Report of the Fourth Meeting of the Scientific Committee of the Southern Indian Ocean Fisheries Agreement (SIOFA)

Yokohama, Japan

25 – 29 March 2019

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Agenda item 1 – Opening

Agenda item 1.1 Opening statement from the Chair

1. The fourth meeting of the SIOFA Scientific Committee (SC) was opened at 10:00 a.m. on 25 March 2019 by Dr Ilona Stobutzki, Chair of the SC. Dr Stobutzki welcomed participants to the meeting and thanked Japan for hosting the meeting.
2. On behalf of the host country, Dr Toshiya Kishiro of the National Research Institute of Far Seas Fisheries explained Japan's involvement in SIOFA and expressed the country's honour to be hosting the SC meeting.
3. The Chair reminded the SC that their role was to provide robust advice to the Meeting of the Parties (MoP) using the best scientific information available.

Agenda item 1.2 Introduction of participants

4. Contracting Parties (CPs), SIOFA Observers and External Experts introduced themselves and a list of participants is at Annex A.

Agenda item 2 – Administrative arrangements

Agenda item 2.1 Adoption of the agenda

5. The agenda was adopted (Annex B).

Agenda item 2.2 Confirmation of meeting documents

6. The Chair noted that there were a number of late papers that needed to be considered and formally accepted as meeting documents.
7. The report of the First Meeting of the Protected Areas and Ecosystems Working Group (PAEWG1; SC-04-30) was accepted as a working paper.
8. The report of the First Meeting of the Stock and Ecological Risk Assessment Working Group (SERAWG1; SC-04-31) was accepted as a working paper.
9. The restricted reports on the Patagonian toothfish and alfonsino scoping studies (SC-04-INFO-10 and SC-04-INFO-11), which were originally submitted to the SERAWG1, were accepted as information papers.
10. The restricted paper on preliminary ecological risk assessment of SIOFA teleosts (SC-04-27) was accepted as a working paper.
11. The Cook Islands' annual report (SC-04-29) was accepted as a working paper.
12. Korea's annual report (SC-04-33) was accepted as a working paper.
13. A paper reporting on China's fishing activities (SC-04-INFO-09) was accepted as an information paper.
14. The paper on scientific research and new/exploratory fisheries (SC-04-INFO-12) was accepted as an information paper.
15. The meeting documents (Annex C) were confirmed.

Agenda item 2.3 Appointment of rapporteurs.

16. Mr Alexander Meyer (Urban Connections, Tokyo) was appointed to act as rapporteur, with assistance from delegations.

Agenda item 2.4 Review of functions and terms of reference

17. The Chair reminded the SC of SIOFA's objectives, the SC's functions and its Terms of Reference, and explained the arrangements for conducting the meeting and finalising the meeting report.

Agenda item 3 – Annual National Reports

18. The Chair reminded the SC that in accordance with Conservation and Management Measure (CMM) 2018/02 paragraph 9, each CP, CNCP and PFE shall provide to the SC an annual National Report.

19. Annual reports were submitted by Australia, Cook Islands, EU, France (Territories), Japan, Korea, Seychelles and Thailand. An annual report was not submitted by Mauritius.

20. A report on fishing activities was submitted by China as an information paper.

Australia Annual Report: SC-04-12

21. Australia presented their annual report, which updates the SIOFA SC on Australia's fishing activities in the SIOFA Area. Australian operators are currently authorised by the Australian Government to target various species with mid-water and demersal trawl, dropline, minor line, automatic longline and demersal longline gears. There was no fishing effort by Australia-flagged vessels during 2017. One trip was undertaken by a single vessel in 2018 (noting this also spanned into the 2019 fishing year). An observer was on-board for the duration of the trip. No VME thresholds were triggered by any Australian-flagged vessels during 2018. All catch and effort data for fishing operations during 2018 will be submitted to SIOFA in accordance with CMM 2018/02 on Data Standards. All data presented in this report comply with Australia's domestic policy associated with the dissemination of fisheries data and this report does not disclose any non-public domain data within the meaning of SIOFA CMM 2016/03 on Data Confidentiality.

Cook Islands Annual Report: SC-04-29

22. The Cook Islands presented their annual report. In 2018 the Cook Islands authorised two vessels to operate in the SIOFA area, pursuant to High Seas fishing authorisations issued by the Ministry of Marine Resources (MMR). These vessels target deepwater finfish species, primarily alfonsino (*Beryx splendens*) and orange roughy (*Hoplosthethus atlanticus*) using bottom and midwater trawl fishing methods. The main catch composition of the fleet in 2018 was alfonsino (57%), orange roughy (33%) and boarfish and cardinal (4%) accounting for 94% of the total species catch.

23. The Cook Islands noted that the catch composition trend by year saw a significant drop in catches in 2018. This was due to a reduction in fishing effort by one of its fleet by nearly half its usual fishing effort. Cook Islands also noted that the CPUE data provided for alfonsino and orange roughy are not thought to be indicative of trends in biomass. The Cook Islands stated their VME encounter thresholds for trawling and

noted that there was 100% observer coverage for its SIOFA fleet in 2018. The Cook Islands noted that many areas in SIOFA are closed to Cook Islands vessels due to the potential for significant adverse impact on known VMEs by bottom fishing activity, and these areas are well known to Cook Islands-flagged vessels.

24. The Cook Islands explained their position that CPUE, by itself, was not an appropriate index to establish the status of orange roughy fish stocks. The SC discussed that CPUE was generally regarded to be an unreliable index of orange roughy biomass due to the aggregating nature of the species.

EU Annual Report: SC-04-23

25. The EU presented their annual report. Two vessels from EU-Spain were operating in the SIOFA Area in 2018, in the Areas 2, 3b and 7. None from EU-France operated in SIOFA in 2018. In 2018, a second EU-Spain vessel operated in the region for 77 fishing days. The EU continues the process of improving the fine scale data collection from fishing activities in SIOFA. EU-Spain implemented a dedicated scientific observation in 2017 and 2018 (observation coverage were 72% and 100% by vessel in 2018). As no EU-France vessel fished in the SIOFA area in 2018, the observer program was not implemented in 2018. However, the training program and the observer recruitment process are ready for commencement, in the case that fishing operations were to resume in the future.

26. The SC asked for more details regarding EU-Spain's shark fishery, including whether Portuguese dogfish (*Centroscymnus coelolepis*) was the main targeted species and whether there was any bycatch associated with the fishing of the species. The EU explained that it will provide answers intersessionally or at SC5.

27. The SC noted the substantial increase in the spatial area of bottom fishing by EU-Spain from 2017 to 2018, and asked the EU if they intended to update their bottom fishing impact assessment (BFIA), which was current up to 2017 and had been submitted to SC3. The EU acknowledged this substantial increase and expanded fishing area and stated their intention to update their BFIA. The Chair reminded the SC that, in accordance with paragraph 18e of CMM 2018/01 on Bottom Fishing, a BFIA shall be updated when a substantial change in the fishery has occurred.

28. The SC asked the EU how the EU-Spain 2018 fishing effort and/or catch levels compare to the average annual levels in active years over a representative period as described in paragraph 9(1)(a)i of CMM 2018/01 on Bottom Fishing. The EU will provide an answer intersessionally or at MoP6.

29. The SC encouraged the EU to submit information on VME threshold encounters and biological sampling in next year's annual report, in accordance with the guidelines for the submission of Annual National Reports, and noted that data for biological sampling has been submitted in other EU papers. The EU stated their intention to provide this information in its 2020 annual report.

France (Territories) Annual Report: SC-04-24

30. France (Territories) presented their annual report, which summarises and updates fishing activity by France for French Territories-flagged vessels in the Southern Indian Ocean Fisheries Agreement (SIOFA) Area for 2018. The fishing activity has been very low in 2018, only one trawler/potter vessel occurs in the area during two days. Traps effort was fifty traps, and vertical longline effort was 2,615 hooks. No VME indicator thresholds were triggered during 2018.

Japan Annual Report: SC-04-10_Rev1

31. Japan presented their annual report, which describes the following seven items requested by the National Report Template, i.e., "1. Fisheries", "2. Catch, effort and

CPUE", "3. Fisheries data collection and research activities", "4. VME thresholds", "5. Biological sampling and length/age composition of catches", "6. Data verification mechanisms" and "7. Observer program". In the SIOFA convention area (CA), Japan has been operating two different types of fisheries discontinuously for 42 years (1977-2018), i.e., trawl fisheries targeting splendid alfonsino and bottom longline fisheries targeting Patagonian toothfish. Based on accumulated information, the seven items are described each for trawl and bottom longline fisheries.

32. Japan explained that their trawl fisheries operate in the mid-water and they assume that there will not be any contact with the seafloor and have not established threshold levels nor a move-on-rule. They have instead temporarily adopted the threshold levels and move-on-rules as required by CMM 2018/01 on Bottom Fishing, based on those applied by the North Pacific Fisheries Commission. The threshold levels are based on bycatch of corals and no other taxa. Japan also explained that, for their bottom longline fisheries, they are temporarily applying the threshold levels and move-on-rules used by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Japan reported that in 2018 no bottom longline fisheries were operated in the SIOFA Area and no VME thresholds were triggered.

33. In response to a suggestion that catch and effort and length frequency data for the Saya de Malha Bank would be useful for understanding fisheries in that sub-area, Japan explained that they had submitted catch and effort data to the Secretariat but not length frequency data.

Korea Annual Report: SC-04-33

34. Korea presented their annual report. The Korean bottom longline fishery and trawl fishery were started in the SIOFA area in 1999 and 2000, respectively. The number of trawlers and longliners operated in the SIOFA Area were one and one-to-three vessels, respectively; however, none of the fishing vessels have been operating in the SIOFA Area since 2014. Major target species were pelagic armorhead and splendid alfonsino by trawl, and Patagonian toothfish and hapuka by bottom longline. The annual observer coverage has been more than 50% of fishing vessel operating days for bottom impacted gear fishery by domestic law since 2009. It consists of threshold (60kg-corals, 800kg-sponges) of VME organisms, move on rule etc. In terms of the verification of catch data and landing and transshipment information, measures to cross-check information collected by different authorities (e.g. NIFS, NFQ, FMC) are specified from September 2015.

35. The SC noted that Korea's catch included some small armorhead fish, which may be in their juvenile stage. The SC **requested** Korea to share more detailed information such as location or timing of the catch, which could be useful for understanding the habitat and behaviour of juvenile-stage armorhead. Korea stated their intention to share such data.

36. The SC **requested** that Korea provide spatial effort data for use in the ecological risk assessments (ERAs) for deepwater chondrichthyans and SIOFA teleosts. Korea stated their intention to provide spatial effort data from their observer programme.

Seychelles Annual Report: SC-04-25

37. Seychelles presented their annual report. Seychelles vessels operating on the high seas consist of mostly purse seiners and longliners that target tuna and tuna-like species. The majority of local vessels operates within the Seychelles EEZ and targets mostly demersal and pelagic species using a range of fishing gears such as traps, handline, dropline and pelagic longlines. Seychelles informed the meeting that since writing the report it was realised that a number of Taiwanese vessels flagged to Seychelles were fishing in the SIOFA Area and catching SIOFA species and that these catches would be reported next year. With the increasing pressure on the inshore

resources and Seychelles' focus on Blue Economy growth and diversification, it is envisaged that in future, fishers could potentially venture into deep-sea fishing activities beyond Seychelles' EEZ. Furthermore, with the newly established Joint Management Area between Mauritius and Seychelles for the continental shelf in the Mascarene Shelf Plateau, there could be future potential for exploration of deep sea resources in this region.

Thailand Annual Report: SC-04-22

38. Thailand presented their annual report. During 2015 – 2017, 62 authorised Thai oversea fishing vessels were fishing in the Western Indian Ocean. The main fishing grounds were distributed around Saya de Malha Bank. The fishing gear mostly used was trawl, while trap was used by only one vessel. The catch of the trawl fishery is composed of both pelagic species, e.g., round scad, bigeye scad, and Indian mackerel, and demersal species, e.g., lizardfish and threadfin bream. However, in 2018, Thai flagged fishing vessel did not operate in the Indian Ocean. As an MCS and data verification mechanism, Thailand has put in place a range of management and technical measures through the Fisheries Act B.E. 2558 (2015), and the subordinate Ministerial Regulations and Implementing Rules for Thai overseas fishing vessels operating in high seas. Furthermore, Thailand has defined the minimum requirements for authorised vessels, which include the installation of VMS ERS and EMS, human observers, port-in and port-out measures, and the submission of logbooks. Currently, Thailand is preparing to re-authorise Thai flagged fishing vessels to operate in the SIOFA Area. Operations are expected to restart from mid-2019.

39. With regard to their trap fishery, Thailand explained that the relevant data have been submitted to the Secretariat. Catch is mainly composed of demersal fish such as red snapper and rabbit fish.

40. Thailand explained that 12 operators have expressed their intention to seek authorisation to fish in the SIOFA area in 2019. While Thailand's regulations do not specify the maximum number of vessels that can be authorised in 2019, Thailand said that not all operators will receive authorisation as Thailand have implemented strict regulatory criteria that operators may have difficulty fulfilling as it needs additional cost.

China Fishing Activities Report: SC-04-INFO-09

41. China presented a report summarising fishing activities by China-flagged vessels in the SIOFA Area based on accumulated data and statistics. China operated three different types of fisheries intermittently from 2000 to 2017 in the SIOFA Area: Light seining targeting mackerel and species of the *Bramidae* family; bottom longline fishery targeting ruby snapper, etc.; and demersal trawl targeting dories and orange roughy. Since 2018, China has not operated any fisheries in the SIOFA Area. It is worth noting that China has authorised a squid jigging fishery since 2003 in the Indian Ocean, but has not operated any squid jigging vessels in the SIOFA Area. Until China becomes a party to SIOFA and the relevant fishing vessels are registered on the SIOFA record of authorised vessels, the Chinese Government prohibits all Chinese fishing vessels from fishing in the SIOFA Area.

Agenda item 3.1 – Guidelines for the submission of Annual National Reports

42. The SIOFA Executive Secretary, Mr Jon Lansley, explained that the Secretariat had reviewed the guidelines for the submission of Annual National Reports after MoP5 to determine whether any revisions were required to align them with newly adopted CMMs. Based on the review, it had been determined that no revisions were necessary.

43. The SC discussed the need to develop a template for national reports, based on the existing guidelines, so as to ensure the greater clarity of and consistency among

Annual National Reports. A draft template was prepared by the Secretariat and reviewed by the SC during the meeting (Annex D).

44. The SC recognised that it would be useful to consider data of a finer resolution than those in the Annual National Reports, presented in a similar format, on a confidential basis during meetings of the SC. The SC also recognised that this would require additional work to be done by CCPs. The SC encouraged CCPs to provide an additional report that would be confidential and contain data of a finer resolution than the Annual National Reports, if possible.

45. The SC discussed the requirement to prepare National Reports each year, despite having no fishing or new information to report. The Chair noted this was a requirement of CMM 2018/02 on Data Standards, paragraph 9.

46. The SC noted that the map of the sub-areas for which CPs were required to submit information did not include the Saya de Malha Bank sub-area this year.

47. The SIOFA Data Manager presented a summary of potential data confidentiality issues identified in previous national reports.

48. The SC reiterated previous discussions that the national reports were public documents and that it is the responsibility of CCPs to ensure that there are no confidentiality issues arising from the national report they submit.

49. The Deep Sea Conservation Coalition (DSCC) expressed their appreciation for SIOFA's approach to date of making national reports open to the public. While acknowledging that some data need to be confidential and should therefore be submitted directly to the Secretariat without being made public, the DSCC encouraged SIOFA to maintain their current practices.

50. Regarding the guidelines for the submission of Annual National Reports, the SC concluded the following:

- The SC **requests** that CCPs use the draft Annual National Report template (Annex D) to be reviewed at SC5.
- The SC **recommends** that the MoP consider whether, if a CCP has not fished in the previous calendar year and there have been no substantive changes to their fisheries-related activities, they can provide a simple statement of this fact, rather than having to submit a full National Report.
- Regarding the omission of Saya de Malha Bank from the map of the sub-areas for which CPs were required to submit information, the SC **requested** the Secretariat to ensure the most up to date map was being used.

Agenda item 4 – Current and historical status of fishing activities

Agenda item 4.1 Historical Catch and Effort Data

51. The Chair reminded the SC that in accordance with CMM 2018/02 on Data Standards, Contracting Parties, CNCPs and PFEs shall provide to the Secretariat, by 31 January 2018, historical catch, effort data and, if available, observer data for period 2000 to 2015 and any previous years where available.

52. The SIOFA Data Manager provided an update on the status of submissions for historical catch and effort data.

53. France (Territories) informed that for the period from 2000 to 2005 the absence of data is likely due to an absence of fishing activities except in 2002. The statement of no

fishing for this period will be sent to the Secretariat by 31st May 2019. The observer data from 2000 to 2018 will be provided.

54. CPs worked with the Data Manager to clarify any data gaps and update their data submission status. The finalised table describing the status of submissions for historical catch and effort data is attached at Annex E.

Agenda item 4.2 Spatial Extent of Historic Catch Data

55. The Chair reminded the SC that in accordance with 2018/01 para 13, CCPs shall, at least 30 days prior to the commencement of the ordinary meeting of the SC in 2018, submit to the Secretariat relevant data on the spatial extent of its historical bottom fishing effort in the Agreement Area expressed as grid blocks of at least 20 minutes resolution or, if available, a finer scale; and any other data the Scientific Committee may consider to be useful in developing the SIOFA BFIA. Furthermore, the Chair reminded the SC that the MoP had tasked the SC with providing advice on an appropriate SIOFA bottom fishing footprint and SIOFA BFIA to MoP7.

56. In accordance with SC Work Plan 2018-2021, the SIOFA Data Manager provided an update on the status of the spatial extent of historical fishing effort data.

57. To aid the work to develop a bottom fishing footprint, the Secretariat provided a summary of the spatial resolution of submitted catch and effort data (Annex E).

58. The SC **noted** that some CPs had submitted historical bottom fishing effort data at a coarser scale than 20 minute grids, in some cases this reflected the data collection scale, for other CPs the data had been collected at a finer spatial scale.

59. In order to develop an appropriate bottom fishing footprint, the SC **requested** the Secretariat to prepare maps of the spatial distribution of effort (2000-2015) to be presented to and considered by the PAEWG intersessionally:

    I. A map at 20 minute grid resolution for the CP data supplied at this resolution or finer

    II. A map at 1 degree grid resolution for all the CP data supplied, except where the spatial scale supplied is larger than 1 degree grid

    III. A map at 1 degree grid resolution for the CP data supplied at the finer spatial scale resolution (the data used in I.)

    IV. The map produced in II. with areas of unfishable depths excluded. The PAEWG will need to provide advice on the depths that should be excluded.

60. The SC **agreed** that the maps will include all grid squares in which fishing effort has been recorded between 2000 and 2015. The SC noted the maps are likely to include confidential data and will need to be managed in line with the CMM 2016/03 Data confidentiality.

61. The SC **agreed** that the maps will be produced separately for longline, trawl and other gears.

62. The SC **requested** maps I., II., and III. are replicated showing the gradient of fishing effort across the footprint noting that these are likely to include confidential data and will need to be managed in line with the CMM 2016/03 Data Confidentiality.

63. The SC welcomed Japan and Korea's intention to submit their historical catch and effort data at the highest spatial scale resolution at which it is available by 31 May 2019.

64. The SC agreed to an intersessional work plan for this mapping work, under the PAEWG prior to SC5.

Agenda item 4.3 Overview of SIOFA fisheries 2018

65. The SIOFA Data Manager presented a draft overview of SIOFA fisheries in 2018 (SC-04-28), by compiling information on active fleets; fishing effort; total catch; catch composition; VME thresholds, response and measures, and encounters; and observer and port sampling programs from National Reports (as at 18 March 2019) and the Secretariat's databases.

66. The SC reviewed and finalised the overview of SIOFA fisheries in 2018 (Annex F).

67. The SC **noted** that currently, VME information are only recorded in National Reports when a VME threshold is triggered. However, the SC encouraged that all VME bycatch be reported in annual reports to facilitate more informed discussions for the setting of VME thresholds and other relevant issues.

68. The SC **requested** that the Secretariat disaggregate catches of deepwater sharks by the main species in the graphs in the SIOFA Overview of Fisheries (Annex F, fig.5), provided there would be no confidentiality issues.

Agenda item 5 – Scientific data standards

Agenda item 5.1 SIOFA Scientific Database

69. The SIOFA Data Manager gave a presentation on the status of the development of the SIOFA Scientific/Observers Database (SC-04-INFO-02).

70. The SERAWG Co-Chair, Mr Lee Georgeson of Australia, presented paper SC-04-14, which updates the SIOFA SC on development of a SIOFA species list, which is needed to categorise SIOFA species into the SIOFA stock assessment framework and for the ecological risk assessment for SIOFA teleosts. The work has relevance to the SIOFA databases, and more broadly, to any future work that requires reliable species-specific information. The species list (provided with the paper as an Excel spreadsheet attachment) was built using catch records held in the SIOFA databases and checked against codes and species reported in annual national reports. Two-hundred-and-eleven species or group codes were identified. These were assumed to be the FAO 3-alpha species codes against which CCPs are required to submit data to SIOFA in accordance with CMM 2018/02. Species distribution data were then checked to confirm if the species or species group corresponding to the code occurred in the SIOFA area. The work uncovered a number of likely errors in the database coding arising from erroneous codes being used by CPs for data submission, including for some key target species. The analysis has also highlighted that a proportion of the data in the SIOFA databases is currently associated with group codes, indicating that deriving species-specific information (such as catch volume) for applications such as stock assessment may be challenging.

71. The SC discussed paper SC-04-14 and concluded the following:

- The SC **agreed** that there were a number of errors and inconsistencies in the SIOFA databases and species list that needed to be rectified to allow continuation of other work.
- Regarding the issue of CPs using erroneous codes (i.e. not FAO 3-alpha species codes) when submitting data to SIOFA, the SC recognised that each

CP may not necessarily use the FAO codes domestically. However, when submitting data to SIOFA, the SC **agreed** that FAO codes shall be used.

- Regarding the issue of data being submitted with group codes, the SC encouraged CCPs to submit catch and other data at a species level.
- The SC **requested** the Secretariat to resolve the species coding issues in collaboration with CCPs before SC5 in 2020.
- The SC did not support requesting FAO to change its global species code for orange roughy (SC3 Report, para 245).

Agenda item 5.2 Templates for data submission

72. The SIOFA Data Manager presented draft templates for data submission (SC-04-09). Since 2017, all CPs, CNCPs and PFEs have provided fisheries data to the Secretariat under various formats (datasets) coming from their respective statistical systems. The task of processing datasets into structured databases is therefore time consuming and more prone to the risk of errors.

73. The Data Manager prepared several Microsoft Excel templates for review by the SC that match the data submission requirements of CMM 2018/02 on Data Standards and would improve the processing of data into databases. Those templates would also help to clearly identify what data are required for submission to the Secretariat. They would also allow the SC to review the reporting relevance of each of the observer's data fields.

74. The SC **requested** that CCPs work intersessionally to review the draft templates and provide comments to the Secretariat by the end of April 2019, and that the Secretariat consider and reflect comments, while taking into account the requirements of CMM 2018/02 on Data Standards and their workload. If necessary, the Secretariat can seek guidance from the SC Chair, and an intersessional discussion can be held to resolve any outstanding issues.

Agenda item 5.3 Secure transfer of SIOFA confidential data

75. In response to a request from SC3 to investigate and implement protocols for the secure transfer of confidential data, the SIOFA Data Manager presented protocols for the secure transfer of confidential data (SC-04-26) for review.

76. The SC acknowledged the work done by the Secretariat and welcomed the implementation of these protocols.

Agenda item 5.4 Annual data holdings report and data inventory

77. The SIOFA Data Manager provided an update on work done by the Secretariat in response to a request from SC3 to prepare an annual data holdings report and data inventory (SC-04-INFO-02).

78. The SC acknowledged the work to date and **requested** the Secretariat to continue to refine and consolidate the annual data holdings report and data inventory into one document. This document would capture any data challenges faced by the Secretariat and assist the SC in understanding data gaps.

Agenda item 5.5 Observer coverage

79. The Chair reminded the SC that paragraph 32 of CMM 2018/01 on Bottom Fishing directs the SC to review the observer coverage levels prescribed in paragraph 31 of the same CMM and provide advice to the MoP. Furthermore, the Chair reminded the SC of the advice given at SC3 in relation to this matter (SC3 Report, para 90).

80. France (Territories) reminded that the observer coverage for the France (Territories) longline fisheries is:

- 100 % catch and bycatch set by set and
- 25% of each line is observed

81. The France (Territories) program was presented as Info Paper (SC-04-INFO-07 French fisheries observation program). France (Territories) recommended that CCPs use the Benthos Observation Protocol presented during SC3 (SC-03-06(02)). France (Territories) recommended that a data acquisition protocol for whale depredation was used by CCPs (SC-04-INFO-06) for a better understanding of whale depredation.

82. France said that observing 100% of each line will not make models more robust, because of an aggregation effect; 25% is enough; better to maximise geographical coverage and fine scale data.

83. The SC **agreed** that with respect to the observer coverage on non-trawl fisheries, there are situations where higher levels of observer coverage should be considered, such as potential interactions with rare and/or species of concern and high risk areas.

84. The SC **noted** that in the SIOFA area where fisheries were often data limited, a high level of observer coverage could facilitate more comprehensive collection of data to better inform science and management.

85. The SC **agreed** that the current observer coverage needed to be representative of the spatial and temporal scope of fishing activities. The SC **agreed** to consider the information on the spatial and temporal coverage at SC5.

86. The SC **requested** CPs and the SERAWG and PAEWG continue to consider what levels of coverage at the level of fishing trips, hauls and subsampling of hauls, would be needed to facilitate the provision of advice from the SC to the MoP.

87. Thailand noted that they have adopted both electronic observer (electronic monitoring and electronic reporting system) and human observers. Thailand said that they intended to submit a proposal for the SC5 to evaluate the use of their electronic observer program for scientific data collection, in line with the Guidelines adopted by MoP4. This work was included in the SC Operational Work Plan (Annex W) and resources are requested to support this work (Annex H).

Agenda item 5.6 Observer data

88. The Chair reminded the SC that, in accordance with paragraph 14 of CMM 2018/02 on Data Standards, they shall review Annex B (Observer Data) of the same CMM by the 2020 SC meeting.

89. The SC **requested** that the Secretariat compile an inventory of submitted observer data by CP (as requested in SC3 Report, para 90) prior to SC5 to facilitate the SC5 review.

Agenda item 5.7 Appropriate spatial resolution for the collection and reporting of data

90. The Chair reminded the SC that, in accordance with paragraph 5 of CMM 2018/02 on Data Standards, the SC shall, by no later than the ordinary meeting of the SC in 2019,

provide advice and recommendations to the MoP on an appropriate spatial resolution for the collection and reporting of data to facilitate effective stock assessment.

91. The SC **recommends** that, with respect to stock assessment data needs, the collection and reporting of data should be done at the finest spatial scale as possible, preferably at the level of each fishing operation with latitude and longitude location information.

Agenda item 6 – Vulnerable Marine Ecosystems

Agenda item 6.1 Protected Areas and Ecosystems Working Group (PAEWG)

92. The Chair of the PAEWG (Mr Patrice Pruvost), presented the report of the first meeting of the PAEWG (SC-04-30). The presentation highlighted some important notes from the report and abstract of the working documents (PAEWG-01-16, PAEWG-01-13, PAEWG-01-12, PAEWG-01-14, PAEWG-01-07, PAEWG-01-08, PAEWG-01-09, PAEWG-01-10 and PAEWG-01-11). The working group progressed scientific discussions and was able to provide advice to the SC on the different items.

93. Dr Tony Thompson of the Food and Agriculture Organization of the United Nations (FAO) reported on the FAO collaboration with the PAEWG1 meeting held on 17-18 March 2019. SIOFA invited the FAO Deep Sea project to provide a multi-regional perspective to the science and management of deep sea fisheries undertaken globally since 2006. Four invited experts with experience from other regions (Martin Cryer (NZ), Tony Thompson (FAO), Ellen Kenchington (Canada), Ashley Rowden (NZ), Keith Reid (CCAMLR)), presented global summaries on information relevant to the protection of VMEs. Discussions on the approach taken in other regions assisted the PAEWG in developing specific advice for the Southern Indian Ocean.

94. The SC thanked FAO for participating in and assisting with PAEWG1, recognising the valuable contribution of the FAO experts to the discussions.

95. The SC acknowledged the role played by FAO facilitating cooperation and exchanges of information among RFMOs in relation to VMEs.

Agenda item 6.2 VME mapping

96. The Chair reminded the SC that paragraph 5 of CMM 2018/01 on Bottom Fishing tasks the SC with providing advice and recommendations to the MoP on maps of where VMEs are known to occur, or likely to occur in the agreement area.

97. France (Territories) invited the SC to consider the FAO experts' recommendations about VME mapping and the related working paper submitted by France (Territories) to the PAEWG (PAEWG-01-15). Mapping predictive modelling results of VME taxa suitable habitats may allow the SC to provide maps about VME encounter risks. Such information may be useful to provide tools to reduce the risk of triggering thresholds of VME, and scientific support to design Protected Areas. VME data from SIOFA fisheries monitoring and fishery-independent data (e.g. GBIF, raw data from scientific surveys, environmental layers from international databases) may be used. A project to produce these maps should include a common development process about the choice of the modelling methods to be used.

98. France (Territories) stated that:

- VME indicator taxa are indicators of habitat structure (cf Kerguelen study); focusing on VME taxa is sufficient;

- FAO advice is to use various modelling methods like Ensemble; a lot of different methods are available;
- two sources of data are available: 1. observer data aggregated at coarse taxonomic level can be used for community analysis, 2. GBIF in which data are species coming from scientific surveys and that are suitable for species distribution modelling;
- validation of VME data is made by each state and GBIF has a national validation process before it gets into the database, but can ask for a second step validation with benthic expert on SIOFA areas;

99. France (Territories) recommends mapping the risk areas for VME encounters and enabling fisheries to avoid the risk areas. There are ways to validate predictive models with VME raw data to highlight the value of the prediction.

100. The SC developed a plan for work to be done by SC5 towards the development of maps where VMEs are known to, or likely to occur (Annex I).

101. The SC:

- **Recommends** that, despite a probable paucity of data, attempts are made to model habitat suitability to investigate their use in providing maps of VME habitat;
- **Noted** that the VME indicator taxa list (Annex J) could be used in conjunction with information on physico-chemical and geological features (such as vents and cold water seeps) to inform protection of potential VMEs in SIOFA;
- **Recommends** reviewing the locations of hydrothermal vents, seamounts and other VME elements and identify areas where VMEs are 'likely to occur';
- **Noted**, in relation to the definition of VMEs, that paragraph 3a of the bottom fishing measure defines VMEs in accordance with paragraph 42 of the deep sea fishing guidelines. These criteria have been considered in the formulation of a SIOFA-specific list of VME indicator taxa.
- **Recommends** that, for consistent estimation of VME taxa quantity, CPs consider recording by weight only and provide guidance to observers on how to convert volume to weight (kg).

Agenda Item 6.3 VME indicator species and responses to VME encounters

102. The Chair recalled the direction within 2018/01 para 6 and by the MoP5 to the SC to provide advice on criteria for what constitutes evidence of an encounter with a VME, in particular threshold levels and indicator species, and the most appropriate response to a VME encounter.

103. The SC discussed the PAEWG1 recommendation to consider adopting the VME indicator taxa list adapted from the CCAMLR VME Taxa Classification Guide 2009 based on a review of the relevance to SIOFA.

104. With regard to VME indicator species the SC:

- **Recommends** that the MoP adopt the VME Indicator taxa list for use in the SIOFA Area (Annex J)
- **Requests** the Secretariat develop a pictorial VME Indicator taxa guide based on that used by CCAMLR, to assist observers and fishers.

- **Notes** Thailand's request for capacity building assistance for on the identification of VME indicator taxa.

105. With regard to VME encounter thresholds the SC recalled the discussions of the PAEWG1.

106. France (Territories) invited the SC to recommend the threshold used by the CCAMLR for longline fisheries, which is already implemented by French vessels in the SIOFA area.

107. For longline gears, the SC **agreed** on the appropriateness of the threshold used to trigger closure of a 'VME risk area' in CCAMLR (10 VME indicator units].

108. For trawl gears, the SC **noted** that CPs currently use different thresholds and some CPs expressed concern that some of these thresholds may not be sufficiently precautionary. The DSCC supported this concern. The SC discussed the application of thresholds in the different trawl fleets (midwater trawl, deep water demersal trawl and shallow water demersal trawl).

109. France (Territories) invited the SC to recommend the use of a common temporary threshold for trawl gears, if consensus is not reached during SC4. According to a precautionary approach, the temporary common threshold may be the lowest threshold used by the CPs in SIOFA.

110. The DSCC urged the Parties to be precautionary in determining thresholds, particularly if fisheries were being initiated prior to an exploratory fisheries measure being developed.

111. The SC:

- **Recommends** setting the catch/recovery of 10 or more VME-indicator units[1] in a single line segment[2] as the threshold that triggers the encounter protocol for longline fishing.
- Could not reach consensus on consistent thresholds for trawl gears. The SC **requests** that interested parties work intersessionally to identify a suitable threshold. Such intersessional work could include review of the methods used by CPs to establish their existing thresholds, as well as development of a consistent threshold based on consolidated records of benthic bycatch data for trawl gears. Using this method, thresholds could be based on medians, percentiles or other metrics (e.g. trawling duration).

112. With regard to the appropriate response to VME encounters the SC **recommends** that:

- If a VME encounter threshold is triggered, this should be considered to be evidence of the potential presence of a VME. To avoid significant adverse impacts on the potential VME, an appropriately-sized area should be closed to fishing by all fishing gears and a review by the SC should be undertaken to determine, based on the best available science, whether or not there is a VME. Such a review should consider cumulative impacts using all available data.
- The SC should also periodically review all benthic bycatch data to inform its consideration of the location of potential VMEs, and potential impacts thereon.

[1] 'VME indicator unit' means either one litre of those VME indicator organisms that can be placed in a 10-litre container, or one kilogram of those VME indicator organisms that do not fit into a 10-litre container.
[2] 'Line segment' means a 1000-hook section of line or a 1 200 m section of line, whichever is the shorter.

Agenda Item 6.4 SIOFA Standard protocols for future protected areas designation

113. The Chair reminded the SC that, in accordance with paragraph 6 of CMM 2018/01 on Bottom Fishing, the SC shall, by no later than the close of the ordinary meeting in 2019, develop and provide advice and recommendations to the MoP on the interim SIOFA Standard Protocol for Future Protected Areas Designation adopted by the MoP in 2018 and research and management plans, to be adopted at MoP6, for each of the protected areas listed in Annex 2 of the same CMM.

114. France (Territories) presented information discussed at the PAEWG1 regarding the use of spatial and biophysical analysis of the SIOFA area (Annex K) to complement the SIOFA Interim Protocol for the Designation of Protected Areas (MoP5 Report, Annex K). The approach, described in PAEWG-01-12 and PAEWG-01-13, would allow to provide scientific information for the protected area proposals based on environmental indices and a description of the ecological context. This information aims to ensure the possibility for the SC to provide a scientific analysis of the protected area proposals even when areas proposed to be protected are located in data poor areas. Furthermore, the approach may allow comparisons between the proposals and analysis according to the concept of a network of protected areas.

115. The SC reviewed and revised the SIOFA Standard Protocol for Future Protected Areas Designation (Annex L). The SC **agreed** that the criteria in the protocol have no particular ranking of importance.

116. The SC **recommends** that the MoP adopt the revised protocol (Annex L).

117. Australia presented draft research and management plans for each of the protected areas listed in Annex 2 of CMM 2018/01 on Bottom Fishing (SC-04-13; SC-04-15 – 18).

118. In relation to the research and management plan for the Atlantis Bank protected area, the SC **recommends** that the MoP consider that fishing with all gears were identified as activities that degrade the biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking.

119. In relation to the research and management plan for the Coral protected area, the SC **recommends** the MoP consider that fishing with all gears were identified as activities that degrade the scientific and biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking.

120. In relation to the research and management plan for the Fools Flat protected area, the SC **recommends** that the MoP consider that fishing with all gears were identified as activities that degrade the biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking.

121. In relation to the research and management plan for the Middle of What protected area, the SC **noted** that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking.

122. In relation to the research and management plan for the Walters Shoal protected area, SC **recommends** that the MoP consider that fishing with all gears were identified as activities that degrade the scientific and biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking.

123. In relation to the research and management plans for the Atlantis Bank, Coral, Fools Flat, Middle of What and Walters Shoal protected areas, the SC:

- **Recalled** the Guidance for SC Recommendations to the Meeting of the Parties outlined in the standard protocol for protected areas designation (SC3 report, Annex H), which states that:

i. If the proposal documents the necessary data and scientific information to support a protected area using protocol, different measures could be applied, such as management measures, technical measures, closures.

ii. In case of an area becoming protected, a management and research plan shall be associated to it on the year to come. It will include:

1. The measures in place in the protected area;

2. The time of review of the protected area;

3. If needed, the research that should be undertaken in the area.

- **Recommends** that any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area, (2) an assessment of impacts, and (3) proposed measures to prevent or minimise those impacts.
- **Recommends** that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas.

i. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos.

- **Recommends** to the Meeting of the Parties that the research and management plans included at Annexes M-Q be adopted for the Atlantis Bank, Coral, Fools Flat, Middle of What and Walters Shoal protected areas**.**

Agenda Item 6.5 VME database

124. The SIOFA Data Manager provided an update on how additional 'non-observer VME data' could be included in the SIOFA database. He confirmed that such data can be added to the current catch and effort database.

Agenda Item 6.6 Bottom Fishing Impact Assessments (BFIA)

125. The Chair reminded the SC that, in accordance with paragraph 15 of CMM 2018/01 on Bottom Fishing, the SC shall consider all BFIAs received and provide advice to the MoP.

126. Comoros presented a report on the BFIA they conducted in the SIOFA Area (SC-04-08) for the proposed registration of their flotilla (Diego Star 2 and Diego Star 3) in the SIOFA record of authorised vessels. This report is based on the historical information of the two vessels available in the logbooks. No information has been gathered from observers. However, to strengthen evaluation measures, Comoros intends to implement a national observer plan, as well as emphasising the capacity building of inspectors and observers. A team of researchers will be available during 2019; this measure will be useful to support evaluation efforts in the future.

127. The SC acknowledged the work done by Comoros and updated the Gap Analysis of CP BFIAs against BFIA standards (Annex R) and the Summary of Contracting Parties' BFIAs presented, completed by the individual Contracting Parties (Annex S) with the information provided by Comoros.

128. The SC discussed potential research to assess the cumulative impact of trawl gears and longline gears. The SC **requested** that the PAEWG work during the meeting to identify specific tasks and resource needs for inclusion in their workplan (Annex T) and that the PAEWG present research papers to SC5.

129. The SC **reaffirmed** that, in accordance with paragraph 18e of CMM 2018/01 on Bottom Fishing, a BFIA shall be updated when a substantial change in the fishery has occurred.

Agenda item 7 – Stock assessment and ecological risk assessment

Agenda item 7.1 Stock Assessment and Ecological Risk Assessment Working Group (SERAWG)

130. The Co-Chairs of the SERAWG (Mr Lee Georgeson and Dr Tsutomu Nishida), presented the report of the first meeting of the SERAWG (SC-04-31). The working group progressed technical discussions in line with the stock assessment and ERA elements (Annex U) of the SC operational work plan -.

Agenda item 7.1.1 SIOFA stock assessment framework

131. The SC acknowledged the value of the preliminary work done to categorise SIOFA species within the tiered stock assessment framework. They recognised that the SIOFA database and species need to be further refined in order to be able continue this work and categorise SIOFA species into tiers with more confidence.

132. The SC **agreed** to continue and support the work to use ERAs to categorise species into an appropriate tier of the stock assessment framework as part of the SC workplan.

Agenda item 7.2 Alfonsino

133. The SC considered the SERAWG advice (SERAWG1 Report, paras 14 – 17, 19) and noted the scoping study (SC-04- SC-04-INFO-11).

134. The SC **agreed** that without work on the assessment it was unable to provide advice on the status of the stock.

135. With respect to progressing the alfonsino stock assessment for consideration by SC5, the SC:

- **agreed** that selection of a stock assessment model should be based on data availability.

- **requested** the Cook Islands to provide an inventory of available acoustic survey data for alfonsino to the SERAWG.
- **agreed** that the acoustic survey inventory would be considered intersessionally to inform whether to proceed with an expert review of the usefulness of the available acoustic data. The SC **agreed** that if such data were deemed to be useful, an acoustics expert should be engaged to investigate whether these data could be used to inform abundance indices that could be used in a stock assessment.
- **agreed** that a stock assessment scientist would review the CPUE data as a potential index of biomass for inclusion in the stock assessment.
- **noted** Japan was developing age length keys for its fishery and **recommends** ageing and analysing 100-150 otoliths per year per area for three areas (Walter's Shoal, South Indian Ridge, 90 degrees east).
- **agreed** to the work plan for the SERAWG to progress this work (Annex V)

136. The SC **agreed** that development of a potential acoustics survey protocol should be done after the review of the previous survey data.

Agenda item 7.3 Patagonian toothfish

137. Australia presented paper SC-04-21: Population structure of Patagonian toothfish on the Kerguelen Plateau and consequences for the fishery in SIOFA Statistical Area 7.

Summary of paper

138. Almost the entire Kerguelen Plateau is situated within the area managed by CCAMLR, with only a portion of the William's Ridge on the eastern side of the Plateau extending into SIOFA Statistical Area 7. Based on available genetic information, catch composition and tag-recapture data from the toothfish fisheries in the French and Australian EEZs, Patagonian toothfish are continuously distributed on the northern part of the Kerguelen Plateau, populations are linked, and toothfish on William's Ridge are part of the same population as those in the Australian EEZ. Population linkages between the French and Australian EEZs are accounted for in the toothfish assessment for the Australian EEZ undertaken by CCAMLR. Based on CCAMLR decision rules, this assessment estimates the catch limit which is fully taken within CCAMLR waters. Any additional fishing mortality of this population on William's Ridge is therefore likely to result in the total fishing mortality exceeding the catch limit set by CCAMLR.

SC discussion

139. The SC considered the advice provide by the SERAWG.

140. The SC **noted** that:

- Large toothfish catches were taken on William's Ridge in 2018 by one fishing vessel. In 2019, there has been further fishing by a second fishing vessel.
- This is the first time that fishing has occurred in this area since the early 2000s.

141. The SC **agreed** that:

- Based on genetic information, catch composition and tag-recapture data from the French and Australian toothfish fisheries, Patagonian toothfish on the northern part of the Kerguelen Plateau are continuously distributed and populations are linked;

- The population linkages between the Australian and French EEZ are accounted for in the CCAMLR assessments as well as the estimation of catch limits for toothfish in the Australian EEZ, and the yield is fully taken within CCAMLR waters;
- This fish population is well studied, with a large amount of fishery-dependent and independent data being available.
- The CCAMLR stock assessments are subject to a rigorous review process;
- The movement of the five toothfish, released in the Australian or French EEZ and recaptured on William's Ridge in 2018, is consistent with the observed movement patterns of toothfish across the Kerguelen Plateau;
- Given continuous toothfish habitat across the northern part of the Kerguelen Plateau, the proximity of William's Ridge to the Australian EEZ, and the known fish movement patterns across the plateau, toothfish on William's Ridge are part of the same population as those in the Australian EEZ;
- Toothfish catches on the SIOFA part of William's Ridge are likely to result in total fishing mortality exceeding the fishing mortality used by CCAMLR to determine the catch limit and may undermine the CCAMLR management objectives for this toothfish population;
- Given the large catches taken on William's Ridge over a short period, there is also a high risk of localised depletion in this relatively small area.
- There is the potential for further unrestricted toothfish catches to be taken on Williams Ridge, without any management measure on catch limits;
- Any additional catches in excess of the already established catch limit for this population should be avoided;
- To help ensure the long-term sustainability of this toothfish population, data from fishing activities in the CCAMLR and SIOFA areas should be incorporated into the stock assessment model, and SIOFA should collaborate with CCAMLR as outlined in the MoU between the two organisations in exchanging data and scientific information and cooperating with each other's conservation and management measures.

142. Australia and Cook Islands expressed their strong concerns about large catches of toothfish on William's Ridge in 2018, 2019 catches of unknown quantity, and potential future catches for which there are no restrictions in place. Based on the high risk of total mortality exceeding the catch limits estimated for this population and the high risk of localised depletion on William's Ridge, Australia and Cook Islands recommended that fishing activities should cease on William's Ridge until management measures to regulate toothfish fishing in this area are in place.

143. The SC **recommends** that the MoP urgently considers adopting temporary measures to regulate toothfish fishing on William's Ridge at levels commensurate with fishing activities reported in 2016.

144. The SC **requested** that the EU provide their fishing data from 2018 and 2019 to Australia so these data can be included in the stock assessment for this population undertaken in 2019.

SC discussion on Toothfish on Del Cano Rise

145. The SC **noted** that:

- Patagonian toothfish catch in the SIOFA part of Del Cano Rise increased dramatically from 2016 to 2018.
- The Del Cano Rise is spread over SIOFA, CCAMLR waters, the French EEZ of Crozet and the South African EEZ of Marion and Prince Edward Islands. Most of the catches in the SIOFA area are taken adjacent to the CCAMLR area and the French EEZ of Crozet.

146. The SC **agreed** that:

- Based on tag-recapture data from the French toothfish fisheries and biological knowledge of the reproduction of Patagonian toothfish, Patagonian toothfish populations of the Del Cano Rise and the Crozet plateau are linked.
- Five toothfish released in the French EEZ (2 around Crozet Island, 3 around Kerguelen Islands) were recaptured on SIOFA part of the Del Cano Rise, which is consistent with movement patterns of toothfish in the region (Sarralde and Barreiro, 2019).
- Patagonian toothfish show size and sex specific habitat preference. In particular, the juvenile phase relies on shallow waters (<600m depth) while large adult, mostly female, are distributed in deep-sea habitats (from 1200m up to 2300m+) (Peron et al., 2016). As there is only deep area in the Del Cano Rise, and based on the oceanography of the area (West to East) (Pollard et al., 2007), the population of the Del Cano Rise is likely to rely on Crozet and Marion-Prince Edwards plateau for its juvenile phase.
- A CCAMLR assessment estimates the catch limits for the toothfish population in the French EEZ of Crozet-Del Cano, and the yield is fully taken within CCAMLR waters (Sinegre et al., 2017).
- This CCAMLR stock assessment is subject to a rigorous review process.
- Toothfish catches from the Del Cano Rise in the SIOFA area are likely to result in catch limits being exceeded for the Crozet-Del Cano toothfish population, which may undermine the CCAMLR management objectives for this population.
- Catches from the Del Cano Rise in the SIOFA area are also likely to impact the recruitment of the population of Crozet-Del Cano. Since there are no observations of recruitment at Crozet through, for example, a trawl survey, any impact on recruitment would only be observed with a large delay which may put the sustainability of the population of Crozet-Del Cano at risk.
- To help ensure the long-term sustainability of this toothfish population, data from fishing activities in the CCAMLR and SIOFA areas should be incorporated into the stock assessment model, and SIOFA should collaborate with CCAMLR as outlined in the MoU between the two organisations in exchanging data and scientific information and cooperating with each other's conservation and management measures.

147. The SC **recommends** that the MoP urgently considers adopting temporary measures to regulate toothfish fishing on the Del Cano Rise in the SIOFA area at levels commensurate with fishing activities reported up to 2016.

148. Dr Keith Reid (CCAMLR) introduced SC-04-INFO-08 and outlined CCAMLR's use of a comparative seabed-area approach and a mark-recapture method from toothfish tagging data to estimate the biomass of toothfish in data-limited areas. The approaches taken by CCAMLR aim to set catch limits for toothfish that allow sufficient data collection to generate fully integrated stock assessments but that do not place

stocks at risk in the intervening period. The catch limit that is used is 4% of the most recent biomass estimate as this exploitation rate is considered unlikely to impede the recovery of stocks in areas that might have been exposed to unknown levels of historical fishing. Fishing in data-limited exploratory toothfish fisheries in CCAMLR has a specific geographic restriction to 'research blocks' and is required to follow a detailed research plan that is endorsed by the Scientific Committee and the Commission. A transparent process to estimate biomass using the two different approaches has been agreed, as has a procedure to determine the most appropriate biomass estimate to use in setting catch limits for future research fishing.

149. The SC thanked CCAMLR for their assistance with the Patagonian toothfish scoping study.

Agenda item 7.4 Orange Roughy

150. The SC recalled the SC3 advice to the MoP (SC3 Report, para 234), in particular:

- All three assessment approaches indicated that ss17 for the 7 sub-regions assessed was likely to be above 50%SSB0.
- The median estimates for the Walters Shoal Region from the base model and eight sensitivities evaluated varied between 63%SSB0 and 85%SSB0. The median estimate of the Base model was 76%SSB0.

151. The SC **noted** that the 2018 stock assessment for the Walters Shoal Region provided deterministic estimates of BMSY assuming a Beverton and Holt stock recruitment relationship, a combination of assumed steepness and natural mortality, and maturity parameters (SC-03-07.1.1(04)). The BMSY estimate using the base model parameters was 23.6% B0 (SC-03-07.1.1(04), Table 3 assuming a 50% age-at-maturity of 37 years and 12 years to reach 95% after 50%).

152. The SC **noted** the advice in SC-03-07.1.1(04) that:

- 'Deterministic BMSY has not been found to be a useful reference point for New Zealand orange roughy stocks. It is highly dependent on the stock recruitment relationship and is therefore very uncertain.'

153. The SC **agreed** that deterministic estimates of BMSY were highly uncertain and therefore not suitable to be used as a reference point for management advice for this stock.

Agenda item 7.5 Deepwater chondrichthyans

154. Australia presented SC-04-19. The paper provides a draft manuscript for an ecological risk assessment for the effects of bottom fishing gears on deepwater chondrichthyans in high seas areas of the Southern Indian and South Pacific Oceans. Productivity-Susceptibility Analysis (PSA) and Sustainability Assessment for Fishing Effects (SAFE) methods were adapted to assess the vulnerability of 174 deepwater chondrichthyans to demersal trawl, demersal longline and demersal gillnet fishing gears in the Southern Indian and South Pacific Oceans. A number of species were categorised as being at high or extreme vulnerability to all gears, including some in the Southern Indian Ocean that are likely taken in association with commercial deepwater shark fisheries. Overall, there was good concurrence between PSA and SAFE results at the upper end of the vulnerability spectrum for Southern Indian Ocean fisheries. Despite a number of methodological limitations of this assessment, such methods can be used effectively to prioritise management action for those species considered to have the highest vulnerability to fishing.

