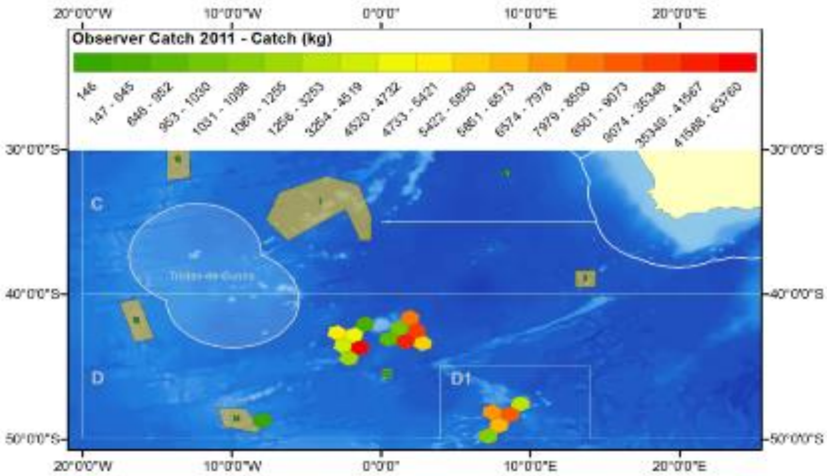
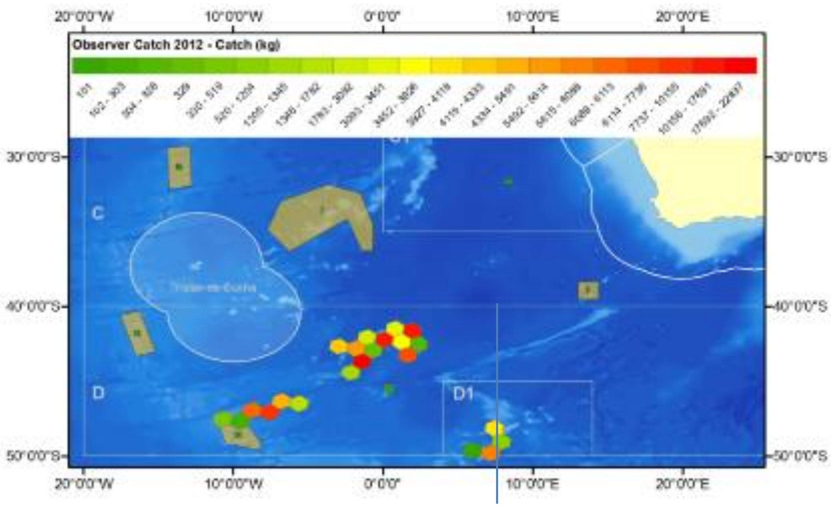


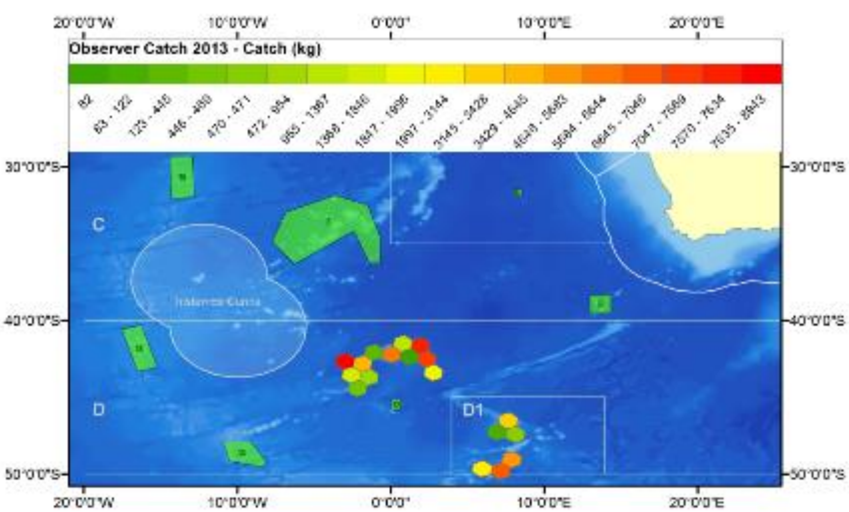
Figure 1: Fishing gears used to fish *D. eleginoides*: Spanish longline system (top) and the Trotline (bottom).

1.2 Spatial and temporal distribution of fishing

In SEAFO CA, the fishery from 2011 to 2014 took place in Sub-Area D, being concentrated over seamounts in Division D1, at Discovery seamount and also at seamounts located in the western part of Sub-Area D (Fig. 2).







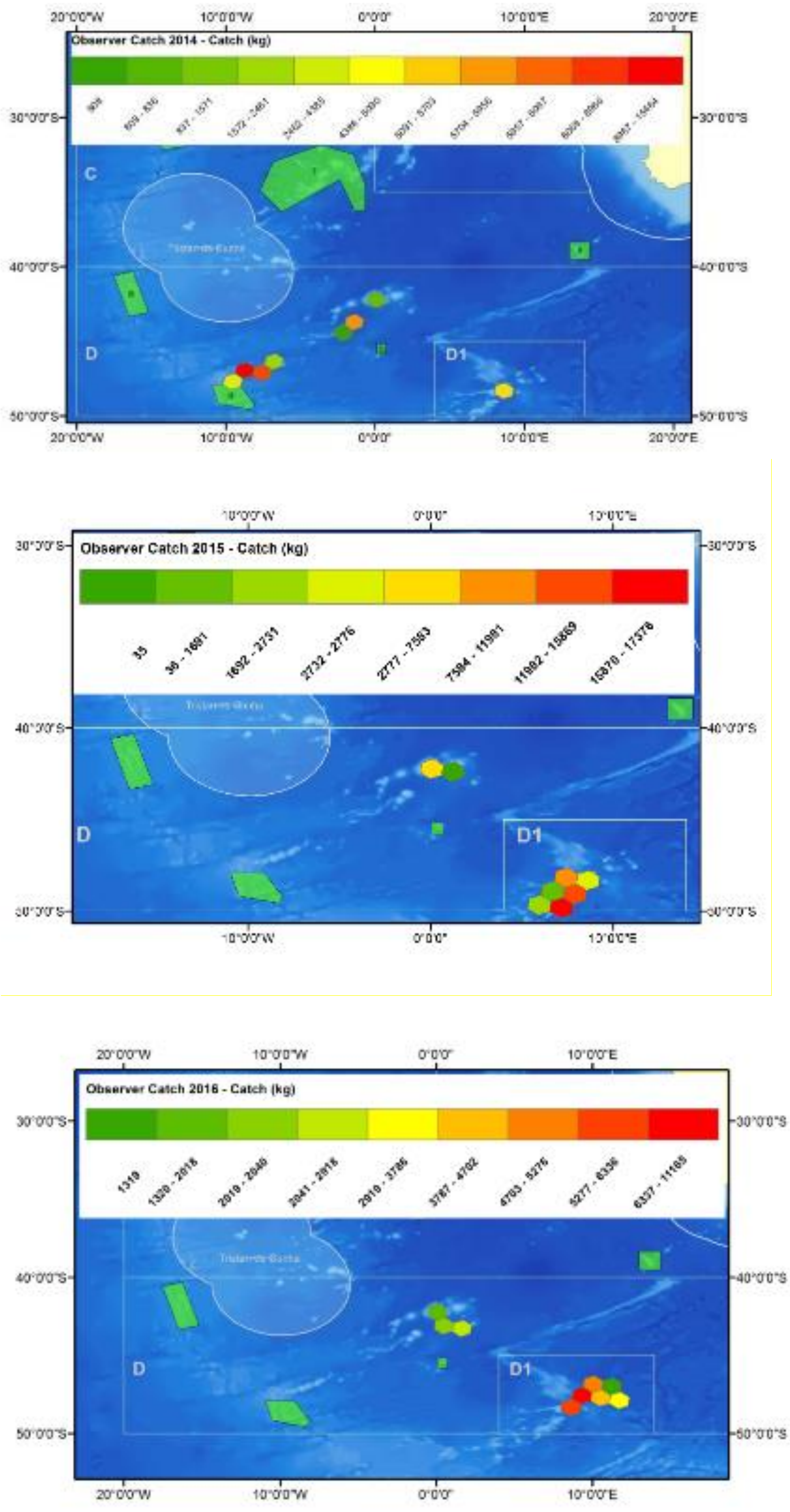


Figure 2: Reported catch of Patagonian toothfish (*Dissostichus* eleginoides) aggregated to 100km diameter hexagonal cells (2011-2016).

Table 1 shows that the main fishing ground is located on Discovery seamount and also in D1 but less hauls were deployed in the western seamounts of Sub-Area D.

Table 1: Number of sets by year and location

Year	Western	Discovery	D1- Meteor
2010	27	5	118
2011	1	207	54
2012	68	207	25
2013	0	108	57
2014	100	64*	13
2015	0	24	127
2016	0	22	67

1.3 Reported retained catches and discards

Table 2A presents data on Patagonian toothfish catches and discards listed by country, as well as fishing gear used and the management area from which catches were taken. Annual catches varied between 18t (2002) and 413t (2007).

Discards were mainly due to parasite infection of fish. In the last three years with complete data (2013, 2014 and 2015) retained catches were 61, 79 and 59t respectively and the annual weight of discarded specimens was 3, 7 and 2 t in the three year period.

Table 2A: Catches (tons) of Patagonian toothfish (*Dissostichuseleginoides*) by South Africa, Spain, Japan and Korea (2002-2016)

Nation	Spain		Japan				Korea				South Africa			
Fishing method	Longlines		Longlines				Longlines				Longlines			
Management Area	D0		D0		D1		D0		D1		D0		D1	
Catch details (t)	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.	Ret.	Disc.
2002	18													
2003	101				47		245	0						
2004	6				124									
2005	N/F	N/F			158		15	0						
2006	11				152		7	0						
2007	N/F		151		15		247	0						
2008	N/F	N/F	19	0	104	0	79	0						
2009	N/F	N/F	82	0	4	0	16	0	46	0	N/F	N/F	N/F	N/F
2010	26	0	41	0	12	2	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	172	6	N/F	N/F	N/F	N/F	N/F	N/F	15	0	28	0
2012	N/F	N/F	86	3	N/F	N/F	N/F	N/F	N/F	N/F	24	0	12	0
2013	N/F	N/F	41	2	20	1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	67	6	12	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	7	<1	52	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	7	<1	53	<1	N/F	N/F	N/F	N/F	N/F	N/F	N/F	N/F

N/F = No Fishing. Blank fields = No data available. *Provisional (September 2016).
Ret. = Retained Disc. = Discarded

Table 2B: Atlantic toothfish (*Dissostichus mawsoni*). (TOA) catches and discards

Nation	**Japan**			
Fishing method	**Longlines**			
Management Area	**D0**		**D1**	
Year	Ret..	Disc.	Ret..	Disc.
2014	< 1	0	0	0
2015	0	0	0	0
2016	0	0	0	0

Ret. = Retained Disc. = Discarded

Retained and discarded bycatch from the Patagonian toothfish fishery are presented in Table 3. The two most important species (in terms of weight) are grenadiers (GRV) and Blue antimora (ANT).

1.4 IUU

IUU fishing activity in the SEAFO CA has been reported to the Secretariat latest in 2012, but the extent of IUU fishing is at present unknown.

Table 3**: Retained and discarded bycatch from the Patagonian toothfishfisheries (kg).**

	2009				**2010**				**2011**		**2012**				**2013**				**2014**			
	Retained		**Discarded**		**Retained**		**Discarded**		**Retained**	**Discarded**	**Retained**		**Discarded**		**Retained**		**Discarded**		**Retained**		**Discarded**	
Species	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D0**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**	**D0**	**D1**
GRV			89	5 833	4 047	1 936	93	2 601		22 414			23 705	186			7 273	869				267
ANT			126	4 786			453	1 348		4 794			4 442	65			796	610			329	106
BYR	1 221		573																			
MCC			336	896																		
BYR																						
BEA	360																					
MZZ								168														
SRX										30			124				20					
MRL			108					1		2			37				1					
COX			2							21			75									
SKH			90																			
LEV			36				4															
KCX				1			3	35									83	10				
HYD													31				17					
BUK							17															
NOX										7												
MWS										6												
ETF																	3					
SEC													2									
SSK							2															
CKH							1	1														
KCF			1																			
TOA																			99			
RTX																					1122	

	2015			
	Retained		**Discarded**	
Species	**D0**	**D1**	**D0**	**D1**
GRV			1221	1579
ANT			452	598
BYR				
MCC				
BYR				
BEA				
MZZ				
SRX			16	
MRL			2	
COX				
SKH				
LEV				
KCX				
HYD			233	
BUK				
NOX				
MWS				
ETF			1	
SEC				
SSK				
CKH				
KCF				
TOA				
RTX			146	
BSH			89	
ETF				
HIB			18	
LEV			5	

BSH: Blue shark (*Prionace glauca*); ETF: Blackbelly lanternshark (*Etmopterus Lucifer*); HIB: Deep-water arrowtooth eel (*Histiobranchus bathybius*); LEV: Lepidion codlings nei (*Lepidion spp*);ANT:Blue antimora (*Antimora rostrata*); BEA:Eaton's skate (*Bathyraja eatonii*); BYR:Kerguelen sandpaper skate (*Bathyraja irrasa*); COX:Conger eels, etc. nei (*Congridae*); CKH:Abyssal grenadier (*Coryphaenoides armatus*); BUK:Butterfly kingfish (*Gasterochisma melampus*); HYD:Ratfishes nei (*Hydrolagus spp*); LEV:Lepidion codlings nei (*Lepidion spp*); KCX:King crabs, stone crabs nei (*Lithodidae*); MCC:Ridge scaled rattail (*Macrourus carinatus*); GRV:Grenadiers nei (*Macrourus spp*); MWS:Smallhead moray cod (*Muraenolepis microcephalus*); MRL:Moray cods nei (*Mur aenolepis spp*); NOX:Antarctic rockcods, noties nei (*Nototheniidae*); MZZ:Marine fishes nei (*Osteichthyes*); KCF:Globose king crab (*Paralomis formosa*); ETF:Blackbelly lantern shark (*Etmopterus lucifer*); SEC:Harbour seal (*Phoca vitulina*); SRX:Rays, stingrays, mantas nei (*Rajiformes*); SKH:Various sharks nei (*Selachimorpha(Pleurotremata)*); (Rajiformes); SSK:Kaup's arrowtooth eel (*Synaphobranchus kaupii*).

2. Stock distribution and identity

Patagonian toothfish is a southern circumpolar, eurybathic species (70-1600m), associated with shelves of the sub-Antarctic islands usually north of 55ºS. Young stages are pelagic (North, 2002). The species occurs in the Kerguelen-Heard Ridge, islands of the Scotia Arc and the northern part of the Antarctic Peninsula (Hureau, 1985; DeWitt et al., 1990). This species is also known from the southern coast of Chile northward to Peru and the coast of Argentina, especially in the Patagonian area (DeWitt, 1990), and also present in Discovery and Meteor seamounts in the SE Atlantic (Figure 3) and El Cano Ridge in the South Indian Ocean (López-Abellán and Gonzalez, 1999, López-Abellán, 2005).

In SEAFO CA the stock structure of the species is unknown. The CCAMLR Scientific Committee in 2009 noted that in most years (since 2003) the main species caught in CCAMLR sub-area 48.6 (adjacent to and directly south of SEAFO Division D) is *D. eleginoides*. The distribution of the species appears to be driven by the sub-Antarctic front which extends into the SEAFO CA.

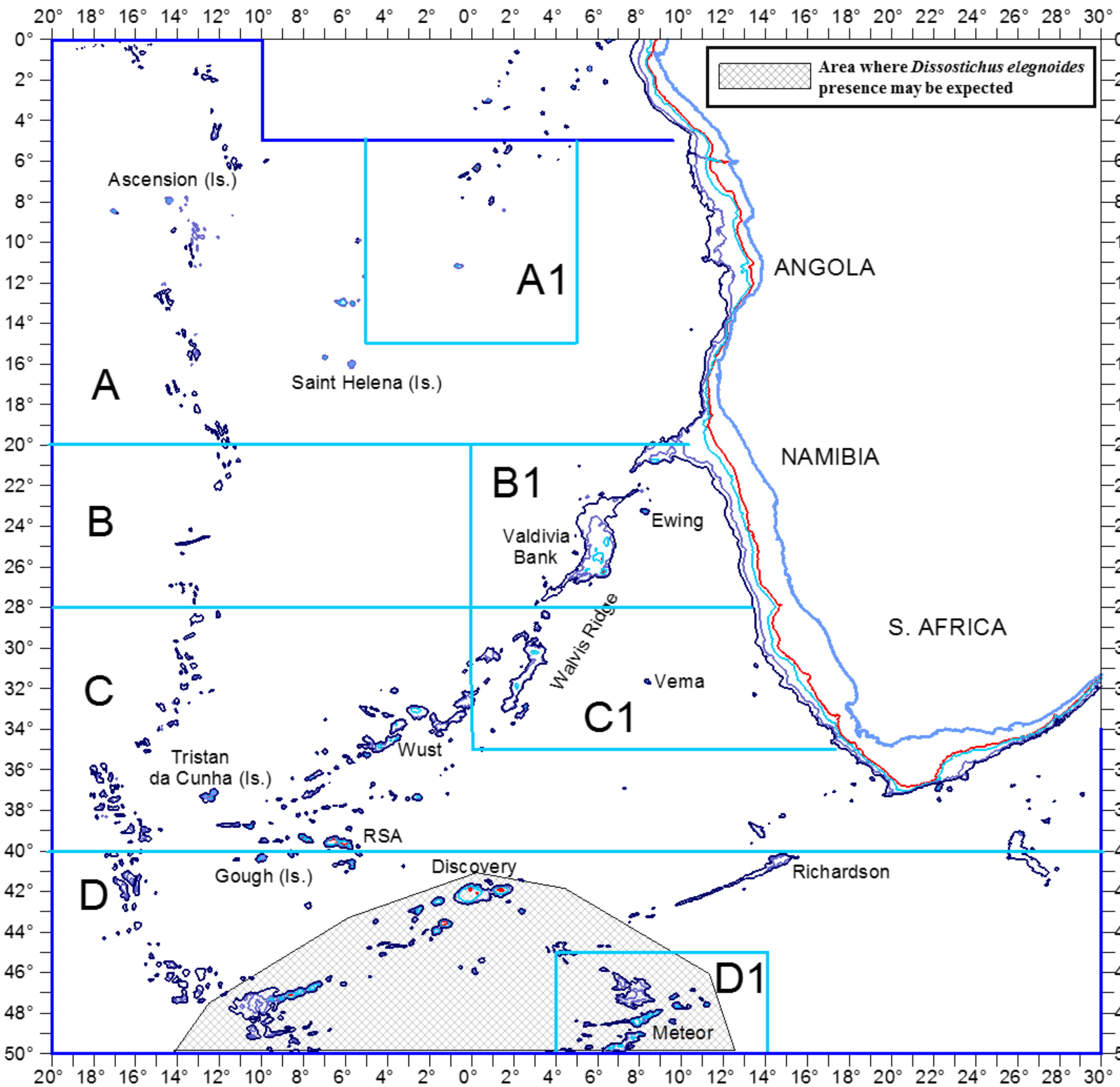


Figure 3: Species geographical distribution in the SEAFO CA
(source: Species profile on the SEAFO website).

3. Data available for assessments, life history parameters and other population information

3.1 Fisheries and survey data

The number of fishing sets sampled from 2006 onwards indicates a good sampling level in line with the SEAFO preliminary guidelines for data collection (Table 4). On average 20 specimens were measured per sampled fishing set, which is considered acceptable given the length range of the exploited population. It will be necessary to apply in future this sampling effort of 20 individuals in all sampled fishing sets (Figure 4).

Table 4. Annual analysis of sampling effort conducted on board fishing vessel

Year	No. of Sets sampled	Mean number of Individuals sampled per set	Min. Individuals sampled per set	Max. Individuals sampled per set	Mean sample size/tonne
2006	146	22.16	1	31	-
2007	222	11.61	1	57	-
2008	120	23.69	2	110	-
2009	275	17.97	1	58	0.13
2010	125	26.91	1	60	0.32
2011	263	32.95	1	60	0.16
2012	298	20.58	1	57	0.17
2013	164	19.87	1	70	0.32
2014	176	25.50	3	50	0.48
2015	149	17.23	1	23	0.29

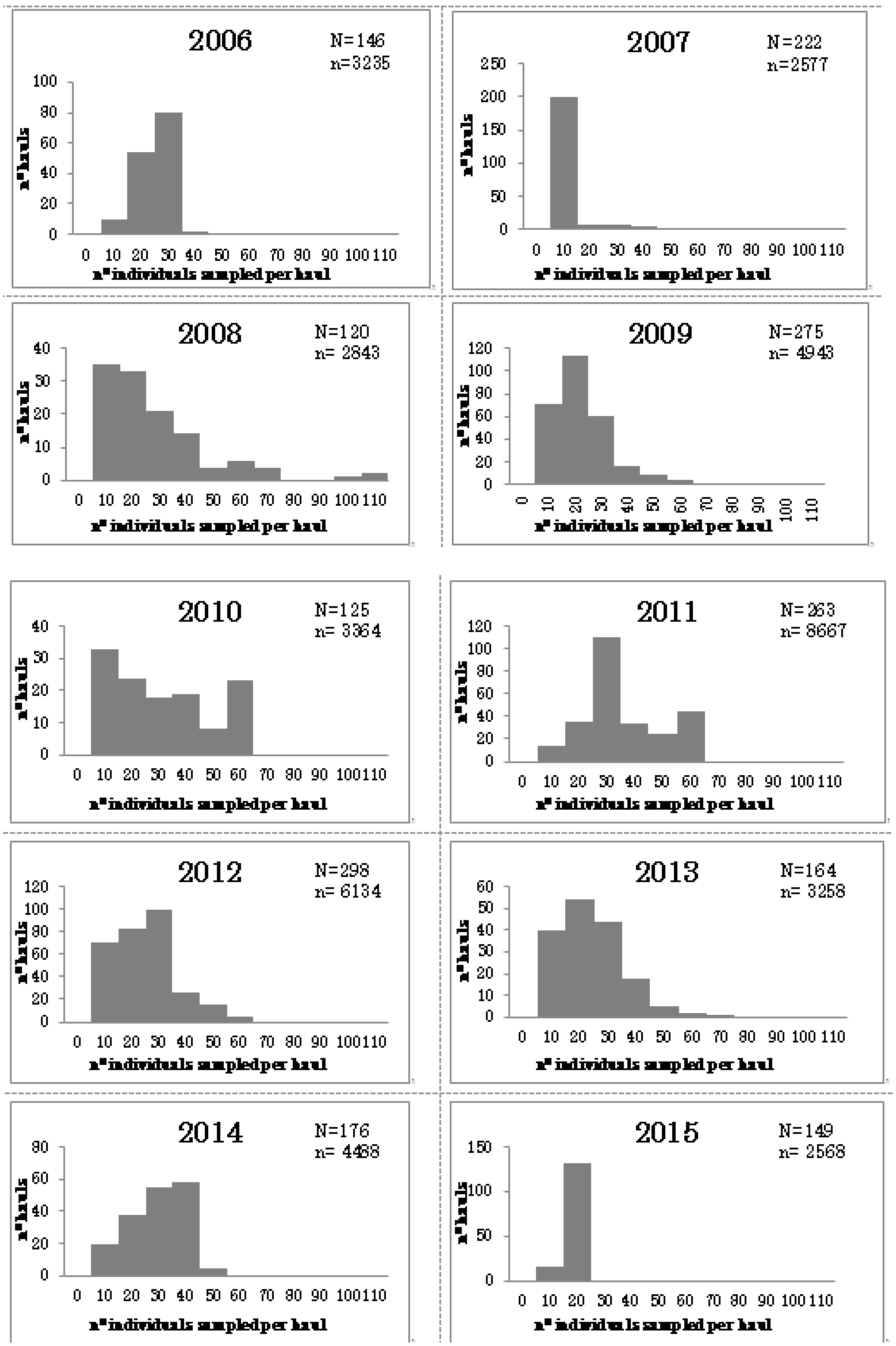


Figure 4: Frequency distribution of sample size per set. Data from Observer Reports submitted to SEAFO. N = number of sets sampled per year; n = total number of individuals sampled.

3.2 Length data and frequency distribution

Figure 5 shows the annual total length frequency distributions of Patagonian toothfish catches based on the observer data from all fleets submitted to SEAFO. Length frequency distributions for the period 2006-2013 suggest a shift towards smaller lengths in the catches in more recent years. The proportion of large fish appears to be declining.

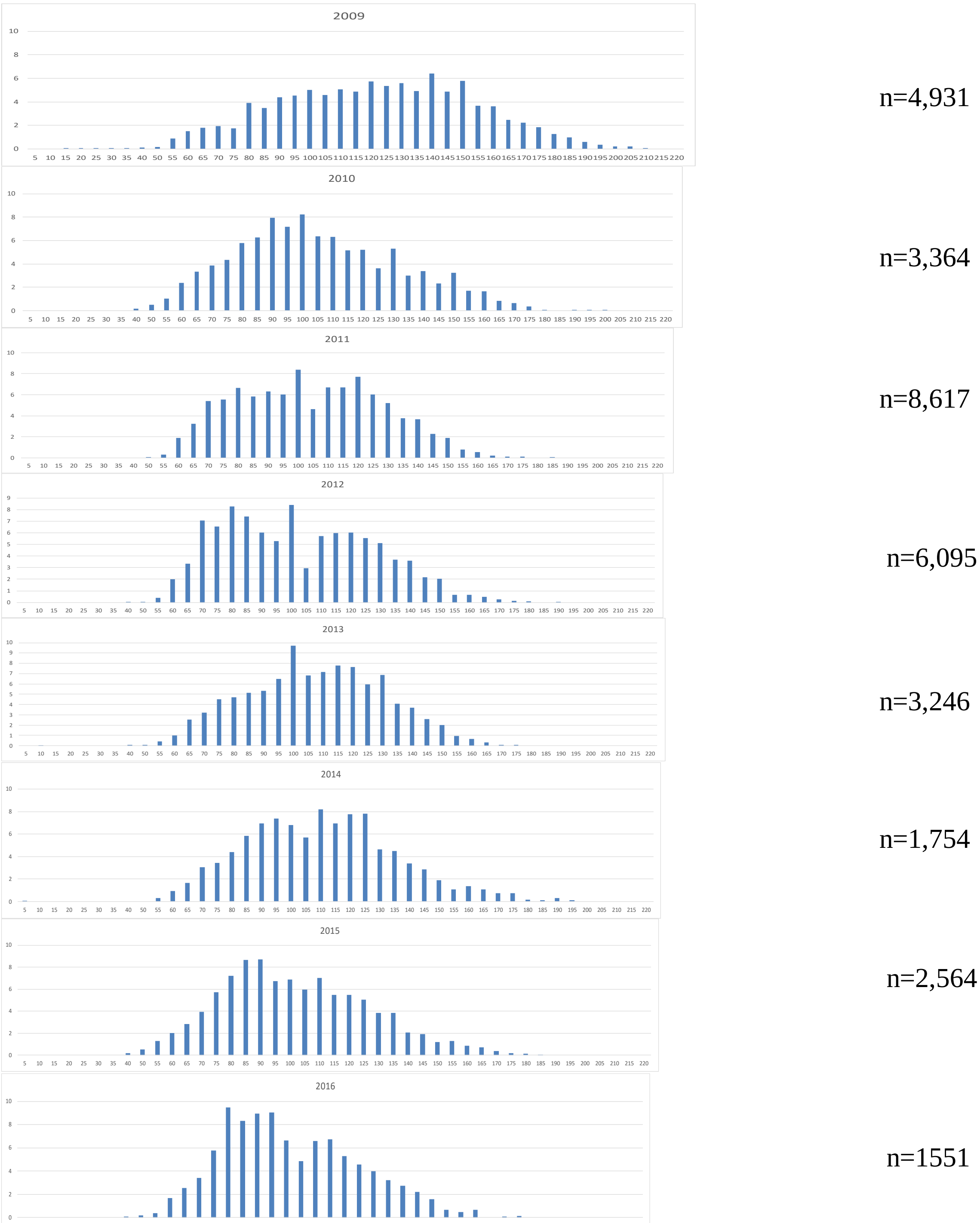


Figure 5: Annual size % frequency distributions *D. eleginoides*raised in SEAFO CA Sub-Area D. (Y axis :0%-10%)

3.3 Length-weight relationships

Table 5 shows the length-weight relationships by sex based on observer data from Japanese fleet in 2013.

Table 5: Length-weight relationships by sex (based on 2013 Japanese observer data)

Samples	a	b	r^2	n
Males	1E-06	3.4484	0.9768	405
Females	2E-06	3.4296	0.9579	860

3.4 Age data and growth parameters

There is no available information for this species in SEAFO CA.

3.5 Reproductive parameters

There is no available information for this species in SEAFO CA.

3.6 Natural mortality

There is no available information for this species in SEAFO CA.

3.7 Feeding and trophic relationships (including species interaction)

There is no available information for this species in SEAFO CA.

3.8 Tagging and migration

Eleven specimens were tagged in Subarea D in 2006 and fourteen in 2010 (Spanish flagged Viking Bay vessel). However, there is no available information on recoveries of tagged specimens or on tagged specimens tagged at adjacent areas of CCAMLR.

4. Stock assessment status

There are no agreed stock assessments.

5. Incidental mortality and bycatch of fish and invertebrates

5.1 Fish bycatch

Table 6 shows the bycatch species in the Patagonian toothfish (*Dissostichus eleginoides)* Fishery and its weights based on the observer reports. SC noted that the major bycatch is grenadiers (Macrouridae - GRV) and the bycatch is discarded. The impact of this bycatch on grenadiers spp. is unknown.

Table 6: VME **Bycatch from Patagonia toothfish fishery (kg)**

	2010		**2011**	**2012**	**2013**	**2014**		**2015**	
Species	**D0**	**D1**	**D0**	**D0**	**D0**	**D0**	**D1**	**D0**	**D1**
Gorgonians (Gorgoniidae)	33.9	13.6	3.8	30.3	2.3	2.6	1.2		0.35
Hard corals, madrepores nei (Scleractinia)	2.1	0.1	15.4	17.6	0.3	2.8			

Black corals and thorny corals (Antipatharia)	3.9	0.5		0.2					
Basket and brittle stars (Ophiuroidea)	1.3	2.0							4.9
Sea pens (Pennatulacea)	1.0	0.3		0.0					
Soft corals (Alcyonacea)	0.2	1.0		1.2					
Feather stars and sea lilies (Crinoidea)	0.9	0.1							
Hydrocorals (Stylasteridae)									1
Sponges								0.4	

5.2 Incidental mortality (seabirds, mammals and turtles)

In the SEAFO database there are records of three seabirds having been caught during Japanese longline daytime fishing in 2014. The seabirds caught were recorded by the ID codes "PUG" – *Puffinus gravis* (Great shearwater) & "DIM" – *Thalassarche melanophris* (Southern black-browed albatross).

5.3 Invertebrate bycatch (VME taxa)

Table 6 shows the bycatch of VME species and its amount based on the observer data for the period 2010-2016. Figure 7 shows their geographic location.

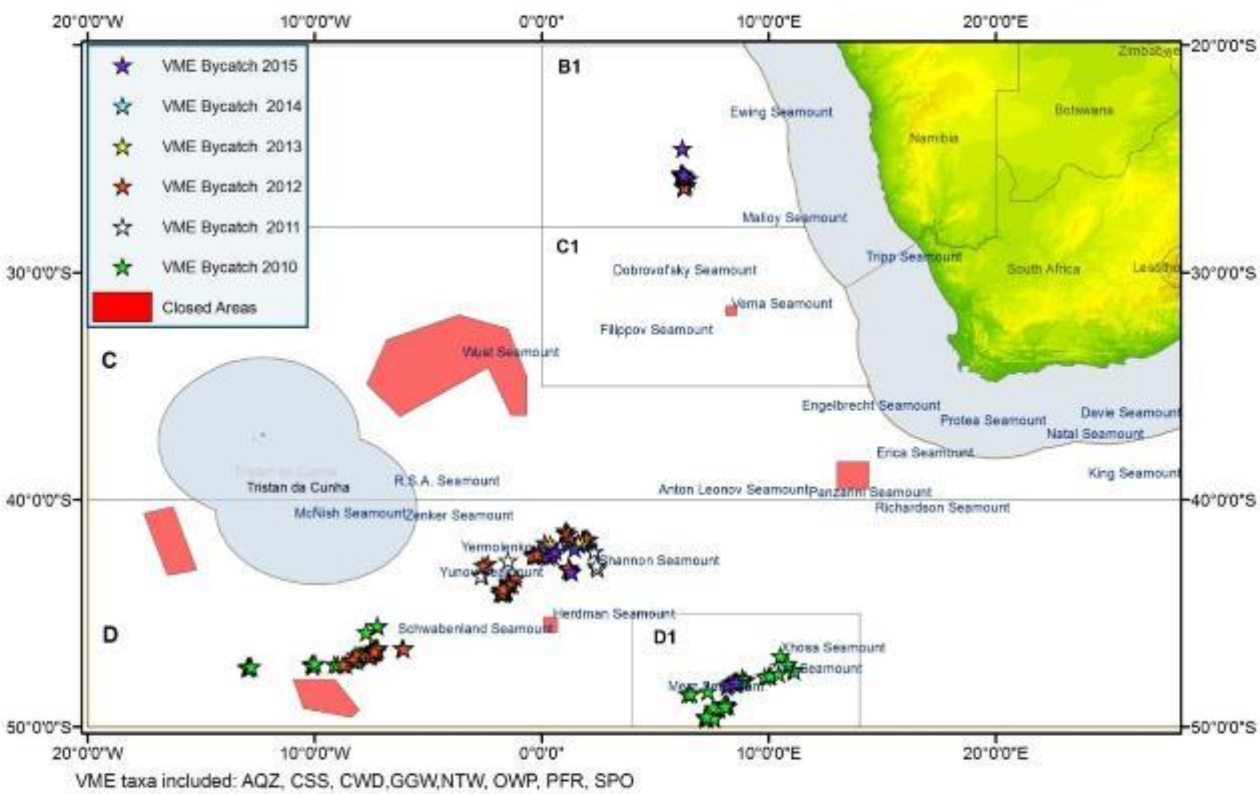


Figure 7: Locations for incidental bycatch of VME species from SEAFO Patagonian toothfish fishery.

5.4 Incidental mortality and bycatch mitigation methods

Offal dumping during hauling and bird scaring devices (Tori lines) are mandated to mitigate seabird bycatch.

5.5 Lost and abandoned gear

Figure 8 shows locations and amount of the lost gears based on the observer data from 2010 to 2013 (no lost gear in 2014-2015).

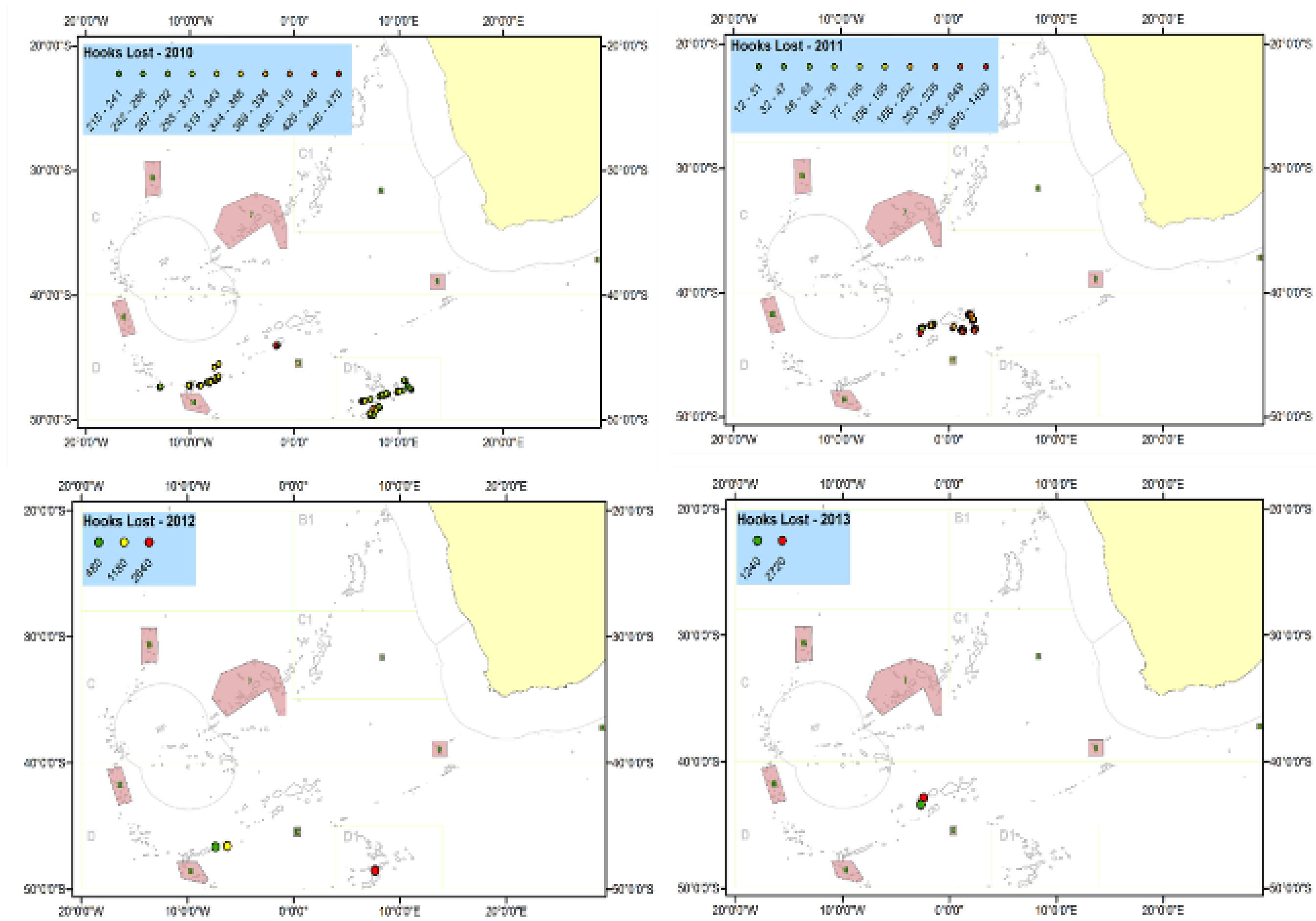


Figure 8: Locations and amount of the lost gears (hooks with attached short line) based on observer data (2010-2013) (no lost gear in 2014-2015).