155. The SC considered the SERAWG advice.

156. The SC **noted** that there is missing data for certain gears in certain years, which may bias the results of the deepwater chondrichthyan ERA towards underestimating the vulnerability of certain species.

157. The SC **noted** that results should be considered in the context of information on the annual levels of catch for each gear type. The SC **noted** that SERAWG1 had requested the Secretariat to provide the annual catch data for deepwater shark catches in SIOFA from 2012 to 2017 for review by the Working Group in accordance with CMM 2016/03 (data confidentiality).

158. The SC **noted** that in accordance with the SIOFA Rules of Procedure these data were viewed and discussed within a closed session by SERAWG1. Upon request observers and industry affiliates were absent while the SERAWG1 considered these fine-scale data, a subset of which were confidential as they related to total annual catches for individual species taken by EU-Spain. Based on the SERAWG's review of available data, the SC **noted** that most of the catch of deepwater chondrichthyans recorded in the SIOFA database is being taken by the demersal longline fishery (although noting that this has replaced a demersal gillnet fishery since 2015) and confirmed that the majority of these catches were being taken by one CP.

159. Based on their discussion of the risk assessment results and the SERAWG's analysis of catches, the SC **noted** that the 'key species of concern' in the longline fishery include *Centroscymnus coelolepis* (Portuguese dogfish – SAFE risk low), *Centrophorus granulosus* (Gulper shark - SAFE risk extreme), *Deania calcea* (Brier shark - SAFE risk extreme), *Dalatias licha* (Black shark – SAFE risk extreme), *Zameus squamulosus* (Velvet shark – SAFE risk extreme), *Scymnodon plunketi* (Plunket's dogfish – SAFE risk extreme) and *Centroselachus crepidater* (Golden dogfish – SAFE risk extreme). Three newly described species of chimaera were also assessed to be at high risk in the SAFE assessment for longline gears (*Chimaera willwatchi*, *C. buccanigella* and *C. didierae*).

160. The SC **noted** that as well as a number of species assessed to be at high or extreme vulnerability for all gears, the majority of species were assessed to be at the lower end of the vulnerability spectrum.

161. The SC **noted** that annual catch information was available to the SERAWG to inform its consideration of the risk assessment results for *C. coelolepis*, *C. granulosus*, *D. calcea*, *D. licha* and *Etmopterus granulosus* (*E. granulosus* - SAFE risk low). *E. granulosus* was included because it is reported as the fourth highest catch volume.

162. The SC **noted** for 2013 – 2016 the annual catch data available indicates that these catches are from targeted fishing for Portuguese dogfish in the longline and gillnet fisheries. The SC noted that for one year of catch data (2015) there were two gears in use (longline and gillnet). For one year (2017) the characteristics of longline fishing by this Contracting Party changed with the addition of catches of toothfish. In this context, it was noted that without additional analyses of the spatial distribution of catches, it was difficult to establish whether catches of the aforementioned 'key species of concern' for which catch data are available for 2017 were being taken in association with the main target species (which is thought to be Portuguese dogfish (*Centroscymnus coelolepis*), as it is the species being caught in the highest volumes) or whether these species of concern may be being taken as bycatch when targeting other species (e.g. toothfish).

163. The SC **noted** that additional analysis of the spatial and depth distribution of catches of the main target species and the species of concern in the longline fishery would be

useful so that catch rate and catch trend information could be considered in the context of the results from the ecological risk assessment.

164. In summary, the SC:

- **Agreed** there is limited catch, effort and biological information for many species of deepwater chondrichthyans;
- **Agreed** that the PSA and SAFE analyses have identified a number of species of deepwater chondrichthyans at high or extreme relative vulnerability to fishing using demersal trawl, demersal longline and demersal gillnet gears;
- **Noted** that based on the results of the ERA and the understanding of the vulnerability of many deepwater chondrichthyans species to fishing, four 'key species of concern' for which catch data are available (*C. coelolepis*, *C. granulosus*, *D. calcea* and *D. licha)* are caught in relatively high volumes.
- **Recommends** the collection and submission of more detailed observer data (e.g. improved species identification in accordance with the implementation of the FAO shark guides, biological samples to enable future genetic research, number of pups/eggs, life status (i.e. if discarded)) for species of concern (e.g. those at high or extreme vulnerability to fishing using certain gears) and all other data in accordance with CMM 2018/02, Annex B;
- **Requests** the MoP to urgently consider measures to mitigate the potential for overexploitation of 'key species of concern' that has been seen in similar fisheries globally.

Agenda item 7.6 Saya de Malha Bank Fisheries

165. The SC **noted** previous advice to SC3 indicated that Mauritius and MRAG had conducted some assessment of the Saya de Malha bank fisheries. The SC **requested** the Secretariat to follow up with MRAG regarding submitting information on any assessments to the next SERAWG meeting.

166. The SC **noted** that the Saya de Malha Bank longline fishery had been grouped together with other longline fisheries in the SIOFA area when conducting the ERA, even though they occur in different areas and target different species. This may lead to skewed results. The SC **recommends** that various longline fisheries should be treated separately in future ERAs.

167. The SC was informed that Seychelles had been involved in the most recent EAF-Nansen cruise which took place from May to June in 2018. In 2008 there was also a survey that covered Mascarene Plateau. The SC was advised of a Nansen data policy which may be used by SIOFA to request data and that benthic mapping data collected could be of interest. It was explained that the owners of the data are the lead participating countries and Mauritius is the current owner of the data. The report from the most recent cruise was due to be finalised in December 2018 but has not yet been completed. Once the report has been finalised this can be shared with SIOFA.

Agenda item 7.7 Other teleosts

168. The Co-Chair of the SERAWG (Australia) presented paper SC-04-27, which updates the SC on a preliminary ecological risk assessment for SIOFA teleosts. The preliminary species list was developed using catch records in the SIOFA databases and information from annual reports submitted by SIOFA Contracting Parties. The species list is incomplete due to the developmental nature of the SIOFA databases

and associated issues, some of which are captured in the paper 'SIOFA species list' submitted to SERAWG1 and SC4.

169. The assessment applies PSA and SAFE methods to assess the relative vulnerability of teleosts to demersal trawl, midwater trawl, 'shallow trawl' (Saya de Malha bank fishery), demersal line and demersal gillnet gears in the SIOFA area. Fishing effort data were provided by most Contracting Parties for the 2012-2016 period; however, some effort data are missing. Species distribution data were sourced from aquamaps.org (80-100% probability of occurrence layer was used). Life history attribute data were sourced from the CSIRO database that underpins the CSIRO ERA online tool and was available for most species.

170. The results are preliminary and cannot currently be used for management advice on species status or fishing mortality. Once refined, the results could be used for prioritising assessment options (in line with the SIOFA stock assessment framework), or for informing requirements for additional data collection. The next step is to refine the SIOFA species list and the assumptions used in the assessment, and to encourage collaboration with other SIOFA CPs.

171. The SC **noted** that the same species list was used for different types of gear in the PSA, which may lead to misleading results. The SC also **noted** that the analysis could be improved by producing an explicit list of data gaps (including, for example, the requirement for some additional species biology, fishing effort and gear configuration data) and **requests** that this should be further investigated.

172. The SC **agreed** that the work described above would lead to additional technical work and have some resourcing implications and **requests** that these be included in the SC Operational workplan (Annex W).

Agenda item 7.8 Harvest strategies

173. The Chair reminded the SC that the MoP had requested that the SC provide advice on candidate target (TRP) and limit reference points (LRP) for orange roughy, alfonsino and toothfish and develop a framework and a work plan for the establishment of harvest strategies for key SIOFA stocks (MoP5 report, paras 52 – 53).

174. The SC **agreed**:

- that scientific work was required to inform SC advice on TRPs and LRPs. The SC **requests** the SERAWG to form a group of key interested parties to work intersessionally with a consultant to draft a technical working paper for submission to the next SERAWG meeting;
- to develop a generic approach for determining reference points for current and future stocks;
- that candidate reference points should take into account the level of data uncertainty in stocks, noting the data-limited nature of some fisheries/stocks;
- that for straddling stocks consistent reference points should be applied across the stock.

175. The SC **recommends** that the MoP consider including six elements when developing harvest strategies, and the SC begin work to populate those elements: (i) operational objectives, (ii) reference points, (iii) an acceptable level of risk of breaching reference points, (iv) a monitoring strategy, (v) decision rules for achieving reference points, and (vi) a process for evaluating harvest strategies.

176. The SC **agreed** to a work plan to progress this work (Annex X). The work plan includes scientists – fishery managers – stakeholders dialogues to discuss the key concepts of harvest strategies.

Agenda item 8 – Proposals to bottom fish in the Agreement Area in a manner at variance with established measures

177. No papers were provided for this agenda item.

Agenda item 9 – Scientific impact assessments

Agenda item 9.1 Demersal gillnet operations

178. No papers were provided for this agenda item.

Agenda item 10 – Cooperation with other RFMOs and international bodies

Agenda item 10.1 FAO ABNJ Deep Seas Project

179. Tony Thompson provided an update on the five-year ABNJ Deep Seas Project. This project is supported by GEF, and implemented jointly by FAO and UNE (September 2014-August 2019). The Project is designed to enhance sustainable use of deep-sea living resources whilst minimising impacts from fisheries to conserve biodiversity conservation in the ABNJ following an ecosystem approach. It brings together over 20 partners who work on deep-sea fisheries and conservation issues in the ABNJ globally. FAO undertook the legal and fisheries components, and UNE-WCMC the spatial planning component. The project has published global reviews on legal instruments, the management of VMEs, orange roughy, CDS, climate change, and Area-based planning, relevant to deep-sea fisheries and biodiversity conservation in the high seas. Soon to be published reports include an Update Worldwide Review of Bottom Fisheries in the High Seas, MSC, and the application of EAFM. Work more relevant to the Indian Ocean and SIOFA includes MSC for deep-sea fisheries, training on implementing international obligations relating to deep sea fishing and conservation in the ABNJ, shark and ecosystem risk assessment, and support to the SIOFA PAEWG and SERAWG. Further details can be found in information paper SC-04-INFO-04.

180. The SC acknowledged the value of elements of the Project and the contribution it had made to SC and CP activities.

181. The Executive Secretary informed the meeting that at the recently-held fourth Project Steering Committee (PSC4) meeting in Reunion, the PSC4 was informed that CSIRO had been engaged to lead an analysis of the risk of different fishing gears to biodiversity for SEAFO, SIOFA, and SPRFMO and that the report would to be made available to SIOFA as soon as completed. An update on the status of the report was not available but this work is due to be completed by May 2019. The SC **requested** the Executive Secretary circulate the report to the SC when available.

182. The Executive Secretary informed the SC that FAO had invited him and the SC Chair to attend the DEEP SEA Conference 2019, 7 to 9 May 2019 in Rome, Italy. The Chair

explained that neither she nor the Executive Secretary would be able to attend and that she would nominate the PAEWG Chair to attend on behalf of SIOFA SC.

183. The Executive Secretary informed the SC that he had been invited to attend the second workshop on the development of a future phase of the Common Oceans ABNJ Programme and identification of project activities, which would be held from 23 to 26 April 2019. The Chair explained that neither he nor the MoP Chair would be able to attend.

184. The SC **agreed** that continued engagement in a future phase was valuable given the proposed themes would contribute to key activities/issues being addressed in SIOFA, that are reflected in the SC Research Plan (Annex G).

185. Australia informed the SC that the Coalition of Legal Toothfish Operators would be holding a workshop on data collecting and reporting for toothfish in the CCAMLR Convention Area, July 2019 in South Africa. More information will be shared with the Secretariat for circulation to CPs and for the Secretariat to consider attendance.

Agenda item 10.2 FAO SIOFA-FIRMS Potential Partnership

186. Tony Thompson presented a brief overview of the Fisheries Resource Monitoring System (FIRMS). FIRMS is a partnership of organisations, which includes many of the R(F)MOs, that displays information of marine fisheries and fish stocks in the EEZ and ABNJ. The information for a region is entered by the partners responsible for that region. FIRMS has two types of membership arrangements: 'Partnership' in which the member is expected to attend the annual meetings and assist in the development of FIRMS through a voting process, and 'Collaborative' which is a more passive membership where meeting attendance is not expected. The amount of information submitted and the way it is displayed is the same in both cases. FIRMS invites SIOFA to become a member of FIRMS under a 'Partnership' or 'Collaborative' arrangement. Further details are found in paper SC-04-11.

187. Dr Thompson explained that joining FIRMS should enable SIOFA to more effectively disseminate SIOFA's work as an RFMO to global stakeholders. Regarding data confidentiality, FAO explained that all data provided by SIOFA to FIRMS would enter the public domain and SIOFA would therefore have to deal with any data confidentiality issues at the input stage.

188. The SC discussed the resourcing implications of joining FIRMS, with the Secretariat required to provide data submissions and potentially participate in meetings. The SC recognised that SIOFA could explore the possibility of seeking funding from FAO for participation in meetings.

189. The SC **recommends** that the MoP consider that the SC supported, in principle, joining FIRMS as a Partnership Arrangement, noting the resourcing implications.

Agenda item 10.3 Southwest Indian Ocean Fisheries Commission (SWIOFC)

190. No papers were provided for this agenda item.

Agenda item 10.4 The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

191. The SC welcomed the *Arrangement between the Meeting of the Parties of the Southern Indian Ocean Fisheries Agreement and the Commission for the Conservation of Antarctic Marine Living Resources* that was signed on 28 August 2018. This recognises the common objectives of the two organisations and

encourages the harmonisation of approaches to the conservation and management in areas of mutual interest. The SC particularly welcomed the potential efficiencies that this arrangement encouraged by information and experience sharing between the respective secretariats.

192. Dr Reid described how the CCAMLR Secretariat manages the CCAMLR toothfish tagging programme including the management of the process for purchasing tags, their distribution to vessels and the curation of all tagging and subsequent recapture data. CCAMLR holds toothfish tagging from EEZs of South Africa, France and Australia.

193. The SC **agreed** that an increased level of interaction with CCAMLR was timely given the increased interest in fishing for Patagonian toothfish in SIOFA in areas adjacent to CCAMLR fisheries with full assessments.

Agenda item 11 – Scientific Committee Work Plan

Agenda item 11.1 Long term research plan

194. The SC **recommends** that the MoP adopt the updated long term research plan to include the impacts of climate change as a priority theme (Annex G).

Agenda item 11.2 2018 – 2021 operational work plan and budget

195. The SC adopted an updated operational work plan (Annex W).

196. The SC discussed priorities as provided in CMMs and requests from the MoP and allocated High, Medium and Low priority to each activity accordingly.

197. The SC **recommends** that the MoP consider the research activities described in Annex H for inclusion in the SIOFA budget.

Agenda item 12 – Review and development of Conservation and Management Measures (CMMs)

Agenda item 12.1 Draft CMM on fishing research

198. The Chair reminded the SC that SC3 had considered and discussed the EU proposal on a draft CMM to regulate fisheries research in the SIOFA Area and the SC had recommended that a revised draft be provided taking into account the guidance and requests provided in paragraph 289 of the SC3 Report.

199. The EU presented an information paper with an updated proposal (SC-04-INFO-12). The SC encouraged CPs to continue to hold intersessional discussions and further refine the proposal to reflect the advice of SC3. The SC encouraged CPs to submit a working paper with an updated proposal to SC5, so as to be able to hold more substantive discussions.

Agenda item 12.2 CMM 2018/01 Interim Management of Bottom Fishing

200. No papers were provided for this agenda item.

Agenda item 12.3 CMM 2018/02 Data Standards

201. The SC recognised the increasing concern arising from whale depredation in the toothfish fishery, and the importance of assessing the amount of fish lost due to depredation and incorporating those values into stock assessment models. The SC encouraged CPs with longline fleets to collect whale depredation data if possible and encouraged CPs to submit working papers for the establishment of formal data collection guidelines to SC5, when the SC is scheduled to review Annex B (Observer Data) of this CMM.

Agenda item 12.4 CMM 2016/03 Data Confidentiality

202. The Secretariat noted some areas of CMM 2016/03 Data Confidentiality that would benefit from clarification.

203. The SC acknowledged that some paragraphs of the CMM could be reviewed/rephrased by the MoP to provide greater clarity, in particular paragraph 2 c).

204. The SC **agreed** that their interpretation of CMM 2016/03 was that it intended to facilitate the work of the SC and working groups, in particular paragraph 2 e), while managing confidentiality of data.

205. The SC suggested the Secretariat could develop process guidelines to assist in their implementation of CMM 2016/03.

Agenda item 13 – SIOFA SC official contacts

206. The Executive Secretary explained to the SC that most CPs do not identify/include the SC HoD and/or SC representatives in the SIOFA Official Contacts. This causes difficulties in consulting all SC representatives in the intersessional period and progressing activities.

207. To facilitate SC intersessional work, the SC **requests** that the MoP require each CP include in the SIOFA Official Contacts List their SC representatives identifying the SC HoD and an alternate.

Agenda item 14 – Advice to the Meeting of Parties

Consolidation of advice to the Meeting of the Parties

In relation to agenda item 3.1 – Guidelines for the submission of Annual National Reports:

- The SC **requests** that CCPs use the draft Annual National Report template (Annex D) to be reviewed at SC5.
- The SC **recommends** that the MoP consider whether, if a CCP has not fished in the previous calendar year and there have been no substantive changes to their fisheries-related activities, they can provide a simple statement of this fact, rather than having to submit a full National Report. (Paragraph 50)

In relation to agenda item 5.1 SIOFA Scientific Database:

- Regarding the issue of CPs using erroneous codes (i.e. not FAO 3-alpha species codes) when submitting data to SIOFA, the SC recognised that each CP may not necessarily use the FAO codes domestically. However, when submitting data to SIOFA, the SC **agreed** that FAO codes shall be used. (Paragraph 71)

In relation to agenda item 5.2 Templates for data submission:

The SC **requested** that CCPs work intersessionally to review the draft templates and provide comments to the Secretariat by the end of April 2019, and that the Secretariat consider and reflect comments, while taking into account the requirements of CMM 2018/02 on Data Standards and their workload. If necessary, the Secretariat can seek guidance from the SC Chair, and an intersessional discussion can be held to resolve any outstanding issues. (Paragraph 74)

In relation to agenda item 5.5 Observer coverage:

The SC **agreed** that with respect to the observer coverage on non-trawl fisheries, there are situations where higher levels of observer coverage should be considered, such as potential interactions with rare and/or species of concern and high risk areas. (Paragraph 83)

The SC **noted** that in the SIOFA area where fisheries were often data limited, a high level of observer coverage could facilitate more comprehensive collection of data to better inform science and management. (Paragraph 84)

The SC **agreed** that the current observer coverage needed to be representative of the spatial and temporal scope of fishing activities. The SC **agreed** to consider the information on the spatial and temporal coverage at SC5. (Paragraph 85)

The SC **requested** CPs and the SERAWG and PAEWG continue to consider what levels of coverage at the level of fishing trips, hauls and subsampling of hauls, would be needed to facilitate the provision of advice from the SC to the MoP. (Paragraph 86)

In relation to agenda item 5.7 Appropriate spatial resolution for the collection and reporting of data:

The SC **recommends** that, with respect to stock assessment data needs, the collection and reporting of data should be done at the finest spatial scale as possible, preferably at the level of each fishing operation with latitude and longitude location information. (Paragraph 91)

In relation to agenda item 6.2 VME mapping the SC:

- **Recommends** that, despite a probable paucity of data, attempts are made to model habitat suitability to investigate their use in providing maps of VME habitat;
- **Noted** that the VME indicator taxa list (Annex J) could be used in conjunction with information on physico-chemical and geological features (such as vents and cold water seeps) to inform protection of potential VMEs in SIOFA;
- **Recommends** reviewing the locations of hydrothermal vents, seamounts and other VME elements and identify areas where VMEs are ‘likely to occur’;

- **Noted**, in relation to the definition of VMEs, that paragraph 3a of the bottom fishing measure defines VMEs in accordance with paragraph 42 of the deep sea fishing guidelines. These criteria have been considered in the formulation of a SIOFA-specific list of VME indicator taxa.
- **Recommends** that, for consistent estimation of VME taxa quantity, CPs consider recording by weight only and provide guidance to observers on how to convert volume to weight (kg). (Paragraph 101)

In relation to agenda item 6.3 VME indicator species and responses to VME encounters the SC:

With regard to VME indicator species the SC:

- **Recommends** that the MoP adopt the VME Indicator taxa list for use in the SIOFA Area (Annex J)
- **Requests** the Secretariat develop a pictorial VME Indicator taxa guide based on that used by CCAMLR, to assist observers and fishers.
- **Notes** Thailand's request for capacity building assistance for on the identification of VME indicator taxa. (Paragraph 104)

The SC:

- **Recommends** setting the catch/recovery of 10 or more VME-indicator units[3] in a single line segment[4] as the threshold that triggers the encounter protocol for longline fishing.
- Could not reach consensus on consistent thresholds for trawl gears. The SC **requests** that interested parties work intersessionally to identify a suitable threshold. Such intersessional work could include review of the methods used by CPs to establish their existing thresholds, as well as development of a consistent threshold based on consolidated records of benthic bycatch data for trawl gears. Using this method, thresholds could be based on medians, percentiles or other metrics (e.g. trawling duration). (Paragraph 111)

With regard to the appropriate response to VME encounters the SC **recommends** that:

- If a VME encounter threshold is triggered, this should be considered to be evidence of the potential presence of a VME. To avoid significant adverse impacts on the potential VME, an appropriately-sized area should be closed to fishing by all fishing gears and a review by the SC should be undertaken to determine, based on the best available science, whether or not there is a VME. Such a review should consider cumulative impacts using all available data.
- The SC should also periodically review all benthic bycatch data to inform its consideration of the location of potential VMEs, and potential impacts thereon. (Paragraph 112)

In relation to agenda item 6.4 SIOFA Standard protocols for future protected areas designation:

[3] 'VME indicator unit' means either one litre of those VME indicator organisms that can be placed in a 10-litre container, or one kilogram of those VME indicator organisms that do not fit into a 10-litre container.
[4] 'Line segment' means a 1000-hook section of line or a 1 200 m section of line, whichever is the shorter.

The SC reviewed and revised the SIOFA Standard Protocol for Future Protected Areas Designation (Annex L). The SC **agreed** that the criteria in the protocol have no particular ranking of importance. (Paragraph 115)

The SC **recommends** that the MoP adopt the revised protocol (Annex L). (Paragraph 116)

In relation to the research and management plan for the Atlantis Bank protected area, the SC **recommends** that the MoP consider that fishing with all gears were identified as activities that degrade the biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. (Paragraph 118)

In relation to the research and management plan for the Coral protected area, the SC **recommends** the MoP consider that fishing with all gears were identified as activities that degrade the scientific and biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. (Paragraph 119)

In relation to the research and management plan for the Fools Flat protected area, the SC **recommends** that the MoP consider that fishing with all gears were identified as activities that degrade the biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. (Paragraph 120)

In relation to the research and management plan for the Middle of What protected area, the SC **noted** that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. (Paragraph 121)

In relation to the research and management plan for the Walters Shoal protected area, SC **recommends** that the MoP consider that fishing with all gears were identified as activities that degrade the scientific and biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. (Paragraph 122)

In relation to the research and management plans for the Atlantis Bank, Coral, Fools Flat, Middle of What and Walters Shoal protected areas, the SC:

- **Recalled** the Guidance for SC Recommendations to the Meeting of the Parties outlined in the standard protocol for protected areas designation (SC3 report, Annex H), which states that:

i. *If the proposal documents the necessary data and scientific information to support a protected area using protocol, different measures could be applied, such as management measures, technical measures, closures.*

ii. *In case of an area becoming protected, a management and research plan shall be associated to it on the year to come. It will include:*

1. *The measures in place in the protected area;*
2. *The time of review of the protected area;*
3. *If needed, the research that should be undertaken in the area.*

- **Recommends** that any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area, (2) an assessment of impacts, and (3) proposed measures to prevent or minimise those impacts.
- **Recommends** that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas.

i. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos.

- **Recommends** to the Meeting of the Parties that the research and management plans included at Annexes M-Q be adopted for the Atlantis Bank, Coral, Fools Flat, Middle of What and Walters Shoal protected areas**.** (Paragraph 123)

In relation to agenda item 6.6 Bottom Fishing Impact Assessments (BFIA):

The SC **reaffirmed** that, in accordance with paragraph 18e of CMM 2018/01 on Bottom Fishing, a BFIA shall be updated when a substantial change in the fishery has occurred. (Paragraph 129)

In relation to agenda item 7.2 Alfonsino:

The SC **agreed** that without work on the assessment it was unable to provide advice on the status of the stock. (Paragraph 134)

In relation to agenda item 7.3 Patagonian toothfish:

The SC **recommends** that the MoP urgently considers adopting temporary measures to regulate toothfish fishing on William's Ridge at levels commensurate with fishing activities reported in 2016. (Paragraph 143)

The SC **requested** that the EU provide their fishing data from 2018 and 2019 to Australia so these data can be included in the stock assessment for this population undertaken in 2019. (Paragraph 144)

The SC **recommends** that the MoP urgently considers adopting temporary measures to regulate toothfish fishing on the Del Cano Rise in the SIOFA area at levels commensurate with fishing activities reported up to 2016. (Paragraph147)

In relation to agenda item 7.4 Orange roughy:

The SC **noted** that the 2018 stock assessment for the Walters Shoal Region provided deterministic estimates of BMSY assuming a Beverton and Holt stock recruitment relationship, a combination of assumed steepness and natural mortality, and maturity

parameters (SC-03-07.1.1(04)). The BMSY estimate using the base model parameters was 23.6% B0 (SC-03-07.1.1(04), Table 3 assuming a 50% age-at-maturity of 37 years and 12 years to reach 95% after 50%). (Paragraph 151)

The SC **noted** the advice in SC-03-07.1.1(04) that:

- 'Deterministic BMSY has not been found to be a useful reference point for New Zealand orange roughy stocks. It is highly dependent on the stock recruitment relationship and is therefore very uncertain.' (Paragraph 152)

The SC **agreed** that deterministic estimates of BMSY were highly uncertain and therefore not suitable to be used as a reference point for management advice for this stock. (Paragraph 153)

In relation to agenda item 7.5 Deepwater chondrichthyans in summary the SC:

- **Agreed** there is limited catch, effort and biological information for many species of deepwater chondrichthyans;
- **Agreed** that the PSA and SAFE analyses have identified a number of species of deepwater chondrichthyans at high or extreme relative vulnerability to fishing using demersal trawl, demersal longline and demersal gillnet gears;
- **Noted** that based on the results of the ERA and the understanding of the vulnerability of many deepwater chondrichthyans species to fishing, four 'key species of concern' for which catch data are available (*C. coelolepis*, *C. granulosus*, *D. calcea* and *D. licha)* are caught in relatively high volumes.
- **Recommends** the collection and submission of more detailed observer data (e.g. improved species identification in accordance with the implementation of the FAO shark guides, biological samples to enable future genetic research, number of pups/eggs, life status (i.e. if discarded)) for species of concern (e.g. those at high or extreme vulnerability to fishing using certain gears) and all other data in accordance with CMM 2018/02, Annex B;
- **Requests** the MoP to urgently consider measures to mitigate the potential for overexploitation of 'key species of concern' that has been seen in similar fisheries globally. (Paragraph 164)

In relation to agenda item 7.6 Saya de Malha Bank Fisheries:

The SC **noted** that the Saya de Malha Bank longline fishery had been grouped together with other longline fisheries in the SIOFA area when conducting the ERA, even though they occur in different areas and target different species. This may lead to skewed results. The SC **recommends** that various longline fisheries should be treated separately in future ERAs. (Paragraph 166)

In relation to agenda item 7.8 Harvest strategies:

The SC **agreed**:

- that scientific work was required to inform SC advice on TRPs and LRPs. The SC **requests** the SERAWG to form a group of key interested parties to work intersessionally with a consultant to draft a technical working paper for submission to the next SERAWG meeting;
- to develop a generic approach for determining reference points for current and future stocks;

- that candidate reference points should take into account the level of data uncertainty in stocks, noting the data-limited nature of some fisheries/stocks;
- that for straddling stocks consistent reference points should be applied across the stock. (Paragraph 174)

The SC **recommends** that the MoP consider including six elements when developing harvest strategies, and the SC begin work to populate those elements: (i) operational objectives, (ii) reference points, (iii) an acceptable level of risk of breaching reference points, (iv) a monitoring strategy, (v) decision rules for achieving reference points, and (vi) a process for evaluating harvest strategies. (Paragraph 175)

In relation to agenda item 10.2 FAO SIOFA-FIRMS Potential Partnership:

The SC **recommends** that the MoP consider that the SC supported, in principle, joining FIRMS as a Partnership Arrangement, noting the resourcing implications. (Paragraph 189)

In relation to agenda item 11.1 Long term research plan:

The SC **recommends** that the MoP adopt the updated long term research plan to include the impacts of climate change as a priority theme (Annex G). (Paragraph 194)

In relation to agenda item 11.2 2018 – 2021 operational work plan and budget:

The SC **recommends** that the MoP consider the research activities described in Annex H for inclusion in the SIOFA budget. (Paragraph 197)

In relation to agenda item 13 – SIOFA SC official contacts:

To facilitate SC intersessional work, the SC **requests** that the MoP require each CP include in the SIOFA Official Contacts List their SC representatives identifying the SC HoD and an alternate. (Paragraph 207)

In relation to agenda item 17.1 – Seabird bycatch:

The SC **recommends** that the MoP consider bycatch mitigation measures for areas of high risk as identified by other RFMOs whose areas of competence are adjacent to or overlap with that of SIOFA. Measures which have been successfully used in CCAMLR longline fisheries include:

- the use of streamer lines as birds scaring device during setting,
- weight integrated lines only to increase sinking speed,
- white line only to increase visibility which decreases the catches,
- Brickle curtain in place during hauling,
- setting only at night between the nautical twilights,
- limitation of the light emitted by the ship during operations,
- discards are forbidden during setting and hauling to decrease attractiveness,
- closure of fishing seasons during periods of high risk of seabird bycatch (Paragraph 221)

Agenda item 15 – Election of Chairperson and Vice Chairperson

208. The Chairperson noted that the 12-month extension had ended for the current Chair (Dr Ilona Stobutzki) and vice-Chair (Dr Tsutomu Nishida).

209. Dr Ilona Stobutzki was nominated as Chair and the SC agreed to appoint her as SIOFA SC Chairperson for an additional 12 months.

210. Dr Tsutomu Nishida was nominated as vice-Chair and the SC agreed to appoint Dr Tsutomu Nishida as SIOFA SC Vice-Chairperson for an additional 12 months.

211. The SC noted that in line with the rules of procedure these would be the final terms for these individuals as the Chair and Vice-Chair.

Agenda item 16 – Future meeting arrangements

212. The Executive Secretary informed the SC that, at MoP5, Mauritius had offered to host SC5. The Executive Secretary is in the process of confirming whether Mauritius still intends to host the meeting and will inform the SC in the intersessional period.

213. The SC initially recommends that two days be allocated for the PAEWG2 meeting.

214. The SC initially recommends that two days be allocated for the SERAWG2 meeting.

Agenda item 17 – Other business

215. The SC observed a moment of silence at 11:00 a.m., 29 March, in remembrance of the victims of the Christchurch terror attack.

17.1 Seabird bycatch

216. The DSCC noted that measures to mitigate seabird bycatch was an important outstanding issue for SIOFA, particularly given that the CCAMLR area abutting SIOFA is recognised as a high risk area for seabird bycatch. The DSCC urged SIOFA to consider this issue at SC5 and for CCPs to provide information about their experiences and for the Secretariat to seek additional information from CCAMLR and the Agreement on the Conservation of Albatrosses and Petrels (ACAP) to assist these discussions.

217. France (Territories) presented their CCAMLR sea bird mitigation measures for longline fishing implemented for all French vessels in SIOFA and noted the strong decline in seabird mortality in the CCAMLR Area. Considering that risks of bird mortality are similar in SIOFA, France (Territories) invited the SC to recommend the adoption of these mitigation measures for longliners and the adoption of appropriate mitigation measures for trawlers.

218. The SC discussed the potential risk of seabird bycatch, especially in areas adjacent to CCAMLR areas, where seabird bycatch has been assessed at high or extreme risk. The SC **noted** some CPs have mandatory bycatch mitigation measures in place.

219. The SC **requested** the Secretariat summarise data on seabird bycatch for consideration at the next SC.

220. The SC **agreed** there was a need to understand the risk of seabird bycatch across the SIOFA Area and to seek advice from other RFMOs, such as CCAMLR and IOTC, and ACAP.

221. The SC **recommends** that the MoP consider bycatch mitigation measures for areas of high risk as identified by other RFMOs whose areas of competence are adjacent to or overlap with that of SIOFA. Measures which have been successfully used in CCAMLR longline fisheries include:

- the use of streamer lines as birds scaring device during setting,
- weight integrated lines only to increase sinking speed,
- white line only to increase visibility which decreases the catches,
- Brickle curtain in place during hauling,
- setting only at night between the nautical twilights,
- limitation of the light emitted by the ship during operations,
- discards are forbidden during setting and hauling to decrease attractiveness,
- closure of fishing seasons during periods of high risk of seabird bycatch.

Agenda item 18 – Adoption of the meeting report

222. The report of the 4th meeting of the SIOFA SC was adopted at 7:42 p.m., 29 March 2019.

Agenda item 19 – Close of meeting

223. The Chair closed the meeting at 7:44 p.m.

LIST OF PARTICIPANTS

(as at 28/03/2019)

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Assistants				
Japan	Ms	Kanna Young	Assistant	
Japan	Ms	Narumi Saito	Assistant	
Japan	Mr	Alex Meyer	Rapporteur	

Agenda

4th Meeting of the Southern Indian Ocean Fisheries Agreement (SIOFA) Scientific Committee

25-29 March 2019

National Research Institute of Fisheries Science, Yokohama,

Japan

Chair: Dr Ilona Stobutzki

The provisional agenda for the 4th meeting of the SIOFA Scientific Committee (SC) has been developed to focus on the areas of work identified in SIOFA CMM 2018/01 and CMM 2018/02, Meetings of the Parties (MoP) and the Scientific Committee Operational Work Plan 2018-21 (SC3 Report Annex M) to meet the governance requirements set out in the Scientific Committee's terms of reference.

Registration will be open from 09:30 on the 25th March and the meeting will run 10:00 to 18:00 each day.

A Heads of Delegation meeting will be held on the 25th March 09:15 – 10:00.

NOTE: Prior to this meeting the following two SC Working Group meetings will convene;

- First Meeting of the Protected Areas and Ecosystems Working Group (PAEWG1), 18-19 March
- First Meeting of the Stock and Ecological Risk Assessment Working Group (SERAWG1), 20-22 March

1. Opening
   - 1.2 Opening statement from the Chair
   - 1.2 Introduction of participants

2. Administrative arrangements
   - 2.1 Adoption of the Agenda
   - 2.2 Confirmation of Meeting Documents
   - 2.3 Appointment of rapporteurs
   - 2.4 Review of functions and terms of reference

3. Annual National Reports

   In accordance with CMM 2018/02 para 9, each Contracting Party, CNCP and PFE shall provide to the SC an annual National Report. Guidelines for the annual National Reports can be found on the SC page of the SIOFA website https://www.apsoi.org/scientific-committee.

   3.1 Guidelines for the submission of Annual National Reports

   Review of guidelines. Sub-areas for reporting catch and effort data, consideration of whether a separate sub-area to encompass Saya de Malha bank fisheries is needed.
   A discussion on confidentiality issues within National Reports that are public documents and made available on the SIOFA website. Secretariat to present summary of potential confidentiality issues identified in previous National Reports.

4. Current and historical status of fishing activities

4.1 Historical Catch and Effort Data

In accordance with 2018/02 para 10, Contracting Parties Contracting Parties, CNCPs and PFEs shall provide to the Secretariat, by 31 January 2018, historical catch, effort data and, if available, observer data for period 2000 to 2015 and any previous years where available. Any State or fishing entity that becomes a party to the Agreement, CNCP or PFE after date of CMM adoption shall provide this data within 12 months of becoming Party to the Agreement, or becoming a CNCP or PFE.
The SIOFA Data Manager to provide an update on the status of submissions for historical catch and effort data.
In accordance with SC Work Plan 2018-2021, report on progress for data sources identified with respect to orange roughy, alfonsino and species from the Saya de Malha Bank.

4.2 Spatial Extent of Historic Catch Data

In accordance with 2018/01 para 13, Contracting Parties Contracting Parties, CNCPs and PFEs shall, at least 30 days prior to the commencement of the ordinary meeting of the SC in 2018, submit to the Secretariat relevant data on the spatial extent of its historical bottom fishing effort in the Agreement Area.
In accordance with SC Work Plan 2018-2021 Secretariat to provide an update on the status of the spatial extent of historical fishing effort data.

4.3 Overview of SIOFA fisheries 2018

At SC3 it was noted that constraints around the lack of availability of the data required for SC work, in particular catch and effort information prevented a completed overview of SIOFA fisheries 2017 being achieved. To avoid similar situation at SC4 a draft overview report by the Secretariat was requested 30 days before the meeting.
The Data Manager to present the draft SIOFA Overview of Fisheries 2018.

5. Scientific data standards

5.1 SIOFA scientific database

The SIOFA Data Manager to provide an update on the SIOFA Scientific Database highlighting improvements since SC3.

5.2 Templates for data submission

MoP5 report (para 31) requested the Secretariat develop spreadsheet templates to guide data submissions in line with requirements of CMM 2018/02. Secretariat to provide an update.

5.3 Secure transfer of SIOFA confidential data

At SC3 SIOFA Database Manager was requested to investigate and implement protocols for the secure transfer of confidential data. Presentation of progress since SC3. Secretariat to present SIOFA Policy for Ensuring Data Confidentiality for SC4 consideration.

5.4 Annual data holdings report and data inventory

SC3 requested Secretariat to prepare an annual data holdings report including challenges and quality control process that had been identified with data submission for presentation at each SC meeting to assist the SC in its deliberations.
SC Work Plan 2018-2021 provides for the provision of a data inventory for alfonsino and Patagonian toothfish.
Presentation of annual data holdings report and data inventory.

5.5 Observer coverage

In accordance with 2018/01 para 32, the SC shall review the observer coverage levels prescribed in paragraph 31 at its ordinary meeting in 2018 and provide advice to the MoP. SC3 para 90 includes the steps required for to progress this review at SC4.

5.6 Observer data

In accordance with 2018/02 para 14. Contracting Parties, CNCPs and PFEs shall, for all observed trips, collect observer data in accordance with the relevant sections of Annex B. All observer data collected by Contracting Parties, CNCPs and PFEs shall be reported to the Secretariat by 31 May each year for the previous calendar year.
Annex B will be reviewed by the SC at its ordinary meeting in 2020. SC4 should be able to undertake a review if the data inventory and other steps described in SC3 Report, para 90, are completed prior to this meeting.
In accordance with SC Work Plan 2018-2021 observer data inventory to be completed prior to SC4 and review of observer coverage levels undertaken at SC4.

5.7 Appropriate spatial resolution for the collection and reporting of data

In accordance with CMM 2018/02 para 5, the SC shall, by no later than the ordinary meeting of the SC in 2019, provide advice and recommendations to the Meeting of the Parties on an appropriate spatial resolution for the collection and reporting of data to facilitate effective stock assessment. Advice expected from SERAWG1.

6. Vulnerable Marine Ecosystems

6.1 Protected Areas and Ecosystems Working Group (PAEWG)

At SC3 the PAEWG ToR was developed and MoP5 agreed the establishment of this Working Group and that the PAEWG to be Chaired by France (Territories).
PAEWG Chairperson to present report from PAEWG1, addressing the following agenda items as appropriate.

6.2 VME mapping

In accordance with CMM 2018/01 para 5, the SC shall, by no later than SC 2017 provide advice and recommendations to the MoP on maps of where VMEs are known to occur, or likely to occur in the agreement area. Advice expected from PAEWG1.

6.3 VME indicator species and responses to VME encounters

In accordance with 2018/01 para 6, the SC shall, by no later than the close of the ordinary meeting in 2019 will develop and provide advice and recommendations to the MoP on;

i. *criteria for what constitutes evidence of an encounter with a VME, in particular threshold levels and indicator species; and*
ii. *the most appropriate response to a VME encounter, including inter alia closing particular areas to a particular gear type or types (also in accordance with SC Work Plan 2018-2021 SC4).*

MoP5 report (para 32) requested SC develop common thresholds for taxa indicators of VME presence and to identify taxa indicators of VMEs presence and define a common VME encounter protocol (para 40).

6.4 SIOFA Standard protocols for future protected areas designation

In accordance with 2018/01 para 6, the SC shall, by no later than the close of the ordinary meeting in 2019 will develop and provide advice and recommendations to the MoP on;

i. *the interim SIOFA Standard Protocol for Future Protected Areas Designation adopted by the Meeting of the Parties in 2018; and*
ii. *research and management plans, to be adopted at MoP6, for each of the protected areas listed in Annex 2*

The SC3 revised the SIOFA Standard protocol for future protected areas designation (Annexes H and I). The MoP5 (paras 40 & 91) requested SC to review the interim protocol for the designation of protected areas.

6.5 VME database

SC3 requested the Secretariat to consider how additional 'non-observer VME data' could be included in the SIOFA database. Secretariat to report on possible approaches.

6.6 Bottom Fishing Impact Assessments (BFIA)

In accordance with CMM 2018/01 para 15, the SC shall consider all BFIAs received and provide advice to the MoP. At SC3 recommendations were made to move towards the cumulative impact assessment of all SIOFA fisheries, para 149 and 151. MoP5 supported the approach for Contracting parties fishing with the same gears to work together to progress cumulative gears. In accordance with SC Work Plan 2018-2021 relevant CP to progress cumulative impact assessments and SC to review these assessments

7. Stock assessment and ecological risk assessment

In accordance with CMM 2018/01 para 6, the SC shall, by no later than the close of the ordinary meeting in 2019 will develop and provide advice and recommendations to the MoP on;

i. the status of stocks of principal deep-sea fishery resources targeted, and, to the extent possible, taken as bycatch and caught incidentally in these deep-sea fisheries, including straddling fishery resources.

Additionally, MoP5 Report requests;

i. SC provide advice on the status of stocks in relation to MSY until specific reference points are adopted (MoP5 Report, para 51).

Advice provided to take into account research activities identified in SC Work Plan 2018-2021 for each key targeted species as follows;

7.4.1 Orange Roughy
7.4.2 Alfonsino
7.4.3 Patagonian Toothfish
7.4.4 Other teleost species
7.4.5 Deepwater chondrichtyans

7.1 Stock Assessment and Ecological Risk Assessment Working Group (SERAWG)

At SC3 the SERAWG TOR was developed and MoP5 agreed to the establishment of this Working Group and that the SERAWG be Co-chaired by Japan and Australia.

SERAWG Co-chairpersons to present report from SERAWG1, addressing the following agenda items as appropriate.

7.1.1 SIOFA stock assessment framework

Discussion on implementation

7.2 Alfonsino

In accordance with SC Work Plan 2018-2021, consideration of the scoping analysis, assessment of status of stocks, advice to MoP and forward work plan.

7.3 Patagonian toothfish

In accordance with SC Work Plan 2018-2021, consideration of the scoping analysis, assessment of status of stocks, advice to MoP and forward work plan.

7.4 Orange Roughy

In accordance with SC Work Plan 2018-2021, consideration of assessment of status of stocks, advice to MoP and forward work plan.

7.5 Deepwater chondrichthyans

In accordance with SC Work Plan 2018-2021, consideration of the ecological risk assessment, assessment of status of stocks, advice to MoP and forward work plan.

7.6 Saya de Malha Bank Fisheries

In accordance with SC Work Plan 2018-2021, consideration of the available assessments, assessment of status of stocks, advice to MoP and forward work plan.

7.7 Other teleosts

Consideration under *Progress on preliminary ERA for SIOFA teleosts.*

7.8 Harvest strategies

The MoP5 Report requests;

i. *SC provide advice on candidate target (TRP) and limit reference points (LRP) for orange roughy, alfonsino and toothfish (MoP5 Report, para 52)*
ii. *SC develop a framework and a work plan for the establishment of harvest strategies for key SIOFA stocks (MoP5 report, para 53)*

The MoP5 requested the SC to facilitate a scientists-fisheries manager dialogue dedicated to the key concepts of harvest strategies (MoP Report, para 53)

8. Proposals to bottom fish in the Agreement Area in a manner at variance with established measures

In accordance with paragraph 20 of CMM 2018/01 a Contracting Party, CNCP and PFE seeking to authorise any vessel flying its flag shall submit to the SC, at least 30 days prior to an ordinary meeting of the SC, a proposal to undertake that activity or activities.

9. Scientific impact assessments

In accordance with SIOFA SC Operational Work Plan 2018-2021

9.1 Demersal gillnet operations

In accordance with CMM 2016/05 para 2, Contracting Parties, CNCPs and PFEs recommend that deepwater gillnets not be used in the Agreement Area by any vessel flying the flag of a Contracting Party, CNCP or PFE until such time as the Meeting of the Parties has received a recommendation from the SC.

10. Cooperation with other RFMOs and international bodies

10.1 FAO ABNJ Deep Sea Project

Food and Agriculture Organization of the United Nations, Areas Beyond National Justification Deep Seas Project update.

10.2 FAO SIOFA-FIRMS Potential Partnership

Consideration for partnership with FAO's Fisheries and Resources Monitoring System (FIRMS) which currently consists of 14 international organizations and 19 regional fishery bodies (RFBs) aiming to provide access to a wide range of high-quality information on the global monitoring and management of fishery marine resources.

10.3 Southwest Indian Ocean Fisheries Commission (SWIOFC)

In accordance with MoP5 Report (para 118), SC to provide advice on scientific activities that could be conducted on straddling demersal stocks of the Saya de Malha bank.

10.4 The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

This collaboration was discussed in relation to the work plan for Patagonian toothfish and the del Carno Bank. SC3 requested CPs assist in the discussions with CCAMLR and work with the Secretariat and Chairperson to coordinate this.

11. Scientific Committee Work Plan

11.1 Long term research plan

Review and update if required

11.2 2018 – 2021 operational work plan and budget

Review and update if required. Discussion on potential projects and collaboration. Discussion on the science budget to provide advice to the Meeting of the Parties. Discussion will include the process for developing project cost estimates and terms of reference, noting the need to align with budget years.

12. Review and development of Conservation and Management Measures (CMMs)

SC to consider reviews of CMMs and development of any new CMMs requiring input from the Scientific Committee.

12.1 Draft CMM on fishing research

EU's proposal for a CMM to regulate fisheries research in the Agreement Area was considered and discussed at SC3. SC3 recommended that a revised draft be provided taking into guidance and requests provided in SC3 Report para 289.

12.2 CMM 2018/01 Interim Management of Bottom Fishing

This CMM shall be reviewed no later than at the ordinary Meeting of the Parties in 2019. This review shall take into account, inter alia, the latest advice of the Scientific Committee, including advice on those matters listed in paragraphs 5 to 7 and appropriate catch levels for principal target species, in accordance with the objective described in paragraph 1 (CMM 2018/01, para 41).

12.3 CMM 2018/02 Data Standards

This CMM should be reviewed periodically by the Scientific Committee and the Meeting of the Parties, taking into account new information or data requirements as may be decided (CMM 2018/02, para 18).

12.4 CMM 2016/03 Data Confidentiality

13. SIOFA SC official contacts

The majority of SIOFA Contracting Parties do not identify/include in the SIOFA Official Contacts the SC HoD and/or SC representatives. To improve intersessional communication with SC representatives and enable progress of intersessional SC activities, SC4 is requested to consider a recommendation to MoP for the inclusion of SC HoD and representatives within the SIOFA List of Official contacts.

14. Advice to the Meeting of Parties

A consolidation of SC4 advise to the MoP

15. Election of Chairperson and Vice Chairperson

At SC4 it was agreed that both SC Chairperson and Vice-Chairperson were appointed for a 12-month extension. As such election of Chairperson and Vice-Chairperson needs to be reconsidered and agreed at SC4. The current Chairperson and Vice-Chairperson can be reappointed for 12 months in line with SIOFA Rules of Procedure.

16. Future meeting arrangements

The SC is asked to agree to (approximate) dates and location for the 5th meeting of the SIOFA SC.

17. Other business

17.1 Seabird bycatch

18. Adoption of the meeting report

19. Close of meeting

4th Meeting of the Southern Indian Ocean Fisheries Agreement (SIOFA) Scientific Committee

25-29 March 2019

List of Meeting Documents

(as at 25/03/2019)

Document Reference N°	Document	Relevant agenda items	Date of submission
SC-04-01	Meeting notice	-	17.01.19
SC-04-02 Rev4	Provisional agenda for the SIOFA Scientific Committee meeting	2	-
SC-04-03	Provisional agenda for Heads of Delegation meeting (tbc circulated by email to HoDs)	2	-
SC-04-04	List of Meeting Documents	2	-
SC-04-05	Table of agenda items and related papers	2	-
SC-04-06	Scientific Committee Terms of Reference	2	-
SC-04-07	SIOFA SC4 List of Participants	2	-
SC-04-08	Impact assessment of bottom fishing following the conservation and management measures of SIOFA / APSOI - COMOROS	6.6	11.02.19
SC-04-09	Templates for data submission (with Zip file)	5.2	22.02.19
SC-04-10_Rev1	National Report of Japan (Mar 1)	3	Rev1 01.03.19 First version submitted 21.02.19
SC-04-11	SIOFA-FAO FIRMS Partnership	10.2	20.02.19
SC-04-12	Annual National Report Australia	3	22.02.19
SC-04-13	Proposal for a Research and Management Plan for the 'Walters Shoal' protected area	6	22.02.19
SC-04-14	SIOFA species list (with Excel Annex)	5	22.02.19
SC-04-15	Proposal for a Research and Management Plan for the 'Atlantis' protected area	6	22.02.19
SC-04-16	Proposal for a Research and Management Plan for the 'CORAL' protected area	6	22.02.19
SC-04-17	Proposal for a Research and Management Plan for the 'FOOLS FLAT' protected area	6	22.02.19
SC-04-18	Proposal for a Research and Management Plan for the 'Middle of What' protected area	6	22.02.19
SC-04-19	Draft manuscript for an ecological risk assessment for the effects of bottom fishing gears on deepwater chondrichthyans in high seas areas of the Southern Indian and South Pacific oceans	7.5	22.02.19
SC-04-20	Preliminary categorisation of species into the SIOFA stock assessment framework	7	22.02.19
SC-04-21	Population structure of Patagonian toothfish (Dissostichus eleginoides) on the Kerguelen Plateau and consequences for the fishery in SIOFA Statistical Area 7	7.3	22.02.19
SC-04-22	Annual National Report Thailand	3	22.02.19
SC-04-23	Annual National Report EU	3	22.02.19
SC-04-24	Annual National Report France territory	3	22.02.19
SC-04-25	Annual National Report Seychelles	3	23.02.19
SC-04-26	Protocols for the secure transfer of confidential data	5.3	22.02.19

SC-04-27	Preliminary ecological risk assessment for SIOFA teleosts RESTRICTED DOCUMENT	7.6	04.03.19
SC-04-28	Draft Overview of SIOFA Fisheries 2018	4.3	07.03.19
SC-04-29	Annual National Report Cook Islands	3	16.03.19
SC-04-30	PAEWG1 Meeting Report	6.1	24.03.19
SC-04-31	SERAWG1 Meeting Report	7.1	24.03.19
SC-04-INFO-01	Expert review of SIODFA proposed BPAs_Goldsworthy-2017	6	22.02.19
SC-04-INFO-02	SIOFA Databases and data submission status	4.1, 4.2, 5.1, 5.4, 5.6	06.03.19
SC-04-INFO-03	EAF-Nansen Programme Information paper	10	07.03.19
SC-04-INFO-04	ABNJ Deep Seas Project update	10.1	08.03.19
SC-04-INFO-05	Laying the Foundations for Management of a Seamount Beyond National Jurisdiction (English and French Versions)	6 &12	10.03.19
SC-04-INFO-06	Whale depredation - Data collection guidelines	5.6	11.03.19
SC-04-INFO-07	French fisheries observation program	5.6	11.03.19
SC-04-INFO-08	Management approaches to data-limited toothfish fisheries in CCAMLR	7.3, 10	11.03.19
SC-04-INFO-09	Annual National Report China	3	18.03.19
SC-04-INFO-10	Patagonian toothfish Study (SERAWG-01-12) RESTRICTED	7.3	24.03.19
SC-04-INFO-11	Alfonsino Scoping Study (SERAWG-01-13) RESTRICTED	7.2	24.03.19
SC-04-INFO-12	Straw man on Scientific Research and New or Exploratory Fisheries_EU	12.1	

Template for the submission of National Reports

(To be annexed to the National Report guidelines)

The tables below provide guidance on the format to be used for CP to report information in their National Report.

Description of fisheries

Table 1: Fleet composition (number of vessels by gear type and size and how this has changed by year).

Year	Vessels that actively fished			
	Gear 1	*Gear 2*	*Gear 3*	*Gear 4*
year	*No of vessels (total tonnage)*	*No of vessels (total tonnage)*	*No of vessels (total tonnage)*	*No of vessels (total tonnage)*
year	*No of vessels (total tonnage)*	*No of vessels (total tonnage)*	*No of vessels (total tonnage)*	*No of vessels (total tonnage)*

Table 2: Summary table of gear effort (unit).

Year	Sub-areas for reporting catch and effort data								
	1	2	3.a	3.b	4	5	6	7	8
year									
year									

Note: please provide one table for each gear/fishery and specify the unit used (e.g. Mid water trawl, hours trawled)

Table 3: Summary table of gear catches (unit)

Year	Sub-areas for reporting catch and effort data								
	1	2	3.a	3.b	4	5	6	7	8
year									
year									

Note: please provide one table for each gear/fishery and specify the unit used (e.g. Mid water trawl, tons)

Catch, effort and CPUE summaries

Table 4: Catch (Kg) by species for main target, bycatch, associated and depended species (R-retained and D-discarded)

Year	*Species 1*		*Species 2*		*Species 3*		*Species 4*		*Species 5*		*Others*		Total	
	R	D	R	D	R	D	R	D	R	D	R	D	R	D
year 1														

year 2														

Fisheries data collection and research activities

Brief description of the fisheries data collection systems implemented, and the research and assessment activities conducted, including:

- Description of the statistical data collection systems in use, and how these have changed or been improved over the past year. If fisheries need to be separated, *please provide a table for each fishery*.

Table 5: Details on the scales and resolutions of the fishery data collection

	fishery/gear data collection items			
Year	tow / set (*individual or some aggregation*)	time scale (*set-tow hauling time, daily, etc.*)	spatial scale (*tow/set exact position or grid, please provide grid resolution*)	species details (*any aggregation or species grouping*)
Year				
Year				
Year				
Year				

Note: please provide one table for each gear/fishery if data collection modes differ.

VME Thresholds

(for bottom fishing activity only)

- Describe threshold levels for encounters with VMEs and any move-on protocols

Table 6: Threshold levels for encounters with VMEs and move-on protocols

Gear/fishery	Threshold (kgs)	Move-on protocols
Gear1		
Gear2		
…		

- For operations that exceeded the pre-determined VME threshold, provided details of the VME taxa observed including (wet) weight, number of taxa, the corresponding effort information and total weight of catch of the operation; and any action taken in respect of the relevant site.

Table 7: Summary VME Taxa (wet) weight (kg), operations exceeding thresholds and effort: *gear type identified, 1 table per gear*

Year	Unit	Sub-areas for reporting catch and effort data								
		1	2	3.a	3.b	4	5	6	7	8
year [Nº of taxa]	Weight (kg)									
	Nº Operations									
	Effort (Tables 2.1..)									
	Weight (kg)									

year [Nº of taxa]	Nº Operations									
	Effort (Tables 2.1..)									

- It is desirable for the SC to report any VME taxa caught during fishing operations as recorded in the logbooks

Table 8: VME taxa bycatch quantities per gear from logbooks data (specify taxa and units)

		gear1/fishery1	gear2/fishery2	
	total set/tow number			
taxa	taxon 1 (unit)			
	taxon 2 (unit)			
	taxon 3 (unit)			
	…			

Summary of observer and port sampling programs

- Information on observer programme design and coverage rates achieved and the type of data collected. (table 9)
- Information on the level of observer coverage and focus on recording bycatch of seabirds, marine mammals, reptiles and other species of concern. (table 9)

Table 9: Observer program design and coverage summary table

	trips coverage (%)	total no of sets/hauls	no of sets/hauls covered	within set/haul coverage (%)	incidental bycatch (bird, mammal) observation coverage (% set/haul)
gear1/fishery1					
gear2/fishery2					
gear3/fishery3					

- Reporting of observed bycatch by species and fishery for all seabirds, marine mammals, reptiles and other species of concern. (table 10)

Table 10: Reporting of observed bycatch

bycatch	gear1/fishery1	gear2/ fishery2	gear3/ fishery3
seabird	*occurrence number*	*occurrence number*	*occurrence number*
mammal	*occurrence number*	*occurrence number*	*occurrence number*
sharks (not retained)	*occurrence number*	*occurrence number*	*occurrence number*
VME taxon 1 (unit)	*quantity*	*quantity*	*quantity*
VME taxon 2 (unit)	*quantity*	*quantity*	*quantity*
other			

SECRETARIAT HISTORICAL DATA HOLDINGS and GAPS Vs CPs DATA COLLECTION

Introduction

SC4 instructed the Secretariat to provide a more detailed data holding inventories than the one below that was presented during day 1 of SC4.

Addition of the data collection status and spatial accuracy within each CP fisheries would help understanding where the data gaps are and what is possible to do. A gear analysis would also be added as the data status may vary between fisheries of the same flag.

The summaries tables below have been possible thanks to the CP that provided general information to the Secretariat about the data they collect from their fisheries.

Legend/colour codes used in the tables 1-2-3

spatial resolution	value-color	
no data provided	999	no reporting to SIOFA
NF	0	no fishing
no data	2	no data available / data not collected / data lost
FAO area	3	FAO area 51 or 57
1°	4	1-degree grid
30'	5	30-minutes grid
20'	8	20-minutes grid
1'	9	1-minute grid
tow-by-tom or set-by-set	10	tow by tow / set by set

1. Longline gear data

1.1. Collection of longline data within CP

Table 1.1

Year	AUS	EU-FR	EU-SP	FR-OT	JPN	KOR
2000	0	2	0	0	0	0
2001	0	2	0	0	0	3
2002	0	2	0	0	0	3
2003	0	2	10	0	0	3
2004	0	8	10	0	4	0
2005	0	8	10	0	4	0
2006	0	8	10	10	4	0
2007	0	8	10	10	4	0
2008	10	8	10	10	4	0
2009	0	8	10	10	4	10
2010	0	8	10	10	10	10
2011	0	8	10	10	0	10
2012	0	8	10	10	0	10
2013	0	8	10	10	10	10
2014	0	8	10	10	0	0
2015	10	8	10	10	0	0
2016	10	8	10	10	0	0
2017	0	8	10	10	10	0

1.2. Longline data submitted by CP to Secretariat databases

Table 1.2

Year	AUS	EU-FR	EU-SP	FR-OT	JPN	KOR
2000	0	2	0	0	0	0
2001	0	2	0	0	0	3
2002	0	2	0	0	0	3
2003	0	2	10	0	0	3
2004	0	4	10	0	4	0
2005	0	4	10	0	4	0
2006	0	4	10	10	4	0
2007	0	4	10	10	4	0
2008	10	4	10	10	4	0
2009	0	4	10	10	4	3
2010	0	4	10	10	4	3
2011	0	4	10	10	0	3
2012	0	4	10	10	0	3
2013	0	4	10	10	4	3
2014	0	4	10	10	0	0
2015	10	4	10	10	0	0
2016	10	3	10	10	0	0
2017	0	8	10	10	4	0

2. Trawl data

2.1. Collection of trawl data within CP

Table 2.1

Year	AUS	COOK	EU-SP	JPN	KOR	THA
2000	10	0	0	0	3	0
2001	10	0	0	5	3	0
2002	10	0	0	5	0	0
2003	10	10	0	5	0	0
2004	10	10	0	0	0	0
2005	10	10	0	0	0	0
2006	10	10	0	0	0	0
2007	10	10	0	0	0	0
2008	10	10	0	0	0	0
2009	10	10	0	5	3	0
2010	10	10	0	5	0	0
2011	10	10	0	5	10	0
2012	10	10	0	5	10	0
2013	10	10	0	5	10	0
2014	10	10	0	5	0	0
2015	10	10	0	5	0	4
2016	10	10	0	10	0	4
2017	0	10	0	10	0	4

2.2. Trawl data submitted by CP to Secretariat databases

Table 2.2

Year	AUS	COOK	EU-SP	JPN	KOR	THA
2000	10	0	0	0	0	0
2001	10	0	0	4	0	0
2002	10	0	0	4	0	0
2003	10	9	0	4	0	0
2004	10	9	0	0	0	0
2005	10	9	0	0	0	0
2006	10	9	0	0	0	0
2007	10	9	0	0	0	0
2008	10	9	0	0	0	0
2009	10	9	0	4	3	0
2010	10	9	0	4	0	0
2011	10	9	0	4	3	0
2012	10	9	0	4	3	0
2013	10	9	0	4	3	0
2014	10	9	0	4	0	0
2015	10	9	0	4	0	4
2016	10	9	0	4	0	4
2017	0	9	0	4	0	4

3. Other gears (gillnet, seine/trap, trap/line)

3.1. Collection of other gear data within CP

Table 3.1

Year	EU-SP	FR-OT	THA
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	10	0
2007	0	10	0
2008	0	10	0
2009	0	10	0
2010	0	10	0
2011	0	10	0
2012	0	10	0
2013	10	10	0
2014	10	10	0
2015	10	10	4
2016	0	10	4
2017	0	10	4

3.2. Other gear data submitted by CP to Secretariat databases

Table 3.2

Year	EU-SP	FR-OT	THA
2000	0	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	10	0
2007	0	10	0
2008	0	10	0
2009	0	10	0
2010	0	10	0
2011	0	10	0
2012	0	10	0
2013	10	10	0
2014	10	10	0
2015	10	10	4
2016	0	10	4
2017	0	10	4

Conclusions

These tables may be used to:

- improve the SIOFA fisheries database with CP providing the Secretariat with more accurate information to achieve the objectives of the Agreement.

- agree on what data and scale could be used to draft a SIOFA fishing footprint map.

Overview of SIOFA Fisheries 2018

Introduction

The information presented below has been extracted from the different reports submitted to Scientific Committees (SC2, SC3 and SC4). Where the information from the national reports is insufficient, data has been extracted from SIOFA databases.

The figures are incomplete as not all 2018 statistical data are available at the date of building this draft (March 2019). The deadline for the data submission to SIOFA Secretariat is 31st May 2019.

Active Fleet Composition

Table 1: Summary of active vessel operating by flag/gear and by year in the SIOFA area

		Year						
Flag	**Gear**	2012	2013	2014	2015	2016	2017	2018
AUS	Multipurpose	0	0	0	1	1	0	0
	Longlines	0	0	0	0	0	0	1
	Trawls	1	1	1	0	0	0	0
COOK	Trawls	2	2	2	2	2	2	2
EU-FR	Longlines	2	2	1	0	1	1	0
EU-SP	Gillnets	0	1	1	1	0	0	0
	Longlines	0	0	0	1	1	1	2
F-OT	Pots/Traps	0	0	0	0	1	0	1
	Longlines	2	2	2	2	0	2	0
JPN	Longlines	0	1	0	0	0	1	0
	Trawls	2	2	1	2	2	2	1
KOR	Longlines	1	3	0	0	0	0	0
	Trawls	1	1	0	0	0	0	0
MUS		?	?	?	?	?	?	?
SYC		0	0	0	0	0	0	0
THA	Pots/Traps	0	0	0	1	1	1	0
	Trawls	0	0	0	56	60	13	0
participating non contacting parties								
COM**	Handlines							2
non contracting parties								
CHN*	Longlines	17	3	0	0	0	0	0
	Seine nets	0	0	6	6	8	5	0
	Total	28	18	14	72	77	28	7

* China as a non-contracting party

** Comoros as a participating non-contracting party

? no information provided

Note: Thailand fleet was mainly composed of small tonnage vessels. Comoros fleet is composed of 2 mother vessels for a fleet of many small boats operated by 2-3 fishermen.

Main fisheries operating in the SIOFA area

Table 2. SIOFA fisheries

Key species	Gear	Participants (reported in national reports between 2000 to 2018)	SIOFA Sub-area
Patagonian toothfish	Demersal longline Traps	EU-Spain, France (Territories), Japan, Korea	7 +++
Orange roughy	Demersal trawl	Australia, Cook Islands, China (2000-02)	Associated with seafloor features
Alfonsino	Midwater trawl	Australia, Cook Islands, Japan, Korea	Associated with seafloor features
Sauries and scads	Demersal trawl Traps	Thailand	8, Saya de Malha Bank
Shallow-water (<200m) snappers, emperors and groupers	Demersal longline Hook and line Demersal trawl Traps	EU-France Mauritius Seychelles (?) Thailand	8, Saya de Malha Bank
Deeper water snappers, lutjanids, Hapuku	Demersal longline Dropline	Australia China EU	
Deepwater sharks – Portuguese dogfish	Demersal gillnet Demersal longline	EU-Spain	
Mackerel and *Brama* spp	Purse seine with lights	China	
Squid	Jigs	China (authorised since 2003 but no fishing)	Not applicable as no fishing

Fishing Effort

Table 3. Gear related fishing effort by country and year.

			Year						
Flag	**Gear**	**Effort unit**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
AUS	Trawl	hours	252	62	106	15	26	0	0
	Longline	x1000 hooks	0	0	0	2	40	0	28
COK	Trawl	shots	1781	1601	1971	2729	1985	2230	1667
EU-ESP	Gillnet	Km	0	5442	5000	1200	0	0	0
	Longline	x1000 hooks	0	0	0	2300	3200	3200	4940
EU-FRA	Longline	x1000 hooks				0	np	np	0
FR-OT	Longline	sets	89	126	103	66	13 (VL)	33	30 (VL)
	Longline	x1000 hooks	503	731.9	634.6	443.5	1.2	150.7	2.6
	Pot/Trap	number					40		50
JPN	Trawl	hours	520	1000	750	2250	2500	3250	?
	Longline	x1000 hooks		96				64	?
KOR	Longline	hooks	2193	1023	0	0	0	0	0
	Trawl	hours	623	233	0	0	0	0	0
MUS			?	?	?	?	?	?	?
SYC	*no fishing*		0	0	0	0	0	0	0
THA	Trawl	shots	0	0	0	4090	4552	795	0
	Pot/Trap	number	0	0	0	0	8	10	0
participating non contacting parties									
COM	Handline								?
non contracting parties									
CHN	Seine net	hours	0	0	4500	10000	4000	300	0
	Longline	x1000 hooks	5010	2050	0	0	0	0	0
TOTAL	longline *	hooks (x1000)	7203	3169		2302	3240	3264	4971
	trawl **	shots	3176	2896	2827	9084	9063	6275	1667
		hours	1395	1295	856	2265	2526	3250	

* does not include potential hooks number from sets

** total trawl effort must take into account both shots number and hours.

? no information provided

Note: 2018 fishing effort are underestimated as some figures and information have not been provided.

Total catches

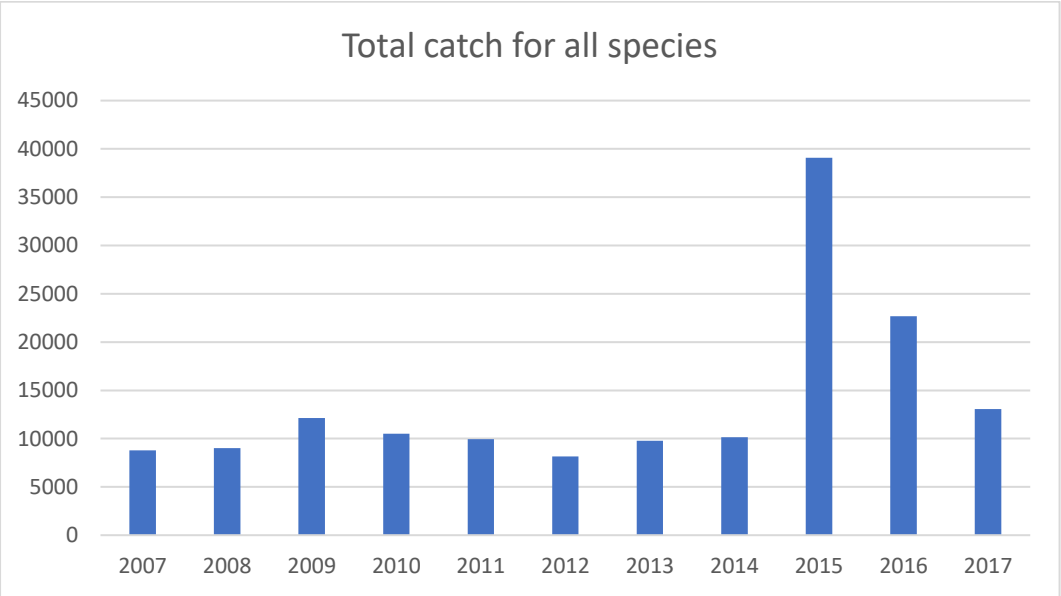


Figure 1: total yearly catch (tonnes) in SIOFA area

High figures in 2015, 2016 and 2017 are explained by the new entry of Thailand as Contracting Party in the Agreement. Thailand catches were mostly made from squads (*Decapterus sp*.) and lizardfish (*Saurida sp.*).

Catch Composition

The catch of trawl vessels is predominantly alfonsino (figure 2) and orange roughy (figure 3). Species also caught by trawling include pelagic armourhead, bluenose warehou, violet warehou, ocean blue-eye trevalla and oreo dories, cardinal fish, hapuku wreckfish.
The addition of Thailand's fishery added Lizardfish and scads as a major catch from small trawlers since 2015.

The catch of longline vessels differs between two groups. There are longline vessels (reported by Japan, Korea and France Overseas Territories) that catch Patagonian toothfish (figure 4) and associated species such as blue antimora.
The other longline vessels catch hapuku wreckfish and ocean blue-eye trevalla, pelagic armourhead, deep-water sharks (Squalidae), alfonsino, rubyfish and common mora.

The catch of the gillnet vessels was predominantly deep-water sharks (Squalidae, figure 5).

China's light seining fishery is targeting mackerel and Brama species (such as Brama japonica) and its bottom longline fishery is targeting ruby snapper and other species in the Lutjanid family.

Alfonsinos (*Beryx sp.*)

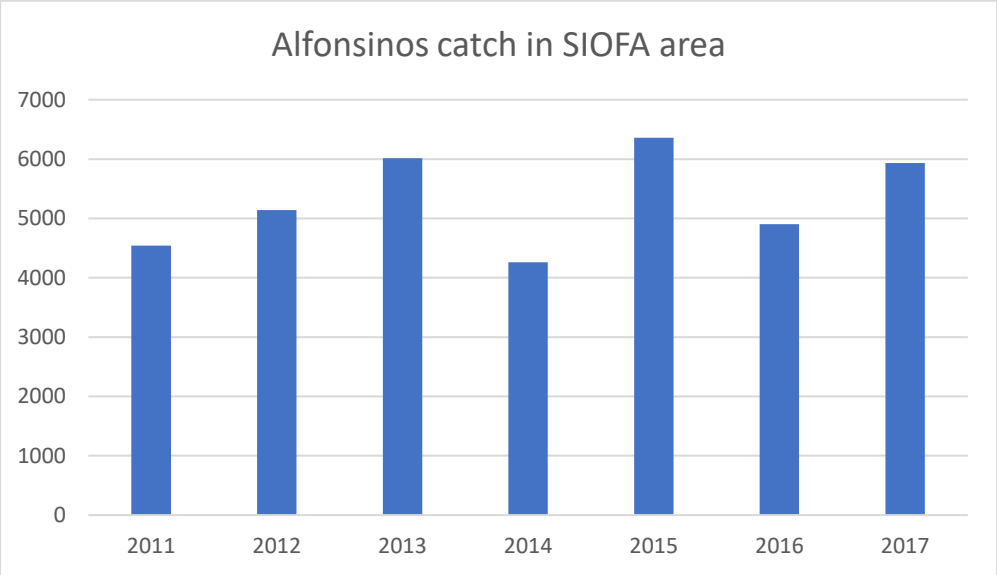


Figure 2: yearly catch of alfonsinos (tonnes)

Orange roughies (*Hoplostethus atlanticus*)

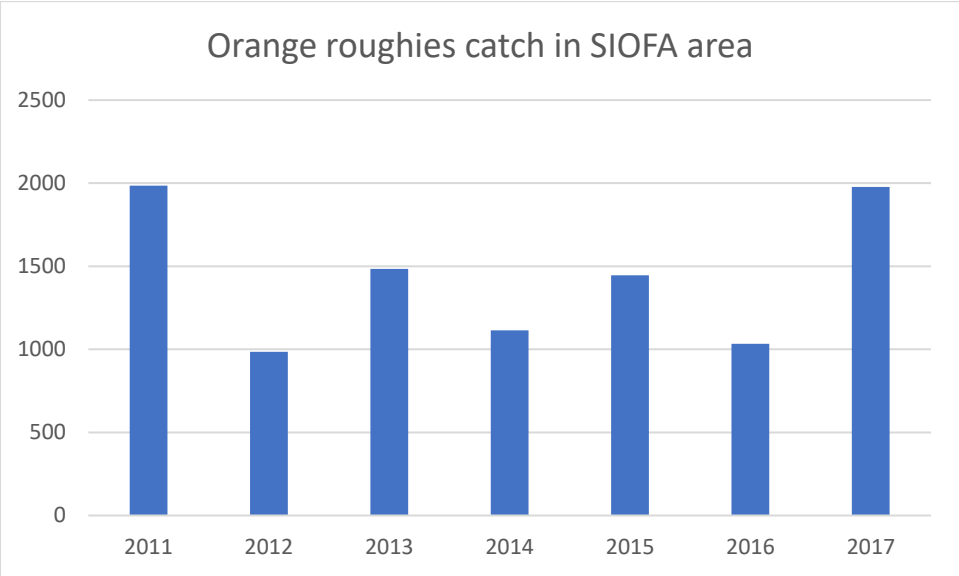


Figure 3: yearly catch of orange roughies (tonnes)

Patagonian toothfish (*Dissostichus eleginoides*)

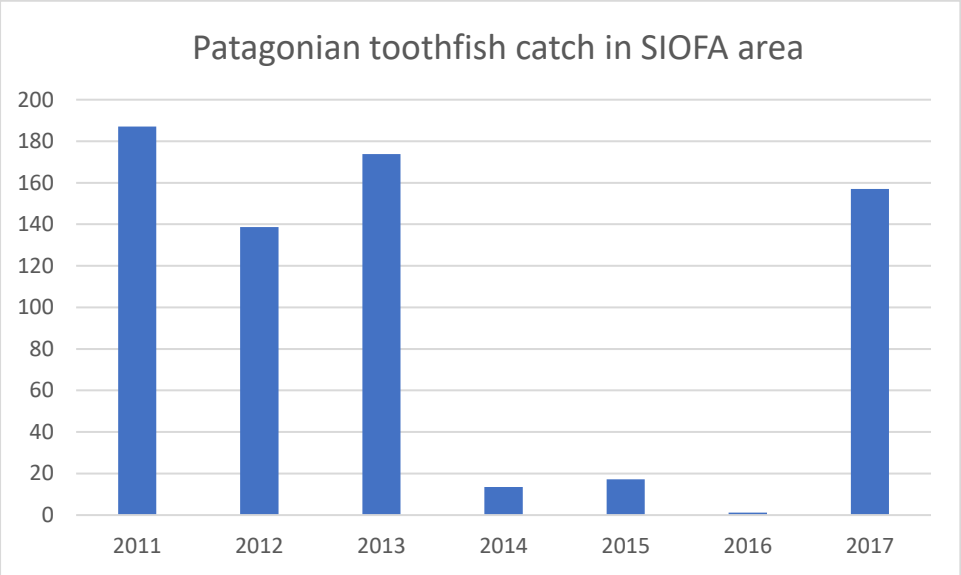


Figure 4: yearly catch of Patagonian toothfish (tonnes)

Deep-water sharks

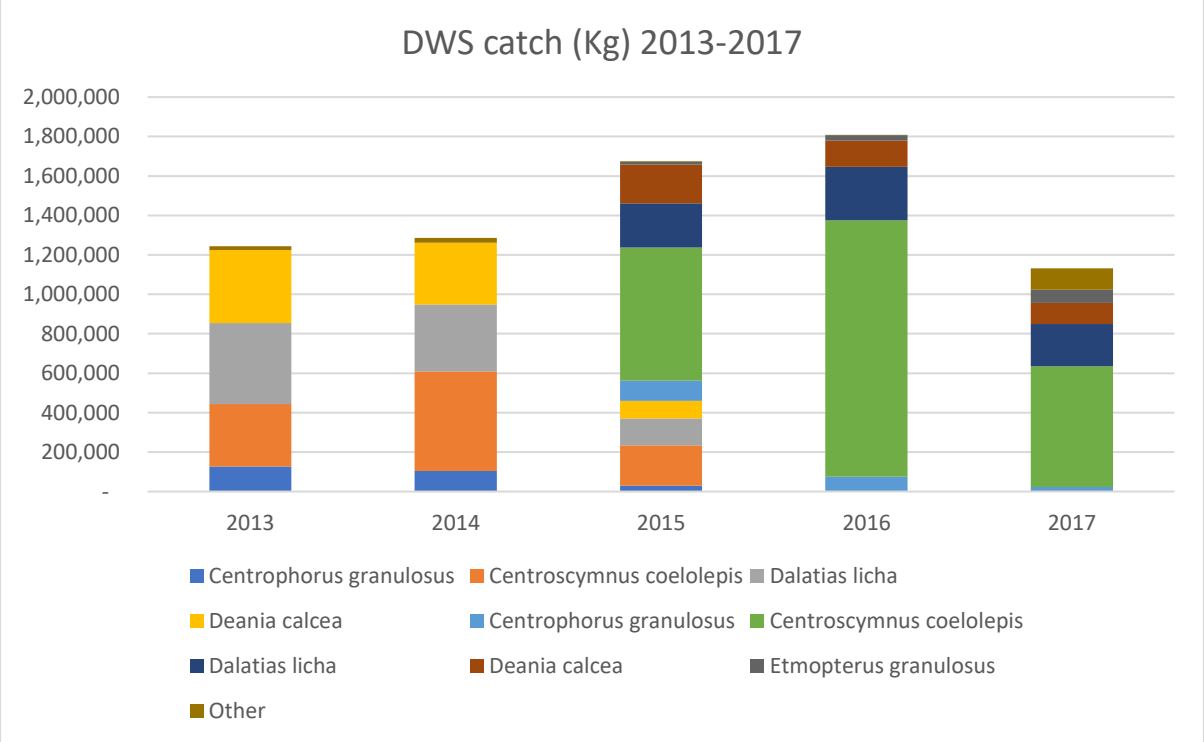


Figure 5: Yearly catch of deep-water sharks (Kg)

Vulnerable Marine Ecosystems (VME)

One of the tools SIOFA implements to manage impacts on Vulnerable Marine Ecosystems (VME) from fishing is the application of move-on rules when thresholds of VME indicators are reached. The table below provides a summary of the thresholds and move-on rules applied by each Flag.

Flag	Threshold	Response and Management	Encounter
COK	Trawl tow, the presence of more than 60 kg of live coral and/or 400 kg of live sponge. If any subsequent trawl within 1nm of the encounter trawl contains more than 30 kg of live coral/and or 200 kg of live sponge	Reported to Cook Islands within 24 hrs of encounter The vessel must not fish within 5nm of that area until the Ministry of Marine Resources has completed an investigation. However, if the vessel deploys an underwater camera system on the trawl net, and the Cook Islands Observer verifies that no substantial VME structures are present, fishing can continue.	No threshold breached out of 627 bottom trawls in 2018
KOR	The threshold for all bottom fishing vessels: >60kg of coral per set or over 800kg of sponges per set.	If the amount of VME that exceeds the weight specified in the criteria, the vessel shall apply a 2 nautical miles move-on rule to resume its fishing operation. The vessel shall relocate its fishing position until it reaches a point where no VMEs are confirmed.	no fishing in 2018
AUS	Trawl > 50 kg of corals or sponges in a shot for trawlers Line >10 kg of corals or sponges per 1000 hooks or 1200 metre section of line (whichever is shorter)	In the SIOFA area of waters (a)if the combined catch of coral or sponge in any one trawl shot exceeds 50kgs the holder must cease fishing within an area two nautical miles either side of the trawl track extended by two nautical miles at each end of the trawl track; or (b)if the combined catch of coral or sponge in any one shot for line method exceeds 10kgs for any 1000 hook section of line or a 1200 metre section of line, whichever is the shorter; the holder must cease fishing within a radius of one nautical mile from the midpoint of the line segment. The holder most not fish in that area using the same method as used for that shot that triggered the limit until AFMA notifies otherwise. In the SIOFA area of waters if a vessel exceeds the catch limit for coral and sponge then as soon as practicable, but in any event no later than 24 hours after the shot, the concession holder must notify AFMA's Service One section. The notification must include details of the shot including the location.	According to logbook data, no thresholds were triggered by any Australian-flagged vessels in 2018.
JPN	Following Article 11 CMM 2016/01, Japan temporally establishes threshold levels for encounters with VMEs and move-on protocols. For trawl fisheries, as they operate in the mid-water, no threshold levels have been established.		No threshold triggered in 2018

Flag	Threshold	Response and Management	Encounter
	For the bottom longline fisheries, Japan applies those used in CCAMLR.		
EUS	The EU-Spain bottom longline fleet is applying the rules adopted by the Fishing Administration, like those applied in SEAFO and CCAMLR in the definition of the VME encounter and thresholds, together with the protocols adopted in the CMM 2016-01.	1- Quantify the species of the VME indicator, that is, sea pens, coral and sponge. 2- If the number of VME indicators exceeds the limits indicated above per set of fishing: 2.1- According to Annex 1 of CMM 2018-01, it will indicate the incident to the General Secretariat of Fisheries. 2.2- According to point 12 of CMM 2018-01, you will stop fishing and will be separated at least 1 nautical mile from the midpoint of the operation, in the direction least likely to lead to an additional encounter. The captain will use his best judgment based on all available sources of information. "	1.2 Kg max bycatch caught on longlines in 2018 No threshold triggered
THA	Bottom trawl: sponges >700 Kg, corals >60 Kg per operation Longline: 10 Kg sponges or corals / per 1000 hooks or per 1,200 meters Trap: >10 Kg sponges or corals	1.Stop fishing operations and move: -for bottom trawl: at least 2 nautical miles from area, -for longline: at least 1 nautical mile away from centre of line segment, -for traps: at least 1 nautical mile away from the area. 2.Report to Department of Fisheries within 24 hours	No record from fishing logbook or observer report that fishing activities encountered Endangered, Threatened or Protected (ETP) species or marine mammals, corals or sponges.
ATF	Ref. CCAMLR protocol.	Ref. CCAMLR protocol. Vessel must collect and retain all benthic organisms for each segment in numbered buckets, those buckets will be made available for observers. The Fishing observers reports all the VME observation in the digital logbook.	No interactions with threatened, endangered and protected species were reported in 2018.

Observers and port sampling programs

SIOFA requires its members to implement Scientific Observer programs.
Table 4 provides a summary of the observer programs implemented by each Flag and information on port sampling.

Table 4. Summary of Observers and Ports Sampling programs in 2018.

Flag	Item	Description
Australia	Coverage	All observer coverage requirements were met during 2018 (trawl: 100%,
	Training	AFMA recruits and trains the observers. 16 trained observers
	Collection	2018 report not yet available
	Port sampling	Australia does not have a port sampling program for vessels that fish in the SIOFA Area.
Cook is.	Coverage	100% on Cook vessel. Visas constraint for Pacific Islands observers to reach South Africa
	Collection	
	Port sampling	Port Sampling by MMR Fisheries Officers may commence in 2018 or 2019 in Port Louis, Mauritius
	Training	7 high experienced observes could benefit the SIOFA trawler cross-endorsement training.
EU France		*no fishing in 2018*
EU Spain	Training	The scientific observers (Biologists or Marine Science degree) are part of the personnel trained at the Instituto Español de Oceanografía; specific training is also adapted for all fleets that are monitored.
	Collection	Reports on the scientific observations were prepared and provided to SIOFA Secretariat, and also information on toothfish fishery tag recovering were delivered
	Coverage	72% for one vessel and 100% for the other
	Port sampling	EU Spain do not have a port sampling program for vessels fishing SIOFA species.
French Territories	Port sampling	Landed boxes of catch are weighted in port
	Coverage	100% of longline, 100% catch/bycatch, 25% sampling.
	Collection	Data collected are sent to MNHN weekly for verification
	Training	All observers receive a 2 weeks training at MNHN on observation protocols, identification and sampling. Another week of training at TAAF on legal matters.

Flag		Description
Japan	Training	Training provided annually since 2016.
	Collection	According to CMM2018/02 for trawl fisheries. Use CCAMLR template for longline fisheries.
	Coverage	Started in January 2017. 100% coverage.
	Port sampling	No port sampling program.
Korea		*no fishing in 2018*
Mauritius		*no information provided*
Thailand	Training	Training provided according to FAO guideline. 22 observers trained for SIOFA area
	Coverage	5% of tows
	Collection	
	Port sampling	All landings are monitored, fish identified by sampling. Declaration checked against the samples
Seychelles		*no fishing in 2018*

FAO species codes and alternative names used by members of the Scientific Committee

FAO common name	FAO code	Scientific name	Alternative common name
Alfonsinos	ALF	*Beryx* spp.	Alfonsino
Splendid alfonsino	BYS	*Beryx splendens*	Alfonsino
Bluenose warehou	BWA	*Hyperoglyphe antarctica*	Blue-eye trevalla, Antarctic butterfish
Orange roughy	ORY	*Hoplostethus atlanticus*	
Violet warehou	SEY	*Schedophilus velaini*	Indian Ocean trevalla
Pelagic armourhead	EDR	*Pentaceros richardsoni*	Southern boarfish
Patagonian toothfish	TOP	*Dissostichus eleginoides*	
Common mora	RIB	*Mora moro*	Ribaldo
Wreckfish	WRF	*Polyprion americanus*	*Centroscymnus coelolepis*
Portuguese dogfish	CYO		
Hapuka	HAU	*Polyprion spp.*	Antarctic butterfish (Japan?)
Rubyfish	RYG	*Plagiogeneion rubiginosum*	
Plagiogeneion spp.		Rubyfish	
Smooth oreo dory	SSO	*Pseudocyttus maculatus* *Neocyttus rhomboidalis*	
Spiky oreo	ONV		
Blue antimora	ANT		
Hapuku wreckfish	WHA	*Polyprion oxygeneios*	Hapuku
Cardinalfishes nei	APO	*Apogonidae*	
Cardinal fishes nei	CDL	*Epigonidae*	Deepwater cardinalfishes
Oreo dories nei	ORD	*Oreosomatidae* *Helicolenus dactylopterus*	*Saurida undosquamis*
Blackbelly rosefish	BRF		
Lizardfish	SZX	*Saurida spp.*	
Scads	SDX	*Decapterus russelli*	Round scad
Ruby snapper	ETC	*Etelis coruscan*	

SIOFA Scientific Committee Work Plan

Updated at SC4

The SIOFA Scientific Committee (SC) Work Plan provides the overarching plan to guide the SC in providing advice to the Meeting of the Parties (MoP). The SC Work Plan is required under the
SC Terms of Reference and needs to be provided to the Meeting of the Parties. The SC Work Plan, including work undertaken as part of the associated Research Priorities Plan and Operational Work Plan, will be undertaken in accordance with articles 7(1)(a) and 7(1)(b) of the SIOFA Agreement.

This SC Work Plan is intended to ensure scientific rigour is applied to scientific decision making processes in SIOFA. The Work Plan is supported by a Research Priorities Plan and an Operational Work Plan.

The timeframe for the SC Work Plan is 3-5 years and it will be reviewed annually in accordance with the SC Terms of Reference.

Scientific Committee Work Plan themes

At SIOFA 1, the Meeting of the Parties agreed that the Scientific Committee's Work Plan should include, but not be limited to, the following priority 'themes':

- Scientific data standards for the collection, reporting, verification and exchange of data
- Advice on vulnerable marine ecosystems
- Current and historical status of fishing activities
- Stock assessments
- Advice on the impacts of fishing on associated and dependent species
- Climate change impacts on fishery resources and ecosystems
- Any other advice that the MoP requests.

The SC will adopt these themes as basis for its first work plan.

Additional work of the SC may include:

- contribution to the formulation of Bottom Fishery Impact Assessment Standards (BFIAS) for the SIOFA area
- advice on new and exploratory fisheries;
- advice on the scientific aspects of CMMs.

Themes may be added or removed depending on the objectives of the SC and in response to directions from the MoP and other relevant SIOFA bodies.

SC4 Revision of Activity Budgets - request to MoP6				
Activity	**2019 Remaining Budget**	**Revised at SC4**		
T/S & length relationship for alfonsino (Univ. students) (MoP5 approved)	5,000	5,000		
Analysis of alfonsino acoustic data (MoP5 approved)	10,000	10,000		
Otolith reading, alfonsino and orange roughy (MoP5 approved)	8,000	8,000		
Genetics work to provide equipment for SNP analyses to postgrad student (MoP5 approved)	5,000	5,000		
Stock Assessment consultant alfonsino work (MoP5 approved)	23,000	23,000		
Risk assessment teleosts species caught on Saya de Malha bank (MoP5 approved)	17,000	0		
Review of observer coverage and data standards & template (MoP5 approved)	17,000	0	**Priority**	**Notes**
1. Alfonsino acoustic data additional work ref workplan		30,000	HIGH	1. CMM alfonsino stock assessment. Costing preliminary
2. Development of T+L Reference points and Harvest strategies Year 1 (2 years total 30,000)		15,000	HIGH	2. MoP request
3. Teleosts risk assessment- Technical work to udpate analysis and input data to online ERA tool		10,000	HIGH	3. Cost effective to inform management on other teleosts species inc. SdMB
4. BFIA Trawl and Longline consultancy - [3 months trawl 2 months longline]		66,900	HIGH	4. CMM - Contribution to footprint
5. EMS Efficiency & Capacity - 20 days + Meeting presentation		15,000	Medium	5. Adopted guidelines - first proposal
6. VME habitat mapping (12 months + meeting particpation)		120,910	HIGH	6. CMM requirement, assessment of SIA, contrubte to protected Area protocol
7. Bio-regionalisation (12 months + meeting particpation)		120,910	Medium/Low	7. Links to protocol for protected Areas - already started first steps
8. EU Voluntary fund (60k limit) - match funding for additional work contributing to SC Work Plan		12,000		
Total	*€ 85,000*	*€ 441,720*		
Balance to be requested from MoP6 =		**€ 356,720**	*(441,720 - 85,000)*	

VME habitat mapping workflow proposal

Context

"VME bioindicator species" consist in a series of taxa which presence, according to various observation thresholds (e.g. related to biomass, abundance, functional attributes), is considered as a proxy of presence of Vulnerable Marine Ecosystems (VME) to be protected. VME risk areas consist in areas where VME are likely to occur and may be impacted by a range of different fishing activities.

According to FAO experts recommendations, PAEWG has therefore indicated that VME indicator taxa distribution models in combination with empirical data sets on the known distribution and status of VME indicator taxa would be useful tools to develop in order to map VME risk areas over the SIOFA region.

To develop such tools, datasets about benthic species presence are needed. Datasets may contain data of various quality and sources. A validation process it is therefore essential to check for data quality.

Consolidated datasets can be used for VME indicator taxa modeling using various and robust modeling technics among which Boosted Regression Trees (BRT), Maximum Entropy (Maxent), Random Forest (RF), Ecological Niche Factor Analysis (ENFA), and others to be defined.

Here we provide a workflow that attempts to describe necessary steps towards development of robust VME taxa habitat models.

Data type

There are two types of data needed:

- Taxa occurrences (absence and presence) ;
- Environnemental enveloppe.

Data sources

1- Taxa presence and absence may be obtained from Contracting Parties (CP), Global Biodiversity Information Facility (GBIF) and from researchers that have been involved in research cruises in SIOFA region.

- CP will provide taxa identified at coarse taxonomical level, at least at the level of the list of VME taxa provided by SC-SIOFA.
    - Presence data
    - Absence data
- GBIF contains taxa identified by experts at very fine taxonomical level (species).
    - Presence data only
- Researchers need to be identified and contacted for access to their databases. They may provide taxa identified at fine taxonomical level (catches) and morphospecies (equivalent to taxa identified at coarse taxonomical level) identified from video transects
    - Presence data

- Absence data

2- Environnemental datasets are available from international databases (see PAEWG-01-12 for details). Other layers may need to be identified and added to the existing layers (e.g. Harris et al. 2014 for geomorphology). Two type of data may be identified :

- Parameters subject to short term variability, including:
  - Sea surface T°
  - Salinity
  - Surface Chlorophyll-a
  - Surface, bottom Current magnitude
  - General current direction
  - Etc
- Parameters with long term stability
  - Bathymetry
  - Rugosity
  - Slope
  - Distance to other terrestrial masses
  - Substratum type
  - Etc

Data verification

- CP VME datasets are deposited into SIOFA databases after Member flags have consolidated the data and has transmitted the methods by which the data has been checked.
- GBIF data can be easily sourced to original depositary (e.g. Natural History Museums) and expert name.
- Researcher datasets is directly sourced to individual experts.
- Video transects analysis are alsodirectly sourced to individual experts.
- Taxonomy can easily be checked using World Register of Marine Species WORMS).

Modeling

SDM are tools that combine taxa occurrence with environmental parameters. SDM allow for the description of ecological niches of each taxon and for the prediction, given environmental parameters, of taxa presence probability in unsampled areas. Communities may also be modelled. SDM predictions, cluster analysis, or relevant dedicated techniques may be used.

- Tools for presence/absence data
  - BRT
  - RF
  - ENFA
  - GDM (for communities)
  - Etc
- Requirements
  - Set spatial scale
  - Set spatial grain (size of pixel i.e. spatial statistical unit)
  - Sampling of pseudo absence data if necessary

- Model selection
  - AIC
  - Bayesian methods
  - etc
- Model evaluation
  - AUC
  - SiH (for clusterisation of SDM predictions)
  - etc
- Uncertainty
  - Can be corrected in the model
  - Or simply projected onto a map

Time Line

Activity	CP	Jan	Feb	Mar	Apr	May	June
Data Collation	EU/France-OT	++	++	++	++	++	
Model Development	EU/France OT			++	++	++	++
Maps	EU/France-OT						
Meeting PAEWG					++		
Data Collation	EU/France-OT	July	August	Sept	Oct	Nov	Dec
Model Development	EU/France OT						
Maps	EU/France-OT	++	++	++	++		
Maps	EU/France-OT		++	++	++	++	++
Meeting PAEWG						++	

The work plan include two meeting of 3 days during the project for 3 persons during

VME Mapping cost

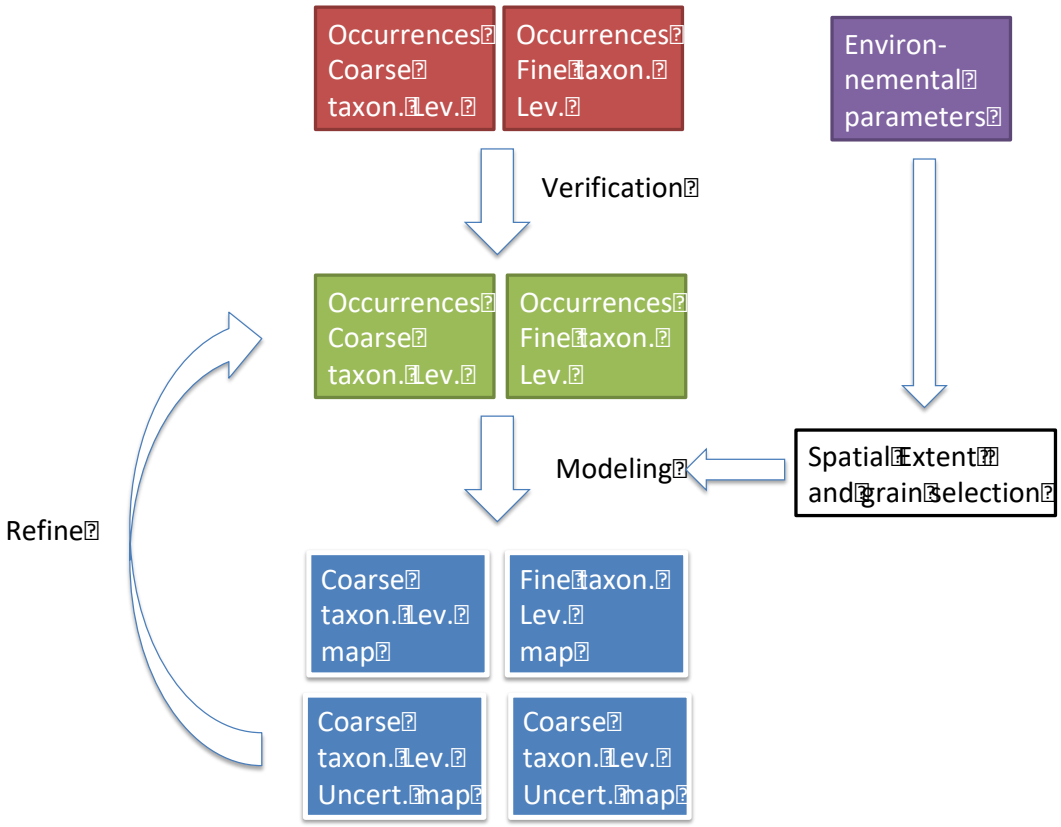
SC ACTIVITY – VME Mapping		
Daily consultant rate (High, Medium or Base)	**395,55 €**	*
Max number of days (inc. meeting and travel days)	**269**	
Consultant costs	***106 402,95 €***	
Travel costs (if applicable)		
Maximum flight costs	**12 000,00 €**	
Travel/meeting days	**9**	
UN DSA day rate including accommodation	**278,64 €**	**
Travel costs	***14 507,79 €***	
Outsourcing costs		
Outsource cost 1: *identify*	**0,00 €**	
Outsource cost 2: *identify*	**0,00 €**	
Outsourcing costs	***0,00 €***	
Total Maximum Budget	**120 910,74 €**	

References

Delegations of France (Territoires) and Australia (2019) Spatial and biophysical analysis of the SIOFA area as a background to complement the Benthic Protected Area Designation Protocol. First Meeting of the Protected Areas and Ecosystems Working Group (PAEWG1), 18-19 March 2019, Yokohama, Japan.

Harris, P. T., Macmillan-Lawler, M., Rupp, J., & Baker, E. K. (2014). Geomorphology of the oceans. *Marine Geology*, *352*, 4-24.

Annex 1 – VME mapping workflow



SIOFA VME indicator taxa

Chemosynthetic organisms (CXV) (no taxa specified)

Cnidaria (CNI), which can be, if possible, detailed in recording as: Gorgonacea (GGW) (Order), Anthoathecatae (AZN) (Order), Stylasteridae (AXT) (Family), Scleractinia (CSS) (Order), Antipatharia (AQZ) (Order), Zoantharia (ZOT) (Order), Actiniaria (ATX) (Order), Alcyonacea (AJZ) (Order), Pennatulacea (NTW) (Order)

Porifera (PFR), which can be, if possible, detailed in recording as: Hexactinellida (HXY) (Class), Demospongiae (DMO) (Class)

Ascidiacea (SSX) (Class)

Bryozoans (BZN) (Phylum)

Brachiopoda (BRQ) (Phylum)

Pterobranchia (HET)

Serpulidae (SZS) (Family)

Xenophyophora (XEF) (Phylum)

Bathylasmatidae (BWY) (Family)

Stalked crinoids (CWD) (Class)

Euryalida (OEQ) (Order)

Cidaroida (CVD) (Order)

SIOFA area bioregionalisation workflow

Context

PAEWG has recognised the usefulness of bioregionalisation approach to help in the design of Protected Areas in the SIOFA area. Bioregionalisation searches for smaller spatial entities within a larger area using a range of environmental information. Ecoregionalisation seeks the same goal using biotic parameters such as Species Distribution Models (SDM).

PAEWG and SC have recommended to further build upon PAEWG-01-12-results to develop a more robust bioregionalisation.

Here we provide a workflow that attempts to describe necessary steps towards development of robust bioregionalisation and ecoregionalisation models.