6. Current conservation measures and management advice

In 2015 the Commission adopted a TAC of 264 t in Sub-Area D applying the harvest control rule, and zero tonnes for the remainder of the SEAFO CA for 2016.

The SC notes that in both 2015 and 2016 about 22% of the TAC was taken (incl. the experimental fishery), hence the fishery is not constrained by the TAC.

The application of the HCR requires as input a 5-year time-series of recent CPUE data. The CPUE series applied in 2015 was derived by pooling all available data in the SEAFO CA. No analysis was made to determine if pooling was a valid approach. Also, the series first discussed in 2016 was not standardised as in 2015, and questions were asked about the consistency of the analysis between years.

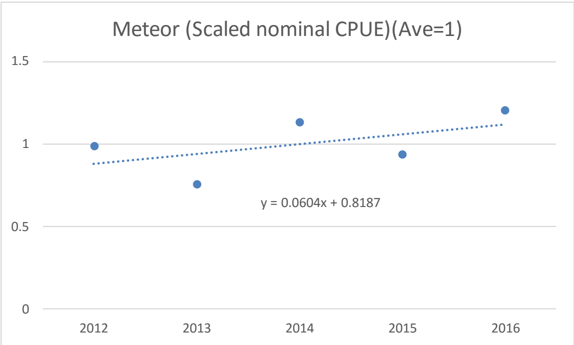
The SC explored standardization using generalised linear models (GLM), but the explorations indicated that the variance explained was too low to extract meaningful results, hence further efforts would be required. There were, however, clear indications of significant area-effects, hence pooling of data from different fishing areas was probably not valid.

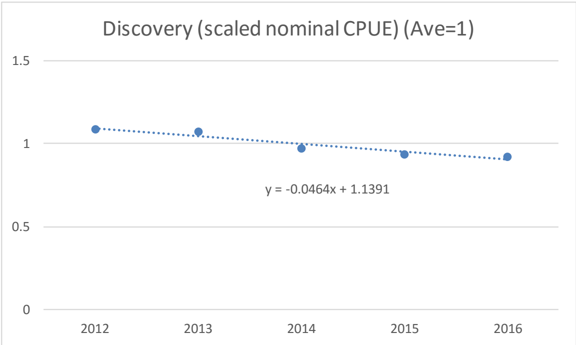
The SC then resorted to deriving CPUE series for separate fishing areas for which the more extensive continuous time-series of catch and effort data are available in the SEAFO database, i.e. the Meteor and Discovery seamounts. Data from the Western part were excluded from the assessment as the time series was not complete. Only Japanese data within the 2011 agreed footprint, i.e. from the party taking the bulk of the catch in all years, were used in order to retain consistency through the time series.

It is uncertain whether the two CPUE series shown in Fig. 9 reflects abundance, but in the absence of other alternatives, the series from Meteor and Discovery were considered valid for the derivation of TACs using the recommended and accepted HCR.

The CPUE series as derived both have best estimates of slope close to zero. For Discovery the best estimate is slightly negative, for Meteor the estimated slope was zero (Fig. 9).

Applying the HCR based on a weighted average of the CPUE slopes on Meteor and Discovery a TAC estimate of 266 t was derived. **The SC recommends a TAC for Subarea D of 266 t and a zero TAC for the remainder of the SEAFO CA for the years 2017 and 2018.**





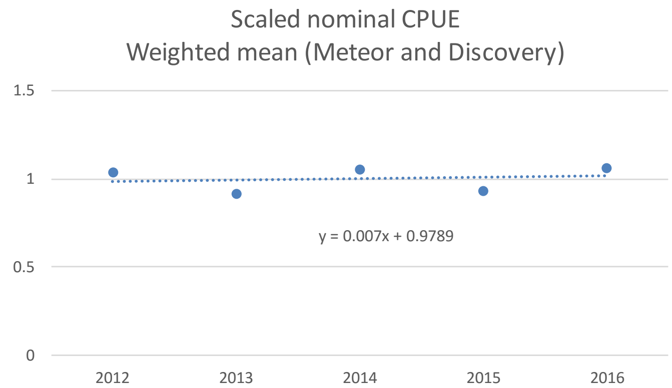


Figure 9: Upper: Average slope in Meteor (left) and Discovery(right) for 5 years CPUE (2012-2016)
Lower: Average slope based on the weighted average of two slopes.

Other Conservation Measures that are applicable to this fishery can be seen in Table 7.

Table 7: Other Conservation Measures that are applicable to this fishery.

Conservation Measure 04/06	On the Conservation of Sharks Caught in Association with Fisheries Managed by SEAFO
Conservation Measure 14/09	To Reduce Sea Turtle Mortality in SEAFO Fishing Operations.
Conservation Measure 25/12	On Reducing Incidental Bycatch of Seabirds in the SEAFO Convention Area
Conservation Measure 30/15	On the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area
Conservation Measure 31/15	On Total Allowable Catches and related conditions for Patagonian Toothfish, orange roughy, Alfonsino and Deep-Sea Red Crab in the SEAFO Convention Area in 2014

7. References

Arana, P.2009. Reproductive aspects of the Patagonian toothfish (Dissostichus eleginoides) off southern Chile. Lat. Am. J. Aquat. Res., 37(3): 381-394.

Dewitt, H.H., P.C. Heemstra and O. Gon. 1990. Nototheniidae. In: Fishes of the Southern Ocean, O. Gon and P.C. Heemstra (Eds.). J.L.B. Smith Institute of Ichthyology, Grahamstown, South Africa: 279-331.

Horn P. L. 2002. Age and growth of Patagonian toothfish (Dissostichus eleginoides) andAntarctic toothfish (D. mawsoni) in waters from the New Zealand subantarctic to the Ross Sea,Antarctica Fisheries Research, 56:275-287.

Hureau, J.C, 1985. Family Nothoteniidae-Antarctic rock cods. In: FAO species identification sheets for fishery purposes. Southern Ocean: Fishing Areas 48, 58 and 88 (CCAMLR Convention Area). Fischer, W. And J.C. Hureau (Eds). FAO, Rome, vols. I-II, 470 p.

López-Abellán L.J. and J. González. 1999. Results of the longline survey on the seamounts in the southeast Atlantic and in the CCAMLR Subarea 48.6 (Atlantic Ocean) and Division 58.4.4 (Indian Ocean). CCAMLR Science, Vol. 6: 99-116.

López-Abellán, L.J. 2005. Patagonian toothfish in international waters of the Southwest Indian Ocean (Statistical Area 51). CCAMLR Science, 12: 207–214.

SC-SEAFO-2011. Report of the 7th Annual Meeting of the SEAFO Scientific Committee. *SEAFO SC Report 2011*. SEAFO, Swakopmund, Namibia.

SC-SEAFO-2013. Report of the 9th Annual Meeting of the SEAFO Scientific Committee. *SEAFO SC Report 2013*. SEAFO, Swakopmund, Namibia.

Annex A: Biological data collected

Sex information collected (2009-2016)

	2009	2010	2011	2012	2013	2014	2015	2016	total
	1	22				399			422
ANT	39	464				607	48	86	1244
BOA								1	1
BSH							1	1	2
BYR	18								18
CGE								11	11
ETF								1	1
GRV		655						197	852
HIB								2	2
KCU								1	1
KCX		29						35	64
MCC	84						165	234	483
MCH							463	641	1104
MRL								1	1
QMC							198		198
RTX						958	60		1018
SRX							2		2
TOA						11			11
TOP	4931	3364	8652	6095	3247	1754	2564	1551	32158
total	**5073**	**4534**	**8652**	**6095**	**3247**	**3729**	**3501**	**2762**	**37593**

Number of otolith collected for TOP:

	TOP
2014	533
2015	732
2016	749

Gonad information collected:

	ANT	MCC	MRL	TOA	TOP	total
2014				9	533	542
2015					732	732
2016	14	40	1		749	804
total	**14**	**40**	**1**	**9**	**2014**	**2078**

APPENDIX X – **Stock Status Report – Alfonsino**

<u>STATUS REPORT</u>

Beryx splendens
Alfonsino

2016

Updated 14 October 2016

TABLE OF CONTENTS

1. Description of the fishery

1.1 Description of fishing vessels and fishing gear

In recent years the Korean trawl fishery was the only fishery targeting the alfonsino in the SEAFO CA. This fishery finished it activity in 2014. During the period 2010-2013 two fishing vessels participated in the fishery.

Although primarily considered as a midwater trawl fishery, 94% of the tows recorded by onboard observers were classified as "Demersal". Whether or not these trawls were bottom trawls remains uncertain, and this is an issue that still requires clarification.

At the SEAFO CA the vessel1 stern trawler operated with the following fishing gears (Table 1 and Figs. 1-4 provide the specifications of the fishing gears):
HAMPIDJAN NET is a bottom otter trawl with two-piece nets of 66 m in length. The head rope is 48 m long; ground rope is 50 m; the height, width and girth of the net are 5.5 m, 30 m and 100 m, respectively. The cod-end mesh size is 120 mm. The ground gear is 50 m in length and 903 kg in weight, and the float is 1,018 kg.
MANUFACTURED NET is a four-piece net with a overall length of 66.9 m. The lengths of the head rope and ground rope are 59.0 m and 77.9 m, respectively. The height, width and girth of the net are 5.5 m, 200 m and 83 m, respectively. The cod-end mesh size is 120 mm. The ground is 77.9 m in length and the weight of the ground is 2,068 kg. The float is 913.200 kg with the floating rate of 44%.
MIDWATER NET is 210 m long. The lengths of head rope and ground ropes are 93.6 m. The height and width of the net are 70.0 m and 240-260 m, respectively. The girth of the net is 816 m and the cod-end mesh size is 120 mm.

Table 1: Fishing gear specifications at vessel 1

Gear Specifications		HAMPIDJAN NET bottom trawl	MANUFACTURED NET bottom trawl	MIDWATER NET
Otter board	type	VRS-TYPE	VRS-TYPE	VRS-TYPE
	material	Steel	Steel	Steel
	size (mm)	2,300 x 4,030	2,750 x 4,900	1,854 x 3,818
	weight (kg)	3,930	4,320	2,000
	under water weight (kg)	2,619	2,473	1,145
Trawl Net	purpose	bottom fishing (figure1)	bottom fishing (figure2)	mid-water fishing (figure3)
	net length overall(m)	66	66.9	210.0
	head rope (m)	48	59.0	93.6
	ground rope (m)	50	77.9	93.6
	net height (m)	5.5	5.5	70
	net width (m)	30	200	240~260
	net girth (m)	100	83	816
	mesh size (mm)	120	120	120

The vessel2 was a stern trawler which operated with two types of fishing gears: a mid-water trawl net; and the bottom trawl net. The gear used for the operation in the SEAFO Convention Area was the mid-water KITE gear (Figure 4).
The height of the net's gate is approximately 50 m, and the total length is around 280 m. When net is settled, it sinks underwater and the sinking depth of the net is controlled by the wire ropes. The upper and

lower parts of the bottom trawl net PE Net have attached plastic buoys and rubber balls respectively. As in the case of KITE gear the wire ropes control the sinking depth of the settled gear.

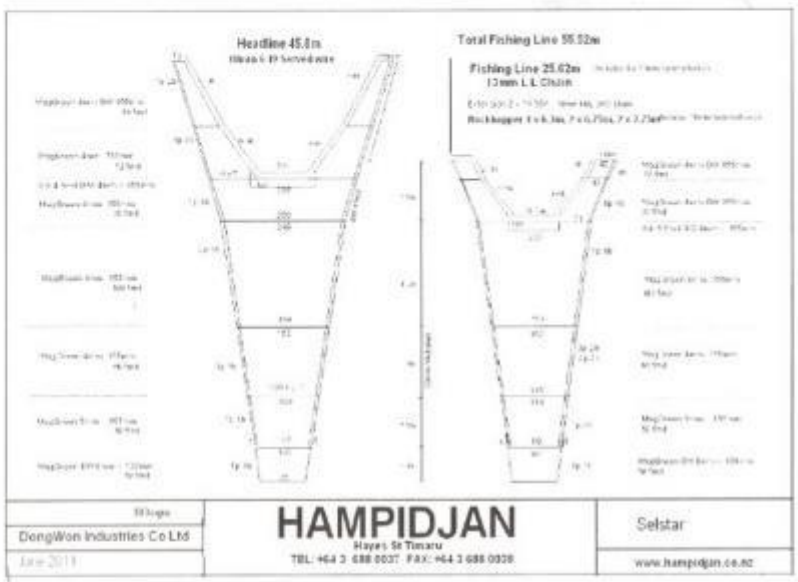


Figure 1: Diagram of HAMPIDJAN NET of the vesse1.

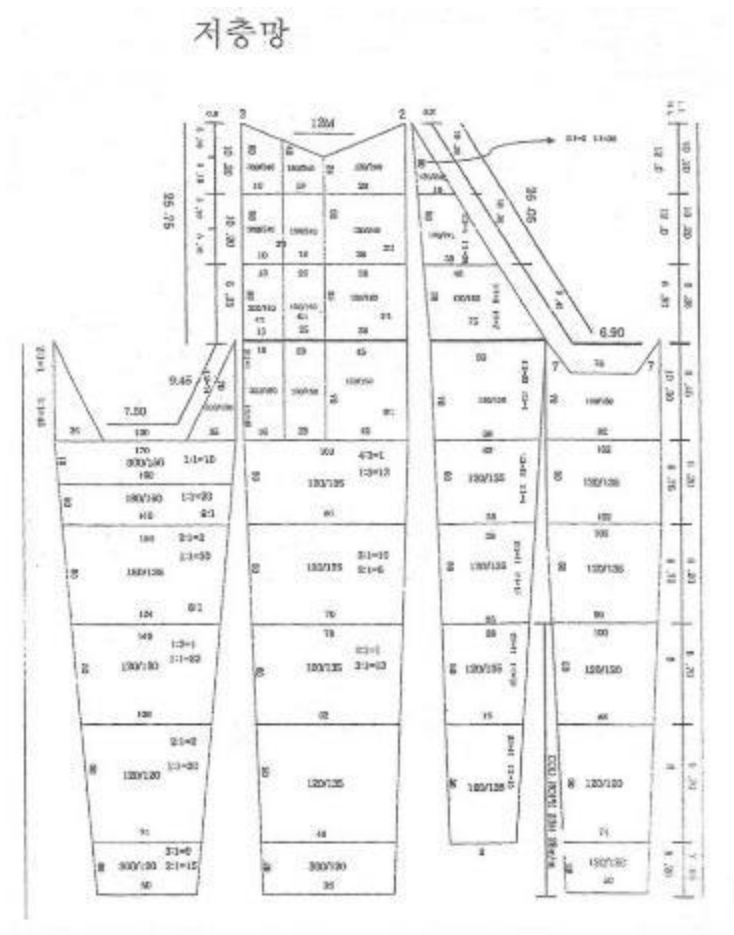


Figure 2: Drawing of the Custom Manufactured Bottom Trawl Net of the vesse1.

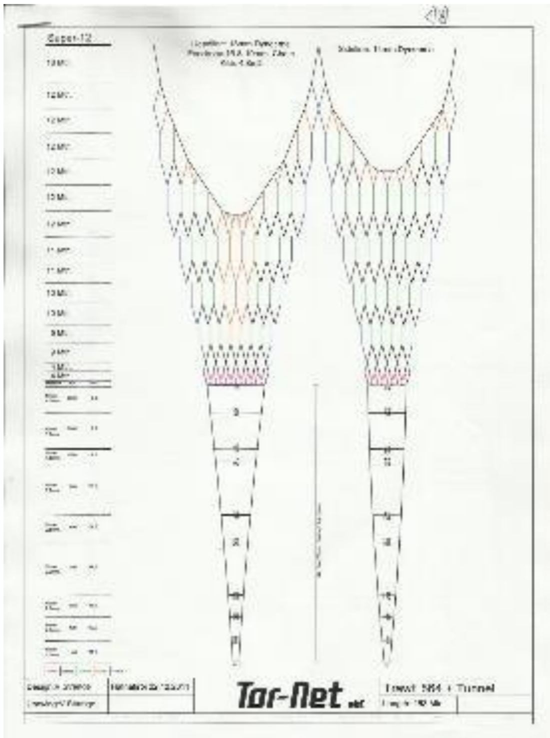


Figure 3: Drawing of mid-water trawl net of the vesse1.

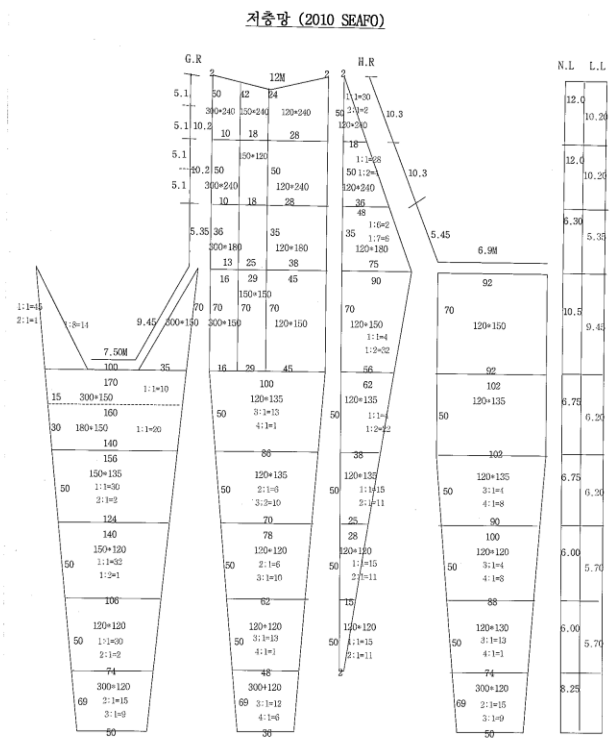


Figure 4: Drawing of mid-water trawl net of the vessel 2.

1.2 Spatial and temporal distribution of fishing

During the period from 2010 to 2011the Korean trawl vessels caught Alfonsino mainly in the northern part of Division B1and in the southern part in 2012 and 2013 (Fig. 5-8).). The three main fishing grounds in Division B1 are shown in these figures.

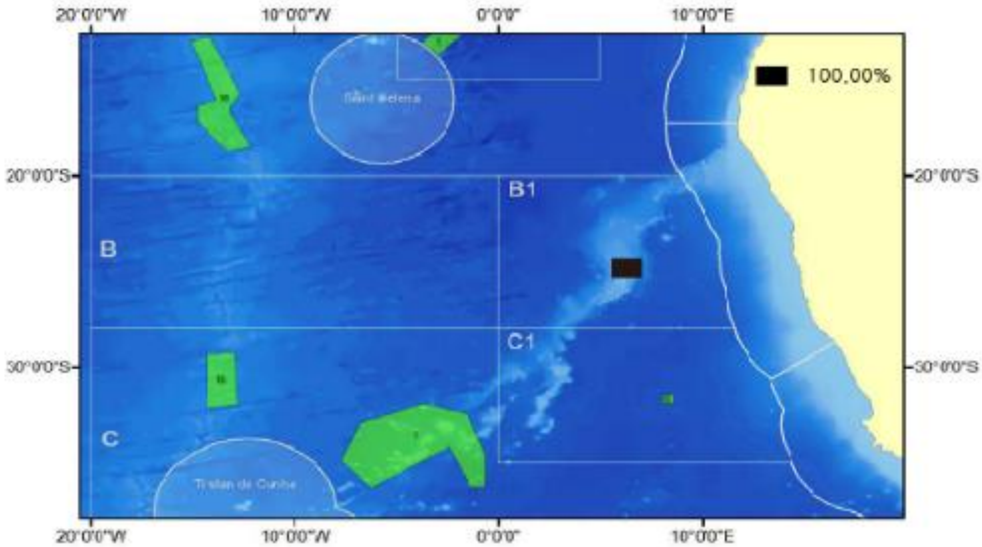


Figure 5: Proportion of catch of Alfonsino (*B. splendens*) by zone (2013).

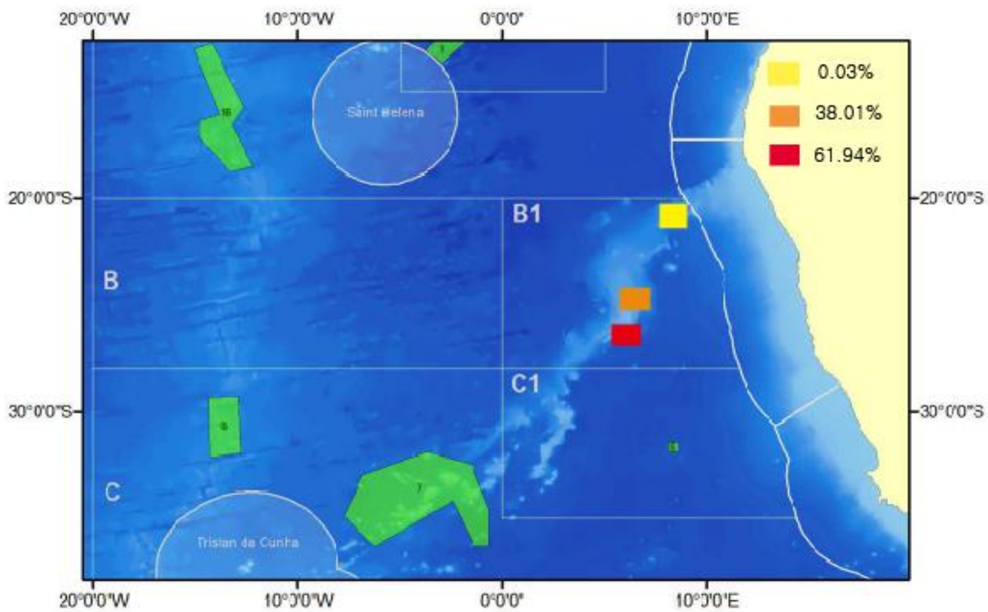


Figure 6: Proportion of catch of Alfonsino (*B. splendens*) by zone c (Jan-Nov 2012).

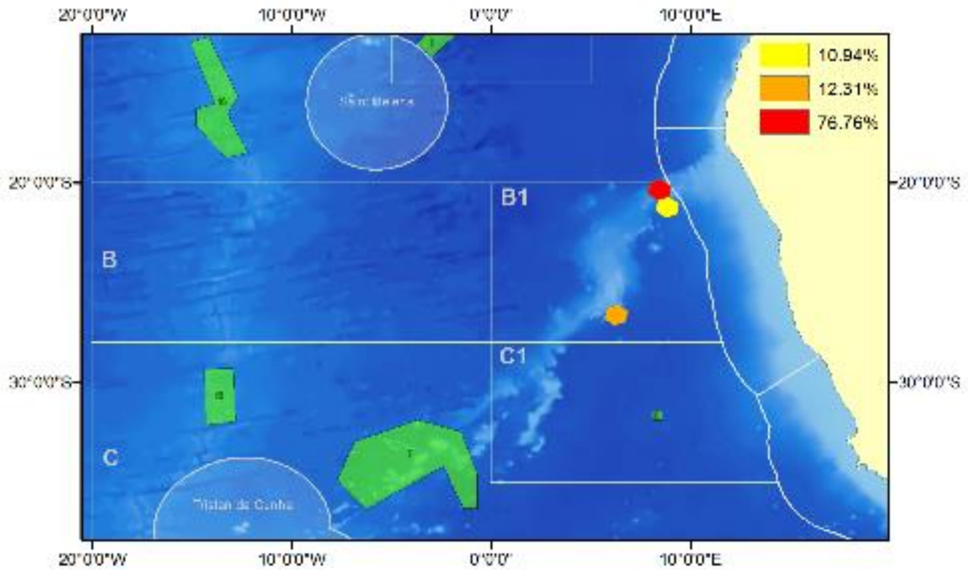


Figure 7: Proportion of catch of Alfonsino (*B. splendens*) aggregated to 100km diameter hexagonal cells (2011).

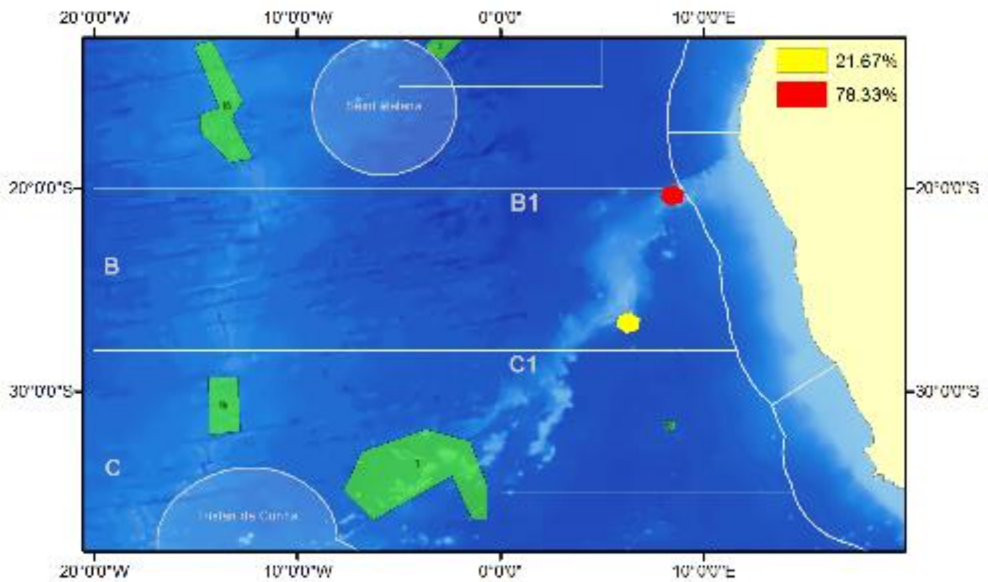


Figure 8: Proportion of catch of Alfonsino (*B. splendens*) aggregated to 100km diameter hexagonal cells (2010).

1.3 Reported retained catches and discards

Table 2 presents Alfonsino catches by country, as well as fishing gear and the sub-divisions in which the catch was taken. The main fishing countries worked in the area included Russia (bottom trawl) in the late 1970s, Ukraine in the mid-1990s, Russia (bottom trawl), Norway (bottom trawl), Spain (MWT /BLL), Poland and Namibia (bottom trawl) in the late 1990s, and South Korea (mid-water trawl) for 4 years from 2010 to 2013, respectively, 198 tonnes, 196 tonnes, 172 tonnes and 1.6tonnes. Historically the highest catches of the fish were recorded by Russia with 2,972 and 2,800 tons in 1977 and 1997 respectively, Poland 1,964 tonnes in 1995, and Norway 1,066 tons in 1998 in the SEAFO CA.

Table 2: Catches (tonnes) of Alfonsino (*B. splendens*) made by various countries. Values in *italics* are taken from Japp (1999). Values in **bold** are from the FAO.

Management Area	B1	A1	Unknown	Unknown	Unknown	A, B & C
Nations	Namibia	Norway	Russia	Portugal	Ukraine	South Korea
Fishing method	Bottom trawl	Bottom trawl	Bottom trawl			Mid-water trawl
1976			*252*			
1977			*2,972*			
1978			*125*			
1993					**172**	
1994						
1995	*1*	N/F				
1996	*368*	N/F			**747**	
1997	*208*	836	*2,800*		**392**	
1998	N/F	1,066	**69**			
1999	1	N/F		**3**		
2000	<1	242		**1**		
2001	1	N/F		**7**		
2002	0	N/F		**1**		
2003	0	N/F		**5**		
2004	6	N/F	210			
2005	1	N/F	54			
2006	N/F	N/F	N/F	<1		
2007	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	198
2011	N/F	N/F	N/F	N/F	N/F	196
2012	N/F	N/F	N/F	N/F	N/F	172
2013	N/F	N/F	N/F	N/F	N/F	1.6
2014	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F

* Provisional (September 2016)
N/F means no fishing. Blank fields mean no data available.

Main species	Alfonsino (continued)					
Management Area			Unknown	Unknown	Unknown	B1?
Nations	Spain	Poland	Cook Island	Mauritius	Cyprus	RSA
Fishing method	MWT /BLL		Bottom trawl	Bottom trawl	Bottom trawl	Bottom trawl
Catches						
1976						
1977						
1978						
1993						
1994						
1995		**1,964**				*60*
1996						*109*
1997	**186**					*124*
1998	**402**					
1999						
2000						
2001	2					

2002						
2003	2					
2004	4		142	115	437	
2005	72					
2006	N/F	N/F	N/F	N/F	N/F	N/F
2007	N/F	N/F	N/F	N/F	N/F	N/F
2008	N/F	N/F	N/F	N/F	N/F	N/F
2009	N/F	N/F	N/F	N/F	N/F	N/F
2010	N/F	N/F	N/F	N/F	N/F	N/F
2011	N/F	N/F	N/F	N/F	N/F	N/F
2012	N/F	N/F	N/F	N/F	N/F	N/F
2013	N/F	N/F	N/F	N/F	N/F	N/F
2014	N/F	N/F	N/F	N/F	N/F	N/F
2015	N/F	N/F	N/F	N/F	N/F	N/F
2016*	N/F	N/F	N/F	N/F	N/F	N/F

1.4 IUU catch

Some IUU fishing activity in the SEAFO CA has been reported for a vessel to the Secretariat, but the extent of this is at present unknown.

2 Stock distribution and identity

Alfonsino has a global distribution and has been reported from all tropical and temperate oceans (excluding from the northeast Pacific and Mediterranean Sea) between latitudes of about 65° N and 43° S. It occurs from depths of about 25 m to at least 1300 m (Busakhin 1982). In the Atlantic Ocean the species occurs at both at western (Gulf of Maine to the Gulf of Mexico) and eastern Atlantic (off south western Europe and the Canary Islands to South Africa) (Fig. 9). This species is benthopelagic: adults inhabit the outer shelf (180 m) and slope to at least 1,300 m depth, probably moving further from the bottom at night but ascending to feed in midwater during the night; often found over seamounts and underwater ridges. There are no estimates of migration behaviour. The species is oviparous; spawning in batches. Eggs, larvae and juveniles are pelagic.

Figure 9: The distribution of Alfonsino (*B. splendens*) (source: FishBase).

Data available for assessments, life history parameters and other population information

3.1 Fisheries and surveys data

Non- availability of the historical data and fishing trends for fishing activities in the SEAFO CA prevent application of standard assessment methods. However, only catch and effort (per haul) data for a period of three years (2010-2012) are available for quantitative stock assessment.

3.2 Length data and frequency distribution

Using the data collected by Korean trawl fisheries between 2010 and 2013, the length frequency distributions were analysed (Table 3 and Fig. 10). The catch landing data in 2013 were not enough to represent the situation of the southern area of Division B1. The length of Alfonsino in the southern area of Division B1 was the largest with average 26.5 cm and 28.0 cm at the 3rd quartile, with two modes at 22 cm and 27 cm in 2011. In the southern area of Division B1 the length of the fish was also the largest in 2011 and reached about 50 cm fork length. No trend appeared in 2012 (May-June) due to paucity of samples (23 samples). Overall length trends between the areas during 2012-2013 were asymmetric. The length of the species in the northern part was larger than that of southern part in 2012 and 2013.

Table 3: Results of length composition of Alfonsino collected by Korean vessels in the SEAFO CA (B1) (2010-2013)

	2010		2011		2012 (5~6)		2012(11)		2013	
	South	North	South	North	South	North	South	North	South	North
No. of samples	200	841	174	593	514	23	77	-	97	5
Minimum length	19.0	17.0	20.0	15.0	17.0	26.0	24.0	-	17.0	25.0
Maximum length	42.0	47.0	50.0	48.0	34.0	35.0	39.0	-	31.0	34.0
Average length	25.8	24.8	26.5	27.8	24.8	31.0	31.5	-	23.7	27.4
Median length	25.0	24.0	25.0	28.0	25.0	32.0	32.0	-	22.0	26.0
1stquartile length	23.0	22.0	23.0	25.0	23.0	30.0	29.0	-	21.0	25.0
3rdquartile length	27.0	26.0	28.0	31.0	26.0	32.5	34.0	-	27.0	27.0

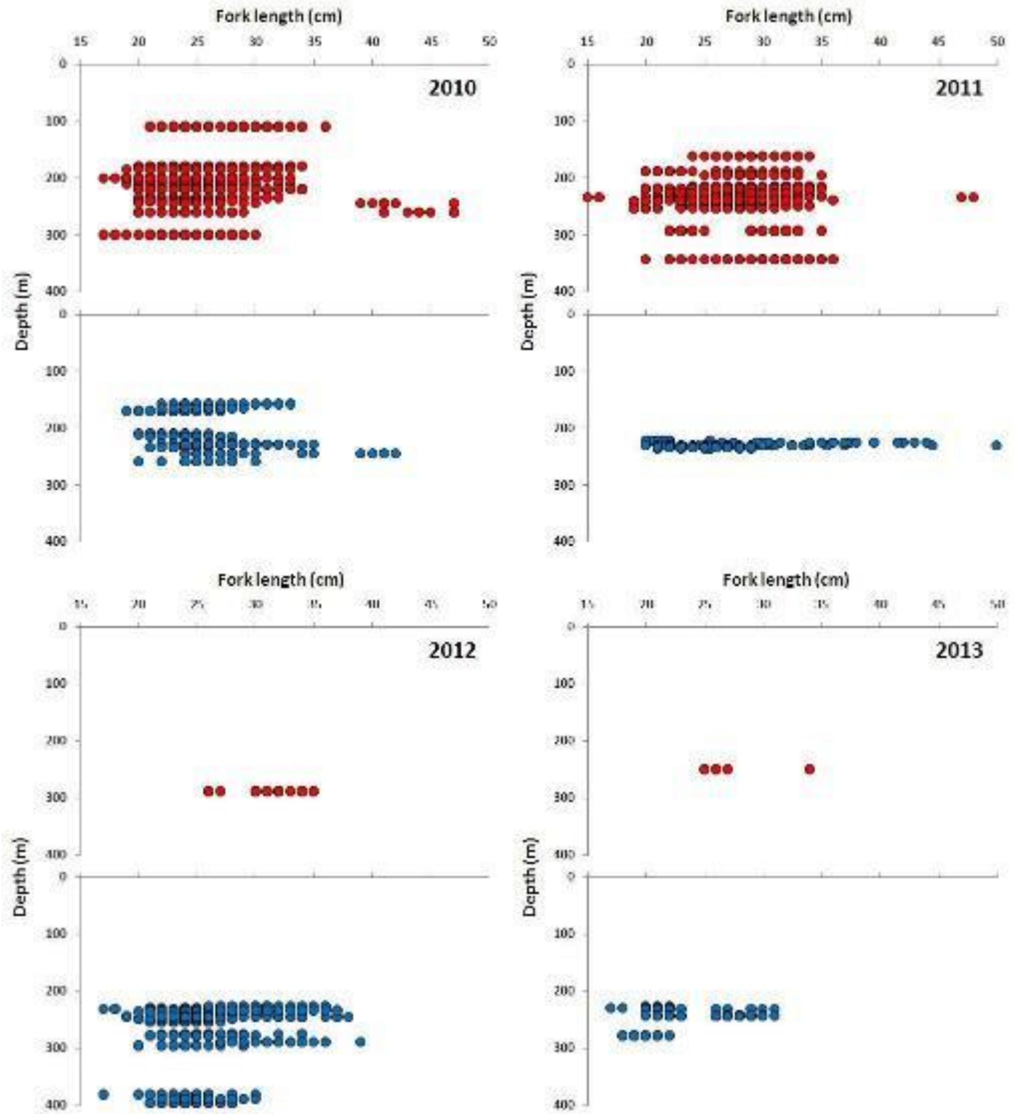


Figure 11: Fork length distribution of Alfonsino (*Beryx splendens*) by depth for 2010-2013.