Data type

There are two types of data needed:

- Taxa occurrences (absence and presence) [and alternatively SDMs as developed in the VME mapping project]
- Environnemental parameters.

Data sources

1a- Taxa presence and absence may be obtained from Contracting Parties (CP) and Global Biodiversity Information Facility (GBIF) and from researchers that have been involved in research cruises in SIOFA region.

- CP will provide taxa identified at coarse taxonomical level, at least at the level of the list of VME taxa provided by SC-SIOFA.
    - Presence data
    - Absence data
- GBIF contains taxa identified by experts at very fine taxonomical level (species).
    - Presence data only
- Researchers need to be identified and contacted for access to their databases. They may provide taxa identified at fine taxonomical level (catches) and morphospecies (equivalent to taxa identified at coarse taxonomical level) identified from video transects
    - Presence data
    - Absence data

1b- Alternatively SDMs as developed in the VME mapping project.

2- Environmental datasets are available from international databases (see PAEWG-01-12 for details). Other layers may need to be identified and added to the existing layers (e.g. Harris et al. 2014 for geomorphology). Two type of data may be identified :

- Parameters subject to short term variability
    - Temperature
    - Salinity
    - Chlorophyll-a
    - Current magnitude
    - General current direction
    - etc
- Parameters with long term stability
    - Bathymetry
    - Rugosity
    - Slope
    - Distance to other terrestrial masses
    - Substratum type
    - Etc

Data verification

- CP datasets are deposited into SIOFA databases after Member flags have consolidated the data and has transmitted the methods by which the data has been checked.
- GBIF data can be easily sourced to original depositary (e.g. Museums) and expert name.
- Researcher datasets is directly sourced to individual experts.
- Video transects analysis are also directly sourced to individual experts.
- Taxonomy can easily be checked using World Register of Marine Species WORMS).
- SDMs having gone through a similar data verification process, no further data consolidation is necessary.

Modeling

- Regions of Common Profile (RCP)
- Clustering approach
    - PCA for data dimensionality reduction
    - Clustering of pixels
        - Supervised
            - K-Means
            - Hierarchical clustering
            - etc
        - Unsupervised
            - Gaussian mixtures
            - etc
    - Model selection
        - Silouhette coefficient
        - Elbow methods
        - etc
    - Model evaluation
        - Confusion matrix
        - etc

Bioregionalisation Time Line

Activity	CP	Jan	Feb	Mar	Apr	May	June
Data Collation	France-OT	++	++	++	++	++	
Model Development	France OT			++	++	++	++
Maps	France-OT						
Meeting PAEWG					++		
Data Collation	France-OT	July	August	Sept	Oct	Nov	Dec
Model Development	France OT						
Maps	France-OT	++	++	++	++		
Maps	France-OT		++	++	++	++	++
Meeting PAEWG						++	

The work plan include two meeting of 3 days during the project for 3 persons during

Bioregionalisation cost

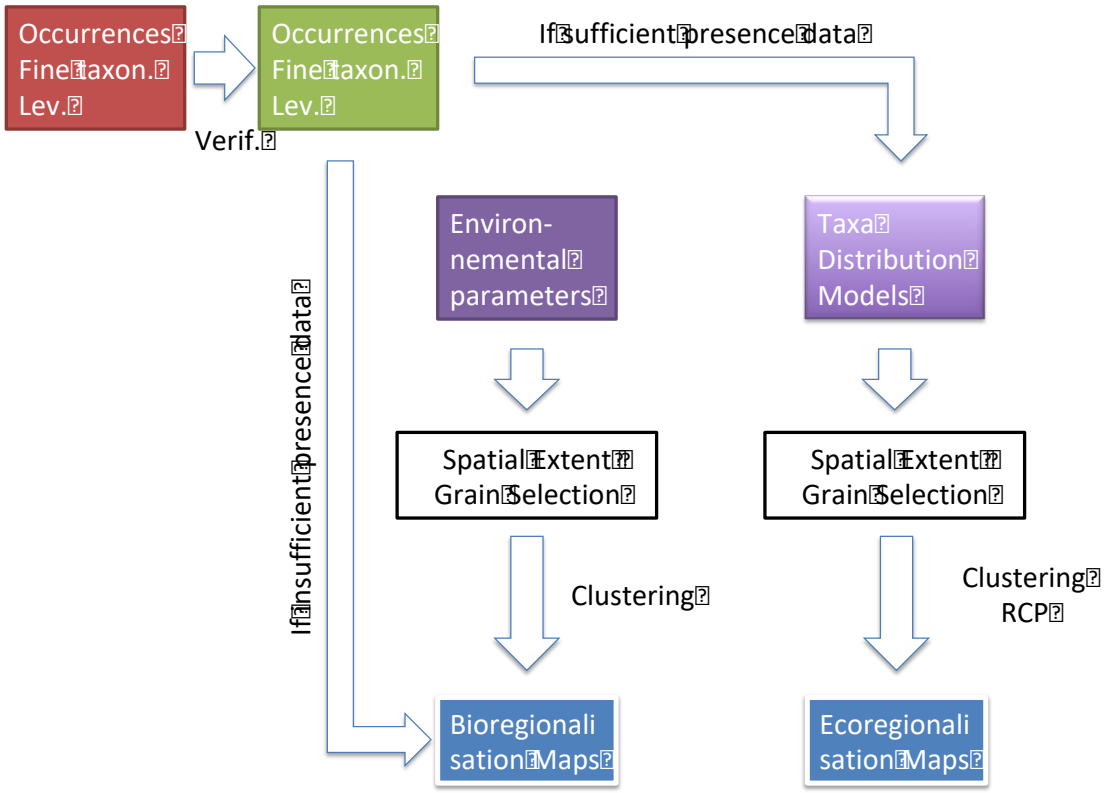
SC ACTIVITY – Bioregionalisation cost		
Daily consultant rate (High, Medium or Base)	**395,55 €**	*****
Max number of days (inc. meeting and travel days)	**269**	
Consultant costs	***106 402,95 €***	
Travel costs (if applicable)		
Maximum flight costs	**12 000,00 €**	
Travel/meeting days	**9**	
UN DSA day rate including accommodation	**278,64 €**	******
Travel costs	***14 507,79 €***	
Outsourcing costs		
Outsource cost 1: *identify*	**0,00 €**	
Outsource cost 2: *identify*	**0,00 €**	
Outsourcing costs	***0,00 €***	
Total Maximum Budget	**120 910,74 €**	

References

Delegations of France (Territoires) and Australia (2019) Spatial and biophysical analysis of the SIOFA area as a background to complement the Benthic Protected Area Designation Protocol. First Meeting of the Protected Areas and Ecosystems Working Group (PAEWG1), 18-19 March 2019, Yokohama, Japan.

Harris, P. T., Macmillan-Lawler, M., Rupp, J., & Baker, E. K. (2014). Geomorphology of the oceans. *Marine Geology*, *352*, 4-24.

Annex 1 – Bio- and Ecoregionalisation worflow



SIOFA Interim standard protocol for future protected areas designation

PROCESS FOR PROPOSAL AND REVIEW

As described in the terms of reference for the Protected Areas and Ecosystems working group (PAEWG, SC3 Report Annex I)

CRITERIA FOR EVALUATING PROTECTED AREA PROPOSALS

1. The objective/s for the protected area is clearly stated and the proposal clearly demonstrates which of the criteria are met.

The proposal should then state which of the following criteria meet the objectives with "the list below having no particular ranking of importance".

2. VMEs are known to occur and/or triggering of VME indicator thresholds reported for the area proposed
    a. Closure may be warranted if there are known or consistent triggering of VME indicator thresholds of CPs, indicating potential VME.
3. Bioregional representation
    a. Area is known to contain unique, rare or distinct, habitats or ecosystems that fishing operations will disturb.
    b. Area with a comparatively higher degree of naturalness due to zero or a low level of human-induced disturbance or degradation from, for example, historical fishing activity.
4. Geographic and/or geomorphological representation
    a. The area provides for important or desirable geographic representation within the SIOFA area
    b. The area proposed is known to contain unique or unusual geomorphological features that fishing operations may damage.
5. Biodiversity representation
    a. The area is known to contain unique or rare (occurring in only a few locations) species, populations or communities.
    b. The area is known to contain a high diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.
    c. The area is known to contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.
6. Scientific interest
    a. The area has scientific research interest associated with understanding ecosystem, biological, geological and biodiversity processes in the SIOFA region.
7. Areas of special significance for threatened or important species or ecosystem properties
    a. There is evidence that the area is of special importance for life history stages of species and/or threatened species.
    b. There is evidence that the area contains habitat for the survival and recovery of endangered, threatened, declining species or is an area with significant assemblages of such species.

Other principles to be considered in formulating recommendations for protected areas

8. Best available information should be used to support protected area proposals and designation. This information should be sufficiently substantiated and/or verified (and preferably provided), for example through the referencing of available literature/research. Mechanisms such as statements and observation made by skippers and crew could be used as supporting information to scientific validated data. In the absence of information, a precautionary approach should be applied.
    a. Recommendations must be informed by the available information. Best available information should include ecological, environmental, social, cultural and economic aspects of the marine environment that is available without unreasonable cost, effort or loss of timeliness.
    b. Data derived from international reference databases should be analysed and provided such as biophysical parameters and spatial indices, such as chlorophyll concentration, bottom temperature, currents velocity, salinity, dissolved oxygen concentration, depth, slope, rugosity, seamounts connectivity and bathomes representativity. A spatial analysis and description of the environmental context obtained from the clustering of the statistical layers may be provided.
    c. Recommendations to implement spatial management measures should not be postponed because of a lack of full scientific certainty, especially where significant or irreversible damage to ecosystems could occur or indigenous species are at risk of extinction.
9. Adverse impacts on existing users should be evaluated.
    a. Where there is a choice of several sites, which if protected would add a similar ecosystem or habitat to the closure network, and only one, or some of the sites are to be closed, the site(s) recommended should minimise adverse impacts on existing users. Where there is a choice to be made among minimum impact sites, selection may also be guided by:
        i. ease of management and enforcement; and
        ii. if there are other benefits such as education or eco-tourism.
10. The rationale used to recommend spatial management measures should be consistent and transparent.
11. There should be an evaluation of existing closures when making recommendations and explanation as to how a new management measure will assist in achieving MoP objectives.
    a. An enumeration of spatial management measures should be prepared to assess progress towards achieving the policies.

Considerations for determining boundaries of protected areas

12. Dimensions of the area
    a. The recommended area should, as far as practicable, include continuous and contiguous depth.
    b. Area designation should be based on seafloor features such as geomorphic features
    c. Size and shape should be orientated to account for inclusion of connectivity corridors and biological dispersal patterns within and across closures.
        i. Where this is unavailable, protected area proposal and designation may consider linkages with adjacent protected areas, or research from other oceans to inform inferences on biological dispersal patterns.

d. Boundary lines should be simple, as much as possible following straight latitudinal/longitudinal lines and, where possible, coinciding with existing regulatory boundaries.
e. The size and shape of each area should be set to minimise socio-economic costs.

GUIDANCE FOR SC RECOMMENDATIONS TO THE MEETING OF THE PARTIES

The SC should make a recommendation to the MoP based on how the proposal satisfies one or more of the criteria of the protocol.

If the scientific evidence to support protecting area using the protocol is uncertain or insufficient, more data may be required.

If the proposal documents the necessary data and scientific information to support a protected area using protocol, different measures could be applied, such as management measures, technical measures, closures.

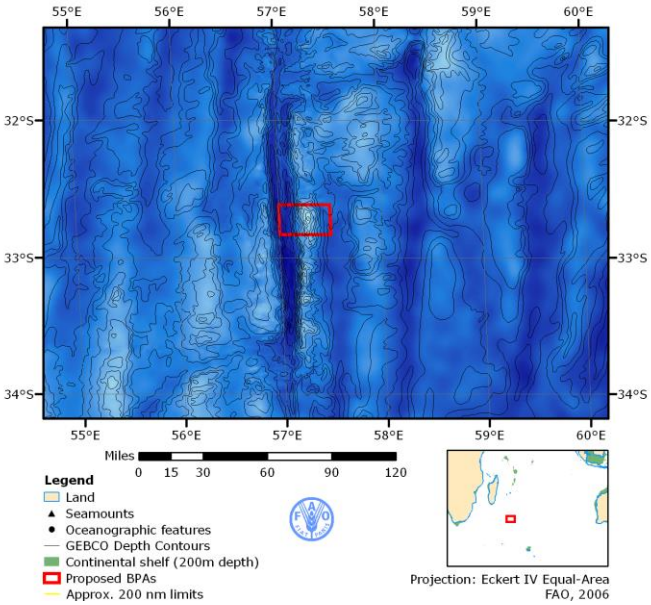
In case of an area becoming protected, a management and research plan shall be associated to it on the year to come. It will include:

- The measures in place in the protected area;
- The time of review of the protected area;
- If needed, the research that should be undertaken in the area. To this end, the parties should consider to ask for international funds.

SIOFA PROTECTED AREAS PROPOSALS AND DESIGNATION TEMPLATE

Name	*This field will contain the name of the proposed protected area*
Details of the proponent/s	*This field should contain details of the proponent/s*
Geographic description	*This field should contain the coordinates of the proposed area's spatial boundaries. It may also contain maps showing the spatial area and/or bathymetry, or other spatial information of relevance to the proposal*
Objectives	*This field will explicitly detail the objective/s that designation of the proposed protected area would address (i.e., the primary reason/s for protection)*
Criteria that the protected area meets	*This field would contain the specific criteria that the protected area meets, structured against the* SIOFA Standard protocol for protected areas designation*. This field will also contain evidence in support of each criteria that the area meets. This evidence may include, but is not limited to:* - *Information from scientific or other surveys* - *References to peer-reviewed literature* - *Photographs, graphs and figures supporting the proposal* - *Fishing data analysis to support the proposal* - *Appropriately substantiated reports and/or statements from skippers or observers to justify the proposal.*
Social, cultural and economic interests	*This section would consider existing fisheries interests and possible adverse impacts of Protected Area designation on those interests. This section may also consider potential future interests. Any social or cultural interests or values should also be included. This section should be backed up by data, formal statements and references in the literature.*
Risks to the proposed area	*This section should contain detailed information on the scope of the Protected Area designation in terms of what activities would be restricted or prohibited. If the proposal is that some activities are restricted, this section should contain information on how these activities will be monitored.*
Review periods	*This section should contain an anticipated review period to review whether the Protected Area is achieving its objectives, including consideration of whether any new information has become available that may enhance or degrade the justification for protection.*
Outline of monitoring and/or research needed	*This section will contain an outline of monitoring and/or research needed to maintain, update or review the Protected Area.*

Research and management plan for the Atlantis protected area

Name	Atlantis Bank
Geographic description	Total area: 8,694 km^2 Coordinates: 32^{0}00'S-57^{0}00'W : 32^{0}50'S-58^{0}00'E Bathymetry: 0-300m 0 km^2; 300-700m 1 km^2; 700-1000m 36 km^2; 1000-1500m 82 km^2; > 1500m 8,575 km^2 
Objectives for this protected area	In line with the protocol for protected areas designation, the objectives for the Atlantis protected area are the maintenance of the value and integrity of the area's biodiversity and as an area of special scientific interest.
Objectives for this plan	In accordance with *the Guidance for SC Recommendations to the Meeting of the Parties* outlined in the standard protocol for protected areas designation (Annex H SC3 report), the objectives for this research and management plan are to describe: - Management and monitoring measures in place in the protected area - The time of review of the research and management plan - If needed, additional research that should be undertaken in the area.
Criteria that the protected area meets	This protected area meets the following criteria: • 5b. Biodiversity representation – The area is known to contain high diversity of ecosystems, habitats, communities or species, or has higher genetic diversity; and • 6. Scientific interest – The area has scientific research interest associated with understanding ecosystem, biological, geological and biodiversity processes in the SIOFA region. Feature description

	This tectonic guyot seamount covers an area of approximately 8694 km^2 and is in sub-tropical waters (Rogers et al. 2012). The guyot rises from 4000 m to a depth of 700 m below the surface. The summit measures at least 25km^2. It is an ancient fossil island with 11-million-year-old fossil beaches and lagoons, a submerged headland, 'sea cliffs', limestone ripple 'beaches' lithified as rock, gabbro, fossil sea-stacks, fossilized corals, clams, snails and sea urchin spines in the limestone, oolitic limestone (Baines et al. 2003; 2007). There have been extensive tectonic studies since 1950s, including as a drilling site within the Ocean Drilling Programme, with several marine expeditions including 1987 Woods Hole Oceanographic Institute (WHOI) survey using JOIDES *Resolution* (Dick et al. 1991), seismic studies led by Cambridge University in the 1980s-1990s, the 1997 WHOI survey using JOIDES *Resolution* and the 2009 International expedition using RSS *James Clark Ross.* <u>Biodiversity representation</u> The benthic habitats support a very diverse deep-sea fauna (Rogers et al. 2012). This includes diverse coral gardens and complex sea-cliff deep-sea communities characterised by large anemones, large sponges and octocorals. The large Paragorgia colonies are unique. Rock outcrops, particularly along the edges of the summit host large stylasterid colonies, including the echinoid *Dermechinus horridus*. Spines of these urchins form substratum for infauna around the outcroppings. The eastern side of the seamount comprises rocky/boulder slopes with glass sponges and octocorals. The western side has rock buttresses flanking rock-slide features hosting rich benthic communities of large, armchair-sized sponges, glass sponges, anemones and sea spider predators. Large populations of lobsters, crabs, sharks, sea fans, siphonophores, orange roughy and big-eye dory have been reported from surveys (Rogers & Taylor 2012). These scientific surveys have identified new species and endemism (e.g. Taylor and Rodgers 2017). JAMSTEC (2000) made observations on near-bottom and/or mesopelagic communities at depths from 750 to 5365 m. Among other results, JAMSTEC reported on the vertical stratification of Crow Shark (*Etmopterus pusillus*), Gilchrist's Orange Roughy (*Hoplostethus gilchristi*) and the Big-eye Dory (*Allocytus verrucosus*). They also found a number of deepwater chondrichthyans species (including *Etmopterus pusillus* and *Pseudotriakis microdon*) but not all were able to be identified. This bank has provided a significant mid-water trawl fishery for alfonsino and reportedly, catches of 1000 t have been taken; small catches of orange roughy have also been taken (G. Patchell, pers. comm. 2018). Acoustic studies of zooplankton and micronekton over seamounts indicate that seamounts focus trophic resources owing to the interaction of pelagic communities with the topography and local physical oceanography. Rogers et al. (2012) found evidence of trophic

	focusing on the Atlantis Seamount, leading to higher biological productivity than in the surrounding pelagic waters. Scientific interest It has been extensively studied (e.g. Baines et al. 2002, 2007; JAMSTEC 2000; Rogers et al. 2012; Taylor and Rogers 2017) and is reportedly the first tectonic guyot ever studied to consider geology of ultraslow-spreading ridges (Baines et al. 2003). It has a unique paleontological record and has been a drilling site within the Ocean Drilling Programme (ODP) (Dick et al. 1991). It has also been studied as part of the International Ocean Discovery Program's 'Expedition 360' (MacLeod et al. 2017). The feature is being studied as part of the IUCN (2013) Seamounts Project: An Ecosystem Approach to Management of Seamounts in the Southern Indian Ocean. Fishing history There are areas that can be fished on Atlantis using bottom trawls and about 60 tows are reported to have been made on this feature (SIODFA 2016). Videos have reportedly shown abandoned trawls on the bottom, presumably from Soviet-era fishing (R. Shotton, pers. comm. 2018). Most of the sea floor is reportedly untouched by bottom trawling (SIODFA 2016). There are many ancient sea-stacks, boulders, rock slides, and gravel beds that make the bottom rugged and difficult to bottom trawl (SIODFA 2016). Romanov (2003) provides a summary and review of Russian and Ukrainian scientific and commercial fishing operations on the deepwater ridges of the southern Indian Ocean. Other supporting information SIODFA has closed this location to fishing by vessels that are members of its association because of the historical and scientific interest. It is listed as an Ecologically and Biologically Significant Area (EBSA) by the Convention of Biological Diversity (CBD) based on the following criteria: C1 Uniqueness or rarity (High ranking). C2: Special importance for the life-history stages of species (Medium rank) C4: Vulnerability, fragility, sensitivity, or slow recovery (High rank) C5: Biological productivity (Medium rank) C6: Biological diversity (High rank) C7: Naturalness (Medium rank) The areas is identified by UNESCO as a priority site of Outstanding Universal Value (OUV) for protection through a listing equivalent to World Heritage Listing (see Freestone et al. 2016). It is proposed to satisfy World Heritage Criteria VIII (major stages in earth's history and geological processes), IX (significant ecological and biological processes in the evolution of ecosystems, communities of plant and animals), X (significant biological diversity and threatened species of OUV). Spatial and environmental analysis

The first meeting of the SIOFA Protected Areas and Ecosystems Working Group and SC4 reviewed a spatial clustering analysis that could inform consideration of how individual SIOFA protected areas are represented within networks of protected areas. The findings of this work provide useful information that strengthens the research and management plan for the Atlantis protected area, particularly in terms of its consideration within a network of protected areas. This information is included below and at Appendices 1–5.

BPAS	Spatial parameters (Appendice1)	Biophysical parameters (Appendice2)	Biodiversity (Appendice3)
Atlantis Bank	**Specific parameters:** - Comparatively higher proportion of slope areas and higher level of rugosity -Large depth variation -Seamount very connected **Common parameters :** -Far from islands and continents **Spatial clusters:** Locate in cluster 4 it represents about 0.3% of cluster 4	**Common parameters :** -Rather high current velocity -Low sea floor temperature -Low chlorophyll-a concentration -High dissolved O2 content **Biophysical clusters:** Locate in cluster 6 it represents about 0.15% of cluster 6	-Good knowledge of benthos -Good scientific knowledge because there has been research cruises done in the area

Atlantis Bank is a seamount (Rogers et al. 2012) located on the South West Indian ridge, which explains the great variation in slope and depth (from 700m to 4000m deep). There is therefore a great diversity of habitats, which makes Atlantis Bank unique. It represents about 0.04% of SIOFA area. Atlantis Bank is the only site in cluster 4 of the space clusters, it represents about 0.3% of cluster 2. The cluster 4 represents 1.3% of SIOFA area.

Moreover, it is a very connected seamount so it has a lot of flow with neighbouring seamounts. It may be part of a biological corridor. In addition, a site very connected to a contribution of new species. The

	good scientific knowledge comes from the fact that many scientific campaigns (mentioned above) have been carried out on Atlantis Bank. All these parameters make it important to protect and maintain this site in good condition.
Social, cultural and economic interests	Some historical fishing data are available (e.g. Romanov 2003), which may assist with understanding any social, cultural and/or economic costs associated with designating this as a protected area. The area is the location of a productive fishery. It is possible that designation could have adverse social, cultural or economic impacts in terms of forgone opportunity for fishing.
Management measures	In accordance with CMM 2018/01, the following management measures apply: *35. The areas included in Annex 2 are provisionally designated as protected areas.* *36. CCPs shall provisionally apply the following measures in the areas listed on Annex 2 until the adoption of a dedicated research and management plan, referred to in paragraph 6(e), for each area at MoP6:* *(a) CCPs shall prohibit all vessels flying their flag from engaging in bottom fishing, excluding line and trap methods; and* *(b) For all other gears, CCPs shall ensure each vessel flying their flag has a scientific observer onboard at all times while fishing inside those areas.* *37. When the Meeting of the Parties adopts a revised SIOFA protocol for protected area designation after advice from the Scientific Committee arising from its review referred to in paragraph 6(d), the Meeting of the Parties shall also review Annex 2 of this CMM, taking into account advice of the Scientific Committee.* All other relevant components of CMM2018/01 as well as all other relevant SIOFA CMMs apply within this protected area.
Management needs	SC4 recommended that the MoP consider that fishing with all gears were identified as activities that degrade the biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been voluntarily observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. Any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area; (2) an assessment of impacts; and (3) proposed measures to prevent or minimise those impacts.

Review periods	This research and management plan should be reviewed at least every 10 years, or more frequently if new information becomes available that enhances or degrades the justification for its designation as a protected area.
Outline of monitoring and/or research needed	SC4 agreed that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos. In addition to the above, a desk-top compilation of publications from research undertaken within this area would assist with future reviews of the designation.
Compliance	Compliance-related issues are outside of the remit of the SIOFA SC.

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SIODFA 2016, Southern Indian Ocean Deepwater Fisheries Association (SIODFA), Benthic Protected Areas in the Southern Indian Ocean. SIODFA Technical Report XVII 16/01. 40 pp

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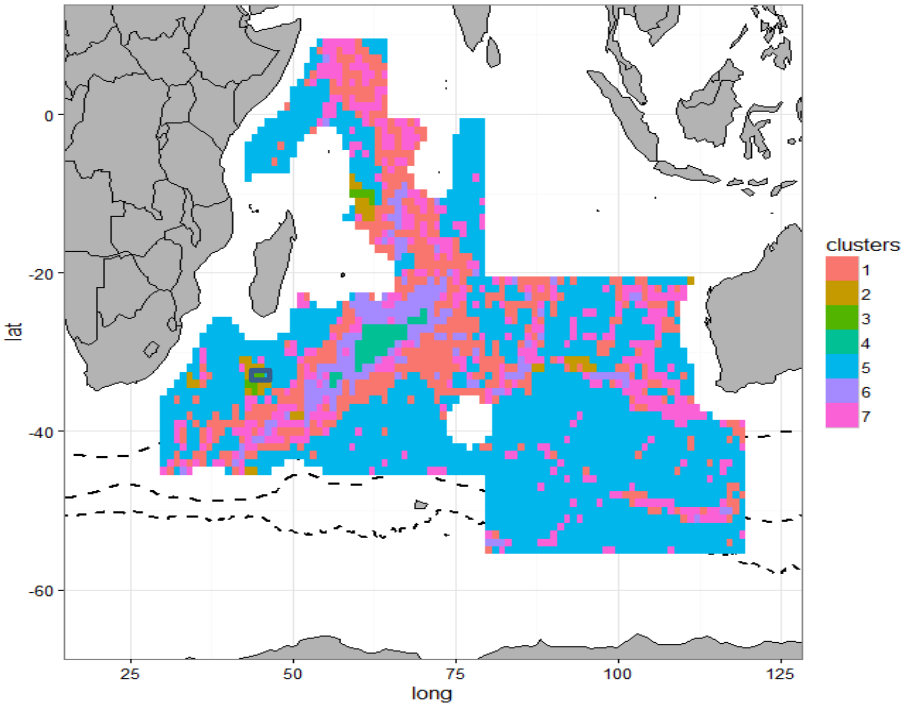
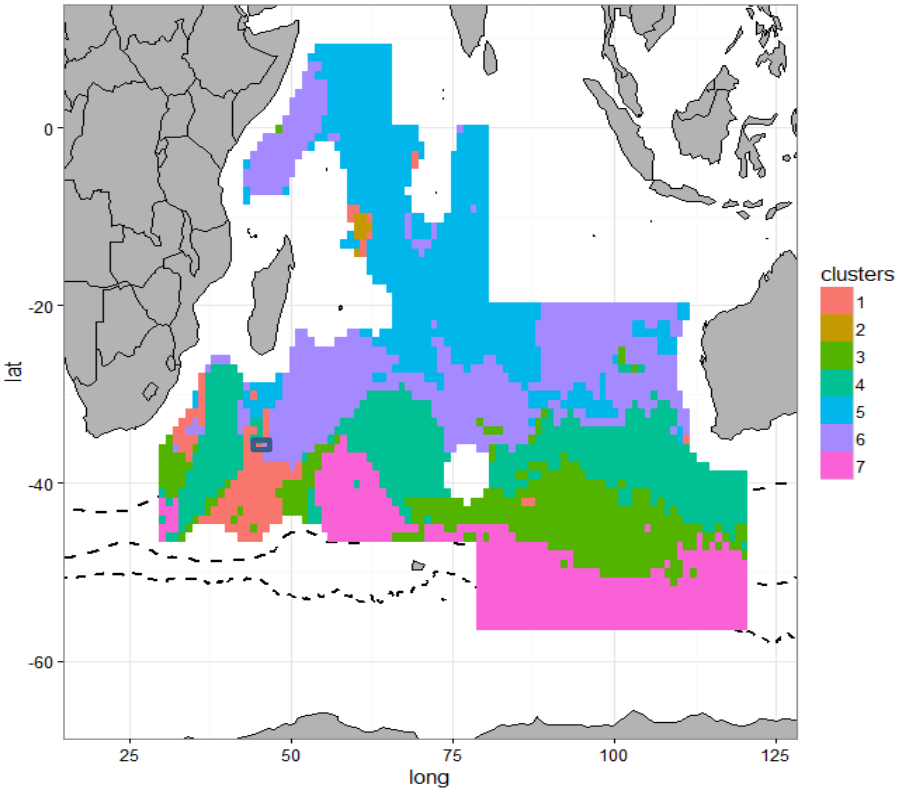
Appendices

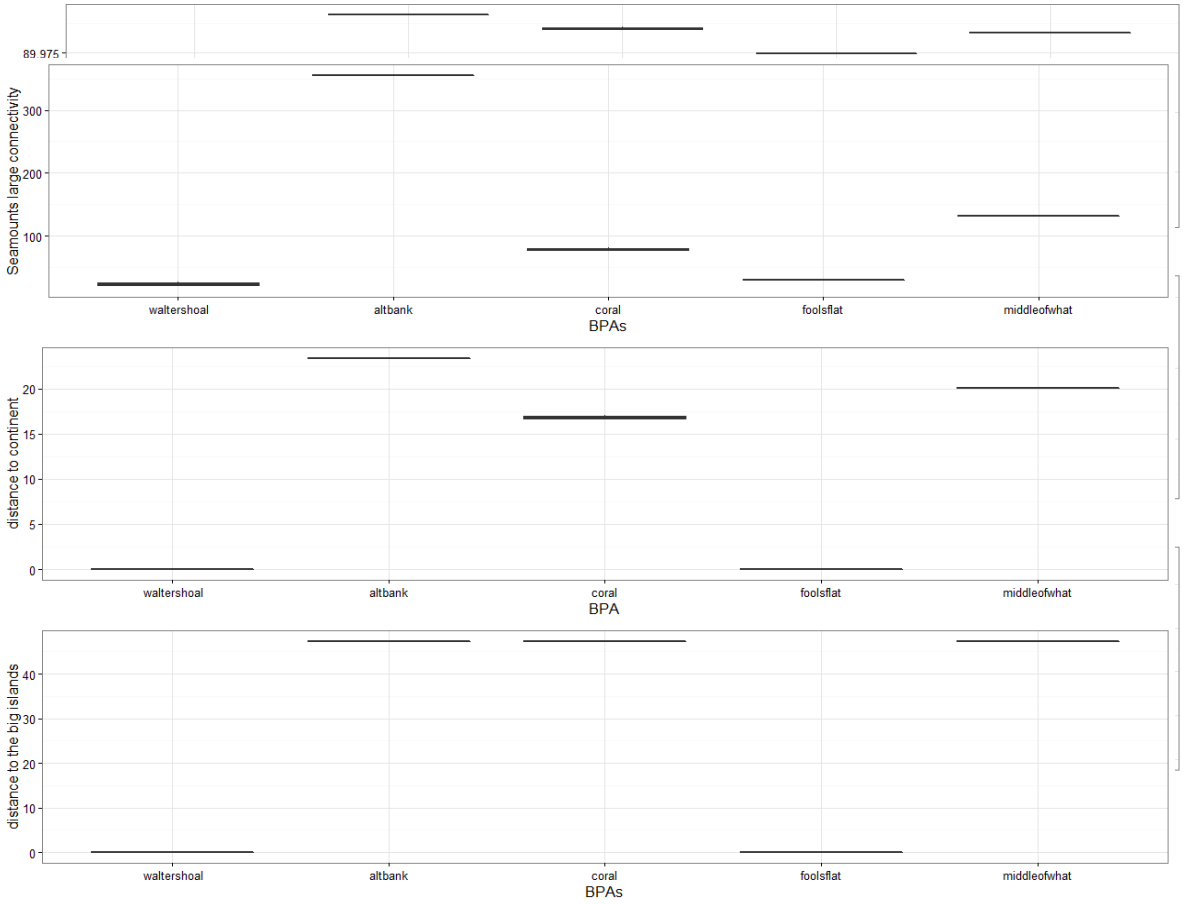
Appendix 1: Spatial clusters

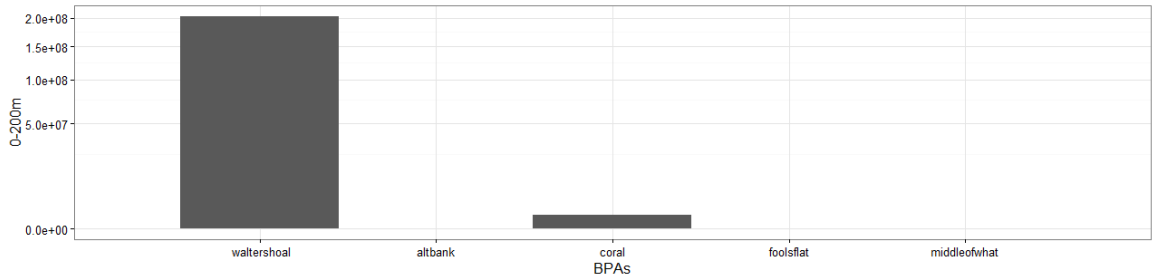


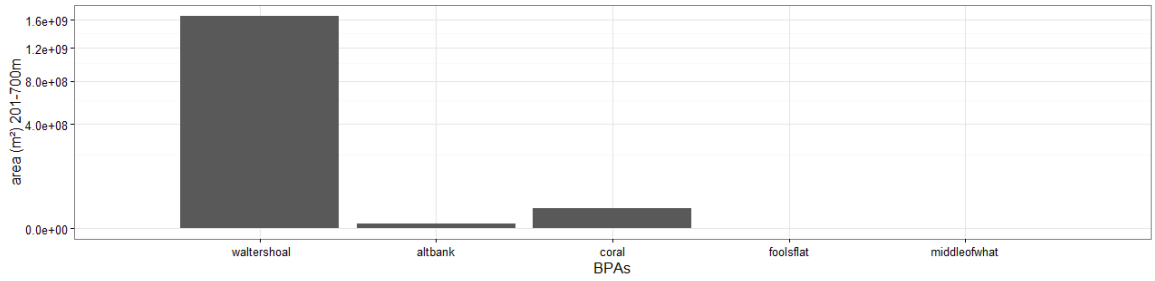
Appendix 2: Biophysical clusters

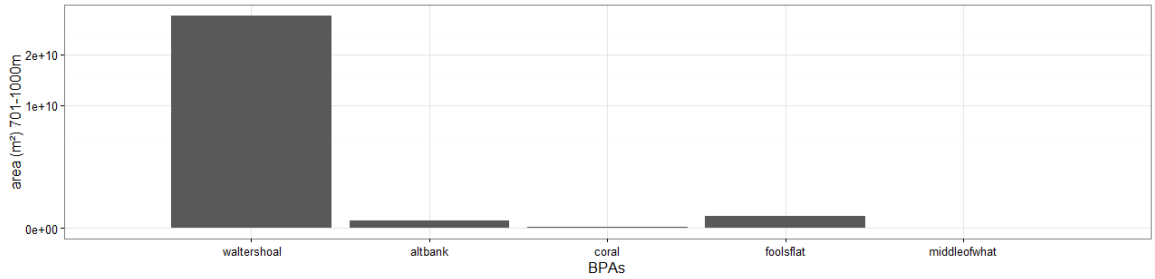


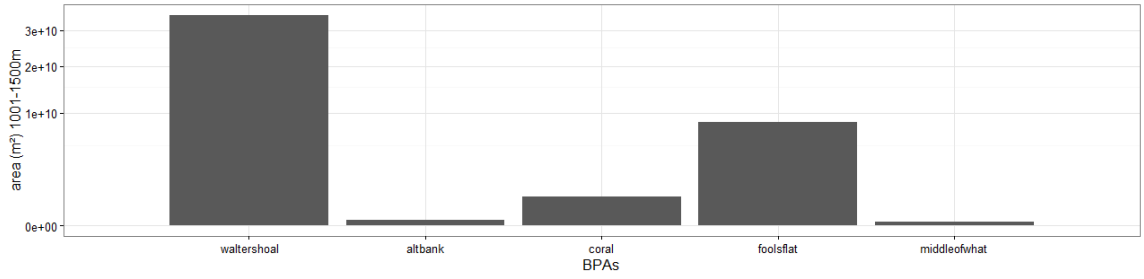
Appendix 3: Boxplot and Histogram of spatial parameters

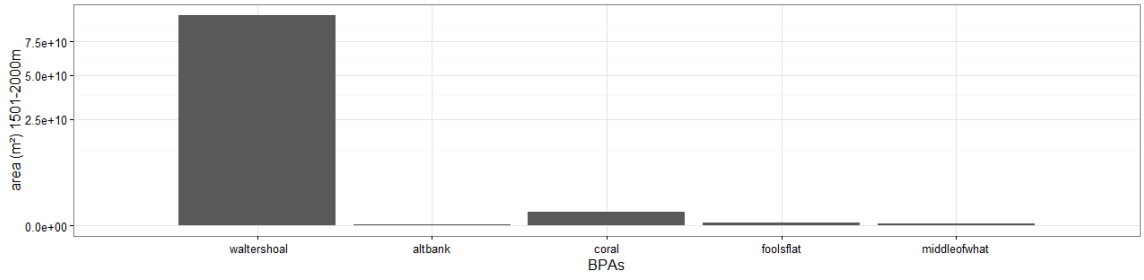


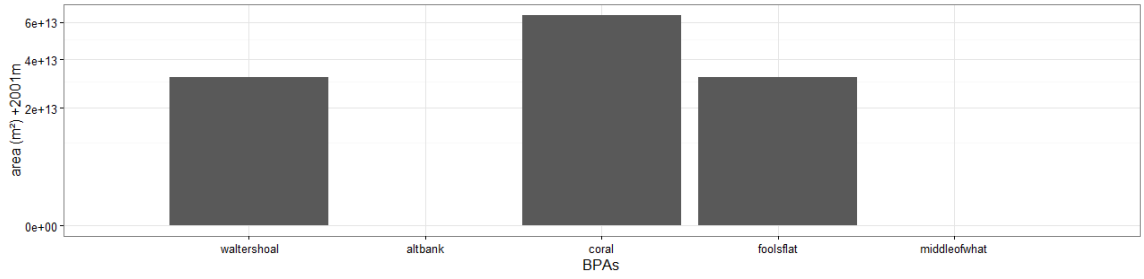

2.0e+08
1.5e+08
1.0e+08
5.0e+07
0.0e+00
0-200m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


1.6e+09
1.2e+09
8.0e+08
4.0e+08
0.0e+00
area (m²) 201-700m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

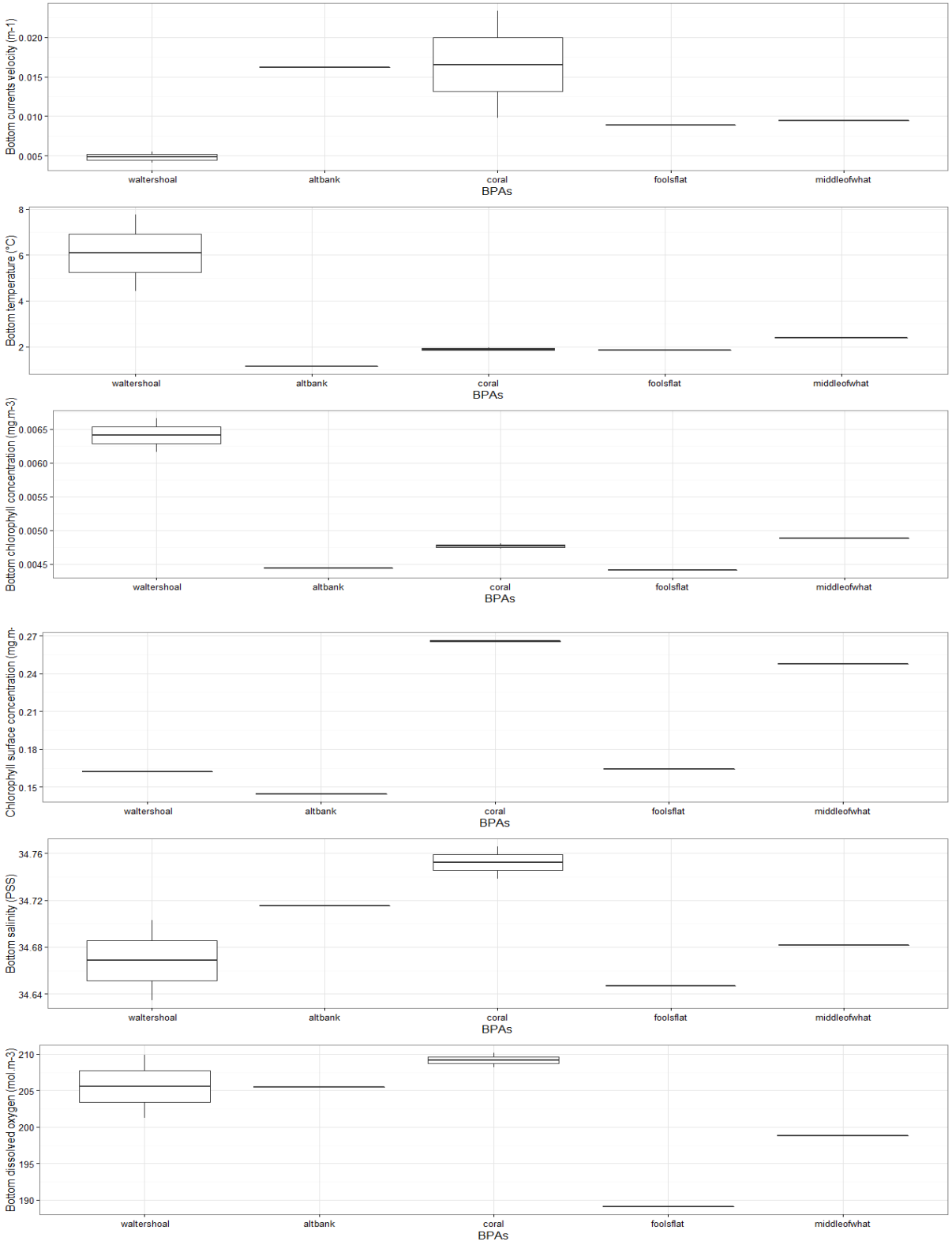

2e+10
1e+10
0e+00
area (m²) 701-1000m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


3e+10
2e+10
1e+10
0e+00
area (m²) 1001-1500m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

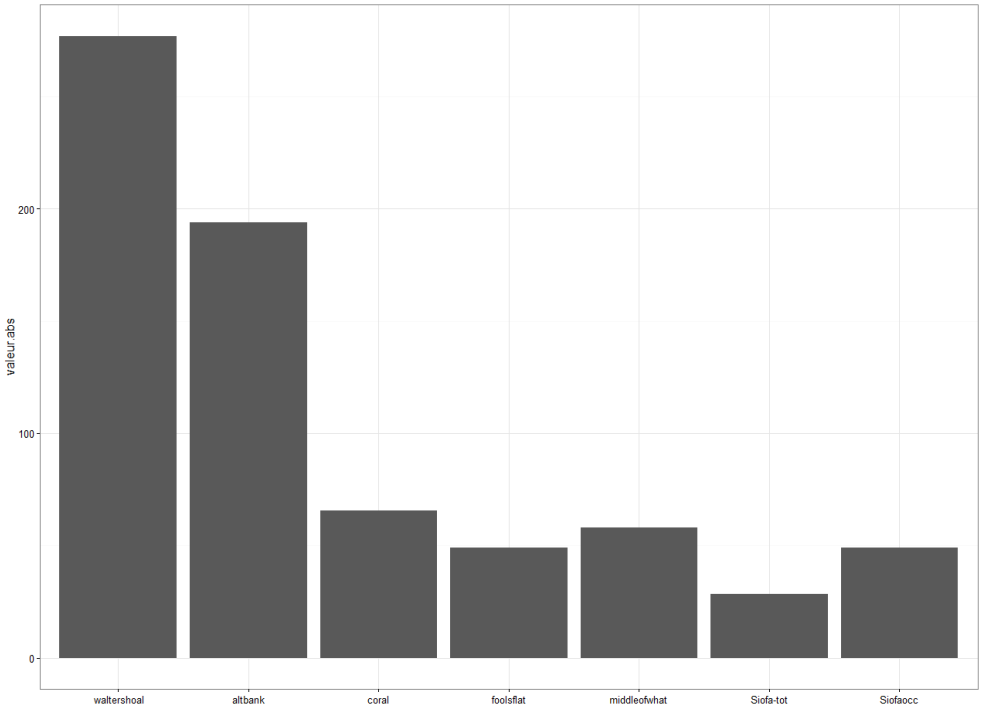

7.5e+10
5.0e+10
2.5e+10
0.0e+00
area (m²) 1501-2000m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

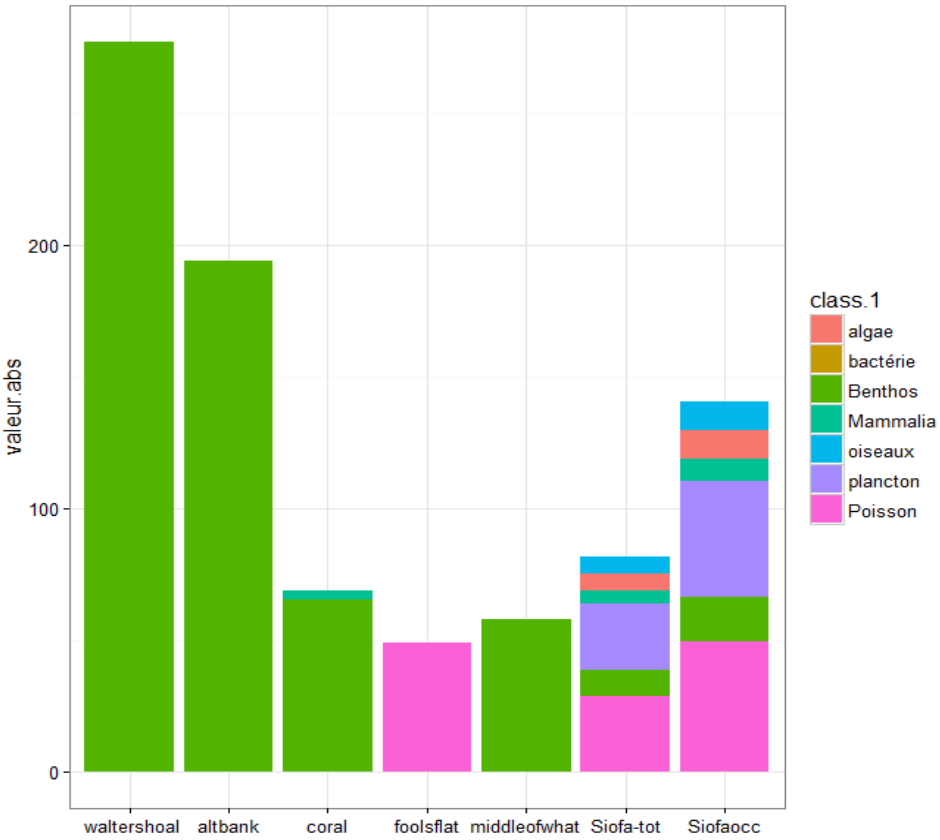

6e+13
4e+13
2e+13
0e+00
area (m²) +2001m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

Appendix 4: Boxplot and Histogram of biophysical parameters

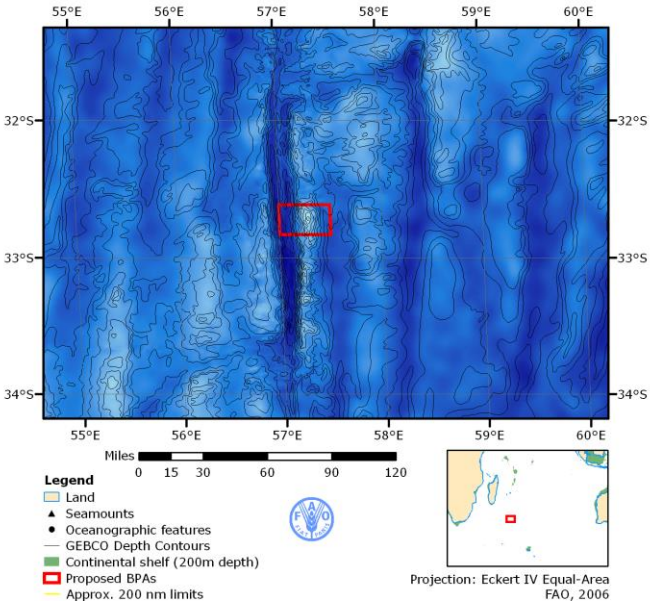


Appendix 5: Graphics Biodiversity





Research and management plan for the Atlantis protected area

Name	Atlantis Bank
Geographic description	Total area: 8,694 km^2 Coordinates: 32^{0}00'S-57^{0}00'W : 32^{0}50'S-58^{0}00'E Bathymetry: 0-300m 0 km^2; 300-700m 1 km^2; 700-1000m 36 km^2; 1000-1500m 82 km^2; > 1500m 8,575 km^2 
Objectives for this protected area	In line with the protocol for protected areas designation, the objectives for the Atlantis protected area are the maintenance of the value and integrity of the area's biodiversity and as an area of special scientific interest.
Objectives for this plan	In accordance with *the Guidance for SC Recommendations to the Meeting of the Parties* outlined in the standard protocol for protected areas designation (Annex H SC3 report), the objectives for this research and management plan are to describe: - Management and monitoring measures in place in the protected area - The time of review of the research and management plan - If needed, additional research that should be undertaken in the area.
Criteria that the protected area meets	This protected area meets the following criteria: • 5b. Biodiversity representation – The area is known to contain high diversity of ecosystems, habitats, communities or species, or has higher genetic diversity; and • 6. Scientific interest – The area has scientific research interest associated with understanding ecosystem, biological, geological and biodiversity processes in the SIOFA region. Feature description

	This tectonic guyot seamount covers an area of approximately 8694 km^2 and is in sub-tropical waters (Rogers et al. 2012). The guyot rises from 4000 m to a depth of 700 m below the surface. The summit measures at least 25km^2. It is an ancient fossil island with 11-million-year-old fossil beaches and lagoons, a submerged headland, 'sea cliffs', limestone ripple 'beaches' lithified as rock, gabbro, fossil sea-stacks, fossilized corals, clams, snails and sea urchin spines in the limestone, oolitic limestone (Baines et al. 2003; 2007). There have been extensive tectonic studies since 1950s, including as a drilling site within the Ocean Drilling Programme, with several marine expeditions including 1987 Woods Hole Oceanographic Institute (WHOI) survey using JOIDES *Resolution* (Dick et al. 1991), seismic studies led by Cambridge University in the 1980s-1990s, the 1997 WHOI survey using JOIDES *Resolution* and the 2009 International expedition using RSS *James Clark Ross.* <u>Biodiversity representation</u> The benthic habitats support a very diverse deep-sea fauna (Rogers et al. 2012). This includes diverse coral gardens and complex sea-cliff deep-sea communities characterised by large anemones, large sponges and octocorals. The large Paragorgia colonies are unique. Rock outcrops, particularly along the edges of the summit host large stylasterid colonies, including the echinoid *Dermechinus horridus*. Spines of these urchins form substratum for infauna around the outcroppings. The eastern side of the seamount comprises rocky/boulder slopes with glass sponges and octocorals. The western side has rock buttresses flanking rock-slide features hosting rich benthic communities of large, armchair-sized sponges, glass sponges, anemones and sea spider predators. Large populations of lobsters, crabs, sharks, sea fans, siphonophores, orange roughy and big-eye dory have been reported from surveys (Rogers & Taylor 2012). These scientific surveys have identified new species and endemism (e.g. Taylor and Rodgers 2017). JAMSTEC (2000) made observations on near-bottom and/or mesopelagic communities at depths from 750 to 5365 m. Among other results, JAMSTEC reported on the vertical stratification of Crow Shark (*Etmopterus pusillus*), Gilchrist's Orange Roughy (*Hoplostethus gilchristi*) and the Big-eye Dory (*Allocytus verrucosus*). They also found a number of deepwater chondrichthyans species (including *Etmopterus pusillus* and *Pseudotriakis microdon*) but not all were able to be identified. This bank has provided a significant mid-water trawl fishery for alfonsino and reportedly, catches of 1000 t have been taken; small catches of orange roughy have also been taken (G. Patchell, pers. comm. 2018). Acoustic studies of zooplankton and micronekton over seamounts indicate that seamounts focus trophic resources owing to the interaction of pelagic communities with the topography and local physical oceanography. Rogers et al. (2012) found evidence of trophic

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Moreover, it is a very connected seamount so it has a lot of flow with neighbouring seamounts. It may be part of a biological corridor. In addition, a site very connected to a contribution of new species. The

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Social, cultural and economic interests	Some historical fishing data are available (e.g. Romanov 2003), which may assist with understanding any social, cultural and/or economic costs associated with designating this as a protected area. The area is the location of a productive fishery. It is possible that designation could have adverse social, cultural or economic impacts in terms of forgone opportunity for fishing.
Management measures	In accordance with CMM 2018/01, the following management measures apply: *35. The areas included in Annex 2 are provisionally designated as protected areas.* *36. CCPs shall provisionally apply the following measures in the areas listed on Annex 2 until the adoption of a dedicated research and management plan, referred to in paragraph 6(e), for each area at MoP6:* *(a) CCPs shall prohibit all vessels flying their flag from engaging in bottom fishing, excluding line and trap methods; and* *(b) For all other gears, CCPs shall ensure each vessel flying their flag has a scientific observer onboard at all times while fishing inside those areas.* *37. When the Meeting of the Parties adopts a revised SIOFA protocol for protected area designation after advice from the Scientific Committee arising from its review referred to in paragraph 6(d), the Meeting of the Parties shall also review Annex 2 of this CMM, taking into account advice of the Scientific Committee.* All other relevant components of CMM2018/01 as well as all other relevant SIOFA CMMs apply within this protected area.
Management needs	SC4 recommended that the MoP consider that fishing with all gears were identified as activities that degrade the biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been voluntarily observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. Any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area; (2) an assessment of impacts; and (3) proposed measures to prevent or minimise those impacts.

Review periods	This research and management plan should be reviewed at least every 10 years, or more frequently if new information becomes available that enhances or degrades the justification for its designation as a protected area.
Outline of monitoring and/or research needed	SC4 agreed that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos. In addition to the above, a desk-top compilation of publications from research undertaken within this area would assist with future reviews of the designation.
Compliance	Compliance-related issues are outside of the remit of the SIOFA SC.

References

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/EAF Nansen Project 2009 Cruise 410) 12th November – 19th December, 2009. International Union for the Conservation of Nature, Gland, Switzerland, 188pp.

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Rogers A.D. & M.L. Taylor. 2012. Benthic biodiversity of seamounts in the southwest Indian Ocean Cruise report – R/V James Cook 066 Southwest Indian Ocean Seamounts expedition – November 7th – December 21st, 2011. 235pp. http://www-odp.tamu.edu/publications/prelim/176_PREL/176OBJT.HTML

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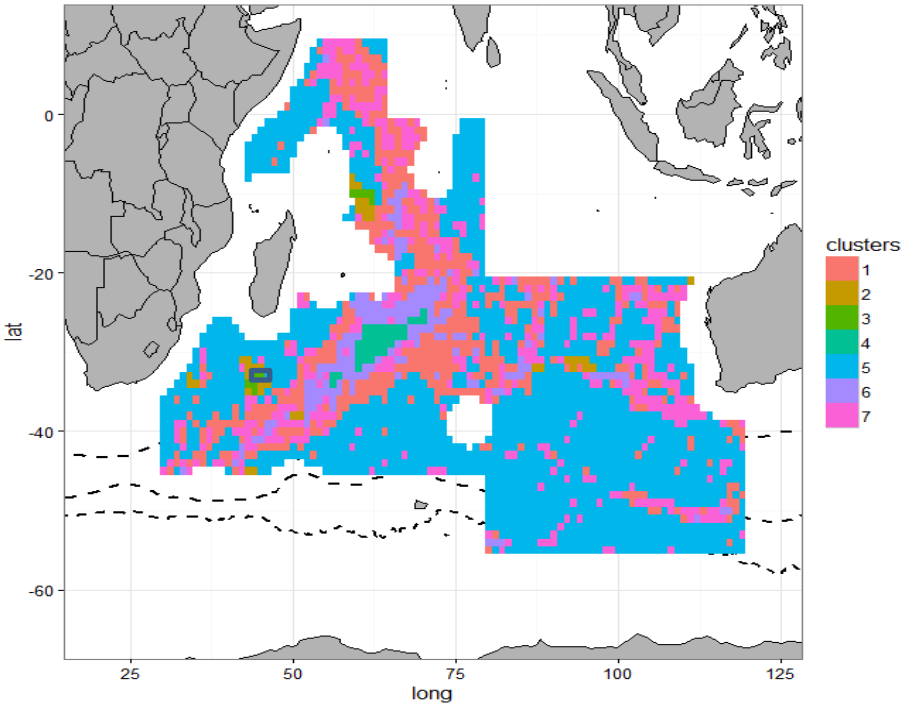
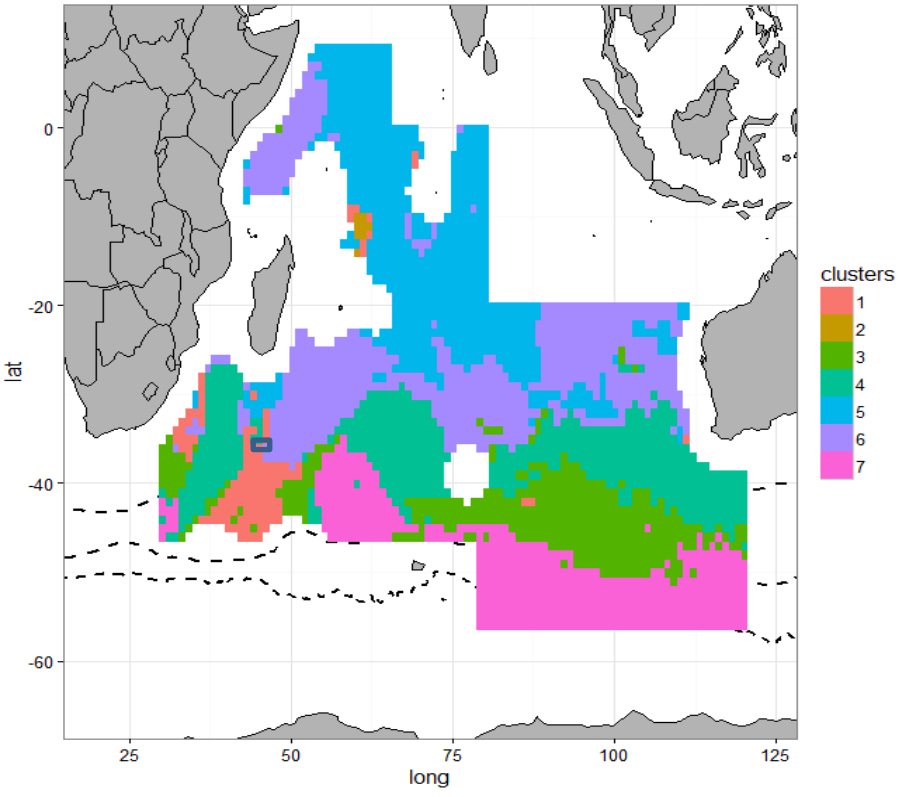
Ocean: new species, genus revisions and systematics, *Zoological Journal of the Linnean Society*, 2017, 181, 70–97.

Appendices

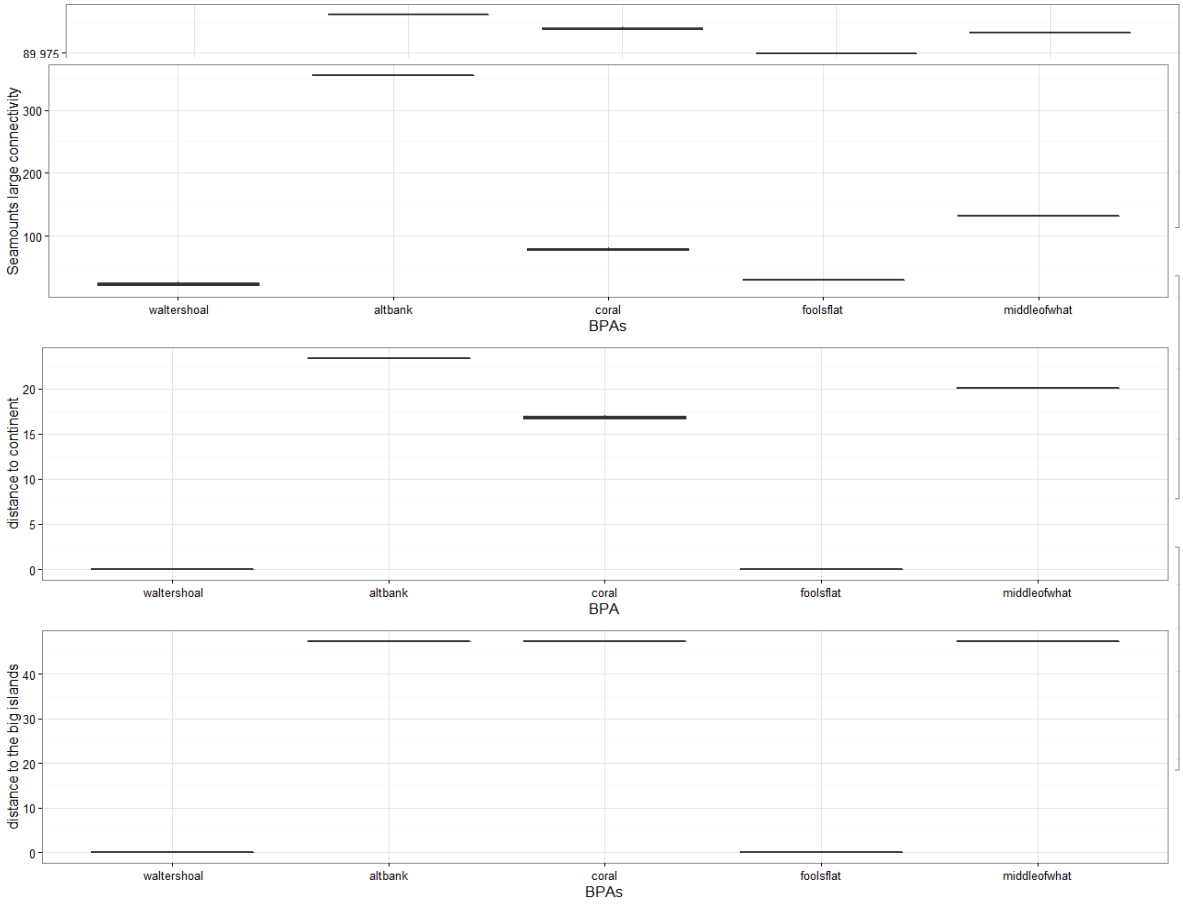
Appendix 1: Spatial clusters

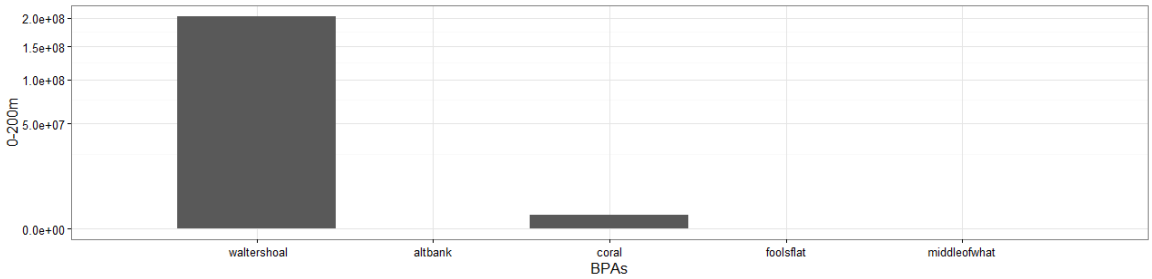


Appendix 2: Biophysical clusters



Appendix 3: Boxplot and Histogram of spatial parameters

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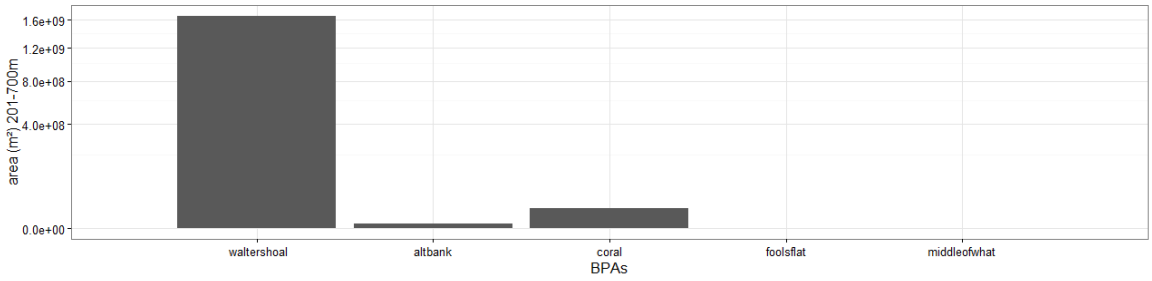
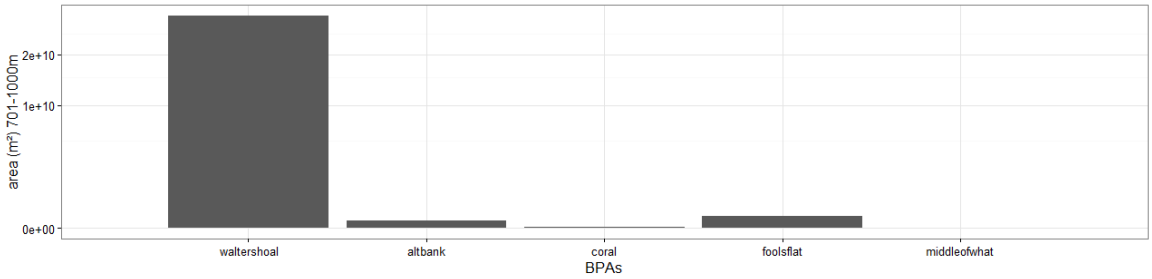
1.5e+08
1.0e+08
5.0e+07
0.0e+00
0-200m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


1.6e+09
1.2e+09
8.0e+08
4.0e+08
0.0e+00
area (m²) 201-700m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs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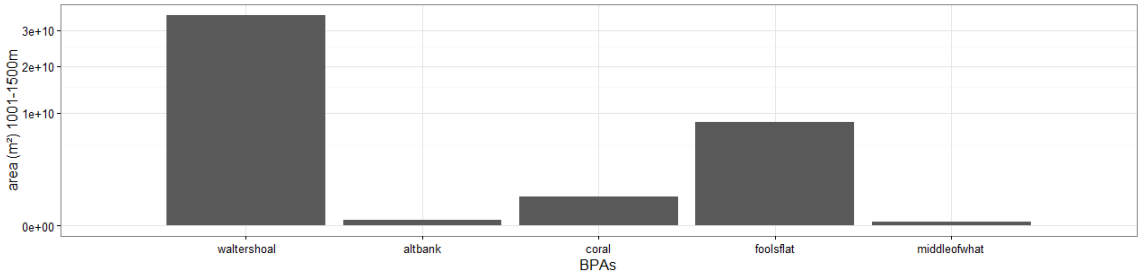
1e+10
0e+00
area (m²) 701-1000m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


3e+10
2e+10
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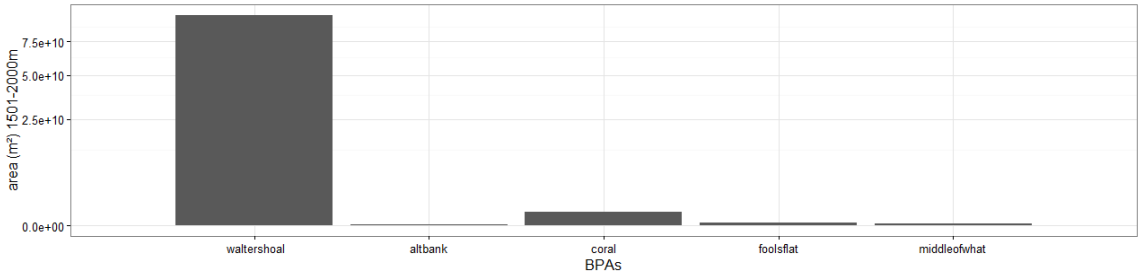
0e+00
area (m²) 1001-1500m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs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5.0e+10
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0.0e+00
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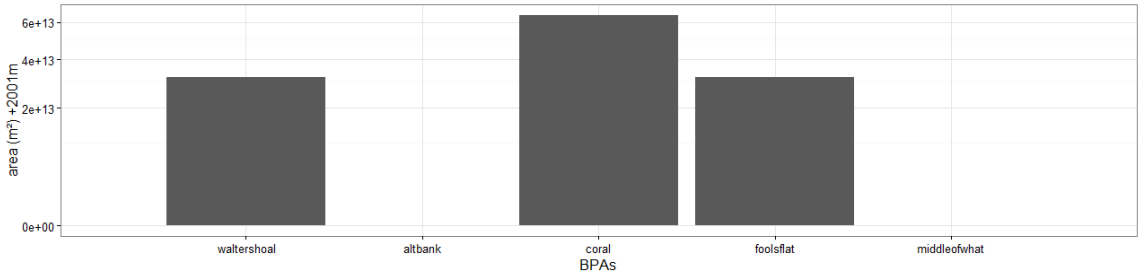
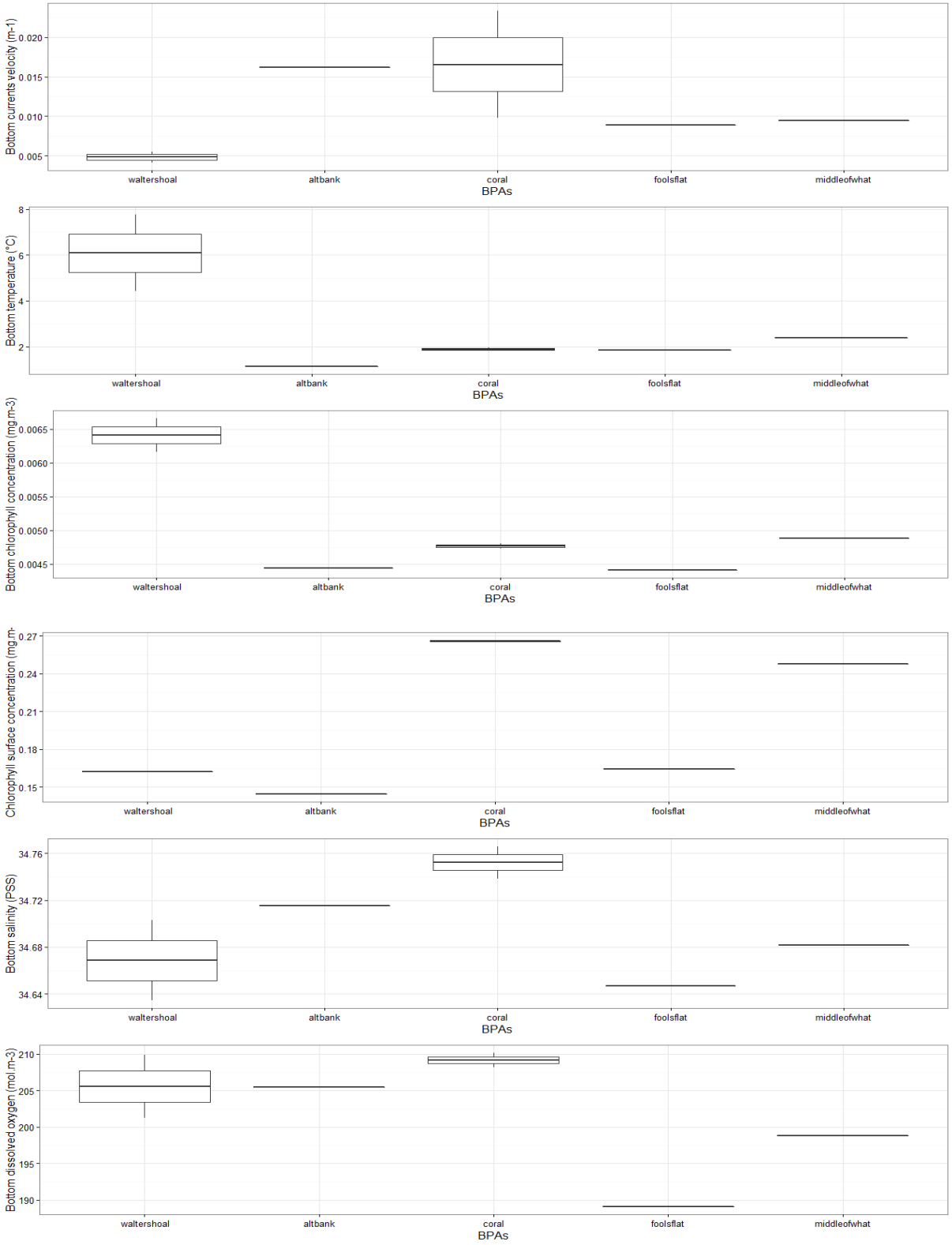
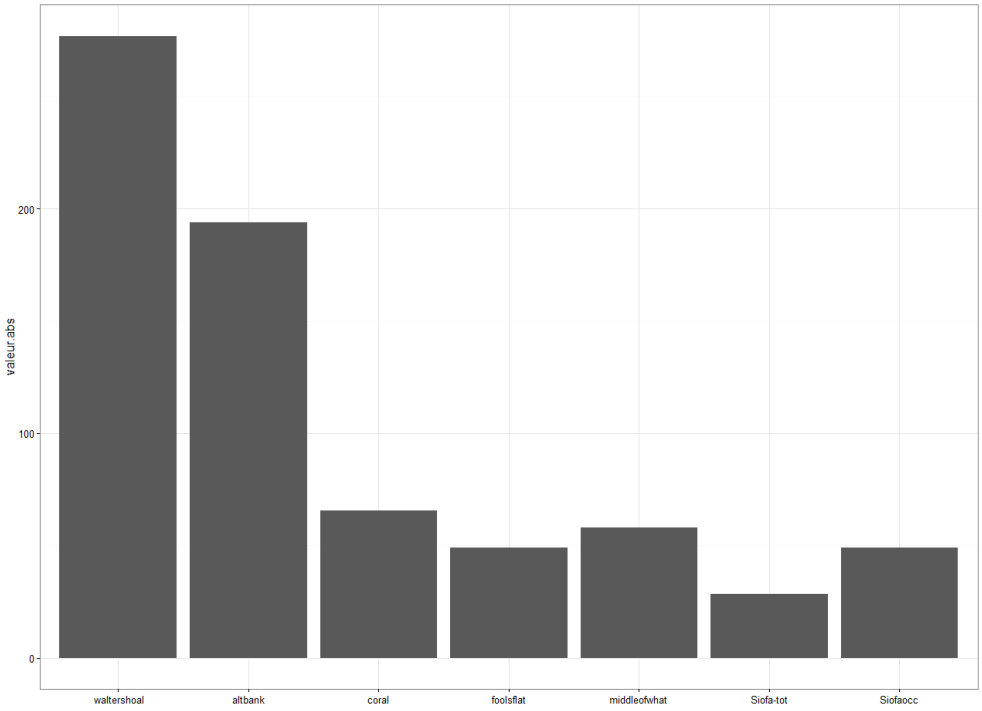
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

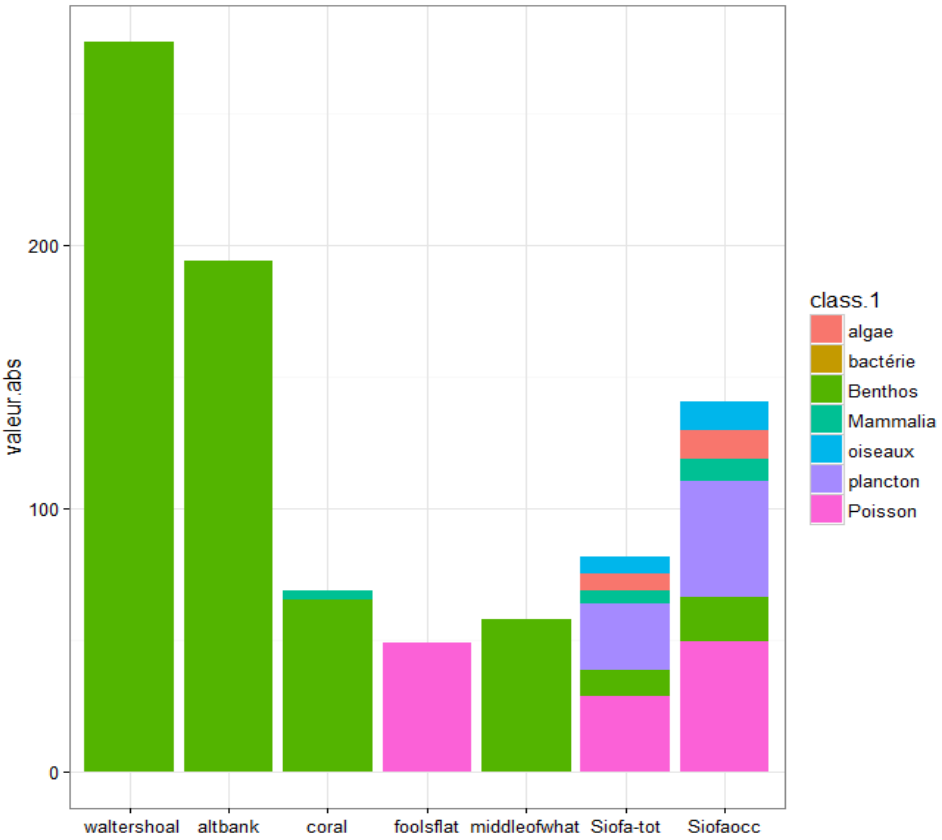

6e+13
4e+13
2e+13
0e+00
area (m²) +2001m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

Appendix 4: Boxplot and Histogram of biophysical parameters



Appendix 5: Graphics Biodiversity





Research and management plan for the Coral protected area

Name	Coral
Geographic description	**Coordinates:** Latitude 41˚ 00′ S, 42˚ 00′ E and 41˚ 40′ S and 44˚ 00' E. **Area**:12, 376 km^2 **Area by depth:**

Depth (m)						
0-100	100-300	300-700	700-1000	1000-1500	> 1500	Total area (Km^2)
0	8	34	50	510	11,775	12,376

Figure 1 General location and bathymetry of the Coral feature

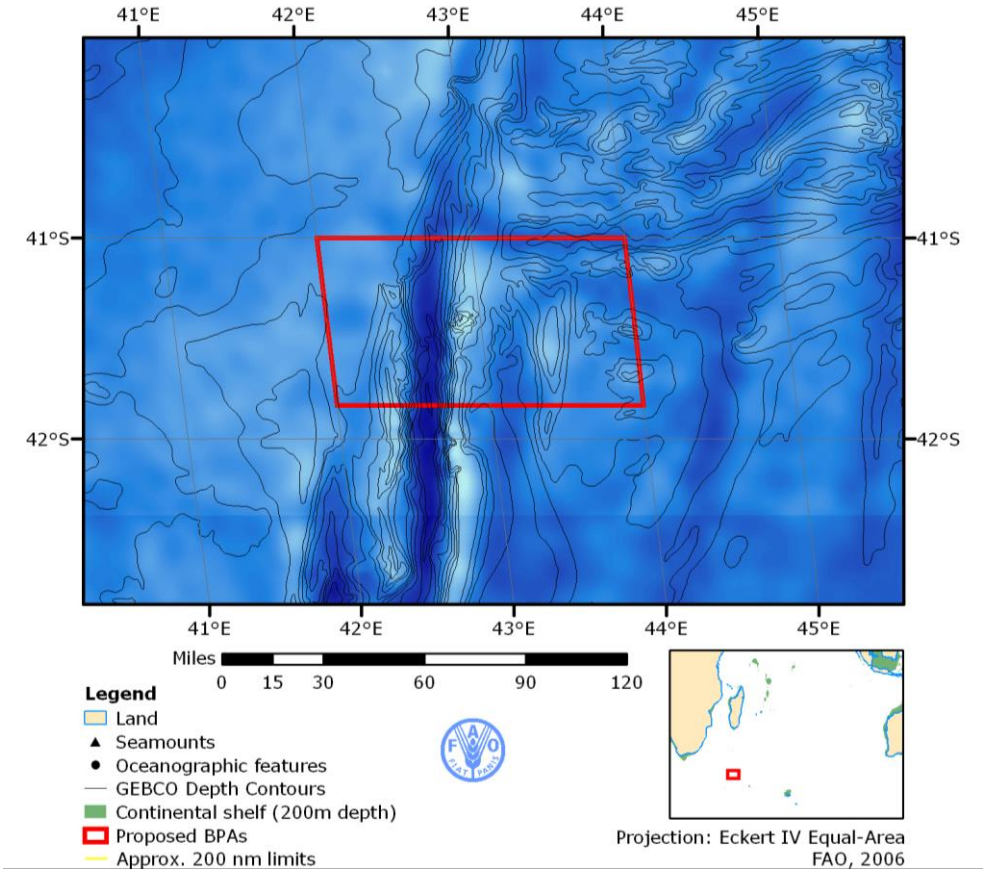


Figure 2
Bathymetry of the Coral feature

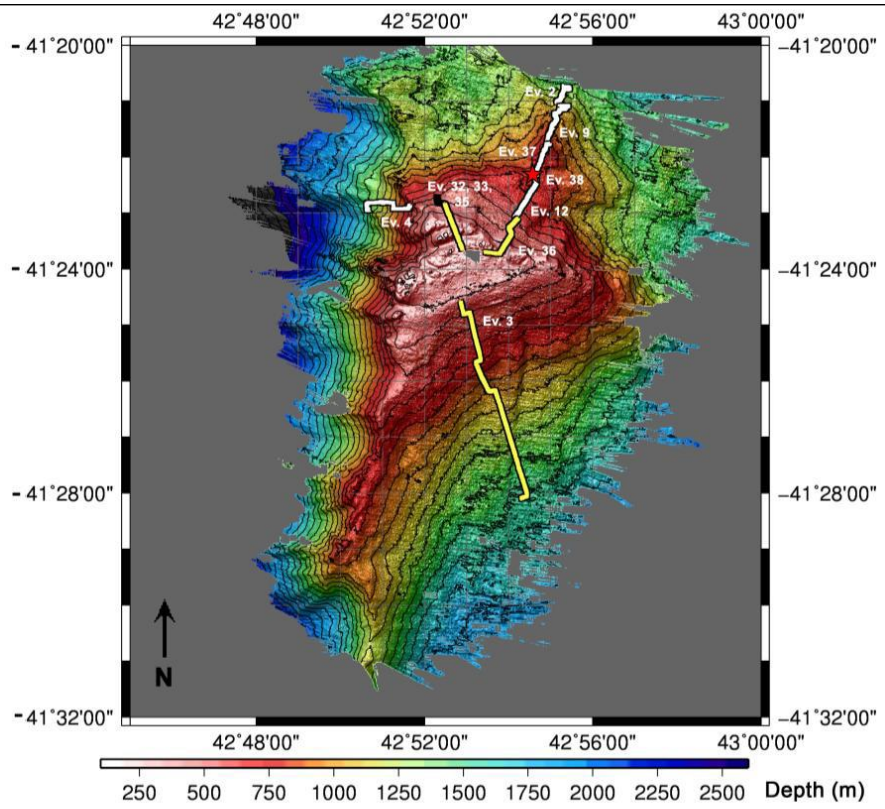
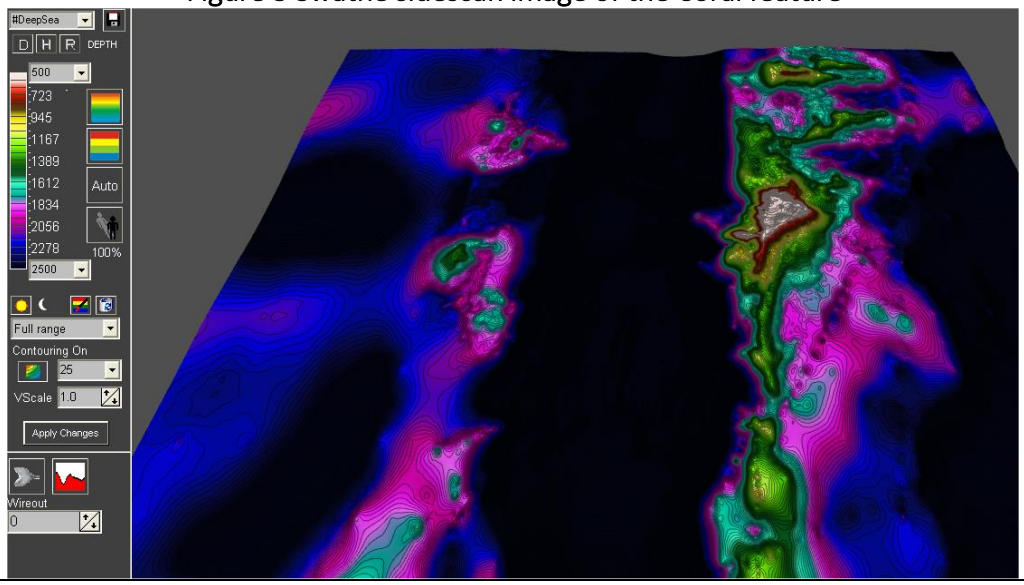


Figure 3 Swathe sidescan image of the Coral feature



Objectives for this protected area	The objectives for this protected area are the maintenance of the value and integrity of the area's bioregional representation, biodiversity representation and scientific interest.
Objectives for this plan	In accordance with the Guidance for SC Recommendations to the Meeting of the Parties outlined in the standard protocol for protected areas designation (Annex H SC3 report), the objectives for this research and management plan are to describe: - Management and monitoring measures in place in the protected area

	- The time of review of the protected area - If needed, the research that should be undertaken in the area.
Criteria that the protected area meets	This area meets the following criteria: - 3b. Bioregional representation - Area with a comparatively higher degree of naturalness due to zero or a low level of human-induced disturbance or degradation from, for example, historical fishing activity; - 5b. Biodiversity representation - The area is known to contain a high diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity; - 6a. Scientific Interest - The area has scientific research interest associated with understanding ecosystem, biological, geological and biodiversity processes in the SIOFA region. Feature description The Coral seafloor feature is on the Southwest Indian Ridge between the Del Cãno Rise and the Bridle feature and is located in sub-Antarctic waters. It is a spreading centre with seamounts and ridges. Depths range from 4500 m to 200 m (Read and Pollard 2017). Bioregional and biodiversity representation The *R.V. James Cook* cruise JC66 in November and December 2011 observed intact cold-water corals at ~1000 m, largely comprising dead coral framework with high densities of associated fauna including both sessile (corals, sponges) and mobile (squat lobsters, echinoderms) elements (Rogers and Taylor 2012). In shallower waters, located on the upper flanks and summit of the seamount are coral gardens comprising Scleractinia and Octocorallia (Rogers and Taylor 2012). The coral framework at 1000m largely comprised *Solenosmilia variabilis* (Rogers and Taylor 2012). The identity of Scleractinia on seamount summit and upper flanks is uncertain but could possibly be *Lophelia pertusa* (Rogers and Taylor 2012). As part of the outputs from this cruise, Nye (2013) described a two new species of hippolytid shrimps (Crustacea: Decapoda: Caridea: Hippolytidae) from the Coral seamount. Rogers (2014) notes that this is the only known example of a seamount with cold-water coral reef habitat lying in sub-Antarctic waters in the Southern Indian Ocean. The water mass overlying the seamount is Sub-Antarctic and hosts pelagic communities completely different to those further north (north of the Sub-Antarctic and Sub-Tropical Fronts). Pelagic species include Antarctic myctophids (*Electrona* spp) and also pelagic grenadiers. The benthic fauna varies depending on depth on the seamount and also the substratum slope and composition. Cold water coral reef is located on the eastern flanks of the seamount at 1,000m depth. The main framework building species appears to be *Solenosmilia variabilis*. The framework is largely comprised of dead coral but is largely intact with fissures and holes probably created through seismic activity. Live colonies of the framework-building species are also present. The coral reef hosts high densities of a range of other coral species, particularly zoanthids and octocorals. Glass sponges also occur at high density (Rogers 2014).

	Vertical cliffs are seen on the western side of the seamount, colonised by dense communities of sponges, octocorals, brachiopods, and benthopelagic fish, sharks and octopus (Rogers and Taylor 2012). Seabirds are very common over the seamount, particularly wandering albatross and white-chinned petrels. The water mass overlying the seamount is sub-Antarctic and hosts pelagic species completely different to those further north, including Antarctic myctophids, and pelagic grenadiers. Coral Seamount is listed as an Ecologically or Biologically Significant Area (EBSA) by the Convention on Biological Diversity and met the following criteria: • Uniqueness or rarity (High ranking). • Special importance for the life-history stages of species (Medium rank) • Importance for threatened, endangered or declining species and/or habitats (no information) • Vulnerability, fragility, sensitivity, or slow recovery (High ranking) • Biological productivity (No information) • Biological diversity (High ranking) • Naturalness (Medium ranking). As part of the submission for assessment, Rogers (n.d.) noted that cold-water coral reef ecosystems (such as the Coral seamount) fit the criteria of a Vulnerable Marine Ecosystem under the FAO Guidelines for Implementation of UNGA Resolution 61/105. <u>Scientific interest</u> The Coral seamount has been extensively studied. Observations were made of this seamount using a remotely operated vehicle (ROV), *Kiel 6000*, on the *R.V. James Cook* cruise JC66 in November and December 2011. In late 2009, the research vessel *Dr. Fridtjof Nansen* carried out a 6-week multi disciplinary survey of six seamounts in the Southwest Indian Ocean. Read and Pollard (2017) provide details of the physical oceanography of the Coral seamount. Pollard and Read (2017) provide details of the circulation and stratification on and around the Coral seamount. Other research supporting this criteria is cited herein. <u>Fishing history</u> Early exploratory trawling by the F.V. Will Watch indicated the presence of extensive coral formations and no subsequent fishing activities were undertaken (SIODFA 2016). Rogers (no date) notes that there was evidence of fishing on the seamount in the form of lost fishing gear, some of which looked relatively recent (lack of biofouling). Rogers and Taylor (2012) noted that ROV work as part of the *RV James Cook* cruise was stopped on at least 4 occasions due to the discovery of fishing line. On one of these incidents the gear was confirmed as a gill net. It looked very new with no overgrowth on the ropes. The net was filled with corals and coral framework and the area around it was cleared of live corals and sponges. The authors noted that this sighting was of great concern as the seamount had been placed under a voluntary closure to fishing by the deep-sea trawling industry. The authors noted that it would appear to confirm rumours of gill net fishing in the region, probably targeted at deep-sea sharks.

Other information to support designation

Industry members from Australia, the Cook Islands and Japan support the designation of Coral seafloor feature.

Spatial and environmental analysis

The first meeting of the SIOFA Protected Areas and Ecosystems Working Group and SC4 reviewed a spatial clustering analysis that could inform consideration of how individual SIOFA protected areas are represented within networks of protected areas. The findings of this work provide useful information that strengthens the research and management plan for the Coral protected area, particularly in terms of its consideration within a network of protected areas. This information is included below and at Appendices 1–5.

BPAS	Spatial parameters (Appendice1)	Biophysical parameters (Appendice2)	Biodiversity (Appendice3)
Coral	**Specific parameters:** -High slope and variation in roughness -Depth variation **Common parameters:** -A little connected area -Far from continents and islands **Spatial clusters (Figure 2):** Locate in clusters 6 and 7 it represents about 0.6% of cluster 6 and about 0.2% of cluster 7	**Specific parameters :** -High velocity -High surface chlorophyll -High salinity **Common parameters :** -Low temperature -High dissolved O2 content **Biophysical clusters (Figure3):** Locate in cluster 1 it represents about 1.7% of cluster 1	-Pretty good knowledge of benthos -Some campaigns carried out on the site

The Coral feature is located on seamounts and ridges on the South West Indian ridge, between the ascent of Del Cãno and the bridle, hence the great variation in slope and depth (from 200m to 4500m deep) (Read and Pollard 2017). There is therefore a great diversity of habitats, which makes Coral special. It represents about 0.07% of SIOFA area. Coral is the only site in clusters 6 and 7 of the space clusters, it represents about 0.6% of cluster 6 and about 0.2% of

	cluster 7. The cluster 6 represents 6.4% and cluster 7 represents 15.2% of SIOFA area. An area with a high concentration of chlorophyll-a is an area with very good organic production that promotes the development of biodiversity. In addition, it is a rather isolated bench that can have a fauna and flora endemic to the area. There is scientific knowledge because there have been some scientific campaigns carried out on Coral. All these parameters make it important to protect and maintain this site in good condition.
Social, cultural and economic interests	Any historical or recent fishing data may assist with understanding any social, cultural and/or economic costs associated with designating this as a protected area. It is possible that designation could have adverse social, cultural or economic impacts in terms of forgone opportunity for fishing.
Management measures	In accordance with CMM 2018/01, the following management measures apply: *35. The areas included in Annex 2 are provisionally designated as protected areas.* *36. CCPs shall provisionally apply the following measures in the areas listed on Annex 2 until the adoption of a dedicated research and management plan, referred to in paragraph 6(e), for each area at MoP6:* *(a) CCPs shall prohibit all vessels flying their flag from engaging in bottom fishing, excluding line and trap methods; and* *(b) For all other gears, CCPs shall ensure each vessel flying their flag has a scientific observer onboard at all times while fishing inside those areas.* *37. When the Meeting of the Parties adopts a revised SIOFA protocol for protected area designation after advice from the Scientific Committee arising from its review referred to in paragraph 6(d), the Meeting of the Parties shall also review Annex 2 of this CMM, taking into account advice of the Scientific Committee.* All other relevant SIOFA CMMs apply within this protected area.
Management needs	SC4 recommended that the MoP consider that fishing with all gears were identified as activities that degrade the scientific and biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been voluntarily observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. Any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area; (2) an assessment of impacts; and (3) proposed measures to prevent or minimise those impacts.

Review periods	This research and management plan should be reviewed at least every 10 years, or more frequently if new information becomes available that enhances or degrades the justification for its designation as a protected area.
Outline of monitoring and/or research needed	SC4 agreed that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos. Goldsworthy (2017) recommended that observations from the RV James Cook cruise in 2011 and any other evidence showing impact of fishing activity, including anecdotal reports, be reviewed expeditiously to confirm status and health of the habitat. A desk-top compilation of publications from research undertaken within this area would assist with future reviews of the designation.
Compliance	Compliance-related issues are outside of the remit of the SIOFA SC.

References

IUCN, 2013. Seamounts Project: An Ecosystem Approach to Management of Seamounts in the Southern Indian Ocean. Gland, Switzerland: IUCN. 60 pp, reports on two research voyages to the South West Indian Ridge, which included Atlantis Bank, Coral Seamount and Middle of What Seamount.

Goldsworthy, L 2017, Review of SIODFA Proposed Benthic Protected Areas, Report prepared for the Australian Government Department of Agriculture and Water Resources, Lyn Goldsworthy AM, November 2017.

Nye, V 2013. New species of hippolytid shrimps (Crustacea: Decapoda: Caridea:Hippolytidae) from a southwest Indian Ocean seamount. *Zootaxa,* 3637, (2), pp. 101-112.

Pollard, R & Read, J 2017. Circulation, stratification and seamounts in the Southwest Indian Ocean, *Deep-Sea Research II* 136 (2017) 36–43

Read, J & Pollard, R 2017. An introduction to the physical oceanography of six seamounts in the southwest Indian Ocean. *Deep-Sea Research II* 136 (2017) 44–58.