Table 4: Summary of fork length distribution of Alfonsino (*Beryx splendens*) by depth for 2010-2013.

	2010		2011		2012(5~6)		2012(11)		2013	
	South	North	South	North	South	North	South	North	South	North
No. of Samples	841	200	174	593	514	23	77	-	5	97
Average Depth (m)	210.9	211.1	229.6	238.4	323.8	288.5	248.2	-	250.0	265.1
Average FL (cm)	25.8	24.8	26.5	27.8	24.8	31.0	31.5	-	27.4	23.7

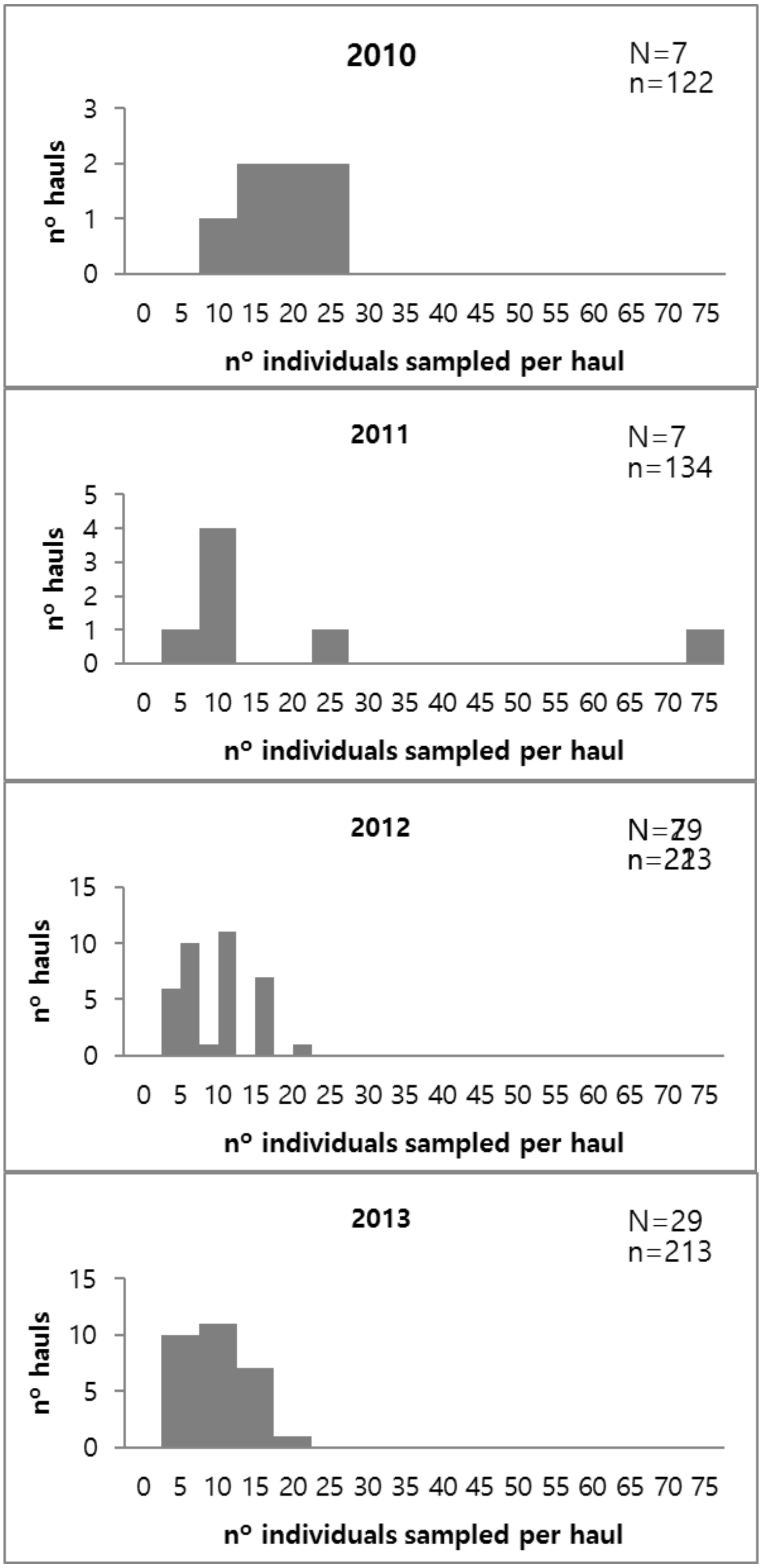


Figure 12: The number of individuals of Alfonsino per haul over a period of four year from 2010 to 2013 in the SEAFO CA.

Table 5: Number of sets by year, minimum and maximum number of individuals per set and the number of individuals sampled between 2010 to 2013 in the SEAFO CA.

Year	No. of Sets Observed	Mean Individuals	Min. Individuals	Max. Individuals	Mean sample size/tonnes
2010	7	17.429	10	25	0.92
2011	7	19.143	5	75	1.36
2012	29	7.345	1	16	0.06
2013	7	3.143	1	7	1.94

3.3 Length-weight relationships

Figure 13 shows the length and weight relationship of Alfonsino for 2010-2013. Two parameters of the length-weight relationship were 0.022 for α and 3.010 for β of combined sex of Alfonsino.

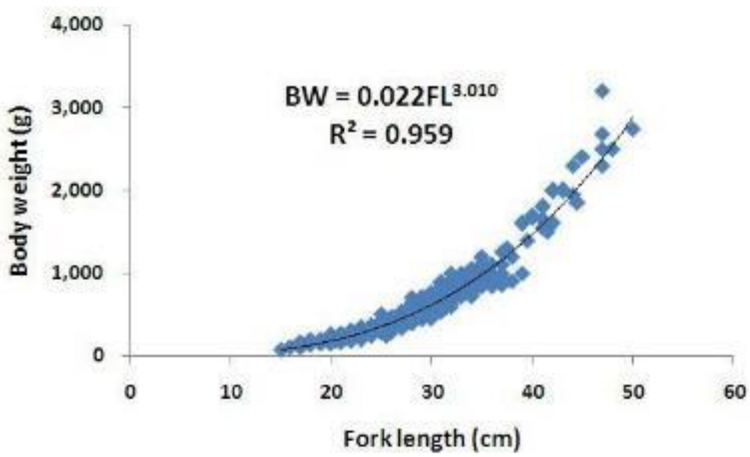


Figure 13: Relationship between length and weight of Alfonsino (*B. splendens*) in the SEAFO CA for 2010 - 2013.

3.4 Age data and growth parameters

The maximum observed age of Alfonsino in the Guinean Gulf was 20 years. The growth parameters of Alfonsino were estimated as K=0.097 year^-1, Linf=48 cm, and t0=-3.08 year^-1 using the specimens from Guinean Gulf (López-Abellán *et al*. 2008).

3.5 Reproductive parameter

The reproductive parameters of Alfonsino were analysed as follows. Spawning season was evaluated as the period from November to February (Nova Caledonia). Length at 1st maturity was estimated as fork length 39.67 cm for females (95% c.i.=39.34, 40.02 cm) and 36.88 cm for males (95% c.i.=36.45, 37.36 cm) (Flores et al. 2012). Fecundity was calculated as 270,000 – 650,000 eggs (source: FishBase).

The biological productivity of *B. splendens* is likely to be moderate to low in general (Anonymous, 2007). Alfonsinos are serial spawners and reproduce in the areas that they normally inhabit. Average size at sexual maturity appears to be about 30–34cm (4–6 years old), and can vary between localities (González et al. 2003). The annual numbers and proportion of the fish by gonad maturity stage by Korean trawl fisheries during the period of 2010 - 2013 are presented in Table 6 and Figure 14. Time of spawning also varies markedly between seasons. The proportion of immature fishes was 99.4%, 91.4%, 98.6% and 97.1% in 2010, 2011, 2012 and 2013, respectively. The fish, which is in pre-spawning and spawning gonad stages, appeared from October indicating that the spawning season may start from sometime after October. To get more accurate reproduction results of Alfonsino in the SEAFO Area, there is a need to collect data for a few more years.

Table 6: Annual number of fish by maturity stages of Alfonsino (*B. splendens*) in the SEAFO CA for 2010 to 2013.

Year	Month	Maturity stage				
		Immature	Developing	Pre-spawning	Spawning	Spent
2010	Sep	882	66	6	0	0
	Oct	33	6	0	0	0
	Nov	0	20	0	0	0
2011	Jan	95	239	0	0	0
	Sep	37	1	0	0	0
	Oct	18	20	12	0	0
	Nov	26	77	34	2	0
2012	May	16	7	0	0	0
	Jun	452	32	0	0	0
	Nov	29	40	3	5	0
2013	Oct	42	4	0	0	0
	Nov	28	25	3	0	0

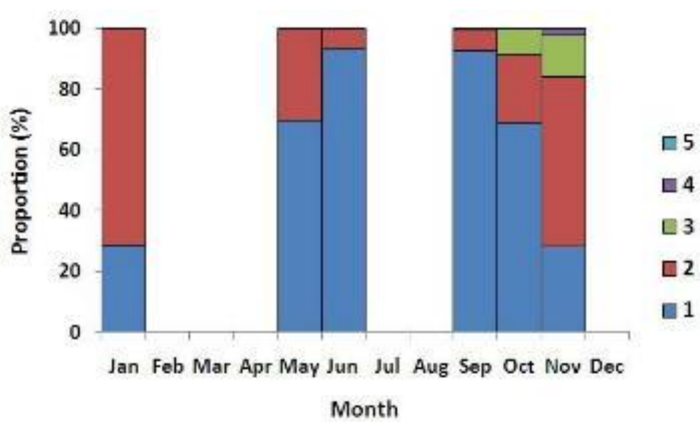


Figure 14: The proportion of maturity stage of Alfonsino in the SEAFO CA for 2010-2013. (1: immature, 2: developing, 3: pre-spawning, 4: spawning, and 5: spent).

3.6 Natural mortality

There is no available information and data in the SEAFO CA.

3.7 Feeding and trophic relationships (including species interaction)

There is no available information and data in the SEAFO CA.

3.8 Tagging and migration

No tagging and migration studies on Alfonsino have been done in the SEAFO Area.

4 Stock assessment

4.1 Available abundance indices and estimates of biomass

There is no available information and data in the SEAFO CA

4.2 Data used

The data used are derived from fishing hauls in which total catch of *Beryx splendens* represented more than 80% of the total catch of *P. richardsoni* and *Beryx splendens* caught by Korean trawls around the Valdivia Bank. This criterion is used since the catches of these two species are negatively correlated, i.e., when one of these two species occurs in the haul the other does not.

In each haul the estimate of CPUE of *Beryx splendens* is represented as the ratio of total catch of the species by the haul duration time.

4.3 Methods used

Nominal CPUE was used to derive a perception of the development of the fishery in the period 2010-2012.

4.4 Results

The progression in CPUE over time showed marked variability and no clear trend.

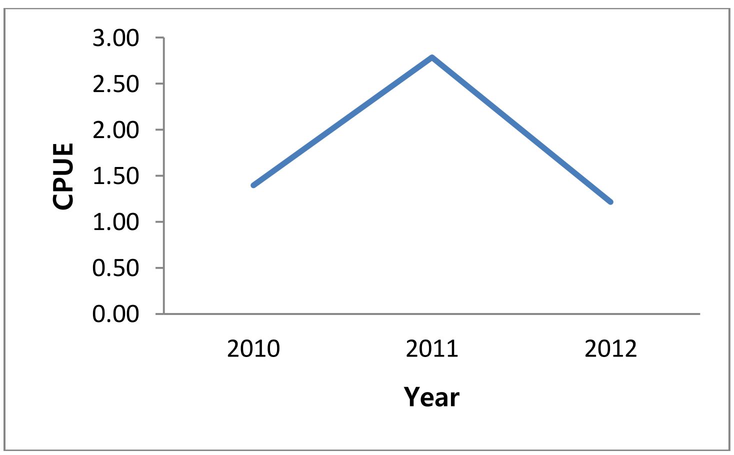


Figure 14: Plot of nominal CPUE (Catch per hour) for 2010-2012.

4.5 Discussion

It should be recognized that the data available for assessment is extremely sparse and represents a short time series. The perception of the stock as described is based on only 3 years of catch and effort data. Length frequency distributions could not be derived based on the insufficient length samples submitted to the Secretariat.

4.6 Conclusion

Catch and effort data per haul on Alfonsino were collected by Korean vessels for only 3 years from 2010 to 2012. These data, although short in series, can be used to get a perception of the trend in nominal CPUE.

4.7 Biological reference points and harvest control rules

No biological reference points could be determined and the SC suggests using an empirical Harvest Control Rule (HCR) to regulate the fishery until the data situation is improved. A candidate HCR consists of the average catch of the last three years to which a 20% uncertainty cap is applied.

ICES Harvest Control Rules, category 5: Data poor stocks (only landings data).Calculation of average catch for three years (2010- 2012) as C_{Y-1}

$$C_{Y-1} = \frac{\sum_{y-3}^{y-1} C_i}{3}$$

= (159+ 165+172)/3

=165

And calculation of the catch advise as

$$C_{Y+1} = 0.8 \times C_{Y-1}$$

= 0.8*165

= 132t

Incidental mortality and by-catch of fish and invertebrates

5.1 Incidental mortality (seabirds, mammals and turtles)

No by-catch of seabirds, mammals and turtles were reported.

5.2 Fish by-catch

In the case of Southeastern Atlantic fisheries, Alfonsino is often found in association with other fish species as, for example, in 2011 the following species (per ton) were caught; Boarfish (*Capros aper*) 14 tonnes, Blackbelly rosefish (*Helicolenus actylopterus*) 3 tonnes, Imperial blackfish (*Schedophilus ovalis*) 6 tonnes, Oilfish (*Ruvettus pretiosus*) 8 tonnes, and Silver scabbardfish (*Lepidopus caudatus*) 4 tonnes.

5.3 Invertebrate by-catch including VME taxa

The main method used to catch Alfonsino is with bottom trawling. Trawling for this species on seamounts impacts habitat (Clark and O'Driscoll, 2003, Koslow et al., 2001), but the precise impact of this on invertebrate populations on the seamounts is unknown.

5.4 Incidental mortality and by-catch mitigation methods

By-catch mitigation measures to reduce incidental mortality for seabirds, mammals and turtles are in place (see current conservation measures in section 6).

5.5 Lost and abandoned gear

There was no reported lost and abandoned gear from the trawl fisheries for Alfonsino in the SEAFO CA.

5.6 Ecosystem implications and effects

The main method to catch Alfonsino is bottom trawling and repeated trawl disturbances will alter the benthic community on a seamount. However, the precise impact of such trawling on the ecosystem as a whole is unknown. (see Conservation Measure 18-10).

Current conservation measures and management advice
There have been no landings of alfonsino in the last 3 years (including 2016). The SC was therefore unable to apply the HCR previously proposed by the SC and accepted by the Commission.

Alfonsino is a seamount-associated species that form aggregations, and the experience worldwide is that serial depletion of aggregations at different seamounts can happen. In the recent fisheries for the species in SEAFO the fishery was concentrated on a single seamount summit, the Valdivia Bank, where it was mainly a bycatch in the target fishery for pelagic armourhead. The only information available from 2015 is the limited observations from the RV Dr Fridtjof Nansen survey noting that only scattered specimens of the species occurred in the main fishing area.

It is also recognized that the last three year's interruption in the exploitation has provided potential for recovery of the resource in the main fishing area on Valdivia Bank. There is however not enough information from any source to determine with certainty whether recovery has happened or not happened.

The SC however recognised that without future fishery data nor survey information the basis for providing scientific advice will deteriorate. The SC therefore discussed what advisory option would be most appropriate while maintaining the potential for data provision from a fishery. It must also be taken into account that the alfonsino is mainly a bycatch and that the catches will depend on the activity level in the target fishery for armourhead.

The SC considered the TAC level advised in 2013 as precautionary at that time. Considering no fishing pressures last 3 years and development of the resource, The SC recommends a TAC of 200 t (status quo) for the SEAFO CA, of which a maximum of 132 tonnes may be taken in Division B1.

Other Conservation Measures that are applicable to this fishery can be seen in Table 7.

Table 7: Other Conservation Measures that are applicable to this fishery.

Conservation Measure 04/06	On the Conservation of Sharks Caught in Association with Fisheries Managed by SEAFO
Conservation Measure 14/09	To Reduce Sea Turtle Mortality in SEAFO Fishing Operations.
Conservation Measure 25/12	On Reducing Incidental Bycatch of Seabirds in the SEAFO Convention Area
Conservation Measure 30/15	On the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area
Conservation Measure 31/15	On Total Allowable Catches and related conditions for Patagonian Toothfish, orange roughy, Alfonsino and Deep-Sea Red Crab in the SEAFO Convention Area in 2014

6 References

Anonymous. (2007). Information describing alfonsino (Beryx splendens) fisheries relating to the South Pacific Regional Fishery Management Organisation (Working Draft, 20 June 2007). SPRFMO-IV-SWG-09.

Busakhin, S.V. (1982). Systematics and distribution of the family Berycidae (Osteichthyes) in the World Ocean. *Journal of Ichthyology 22 (6)*: 1–21.

Chile. 2009. Information describing alfonsino (*Beryx splendens*) fisheries relating to the South Pacific Regional Fishery Management Organisation. SP-07-SWG-INF-07

Clark, M.; O'Driscoll, R. 2003: Deepwater fisheries and aspects of their impact on seamount habitat in New Zealand. Journal of Northwest Atlantic Fishery Science 31: 441-458

DeLury, D.B. 1947. On the estimation of biological populations. Biometrics, 3: 145–167.

Fisheries Agency of Japan. 2008. Information describing splendid alfonsin (*Beryx splendens*) fisheries relating to the North Western Pacific Regional Fishery Management Organization. Working draft.

Fisheries Agency of Japan. 2008. Report on Identification of Vulnerable Marine Ecosystems in the Emperor Seamount and Northern Hawaiian Ridge in the Northwest Pacific Ocean and Assessment of Impacts Caused by Bottom Fishing Activities on such Vulnerable Marine Ecosystems or Marine Species as well as Conservation and Management Measures to Prevent Significant Adverse Impacts (Bottom Gillnet).

Flores A, Wiff R, Gálvez P, and Díaz E. 2012. Reproductive biology of alfonsino Beryx splendens. J Fish Biol.

Gili, R., L. Cid, H. Pool, Z. Young, D. Tracey, P. Horne and P. Marriott. 2002. Estudio de edad, crecimiento y mortalidad natural de los recursos orange roughy y alfonsino. FIP 2002-12. Informe Final. IFOP-SUBPESCA. 129 p. Age, growth and natural mortality of orange roughy and alfonsino. (Final report FIP N° 2000-12. 129 p. (In Spanish).

González, J.A.; Rico, V.; Lorenzo, J.M.; Reis, S.; Pajuelo, J.G.; Afonso Dias, M.; Mendonça, A.; Krug, H.M.; Pinho, M.R. (2003). Sex and reproduction of the alfonsino *Beryx splendens* (Pisces, Berycidae) from the Macronesian archipelagos. *Journal of Applied Ichthyology 19*: 104–108.

Heemstra, P.C., 1986. Berycidae. p. 409-410. In M.M. Smith and P.C. Heemstra (eds.) Smiths' sea fishes. Springer-Verlag, Berlin.

Hilborn, R. and C.J. Walters. 1992. Quantitative Fisheries Stock assessment: Choice, Dynamics and Uncertainty. Chapman and Hall: 570 pp.

Koslow, J.A.; Gowlett-Holmes, K.; Lowry, J.K.; O'Hara, T.; Poore, G.C.B.; and Williams, A. (2001). Seamount benthic macrofauna off southern Tasmania: community structure and impacts of trawling. Marine Ecology Progress Series 213: 111-125.

Lehodey, P.; Grandperrin, R. (1996). Age and growth of the alfonsino *Beryx splendens* over seamounts off New Caledonia. *Marine Biology 125*: 249–258.

Leslie, P.H. and D.H.S. Davis. 1939. An attempt to determine the absolute number of rats on a given area. J. Anim. Ecol., 8: 94–113.

López Abellán, L.J., M. T. G. Santamaría and E. Román (2007). Estudio comparado del crecimiento del alfonsiño Beryx splendens Lowe, 1834 de las montañas submarinas del golfo de Guinea y del océano Índico suroccidental. Bol. Inst. Esp. Oceanogr. 23 (1-4): 33-44.

Maul, G.E., 1986. Berycidae. p. 740-742. In P.J.P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen and E. Tortonese (eds.) Fishes of the north-eastern Atlantic and the Mediterranean. UNESCO, Paris. Vol. 2.

Maul, G.E., 1990. Berycidae. p. 626. In J.C. Quero, J.C. Hureau, C. Karrer, A. Post and L. Saldanha (eds.) Check-list of the fishes of the eastern tropical Atlantic (CLOFETA). JNICT, Lisbon; SEI, Paris; and UNESCO, Paris. Vol. 2.

Nakamura, I., T. Inada, M. Takeda and H. Hatanaka, 1986. Important fishes trawled off Patagonia. Japan Marine Fishery Resource Research Center, Tokyo. 369 p.

Paulin, C., A. Stewart, C. Roberts and P. McMillan, 1989. New Zealand fish: a complete guide. National Museum of New Zealand Miscellaneous Series No. 19. 279 p.

Paxton, J.R., 1999. Berycidae. Alfonsinos. p. 2218-2220. In K.E. Carpenter and V.H. Niem (eds.) FAO species identification guide for fishery purposes. The living marine resources of the WCP. Vol. 4. Bony fishes part 2 (Mugilidae to Carangidae). FAO, Rome. Rico, V.; Lorenzo, J.M.; González, J.A.; Krug, H.M.; Mendonça, A.; Gouveia, E.; Afonso Dias, M. (2001). Age and growth of the alfonsino *Beryx splendens* Lowe, 1834 from the Macronesian archipelagos. *Fisheries Research 49*: 233–240.

Rico, V.; Lorenzo, J.M.; González, J.A.; Krug, H.M.; Mendonça, A.; Gouveia, E.; Afonso Dias, M. (2001). Age and growth of the alfonsino *Beryx splendens* Lowe, 1834 from the Macronesian archipelagos. *Fisheries Research 49*: 233–240.

Seber, G.A.F. 2002. The Estimation of Animal Abundance and Related Parameters. Second Edition. Blackburn Press, New Jersey.

STATUS REPORT

Pseudopentaceros richardsoni
Common names: Pelagic armourhead, Southern boarfish

2016
Updated 14 October 2016

TABLE OF CONTENTS

1 Description of the fishery

1.1 Fishing fleets and fishing gear

In recent years the Korean trawl fishery was the only fishery targeting the pelagic armourhead in the SEAFO CA. It started in 2010 but due to the depletion of the pelagic armourhead stock, the fishery finished in 2014. During the period 2010-2013 two fishing vessels participated in the fishery, F/V Adventure and F/V Dongsan Ho.

Although primarily considered as a midwater trawl fishery, 94% of the tows recorded by onboard observers were classified as "Demersal". Whether or not these trawls were bottom trawls remains uncertain, and this is an issue that still requires clarification.

At the SEAFO CA the F/V Adventure stern trawler operated with the following fishing gears (Table 1 and Figs. 1- 4 provide the specifications of the fishing gears):
HAMPIDJAN NET is a bottom otter trawl with two-piece nets of 66 m in length. The head rope is 48 m long; ground rope is 50 m; the height, width and girth of the net are 5.5 m, 30 m and 100 m, respectively. The cod-end mesh size is 120 mm. The ground gear is 50 m in length and 903 kg in weight, and the float is 1,018 kg.
MANUFACTURED NET is a four-piece net with a overall length of 66.9 m. The lengths of the head rope and ground rope are 59.0 m and 77.9 m, respectively. The height, width and girth of the net are 5.5 m, 200 m and 83 m, respectively. The cod-end mesh size is 120 mm. The ground is 77.9 m in length and the weight of the ground is 2,068 kg. The float is 913.200 kg with the floating rate of 44%.
MIDWATER NET is 210 m long. The lengths of head rope and ground ropes are 93.6 m. The height and width of the net are 70.0 m and 240-260 m, respectively. The girth of the net is 816 m and the cod-end mesh size is 120 mm.

Table 1: Specifications of the fishing gears available at F/V Adventure.

Gear Specifications		HAMPIDJAN NET bottom trawl	MANUFACTURED NET bottom trawl	MIDWATER NET
Otter board	type	VRS-TYPE	VRS-TYPE	VRS-TYPE
	material	Steel	Steel	Steel
	size (mm)	2,300 x 4,030	2,750 x 4,900	1,854 x 3,818
	weight (kg)	3,930	4,320	2,000
	under water weight (kg)	2,619	2,473	1,145
Trawl Net	purpose	bottom fishing (figure1)	bottom fishing (figure2)	mid-water fishing (figure3)
	net length overall(m)	66	66.9	210.0
	head rope (m)	48	59.0	93.6
	ground rope (m)	50	77.9	93.6
	net height (m)	5.5	5.5	70
	net width (m)	30	200	240~260
	net girth (m)	100	83	816
	mesh size (mm)	120	120	120

At the SEAFO CA F/V Dongsan Ho, a stern trawler, operated with mid-water KITE trawl and the bottom trawl net PE Net. The mid-water KITE trawl (Fig. 4) includes ropes and has kites at the upper part and chains at the lower part . The height of the net's gate is approximately 50 m, and the total length is around 280 m. When net is settled, it sinks underwater and the sinking depth of the net is controlled by the wire ropes. The upper and lower parts of the bottom trawl net PE Net have attached plastic buoys and rubber balls respectively. As in the case of KITE gear the wire ropes control the sinking depth of the settled gear.

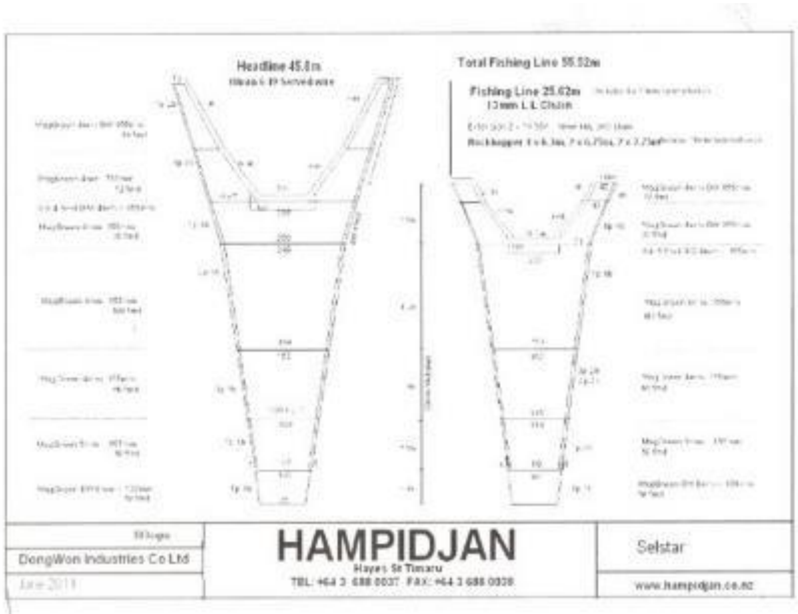


Figure 1: Diagram of HAMPIDJAN NET of F/V Adventure.

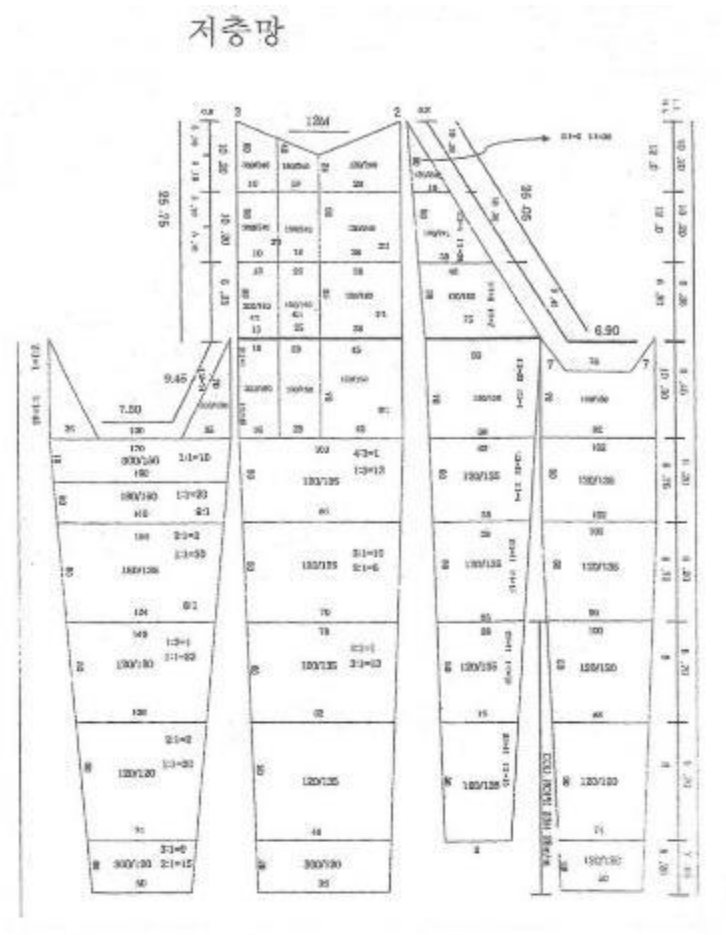


Figure 2: Drawing of the Custom Manufactured Bottom Trawl Net of F/V Adventure.

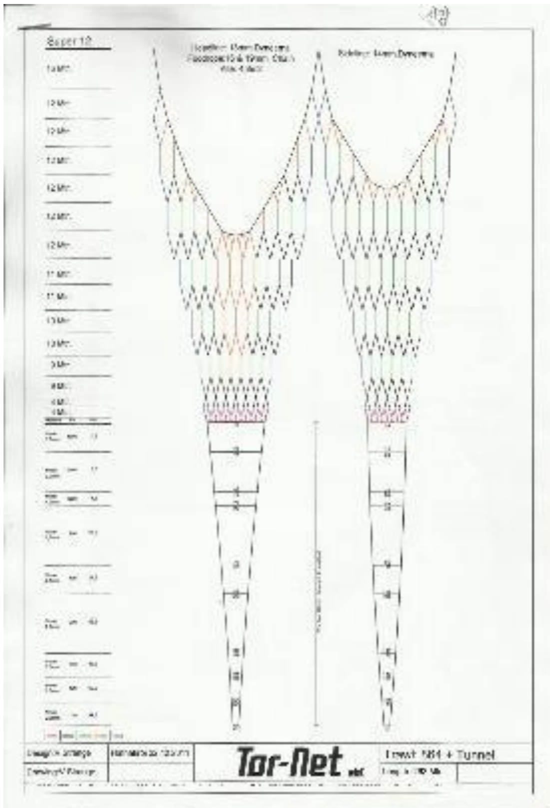


Figure 3: Drawing of mid-water trawl net of F/V Adventure.

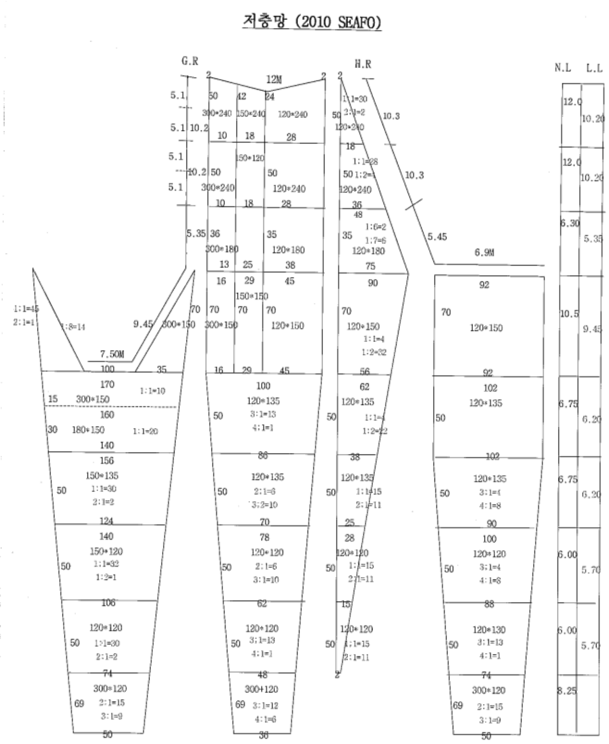
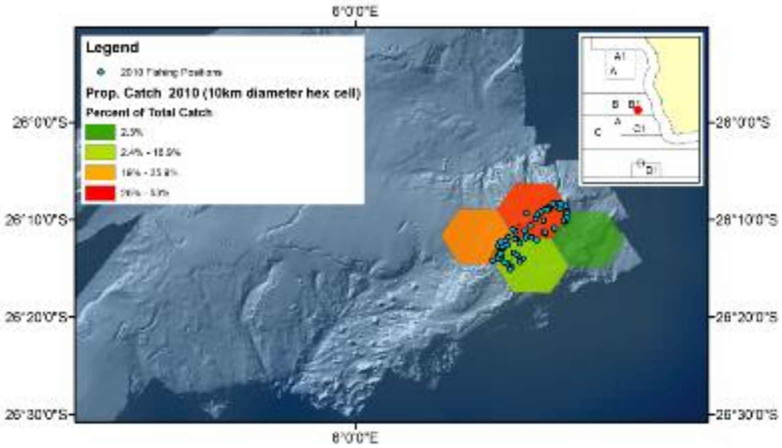


Figure 4: Drawing of mid-water KITE trawl of F/V Dongsan Ho.

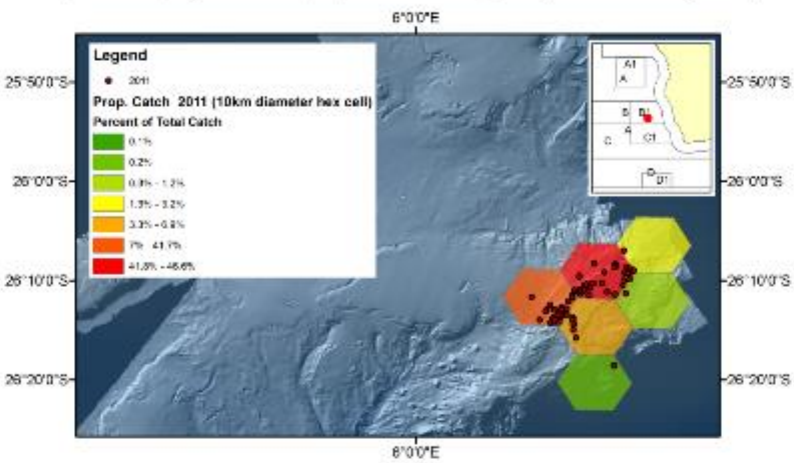
1.2 *Spatial and temporal distribution of fishing*

During the period 2010-2013 the Korean trawl fishery targeting pelagic armourhead took mainly place at the southern and northern parts of the Valdivia Bank, in Division B1 of the SEAFO CA (Figure 5). In addition in 2013, a single haul was also conducted at North Walvis Ridge in Subdivision B1 (Table 1, Fig. 5, lower).

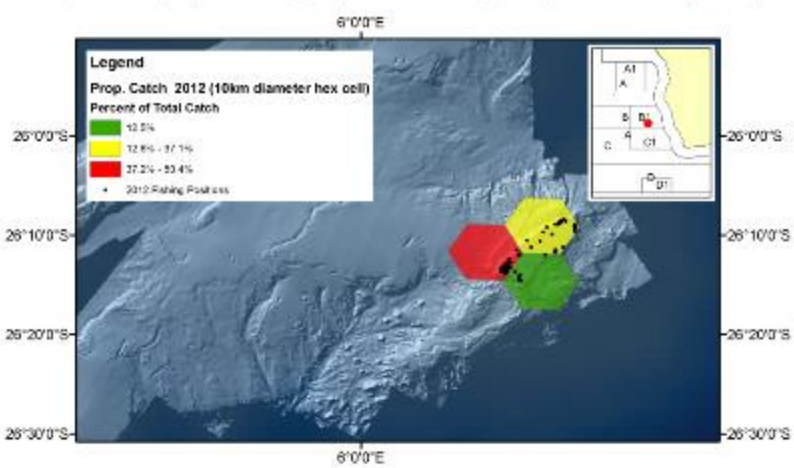
At the Valdivia Bank, the fishing grounds of the Korean fishery were primarily located in a small area of about 200 km^2.