Rogers, A.D. No date. Template for Submission of Scientific Information to Describe Ecologically or Biologically Significant Marine Areas, available at https://www.cbd.int/doc/meetings/mar/ebsa-sio-01/other/ebsa-sio-01-uk-02-en.pdf

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Appendices

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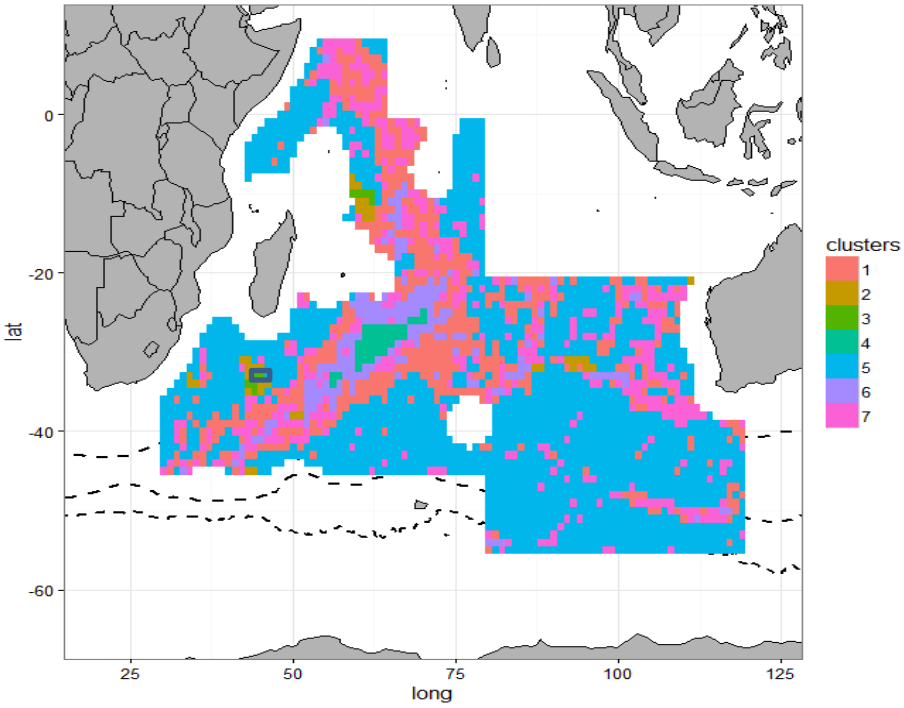
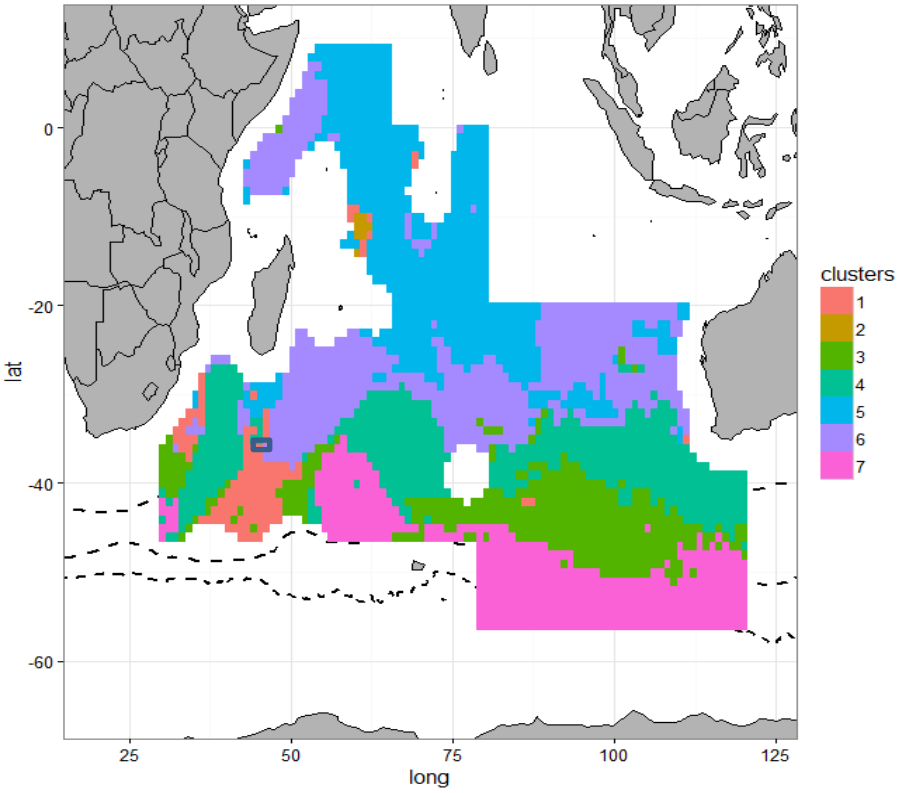
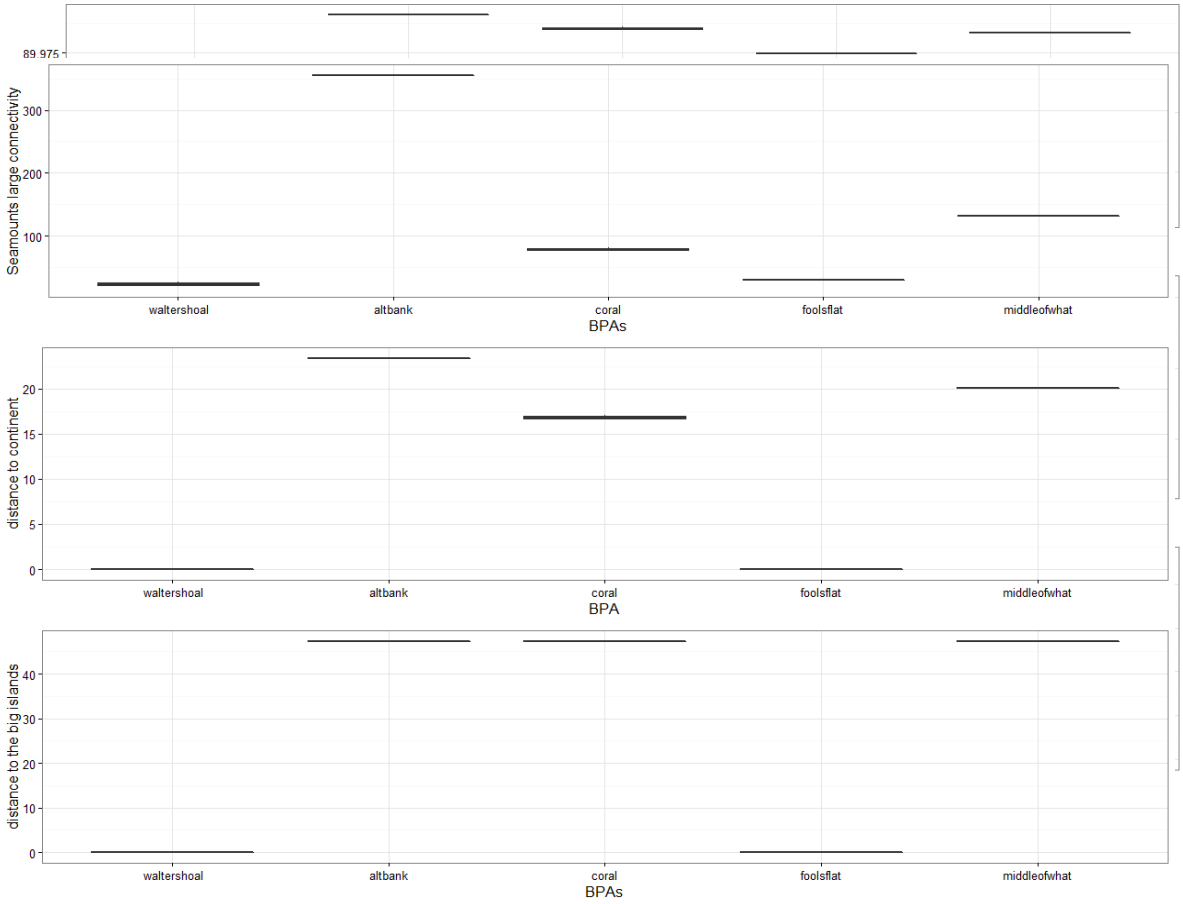
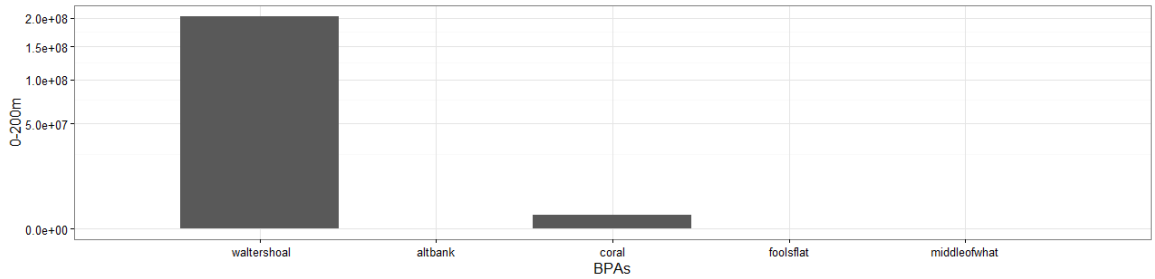


Appendix 2: Biophysical clusters



Appendix 3: Boxplot and Histogram of spatial parameters




2.0e+08
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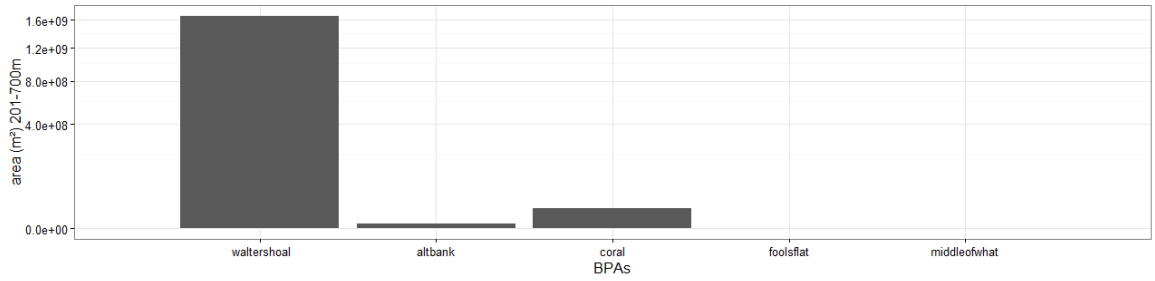
0-200m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs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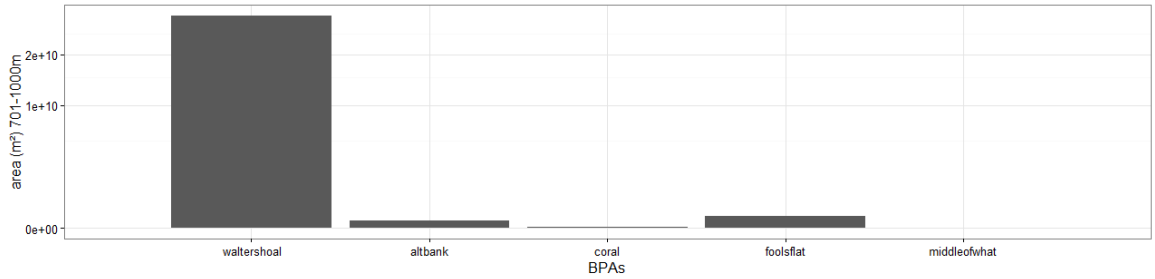
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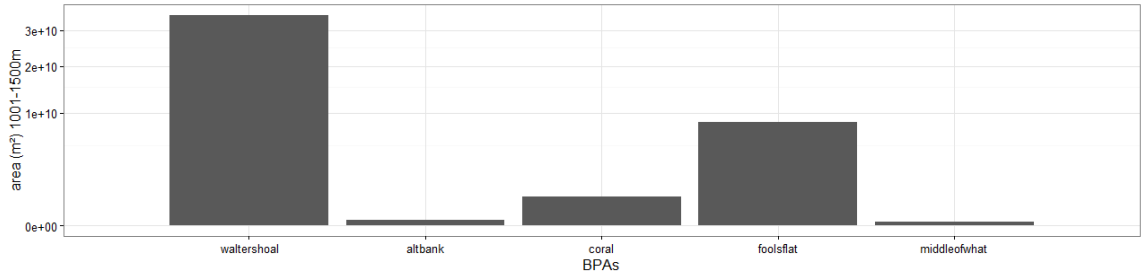
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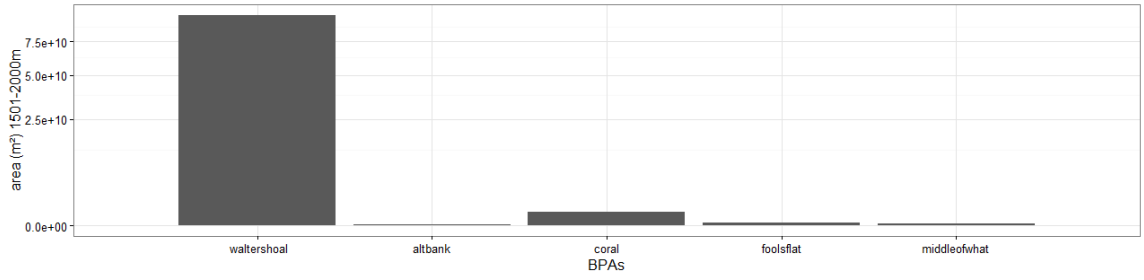
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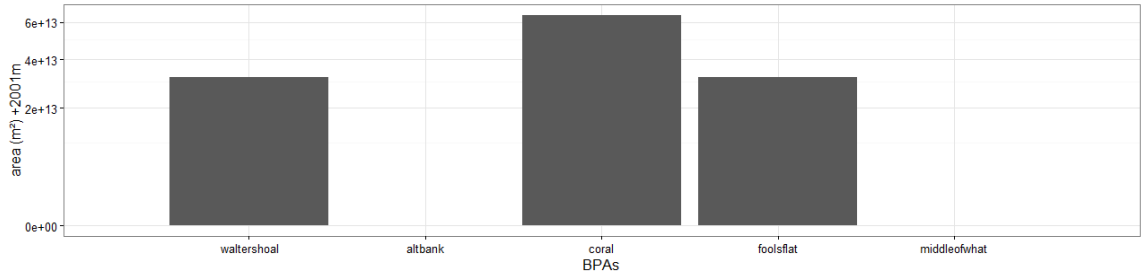
middleofwhat
BPAs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2e+13
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coral
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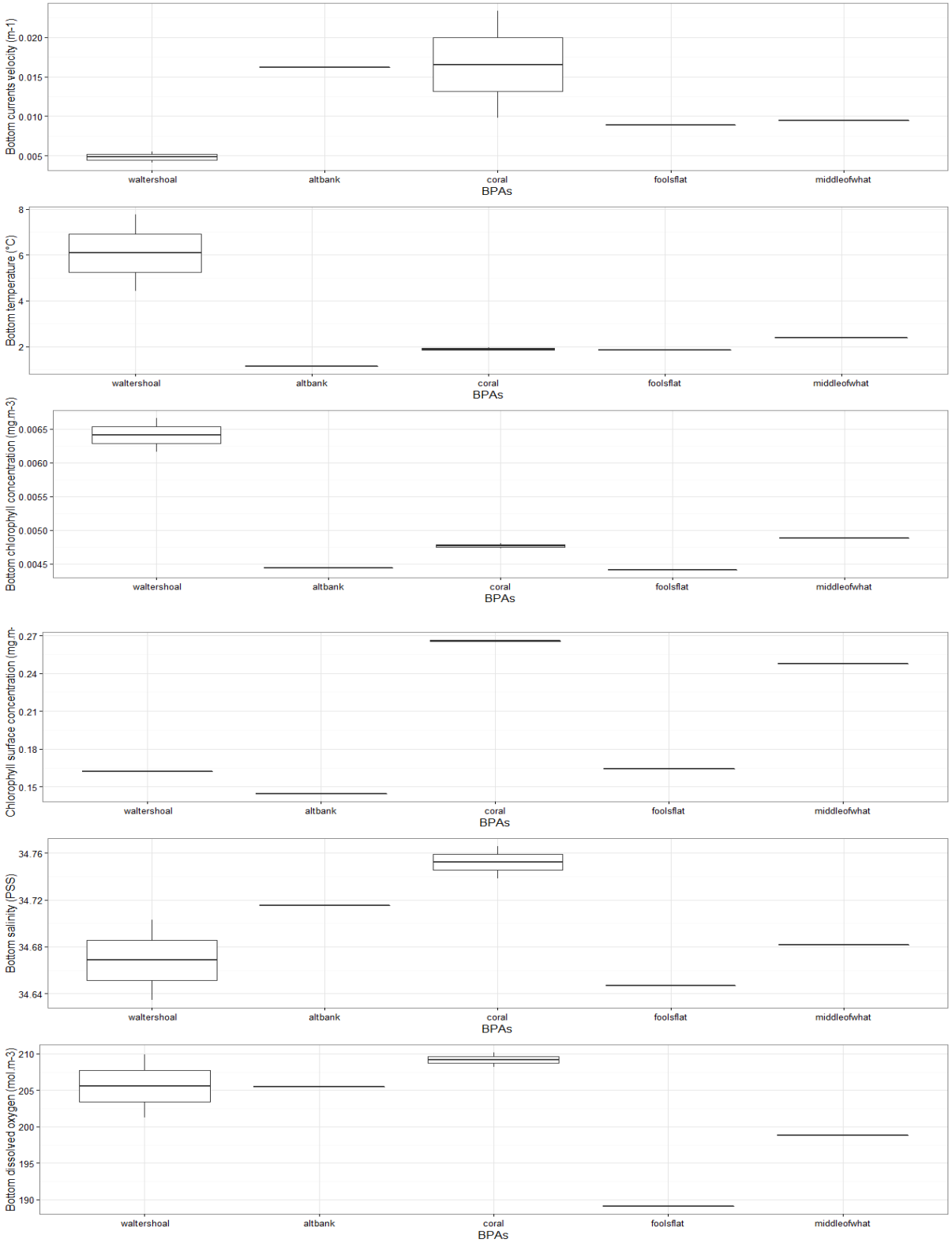
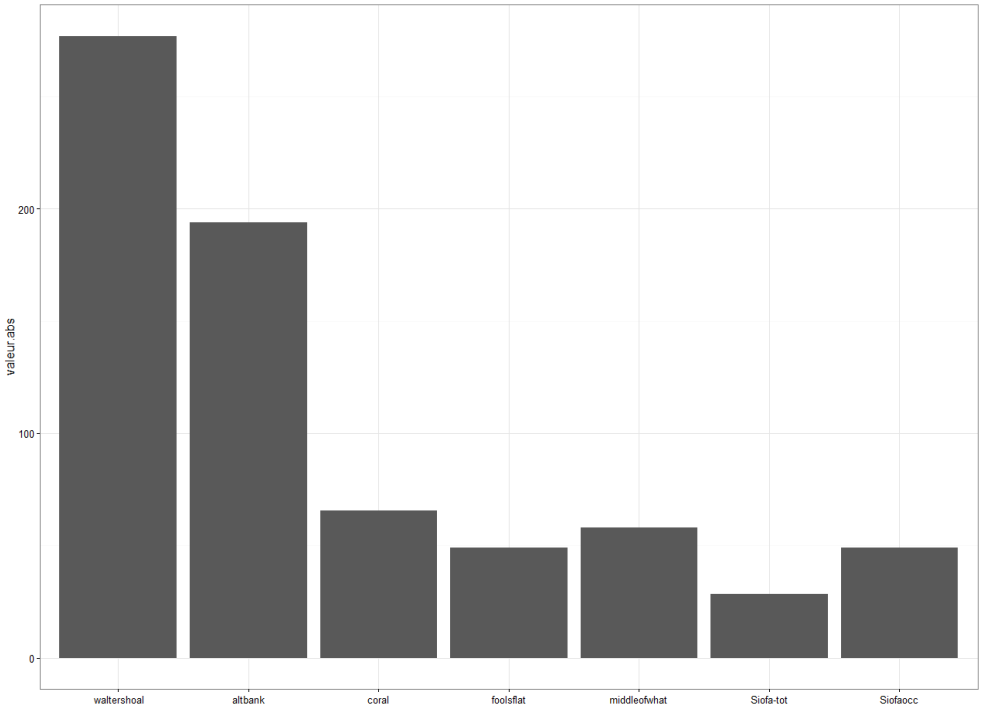
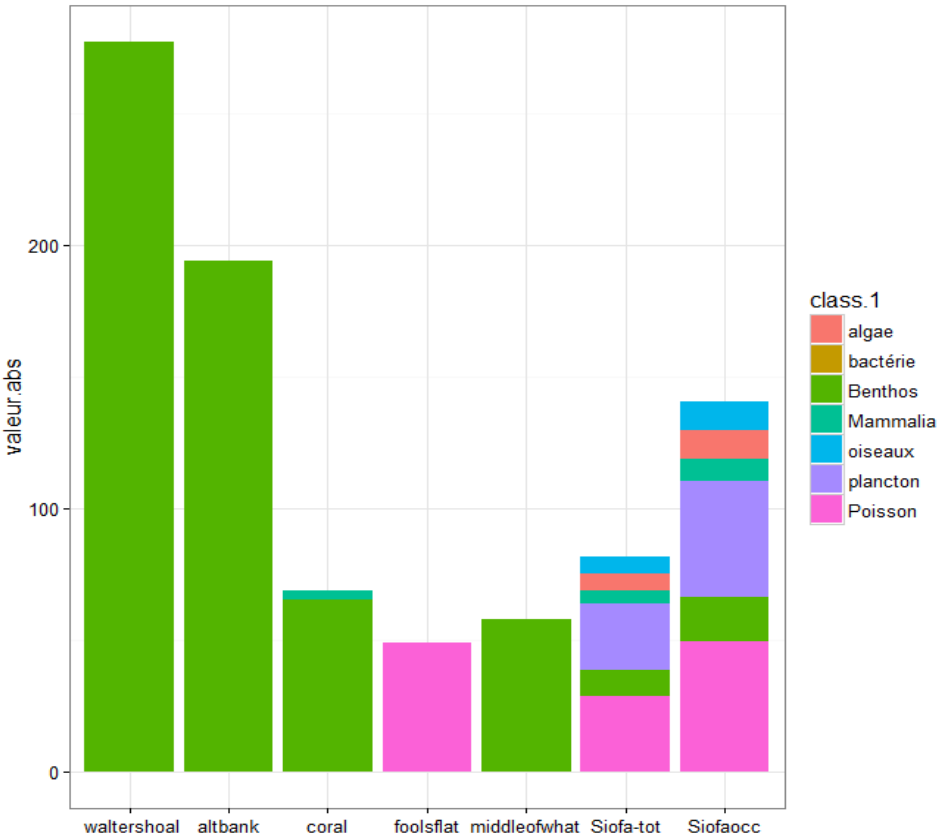
middleofwhat
BPAs

Appendix 4: Boxplot and Histogram of biophysical parameters



Appendix 5: Graphics Biodiversity





Research and management plan for the Fools Flat protected area

<table>
<tr><td>Name</td><td>Fools Flat</td></tr>
<tr><td>Geographic description</td><td>
Coordinates: Latitude 31˚ 20′ S, 94˚ 55′ E and 31˚ 30′ S and 95˚ 00' E.
Area: 585.3 km^2
Area by depth range:
<table>
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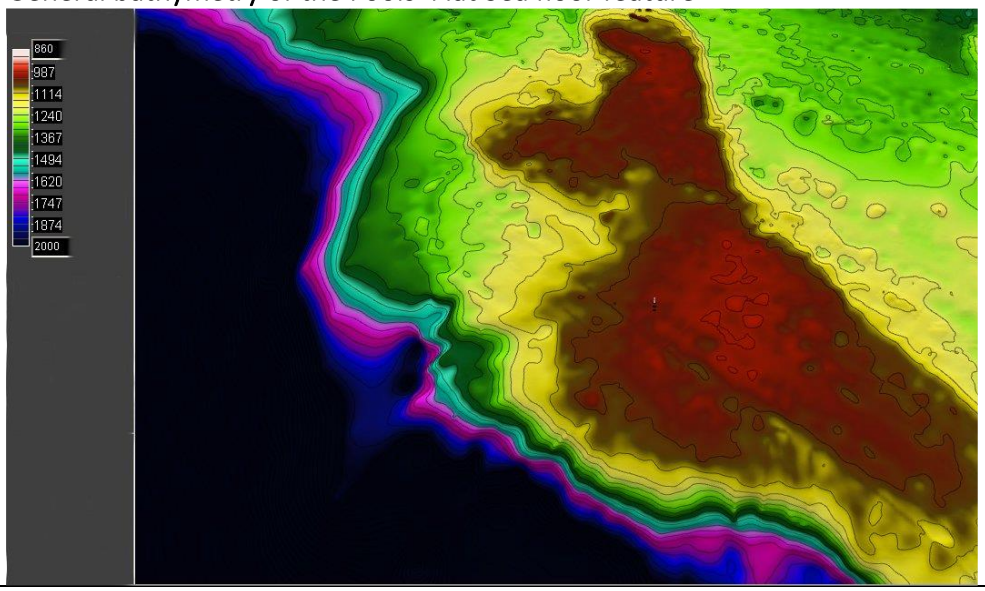
<tr><td>701 – 1000</td><td>1.7</td></tr>
<tr><td>1001 – 1500</td><td>299.7</td></tr>
<tr><td>>1500</td><td>283.9</td></tr>
<tr><td>Total</td><td>585.3</td></tr>
</table>
Figure 1
General bathymetry of the Fools' Flat Sea floor feature


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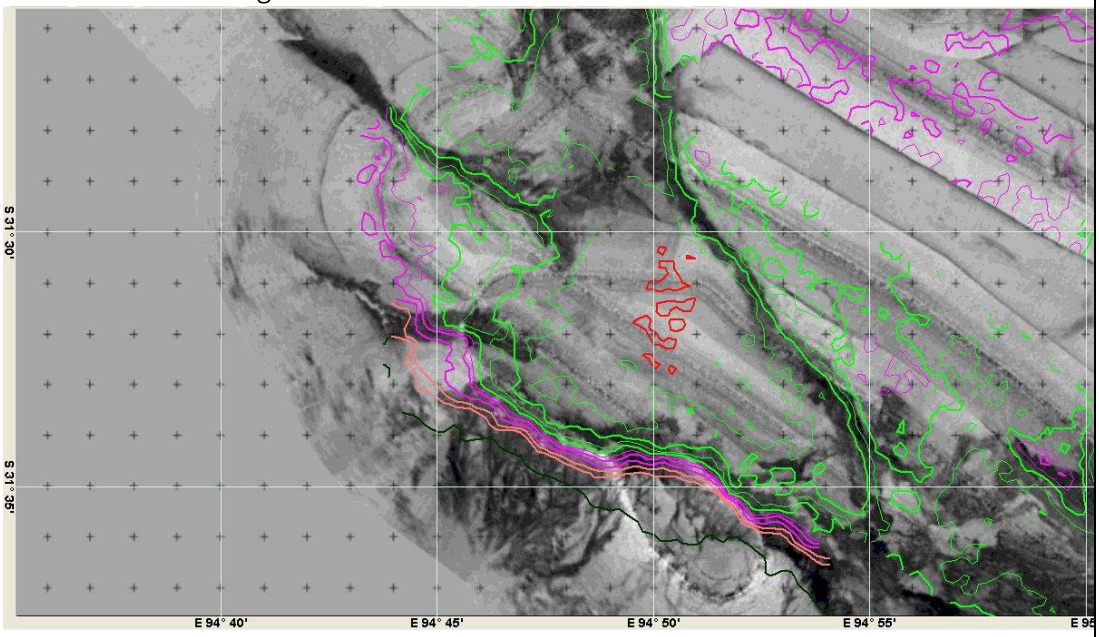
	Figure 2 Swath Sidescan Image of Fools Flat 
Objectives for this protected area	The objectives for this area are to maintain the value and integrity of the area's bioregional representation, geographic and/or geomorphological representation and biodiversity representation.
Objectives for this plan	In accordance with the Guidance for SC Recommendations to the Meeting of the Parties outlined in the standard protocol for protected areas designation (Annex H SC3 report), the objectives for this research and management plan are to describe: - Management and monitoring measures in place in the protected area - The time of review of the protected area - If needed, the research that should be undertaken in the area.
Criteria that the protected area meets	The area meets the following criteria: - 3b. Bioregional representation – The area has a comparatively higher degree of naturalness due to zero or a low level of human-induced disturbance or degradation from, for example, historical fishing activity; - 4a. Geographic and/or geomorphological representation - The area provides for important or desirable geographic representation within the SIOFA area; - 5b. Biodiversity representation – The area is known to contain high diversity of ecosystems, habitats, communities or species, or has higher genetic diversity. Feature description and geographical representation This region is located on the southern side of Broken Ridge Plateau to the south of the Rusky Knoll feature. This site reportedly has a wide range of benthic habitat types (SIODFA 2016). The seamount shoals to around 990 m; its southern side (the edge of Broken Ridge) drops steeply down to over 4000 metres. Figure 1 shows the bathymetry of this seafloor feature. CBD (2015) notes that the seamount

	appears to have suitable environmental conditions for the deepwater species of fish that occur in the area. CBD (2015) notes that is believed to be biologically pristine, and its benthos and topography are highly fractured. There are some indications that this feature may have been above sea level at some time in the past (CBD 2015). <u>Bioregional and biodiversity representation</u> The Fools Flat (central) region is the only part of the entire Broken Ridge that shows substantial coral reefs (FAO 2006). CBD (2015) notes that the extent of this coral habitat is much greater than identified on Coral Seamount in the southwest Indian Ocean, with individual reefs of over 2.5 km^2 in area, and possibly the largest area of cold-water coral habitat yet identified in any ocean. The unique nature of this region comes from the presence of framework-building scleractinian coral reefs on the shallow southern side of the largest single feature in the Indian Ocean, a 1300km-long ridge (CBD 2015). There are reportedly stands of brain and black coral on the southern rim of the ridge, which have elevations of 20 – 30 m and can be seen with sidescan sonar (Figure 2) (SIODFA 2016). When these have been observed on vessel echo sounders they look like aggregations of fish (but they do not move) – hence the term "Fool's Flat". There appears to be strong upwelling over the south-west boundary and this no doubt has resulted in favourable conditions for the growth of deepwater corals (SIODFA 2016). CBD (2015) notes that the main framework-building species appears to be *Solenosmilia variabilis*. The framework largely comprises dead coral, and these three-dimensional habitats are sensitive to impacts, with slow recovery (Koslow et al. 2000, Rogers et al. 2008, Althaus et al. 2009, FAO 2009, Williams et al. 2010) Fools Flat is listed as an Ecologically or Biologically Significant Area (EBSA) by the Convention on Biological Diversity and met the following criteria: • Uniqueness or rarity (High ranking) • Special importance for the life-history stages of species (No information) • Importance for threatened, endangered or declining species and/or habitats (No information) • Vulnerability, fragility, sensitivity, or slow recovery (High ranking) • Biological productivity (No information) • Biological diversity (No information) • Naturalness (High ranking). <u>Fishing history</u> The only trawl shots undertaken here have been on the flat sedimented bottom at around 1000m (SIODFA 2016). At least two fishing vessels are believed to have collected data in the past (SIODFA 2016). It is reported that there has been past fishing by Soviet/Ukrainian vessels across the flats about the Broken Ridge area.

CBD (2015) reports that a single bottom trawl shot was carried out on July 8 1997, which landed at 31o 43.54' S, 95 o 13.7'E at 795 m and immediately came fast. A catch of 3.5 tonnes of dead brain coral was taken, which destroyed the net. This identified the type of habitat as coral reef rather than rocky knoll, and no further fishing activity was undertaken on this type of feature.

Other information to support designation

Industry members from Australia, the Cook Islands and Japan support the designation of Fools' Flat feature. No trawling by SIODFA vessels is permitted.

Spatial and environmental analysis

The first meeting of the SIOFA Protected Areas and Ecosystems Working Group and SC4 reviewed a spatial clustering analysis that could inform consideration of how individual SIOFA protected areas are represented within networks of protected areas. The findings of this work provide useful information that strengthens the research and management plan for the Fools Flat protected area, particularly in terms of its consideration within a network of protected areas. This information is included below and at Appendices 1–5.

BPAS	Spatial parameters (Appendice1)	Biophysical parameters (Appendice2)	Biodiversity (Appendice3)
Fools flat	**Specific parameters :** -High slope and average roughness -Depth variation -Isolated site **Common parameters :** -Far from continents and islands **Spatial clusters:** Locate in cluster 1 it represents about 0.2% of cluster 1	**Specific parameters**: -Low salinity -Average velocity **Common parameters :** -Low temperature -Low chlorophyll concentration -High dissolved O2 content **Biophysical clusters:** Locate in cluster 6 it represents about 0.15% of cluster 6	-Pretty good knowledge of fish -Some campaigns carried out

Fools Flat is located on the south side of the Broken Ridge Plateau to Vancouver Island and on a seamount, resulting in a wide variation in slope and depth (from 700m to 4500m deep). There is therefore a great diversity of habitats, which makes Fools Flat special. It represents about 0.04% of SIOFA area. Fools Flat is the only site in cluster 1 of the space clusters, it represents about 0.2% of cluster 1. The cluster 1 represents 18,7% of SIOFA area.

	In addition, it is a rather isolated bench that can have a fauna and flora endemic to the area. There is little scientific knowledge because there have been few scientific campaigns carried out on Fools Flat. All these parameters make it important to protect and maintain this site in good condition.
Social, cultural and economic interests	Historical fishing data may assist with understanding any social, cultural and/or economic costs associated with designating this as a protected area. It is possible that designation could have adverse social, cultural or economic impacts in terms of forgone opportunity for fishing.
Management measures	In accordance with CMM 2018/01, the following management measures apply: *35. The areas included in Annex 2 are provisionally designated as protected areas.* *36. CCPs shall provisionally apply the following measures in the areas listed on Annex 2 until the adoption of a dedicated research and management plan, referred to in paragraph 6(e), for each area at MoP6:* *(a) CCPs shall prohibit all vessels flying their flag from engaging in bottom fishing, excluding line and trap methods; and* *(b) For all other gears, CCPs shall ensure each vessel flying their flag has a scientific observer onboard at all times while fishing inside those areas.* *37. When the Meeting of the Parties adopts a revised SIOFA protocol for protected area designation after advice from the Scientific Committee arising from its review referred to in paragraph 6(d), the Meeting of the Parties shall also review Annex 2 of this CMM, taking into account advice of the Scientific Committee.* All other relevant components of CMM2018/01 as well as all other relevant SIOFA CMMs apply within this protected area.
Management needs	SC4 recommended that the MoP consider that fishing with all gears were identified as activities that degrade the biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been voluntarily observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. Any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area, (2) an assessment of impacts, and (3) proposed measures to prevent or minimise those impacts.
Review periods	This research and management plan should be reviewed at least every 10 years, or more frequently if new information becomes available that enhances or degrades the justification for its designation as a protected area.
Outline of monitoring	SC4 agreed that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required

and/or research needed	within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos. Goldsworthy (2017) noted that a research survey on the vertical distribution, and condition of the deep-water corals and other species and habitats would strengthen knowledge and understanding of the site. More robust oceanographic data, for example of the upwellings over time, would provide additional information concerning the assumed unique habitat. Goldsworthy (2017) also noted that fishing data should also be provided in more detail, including information on the reports of trawling in the area, and any information on coral bycatch. An analysis of the Russian/Ukrainian fishing data and any other fishing data available would provide confirmation of the assertion that trawl shots have been limited to the flat sedimented bottom. According to Goldsworthy (2017), a more thorough analysis of fishing data and direct observation should be undertaken to confirm the asserted minimal impact of past fishing. A desk-top compilation of publications from research undertaken within this area would assist with future reviews of the designation.
Compliance	Compliance-related issues are outside of the remit of the SIOFA SC.

References

Althaus F, Williams A, Schlacher TA, Kloser RJ, Green MA (2009) Impacts of bottom trawling on deep-coral ecosystems of seamounts are long-lasting. Marine Ecology Progress Series 397: 279–294.

FAO 2006 Management of Demersal Fisheries Resources of the Southern Indian Ocean. FAO Fisheries Circular No. 1020 FAO Rome 2006.

FAO 2009. International guidelines for the management of deep- sea fisheries in the high seas. FAO Rome 2009.

CBD 2015. Ecologically or Biologically Significant Areas (EBSAs): Fool's Flat, published: 13 Jun 2015, available at https://chm.cbd.int/database/record?documentID=204021

Goldsworthy, L 2017, Review of SIODFA Proposed Benthic Protected Areas, Report prepared for the Australian Government Department of Agriculture and Water Resources, Lyn Goldsworthy AM, November 2017.

Koslow, J.A., Hoehlert GW, Gordon JD, Haedrich RL, Lorance P and N Parin. 2000. Continental slope and deep-sea fisheries: implications for a fragile ecosystem. ICES Journal of Marine Science 57: 548-557.

Kotlyar, 1980: Classification & distribution of trachichthyid fish from the Indian Ocean. Trudy Instituta Okeanologii 110.

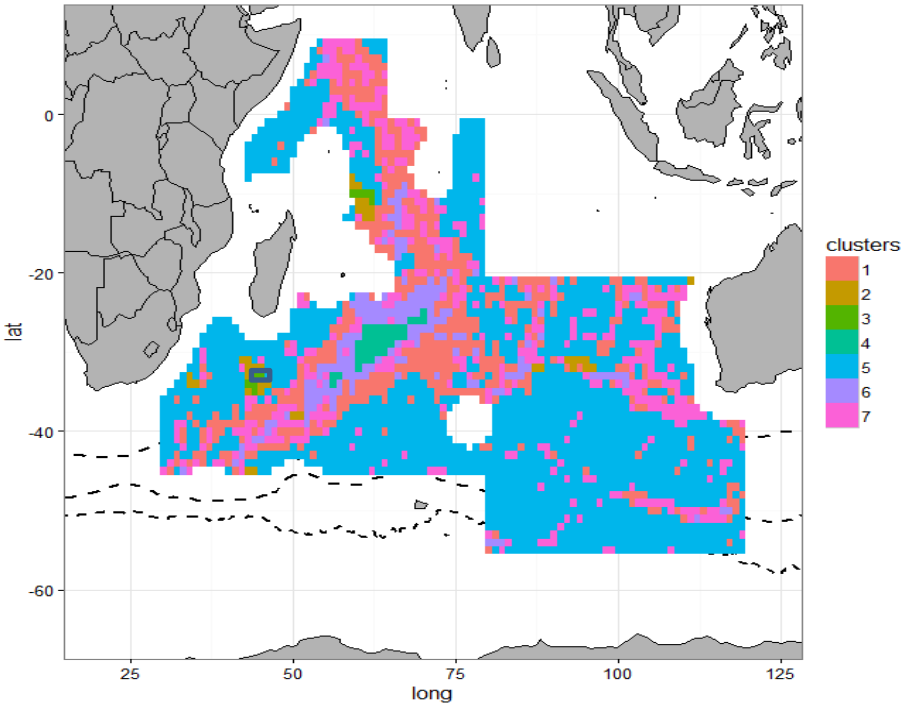
Rogers A.D., Clark M.R, Hall-Spencer K.M and Gjerde K.M. (2008). The Science behind the Guidelines: A Scientific Guide to the FAO Draft International Guidelines (December 2007) For the Management of Deep-Sea Fisheries in the High Seas and Examples of How the Guidelines May Be Practically Implemented. IUCN, Switzerland, 2008.

SIODFA 2016, Southern Indian Ocean Deepwater Fisheries Association (SIODFA), Benthic Protected Areas in the Southern Indian Ocean. SIODFA Technical Report XVII 16/01. 40 pp

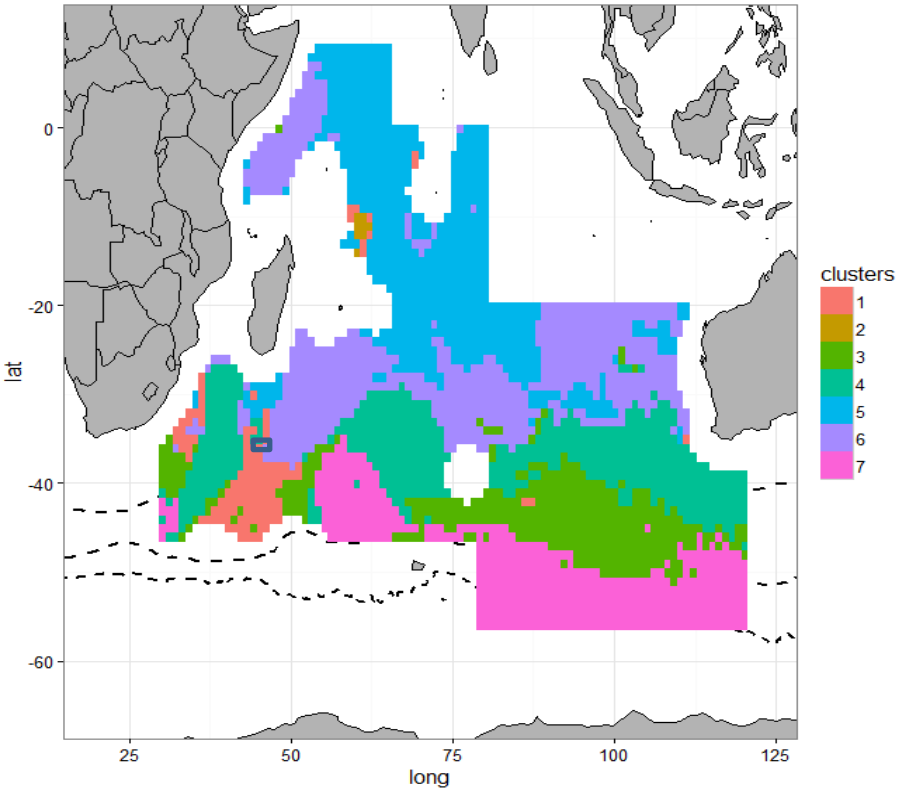
Williams A, Schlacher TA, Rowden AA, Althaus F, Clark MR, et al. (2010) Seamount megabenthic assemblages fail to recover from trawling impacts. Marine Ecology 31(S1): 183–199.

Appendices

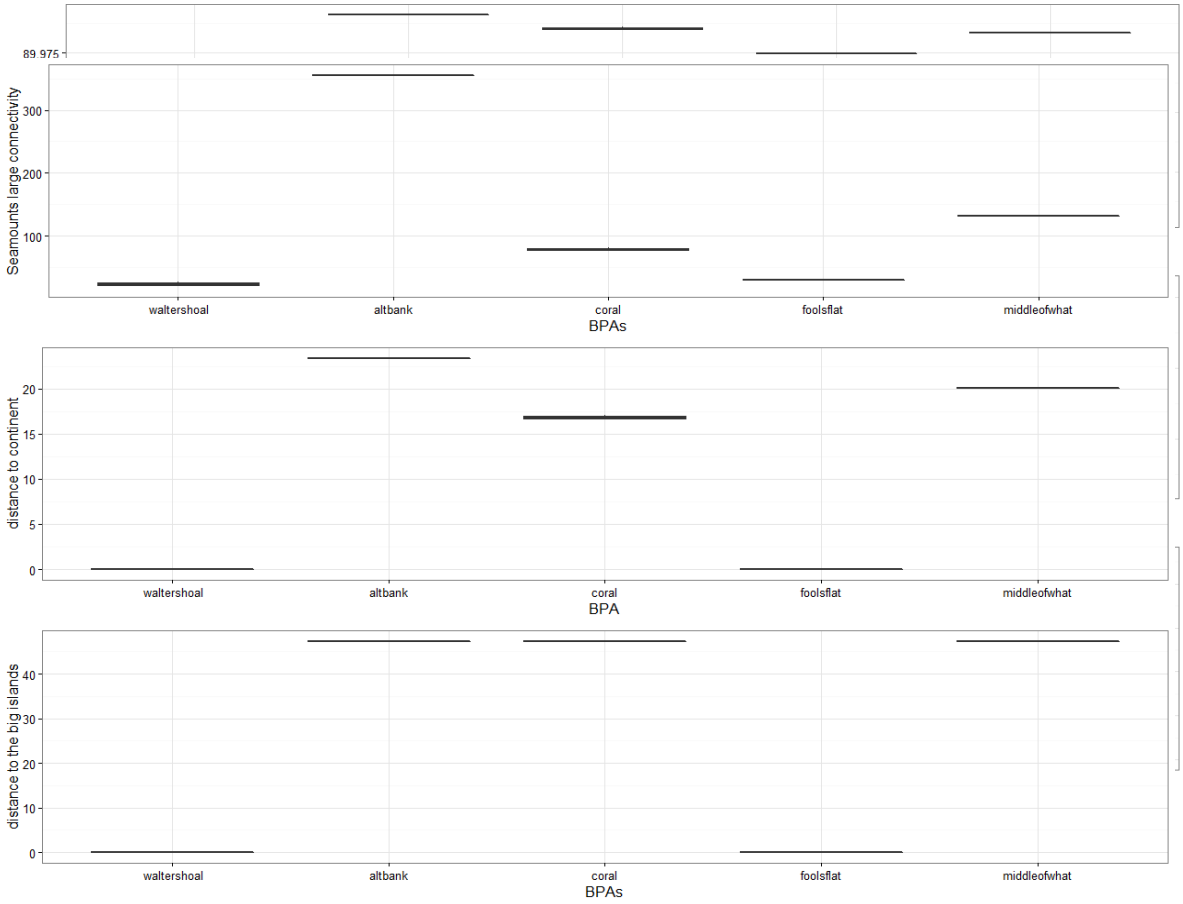
Appendix 1: Spatial clusters

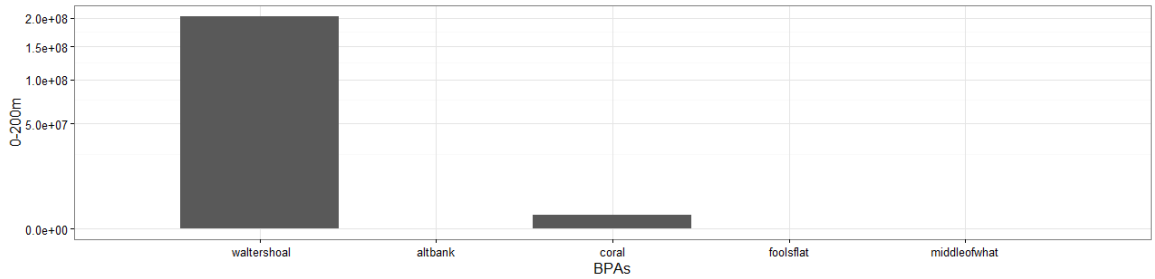


Appendix 2: Biophysical clusters



Appendix 3: Boxplot and Histogram of spatial parameters

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0-200m
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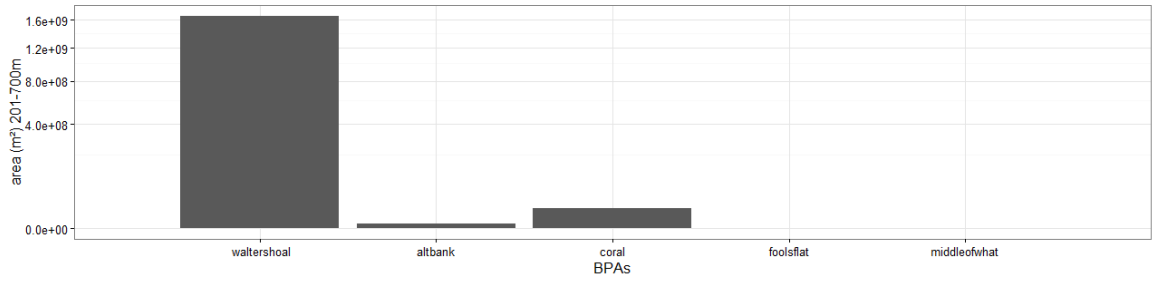
foolsflat
middleofwhat
BPAs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middleofwhat
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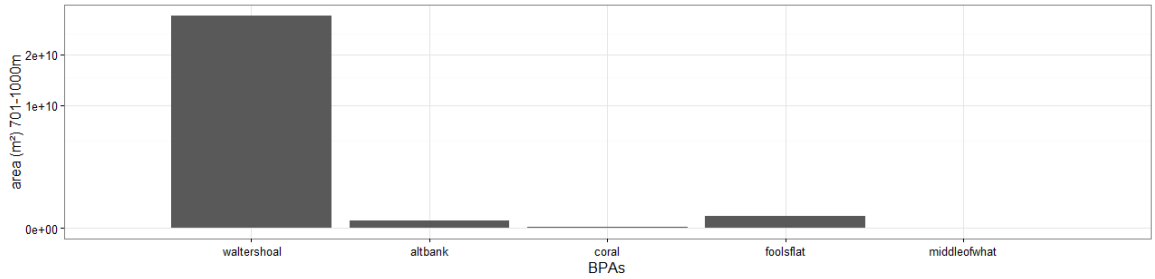
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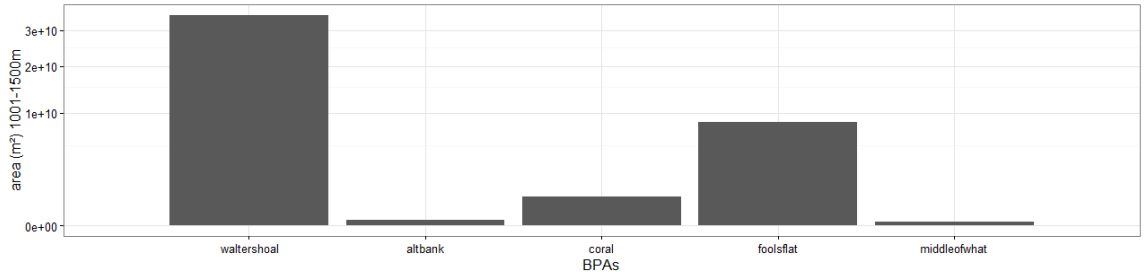
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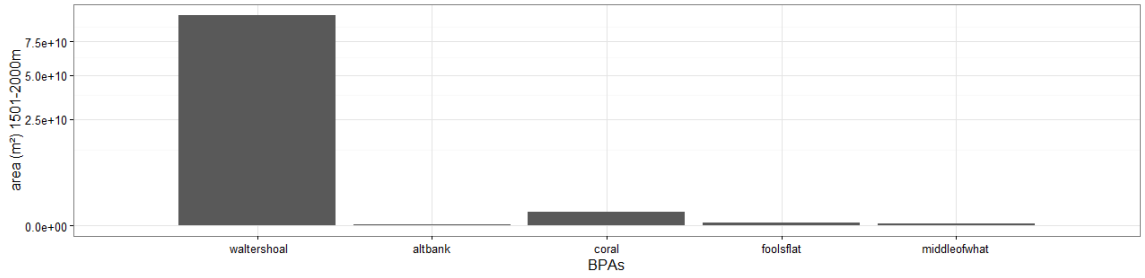
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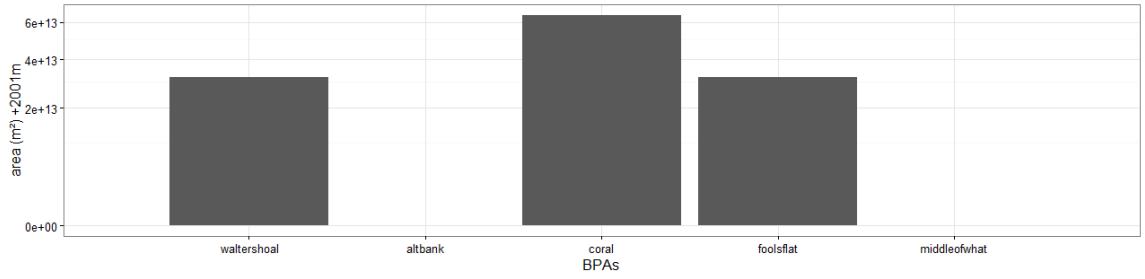
foolsflat
middleofwhat
BPAs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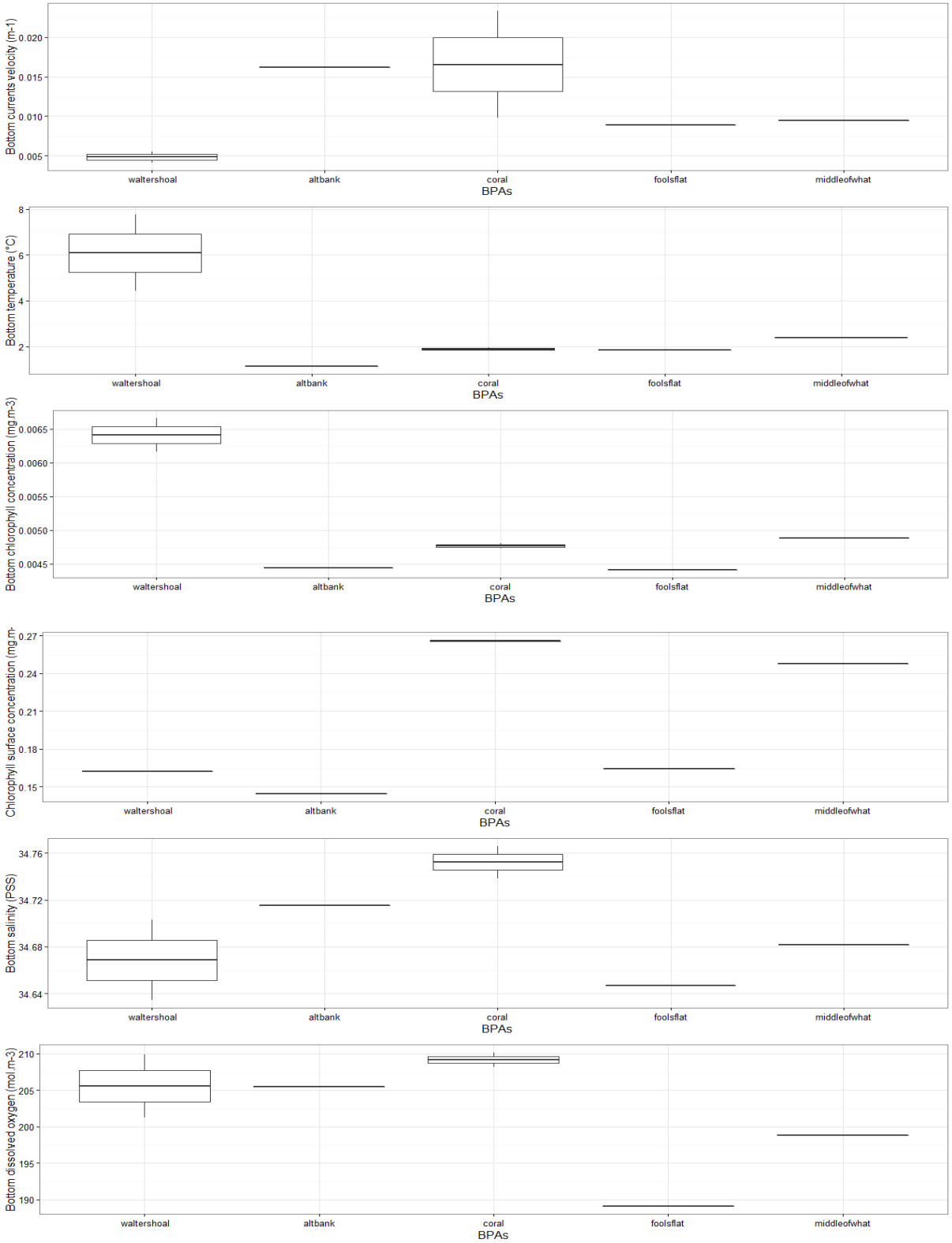
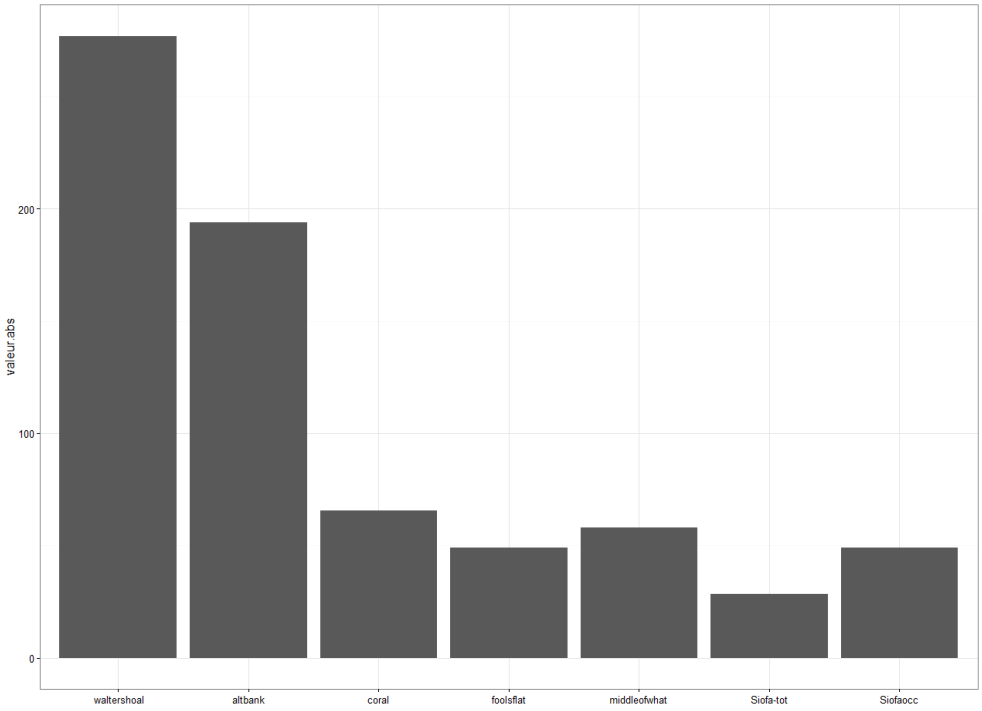
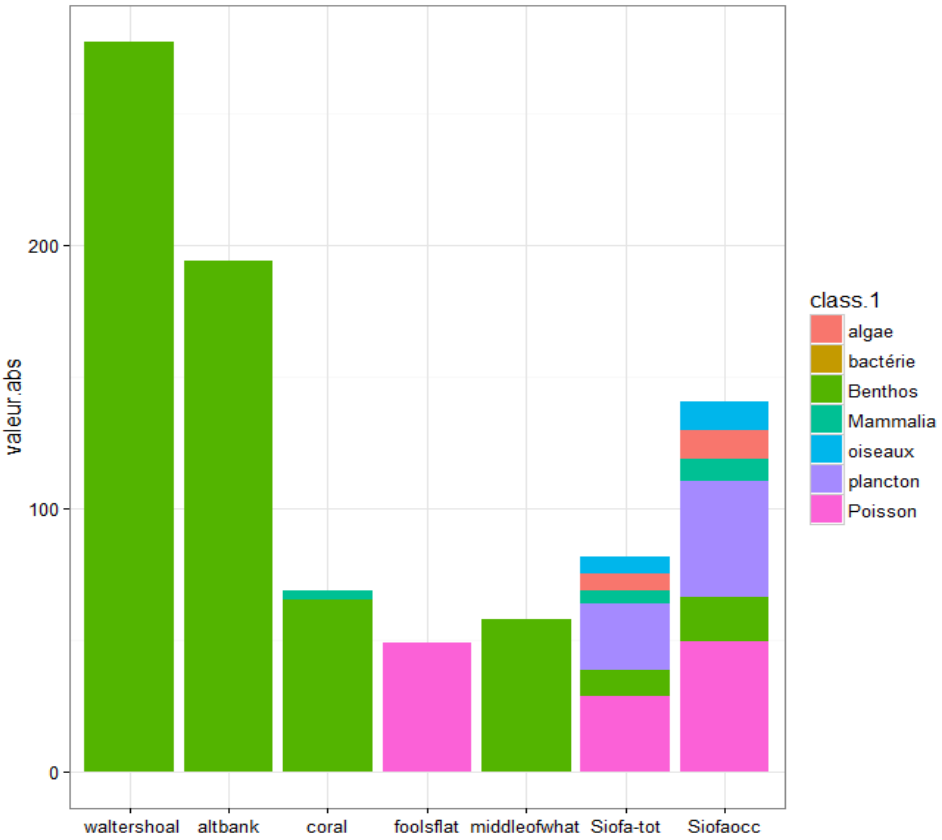
4e+13
2e+13
0e+00
area (m²) +2001m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

Appendix 4: Boxplot and Histogram of biophysical parameters



Appendix 5: Graphics Biodiversity





Research and management plan for the Middle of What protected area

Name	Middle of What (MOW)
Geographic description	**Coordinates:** Latitude 37˚ 54′ S, 50˚ 23′ E and 37˚ 56.5′ S and 50˚ 27′ E. **Area**: 6084 km^2

Figure 1
General bathymetry of the MOW seafloor feature

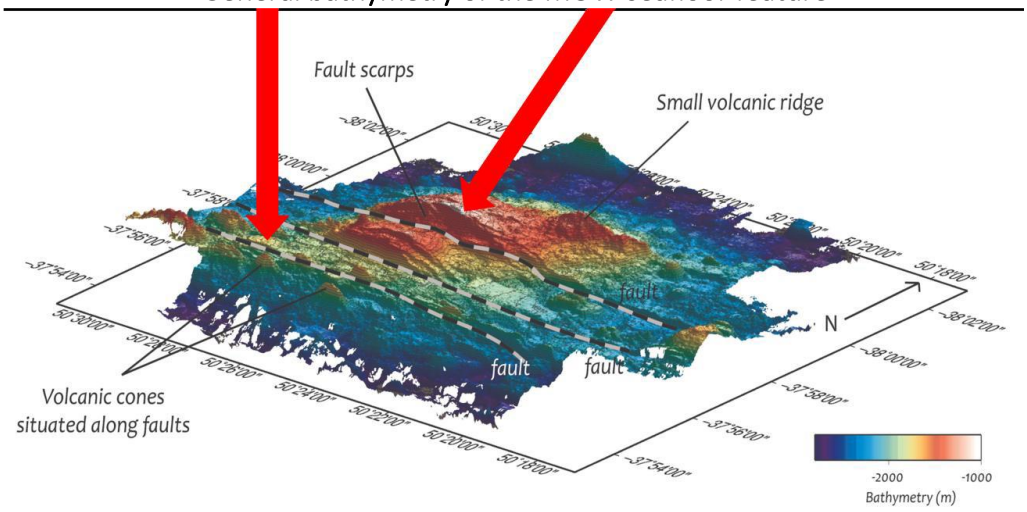


Figure 2

The small volcanic ridge to the side of the main MOW seafloor feature

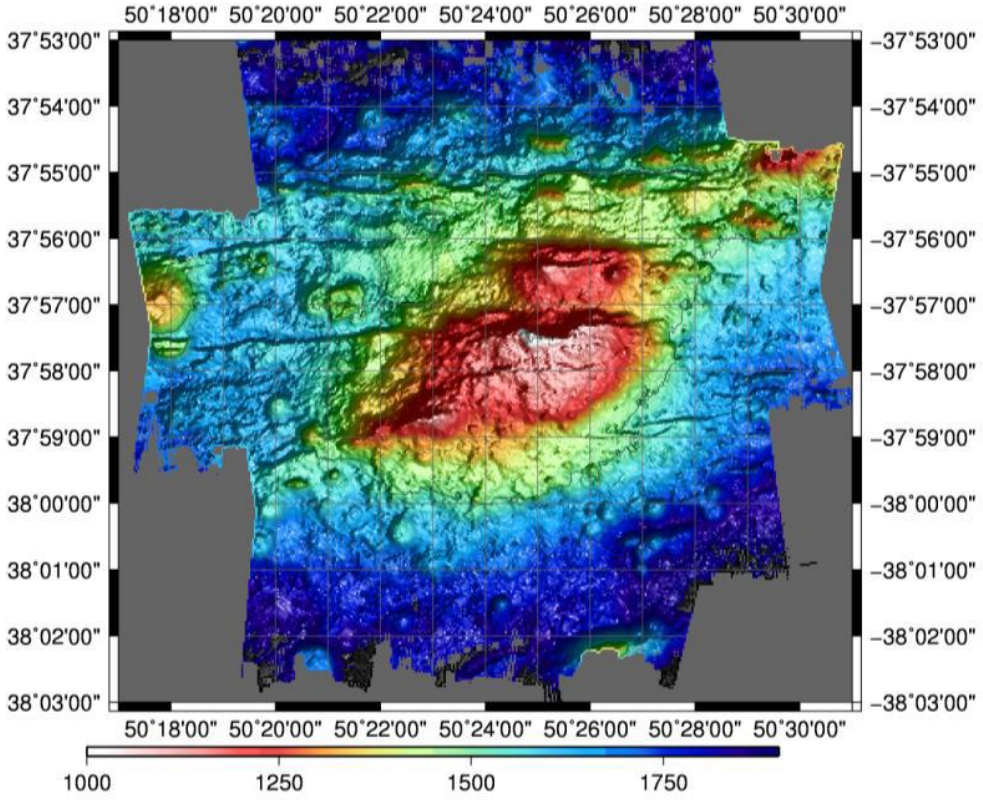
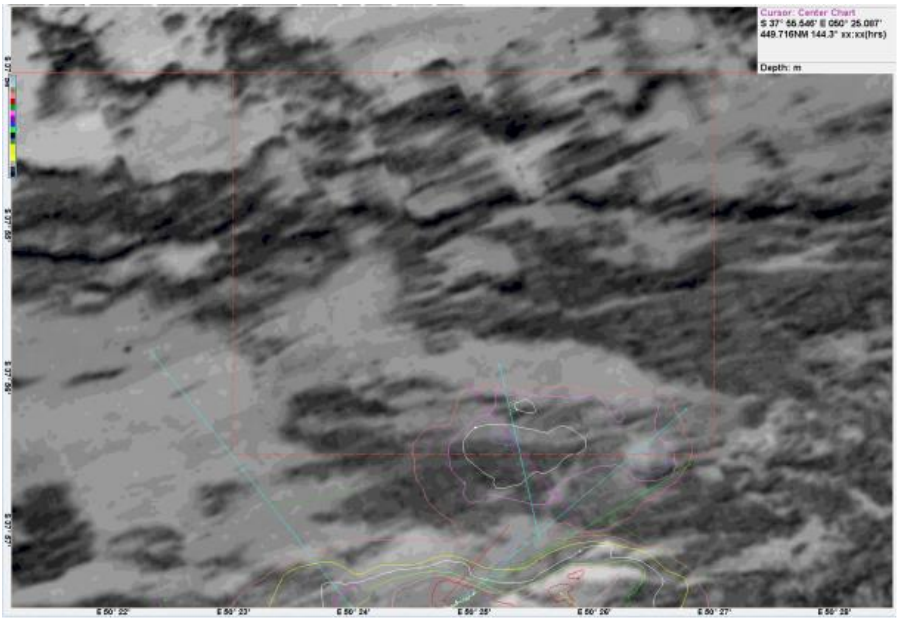


	Figure 3 Low resolution mapping of MOW seafloor feature 
Objectives for this protected area	In line with the protocol for protected areas designation, the objective for this area is the protection of its bioregional representativeness.
Objectives for this plan	In accordance with the Guidance for SC Recommendations to the Meeting of the Parties outlined in the standard protocol for protected areas designation (Annex H SC3 report), the objectives for this research and management plan are to describe: - Management and monitoring measures in place in the protected area - The time of review of the protected area - If needed, the research that should be undertaken in the area.
Criteria that the protected area meets	The area meets the following criteria: 3b. Bioregional representation - Area with a comparatively higher degree of naturalness due to zero or a low level of human-induced disturbance or degradation from, for example, historical fishing activity. Feature description The location of the MOW seafloor feature is towards the southern end of the South Indian Ridge in waters forming a dynamic boundary region between sub-Antarctic and sub-tropical waters and has a deep summit (~900-1000m depth). Strong currents sweep over the seamount. It is a spreading centre with seamounts and ridges with depths from 4500 m to 180 m. This area was surveyed by the R.V. James Cook during November - December 2011 and by RV *Dr Fridtjof Nansen* in 2009 (Rogers et al. 2009).

	Read and Pollard (2017) provide details of the physical oceanography of the MoW feature. Pollard and Read (2017) provide details of the circulation and stratification on and around the feature. Bioregional and biodiversity representation The area has been proposed as an Ecologically and Biologically Significant Area (EBSA) for consideration by the Convention on Biological Diversity (Rogers n.d.). The proposal notes that this is the only known example of a seamount with cold-water coral reef habitat lying in the boundary region of sub-Antarctic and sub-tropical water masses in the Southern Indian Ocean. The water mass overlying the seamount hosts pelagic communities typical of sub-tropical waters. The benthic fauna varies depending on depth on the seamount and also the substratum slope and composition. Cold water coral reef is located on the peak of the seamount at ~1,000m depth. The proposal notes that the main framework building species appears to be *Solenosmilia variabilis*. The framework is largely comprised of dead coral and is highly degraded probably as a result of trawling damage. However, more intact stony coral reef is present on parasitic sub-cones located on the Southern flanks of the seamount. Very broken ground around these sub-cones also host coral garden habitat with large (2m tall) bamboo corals and stylasterids particularly notable. Lantern sharks are very abundant around Middle of What Seamount, especially around the sub-cones, but note this is from a single set of observations. Live colonies of the framework-building species are also present. The coral reef hosts high densities of a range of other coral species, particularly octocorals and sponges. Glass sponges also occur at high density. The proposal notes evidence of fishing on the seamount in the form of highly degraded and damaged coral habitat on the summit of the main feature of the seamount to the extent that this area could be viewed as compromised as an area for conservation. However, the parasitic cones located on the southern flanks of the seamount host intact cold-water coral reef and rough ground to the south and also the northeastern part of the seamount host extensive coral garden habitat. High numbers of sharks were observed in the southern area. The benthic habitats documented on this seamount includes a very high diversity of species, especially corals and coral associates. Rogers (n.d) noted that this diversity is currently being analysed in various laboratories in the UK, France, Australia and the USA. Preliminary results for, for example, ophiuroids, indicate 50% of the species are new to science. The EBSA proposal notes the area as meeting the following EBSA criteria: • Uniqueness or rarity (High ranking) • Special importance for the life-history stages of species (Medium ranking) • Importance for threatened, endangered or declining species and/or habitats (High ranking) • Vulnerability, fragility, sensitivity, or slow recovery (High ranking) • Biological productivity (High ranking)

- Biological diversity (High ranking)
- Naturalness (Medium ranking).

Scientific interest

The MoW feature has been the subject of a number of research cruises, cited herein.

Fishing history

This general area tends to be an area of much past fishing activity (SIODFA 2016). This fishing ground was one targeted by inexperienced vessels during the 'race for fish' which occurred in the period of 2000-2001, but there has been limited fishing since then (SIODFA 2016).

Other information to support designation

Industry members from Australia, the Cook Islands and Japan support the designation of the MOW feature. No trawling by SIODFA vessels is permitted.

Spatial and environmental analysis

The first meeting of the SIOFA Protected Areas and Ecosystems Working Group and SC4 reviewed a spatial clustering analysis that could inform consideration of how individual SIOFA protected areas are represented within networks of protected areas. The findings of this work provide useful information that strengthens the research and management plan for the Middle of What protected area, particularly in terms of its consideration within a network of protected areas. This information is included below and at Appendices 1–5.

BPAS	Spatial parameters (Appendice1)	Biophysical parameters (Appendice2)	Biodiversity (Appendice3)
Middle of What	**Specific parameters:** -High slope with average roughness -Present in deep bathomes **Common parameters:** -Moderately connected site -Far from the islands and mainland **Spatial clusters:** Locate in cluster 2 it represents about 2.7% of cluster 2	**Specific parameters:** -High surface chlorophyll concentration **Common parameters :** -Average velocity -Average temperature -High dissolved O2 content **Biophysical clusters:** Locate in cluster 6 it represents about 0.15% of cluster 6	-Reasonably good knowledge of benthos -Some campaigns carried out

	Middle of What (MOW) is located on seamounts and ridges on the southern tip of South West Indian ridge, resulting in great variation in slope and depth (in deeper bathomes). There is therefore a great diversity of habitats, which makes Middle of What special. It represents about 0.04% of SIOFA area. MOW is the only site in cluster 1 of the space clusters, it represents about 2.7% of cluster 2. The cluster 2 represents 1.3% of SIOFA area. An area with a high concentration of chlorophyll-a is an area with very good organic production that promotes the development of biodiversity. There is scientific knowledge because there have been some scientific campaigns carried out on MOW. All these parameters make it important to protect and maintain this site in good condition.
Social, cultural and economic interests	Historical fishing data may assist with understanding any social, cultural and/or economic costs associated with designating this as a protected area. It is possible that designation could have adverse social, cultural or economic impacts in terms of forgone opportunity for fishing.
Management measures	In accordance with CMM 2018/01, the following management measures apply: *35. The areas included in Annex 2 are provisionally designated as protected areas.* *36. CCPs shall provisionally apply the following measures in the areas listed on Annex 2 until the adoption of a dedicated research and management plan, referred to in paragraph 6(e), for each area at MoP6:* *(a) CCPs shall prohibit all vessels flying their flag from engaging in bottom fishing, excluding line and trap methods; and* *(b) For all other gears, CCPs shall ensure each vessel flying their flag has a scientific observer onboard at all times while fishing inside those areas.* *37. When the Meeting of the Parties adopts a revised SIOFA protocol for protected area designation after advice from the Scientific Committee arising from its review referred to in paragraph 6(d), the Meeting of the Parties shall also review Annex 2 of this CMM, taking into account advice of the Scientific Committee.* All other relevant components of CMM2018/01 as well as all other relevant SIOFA CMMs apply within this protected area.
Management needs	The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been voluntarily observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. Any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area, (2) an assessment of impacts, and (3) proposed measures to prevent or minimise those impacts.

Review periods	This research and management plan should be reviewed at least every 10 years, or more frequently if new information becomes available that enhances or degrades the justification for its designation as a protected area.
Outline of monitoring and/or research needed	SC4 agreed that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos. The following monitoring and/or research needs have been identified: - Goldsworthy (2017) noted that as this is an area of fishing interest, an analysis of impact on existing/future fishing interests should be undertaken. - A desk-top compilation of publications from research undertaken within this area would assist with future reviews of the designation.
Compliance	Compliance-related issues are outside of the remit of the SIOFA SC.

References

Pollard, R & Read, J 2017. Circulation, stratification and seamounts in the Southwest Indian Ocean, *Deep-Sea Research II* 136 (2017) 36–43

Read, J & Pollard, R 2017. An introduction to the physical oceanography of six seamounts in the southwest Indian Ocean. *Deep-Sea Research II* 136 (2017) 44–58.

Rogers AD no date. Template for Submission of Scientific Information to Describe Ecologically or Biologically Significant Marine Areas: Middle of What Seamount, available here https://www.cbd.int/doc/meetings/mar/ebsa-sio-01/other/ebsa-sio-01-uk-01-en.pdf

Rogers, A., Alvheim, O., Bemanaja, E., Benivary, D., Boersch- Supan, P., Bornman, T., Cedras, R., DuPlessis, N., Gotheil, S., Høines, A., Kemp, K., Kristiansen, J., Letessier, T., Mangar, V., Mazungula, N., Mørk, T., Pinet, P., Read, J., Sonnekus, T. (Eds.), Secondary "Dr. Fritjof Nansen" Southern Indian Ocean Seamounts (IUCN/UNDP/ASCLME/NERC/EAF Nansen Project 2009 Cruise 410) 12th November – 19th December. Gland, CH, International Union for Conservation of Nature, 12/2009, 188 pp.

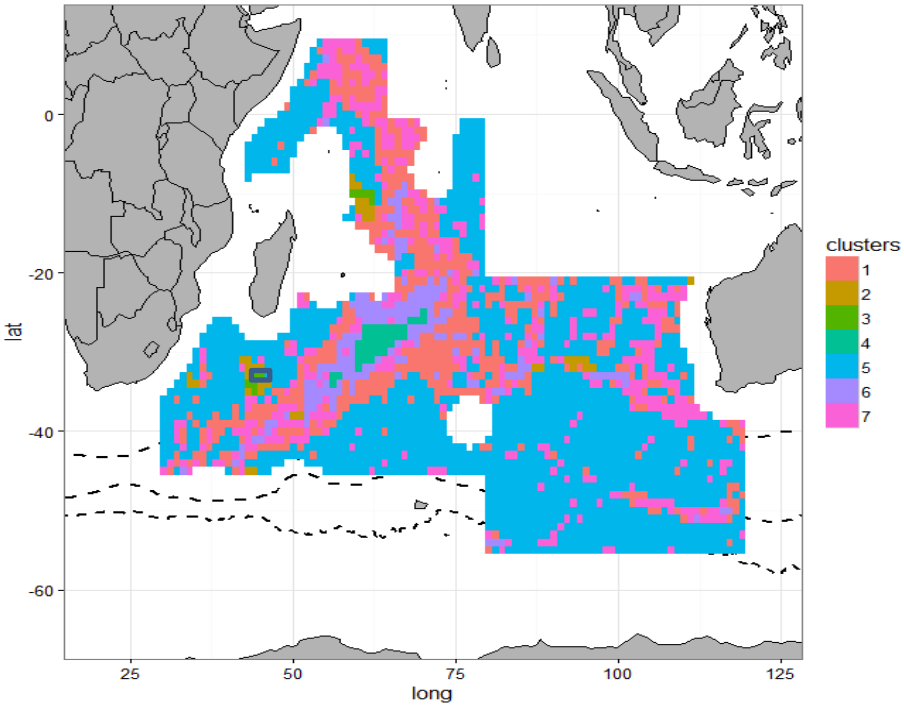
Rogers, A.D. 2012. An Ecosystem Approach to Management of Seamounts in the Southern Indian Ocean: Volume 1 – Overview of Seamount Ecosystems and Biodiversity. Gland, Switzerland, IUCN, for a history of scientific exploration in the region.

Rogers A.D. & M.L. Taylor. 2012. Benthic biodiversity of seamounts in the southwest Indian Ocean Cruise report – R/V James Cook 066 Southwest Indian Ocean Seamounts expedition – November 7th – December 21st, 2011. 235pp. http://www-odp.tamu.edu/publications/prelim/176_PREL/176OBJT.HTML

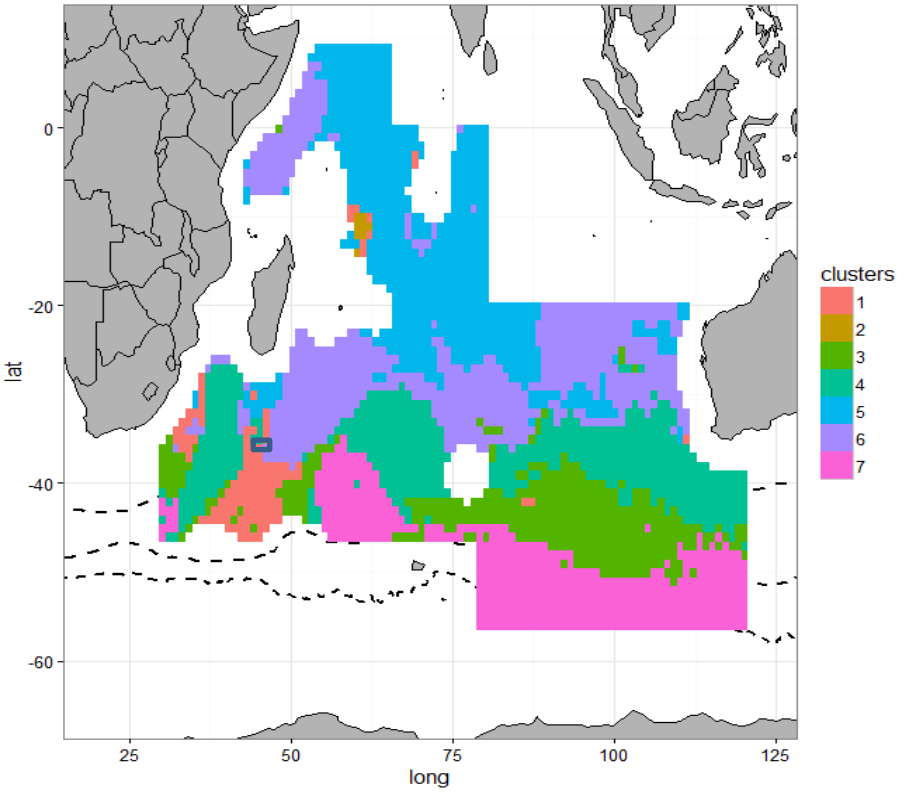
SIODFA 2016, Southern Indian Ocean Deepwater Fisheries Association (SIODFA), Benthic Protected Areas in the Southern Indian Ocean. SIODFA Technical Report XVII 16/01. 40 pp

Appendices

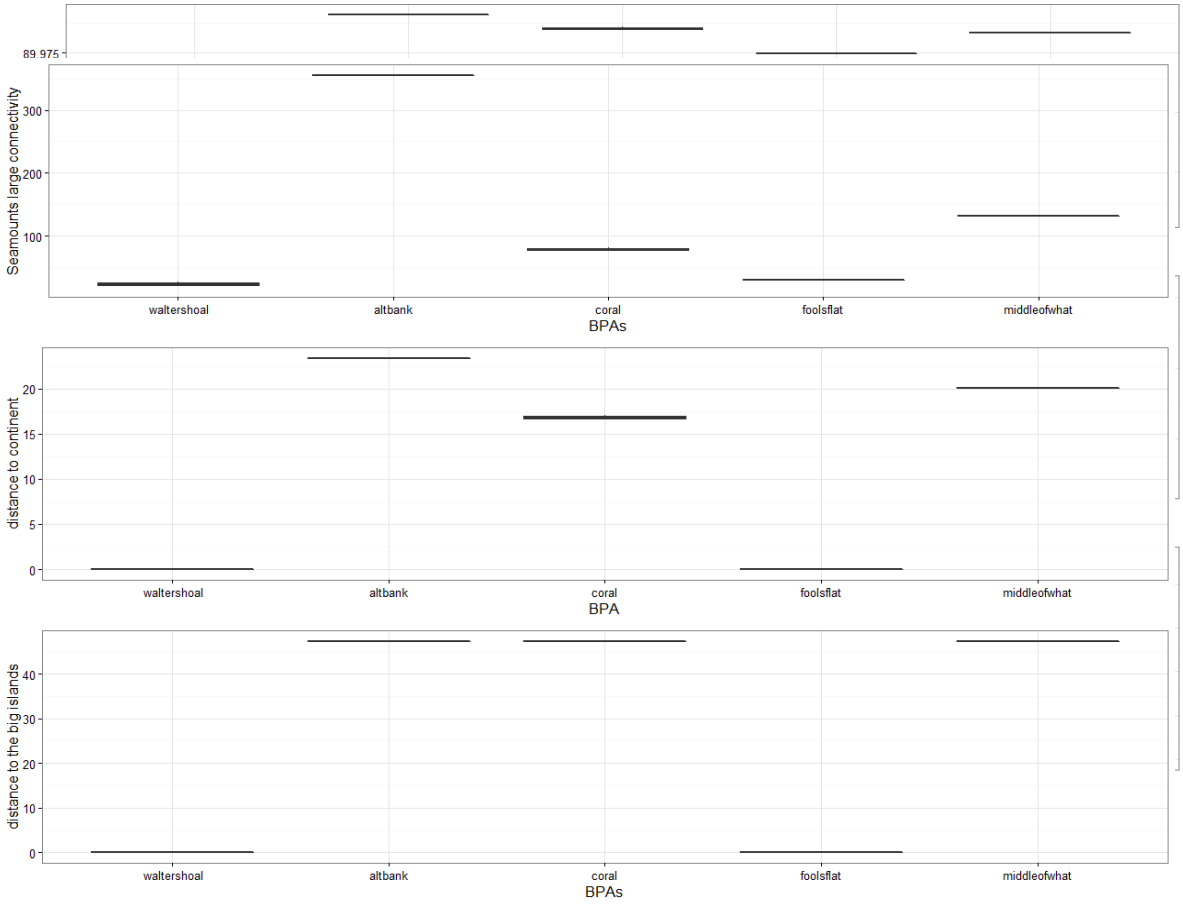
Appendix 1: Spatial clusters

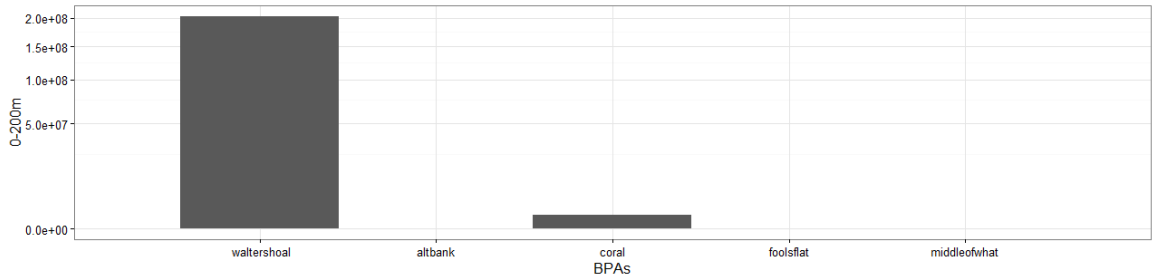


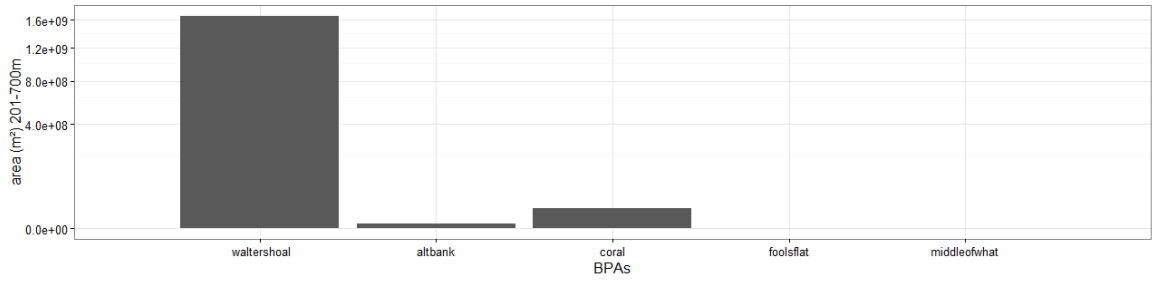
Appendix 2: Biophysical clusters

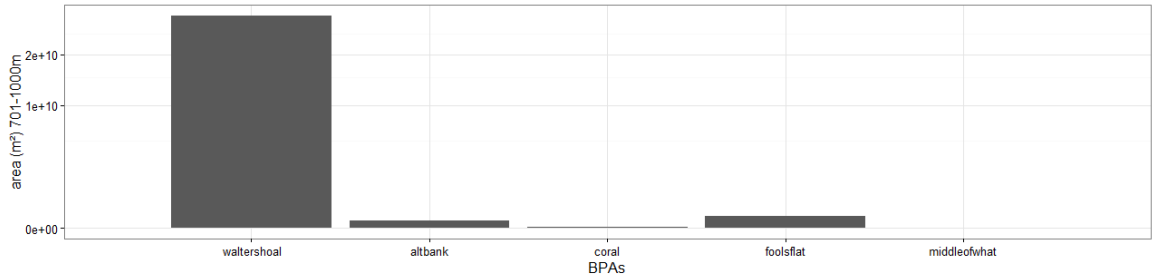


Appendix 3: Boxplot and Histogram of spatial parameters




2.0e+08
1.5e+08
1.0e+08
5.0e+07
0.0e+00
0-200m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


1.6e+09
1.2e+09
8.0e+08
4.0e+08
0.0e+00
area (m²) 201-700m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs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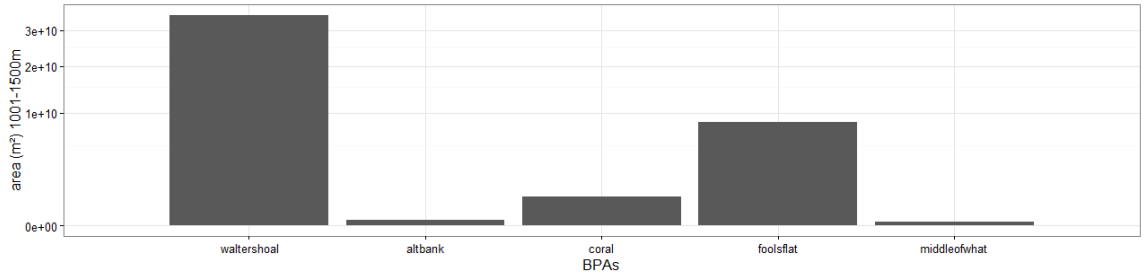
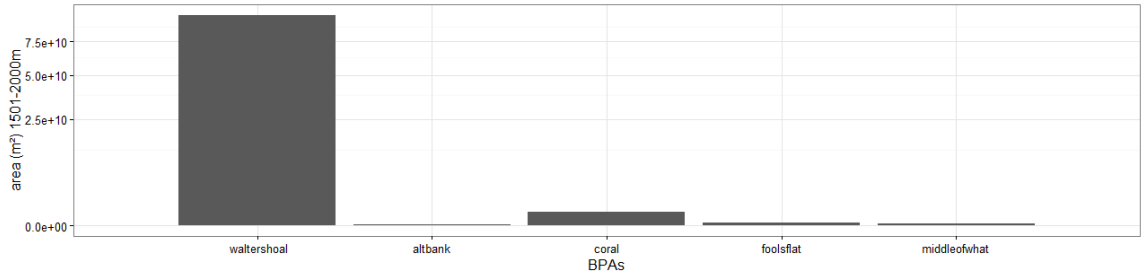
1e+10
0e+00
area (m²) 701-1000m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


3e+10
2e+10
1e+10
0e+00
area (m²) 1001-1500m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs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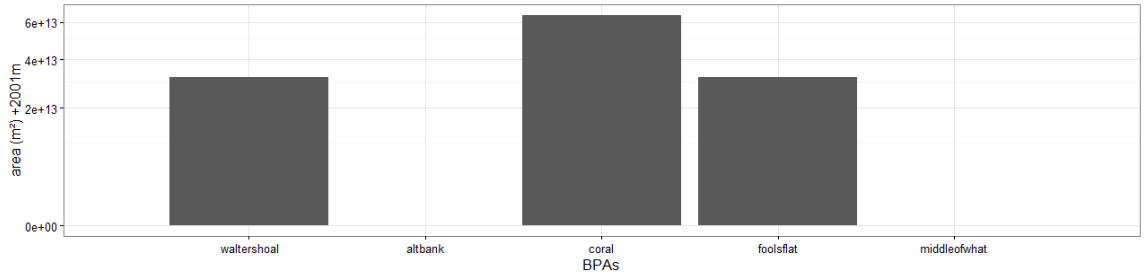
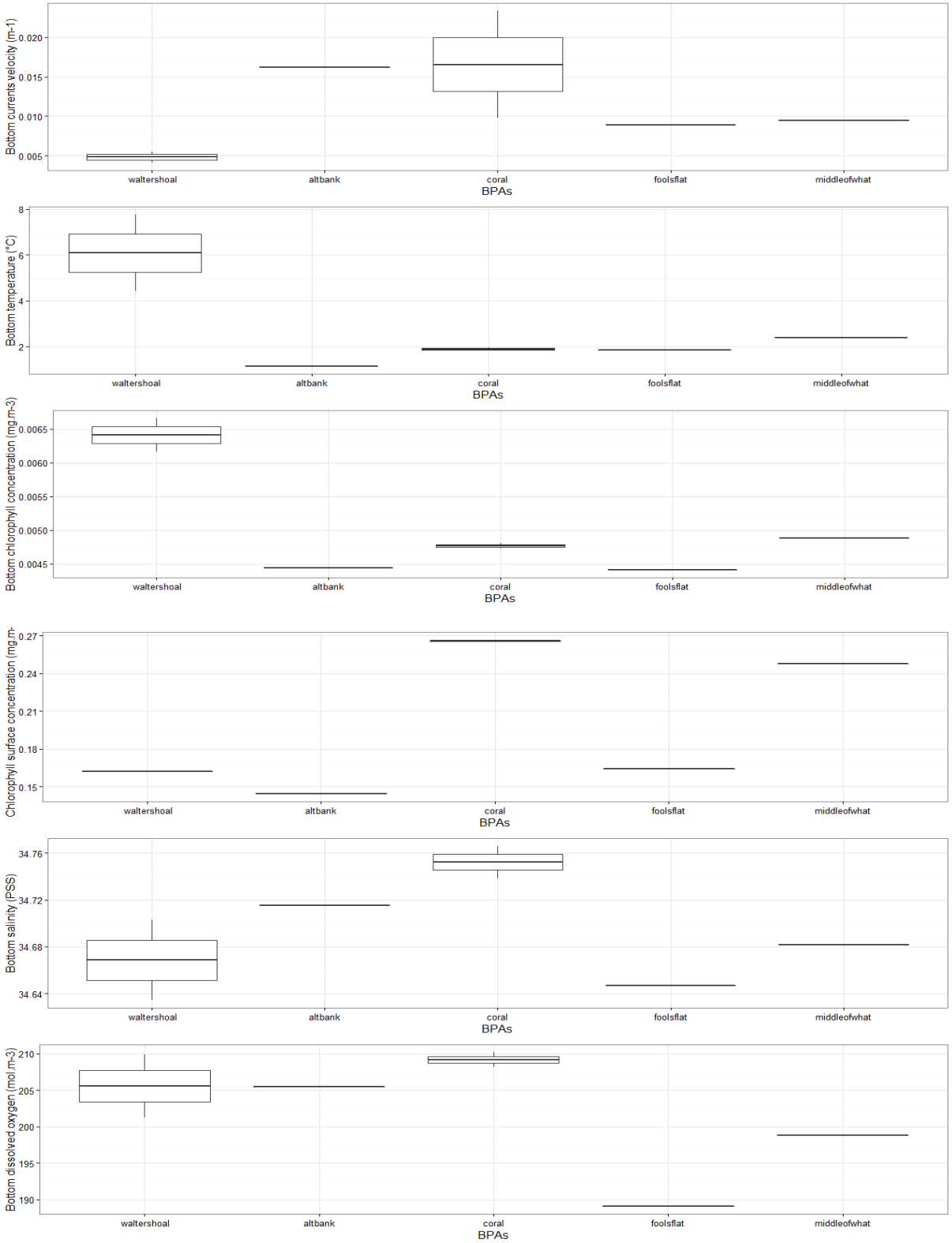
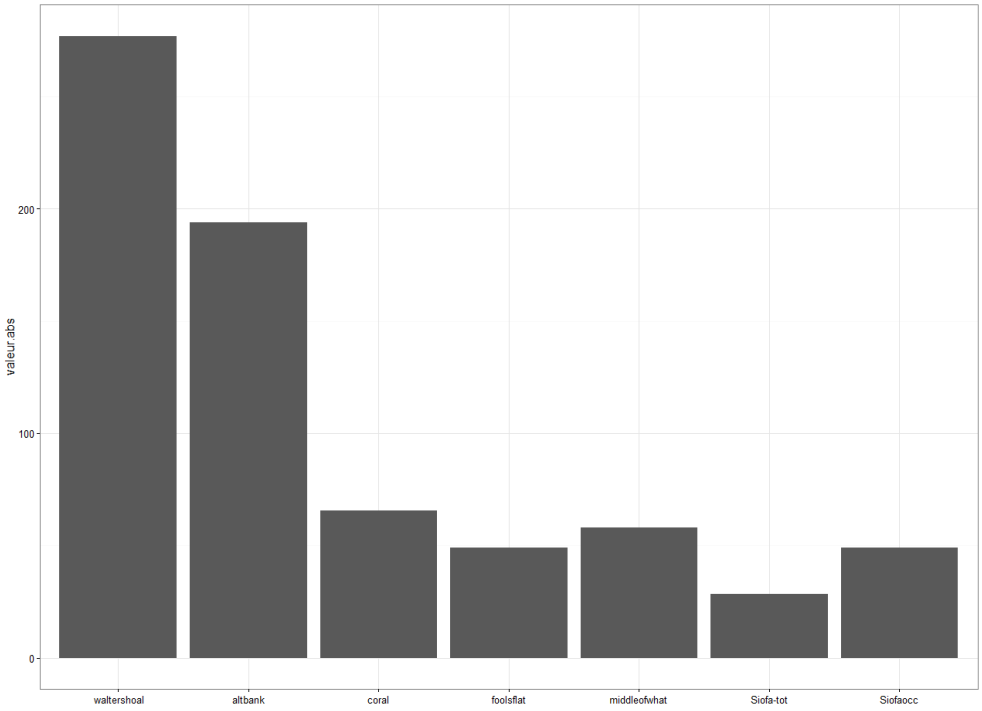
5.0e+10
2.5e+10
0.0e+00
area (m²) 1501-2000m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

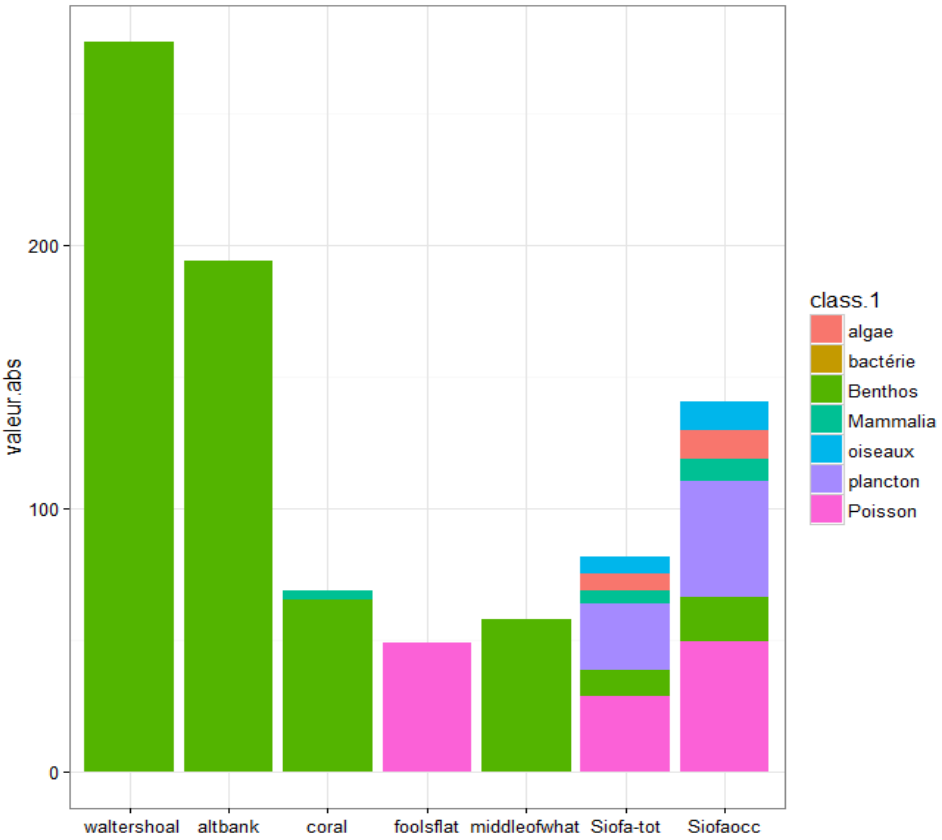

6e+13
4e+13
2e+13
0e+00
area (m²) +2001m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

Appendix 4: Boxplot and Histogram of biophysical parameters



Appendix 5: Graphics Biodiversity





Research and management plan for the Walters Shoal protected area

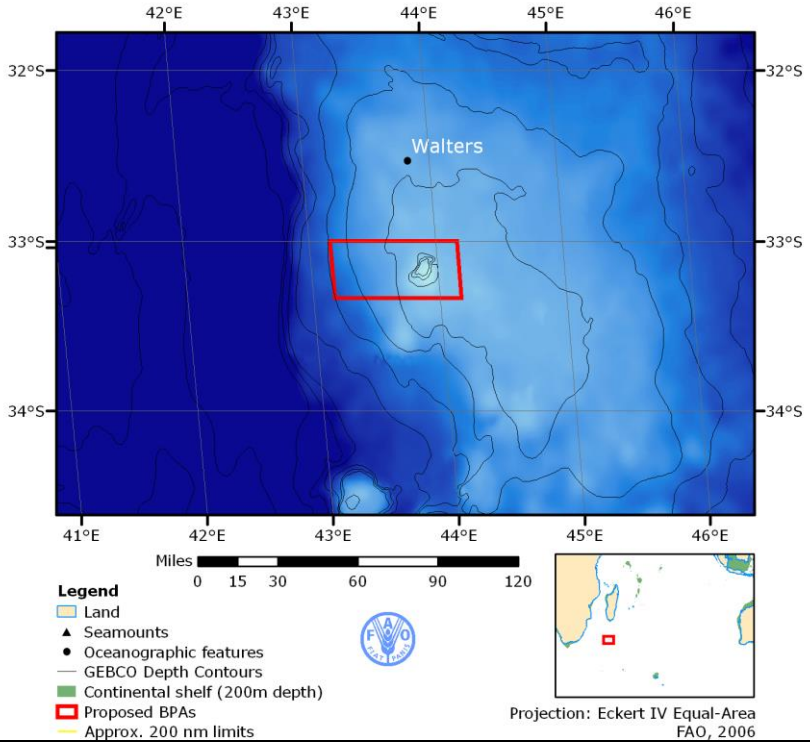
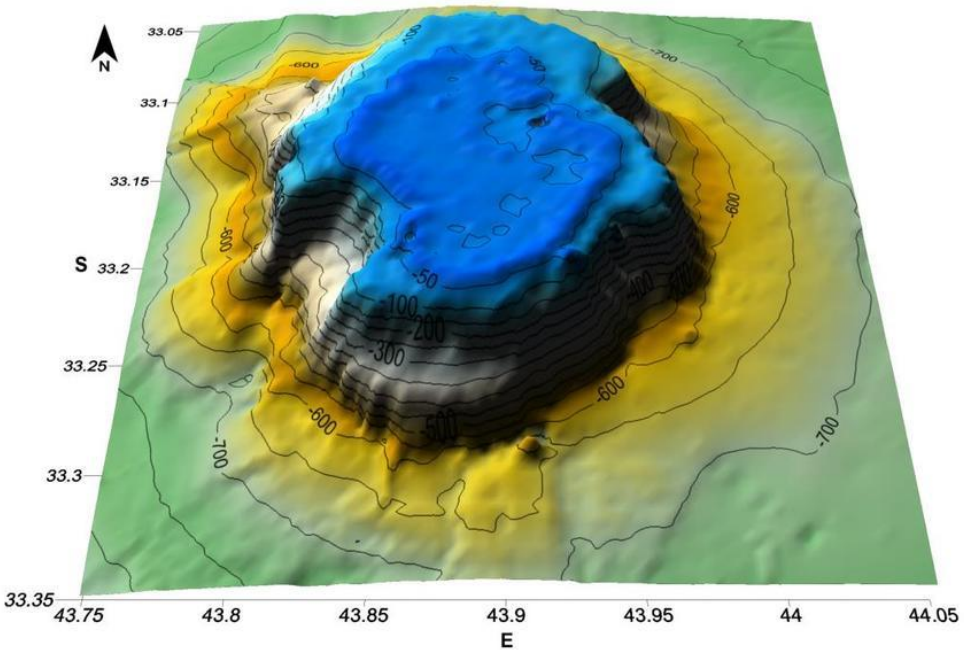
Name	Walters Shoal
Geographic description	Total area: 3,443 km^2 Coordinates: 33^0 00'N-43^0 10'W : 33^0 20'S -44^{0}10'E Bathymetry: 01-100 m 88 km^2; 100-300 m 104 km^2; 300-700 m 557 km^2; 700-1000 m 1,980 km^2; 1000-1500 m 670 km^2; >1500 m 42 km^2 Figure 1 Map showing location and bathymetry of the Walters Shoal 

	Figure 2 Bathymetric map  Source: Payne 2015
Objectives for this protected area	In line with the protocol for protected areas designation, the objectives for the Walters Shoal protected area are to maintain the value and integrity of the area's bioregional representation, biodiversity representation and scientific interest.
Objectives for this plan	In accordance with the Guidance for SC Recommendations to the Meeting of the Parties outlined in the standard protocol for protected areas designation (Annex H SC3 report), the objectives for this research and management plan are to describe: - Management and monitoring measures in place in the protected area - The time of review of the protected area - If needed, the research that should be undertaken in the area.
Criteria that the protected area meets	This area meets the following criteria: • 3b. Bioregional representation – The area has a comparatively higher degree of naturalness due to zero or a low level of human-induced disturbance or degradation from, for example, historical fishing activity. • 5b. Biodiversity representation – The area is known to contain high diversity of ecosystems, habitats, communities or species, or has higher genetic diversity. • 6. Scientific interest – The area has scientific research interest associated with understanding ecosystem, biological, geological and biodiversity processes in the SIOFA region.