Proportion Catch of pelagic armourhead (Peudopentaceros richardsoni) in 2011 (10km diameter hexagonal cells)



Proportion Catch of pelagic armourhead (Peudopentaceros richardsoni) in 2012 (10km diameter hexagonal cells)



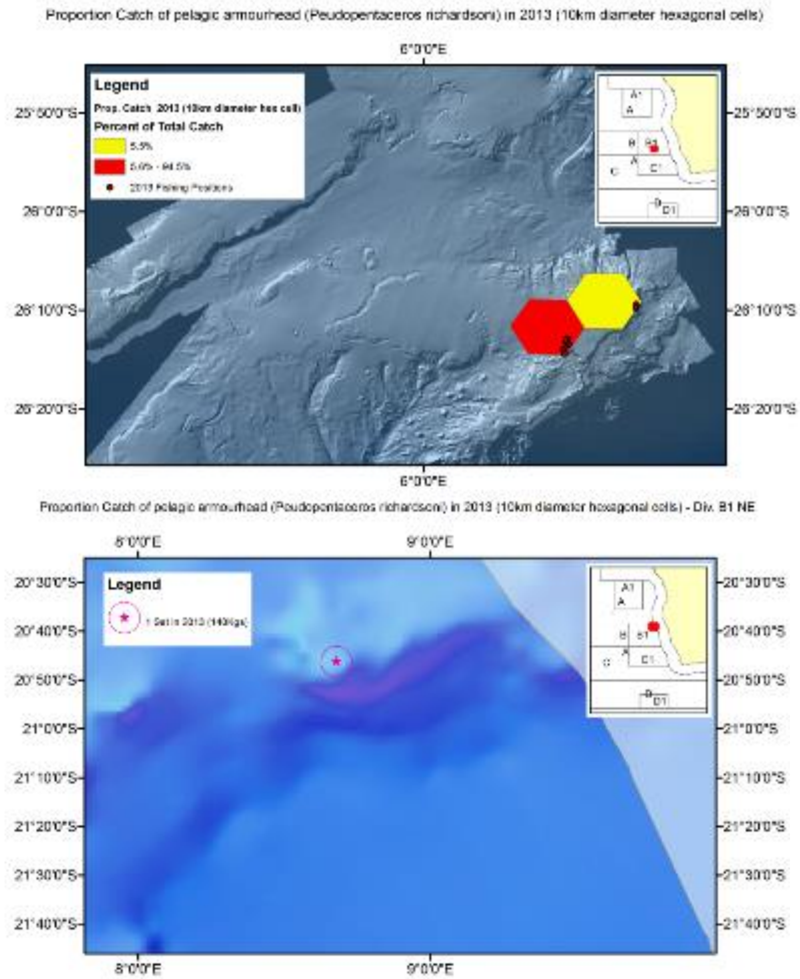


Figure 5: Spatial distribution of fishing positions and reported catches of pelagic armourhead (*P. richardsoni*) aggregated by 10km diameter hexagonal cells, 2010-2013. Lower map shows the single fishing position in the northeastern seamount of B1 (northeastern Walvis Ridge) reported in 2013. Data from observer reports submitted to SEAFO until Sept. 2014.

Table 1: Number of trawl hauls by year and SEAFO region (ref. Fig. 5).

Year	Valdivia Bank	North Walvis Ridge
2010	63	
2011	88	
2012	117	
2013	9	1

1.3 Reported retained catches and discards

Table 2 presents the annual catches and by-catches of pelagic armourhead by country, fishing gear and SEAFO CA sub-divisions since 1976,. At the early years the main fishing countries were:
Russia operating with bottom trawls (late 1970s and 1993);
Ukraine operating with bottom trawls (mid-1990s);
Namibia and South Africa both operating with bottom trawls (mid-1990s);
South Korea primarily operating with mid-water trawl (2010-2013).

The highest annual catches were recorded by Russia with 1,273 and 1,000 t in 1977 and 1993, respectively, and by Korea with 688 t in 2010.

Table 2: Reported catches (tonnes) of pelagic armourhead *(Pseudopentaceros richardsoni*) from the SEAFO CA. Data reported by SEAFO CPs and other flag states reporting to SEAFO, and from FAO.

Nation	**Namibia**		**Russia**	**Ukraine**	**South Africa**		**Spain**		**Cyprus**	**Rep. of Korea**	
Management Area	B1		B1	UNK	B1		B1		UNK	**B1**	
Fishing method	BT		BT	BT	BT		BT / LL		BT	**MT**	
Catch details	(t)		(t)	(t)	(t)		(t)		(t)	**(t)**	
	Catch	Discard	Catch	Catch	Catch	Discard	Catch	Discard	Catch	Catch	**Discard**
1976			108								
1977			1273								
1978			53								
1993			1000	435 FAO							
1994											
1995	8			49	530						
1996	284			281	201						
1997	559			18	12						
1998	N/F										
1999	N/F										
2000	20										
2001	N/F						<1				
2002	N/F										
2003	4						3				
2004							3		22		
2005											
2006											
2007											
2008											
2009	N/F		N/F	N/F	N/F		N/F		N/F	N/F	
2010	N/F		N/F	N/F	N/F		N/F		N/F	688	**0**
2011	N/F		N/F	N/F	N/F		N/F		N/F	135	**0**
2012	N/F		N/F	N/F	N/F		N/F		N/F	152	**<1**
2013	N/F		N/F	N/F	N/F		N/F		N/F	13	0
2014	N/F		N/F	N/F	N/F		N/F		N/F	N/F	
2015	N/F		N/F	N/F	N/F		N/F		N/F	N/F	
2016*											

N/F = no fishing
UNK = Unknown
Blank fields = No data available.
******* Provisional (Aug 2016)
FAO = values from FAO
TB = Bottom Trawl
TM = Mid-water Trawl
LL = Longline

1.4 IUU catch

IUU catches are unknown. Historically, fishing vessels have reported IUU fishing activity in the SEAFO CA to SEAFO secretariat. The reports may have been incomplete, and the extent of such activity and impacts on pelagic armourhead are unknown. In recent years no reports or other information indicating IUU fishing were received, so it is believed that IUU activity have stopped or become much reduced.

2 Stock distribution and identity

The pentacerotid *Pseudopentaceros richardsoni* (Smith 1844) is a southern circumglobal, benthopelagic species. The species inhabits the outer shelf and upper continental shelves, as well as, seamounts and underwater ridges (100-1000 m) between 0 and 1 000 m depth (Heemstra, 1986), e.g. Tristan de Cunha, on the Walvis Ridge and seamounts off South Africa (Southeast Atlantic); south of Madagascar (Western Indian Ocean) as well as in southern Australia, New Zealand and the Southeast Pacific.

In the SEAFO CA, the potential distribution area of the species and adjacent waters is shown in Figure 6. It is unlikely that the species is abundant south of about 40^{O}S, i.e. in Division D.

P. richardsoni populations particularly the adult exploited fraction, have patchy distributions Adult fraction tend to occur in a restricted depth *stratum* on the summit of seamounts and oceanic banks. The species recruit to the summit of the seamounts after approximately 4 years of pelagic life and thereafter aggregates.

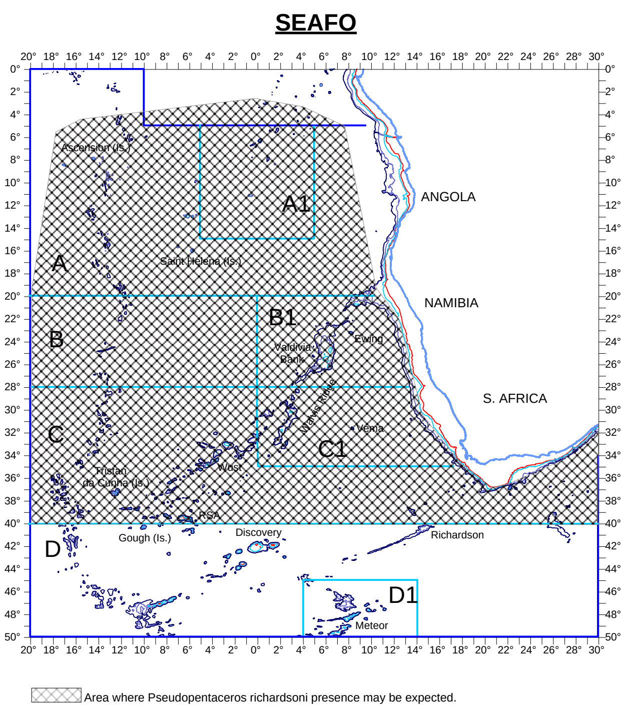


Figure 6: Potential geographical distribution of *P.richardsoni* in the SEAFO CA and adjacent waters (source: Species profile on the SEAFO website referring to several sources).

3 Data available for assessments, life history parameters and other population information

3.1 Fisheries and survey data

Geo-referenced data on catch and effort were available from haul-by-haul observer reports for the entire time-series of the Korean fishery (2010-2013), but logbook data were not available.

During the investigation of selected SEAFO seamounts in Jan-Feb 2015 by the RV Dr Fridtjof Nansen (FAO, 2016) pelagic armourhead were recorded in trawl catches and videos, and attempts were made to record aggregations of these species by acoustics. Small aggregations were observed in videos on a summit knolls in Wüst, and a single aggregation in Valdivia Middle. Scattered individuals occurred on the upper slope of Vema. The main former fishing area Valdivia Bank appeared impoverished with only scattered individuals and no acoustic recordings.

3.2 Length data and length frequency distributions

In 2014 the SC reviewed length data collected by observers on Korean fishing vessels. The number of individuals measured was considered insufficient to derive reliable length compositions of the catches. As a consequence, the length frequency distributions and length statistics (e.g. ranges and mean lengths) presented in 2013 or earlier SC reports were considered invalid. However, if sufficient length data were available, cohort analyses to perceived stock status based on length could be adopted.

The number hauls versus the number of fishes measured at each fishing haul are presented in Figure 7 and Table 3. Although most trawl tows have been sampled the number of individual measured per haul was clearly insufficient. This number has even decreased in the latter years

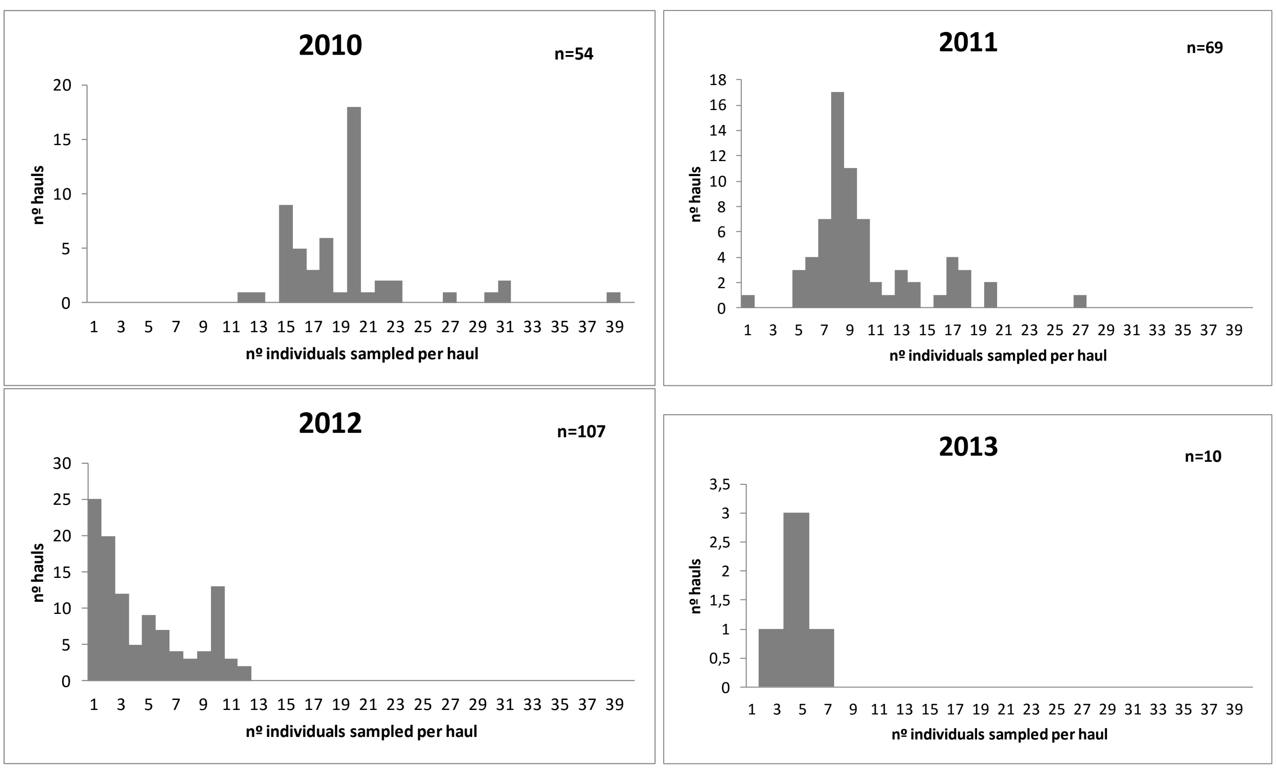


Figure 7: Frequency distributions of sample sizes for individual trawl tows, 2010-2013 in the Valdivia Bank trawl fishery for pelagic armourhead. The source is observer reports submitted to SEAFO until September 2014. n- number of tows sampled by observers.

Table 3: Total number of trawl tows sampled per year, annual mean, minimum, maximum number of fishes measured per trawl tow. The mean number of individuals measured per tonne is presented in the last column. (Data presented are official data submitted to SEAFO till Sept. 2014).

Year	No. of trawl tows sampled	Mean ind. sampled/tow	Min. ind. sampled/tow	Max. ind. sampled/tow	Mean ind. sampled/tonne
2010	54	19.3	12	39	0.03
2011	69	10.1	1	27	0.09
2012	107	4.5	1	12	0.03
2013	10	4.5	2	7	0.35

3.3 Length-weight relationships

The weight-length relationship of pelagic armourhead (for the two sexes combined) derived from observed data collected between 2010–2012 was: W=.016 L3.048 (r2 =.96).

3.4 Age data and growth parameters

There is no available information for SEAFO CA.

3.5 Reproductive parameters

For the period 2010 – 2012, the number of fishes by maturity stage and month are shown in Table 4. High proportions of pre-spawning and spawning stages were observed (Fig. 8). Although for the period 2010-2012 fishing activity in SEAFO CA has been restricted to May and June, data suggest that spawning is likely to occur after May, probably before September. If this is the case at the SEAFO CA the spawning period is different from that in the Southwest Indian Ocean, admitted to occur between October and December (López-Abellán et al. 2007).

Table 4: Annual number of fish by maturity stage of Pelagic Armourhead (*Pseudopentaceros richardsoni*) in the SEAFO CA for 2010-2012. Source: observer samples from Korean fishery.

Year	Month \ Maturity stage	Immature	Developing	Pre-spawning	Spawning	Spent
2010	Sep	0	504	159	0	0
	Oct	0	437	107	0	0
	Nov	0	84	26	0	0
2011	Jan	14	78	27	0	0
	Sep	59	75	4	0	0
	Oct	30	26	13	0	0
	Nov	0	16	27	2	0
2012	May	0	0	38	96	0
	Jun	0	0	69	352	0

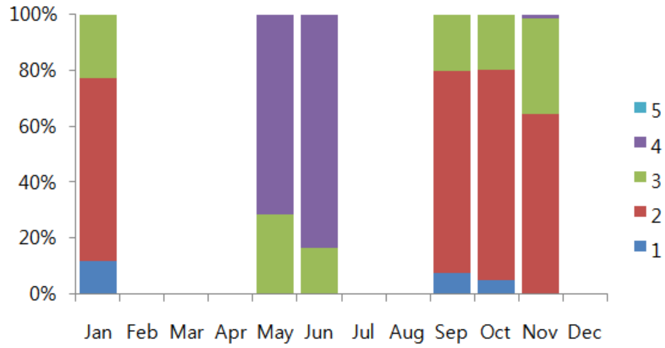


Figure 8: Pelagic Armourhead (*Pseudopentaceros richardsoni*) in the SEAFO CA for 2010-2012 **-** Proportion of specimens by maturity stage by month (1: immature, 2: developing, 3: pre-spawning, 4: spawning and 5: spent).

The adjustment of the maturity ogive to the reproductive data indicates 44.1 cm FL as size of first maturity (Fig. 9).

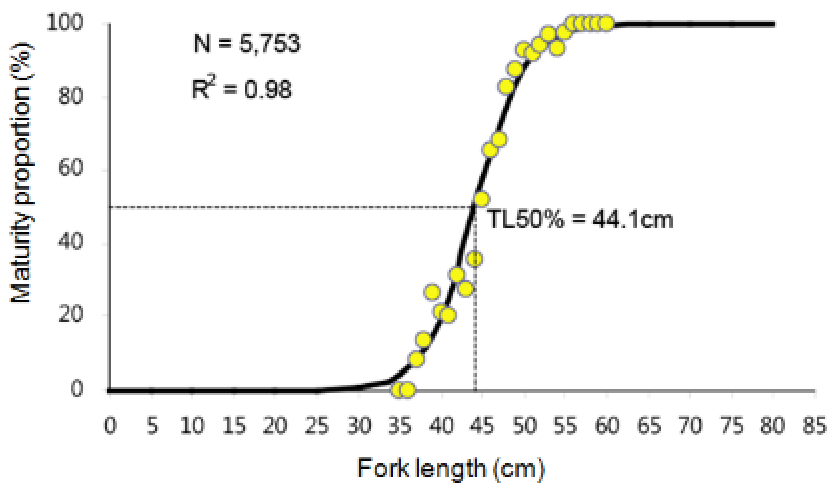


Figure 9: Pelagic armourhead (*Pseudopentaceros richardsoni*) **-** Valdivia Bank (SEAFO CA Subdivision B1). Proportion mature specimens *versus* fork length in cm

3.6 Natural mortality

Empirical natural mortality for pelagic armourhead were estimated using different methods (Tab. 6). For some methods the species growth parameter estimates (K=0.27 $year^{-1}$; L_{inf}=65.1 cm; and t_0=-0.34 year-1) derived for the Southwest Indian Ocean (López-Abellán et al. 2008a) and for Valdivia Bank during the Spanish-Namibian research survey (López-Abellán et al. 2008b) were used. In the Southwest Indian Ocean the maximum observed age of the species was 14 years.

Table 6: Empirical natural mortality estimates determined using the Fishmethods R package.

Method	M
Pauly (1980) - Length Equation	0.457
Hoenig (1983) - Joint Equation	0.316
Hoenig (1983) - Fish Equation	**0.300**
Alverson and Carney (1975)	0.253
Roff (1984)	0.417
Gunderson and Dygert (1988)	0.089

The estimate M=0.3 calculated using the Hoenig´s method was considered the most adequate for the species and it was therefore adopted for the subsequent analyses.

3.7 Feeding and trophic relationships (including species interaction)

There is no available information for SEAFO CA

3.8 Tagging and migration

There is no available information SEAFO CA

4 Stock assessment status

The specific spatial distribution of the adult fraction of *P. richardsoni* population favours the use of catch per unit of effort (CPUE) data as indicator of biomass and support the analysis of CPUE temporal trends. Furthermore given the fact that data time series available begins at the start of fishery local depletion model was used as a tool to evaluate the status of the population.

Depletion estimators are widely used to estimate population abundance (Seber, 2002; Hilborn and Walters, 1992). These estimators assume a simple linear relationship between CPUE and cumulative effort (DeLury, 1947) or cumulative catch (Leslie and Davis, 1939). Procedures and discussions to evaluate stock status using depletion models are available in the Scientific Committee reports (SEAFO SC Report 2012 (Pages 21-23); SEAFO SC Report 2013 (Pages 17-18)).

As data available suggest that prior to 2010 the stock was unexploited, the Gulland (1971) method was adopted to estimate maximum sustainable yield (MSY)

4.1 Data used:

Catch and effort data per fishing haul were available for the whole fishery time series. The fishing hauls considered in the analysis were restricted to those in which the total catch of *P. richardsoni* represented more than 80% of the total catch of *P. richardsoni* plus *Beryx splendens*. This criterion was adopted because catches of these two species are highly negatively correlated, i.e., when one of these two species occurs in the haul the other does not occur, as it can be seen for 2010 data (Fig. 11).

For each haul the estimate of CPUE of *P. richardsoni* corresponded to the ratio of total catch of the species by the haul duration.

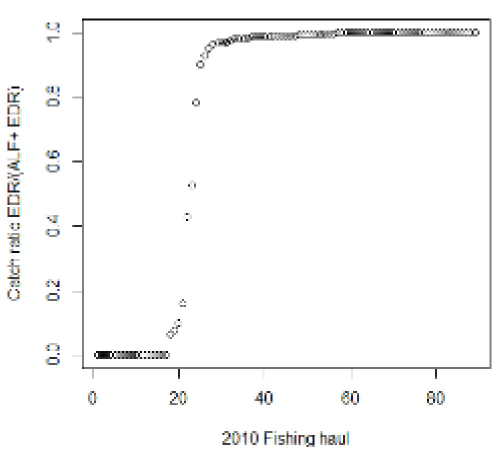


Figure 10: Korean trawl fishery - 2010 estimates of ratio of total catch *Pseudopentaceros richardsoni* by the total catch of *Pseudopentaceros richardsoni* and *Beryx splendens* by haul.

4.2 Methods used

The depletion model was adjusted to the whole data set available for the Korean trawl fishery (2014 was the last year with fishery data available). This model assumes that no recruitment and emigration/immigration to the fishing area occur during a particular season of fishing. So, under these assumptions, catch rates will decline with continued fishing until all the fish have been removed.

The model is adjusted by fitting a linear regression model to CPUE and the corresponding temporal cumulative catches. The total biomass available at the beginning of the season is estimated as the total catch that corresponds to local extinction, i.e. point that intersects the x-axis.

The uncertainties on parameter estimates were determined by bootstrapping; a total of 2000 bootstrap samples were derived from the input data and confidence interval of each parameter using the bootstrap estimates were derived accordingly. MSY estimate was determined based on the estimate of the initial biomass value derived from the depletion model and following the Gulland approach as MSY = 0.5*B*M, where B is unexploited (virgin) biomass and M the estimate of instantaneous natural mortality rate.

4.3 Results

The CPUE time-series showed a big decline from 2010 to 2011 follow by a stability at low levels in 2011, 2012, and 2013 (Fig. 11). In 2014 there was no fishery, hence no data on CPUE.

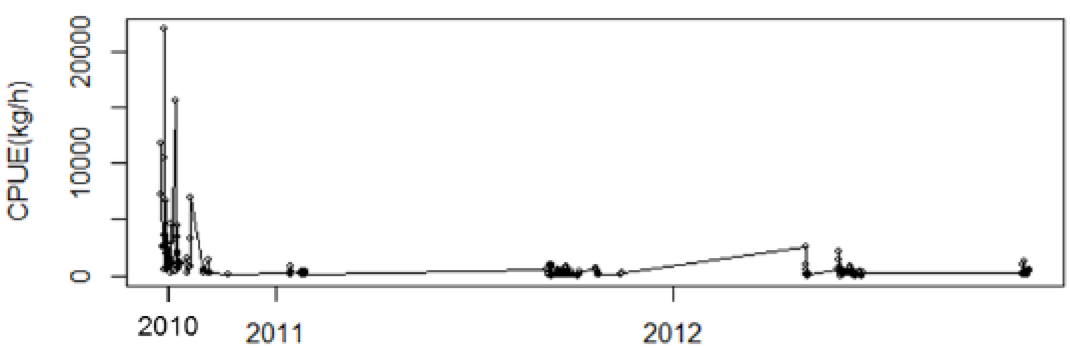


Figure 11: Time-series of catch per unit of effort (CPUE, kg/trawl hour), i.e. set-by-set data, for pelagic armourhead from 2010 to 2013. Source: observer reports submitted to SEAFO.

Figure 12 presents the CPUE against cumulative catch and the adjusted regression lines for 2010 and 2011. The 2010 biomass estimate at the beginning of the fishing season (851 t) was considered a proxy of the unexploited biomass. Table 6 shows estimates of the biomass at the beginning of the fishing seasons in 2010 and 2011, as well as the 25% and 75% percentiles.

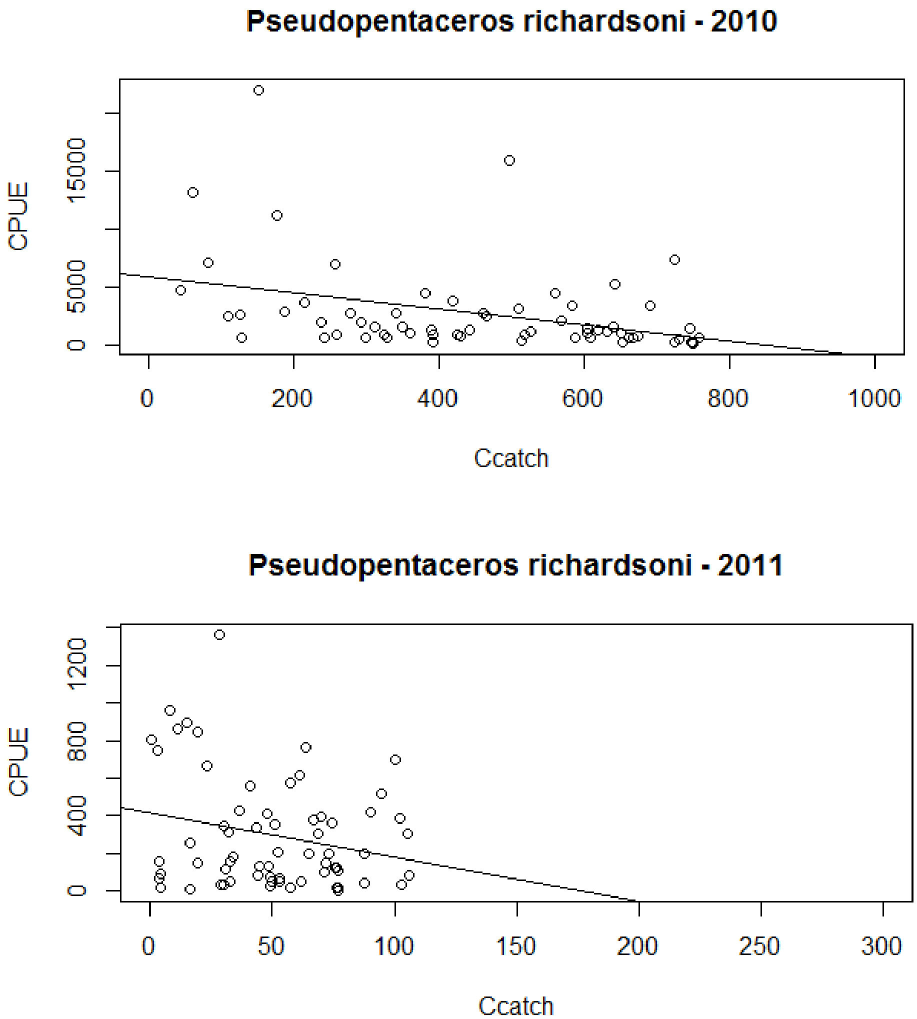


Figure 12: The CPUE against cumulative catch (Ccatch, tonne) of *Pseudopentaceros richardsoni* and the adjusted regression lines for 2010 and 2011. Note the different scales on the CPUE axes.

Table 6: Summary statistics of the biomass (t) at the beginning of the fishing season derived from 2000 bootstrap re-sampling estimates.

Year	25 Percentile	Estimate	75 Percentile
2010	751	851	1096
2011	137	176	229

Applying the Gulland method, and assuming a virgin biomass of 851t and 0.3 for M, the estimate of MSY is 128 t.

4.4 Discussion

The catches of P. richardsoni were derived from a directed fishery on Valdivia Bank held in a very small area, where the adults concentrated. Such species spatial distribution pattern make it highly vulnerable to overfishing.

The biomass index derived from onboard observer data Korean fishery targeting pelagic armourhead show a strong decrease (in 2011 the CPUE was approximately 16% of that in 2010). After 2011 the values of CPUE remained stable but very low levels.
The depletion model run adjusted for the year 2010 showed a significant negative regression slope and the regression explained near 40% of the variance.
Similar perception of the stock development could be depicted from the analysis of CPUE time series and from depletion model. No valid size or age distributions allowing evaluation of trends in size-age structure of the stock through time, as well as, no recruitment indexes were available. However, under the assumption of a 4-year recruitment age, it was expected that until 2015 the entries in the population mainly come from year classes born prior to 2010, i.e. before the fishery started.

The current perception of the stock fished primarily on the Valdivia Bank is that it is reduced to a low level.
The 2010-2013 fishery for armourhead was mainly conducted on the Valdivia Bank. A single catch was, however, also reported from a seamount in the northeastern corner of B1. The true distribution of the species in the SEAFO CA is probably wider, but the areas of suitable character and depth, i.e. shallower than 600m and north of 40°N, are few and widely dispersed (Figure 13). Fisheries expanding into other areas also have to be closely monitored and regulated (Ch 4.7).

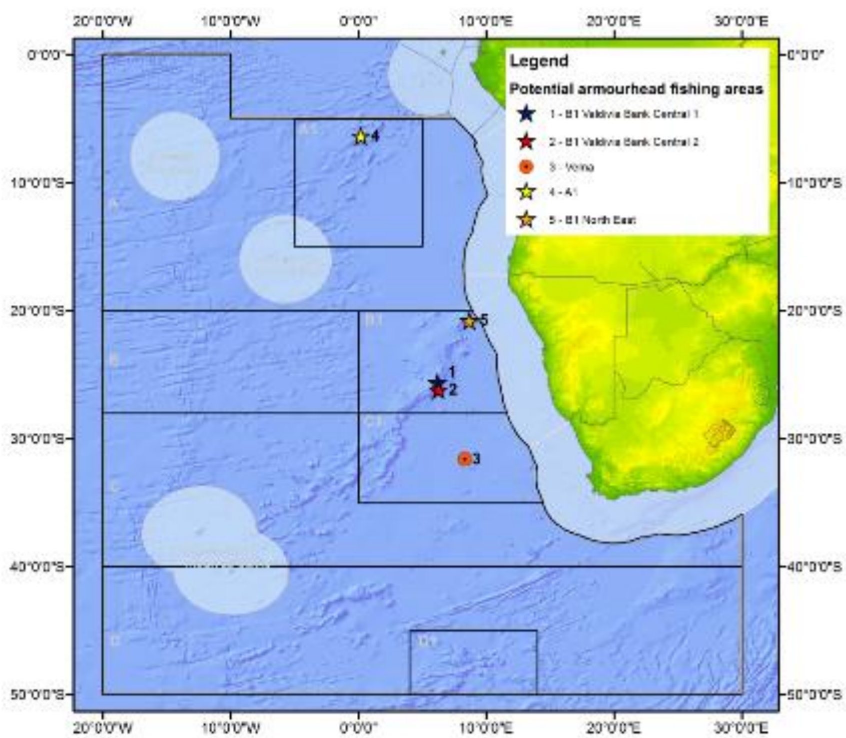


Figure 13: Bathymetry of the SEAFO CA and locations with bottom depths of 600m or less

There is no information on recruitment, and it is not known whether the concentrations of the species constitute a self-sustaining population or are sustained by immigration/influx of larvae and juveniles from other areas. Furthermore, it is unknown if the 2013 biomass estimate on Valdivia Bank was above or below a level at which recruitment is impaired.

In recent years, i.e. 2014 onwards, there is no further information that allows to perceive the status of the adult population in Valvidia Bank.

.

5 Incidental mortality and by-catch of fish and invertebrates

Incidental mortality (seabirds, mammals and turtles)

There are no reports of incidental bycatches of birds, mammals and turtles in the armourhead fishery.

5.1 Fish by-catch

Observer reports document that by-catch species in the pelagic armourhead fishery on Valdivia Bank were blackbelly rosefish, imperial blackfish, oilfish, Cape bonnetmouth, and silver scabbardfish. Among these alfonsino, blackbelly rosefish, imperial blackfish, and oilfish were the most abundant species (Table 7).

Minor catches of Japanese mackerel (*Scomber japonicas*) (50 t in 2010)**,** Cape horse mackerel (*Trachurus capensis*), and the longspine bellowfish (*Notopogon xenosoma*) were also recorded in the Korean observer reports, but it is uncertain whether these species occurred in the armourhead fishery. The identification of the latter species is also uncertain.

Table 7: By-catch from Pelagic Armourhead / southern boarfish (*Pseudopentaceros richardsoni*) fishery.

	2010	2011	2012	2013
Species (FAO code)	**B1**	**B1**	**B1**	**B1**
BRF	161	42	35	4
HDV	24	35	24	<1
OIL	5	13	7	<1
EMM	11	2	<1	0
GEM	0	0	<1	0
SVS	30	15	2	0

BRF: Blackbelly rosefish (*Helicolenus mouchezi*); HDV: Imperial blackfish (*Schedophilus ovalis*); OIL: Oilfish (*Ruvettus pretiosus*) ; EMM: Cape bonnetmooth (*Emmelichthys nitidus*) and PRP: Roudi escolar (*Promethichthys prometheus*)??, SVS: silver scabbardfish (*Lepidotus caudatus*).

5.2 VME indicator incidental catch

For the Korean armourhead fishery on Valdivia Bank observers recorded 0.4 kg of VME indicator species in 2013 and less than 1 kg in previous years of the 2010-2013. Catches never exceeded the agreed SEAFO threshold levels.

5.3 Incidental and bycatch mitigation methods

There are no technical mitigation measures implemented for the armourhead fishery.

5.4 Lost and abandoned gear

There were no reported lost and abandoned gear resulting from the armourhead fishery

5.5 Ecosystem implications and effects

There is no formal evaluation available for this fishery.

6 Biological reference points and harvest control rules

Apart from the provisional estimate of MSY=128 t (Ch. 4.4), no reference points have been estimated and found to be valid. The main reason is the shortage of basic data to carry out assessments.

In 2014 SC recommended that a harvest control rule be implemented and suggested as a candidate HCR the following:

$$TAC_{y+1} = \begin{cases} TAC_y \times (1 + \lambda_u \times slope) & if \quad slope \geq 0 \\ TAC_y \times (1 + \lambda_d \times slope) & if \quad slope < 0 \end{cases}$$

Where 'Slope' = average slope of the Biomass Indicator (CPUE) in the recent 5 years
and ;
λu :TAC control coefficient if slope > 0 (Stock seems to be growing) : λu=1
λd :TAC control coefficient if slope < 0 (Stock seems to be decreasing) : λd=2

The TAC generated by this HCR is constrained to ± 5% of the TAC in the preceding year.

7 Current conservation measures and management advice.

The TAC advised in 2014 was derived using the average of the catches in 2011 and 2012. This is a simplistic approach not based on stock assessments or stock trend indices, hence the resulting TAC advice will be uncertain. Currently, due to the interruption of the fishery, the recommended and accepted HCR cannot be applied, nor the average of recent catches as in 2014. Due to the lack of recent fishery data there is even greater uncertainty than in 2014.

Prior to the interruption of the fishery, the catch per unit of effort had declined to a low level. The survey in 2015 did not detect concentrations of armourhead in the previous fishing area at that time. It was expressed that the absence of a fishery has provided a potential for recovery. Despite the fishing opportunity available in the past 3 years, there was no fishery, and this lack of activity has not been explained.

Due to the uncertainties explained above, SC members expressed different views on the TAC advice for 2017-2018 for the SEAFO CA. The agreed advice is a TAC of 135 tonnes. This level is slightly lower than that derived in 2014, hence possibly more precautionary. It must be emphasized that the state of the stock is unknown.

8 References

DeLury, D.B. 1947. On the estimation of biological populations. Biometrics, 3: 145–167.

FAO. 2016. Investigation of vulnerable marine ecosystems (VMEs), fisheries resources and biodiversity in the convention area of the South East Atlantic Fisheries Organisation (SEAFO) 15 January– 12 February 2015. FAO-NORAD Project No: GCP/INT/003/NOR, Cruise Report "Dr. Fridtjof Nansen" EAF – N/2015/2, 86p.

Garcia, S.M., Sparre, P., Csirke, J., 1989. Estimating surplus production and maximum sustainable yield from biomass data when catch and effort time series are not available. Fish. Res. 8, 13-23.

Gulland J.A. 1971. *The Fish Resources of the Ocean*. Fishing News (Books), West Byfleet, 255 pp.

Heemstra, P.C., 1986. *Pentacerotida*e. p. 622-623. In M.M. Smith and P.C. Heemstra (eds.) Smiths' sea fishes. Springer-Verlag, Berlin.

Hewitt, D. A., Hoenig, J. M. 2005. *Comparison of two approaches for estimating natural mortality based on longevity.* Fishery Bulletin, 103(2): 433-437.

Hilborn, R. and C.J. Walters. 1992. *Quantitative Fisheries Stock assessment: Choice, Dynamics and Uncertainty*. Chapman and Hall: 570 pp.

Hoenig, J. M. 1983. *Empirical Use of Longevity Data to Estimate Mortality Rates*. Fishery Bulletin 82:898-903.

Leslie, P.H. and D.H.S. Davis. 1939. *An attempt to determine the absolute number of rats on a given area*. J. Anim. Ecol., 8: 94–113.

López-Abellán, L.J., M.T.G. Santamaría and J.F. González.2008a. Approach to ageing and growth back-calculation based on the otolith of the southern boardfish *Pseudopentaceros richardsoni* (Smith, 1844) from the south-west Indian Ocean seamounts. *Marine and freshwater Research* 59: 269-278.

López-Abellán, L.J., J.A. Holtzhausen, L.M. Agudo, P. Jiménez, J. L. Sanz, M. González-Porto, S. Jiménez, P. Pascual, J. F. González, C. Presas, E. Fraile and M. Ferrer. 2008b. Preliminary report of the multidisciplinary research cruise on the Walvis Ridge seamounts (Atlantic Southeast-SEAFO). http://hdl.handle.net/10508/370, Part I-II: 191 pp.

Seber, G.A.F. 2002. *The Estimation of Animal Abundance and Related Parameters*. Second Edition. Blackburn Press, New Jersey.

Report of the Japanese exploratory fishings by FV Shinsei-maru No. 3 in 2015 and 2016

National Research Institute of Far Seas Fisheries (NRIFSF)
Japan Fisheries Research and Education Agency, Japan

October, 2016

Abstract

FV Shinsei maru No. 3 conducted the exploratory bottom fishings in the new fishing ground in the Discovery seamount area of the SEAFO CA for 10 sets and 4 days each in April 25-28, 2015 and March 2-5, 2016. This is the report of the results of these exploratory fishings. According to the results, it was found that (a) there were negligible amounts of VME species (corals) in two locations (0.01 kg for gorgonian and 0.58 for stony coral respectively) in only 2016, which are less than the threshold values and (b) there are continuous Patagonian toothfish distributions from the existing fishing area to the exploratory fishing area. It was recognized again that the trot bottom longline was the VME safe gear and the exploratory fishing areas (two 1°x1° blocks) in 2015 and 2016 are also recognized as parts of Patagonian toothfish fishing grounds in the Discovery area.

Contents

Submitted to the SEAFO 12th Scientific Committee (Oct. 6-14, 2016) (Windhoek, Namibia)

1. INTRODUCTION

In 2011, existing bottom fishing areas have been identified in response to 2006 UNGA resolution 61/105. This has resulted to split some of fishable sea mountains shallower than 2000m such as Discovery Seamounts into existing and new bottom fishing areas.

There is no clear geographical (seafloor-topological) boundary around Discovery Seamounts so it is considered that fish might move across the boundary of existing and new bottom fishing areas. Furthermore, VME information, fish distribution, detailed sea bed map, etc. in new bottom fishing area will never be known unless fishing activities occur there.

We believe that collecting such primary information in new bottom fishing areas is meaningful and accumulating such information could contribute to achieve the objective of the SEAFO Convention to ensure the long term conservation and sustainable use of fishery resources.

Under such circumstances, the primary objectives of this exploratory fishing are to investigate Patagonian toothfish resources using some part of TAC and to evaluate if this exploratory fishing produces Significant Adverse Impact (SAI) on VME species.

To now four exploratory fishings have completed during 2012-2016 and we had completed reports to 2014. In this document, we will report of results of exploratory fishing for two years (2015-2016).

2. EXPLORATORY FISHING PLANS (2015-2016)

The original plans of the exploratory fishing for 2015-2016 are available SEAFO/DOC /SC/05/2014 and SEAFO/DOC/SC/16/2015 respectively. They were approved by the SEAFO Scientific Committee and the annual commission meeting in 2014 and 2015 respectively.

3. DATA

Information collected by the observer during the exploratory fishings (2015-2016) is used for this report.

4. Results

4.1 Periods of the exploratory fishing completed in 2015-2016 (Table 1)

Table 1 Periods of commercial fishing and exploratory fishing by trip in 2015 and 2016

year	Trip no	Commercial fishing operations	Exploratory fishings
2015	1	(2014/11/13) – 2015/1/1-3	No
	2	4/29-6/29	4/25-28 (10 operations in 4 days)
2016	1	2/25-3/1	3/2-5 (10 operations in 4 days)
	2	3/22-4/21	No
	3	6/19-8/13	No

4.2 Areas of the exploratory fishing planned and completed

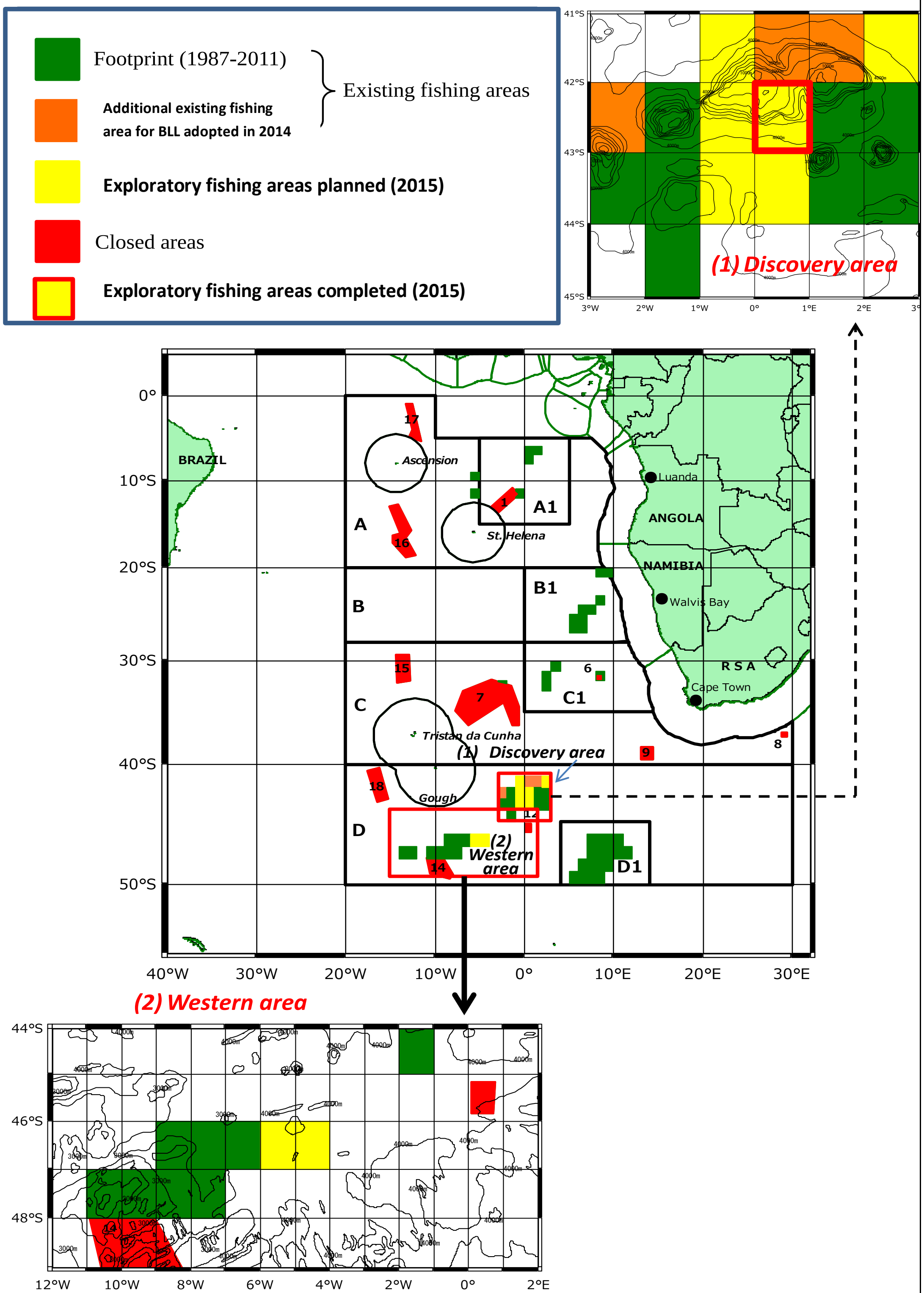
(1) 2015

The 2015 exploratory fishing areas were planned for six 1°x1° areas in the Discovery seamount and two in the western area, which are indicated by yellow makers in Box 1 (page 4). Among six blocks, one was completed by the exploratory fishing in 4 days (April 25-28, 2015), which is indicated by yellow marker with the red frame.

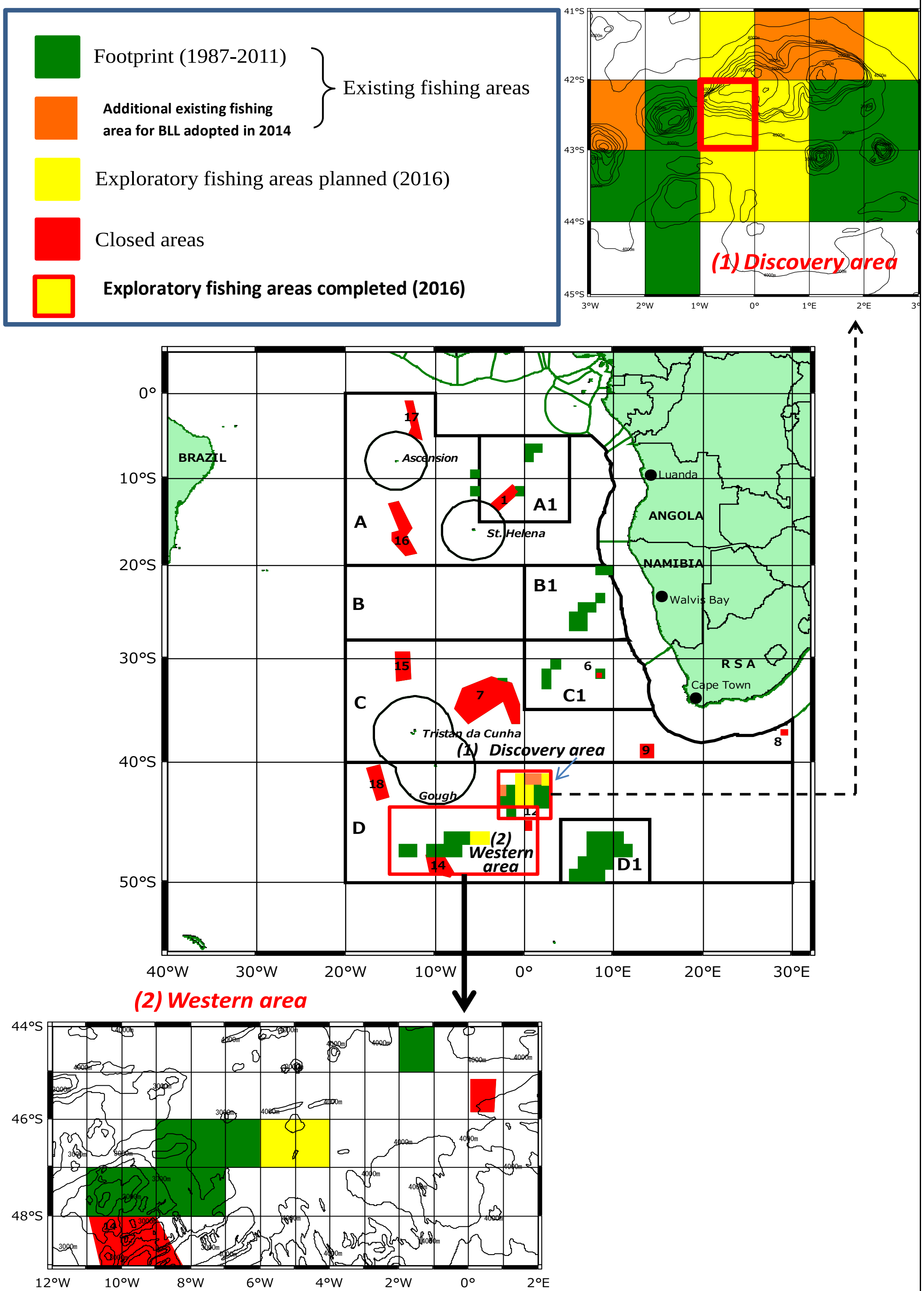
(2) 2016

The 2016 exploratory fishing areas were planned for six 1°x1° areas in the Discovery seamount and two in the western area, which are indicated by yellow makers in Box 2 (page 5). Among six blocks, one was completed by the exploratory fishing in 4 days (March 2-5, 2016), which is indicated by yellow marker with the red frame.

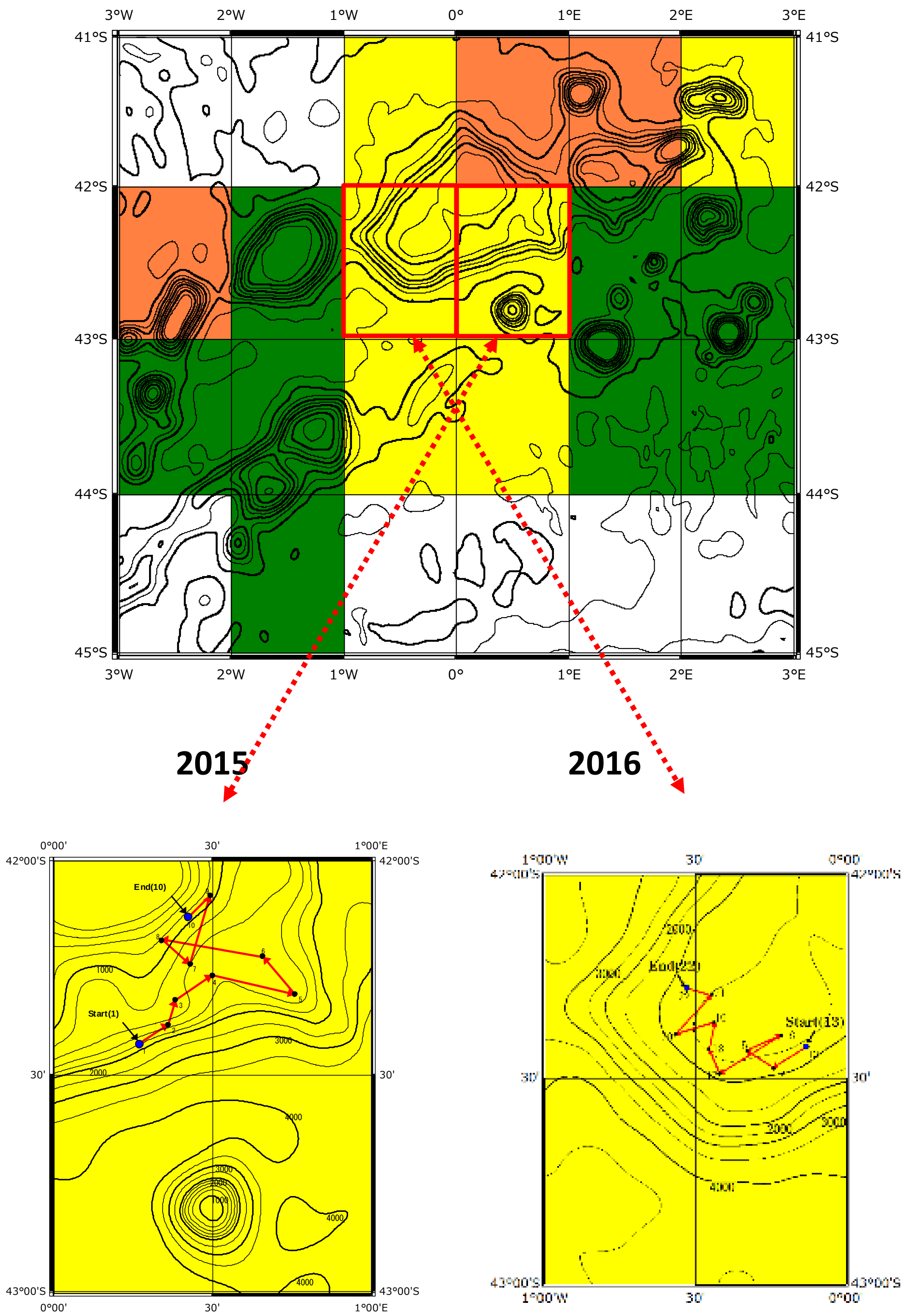
Box 1 Exploratory fishing planned and completed in 2015



Box 2 Exploratory fishing planned and completed in 2016



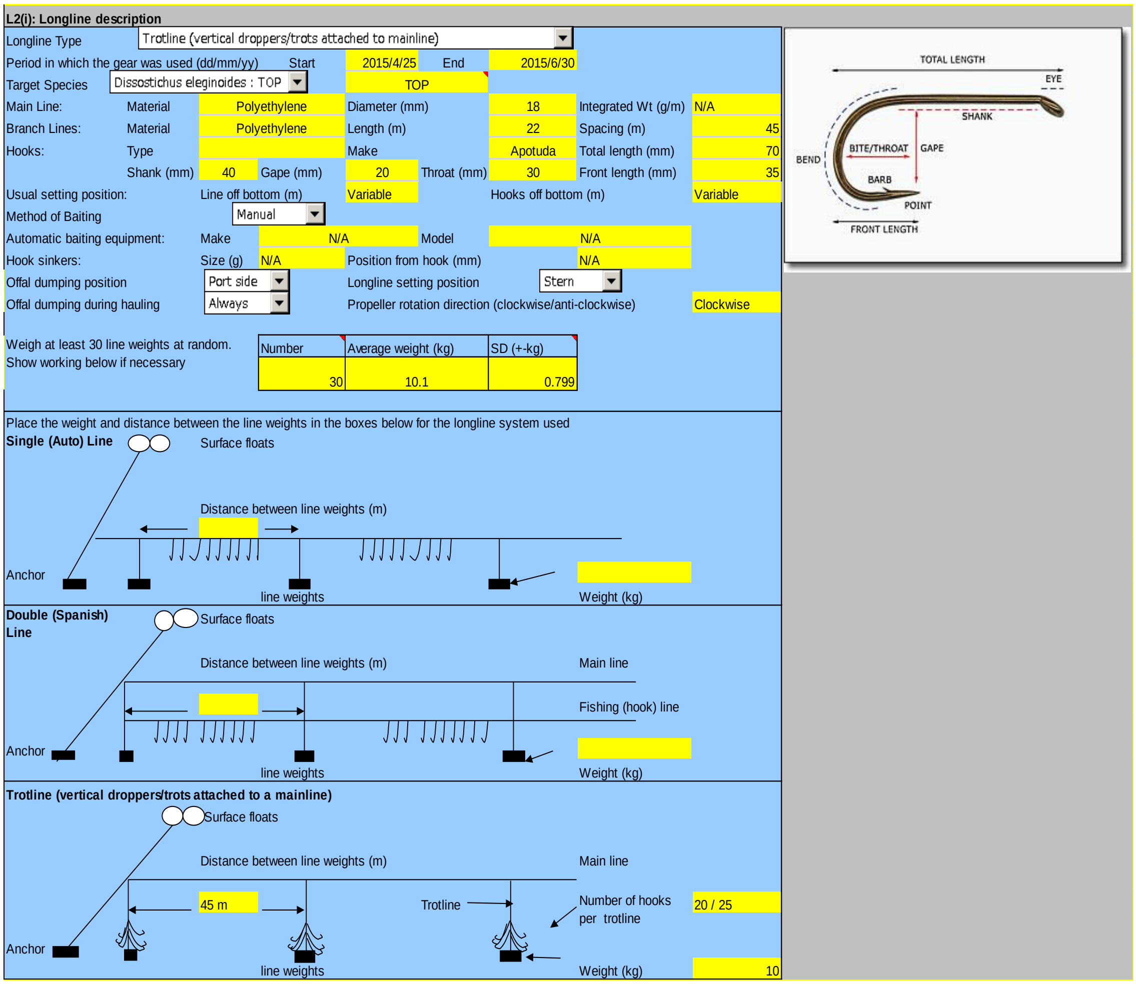
4.3 Track lines (2015 and 2016) (Map 1)



Map 1 Track lines of RV Shinsei Maru No 3 in the exploratory fishing area (2015-16)

4.4 Gear descriptions (Panel 1 :2015 and Panel 2: 2016)

Panel 1 (2015)



L2(i): Longline description

Longline Type	Trotline (vertical droppers/trots attached to mainline)						
Period in which the gear was used (dd/mm/yy)		Start	2015/4/25	End	2015/6/30		
Target Species	Dissostichus eleginoides : TOP		TOP				
Main Line:	Material	Polyethylene	Diameter (mm)	18	Integrated Wt (g/m)	N/A	
Branch Lines:	Material	Polyethylene	Length (m)	22	Spacing (m)	45	
Hooks:	Type		Make	Apotuda	Total length (mm)	70	
	Shank (mm) 40	Gape (mm) 20	Throat (mm) 30		Front length (mm)	35	
Usual setting position:	Line off bottom (m)	Variable	Hooks off bottom (m)	Variable			
Method of Baiting	Manual						
Automatic baiting equipment:	Make	N/A	Model	N/A			
Hook sinkers:	Size (g)	N/A	Position from hook (mm)	N/A			
Offal dumping position	Port side		Longline setting position	Stern			
Offal dumping during hauling	Always		Propeller rotation direction (clockwise/anti-clockwise)	Clockwise			

Weigh at least 30 line weights at random.
Show working below if necessary

Number	Average weight (kg)	SD (+-kg)
30	10.1	0.799

Place the weight and distance between the line weights in the boxes below for the longline system used

Single (Auto) Line
Surface floats
Distance between line weights (m)
Anchor
line weights
Weight (kg)

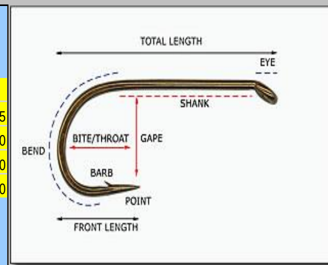
Double (Spanish) Line
Surface floats
Distance between line weights (m)
Main line
Fishing (hook) line
Anchor
line weights
Weight (kg)

Trotline (vertical droppers/trots attached to a mainline)
Surface floats
Distance between line weights (m): 45 m
Main line
Trotline
Number of hooks per trotline: 20 / 25
Anchor
line weights
Weight (kg): 10

Panel 2 2016

L2(i): Longline description

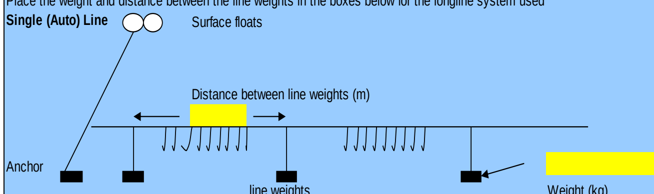
Longline Type	Trotline (vertical droppers/trots attached to mainline)						
Period in which the gear was used (dd/mm/yy)		Start	2016/2/25	End	2016/3/6		
Target Species	Dissostichus eleginoides : TOP		TOP				
Main Line:	Material	Polypropylene	Diameter (mm)	16		Integrated Wt (g/m)	N/A
Branch Lines:	Material	Polypropylene	Length (m)	8		Spacing (m)	45
Hooks:	Type	APO 10/0	Make	Poutada		Total length (mm)	70
	Shank (mm)	40	Gape (mm)	25	Throat (mm) 30	Front length (mm)	30
Usual setting position:	Line off bottom (m)		0.3		Hooks off bottom (m)		0
Method of Baiting		Manual					
Automatic baiting equipment:	Make	N/A	Model	N/A			
Hook sinkers:	Size (g)	N/A	Position from hook (mm)	N/A			
Offal dumping position		Port side	Longline setting position	Stern			
Offal dumping during hauling		Always	Propeller rotation direction (clockwise/anti-clockwise)				Clockwise

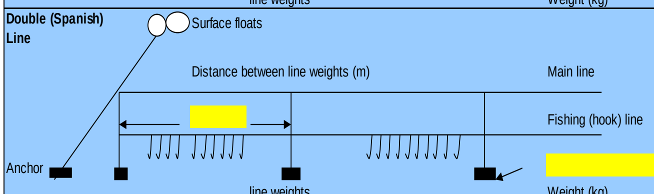


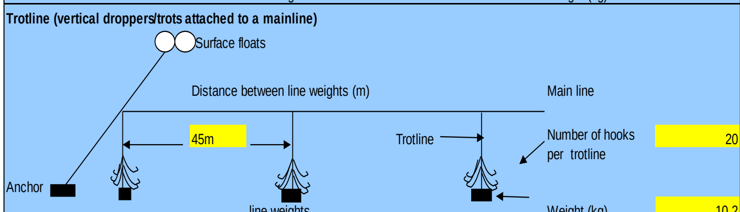
Weigh at least 30 line weights at random.
Show working below if necessary

Number	Average weight (kg)	SD (+-kg)
30	10.172	0.607

Place the weight and distance between the line weights in the boxes below for the longline system used







4.5 Fishing efforts and gear lost

Table 2 shows the summary of fishing effort and Table 4 and 5 show catch (retain, discards, release information) during the exploratory fishing operations in 2015 and 2016 respectively. Maps 2-10 depicts distributions of catch (13 species).

Table 2 Fishing effort information in the exploratory fishing operations (2015-2016)

Category	2015	2016
Fishing periods	4/25-28 (trip 2)	3/2-5 (trip 1)
Fishing days	4 days	4 days
Number of total sets	10 operations (set number 1-10)	10 operations (set number 13-22)
Total number of hooks used	40,200	40,200
Number of hooks lost	none	See Table 3

Table 3 Information of gear lost (2016)

Set number	14	15	16	17	18	19	20	21	22
Stones	0	1	0	9	0	0	0	0	0
Hooks	0	20	0	10	30	0	0	0	0
Dropline	0	1	0	0	0	0	0	0	0
Snaps	0	1	0	0	0	0	0	0	0
Section	0	1	0	0	0	0	0	0	0
Anchor	0	0	0	0	1	0	0	0	0

4.6 Catch and bycatch

Catch and by catch information are summarized in Tables 4 -5 and Maps 2-14, i.e.,

Table 4 Catch and bycatch information (retain, discards and release) (2015)

Table 5 Catch and bycatch information (retain, discards and release) (2016)

Maps 2-14 Distribution of catch and bycatch by (13) species (2015-2016)

Table 4 Catch and bycatch information (retain, discards and release) (2015)

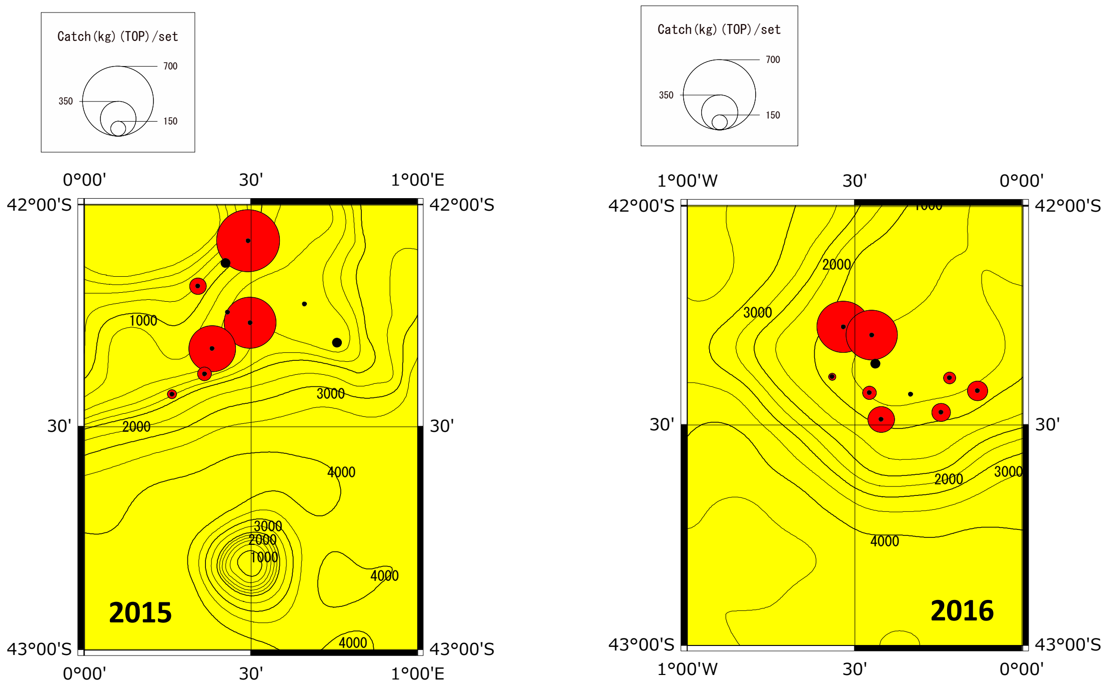
Species Name (number)		total retained catch weight (kg)	total discarded catch weight (kg)	observed number retained	observed number discarded	observed number discarded dead	observed number released alive average health	observed number released alive
TOP	Patagonian toothfish	1981.86	103	67	6			
GRV	Rattail		720.2			128		
ANT	Deep sea cod		383.7			127		
GSK	Greenland Shark							1
HIB	Deepwater arrow tooth eel		17.7			6		
SRX	Skates and rays		15.5			1	3	
HYD	Chimaeras ghost sharks		199.7			7		
CGE	Deep sea red crab							1
MRL	Mory cods		1					
LEV	Lepidion codlings nei		5.3			1		
BSH	Blur Shark		88.6			2		

Table 5 Catch and bycatch information (retain, discards and release) (2016)

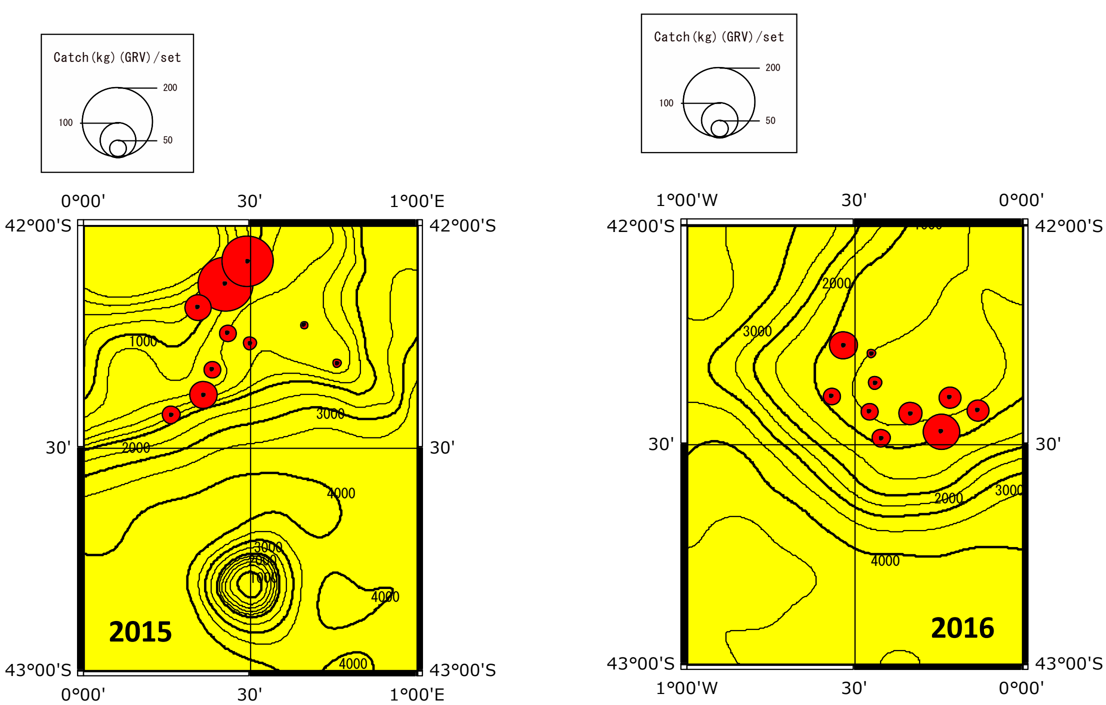
Species Name (number)		total retained catch weight (kg)	total discarded catch weight (kg)	observed number retained	observed number retained without tags	observed number discarded	observed number discarded dead	observed number released alive average health	observed number released alive	observed number lost/dropped off at surface
TOP	Patagonian toothfish	2017.71	0	84		0				
GRV	Rattail	601.6			276					33
ANT	Deep sea cod		9.5				15			
GSK	Greenland Shark								1	
HIB	Deepwater arrow tooth eel								1	
CGE	Deep sea red crab								3	
MRL	Mory cods		0.7				1			
KCX	Crab species								5	
ETF	Blackbelly lanternshark								1	

Map 2-14 Distribution of catch and bycatch by species (2015: left and 2016: right)

(•) black dot ➔ 0 (zero) catch

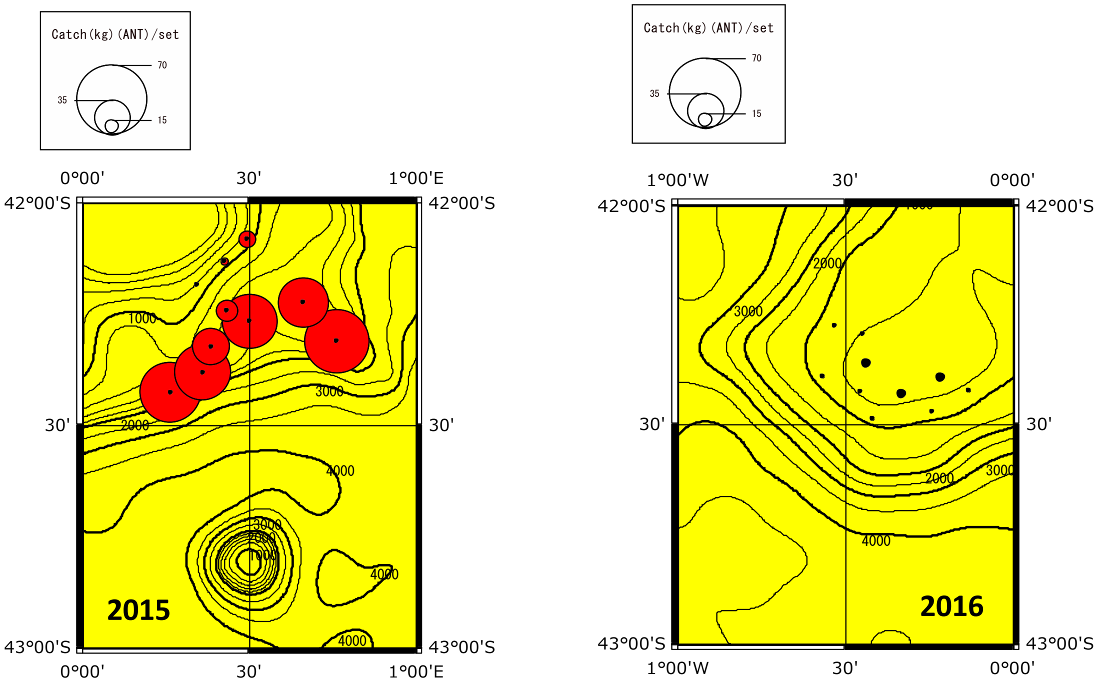


Map 2 Catch (Kg) (TOP) Patagonian toothfish

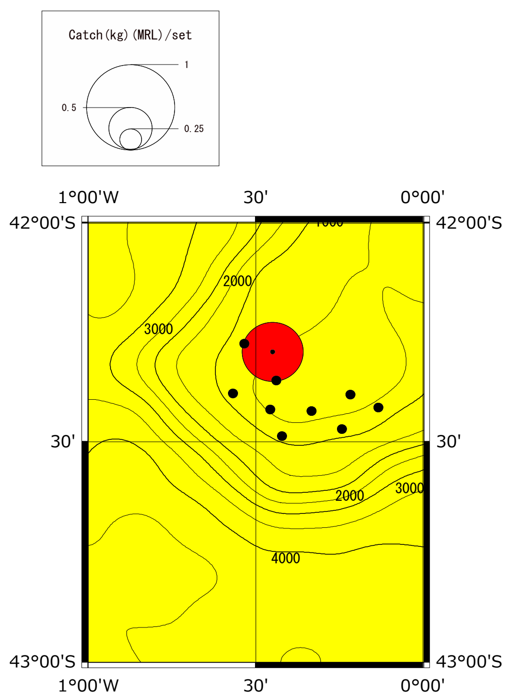


Map 3 Bycatch (Kg) (GRV) Rattail

(•) black dot → 0 (zero) catch

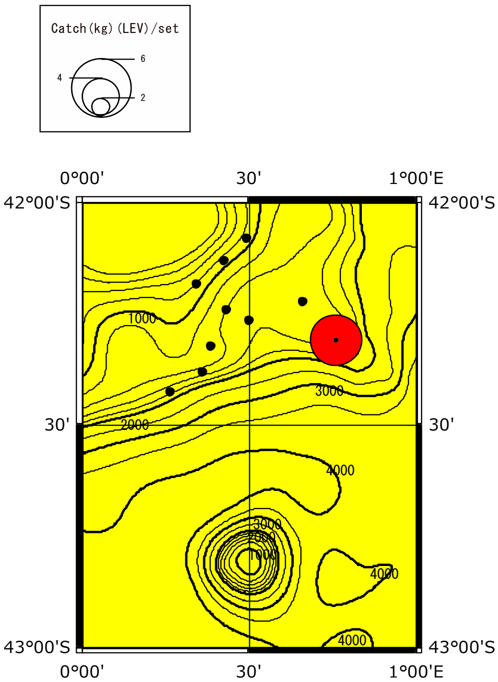


Map 4 Bycatch (Kg) (ANT) Blue antimora

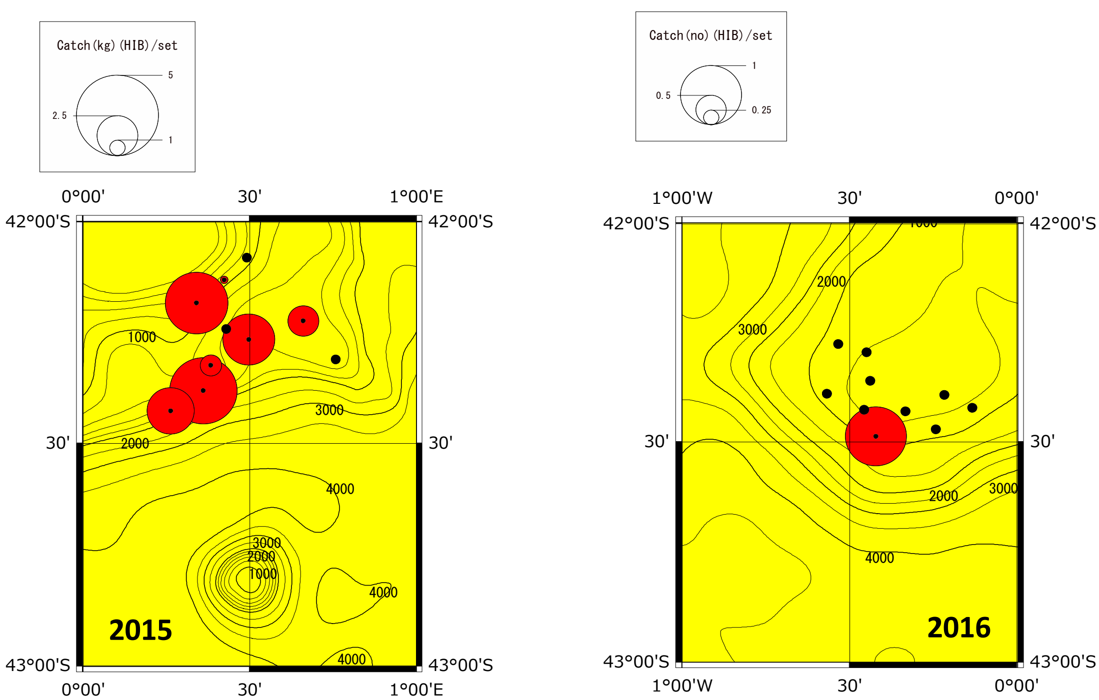


Map 5 Bycatch (Kg) (MRL) Moray cods

(•) black dot → 0 (zero) catch

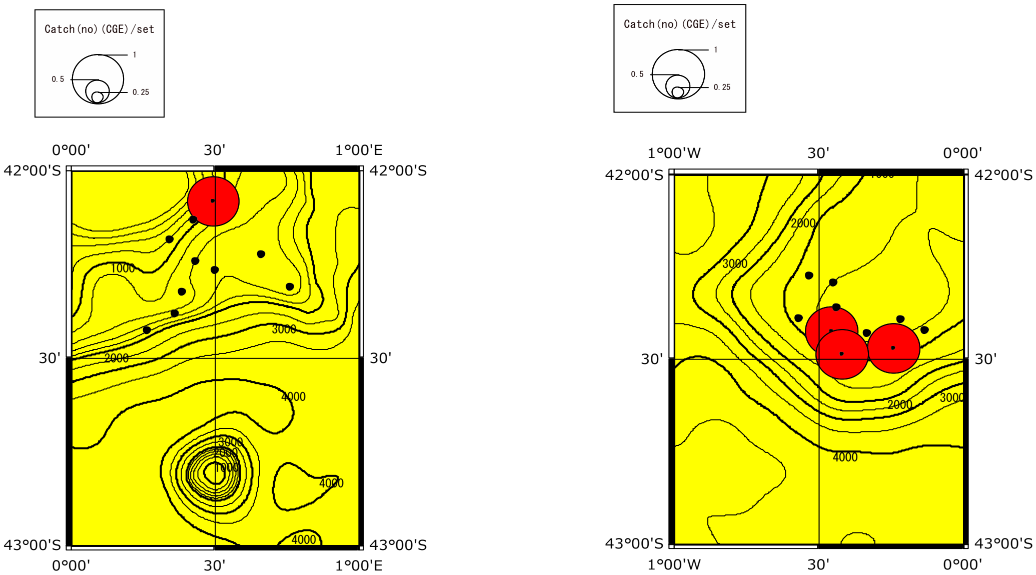


Map 6 Bycatch (no of fish) (LEV) Lepidion codling

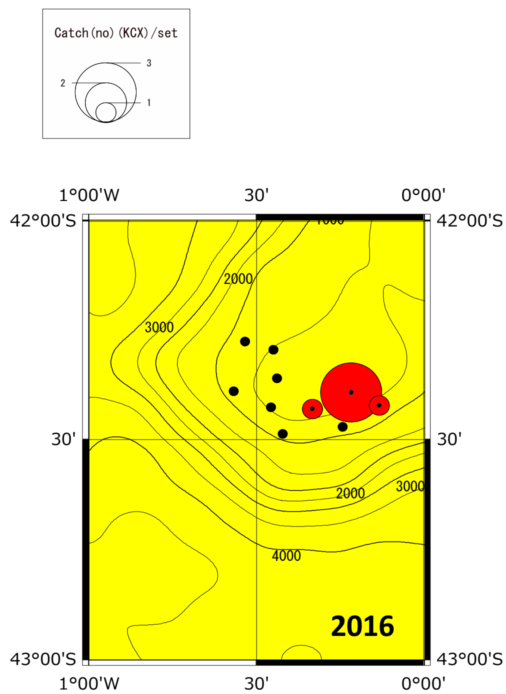


Map 7 Bycatch (Kg in 2015 and number in 2016) (HIB) Deepwater arrow tooth eel

(•) black dot ➔ 0 (zero)

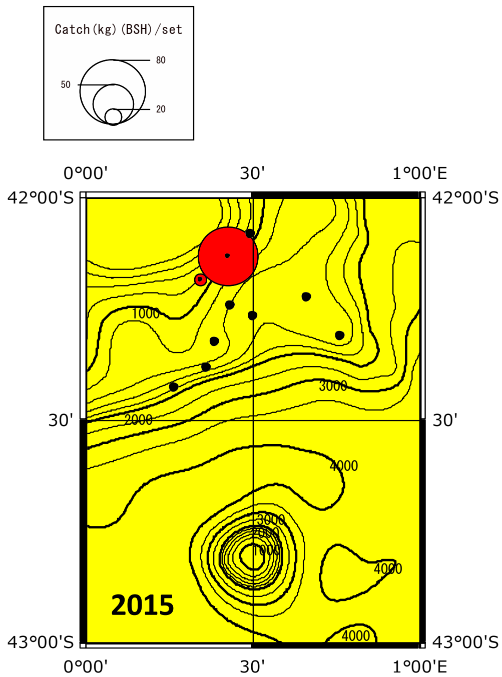


Map 8 Bycatch (number) (CGE) Deep sea red crab

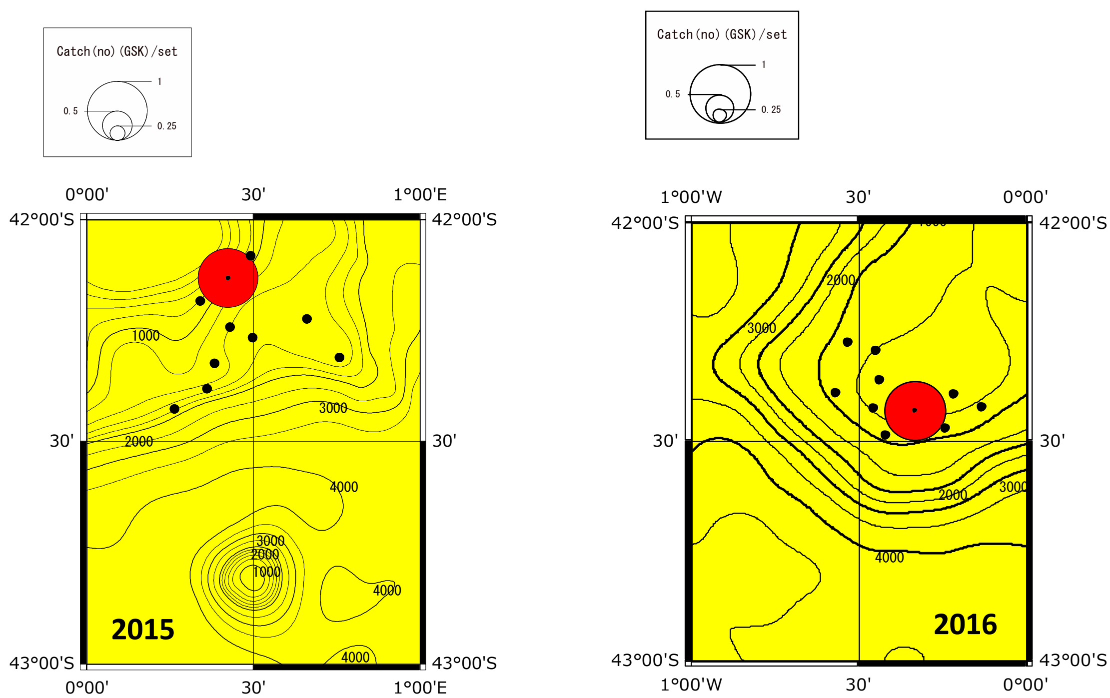


Map 9 Bycatch (number) (KCX) Crab species

(•) black dot ➔ 0 (zero) catch

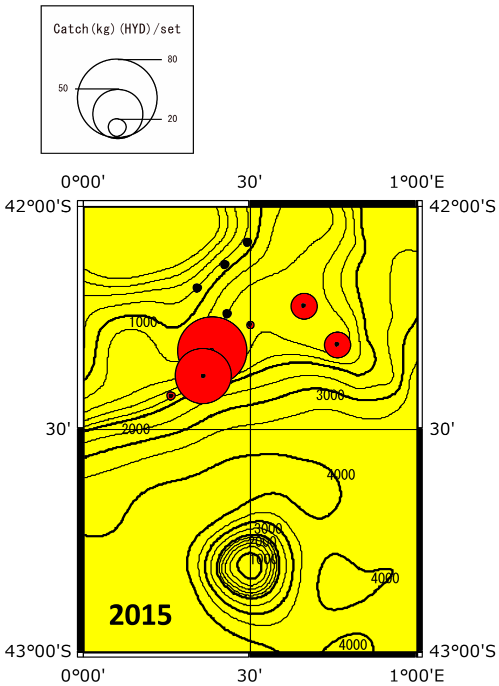


Map 10 Bycatch (Kg) (BSH) blue shark

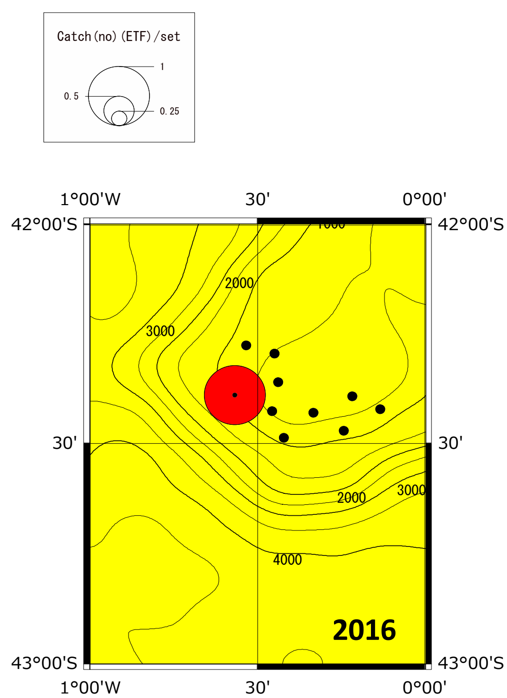


Map 11 Bycatch (number) (GSK) Greenland Shark(?) (miss – identified?)

(·) black dot → 0 (zero) catch

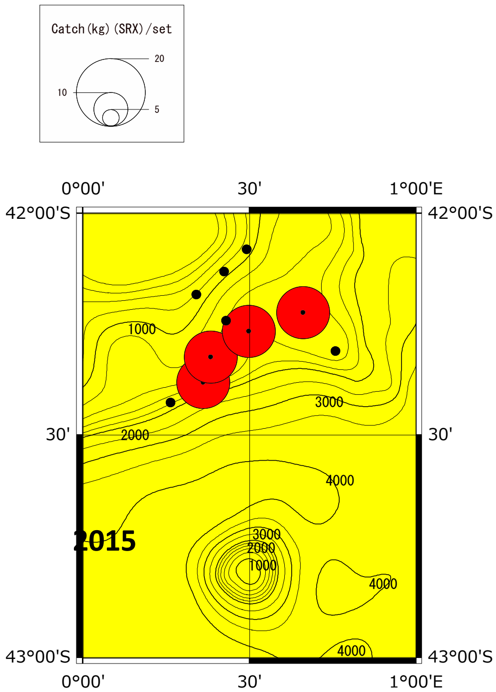


Map 12 bycatch (Kg) (HYD) Chimaeras ghost sharks



Map 13 Bycatch (number) (ETF) Blackbelly lanternshark

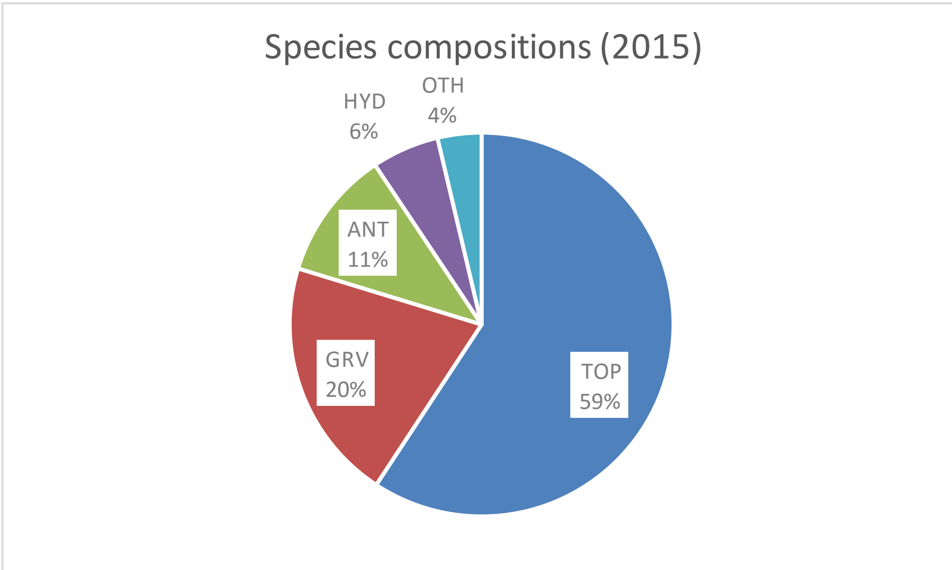
(·) black dot ➔ 0 (zero) catch

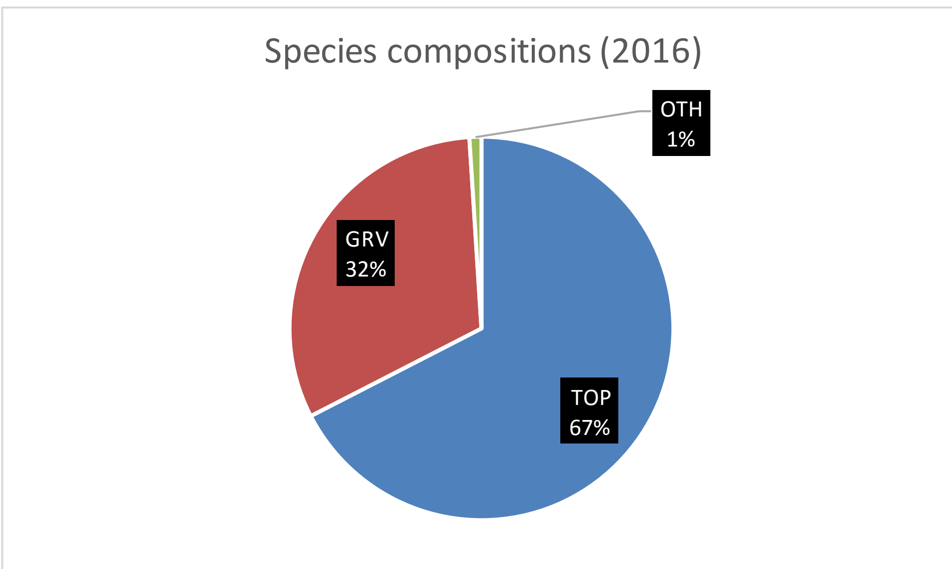


Map 14 Bycatch (Kg) (SRX) Skates and rays

4.7 Species compositions of catch + bycatch in the exploratory fishing (2015-2016) (Box 3)

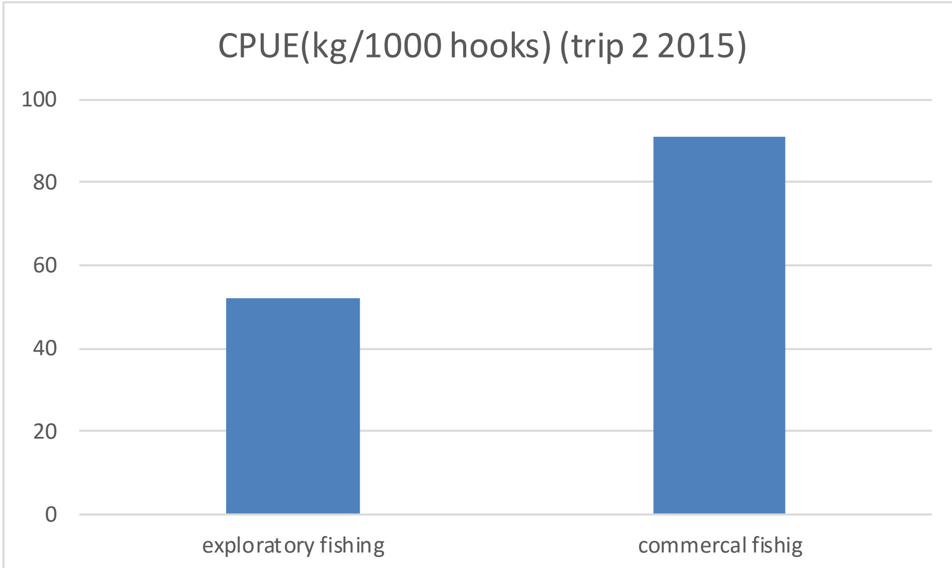
Box 3 **Species compositions of catch + bycatch in the exploratory fishing (2015-2016)**





TOP Patagonian toothfish
GRV Rattail
ANT Blue antimora
HYD Chimaeras ghost sharks (less than 500m)

4.8 Comparison of CPUE between exploratory & commercial fishing within the same trip (Fig. 1)



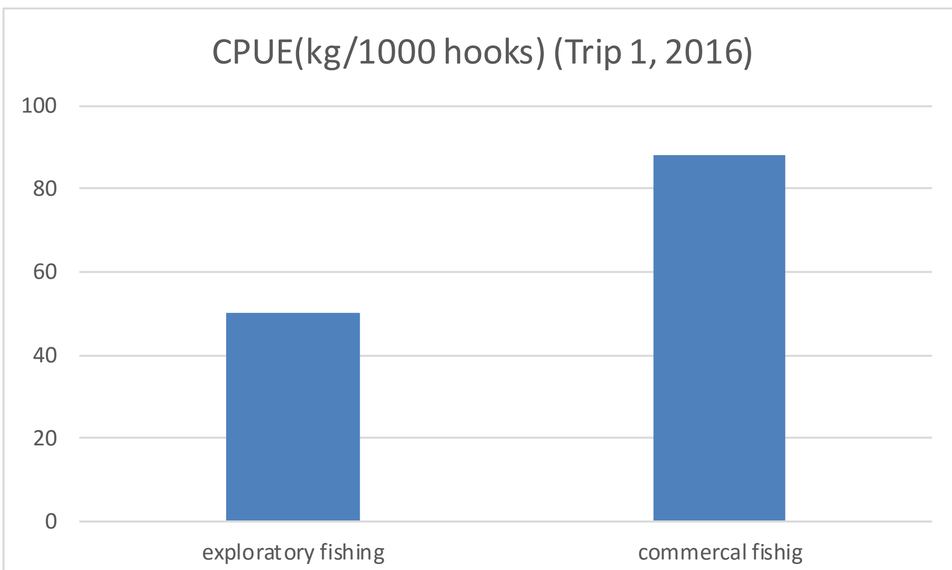
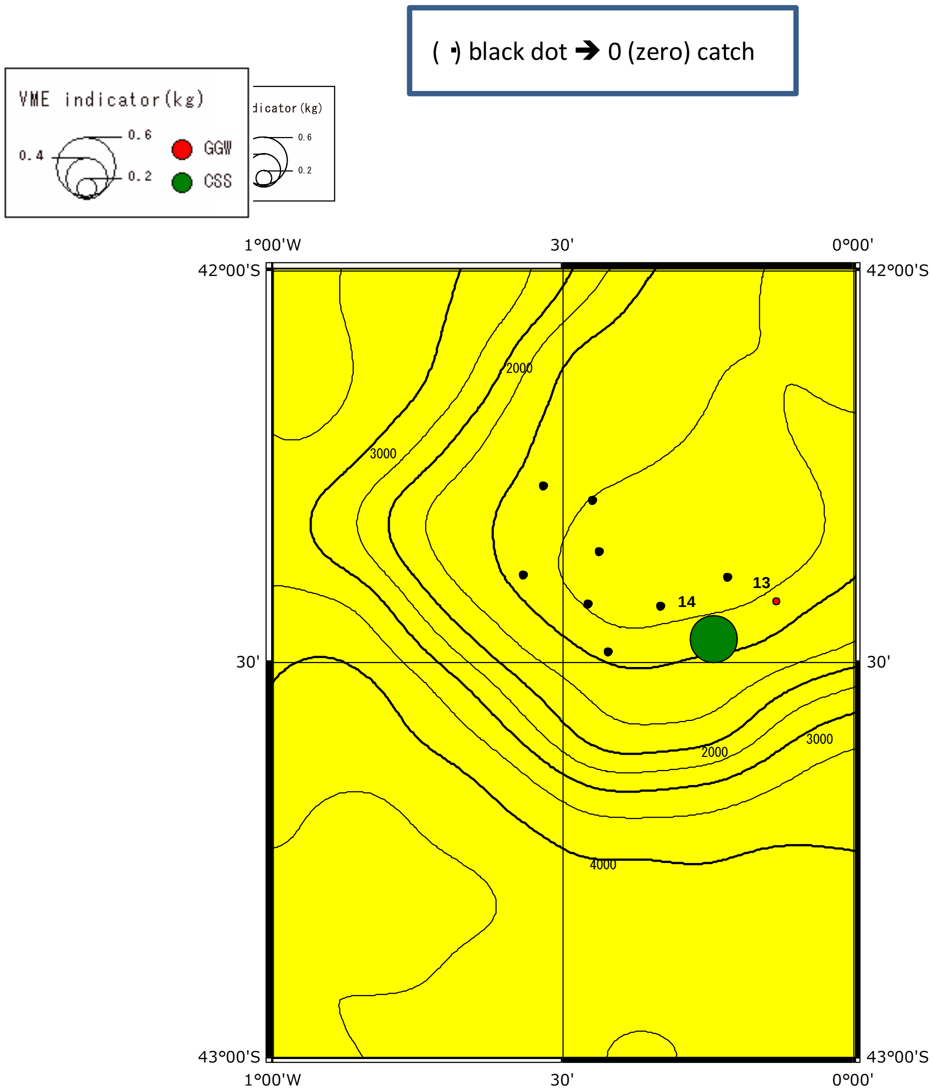


Fig. 1 Comparison of CPUE between exploratory & commercial fishing within the same trip

4.9 VME

In 2015, no VME species were incidentally captured in the exploratory fishing. In 2016, two VME species (GGW and CSS) were incidentally caught in 2 separate locations (Map 15). Their weights were 0.01 kg (GGW) and 0.58 kg (CSS) less than the threshold levels (10 VME-indicator units, i.e., 10kg/1000 hooks).



Map 15

year	Set number	Date	Code	Scientific name	English name	Weight (kg)
2016	13	March 3	GGW	Gorgoniidae	Gorgonian	0.01
	14	March 3	CSS	Scleractinia	Stony coral	0.58

Bycatch weights of VME species by the exploratory fishing (2016)

4.10 Sea birds

(1) Mitigation (stream line and bottle tests)

FV Shinsei No 3 deployed the stream lines (Fig. 2 in 2015 and Fig. 3 in 2016) requested by SEAFO Sea bird mitigation measure (CM25/12) during the exploratory fishing and also during the commercial fishing operations. Bottle tests were conducted and passed before starting operations in 2015 and 2016.

Fig. 2 Stream lines deployed by FV Shinsei No 3 during the exploratory fishing (2015)

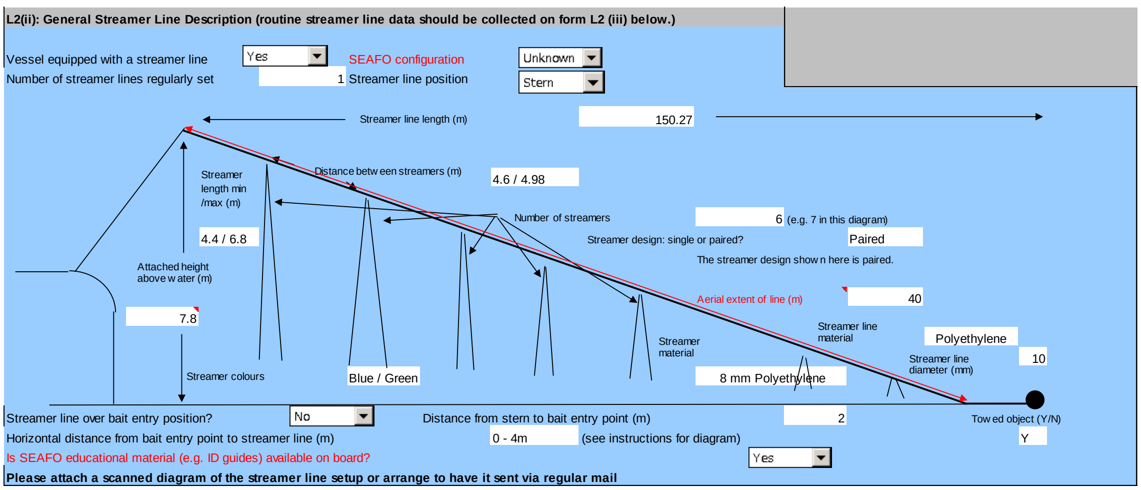
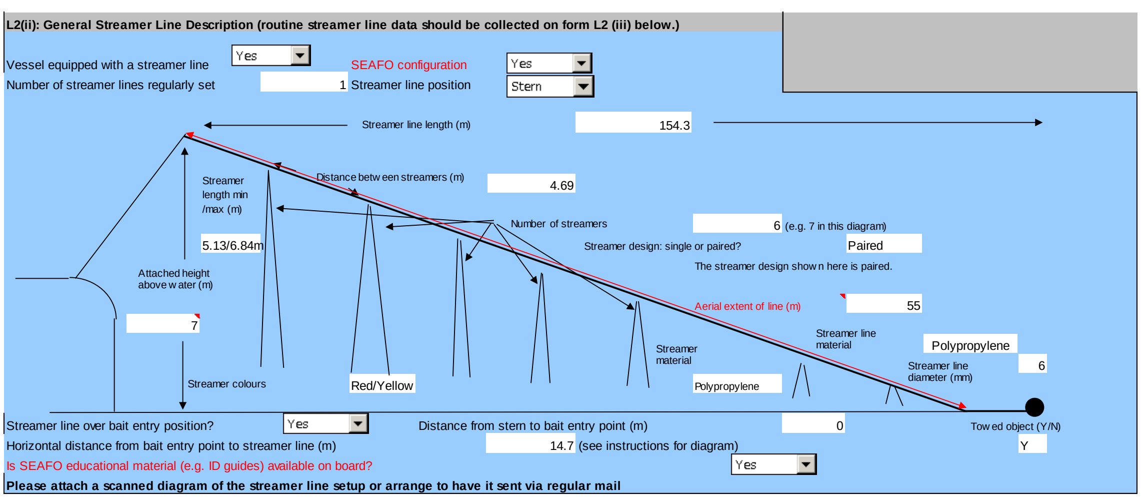


Fig. 3 Stream lines deployed by FV Shinsei No 3 during the exploratory fishing (2016)



(2) Observations

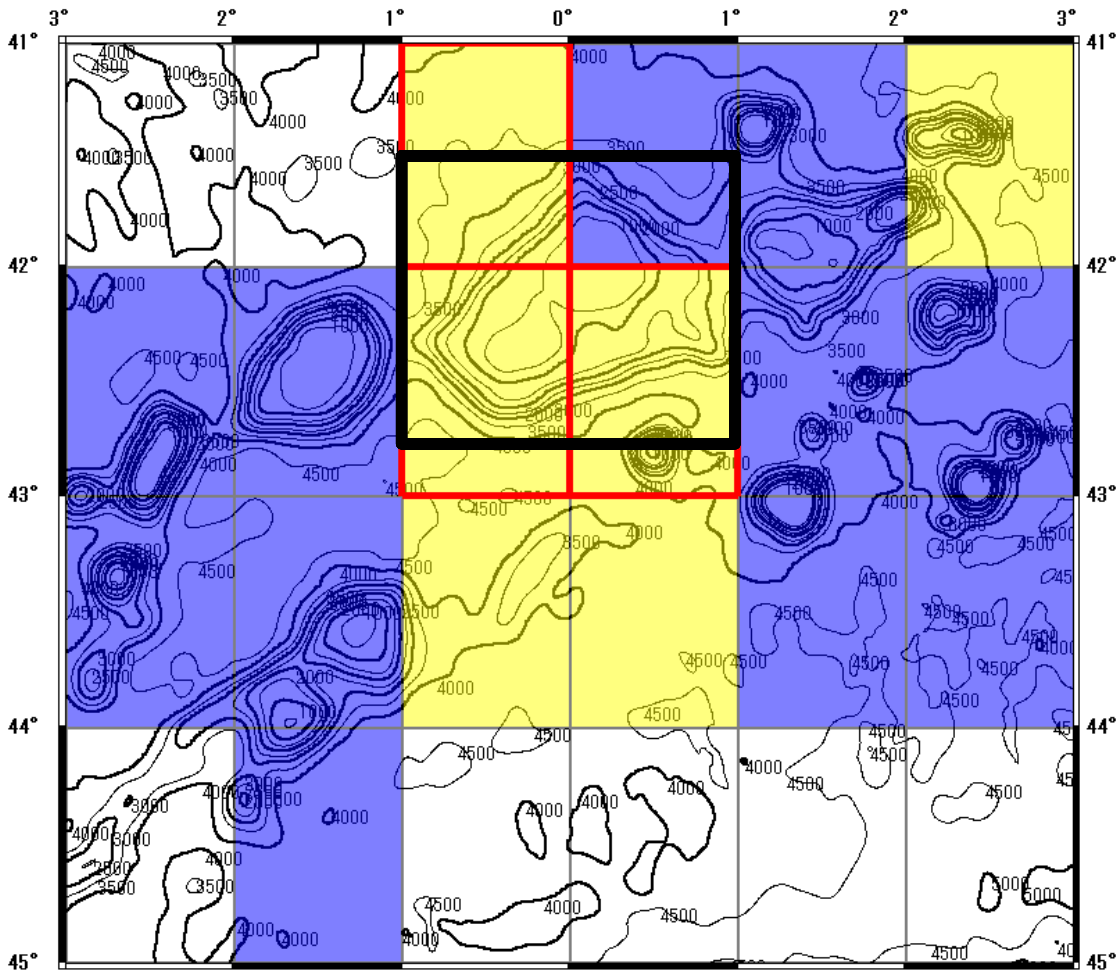
One observer on board investigated sea birds around the FV Shinsei Maru No 3 during the exploratory fishings (2015-2016) (Table 7).

Table 7 Results of seabird observation during day Settings in exploratory fishings

year	date	Set number	FAO Species Code	Scientifc name	English name	Distance astern (m)	number	Foraging method
2015	April-16	7	DIX	Diomedea exulans	Wandering albatross	100		Not Feeding
		7	PCI	Procellaria cinerea	Grey petrel	50		Diving
		7	PRO	Procellaria aequinoctialis	White-chinned petrel	50		Diving
		7	DAC	Daption capense	Cape petrel	30		Setting on surface
	April-16	9	DIX	Diomedea exulans	Wandering albatross	100		Not Feeding
		9	PCI	Procellaria cinerea	Grey petrel	50		Diving
		9	PRO	Procellaria aequinoctialis	White-chinned petrel	50		Diving
		9	DAC	Daption capense	Cape petrel	40		Setting on surface
2016	March-16	13	PUG	Puffinus gravis	Great shearwater	40	10	
		13	PRO	Procellaria aequinoctialis	White-chinned petrel	60	1	
		13	DIM	Thalassarche melanophrys	Black-browed albatross	60	3	
		13	OCO	Oceanites oceanicus	Wilson's storm petrel	60	4	
		13	PCI	Procellaria cinerea	Grey petrel	60	2	
		14	DIX	Diomedea exulans	Wandering albatross	50	1	
		14	PUG	Puffinus gravis	Great shearwater	50	7	
		14	DIM	Thalassarche melanophrys	Black-browed albatross	50	1	
		14	OCO	Oceanites oceanicus	Wilson's storm petrel	50	5	
		15	DIX	Diomedea exulans	Wandering albatross	50	1	
		15	PUG	Puffinus gravis	Great shearwater	50	10	
		15	OCO	Oceanites oceanicus	Wilson's storm petrel	50	3	
		15	DIM	Thalassarche melanophrys	Black-browed albatross	50	1	
		15	PCI	Procellaria cinerea	Grey petrel	50	1	
		16	NA (Night)					
	March-16	17	NA (Night)					
	March-16	18	NA (Night)					
		19	NA (Night)					
		20	PUG	Puffinus gravis	Great shearwater	45	25	
		20	DIM	Thalassarche melanophrys	Black-browed albatross	45	1	
		20	OCO	Oceanites oceanicus	Wilson's storm petrel	50	1	
		20	PFG	Puffinus griseus	Sooty shearwater	50	2	
		20	PRO	Procellaria aequinoctialis	White-chinned petrel	50	1	
		20	DIX	Diomedea exulans	Wandering albatross	50	1	
		21	NA (Night)					
	March-16	22	DIX	Diomedea exulans	Wandering albatross	60	2	
		22	PUG	Puffinus gravis	Great shearwater	60	60	
		22	PRO	Procellaria aequinoctialis	White-chinned petrel	60	1	
		22	PFG	Puffinus griseus	Sooty shearwater	60	2	
		22	PHU	Phoebetria fusca	Sooty albatross	80	1	
		22	PHE	Phoebetria palpebrata	Light-mantled sooty albatross	100	1	

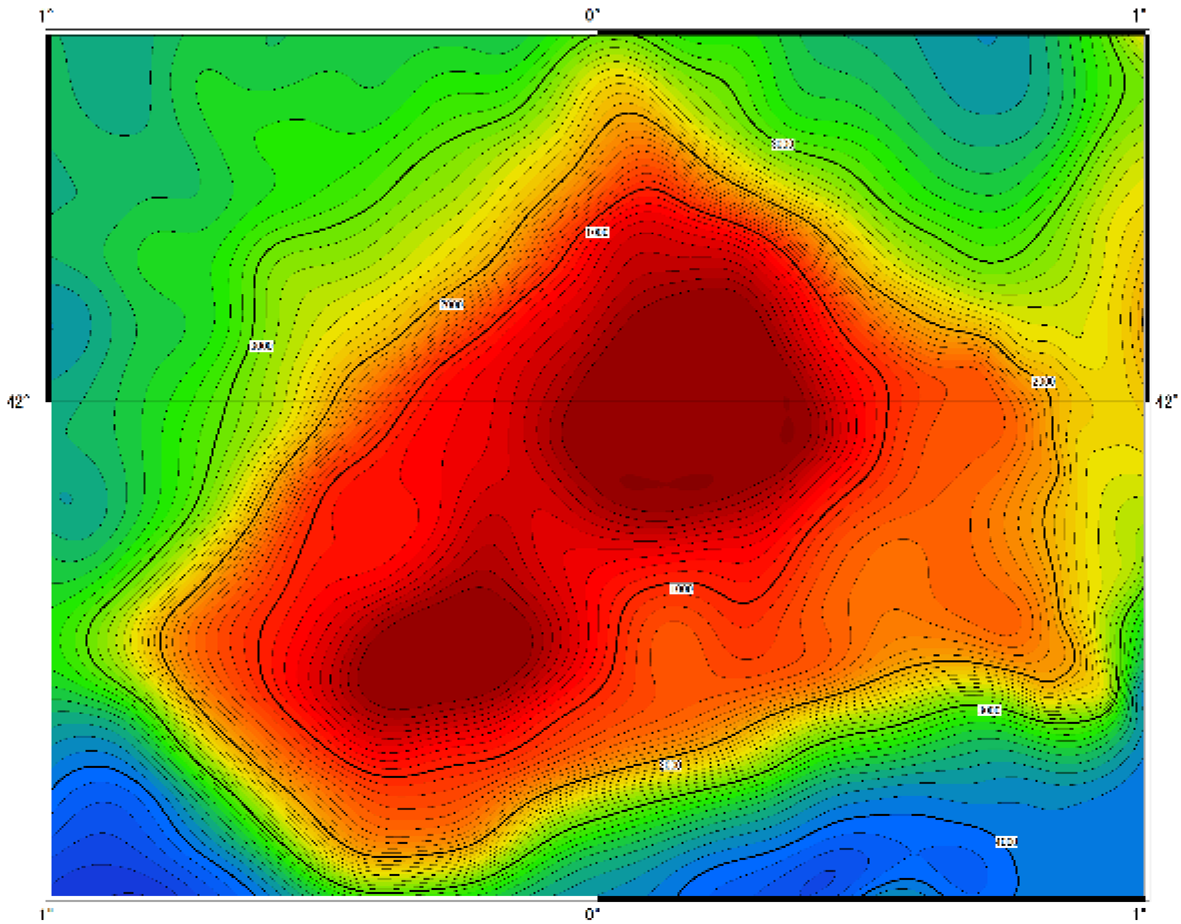
4.11 Sea bed mappings of the main exploratory fishing area

Hybrid bathymetry maps in the good fishing area of the exploratory fishing (Black frame area in Map 16) were created by combining echo sounder data of FV Shinsei Maru No 3 and ETOPO1 depth digital data built from numerous global and regional data sets (Maps 17-19).

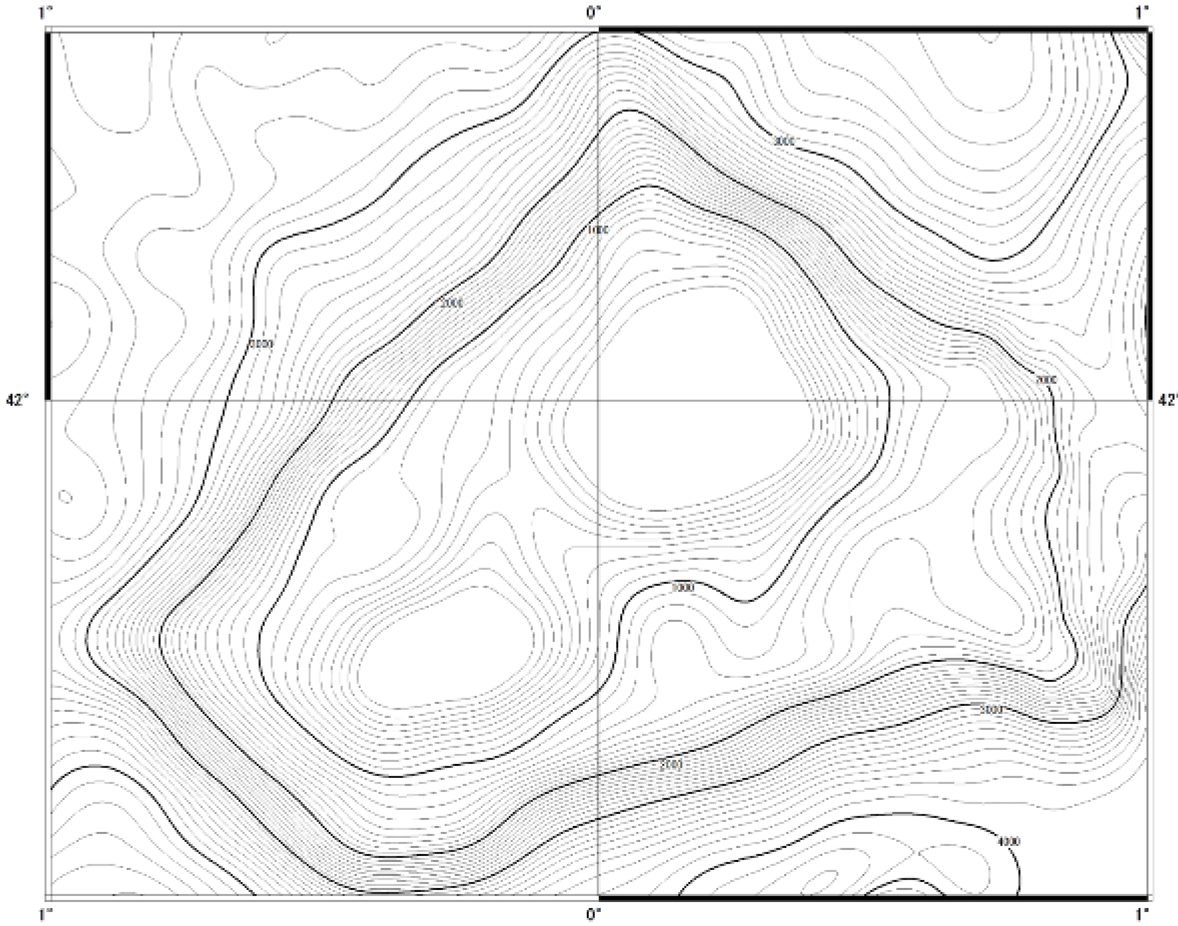


Map 16 Sea bed mapping area (Black frame)

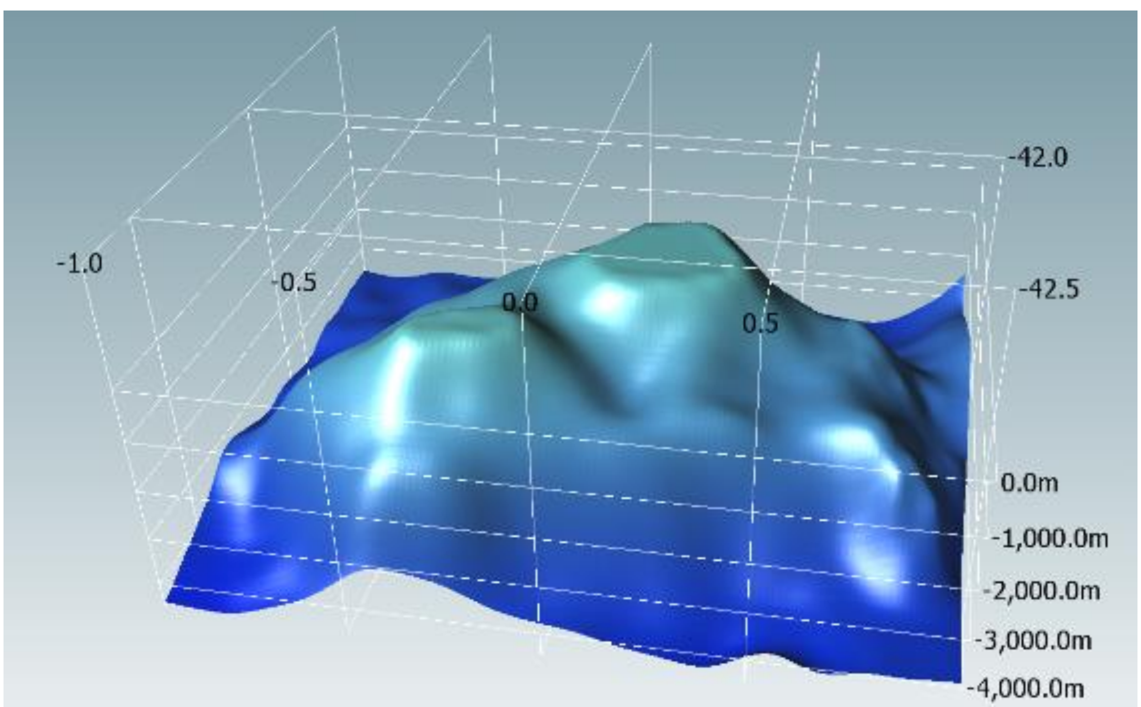
Good fishing ground in the exploratory fishing area

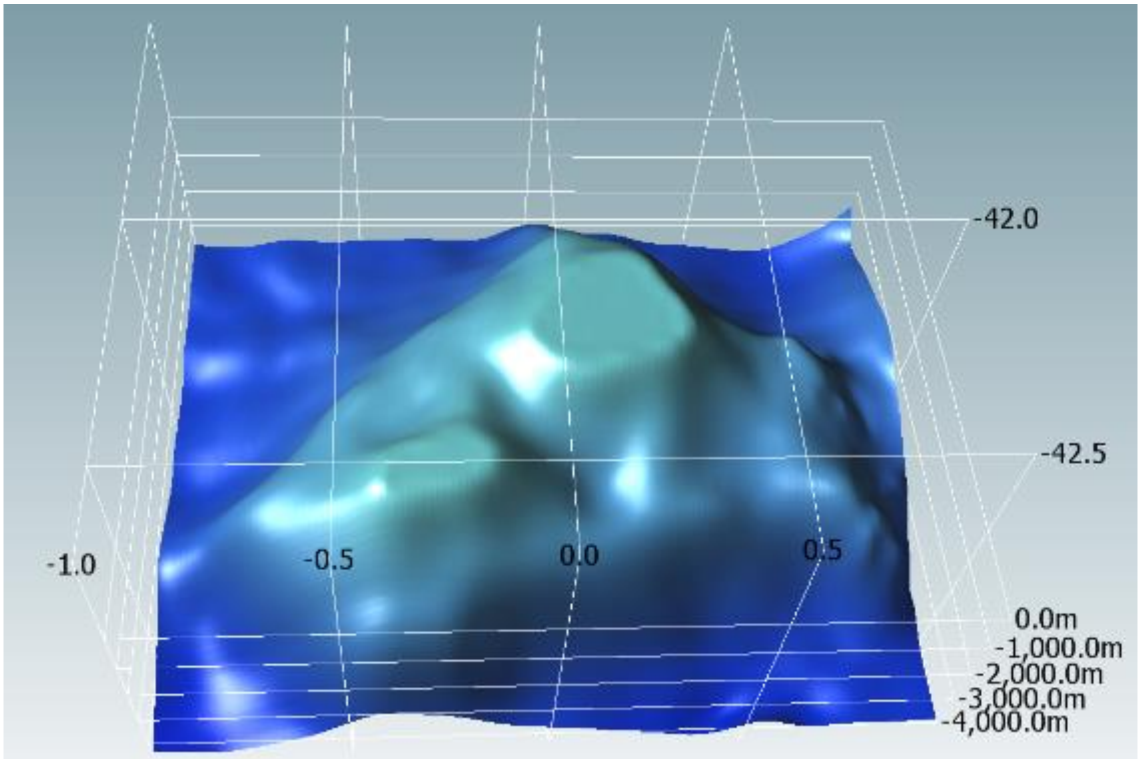


Map 17 Hybrid bathymetry map based on echo sounder data of FV Shinsei Maru No 3 and ETOPO1 digital depth data (Filled mode).



Map 18 Hybrid bathymetry map based on echo sounder data of FV Shinsei Maru No 3 and ETOPO1 digital depth data (Filled mode).





Map 19 Hybrid 3D bathymetry map based on echo sounder data of FV Shinsei Maru No 3 and ETOPO1 digital depth data (Filled mode).

Appendix A: List of biological data collected (Table 8 for 2015) (Table 9 for 2016)

Table 8 (1) Biological data collected (2015)

Set number	Date	Observer ID	Basket/ Magazine No.	Serial No.	Species Code	Scale/Otolith/ Both/Thorns	Total Length (cm)	Snout-Anus Length (cm)	Wingspan (cm)	Pelvic length (cm)	Weight (kg)	Sex	Maturity Stage	Gonad Weight (g)	Comments	Trunk Weight
1	26-Apr-15	1		1	TOP	O	117				17	M	2	20		10
1	26-Apr-15	1		2	TOP	O	90				9.4	F	1	40		5.4
1	26-Apr-15	1		3	TOP	O	82				6.3	F	1	20		3.6
1	26-Apr-15	1		4	TOP	O	133				33	F	2	120		19.7
1	26-Apr-15	1		5	TOP	O	151				44.5	F	2	140		27.1
1	26-Apr-15	1		1	MCC	O	58	20			0.8	F	2			
1	26-Apr-15	1		2	MCC	O	62	22			1.1	F	1			
1	26-Apr-15	1		3	MCC	O	54	22			0.9	F	1			
1	26-Apr-15	1		4	MCC	O	84	30			2.8	F	3			
1	26-Apr-15	1		5	MCC	O	71	25			1.8	F	4			
1	26-Apr-15	1		6	MCC		41	14			0.3	F	1			
1	26-Apr-15	1		7	MCC		66	24			1.4	M	3			
1	26-Apr-15	1		8	MCC		71	26			2.1	F	4			
1	26-Apr-15	1		9	MCC		73	26			2	F	3			
1	26-Apr-15	1		10	MCC		44	17			0.5	F	1			
2	26-Apr-15	1		1	TOP	O	138				31.2	F	2	100		16.8
2	26-Apr-15	1		2	TOP	O	111				16	F	2	150		9.1
2	26-Apr-15	1		3	TOP	O	100				11.1	F	2	60		6.6
2	26-Apr-15	1		4	TOP	O	132				30.2	F	2	100		17.2
2	26-Apr-15	1		5	TOP	O	153				41.7	F	2	180		24.5
2	26-Apr-15	1		6	TOP		129				25.6	F	2	100		15.2
2	26-Apr-15	1		7	TOP		92				8.6	F	1	40		4.7
2	26-Apr-15	1		1	MCC		91	35			4.1	F	4			
2	26-Apr-15	1		2	MCC		57	20			1	F	1			
2	26-Apr-15	1		3	MCC		50	18			0.7	F	1			
2	26-Apr-15	1		4	MCC		89	32			3.7	F	3			
2	26-Apr-15	1		5	MCC		82	32			2.9	F	4			
2	26-Apr-15	1		6	MCC		70	25			1.6	F	2			
2	26-Apr-15	1		7	MCC		45	15			0.4	M	1			
2	26-Apr-15	1		8	MCC		52	19			0.7	M	1			
2	26-Apr-15	1		9	MCC		53	19			0.7	F	1			
2	26-Apr-15	1		10	MCC		97	35			4.7	F	4			
2	26-Apr-15	1		1	SRX		129		87	90	15.5	M	3			
3	27-Apr-15	1		1	TOP	O	133				28.5	F	2	80		17
3	27-Apr-15	1		2	TOP	O	148				43.9	F	2	200		27.4
3	27-Apr-15	1		3	TOP	O	127				25	F	2	60		15
3	27-Apr-15	1		4	TOP	O	142				44.5	F	2	220		27
3	27-Apr-15	1		5	TOP	O	122				25.1	F	2	100		14.6
3	27-Apr-15	1		6	TOP		93				8.9	F	1	40		5.2
3	27-Apr-15	1		7	TOP		152				50.2	F	2	300		29
3	27-Apr-15	1		8	TOP		110				14.2	F	2	40		8.3
3	27-Apr-15	1		9	TOP		146				39.1	F	2	220		21.2
3	27-Apr-15	1		10	TOP		149				43.9	F	2	200		25.5
3	27-Apr-15	1		11	TOP		99				10.3	F	2	20		6
3	27-Apr-15	1		12	TOP		97				9.2	F	1	40		5.3
3	27-Apr-15	1		13	TOP		157				47.3	F	2	140		28.8
3	27-Apr-15	1		14	TOP		130				27.2	F	2	80		16
3	27-Apr-15	1		1	MCC	O	71	32			2.8	F	2			
3	27-Apr-15	1		2	MCC	O	45	19			0.8	F	2			
3	27-Apr-15	1		3	MCC	O	71	31			2.1	F	2			
3	27-Apr-15	1		4	MCC	O	61	24			1.3	F	2			
3	27-Apr-15	1		5	MCC	O	72	32			3.1	F	3			
3	27-Apr-15	1		6	MCC		51	21			0.9	M	2			
3	27-Apr-15	1		7	MCC		68	25			1.6	F	2			
3	27-Apr-15	1		8	MCC		45	17			0.6	F	1			
3	27-Apr-15	1		9	MCC		57	22			1	F	1			
3	27-Apr-15	1		10	MCC		52	18			0.7	F	1			
4	27-Apr-15	1		1	TOP	O	130				30.3	M	2	40		18.6
4	27-Apr-15	1		2	TOP	O	123				21.6	F	2	60		12.7
4	27-Apr-15	1		3	TOP	O	159				62.9	F	2	300		41
4	27-Apr-15	1		4	TOP	O	165				60.2	F	2	200		37
4	27-Apr-15	1		5	TOP	O	154				51.8	F	2	200		30.9
4	27-Apr-15	1		6	TOP		118				22	F	2	200		12.7
4	27-Apr-15	1		7	TOP		136				31	F	2	200		19
4	27-Apr-15	1		8	TOP		146				44	F	2	220		26
4	27-Apr-15	1		9	TOP		143				37.1	F	2	160		22.7
4	27-Apr-15	1		10	TOP		92				8.5	M	1	20		4.9
4	27-Apr-15	1		11	TOP		117				19	M	2	40		11
4	27-Apr-15	1		12	TOP		161				58	F	2	220		36.3
4	27-Apr-15	1		13	TOP		127				25	F	2	60	Shark damage	
4	27-Apr-15	1		14	TOP		118				19.5	F	2	60		10.6
4	27-Apr-15	1		15	TOP		114								Bad shark damage	
4	27-Apr-15	1		1	MCC	O	51	18			0.7	M	1			
4	27-Apr-15	1		2	MCC	O	83	31			2.9	F	2			
4	27-Apr-15	1		3	MCC	O	56	20			0.9	F	1			
4	27-Apr-15	1		4	MCC	O	54	20			1	F	1			
4	27-Apr-15	1		5	MCC	O	38	14			0.3	F	1			
4	27-Apr-15	1		6	MCC		57	21			1	F	1			
4	27-Apr-15	1		7	MCC		55	19			0.9	F	1			
4	27-Apr-15	1		8	MCC		52	20			0.9	M	1			
4	27-Apr-15	1		9	MCC		63	24			1.6	F	2			
4	27-Apr-15	1		10	MCC		49	18			0.8	F	1			
4	27-Apr-15	1		1	SRX		133		85	93	16.4	M	3			
5	27-Apr-15	1		1	MCC	O	85	35			4.3	F	4			
5	27-Apr-15	1		2	MCC	O	73	31			2.7	F	3			
5	27-Apr-15	1		3	MCC	O	59	23			1.3	F	2			
5	27-Apr-15	1		4	MCC	O	65	28			2.2	F	3			
5	27-Apr-15	1		5	MCC	O	61	25			1.3	F	2			
5	27-Apr-15	1		6	MCC		68	29			2.5	F	3			
5	27-Apr-15	1		7	MCC		59	22			1.1	F	2			
5	27-Apr-15	1		8	MCC		62	26			1.4	F	2			
5	27-Apr-15	1		9	MCC		69	29			2	F	3			
5	27-Apr-15	1		10	MCC		89	39			5	F	4			
5	27-Apr-15	1		1	LEV		89				5.3					

Table 8 (2) Biological data collected (2015)

Set number	Date	Observer ID	Basket/ Magazine No.	Serial No.	Species Code	Scale/Otolith/ Both/Thorns	Total Length (cm)	Snout-Anus Length	Wingspan (cm)	Pelvic length (cm)	Weight (kg)	Sex	Maturity Stage	Gonad Weight (g)	Comments	Trunk Weight
6	28-Apr-15	1		1	TOP	O	132				33.9	F	2	100		20.3
6	28-Apr-15	1		2	TOP	O	108				13.4	M	5	80		7.9
6	28-Apr-15	1		1	MCC	O	51	19			0.7	F	1			
6	28-Apr-15	1		2	MCC	O	46	16			0.5	M	1			
6	28-Apr-15	1		3	MCC	O	60	22			1.1	F	1			
6	28-Apr-15	1		4	MCC	O	48	20			1	F	1			
6	28-Apr-15	1		5	MCC	O	59	24			1.2	F	2			
6	28-Apr-15	1		6	MCC		58	24			1.5	F	2			
6	28-Apr-15	1		7	MCC		50	18			0.8	M	2			
6	28-Apr-15	1		8	MCC		53	19			1.2	U	1			
6	28-Apr-15	1		9	MCC		63	26			1.5	F	2			
6	28-Apr-15	1		10	MCC		77	33			3	F	3			
7	28-Apr-15	1		1	TOP	O	88				8.3	F	1	20		4.9
7	28-Apr-15	1		2	TOP	O	123				25	F	2	80		14.1
7	28-Apr-15	1		3	TOP	O	130				28	M	2	50		15.6
7	28-Apr-15	1		4	TOP	O	149				51	F	2	140		31.7
7	28-Apr-15	1		5	TOP	O	120				20.8	F	2	100		11.2
7	28-Apr-15	1		6	TOP		108				14	F	2	60		8.3
7	28-Apr-15	1		7	TOP		127				24.5	F	2	120		
7	28-Apr-15	1		1	MCC	O	57	19			1.1	M	2			
7	28-Apr-15	1		2	MCC	O	55	20			1.1	F	2			
7	28-Apr-15	1		3	MCC	O	50	18			0.8	M	1			
7	28-Apr-15	1		4	MCC	O	76	28			2.6	F	2			
7	28-Apr-15	1		5	MCC	O	94	32			4.4	F	3			
7	28-Apr-15	1		6	MCC		80	32			3.5	F	4			
7	28-Apr-15	1		7	MCC		85	32			3.1	F	3			
7	28-Apr-15	1		8	MCC		88	32			3.2	F	3			
7	28-Apr-15	1		9	MCC		91	34			4.1	F	2			
7	28-Apr-15	1		10	MCC		53	19			1	M	2			
7	28-Apr-15	1		1	BSH		157				16.2	M	2			
8	29-Apr-15	1		1	TOP	O	136				31.6	F	2	200		19.5
8	29-Apr-15	1		1	MCC	O	51	19			0.8	M	2			
8	29-Apr-15	1		2	MCC	O	74	27			1.9	F	2			
8	29-Apr-15	1		3	MCC	O	81	30			2.7	F	3			
8	29-Apr-15	1		4	MCC	O	70	26			1.9	F	3			
8	29-Apr-15	1		5	MCC	O	89	30			3.1	F	2			
8	29-Apr-15	1		6	MCC		89	30			3.3	F	2			
8	29-Apr-15	1		7	MCC		76	27			2.2	F	2			
8	29-Apr-15	1		8	MCC		48	18			0.7	M	2			
8	29-Apr-15	1		9	MCC		70	25			1.5	F	2			
8	29-Apr-15	1		10	MCC		94	34			3.8	F	3			
9	29-Apr-15	1		1	TOP	O	146				39.3	F	2	150	DNA Sample	23.8
9	29-Apr-15	1		2	TOP	O	95				10.8	F	2	50	DNA Sample	6.3
9	29-Apr-15	1		3	TOP	O	132				31	M	2	100	DNA Sample	18.2
9	29-Apr-15	1		4	TOP	O	144				32.9	F	2	100	DNA Sample	18.6
9	29-Apr-15	1		5	TOP	O	121				21.1	M	2	40	DNA Sample	12
9	29-Apr-15	1		6	TOP		92				9.4	F	2	50		5.4
9	29-Apr-15	1		7	TOP		132				24	F	2	100		13.4
9	29-Apr-15	1		8	TOP		142				62	F	2	400	Caudal Fin Missing	35.8
9	29-Apr-15	1		9	TOP		82				5.7	M	1	10		3.1
9	29-Apr-15	1		10	TOP		149				39.2	F	2	160		22.5
9	29-Apr-15	1		11	TOP		86				6.2	M	1	10		3.8
9	29-Apr-15	1		12	TOP		86				7	M	1	10		4.1
9	29-Apr-15	1		13	TOP		138				31.3	F	2	100		17.2
9	29-Apr-15	1		14	TOP		122				19	F	2	100		10.8
9	29-Apr-15	1		15	TOP		158				55.6	F	2	200		30.8
9	29-Apr-15	1		16	TOP		141				34	M	2	50		20.6
9	29-Apr-15	1		17	TOP		113				19.7	M	2	50		11.2
9	29-Apr-15	1		18	TOP		119				18.2	M	2	40		10.9
9	29-Apr-15	1		19	TOP		133				29.9	F	2	100		16.8
9	29-Apr-15	1		20	TOP		141				35	F	2	250		20.5
9	29-Apr-15	1		21	TOP		99				11	F	1	20		6.8
9	29-Apr-15	1		22	TOP		90				8.2	F	1	40		4.7
9	29-Apr-15	1		23	TOP		122				25.2	M	2	50		14.7
9	29-Apr-15	1		1	MCC	O	50	17			0.5	F	1			
9	29-Apr-15	1		2	MCC	O	61	22			1	M	2			
9	29-Apr-15	1		3	MCC	O	71	27			2.4	F	3			
9	29-Apr-15	1		4	MCC	O	87	31			3.1	F	2			
9	29-Apr-15	1		5	MCC	O	52	19			0.8	F	1			
9	29-Apr-15	1		6	MCC		67	25			1.3	F	2			
9	29-Apr-15	1		7	MCC		57	20			1	F	1			
9	29-Apr-15	1		8	MCC		90	32			3.3	F	2			
9	29-Apr-15	1		9	MCC		93	33			3.6	F	2			
9	29-Apr-15	1		10	MCC		70	24			1.7	F	2			
10	29-Apr-15	1		1	MCC	O	85	30			2.8	F	2			
10	29-Apr-15	1		2	MCC	O	48	17			0.5	F	1			
10	29-Apr-15	1		3	MCC	O	86	30			2.8	F	3			
10	29-Apr-15	1		4	MCC	O	63	22			1.3	F	2			
10	29-Apr-15	1		5	MCC	O	78	30			2.6	F	3			
10	29-Apr-15	1		6	MCC		100	35			4.5	F	3			
10	29-Apr-15	1		7	MCC		83	34			4.4	F	3			
10	29-Apr-15	1		8	MCC		91	34			3.2	F	3			
10	29-Apr-15	1		9	MCC		34	13			0.2	M	1			
10	29-Apr-15	1		10	MCC		49	17			0.5	M	2			
10	29-Apr-15	1		1	BSH		238				35.6	F				
10	29-Apr-15	1		2	BSH		252				36.8	F				

Table 9 (1) Biological data collected (2016)

Set number	Date	Observer ID	Basket/ Magazine No.	Serial No.	Species Code	Scale/Otolith/ Both/Thorns	Total Length (cm)	Snout-Anus Length (cm)	Wingspan (cm)	Pelvic length (cm)	Weight (kg)	Sex	Maturity Stage	Gonad Weight (g)	Comments	HGT (Trunk weight) before freezing
13	03/03/2016	2		1	TOP	O	128				40.7	F	2	50		24.8
13	03/03/2016	2		2	TOP	O	102				12.5	F	1	5		7.3
13	03/03/2016	2		3	TOP	O	109				14.8	F	1	10		8.3
13	03/03/2016	2		4	TOP	O	161				63.2	F	2	260		39.6
13	03/03/2016	2		5	TOP	O	125				28.8	F	2	50		15.6
13	03/03/2016	2		6	TOP		118				22.5	F	2	30		12.3
13	03/03/2016	2		7	TOP		92				8.5	M	1	5		4.8
13	03/03/2016	2		8	TOP		127				25.4	F	2	50		14.8
13	03/03/2016	2		1	GRV			32			3.6					
13	03/03/2016	2		2	GRV			35			4.2					
13	03/03/2016	2		3	GRV			18			0.9					
13	03/03/2016	2		4	GRV			21			1.4					
13	03/03/2016	2		5	GRV			19			1					
13	03/03/2016	2		6	GRV			32			4					
13	03/03/2016	2		7	GRV			30			3.5					
13	03/03/2016	2		8	GRV			20			1.1					
13	03/03/2016	2		9	GRV			19			0.7					
13	03/03/2016	2		10	GRV			22			1.5					
13	03/03/2016	2		11	GRV			17			0.6					
13	03/03/2016	2		12	GRV			15			0.5					
13	03/03/2016	2		13	GRV			22			1.6					
13	03/03/2016	2		14	GRV			17			0.6					
13	03/03/2016	2		15	GRV			35			4.1					
13	03/03/2016	2		16	GRV			15			0.5					
13	03/03/2016	2		17	GRV			20			1.1					
13	03/03/2016	2		18	GRV			28			2					
13	03/03/2016	2		19	GRV			24			1.6					
13	03/03/2016	2		20	GRV			23			1.5					
13	03/03/2016	2		21	GRV			18			1					
13	03/03/2016	2		22	GRV			18			0.9					
13	03/03/2016	2		23	GRV			19			1.1					
13	03/03/2016	2		24	GRV			16			0.7					
13	03/03/2016	2		25	GRV			27			1.7					
13	03/03/2016	2		26	GRV			18			1					
13	03/03/2016	2		27	GRV			22			2.2					
13	03/03/2016	2		28	GRV			23			2.4					
13	03/03/2016	2		29	GRV			20			2.1					
13	03/03/2016	2		30	GRV			20			2.1					
13	03/03/2016	2		31	GRV			14			0.4					
13	03/03/2016	2		32	GRV			17			0.6					
13	03/03/2016	2		33	GRV			13			0.3					
13	03/03/2016	2		34	GRV			17			0.6					
13	03/03/2016	2		35	GRV			20			1					
13	03/03/2016	2		36	GRV			16			0.5					
13	03/03/2016	2		37	GRV			19			1					
13	03/03/2016	2		38	GRV			19			1					
13	03/03/2016	2		39	GRV			24			1.4					
13	03/03/2016	2		40	GRV			16			0.6					
13	03/03/2016	2		41	GRV			18			0.9					
13	03/03/2016	2		42	GRV			18			0.8					
13	03/03/2016	2		43	GRV			17			0.7					
13	03/03/2016	2		44	GRV			16			0.6					
13	03/03/2016	2		45	GRV			19			1					
13	03/03/2016	2		46	GRV			18			0.9					
13	03/03/2016	2		1	KCX		18				1.8				RELEASED	
13	03/03/2016	2		2	KCX		18				1.7				RELEASED	
13	03/03/2016	2		1	ANT		48				1					
13	03/03/2016	2		2	ANT		62				1.5					
13	03/03/2016	2		3	ANT		42				0.5					
13	03/03/2016	2		4	ANT		60				1.3					
14	03/03/2016	1		1	TOP	O	95				10.4	F	2	60		6.2
14	03/03/2016	1		2	TOP	O	148				45.2	F	2	50		28.3
14	03/03/2016	1		3	TOP	O	85				8.1	F	2	40		4.2
14	03/03/2016	1		4	TOP	O	120				23.1	F	2	30		13.8
14	03/03/2016	1		5	TOP	O	106				14.8	F	2	40		8.4
14	03/03/2016	1		6	TOP		111				14.9	F	2	30		8.3
14	03/03/2016	1		7	TOP		90				8	F	1	5		4.7
14	03/03/2016	1		8	TOP		113				19.5	M	2	20		10.7
14	03/03/2016	1		9	TOP		133				30.6	F	2	50		17.4
14	03/03/2016	1		1	MCC			21			1					
14	03/03/2016	1		2	MCC			16			0.4					
14	03/03/2016	1		3	MCC			18			0.5					
14	03/03/2016	1		4	MCC			23			1.1					
14	03/03/2016	1		5	MCC			20			0.9					
14	03/03/2016	1		6	MCC			25			2.1					
14	03/03/2016	1		7	MCC			22			1.1					
14	03/03/2016	1		8	MCC			19			0.8					
14	03/03/2016	1		9	MCC			22			1.9					
14	03/03/2016	1		10	MCC			21			1					
14	03/03/2016	1		11	MCC			32			3.5					
14	03/03/2016	1		12	MCC			27			2.8					
14	03/03/2016	1		13	MCC			28			2.2					
14	03/03/2016	1		14	MCC			33			3.7					
14	03/03/2016	1		15	MCC			30			3					
14	03/03/2016	1		16	MCC			32			3					
14	03/03/2016	1		17	MCC			22			1.2					
14	03/03/2016	1		18	MCC			17			0.8					
14	03/03/2016	1		19	MCC			31			3.2					
14	03/03/2016	1		20	MCC			34			4.1					

Table 9 (2) Biological data collected (2016)

Set number	Date	Observer ID	Basket/ Magazine No.	Serial No.	Species Code	Scale/Otolith/ Both/Thor	Total Length (cm)	Snout-Anus Length	Wingspan (cm)	Pelvic length (cm)	Weight (kg)	Sex	Maturity Stage	Gonad Weight (g)	Comments	HGT (Trunk weight) before freezing
14	03/03/2016	1		21	MCC			33			3.6					
14	03/03/2016	1		22	MCC			22			1.9					
14	03/03/2016	1		23	MCC			20			0.9					
14	03/03/2016	1		24	MCC			30			2.9					
14	03/03/2016	1		25	MCC			28			2.8					
14	03/03/2016	1		26	MCC			23			1.2					
14	03/03/2016	1		27	MCC			23			1.2					
14	03/03/2016	1		28	MCC			34			1.6					
14	03/03/2016	1		29	MCC			18			0.9					
14	03/03/2016	1		30	MCC			26			2.2					
14	03/03/2016	1		31	MCC	O		33			3.8	F	3	160		
14	03/03/2016	1		32	MCC	O		25			2.2	F	3	120		
14	03/03/2016	1		33	MCC	O		28			2.5	F	2	80		
14	03/03/2016	1		34	MCC	O		29			2.9	F	3	170		
14	03/03/2016	1		35	MCC	O		30			3.8	F	2	60		
14	03/03/2016	1		36	MCC	O		34			4.6	F	3	360		
14	03/03/2016	1		37	MCC	O		35			4	F	3	190		
14	03/03/2016	1		38	MCC	O		32			4.5	F	3	210		
14	03/03/2016	1		39	MCC	O		33			4.5	F	3	410		
14	03/03/2016	1		40	MCC	O		29			3.1	F	3	190		
14	03/03/2016	1		41	GRV			31			3.4	F	3			
14	03/03/2016	1		1	ANT	O	59				1.5	F	1	5		
14	03/03/2016	1		2	ANT		60				2					
14	03/03/2016	1		1	KCX		17				1.6				RELEASED	
14	03/03/2016	1		1	CGE		15				1.8				RELEASED	
14	03/03/2016	1		2	CGE		14				1.2				RELEASED	
15	04/03/2016	2		1	TOP	O	102				12.4	F	1	5		7.4
15	04/03/2016	2		2	TOP	O	108				15.6	F	2	40		8.9
15	04/03/2016	2		1	MCC	O		30			3.3	F	2	120		
15	04/03/2016	2		2	MCC	O		18			0.7	M	1	70		
15	04/03/2016	2		3	MCC	O		32			3.5	F	3	240		
15	04/03/2016	2		4	MCC	O		20			1	F	2	30		
15	04/03/2016	2		5	MCC	O		16			0.6	F	1	5		
15	04/03/2016	2		6	MCC			29			2.9	F	3	280		
15	04/03/2016	2		7	MCC			32			4	F	3	320		
15	04/03/2016	2		8	MCC			39			3.6	F	3	260		
15	04/03/2016	2		9	MCC			30			3.4	F	3	280		
15	04/03/2016	2		10	MCC			26			2.5	F	3	250		
15	04/03/2016	2		11	MCC			16			0.5	F	1	10		
15	04/03/2016	2		12	MCC			22			1.5	M	1	50		
15	04/03/2016	2		13	MCC			17			0.6	F	1	30		
15	04/03/2016	2		14	MCC			18			0.8	F	1	30		
15	04/03/2016	2		15	MCC			18			0.9	F	1	50		
15	04/03/2016	2		16	MCC			17			0.8	F	1	20		
15	04/03/2016	2		17	MCC			19			1.1	M	2	80		
15	04/03/2016	2		18	MCC			32			3.1	F	3	240		
15	04/03/2016	2		19	MCC			14			0.5	M	1	5		
15	04/03/2016	2		20	MCC			31			3.3	F	3	290		
15	04/03/2016	2		21	MCC			18			0.9	F	1	50		
15	04/03/2016	2		22	MCC			18			0.9	F	1	60		
15	04/03/2016	2		23	MCC			17			0.7	F	1	30		
15	04/03/2016	2		24	MCC			19			0.8	F	1	40		
15	04/03/2016	2		25	MCC			33			3.9	F	3	300		
15	04/03/2016	2		26	MCC			27			2.3	F	2	230		
15	04/03/2016	2		27	MCC			16			0.5	M	1	5		
15	04/03/2016	2		28	MCC			34			4.3	F	3	410		
15	04/03/2016	2		29	MCC			27			2.7	F	3	290		
15	04/03/2016	2		30	MCC			19			0.8	F	1	20		
15	04/03/2016	2		31	MCC			22			1.4					
15	04/03/2016	2		32	MCC			20			1					
15	04/03/2016	2		33	MCC			19			0.9					
15	04/03/2016	2		34	MCC			18			0.8					
15	04/03/2016	2		35	MCC			25			1.5					
15	04/03/2016	2		36	MCC			21			1.1					
15	04/03/2016	2		37	MCC			20			1					
15	04/03/2016	2		38	MCC			14			0.3					
15	04/03/2016	2		39	MCC			12			0.1					
15	04/03/2016	2		40	MCC			13			0.2					
15	04/03/2016	2		41	MCC			19			0.8					
15	04/03/2016	2		1	KCX		12				0.5				RELEASED	
16	03/03/2016	2		1	TOP	O	117				23.7	F	2	100		12.8
16	03/03/2016	2		2	TOP	O	88				7.7	F	1	5		4.2
16	03/03/2016	2		3	TOP	O	71				3.6	F	1	2		1.9
16	03/03/2016	2		4	TOP	O	94				10.5	F	1	5		5.8
16	03/03/2016	2		5	TOP	O	127				32.1	F	2	40		18.8
16	03/03/2016	2		6	TOP		90				13.2	F	2	20		7.6
16	03/03/2016	2		7	TOP		78				4.4	F	1	5		2.4
16	03/03/2016	2		8	TOP		91				8.6	M	2	5		4.7
16	03/03/2016	2		9	TOP		135				30.3	F	2	80		18.1
16	03/03/2016	2		1	GRV			26			2.3					
16	03/03/2016	2		2	GRV			16			0.5					
16	03/03/2016	2		3	GRV			19			0.9					
16	03/03/2016	2		4	GRV			22			1.5					
16	03/03/2016	2		5	GRV			18			0.9					
16	03/03/2016	2		6	GRV			28			3					
16	03/03/2016	2		7	GRV			20			1.5					
16	03/03/2016	2		8	GRV			19			1					
16	03/03/2016	2		9	GRV			15			0.5					

Table 9 (3) Biological data collected (2016)

Set number	Date	Observer ID	Basket/ Magazine No.	Serial No.	Species Code	Scale/Otolith/ Both/Thor	Total Length (cm)	Snout-Anus Length	Wingspan (cm)	Pelvic length (cm)	Weight (kg)	Sex	Maturity Stage	Gonad Weight (g)	Comments	HGT (Trunk weight) before freezing
18	04/03/2016	2		16	MCC			33			4	F	3	280		
18	04/03/2016	2		17	MCC			28			2.6	F	2	120		
18	04/03/2016	2		18	MCC			20			1	F	1	5		
18	04/03/2016	2		19	MCC			30			2.5	F	2	180		
18	04/03/2016	2		20	MCC			26			2.3	M	2	40		
18	04/03/2016	2		21	MCC			23			1.5	M	1	5		
18	04/03/2016	2		22	MCC			17			0.6	M	1	2		
18	04/03/2016	2		23	MCC			24			2	F	2	80		
18	04/03/2016	2		24	MCC			31			3.2	F	3	220		
18	04/03/2016	2		25	MCC			15			0.5	M	1	2		
18	04/03/2016	2		26	MCC			16			0.6	M	1	2		
18	04/03/2016	2		27	MCC			17			0.6	M	1	2		
18	04/03/2016	2		1	CGE		14				1.3				RELEASED	
18	04/03/2016	2		1	ANT	O	62				1.9	M	1	5		
19	05/03/2016	1		1	MCC	O		27			2.1	F	2	80		
19	05/03/2016	1		2	MCC	O		25			2	F	2	20		
19	05/03/2016	1		3	MCC	O		19			1.4	M	2	10		
19	05/03/2016	1		4	MCC	O		23			1.5	M	5	5		
19	05/03/2016	1		5	MCC	O		22			1.4	F	2	2		
19	05/03/2016	1		6	MCC			20			1	F	2	5		
19	05/03/2016	1		7	MCC			18			0.7	F	1	2		
19	05/03/2016	1		8	MCC			16			0.5	M	1	2		
19	05/03/2016	1		9	MCC			16			0.5	M	1	2		
19	05/03/2016	1		10	MCC			19			0.8	F	2	5		
19	05/03/2016	1		11	MCC			22			1.5	M	3	20		
19	05/03/2016	1		12	MCC			21			1.1	M	2	10		
19	05/03/2016	1		13	MCC			19			1	F	2	5		
19	05/03/2016	1		14	MCC			25			2	F	2	10		
19	05/03/2016	1		15	MCC			26			2.1	F	3	60		
19	05/03/2016	1		16	MCC			18			0.9	M	2	5		
19	05/03/2016	1		17	MCC			16			0.4	M	1	2		
19	05/03/2016	1		18	MCC			33			3.5	F	3	160		
19	05/03/2016	1		19	MCC			18			1	F	2	15		
19	05/03/2016	1		20	MCC			31			3.1	F	3	80		
19	05/03/2016	1		21	MCC			18			0.6					
19	05/03/2016	1		22	MCC			21			0.9					
19	05/03/2016	1		23	MCC			22			1.1					
19	05/03/2016	1		24	MCC			23			1.6					
19	05/03/2016	1		25	MCC			20			1					
19	05/03/2016	1		26	MCC			22			1.3					
19	05/03/2016	1		27	MCC			24			1.5					
19	05/03/2016	1		28	MCC			26			1.8					
19	05/03/2016	1		29	MCC			17			0.5					
19	05/03/2016	1		30	MCC			19			0.8					
19	05/03/2016	1		1	CGE		15				1.1					
20	05/03/2016	2		1	TOP	O	114				18.4	F	2	80		10.6
20	05/03/2016	2		2	TOP	O	124				28.4	M	2	40		17.6
20	05/03/2016	2		3	TOP	O	134				29.6	F	2	30		17.8
20	05/03/2016	2		4	TOP	O	97				9.8	M	1	5		5.6
20	05/03/2016	2		1	MCC	O		18			1	M	1	5		
20	05/03/2016	2		2	MCC	O		23			1.5	F	2	30		
20	05/03/2016	2		3	MCC	O		15			0.4	M	1	2		
20	05/03/2016	2		4	MCC	O		26			2.4	F	2	50		
20	05/03/2016	2		5	MCC	O		33			3.2	F	2	180		
20	05/03/2016	2		6	MCC			15			0.6	M	1	2		
20	05/03/2016	2		7	MCC			16			0.7	M	1	2		
20	05/03/2016	2		8	MCC			28			2.9	F	3	180		
20	05/03/2016	2		9	MCC			30			2.6	F	2	60		
20	05/03/2016	2		10	MCC			29			2.6	F	2	40		
20	05/03/2016	2		11	MCC			20			1	F	1	5		
20	05/03/2016	2		12	MCC			20			1	M	1	5		
20	05/03/2016	2		13	MCC			22			1.1	M	1	5		
20	05/03/2016	2		14	MCC			16			0.6	M	1	2		
20	05/03/2016	2		15	MCC			26			2	M	2	20		
20	05/03/2016	2		16	MCC			18			0.9	F	1	5		
20	05/03/2016	2		17	MCC			24			2.2	F	2	30		
20	05/03/2016	2		18	MCC			33			2.8	F	3	190		
20	05/03/2016	2		19	MCC			28			2.4	F	2	100		
20	05/03/2016	2		20	MCC			17			0.7	M	1	2		
20	05/03/2016	2		21	MCC			16			0.7	F	1	2		
20	05/03/2016	2		22	MCC			19			0.8	M	1	5		
20	05/03/2016	2		23	MCC			21			1	M	1	5		
20	05/03/2016	2		24	MCC			26			2.3	M	2	40		
20	05/03/2016	2		25	MCC			21			0.9	F	2	20		
20	05/03/2016	2		26	MCC			30			2.7	F	2	40		
20	05/03/2016	2		27	MCC			16			0.5	M	1	2		
20	05/03/2016	2		28	MCC			15			0.5	F	1	5		
20	05/03/2016	2		29	MCC			22			1.2	F	1	5		
20	05/03/2016	2		30	MCC			18			0.9	F	1	5		
20	05/03/2016	2		31	MCC			24			2.2					
20	05/03/2016	2		1	ANT	O	55				1.5	F	1	5		
20	05/03/2016	2		2	ANT	O	57				1.5	F	1	5		
20	05/03/2016	2		3	ANT	O	64				2.5	F	2	10		
20	05/03/2016	2		4	ANT	O	60				2	F	1	5		

Table 9 (4) Biological data collected (2016)

Set number	Date	Observer ID	Basket/ Magazine No.	Serial No.	Species Code	Scale/Otolith/ Both/Thor	Total Length (cm)	Snout-Anus Length	Wingspan (cm)	Pelvic length (cm)	Weight (kg)	Sex	Maturity Stage	Gonad Weight (g)	Comments	HGT (Trunk weight) before freezing
18	04/03/2016	2		16	MCC			33			4	F	3	280		
18	04/03/2016	2		17	MCC			28			2.6	F	2	120		
18	04/03/2016	2		18	MCC			20			1	F	1	5		
18	04/03/2016	2		19	MCC			30			2.5	F	2	180		
18	04/03/2016	2		20	MCC			26			2.3	M	2	40		
18	04/03/2016	2		21	MCC			23			1.5	M	1	5		
18	04/03/2016	2		22	MCC			17			0.6	M	1	2		
18	04/03/2016	2		23	MCC			24			2	F	2	80		
18	04/03/2016	2		24	MCC			31			3.2	F	3	220		
18	04/03/2016	2		25	MCC			15			0.5	M	1	2		
18	04/03/2016	2		26	MCC			16			0.6	M	1	2		
18	04/03/2016	2		27	MCC			17			0.6	M	1	2		
18	04/03/2016	2		1	CGE		14				1.3				RELEASED	
18	04/03/2016	2		1	ANT	O	62				1.9	M	1	5		
19	05/03/2016	1		1	MCC	O		27			2.1	F	2	80		
19	05/03/2016	1		2	MCC	O		25			2	F	2	20		
19	05/03/2016	1		3	MCC	O		19			1.4	M	2	10		
19	05/03/2016	1		4	MCC	O		23			1.5	M	5	5		
19	05/03/2016	1		5	MCC	O		22			1.4	F	2	2		
19	05/03/2016	1		6	MCC			20			1	F	2	5		
19	05/03/2016	1		7	MCC			18			0.7	F	1	2		
19	05/03/2016	1		8	MCC			16			0.5	M	1	2		
19	05/03/2016	1		9	MCC			16			0.5	M	1	2		
19	05/03/2016	1		10	MCC			19			0.8	F	2	5		
19	05/03/2016	1		11	MCC			22			1.5	M	3	20		
19	05/03/2016	1		12	MCC			21			1.1	M	2	10		
19	05/03/2016	1		13	MCC			19			1	F	2	5		
19	05/03/2016	1		14	MCC			25			2	F	2	10		
19	05/03/2016	1		15	MCC			26			2.1	F	3	60		
19	05/03/2016	1		16	MCC			18			0.9	M	2	5		
19	05/03/2016	1		17	MCC			16			0.4	M	1	2		
19	05/03/2016	1		18	MCC			33			3.5	F	3	160		
19	05/03/2016	1		19	MCC			18			1	F	2	15		
19	05/03/2016	1		20	MCC			31			3.1	F	3	80		
19	05/03/2016	1		21	MCC			18			0.6					
19	05/03/2016	1		22	MCC			21			0.9					
19	05/03/2016	1		23	MCC			22			1.1					
19	05/03/2016	1		24	MCC			23			1.6					
19	05/03/2016	1		25	MCC			20			1					
19	05/03/2016	1		26	MCC			22			1.3					
19	05/03/2016	1		27	MCC			24			1.5					
19	05/03/2016	1		28	MCC			26			1.8					
19	05/03/2016	1		29	MCC			17			0.5					
19	05/03/2016	1		30	MCC			19			0.8					
19	05/03/2016	1		1	CGE		15				1.1					
20	05/03/2016	2		1	TOP	O	114				18.4	F	2	80		10.6
20	05/03/2016	2		2	TOP	O	124				28.4	M	2	40		17.6
20	05/03/2016	2		3	TOP	O	134				29.6	F	2	30		17.8
20	05/03/2016	2		4	TOP	O	97				9.8	M	1	5		5.6
20	05/03/2016	2		1	MCC	O		18			1	M	1	5		
20	05/03/2016	2		2	MCC	O		23			1.5	F	2	30		
20	05/03/2016	2		3	MCC	O		15			0.4	M	1	2		
20	05/03/2016	2		4	MCC	O		26			2.4	F	2	50		
20	05/03/2016	2		5	MCC	O		33			3.2	F	2	180		
20	05/03/2016	2		6	MCC			15			0.6	M	1	2		
20	05/03/2016	2		7	MCC			16			0.7	M	1	2		
20	05/03/2016	2		8	MCC			28			2.9	F	3	180		
20	05/03/2016	2		9	MCC			30			2.6	F	2	60		
20	05/03/2016	2		10	MCC			29			2.6	F	2	40		
20	05/03/2016	2		11	MCC			20			1	F	1	5		
20	05/03/2016	2		12	MCC			20			1	M	1	5		
20	05/03/2016	2		13	MCC			22			1.1	M	1	5		
20	05/03/2016	2		14	MCC			16			0.6	M	1	2		
20	05/03/2016	2		15	MCC			26			2	M	2	20		
20	05/03/2016	2		16	MCC			18			0.9	F	1	5		
20	05/03/2016	2		17	MCC			24			2.2	F	2	30		
20	05/03/2016	2		18	MCC			33			2.8	F	3	190		
20	05/03/2016	2		19	MCC			28			2.4	F	2	100		
20	05/03/2016	2		20	MCC			17			0.7	M	1	2		
20	05/03/2016	2		21	MCC			16			0.7	F	1	2		
20	05/03/2016	2		22	MCC			19			0.8	M	1	5		
20	05/03/2016	2		23	MCC			21			1	M	1	5		
20	05/03/2016	2		24	MCC			26			2.3	M	2	40		
20	05/03/2016	2		25	MCC			21			0.9	F	2	20		
20	05/03/2016	2		26	MCC			30			2.7	F	2	40		
20	05/03/2016	2		27	MCC			16			0.5	M	1	2		
20	05/03/2016	2		28	MCC			15			0.5	F	1	5		
20	05/03/2016	2		29	MCC			22			1.2	F	1	5		
20	05/03/2016	2		30	MCC			18			0.9	F	1	5		
20	05/03/2016	2		31	MCC			24			2.2					
20	05/03/2016	2		1	ANT	O	55				1.5	F	1	5		
20	05/03/2016	2		2	ANT	O	57				1.5	F	1	5		
20	05/03/2016	2		3	ANT	O	64				2.5	F	2	10		
20	05/03/2016	2		4	ANT	O	60				2	F	1	5		

Table 9 (5) Biological data collected (2016)

Set number	Date	Observer ID	Basket/ Magazine No.	Serial No.	Species Code	Scale/Otolith/ Both/Thor	Total Length (cm)	Snout-Anus Length	Wingspan (cm)	Pelvic length (cm)	Weight (kg)	Sex	Maturity Stage	Gonad Weight (g)	Comments	HGT (Trunk weight) before freezing
21	06/03/2016	2		1	TOP	O	103				13.3	F	1	5		7.9
21	06/03/2016	2		2	TOP	O	121				21.3	M	2	30		12.9
21	06/03/2016	2		3	TOP	O	122				29	F	2	50		16.6
21	06/03/2016	2		4	TOP	O	124				19.4	F	2	40		10.7
21	06/03/2016	2		5	TOP	O	128				27.5	F	2	40		15.6
21	06/03/2016	2		6	TOP		108				14.3	F	2	20		8.3
21	06/03/2016	2		7	TOP		129				25.2	M	2	30		14.9
21	06/03/2016	2		8	TOP		134				36.3	F	2	50		22.2
21	06/03/2016	2		9	TOP		145				48.7	F	2	200		31
21	06/03/2016	2		10	TOP		141				38.3	F	2	40		22.3
21	06/03/2016	2		11	TOP		130				25.2	F	2	30		14.1
21	06/03/2016	2		12	TOP		101				12.3	F	1	5		7.3
21	06/03/2016	2		13	TOP		135				30.3	M	2	40		17.6
21	06/03/2016	2		14	TOP		123				19.7	M	2	20		11.7
21	06/03/2016	2		15	TOP		98				10.6	M	1	5		5.9
21	06/03/2016	2		16	TOP		143				40.1	F	2	180		23.3
21	06/03/2016	2		17	TOP		104				11.5	F	1	5		6.7
21	06/03/2016	2		18	TOP		112				16.7	F	2	20		9.7
21	06/03/2016	2		19	TOP		136				27.5	F	2	50		15.3
21	06/03/2016	2		1	MCC	O		20			0.9	M	1	2		
21	06/03/2016	2		2	MCC	O		21			1.5	M	1	5		
21	06/03/2016	2		3	MCC	O		23			1.5	F	1	5		
21	06/03/2016	2		4	MCC	O		20			1.1	M	1	2		
21	06/03/2016	2		5	MCC	O		22			1.4	M	1	5		
21	06/03/2016	2		6	MCC			19			1	M	1	2		
21	06/03/2016	2		7	MCC			16			0.6	M	1	2		
21	06/03/2016	2		8	MCC			20			1	F	1	2		
21	06/03/2016	2		9	MCC			18			0.8	F	1	2		
21	06/03/2016	2		10	MCC			17			0.6	F	1	2		
21	06/03/2016	2		11	MCC			16			0.5	M	1	2		
21	06/03/2016	2		12	MCC			17			0.6	F	1	2		
21	06/03/2016	2		13	MCC			17			0.6	F	1	2		
21	06/03/2016	2		14	MCC			22			1.1	M	1	2		
21	06/03/2016	2		15	MCC			18			0.9	M	1	2		
21	06/03/2016	2		16	MCC			14			0.3	F	1	2		
21	06/03/2016	2		17	MCC			20			1	F	1	2		
21	06/03/2016	2		18	MCC			17			0.7	M	1	2		
21	06/03/2016	2		19	MCC			20			1.1	F	1	2		
21	06/03/2016	2		20	MCC			19			0.8	M	1	2		
21	06/03/2016	2		21	MCC			23			1.2	F	1	2		
21	06/03/2016	2		22	MCC			17			0.7	F	1	2		
21	06/03/2016	2		23	MCC			22			1.2	F	1	2		
21	06/03/2016	2		24	MCC			20			0.9	M	1	2		
21	06/03/2016	2		25	MCC			19			0.8	F	1	2		
21	06/03/2016	2		26	MCC			19			0.9	M	1	2		
21	06/03/2016	2		27	MCC			15			0.5	M	1	2		
21	06/03/2016	2		28	MCC			17			0.6	F	1	2		
21	06/03/2016	2		29	MCC			23			0.5	F	1	2		
21	06/03/2016	2		30	MCC			21			1	M	1	2		
21	06/03/2016	2		1	MRL	O	49				0.7	F	1	10		
21	06/03/2016	2		1	ANT	O	53				1.2	M	2	15		
21	06/03/2016	2		2	CGE		13				1.3					
22	06/03/2016	2		1	TOP	O	140				36.7	F	2	150		20.9
22	06/03/2016	2		2	TOP	O	133				33.2	F	2	140		18.7
22	06/03/2016	2		3	TOP	O	127				23.9	F	2	40		14.1
22	06/03/2016	2		4	TOP	O	112				17.9	F	2	30		9.6
22	06/03/2016	2		5	TOP	O	105				14.6	F	2	20		8.4
22	06/03/2016	2		6	TOP		104				12.1	F	1	5		6.8
22	06/03/2016	2		7	TOP		128				26.5	F	2	110		14.1
22	06/03/2016	2		8	TOP		100				10.8	F	1	5		6.4
22	06/03/2016	2		9	TOP		131				29.8	M	2	20		17.8
22	06/03/2016	2		10	TOP		133				27.6	F	2	40		15.3
22	06/03/2016	2		11	TOP		130				35	M	2	40		21.1
22	06/03/2016	2		12	TOP		132				30.4	F	2	80		17.4
22	06/03/2016	2		13	TOP		132				30.7	F	2	100		17.5
22	06/03/2016	2		14	TOP		141				39.6	F	2	120		22.6
22	06/03/2016	2		15	TOP		89				8.2	M	1	5		4.8
22	06/03/2016	2		16	TOP		132				27.7	F	2	100		16
22	06/03/2016	2		17	TOP		160				52.1	F	2	200		29.1
22	06/03/2016	2		18	TOP		136				30.7	F	2	100		17.5
22	06/03/2016	2		19	TOP		104				13.7	F	2	10		8
22	06/03/2016	2		20	TOP		102				13.5	F	2	5		8.5
22	06/03/2016	2		1	MCC	O		23			1.9	M	4	40		
22	06/03/2016	2		2	MCC	O		29			2.4	F	2	180		
22	06/03/2016	2		3	MCC	O		20			1.2	M	1	5		
22	06/03/2016	2		4	MCC	O		24			1.6	F	1	5		
22	06/03/2016	2		5	MCC	O		33			3.2	F	3	200		
22	06/03/2016	2		6	MCC			23			1.7	M	2	10		
22	06/03/2016	2		7	MCC			34			3.5	F	3	200		
22	06/03/2016	2		8	MCC			32			3.6	F	3	220		
22	06/03/2016	2		9	MCC			30			3	F	3	190		
22	06/03/2016	2		10	MCC			33			3.1	F	3	200		
22	06/03/2016	2		11	MCC			32			3.5	F	3	80		
22	06/03/2016	2		12	MCC			27			2.2	F	2	60		
22	06/03/2016	2		13	MCC			20			1.1	F	1	2		
22	06/03/2016	2		14	MCC			19			1	M	1	2		
22	06/03/2016	2		15	MCC			32			3.5	F	3	210		
22	06/03/2016	2		16	MCC			31			3.5	F	3	160		
22	06/03/2016	2		17	MCC			33			3.3	F	3	190		
22	06/03/2016	2		18	MCC			30			2.6	F	3	200		
22	06/03/2016	2		19	MCC			28			2.6	F	3	160		
22	06/03/2016	2		20	MCC			30			3.2	F	5	40		
22	06/03/2016	2		21	MCC			28			2.6	F	2	120		
22	06/03/2016	2		22	MCC			22			1.1	F	1	5		
22	06/03/2016	2		23	MCC			23			1.5	M	1	5		
22	06/03/2016	2		24	MCC			24			1.7	M	2	10		
22	06/03/2016	2		25	MCC			24			1.4	M	1	5		
22	06/03/2016	2		26	MCC			25			1.6	M	2	10		
22	06/03/2016	2		27	MCC			21			1	M	1	2		
22	06/03/2016	2		28	MCC			18			0.9	M	1	2		
22	06/03/2016	2		29	MCC			24			1.6	M	2	10		
22	06/03/2016	2		30	MCC			14			0.5	F	1	2		
22	06/03/2016	2		31	MCC			16			0.5					
22	06/03/2016	2		32	MCC			18			0.9					
22	06/03/2016	2		33	MCC			30			3					
22	06/03/2016	2		34	MCC			31			2.9					
22	06/03/2016	2		35	MCC			28			2.5					
22	06/03/2016	2		36	MCC			23			1.7					
22	06/03/2016	2		37	MCC			15			0.6					
22	06/03/2016	2		38	MCC			18			0.6					
22	06/03/2016	2		39	MCC			17			0.6					
22	06/03/2016	2		1	ANT	O	58				2.1	M	1	5		

APPENDIX XIII – Proposal for exploratory fishing within the SEAFO CA during 2017

PLAN OF EXPLORATORY FISHING IN NEW BOTTOM FISHING GROUND IN THE SEAFO CONVENTION AREA IN 2017

Japan
October, 2016

1. INTRODUCTION

In 2011, existing bottom fishing areas have been identified in response to 2006 UNGA resolution 61/105. This has resulted to split some of fishable sea mountains shallower than 2,000 m such as Discovery Seamounts into existing and new bottom fishing areas.

There is no clear geographical (seafloor-topological) boundary around the Discovery Seamount. Hence it is considered that fish might move across the boundary of existing and new bottom fishing areas. Furthermore, VME information, fish distribution, detailed sea bed map, etc. in new bottom fishing areas will never be known unless exploratory fishing activities occur there.

We believe that collecting such primary information in new bottom fishing areas is meaningful and accumulating such information could contribute to achieve the objective of the SEAFO Convention to ensure the long term conservation and sustainable use of fishery resources.

2. OBJECTIVES

Under such circumstances, the primary objectives of this exploratory fishing are to investigate Patagonian toothfish resources using some part of TAC and to evaluate if this exploratory fishing produces Significant Adverse Impact (SAI) on VME species

3. SPECIFICATIONS OF THE EXPLORATORY FISHING

(1) Target Species

Dissosticus spp. (Patagonian toothfish)

(2) Period

March-August, 2017 changeable due to fishing conditions.

(3) **Areas (BOX 1)**

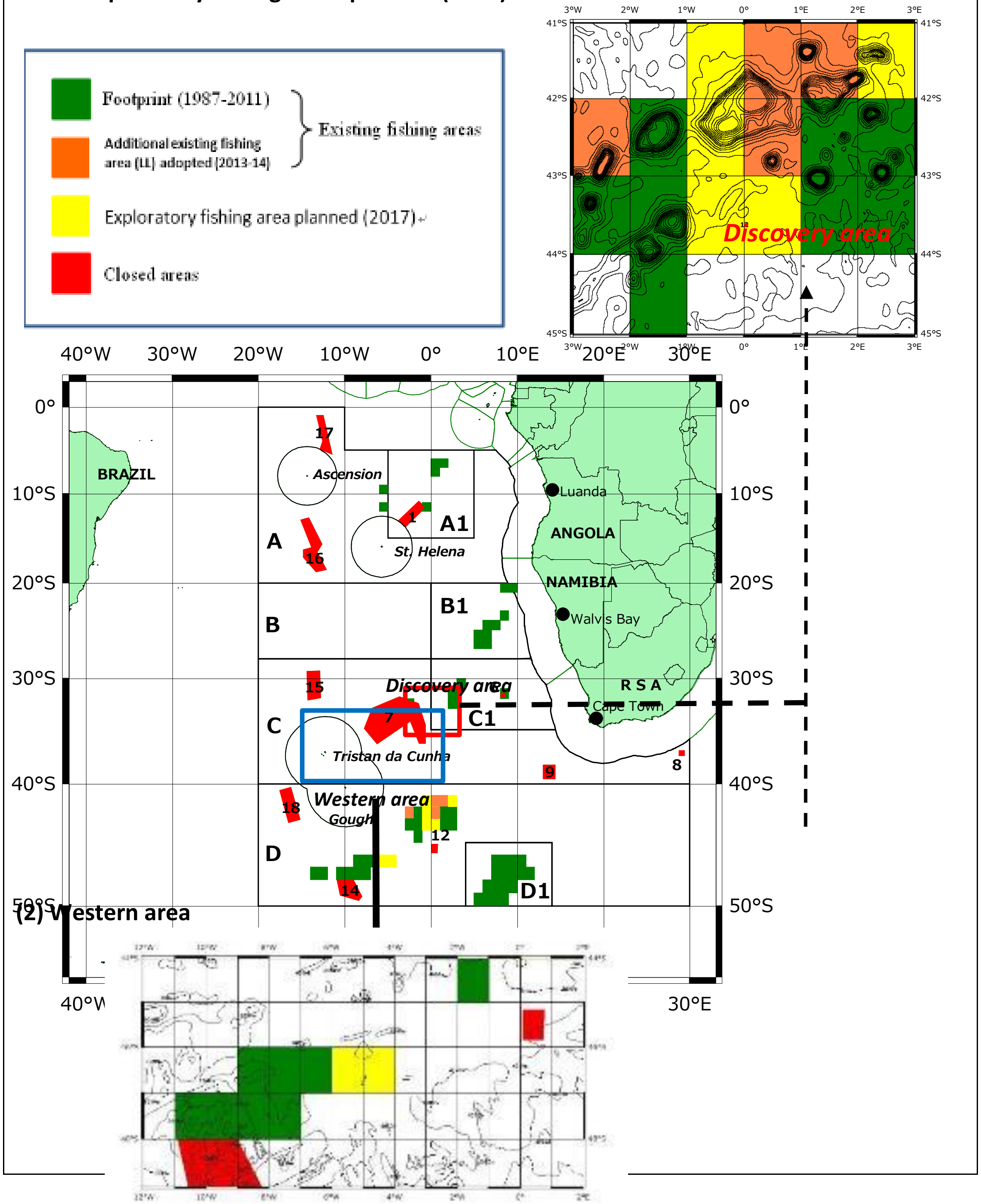
Discovery area (five 1ºx1º areas)

S41-42°W1-0°
S41-42°E2-3°
S42-43°W1-0°
S43-44°W1-0°
S43-44°0-E1°

Western area (two 1ºx1º areas)

S46-47°W6-5°
S46-47° W5-4°

BOX 1 Exploratory fishing areas planned (2017)



(4) Exploratory Bottom Fishing Protocol

The exploratory fishing will fully comply relevant Exploratory Bottom Fishing Protocols stipulated in Articles 6 (Exploratory bottom fishing) and Article 7 (Assessment Exploratory Bottom Fishing Activities) in Conservation Measure (CM) 30/15.

(5) Coverage (area to be surveyed)

The exploratory fishing will be conducted by following 2 steps, in order to cover as many as representative areas as possible in the fisherable zone, i.e., 2,000m or shallower waters.

Step 1

On the first entry of the research area, the first 10 hauls shall be research hauls and must satisfy following criteria.

- Each research haul must be separated by not less than 3 nautical miles (NM) from any other research haul, distance to be measured from the geographical mid-point of each research haul.
- Each haul shall comprise at least 3,500 hooks and no more than 5,000 hooks.
- Each haul shall have a soak time of not less than 6 hours, measured from the time of completion of the setting process to the beginning of the hauling process.

Step 2

On completion of 10 research hauls, the vessel will continue the exploratory fishing in order to cover as many as representative areas as possible in the fisherable zone, i.e., 2,000m or shallower waters.

(6) Observer

One observer will be assigned to collect necessary information described in this proposal, which will be reported to the SEAFO Secretariat and presented in the 2017 Scientific Committee meeting.

(7) **Data collection**

The observer will collect the following data while the vessel is engaged in exploratory fishing. In the exploratory fishing, more scientific information is collected than in commercial fishing in order to fulfil requirements stipulated in the Exploratory Bottom Fishing Protocol (Article 6 and 7 in CM 30/15) (Table 1).

- <u>Patagonian tooth fish (*Dissosticus eleginoides)*</u>
  - Total catch in weight/line
  - Length measurement / Maximum 50fish/line
  - Weight, sex, maturity, gonad state / Maximum 30fish/line

- <u>Rattail (*Macrourid* spp.)</u>
  - Total catch in weight/line
  - Length and weight measurement / Maximum 10pcs/line

- <u>Other by-catch species</u>
  - Total catch in weight/line by the lowest taxon possible

Table 1 Comparisons of data collection between exploratory fishing and commercial fishing.

Data collection			
Commercial fishng (Existing bottom fishing area)		**Exploratory fishing (New bottom fishing area)**	
Patagonian toothfish		Patagonian toothfish	
Type	Quatinty	Type	Quatinty
Total cathch weight / line		Total cathch weight / line	
Length	20 samples/line	Length	50 samples/line
Gonad stages	20 samples/line	Gonad stages	30 samples/line
Gonad weight	20 samples/line	Gonad weight	30 samples/line
Individual weight	20 samples/line	Individual weight	30 samples/line
Sex	20 samples/line	Sex	30 samples/line
Otoliths	5 samples/line	Otoliths	5 samples/line
Bycatch species		Rat tail	
Number of each speices / line		Total cathch weight / line	
		Length	10 samples/line
		Individual weight	10 samples/line
		Bycatch species excepted Rat tail	
		Number of each speices / line	

- VME

VME data according to interim VME data collection protocol set out in Annex 4 of Conservation Measure 30/15.

(8) Mitigation plan to prevent significant adverse impact to VME species.

The exploratory fishing will fully comply the encounter protocol stipulated in Article 8 (Encounters with possible VMEs) and Annex 6 (VME Indicators and threshold levels) in CM 30/15.

The vessel has been using Trot line fishing method in the Convention area. During the exploratory fishing in new bottom fishing area, the vessel will employ the same fishing method.

Fishing gear configuration (Fig. 1)

- 201 drop lines per standard main line of 9,000m (one drop line every 45m of the main line).
- One drop line has 5 clusters with 5 snoods and hooks = 25 hooks per drop line.
- Distance between clusters is about 40cm. Snood length is about 50cm.
- Distance between the bottom clusters to concrete weight is about 1m.

Expected behaviour and feature of fishing gear

- Trot line normally sinks vertically since the weight is attached on the bottom of each drop line.
- The line is hauled vertically by using hydraulic driven line hauler.
- Only both end of anchors and concrete weights are on the seabed constantly.
- Bottom section of drop lines, hooks and snoods could be on the seabed occasionally.

Taking above into consideration, the trot line would have much less impact against VME in comparison with other fishing method such as Auto-line and Spanish line since the most part of main lines and snoods with hooks are constantly on the seabed with these methods.

4. REPORTS

The report of the Exploratory fishinge (2017) will be submiited to the Scientific Commiitte in 2017 and details of the exploratory fishing activities will be presented including the sea bed maps craeted by the information collected.

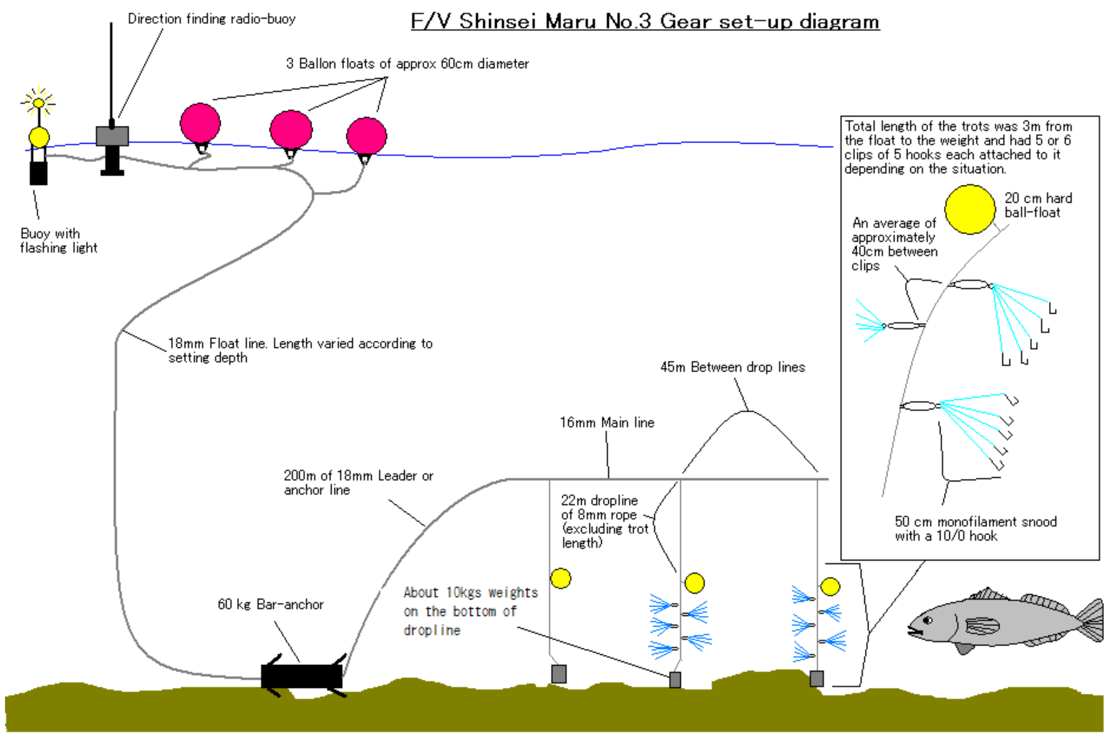


Fig.1 Fishing gear configuration (trot line)

5. VESSEL INFORMATION

(1)	Name of fishing vessel	Shinsei Maru No.3
	Previous names (if known)	Same as above
	Registration number	128862
	IMO number (if issued)	8520094
	External markings	Vessel marked with name and international radio call sign. White hull and white superstructure
	Port of registry	Yaizu – Japan
(2)	Previous flag (if any)	N/A
(3)	International Radio Call Sign	JAAL
(4)	Name of vessel's owner(s)	TAIYO A&F CO.,LTD.
	Address of vessel owner(s)	4-5,TOYOMI-CHO,CHUO-KU,TOKYO,JAPAN
	Beneficial owner(s) if known	Same as above
(5)	Name of licence owner	Same as the owner
	Address of licence owner (operator)	
(6)	Type of vessel	Longline fishing vessel
(7)	Where was vessel built	Shimizu, Shizuoka, Japan
	When was vessel built	1985
(8)	Vessel length overall LOA (m)	47.2
(9)	Details of the implementation of the tamper-proof requirements of the VMS device installed	The vessel is fitted with MAR-GE Argos VMS system. This is a sealed unit which has own GPS inside to ensure the independence from other acoustic devices and protected with official seals that indicate whether the unit has been accessed or tampered.
(10)	Name of operator	Same as the owner
	Address of operator	Same as the owner
(11)	Names and nationality of master and, where relevant, of fishing master	Master: Fujimori Kojima, Japanese Fishing master : Masayuki Matsumura , Japanese
(12)	Type of fishing method(s)	Bottom longline
(13)	Vessel beam (m)	8.7
(14)	Vessel gross registered tonnage	735
(15)	Vessel communication types and numbers (INMARSAT A, B and C)	INMARSAT -FB : 773190498 INMARSAT –C : 432521000@satmailc.com
(16)	Normal crew complement	33
(17)	Power of main engine(s) (kW)	735
(18)	Carrying capacity (tonne)	250M/T
	Number of fish holds	4 holds
	Capacity of all holds (m^3)	502.4 m^3
(19)	Any other information in respect of each licensed vessel they consider appropriate (e.g. ice classification) for the purposes of the implementation of the conservation measures adopted by the Commission.	N/A

APPENDIX XIV – FAO ABNJ Project