	Feature description This feature is located near the southern end of the Madagascar Ridge and consists of a spreading plateau with canyons, seamounts and ridges with depths rising from 4500 m to within 15 m of the surface (Rogers 2012). Biodiversity and bioregional representation Walters Shoal was sampled in 1964 during the International Ocean Expedition by the R/V *Anton Bruun*, which led to the discovery of several invertebrates (Payne 2015). Clark (1972) described a new endemic sub-species of crinoid, *Comanthus wahlbergi tenuibrachia* (currently *Comanthus wahlbergi*). Kensley (1975) described a new endemic isopod, *Jaeropsis waltervadi*. Kensley (1969, 1981) described an endemic species of shrimp, *Alpheus waltervadi,* and the presence of four other decapods. Various corals were collected in 1976 using the French vessel *Marion Dufresne* (Zibrowius 1982). Many fishery resources (and some crustaceans) were also found by French and Soviet vessels (Collette and Parin 1991; Romanov 2003; Rogers et al. 2009). Collette and Parin (1991) describe the discovery of fishery resources in more detail. Nesis (1994) describes cephalod species found in on, over or around the seamount. A number of endemic fish species were discovered and described by Poss and Collette (1990), Collette et al. (1991) and Iwamoto et al. (2004). Early work on the distribution patters of Walters Shoal benthic and water-column fauna were undertaken (e.g. Parin et al. 1993 and Detonova and Sagaidachny (1994) but these are reportedly inaccessible (Payne 2015). More recently, a commercial fishing trip on board the Spanish vessel *Iannis* led to the discovery of a new species of lobster, *Palinurus barbarae*, as described by Groeneveld et al (2006). The research vessel *Dr Fridtjof Nansen* undertook a research cruise in 2009 aimed at understanding pelagic biology and physical oceanography of the region, and included a sampling point near the Walters Shoal seamount (Rogers et al. 2009). Mah (2018) describes two new starfish species discovered during the 2017 *Marion Dufresne* expedition on Walters Shoal – *Iphaster noemieae* (new genus and new species) and *Sphaeriodiscus ganae* (new species), with these new species most probably endemic to the Walters Shoal. Le Corre et al. (2012) note that Walters Shoal is an important foraging ground for the red-tailed tropicbird and Barau's petrel.

	It provides a habitat for a variety of whale species, including sperm whales, humpback whales and short-finned whales (Collette and Parin 1991; Rogers et al. 2009; Shotton 2006). Scientific interest There is a long history of scientific research associated with the Walters Shoal feature (see Payne et al. 2015 for a comprehensive review). More recently, the IUCN undertook a research voyage in 2016 on the shallows of the Madagascar Ridge MAD-Ridge 2016 Expedition, South-West Indian Ocean to analyse the hydrodynamics, hydrology and trophic levels (first and intermediate), and in April–May 2017 undertook a 26 day research trip to Walters Shoal to obtain information on the benthic component and "water column", and the pelagic and avian fauna. The voyage included video recordings (see https://www.iucn.org/theme/marine-and-polar/our-work/international-ocean-governance/conservation-seamounts-ecosystems/ffem-swio-project/walters-shoal-expedition for links to this project). Exploration of scientific results from the IUCN Walters Shoal expedition are still ongoing. A first estimate is that there have been about 100 new species collected among the benthic samples and that about half of them are endemic to Walters Shoal (Guduff et al. 2018). Fishing history The broader Walters Shoal area is considered to be a productive fishing ground (see Zucchi et al. 2018 for additional detail). The protected feature is known to have been trawled on the western side in the past and bottom fished in the shallow areas (SIODFA 2016). Lobster fishing has also been reported in shallow areas of sandy bottom (SIODFA 2016). Romanov (2003) provides a summary and review of Russian and Ukrainian scientific and commercial fishing operations on the deepwater ridges of the southern Indian Ocean. Spatial and environmental analysis The first meeting of the SIOFA Protected Areas and Ecosystems Working Group and SC4 reviewed a spatial clustering analysis that could inform consideration of how individual SIOFA protected areas are represented within networks of protected areas. The findings of this work provide useful information that strengthens the research and management plan for the Walters Shoal protected area, particularly in terms of its consideration within a network of protected areas. This information is included below and at Appendices 1–5.

BPAS	Spatial parameters (Appendice 1)	Biophysical parameters (Appendice 2)	Biodiversity (Appendice 3)
Walters Shoal	**Specific parameters:** - Large variation in slope - Large depth variation - Close to islands and continents **Common parameters :** - Low roughness - Seamounts rather isolated **Spatial clusters:** Locate in cluster 3 it represents about 20% of cluster 3	**Specific parameters** -Very high concentration of chlorophyll in depth -High temperature **Common parameters :** -Low salinity -High dissolved O2 content - Chlorophyll surface concentration mean -Low velocity **Biophysical clusters:** Locate in cluster 1 it represents about 1.7% of cluster 1	- Good knowledge of benthos and biodiversity - Good scientific knowledge because several campaigns have been carried out

Walters Shoal is located on a plateau area spread out with canyons, seamounts and ridges, which explains the great variation in slope and depth (from 15m to 4500m deep). There is therefore a great diversity of habitats, which makes Walters Shoal unique. In addition, Walters Shoal is located south of Madagascar and east of the tip of Africa. So there may be an island or mainland effect, which can lead to an increase in planktonic biomass due to the iron supply from the territories (Guyomard et al. 2006). It represents about 0.07% of SIOFA area. Walters Shoal is the only site in cluster 3 of the space clusters, it represents about 20% of cluster 3. The cluster 3 represents 0.4% of SIOFA area.

An area with a high concentration of chlorophyll-a is an area with very good organic production that promotes the development of biodiversity. In addition, it is a rather isolated bench that can have a fauna and flora endemic to the area. The good scientific knowledge comes from the fact that many scientific campaigns (mentioned above) have been carried out on Walters Shoal.

All these parameters make it important to protect and maintain this site in good condition.

Walter Shoal has a good scientific knowledge due to several scientific research have been carried out.

The fisheries footprint and VME mapping need to be completed.

Social, cultural and economic interests	Some historical fishing data are available (e.g. Romanov 2003), which may assist with understanding any social, cultural and/or economic costs associated with designation of this protected area. The area is the location of a productive fishery. Designation could have adverse social, cultural or economic impacts in terms of forgone opportunity for fishing.
Management measures	In accordance with CMM 2018/01, the following management measures apply: *35. The areas included in Annex 2 are provisionally designated as protected areas.* *36. CCPs shall provisionally apply the following measures in the areas listed on Annex 2 until the adoption of a dedicated research and management plan, referred to in paragraph 6(e), for each area at MoP6:* *(a) CCPs shall prohibit all vessels flying their flag from engaging in bottom fishing, excluding line and trap methods; and* *(b) For all other gears, CCPs shall ensure each vessel flying their flag has a scientific observer onboard at all times while fishing inside those areas.* *37. When the Meeting of the Parties adopts a revised SIOFA protocol for protected area designation after advice from the Scientific Committee arising from its review referred to in paragraph 6(d), the Meeting of the Parties shall also review Annex 2 of this CMM, taking into account advice of the Scientific Committee.* All other relevant components of CMM2018/01 as well as all other relevant SIOFA CMMs apply within this protected area.
Management needs	SC4 recommended that the MoP consider that fishing with all gears were identified as activities that degrade the scientific and biodiversity value of the area, noting that different gears typically have different levels of impact. The SC noted that fishing using trawl gears is not currently permitted in the area and a closure to trawl fishing has been voluntarily observed by Australian and Cook Islands vessels since 2006. Information on the use of non-trawl gears in this area is lacking. Any fishing-related or research activity planned in the protected area requires a research plan for review by the PAEWG and SC. This research plan should specify (1) how the activity furthers the objectives of the protected area, (2) an assessment of impacts, and (3) proposed measures to prevent or minimise those impacts. Guduff et al. (2018) note a number of management and governance options for the Walters Shoal (see https://www.iddri.org/en/publications-and-events/report/laying-foundations-management-seamount-beyond-national-jurisdiction).

Review periods	This research and management plan should be reviewed at least every 10 years, or more frequently if new information becomes available that enhances or degrades the justification for its designation as a protected area.
Outline of monitoring and/or research needs	The following monitoring and/or research needs have been identified: Goldsworthy (2017) recommended that it would be useful to review the findings of the 2015 and 2016 IUCN research voyages to review any additional information on the biodiversity, habitat and ecosystems of the feature. (https://www.iucn.org/theme/marine-and-polar/our-work/international-ocean-governance/conservation-seamounts-ecosystems/ffem-swio-project/walters-shoal-expedition). - A desk-top compilation of publications from research undertaken within this area would assist with future reviews of the designation. Guduff et al. (2018) recommend a series of steps in relation to strengthening scientific knowledge of the Walters Shoal, including: - Collection of referential data (seabed mapping, conservation, fishing and mining exploration/exploitation zones, zones with a potential for covering vulnerable marine ecosystems etc.) - Sampling and inventory of benthic and pelagic fauna, marine avian and megafauna etc. - Measure of environmental conditions (temperature, current, vertical profiles in the water column etc.) - Listing and details on commercial and non-commercial species, stock assessment and monitoring of low productivity species IUCN (2013) lists a series of knowledge gaps to fill on physical, ecological and connectivity aspects. SC4 agreed that 'non-destructive' monitoring in the form of scientific research (including, for example, the use of camera based systems) should be required within protected areas, and that components of the 'Framework for the Development of Research and Management Plans (PAEWG-01-14)' could be a useful guide for informing monitoring and scientific research within protected areas. 'Non-destructive', in this context, is defined as research that does not cause significant adverse impacts on VMEs but may include the collection of minimal amounts of benthos.
Compliance	Compliance-related issues are outside of the remit of the SIOFA SC.

References

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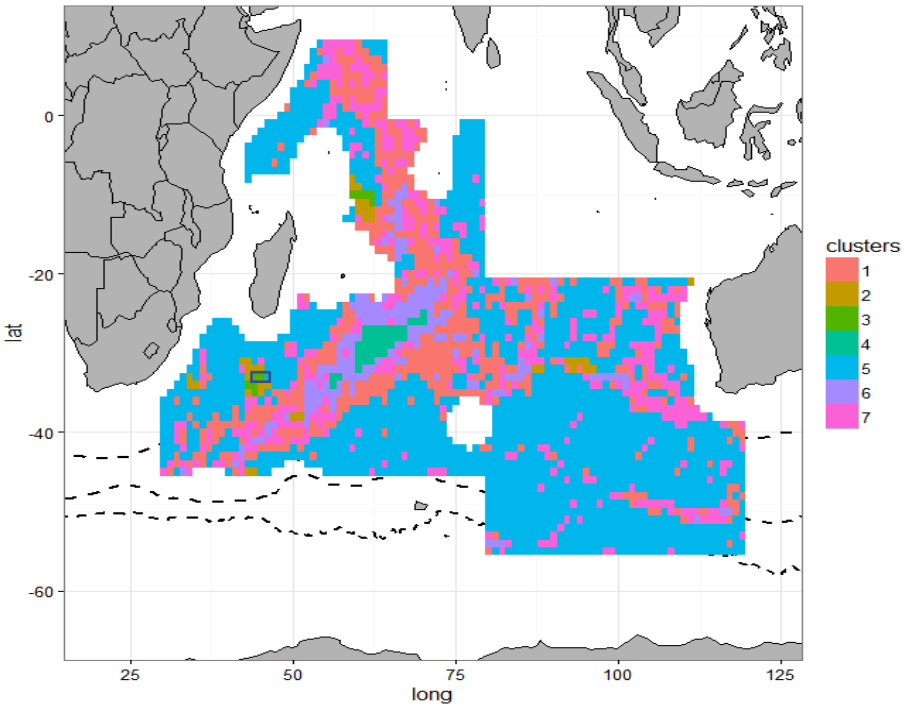
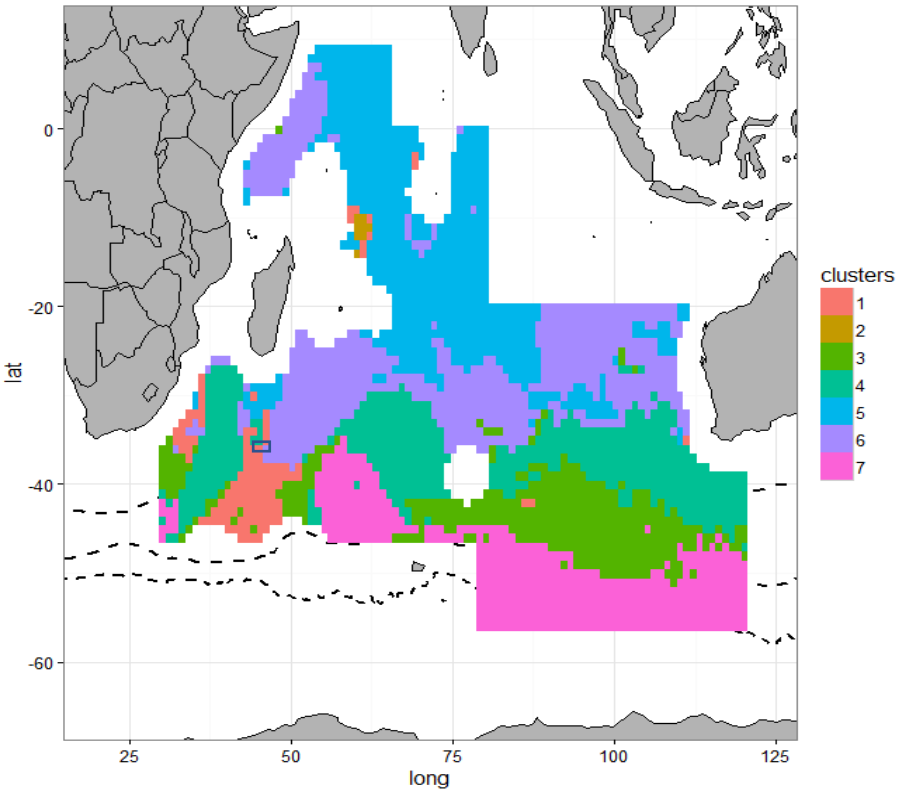
Appendices

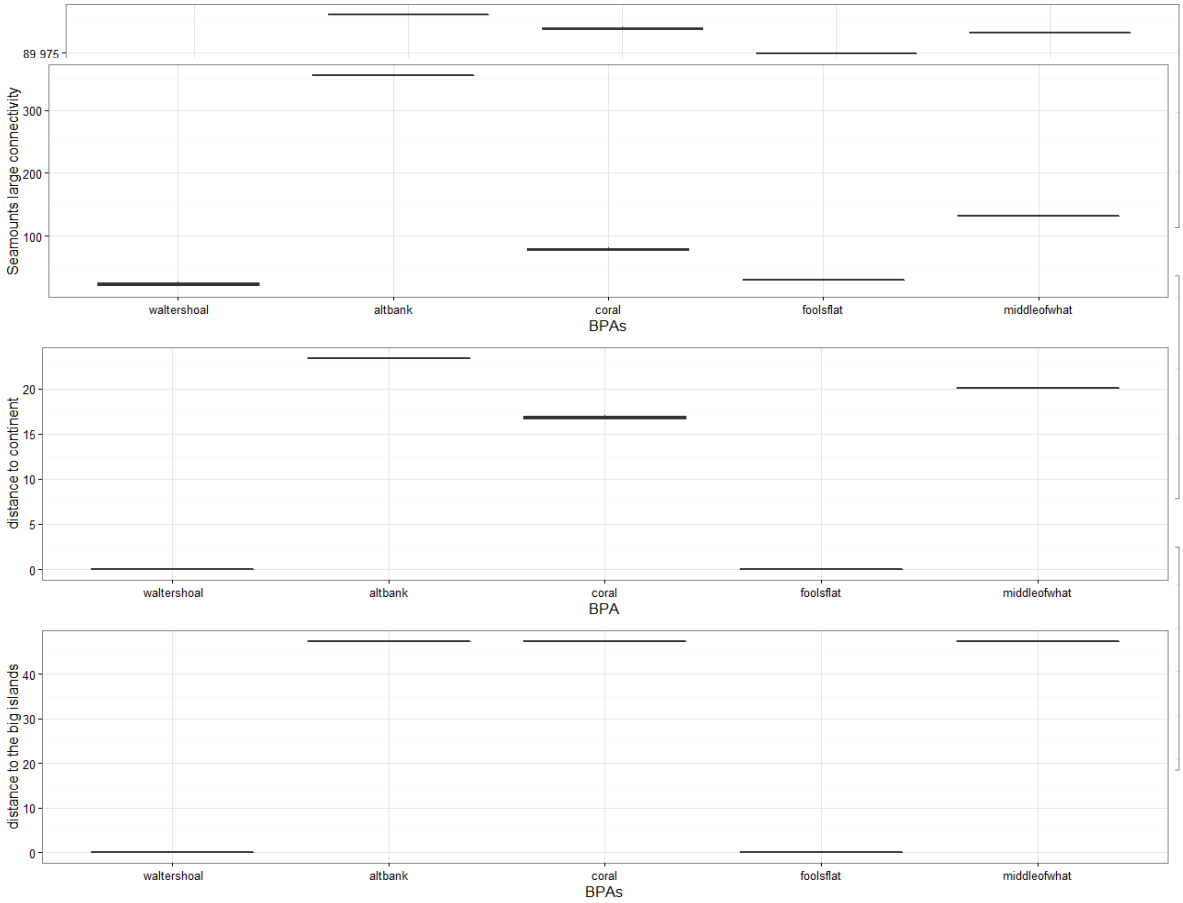
Appendix 1: Spatial clusters

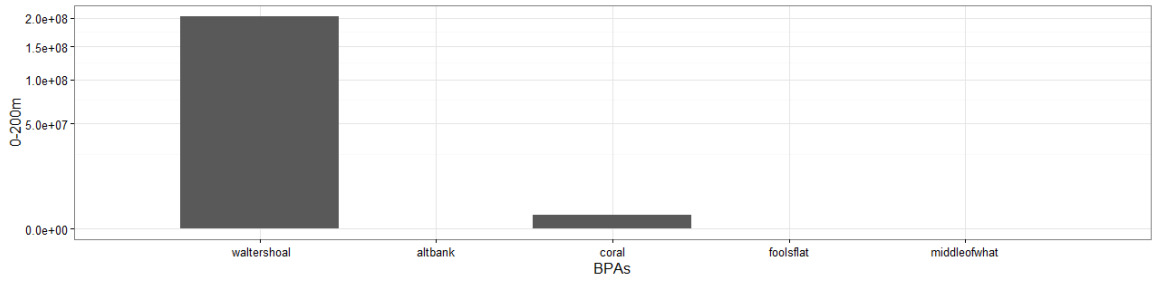


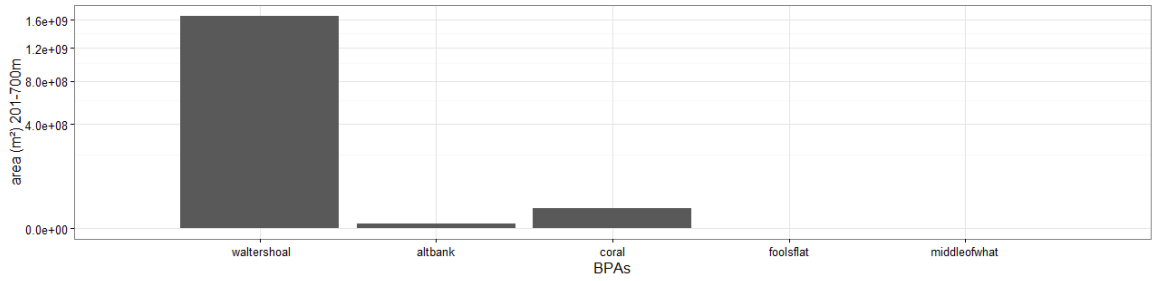
Appendix 2: Biophysical clusters

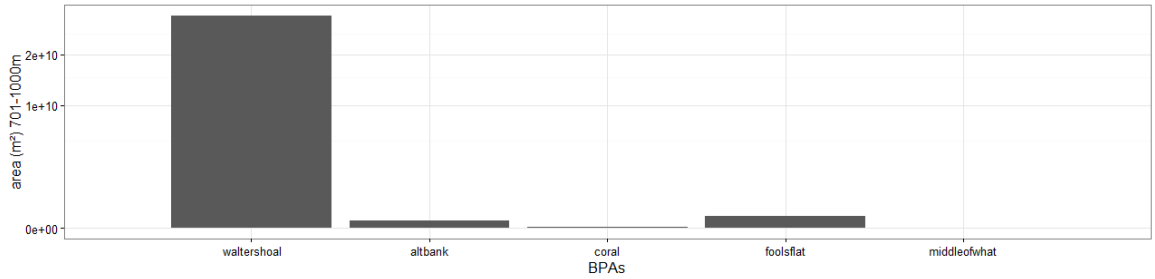


Appendix 3: Boxplot and Histogram of spatial parameters




2.0e+08
1.5e+08
1.0e+08
5.0e+07
0.0e+00
0-200m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


1.6e+09
1.2e+09
8.0e+08
4.0e+08
0.0e+00
area (m²) 201-700m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs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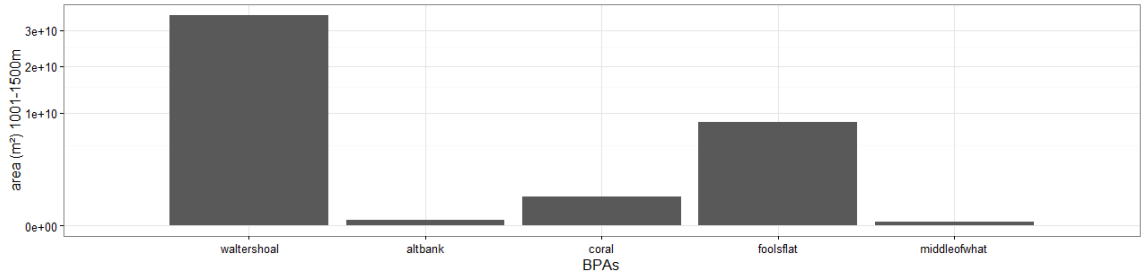
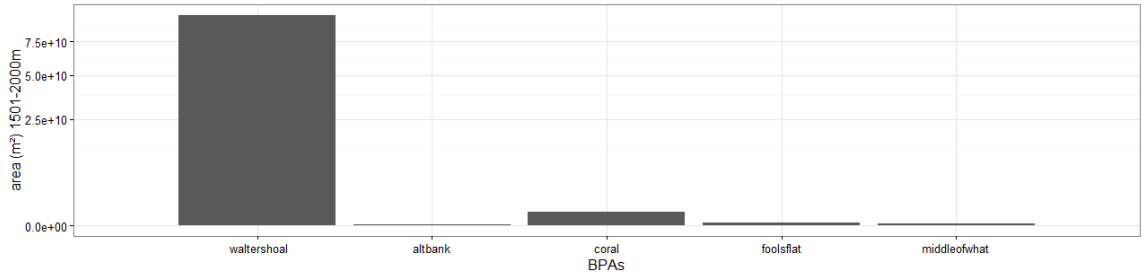
1e+10
0e+00
area (m²) 701-1000m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs


3e+10
2e+10
1e+10
0e+00
area (m²) 1001-1500m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs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0.0e+00
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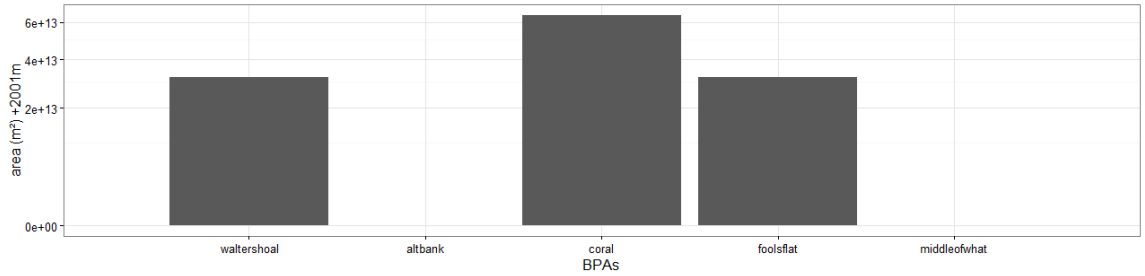
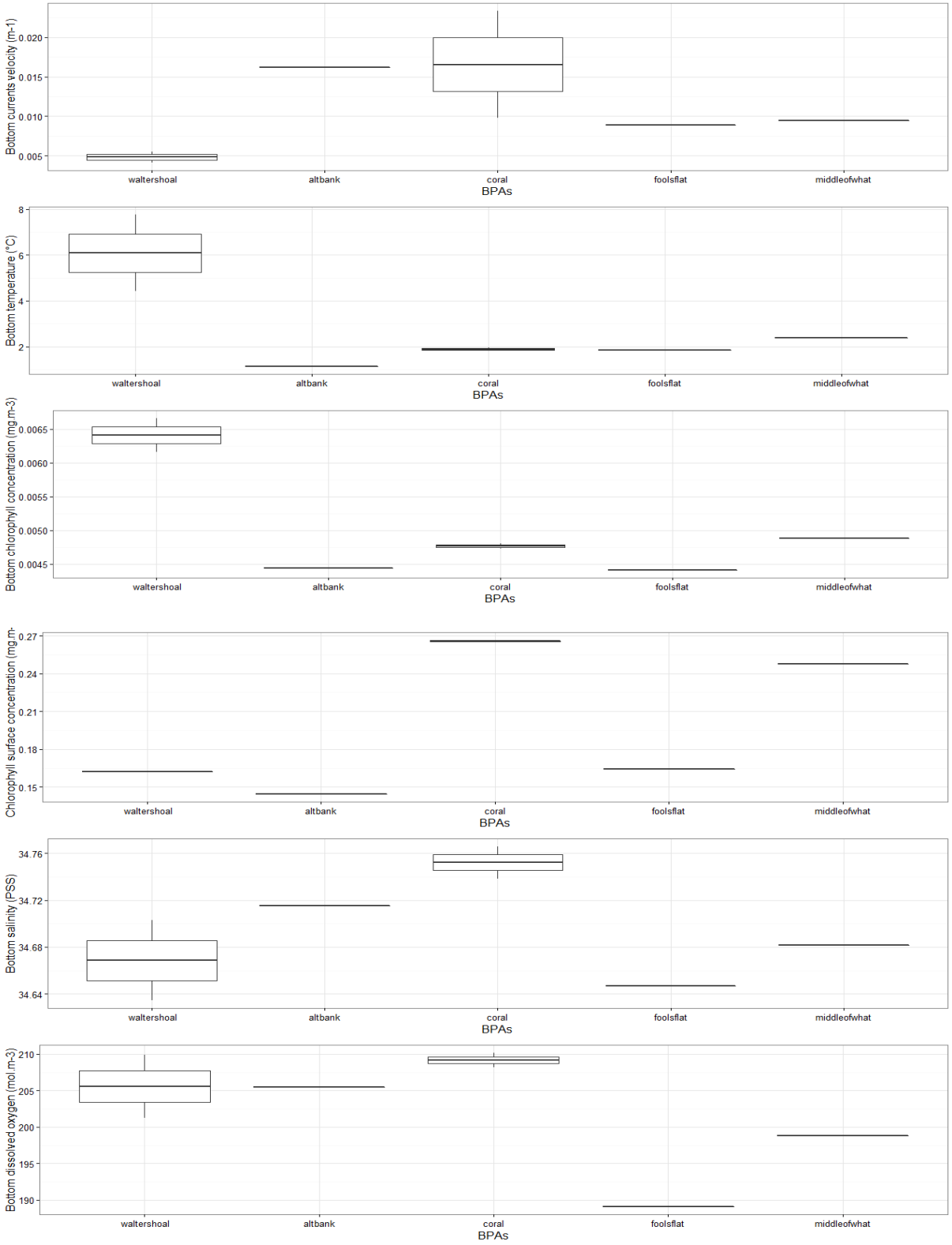
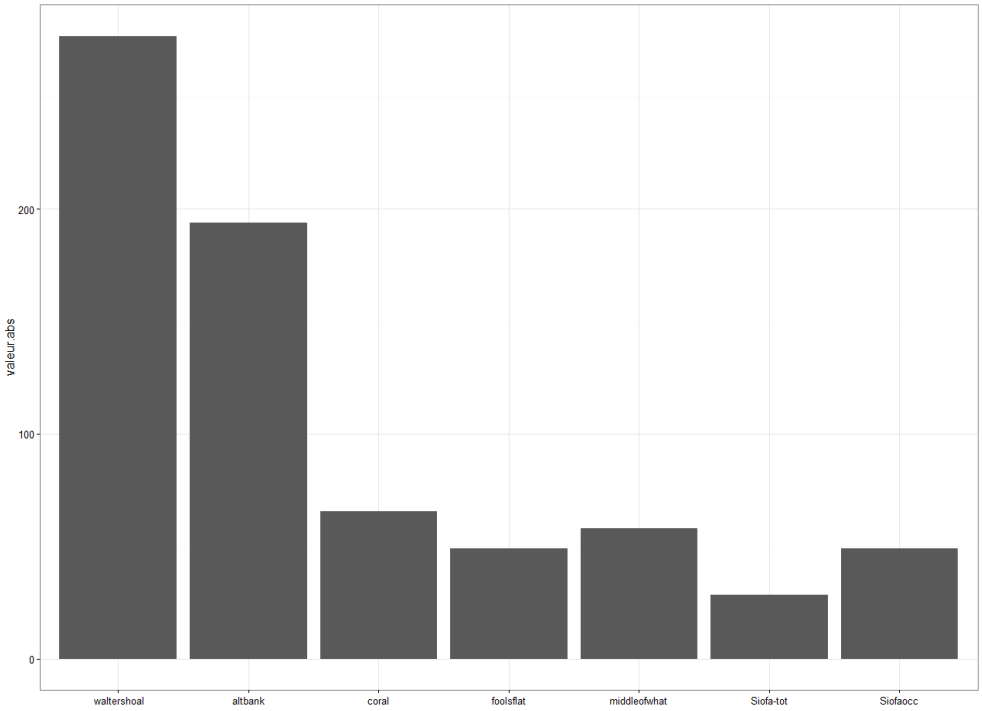
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

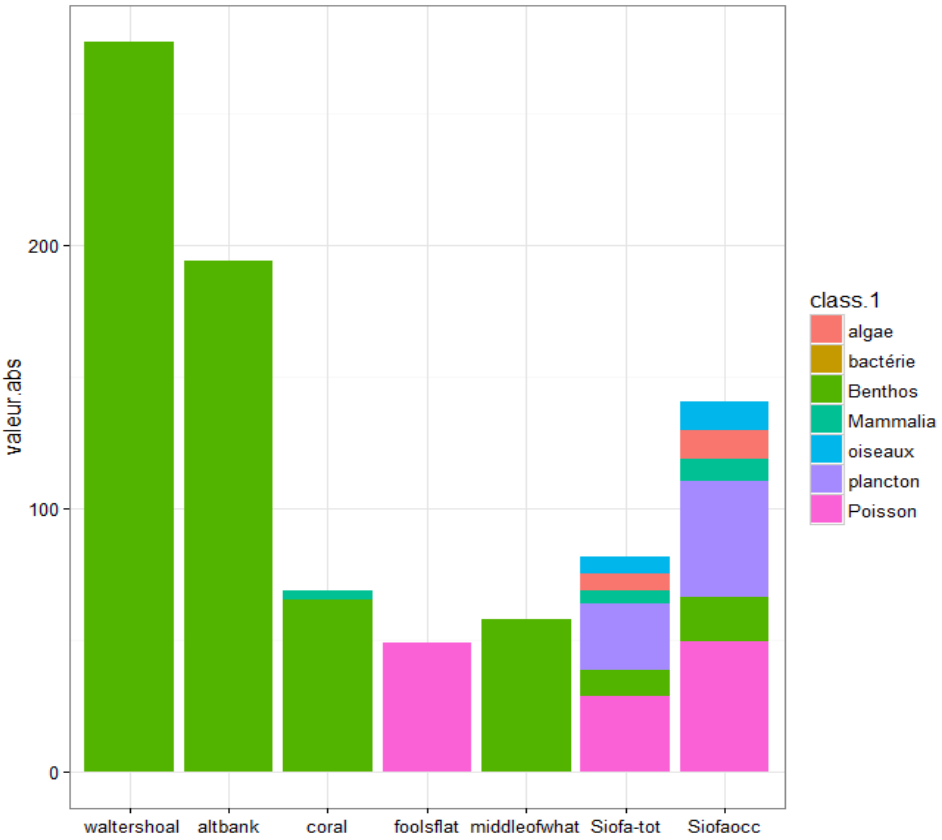

6e+13
4e+13
2e+13
0e+00
area (m²) +2001m
waltershoal
altbank
coral
foolsflat
middleofwhat
BPAs

Appendix 4: Boxplot and Histogram of biophysical parameters



Appendix 5: Graphics Biodiversity





Gap Analysis of CCP BFIAs against BFIA standards

BFIAS section	Requirement	Status of completion (in BFIA)	Comments
5.1 Description of the proposed fishing activities	General	BFIAs not received from Korea, Mauritius, Seychelles	
	Details of the vessels to be used	ALL except those not submitting BFIAs,	All complied
	Data Standards for vessel data, and confirmation that they appear on the SIOFA record of authorised vessels	ALL Not Comoros	Comoros vessels not yet included on the SIOFA record of authorised vessels, pending assessment
	Detailed description of fishing methods, range in fishing height off bottom, net opening and any factors affecting gear selectivity	All	
	Seabed depth range to be fished	Yes Not Comoros	Comoros identify the high seas banks to be fished but not seabed depth range
	Target species, and likely or potential by-catch species	Yes	
	Intended period and duration of fishing	Yes	
	Effort indices: How many vessels, how many tows (cumulative effects), estimated tow		Cumulative effects not clearly described. Length of static gear as measure of effort needs to be specified. Soak time, number of traps for trap gear not available (Thailand). Effort indices not always clear

BFIAS section	Requirement	Status of completion (in BFIA)	Comments
	durations or distance (ranges)		
	Estimated total catch and discard quantities by target and bycatch species	Not (always?) cumulative – i.e. the entire catch history.	
5.2 Mapping and description of proposed fishing areas	General		
	Maps of the (intended) fishing areas, at the appropriate resolution in relation to the most recent SIOFA maps of historically fished areas	AUS, CKI, JPN, EU, THA, FR(OT), Comoros	Resolution required not defined but 20' is the minimum specified requirement. Is important to specify if this is not used for whatever reason. Some JPN fishing intentioned reported by 30' resolution.
	Area, or topographic features ***likely*** to support such VMEs	AUS, CKI,	CKI notes that the UN implied method is not suitable for addressing this issue. References conflict in advice they give.
	Mapping of all known VMEs, or evidence of VMEs	AUS, CKI, JPN	FR(OT) noted that got one 'VME' organism. Thailand report that they found no VMEs. EU has data yet to be analysed. JPN can make map available. Comoros handline fishery assessment does not address VMEs.
	Mapping of the results of predictive habitat modelling for VMEs	None	EU suggests that there is insufficient data to do this, but with a coordinated approach could make it possible. CKI believes that this activity gives inaccurate results and is unjustifiable. FR(OT) is of a contrary view – but need a common data collection framework to do.
	Baseline data and description of the proposed fishing areas	AUS, CKI, FR(OT); EU, Comoros &THA - at least in part	
5.3 Impact assessment	Scoping of issues of concern	AUS, CKI	
	Risk assessment	AUS, CKI, EU - 1,2,3, & 4; FT(OT)	FT(OT) had such little effort that a risk effort was scarcely useful Comoros handline fishery risk not assessed
	Determination of the level of risk posed by an activity, against 1.		FR(OT) had few data; it did not enable a detailed assessment Comoros handline fishery risk not assessed

BFIAS section	Requirement	Status of completion (in BFIA)	Comments
	Intensity, 2. Duration, 3. Spatial extent and 4. Cumulative impact		
	Overall risk	AUS (qualified), CKI, FT(OT), JPN, THA (general statement)	NB: is risk both to environment and to the stocks including bycatch. Difficult/impossible/meaningless to combine qualitative and quantitative components of the risk assessment within and among fishing countries. Parties concluded that their own operations had 'low' risk but these assessments are not comparable among parties, a difficulty that may be unavoidable. Comoros risk not assessed
	Interactions with VMEs: Impacts ***likely*** to result from the fishing gears to be used	AUS, CKI, JPN, THA, FT(OT)	FT(OT) - not possible with available data. EU used CCAMLR standards to assess. Comoros VME handline fishery impacts risk not assessed
	Interactions with VMEs: The probability, likely extent (% of habitat targeted) and intensity of the interaction between the proposed fishing gear/targeting practices on the VMEs	AUS, CKI, FT(OT), THA	Can map and calculate % habitat but not of all this area will contain VMES – %s must be overestimate. FR(OT) concludes low level of fishing activity must result in negligible impact. Comoros handline fishery VME interactions not assessed
	Interactions with VMEs: Characteristics of the habitats and benthic communities that may be impacted	AUS, CKI, JPN, THA	JPN longline fishery, EU and FR(OT) had insufficient data. Comoros handline fishery VME interactions not assessed
	Interactions with VMEs: Diversity of the ecosystem in the proposed fishing areas, and will fishing reduce this biodiversity?	AUS, CKI, JPN, THA (partial)	JPN longline fishery, EU and FR(OT) had insufficient data. Comoros handline fishery VME interactions not assessed
5.4 impact on the status of		CKI, THA (partial)	Comoros handline fishery impacts not addressed

BFIAS section	Requirement	Status of completion (in BFIA)	Comments
deep sea stocks to be fished			
5.5 Mitigation Measures		ALL	Comoros handline fishery, mitigation measures not addressed (shallow bank fishery)

Summary of BFIAs submitted by the individual Contracting Parties, cooperating non-Contracting Parties, participating fishing entities and cooperating non-participating fishing entities (CCPs)

CCPs	BFIA submitted	Interpretation of BFIA requirements	Method/data used and results	Overall assessment of impact/risk
Australia	Y	This BFIA has focussed primarily on the risk of direct impacts by bottom fishing on VMEs characterised by benthic fauna because of the potential for widespread and long-lasting effects. There is less emphasis on the status of deep water stocks because impacts assessment requires knowledge of total catch by all fleets in the SIOFA Area. Assessing the potential for SAI on VMEs needs to consider 'impact' and 'risk' (the intensity, duration, spatial extent and cumulative effects of fishing activities), and define the dependency of these elements on spatial and temporal scales. In this BFIA, the 'overall risk' is considered as the risk remaining after monitoring, management and mitigation measures are accounted for. This BFIA used a qualitative framework because data paucity and knowledge uncertainties preclude a quantitative analysis of risk – especially of cumulative impacts. Semi-quantitative metrics are incorporated for fishing intensity, and the overlap of	Operations for the SIOFA Area were selected from general high seas logbook data if the spatial location of the start coordinates of fishing operations occurred within the SIOFA Area boundary as defined by its GIS shape file (FAO 2010). Operations represent the unit of logbook recording which is equal to one trawl shot or one longline/dropline set. Gridded analysis for two spatial scales, 20' x 20' (the standard SPRFMO footprint grid cell) and 0.1° x 0.1° (6 minutes – approaching the limit of logbook resolution of 1 minute) was generated in Oracle using Oracle spatial intersect functions SDO_RELATE. To map fishing footprint and effort distribution, fishing operations reported in AFMA logbooks from 1999-2009 were assigned to grid cells based on their start position only if no end point was reported. Where an end point was reported, and the length of a straight line between start and end points was <6 km, all grid cells (of either scale) touching any segment of the straight line were retained as part of the footprint and the fishing effort distribution; where the distance to the end point was >6 km only the start position was used. Six kilometres is used in domestic Australian deepsea fisheries as a limit for filtering tow lengths as part of data quality assurance; it was assumed to be a realistic limit for high seas data. Fishing effort distribution will be underestimated by logbook records that lack an end position. For the creation of the 20'x20' permit footprint these records were mapped and examined individually. Four blocks were added by AFMA because the reported start position was within close vicinity (within a margin of reporting error) of the block boundary and related trawl tracks and seabed features were such that it was more than likely that the added block had been fished within the relevant period. An additional block was added by AFMA to ensure the footprint is able to be implemented in permit conditions. Furthermore, any part of the 20' grid-cells overlying national EEZs or the BPAs (voluntary closed	This BFIA conducted for Australian vessels fishing in the area to be managed under the SIOFA (SIOFA Area), concludes that the current overall risk of SAI on VMEs by Australian vessels fishing with bottom trawls and bottom-set auto-longlines is low. The BFIA concludes that the current overall risk of SAI on VMEs from mid-water trawling and drop-lining by Australian vessels is negligible. Despite the potential for demersal trawling and auto-longlining to severely impact VME fauna at fine ('site') scales, and for impacts to persist and to accumulate through time, the current risk of SAI at the scale of the fishery was considered as low when the following factors are accounted for: - low current fishing effort by Australian vessels - few areas of high fishing intensity - restriction of fishing to a 'footprint' area – although this permits access to 45% of deep upper slope depths (700-1000 m) and 45% of seamounts most likely to support VMEs - limited spatial extent of Australian fishing effort: mostly low spatial overlap with the bathomes most likely to support VMEs, but medium overlap on the deep upper slope (700-1000 m depths) and on seamounts - management arrangements to monitor and mitigate impacts and risks.

		fishing with the predicted locations of VMEs in bathomes and on seamounts.	areas, see section 3.1.4) were excluded from the permit footprint. Overlap analyses between the 0.1º mapped fishing distribution and depth zones (at 30 arc seconds, 0.2 n.m. resolution) were performed in ArcGIS using the Intersect analysis function. Areas for calculating the proportion overlap between fished grid cells and depth zones were calculated using a Lambert Azimuthal Aqual Area projection centred on the SPRFMO Area (PROJECTION: Lambert Azimuthal Equal Area, DATUM: WGS84, SPHEROID: WGS84, Central_Meridian: 75.0, Latitude_Of_Origin: -20.0). Where grid cells containing fishing effort crossed the SIOFA boundary they were clipped to the boundary extent. It should be noted that the depths reported here refer to the centroid depths of the grid-cells, derived from the bathymetry grid, not the reported operation depth. The form of the analytical result is therefore limited by the resolution of the underlying data (also see Section 4.1.4). For area and overlap analyses of seamount features, the Yesson et al. (2011) seamounts and knoll polygons were combined into one flat (planar) polygon area classified as 'area under seamounts', this polygon was subdivided into the bathomes and intersected with the 1º mapped fishing distribution. The footprint covers 0.84% of the SIOFA Area, but overlays up to 45% of the area of individual fishable bathomes (Table 3.1.2.1). The historical Australian fishing effort has been focussed on two distinct and separate regions: (1) the southern Madagascar Plateau and the Southwest Indian Ridge; (2) the intersection of Ninety East Ridge and Amsterdam Fracture Zone. Fishing distribution has been mapped separately for nine 'fishing grounds' within these two fishing regions (see section 4.2.3).	
Cook Islands	Y	This report is a bottom fisheries impact assessment on the operations of Cook Islands vessels in SIOFA. The BFIAS also specifies that elements of risk, management and mitigation be considered. Many elements of the ecological and fishery risk in this	The assessment took into account habitat mapping which provided a full dataset on the fishable region between 1 and 1500 metres in the entire SIOFA region. This provided a quantitative assessment. The fine scale bottom trawl data for the FV Will Watch was used to develop a bottom fished footprint for the SIOFA area using data from 1997 to 2016. In total 5,139 fine scale bottom trawl shots with both start and end position were available for spatial analysis from a total of 11,051 bottom trawl	**Intensity** - The crux of this criterion is 'what is the specific site being affected'? The sea floor that is affected is where there is contact with the bottom trawl. As indicated in sections 2.2, 4.2 and 4.5 of this BFIA, tows are usually undertaken on highly-defined lanes. In general, where fishing occurs, the impact will be intense, chronic and have severe impacts. However, of relevance is the intensity or severity of the impact of the

		assessment are quantitative, as result of the extensive data collection and research programs undertaken by the Cook Islands, including habitat mapping prior to fishing. The status of deep water stocks is described, based on the stock assessment work promoted by the Cook Islands for orange roughy. The UN requirement to monitor the status of harvested fishstocks to ensure the CP is fishing sustainably, has been followed throughout the history of the fishery. However other elements are qualitative, as it was not possible to take account of the cumulative impacts of other threatening activities in the SIOFA region, such as bottom longlining impacts on deepwater sharks	shots, and these were assumed to cover all of the historical fishing grounds in SIOFA. For midwater trawling a further 5,673 trawls were available with both start and finish position, out of 11,945 trawls. To generate estimates of actual seabed swept area from the tow-by-tow data, all tows were buffered assuming a 25 metre swept area of the groundrope. The trawl doors and sweeps do not touch the bottom in normal trawling operations in the SIOFA region, thus this was considered the appropriate swept width. However, analyses with a 160 metre swept width between trawl doors were also done, which is the maximum door spread normally achieved by these vessels, as measured by door sensors. The buffering was carried out by implementing an ArcGIS spatial buffer of 12.5 m either side of each tow.1 The resulting 25 m wide polygon trawl tracks were dissolved (ArcGIS / Dissolve) by fishing area for the whole period, to produce complex merged polygons of swept area as shown in Figure 18. The result of dissolving is a full fine-scale analysis of actual true footprint impact. Fine scale data accurate to within 10 metres of the actual position, have been used. The results of the analysis are shown in Table 5. Ninety East Ridge and Broken Ridge are not included in the analysis, as the bottom fished area in this region is insignificant (<.001%). Using the swept area of the groundrope for the Southwest Indian Ridge, the fished habitat is 0.74% of the total. If the distance between the doors is used, it increases to 3.31%. For the Walter's Shoal region, the bottom trawl impact is only 0.16%, increasing to 2.61%. If the whole region of SIOFA is considered, only 0.16% of the potential fishable habitat from 0 metres to 1500 metres has ever been potentially impacted by bottom trawling. If we assumed that all midwater trawling touched the bottom for the entire tow, this increases to 0.28%. It is not possible to calculate the bottom area impact of midwater trawls by the Cook Islands vessels, as noted earlier. This is because only a relatively small (21.7%) proportion of the tows actually touch the bottom, and of these 36.3% had bottom contact for I minute or less. The actual contact point cannot generally be recorded, as the skipper are usually	bottom trawl on the ecosystem, community, habitat or population as a whole. These concepts are frequently confounded, even though they are different and raise different considerations. The FAO Guidelines refer to 'ecosystem integrity', i.e. the state of being whole and undivided, which again raises immediate difficulties in interpretation. The intensity can be set at severe at the local scale, but this is not appropriate for the BFIA, which should consider the wider VME impact, and is indeed noted in paragraph 18 of the Guidelines that notes that when determining the scale and significance of an impact, among the factors to be considered is "the spatial extent of the impact relative to the availability of the habitat type affected". **Duration** – The duration of the impact, depending on the species, may be long, if a VME is actually impacted. This is well documented in a range of studies that are not reported in this BFIA. However, recent research shows that it is not uncommon to find VMEs that have been destroyed naturally. **Spatial extent** – The spatial impact relative to the distribution of any VMEs has been described quantitatively in this assessment as being extremely small. For the seamounts and ridges of the Southwest Indian Ridge, 99.29% of the fishable habitat is untouched, and much is untouchable. And for the slopes, banks and knolls of Walter's, large areas are impossible to fish with a bottom trawl. **Cumulative impact** - The risk from cumulative impact is low, as most trawls are carried out on repeat trawl lines. If the trawl removes the benthos, the duration will be long for that site, but it is not possible to remove what is not there. Hence the impact remains constant, not cumulative. All known VMEs are closed to fishing by Cook Island trawl

			very intent on keeping the gear clear of the bottom as the fish are positioned in the mouth of the net. If the net does touch the bottom, the groundrope parts as the breakaway link does its job, and the net will need to be repaired. Hence it is an accident when the bottom is touched, but is a possibility. The method has been rated as low impact in SPRFMO. An assessment of likely VME habitat and the low likelihood of overlap with the trawl fisheries was presented. A large proportion of the habitat, in depths of 400-1500 m is simply unfishable by bottom trawl. If the potential VME habitat was considered to be 100% of the fishable depths down to 1500 metres, which is what early predictive models suggested, then the analysis indicates that 99% of the VME habitat is not at risk from the fishery. The stock status of key harvested species has been monitored throughout the history of the fishery by conducting and analysing research surveys to assess the status of these stocks. The stock status results from these surveys were confirmed in the 2017 SAWG by the stock assessment for the orange roughy fishery.	vessels, which reduces risk even further. Management arrangements to monitor and mitigate impacts and risks are in operation
European Union – Spain	Y	This BFIA presents estimates of the i) accumulated historical impact and ii) the recent impact over the seabed of the Spanish longline fleet. These two information sets are the input required for the future estimation of the potential impact of this fleet. To address this latter objective the data on the total extension of the fishing gear over the bottom for the each fishing haul was included in the report. The area impacted by the longline fishery is presented and mapped. The maps were constructed based on georeferenced data on a set-by-set basis. Information on the relative area	The assessment uses data from 2003-2017 (Table 1), the period for which bottom longline data were available. This table includes the total extension of the fishing gear (in Km) deployed in each fishing season and in each area. The footprint defines an area determined by the bottom longline distribution of the historical fishing activity in 10' square grids, considering the total length of fishing sets to define grid intersections (Fig. 2). As shown in figure 2, most of the fishing activity took place in the areas 2 and 3b of SIOFA CA, and most of the grids has been moderately fished (3-50 sets). The overlap of the EU-Spanish footprint (10'x10' grid) in the SIOFA Area has been calculated for the historical data as well as for the last fishing year (2017). The historical footprint overlap covers 0.39% of the total SIOFA area, being the footprint of the last year only the 0.16%. When comparing the same data using the SIOFA area up to 2000m, the overlap results are 22.59% for the historical data and 9.42% for the 2017 data (Table 2). As there are not SIOFA official surface areas available, it has been used the estimations provided by Australia in the 2011 report for SIOFA (CSIRO, 2011).	Although the impact on VME taxa is considered to be low, the preliminary data on taxa potentially impacted are Sponges (Demospongia (DMO) and Hexactinellida(HXY)), Cnidarians from the Stylasteridae family (AXT), Cnidarians from the Order Gorgonacea (family Isidiidae and others-GGW), Cnidarians from the order Actiniaria (ATX) and Echinodermata from the Euryalidae family (OEQ). Data on VME taxa by-catch are improving its quality once scientific observation on board is in place, apart from the application of protocols to fulfil the incidental by-catch VME thresholds. Estimates of fishing "footprint index" (km2 per unit of fishing effort) and "impact index" have been developed for the autoline longline system in CCAMLR (SC-CAMLR XXX, Annex 7, Appendix D) waters: Footprint index: mean = 6.67 x 10–3; median = 5.26 x 10^{-3}; 95% quantile = 12.1 x 10^{-3} (km2 of seabed area per km of longline deployed)

		impacted by the longline fishery is also presented. It is proposed that both the footprint index and the impact index estimated by CCAMLR for autoline be used in SIOFA area for this fishing fleet and gear. No qualitative assessment on the impact of EU-Spain longline fishery is presented.		Impact index: mean = 5.07 x 10–3; median = 4.70 x 10^{-3}; 95% quantile = 9.04 x 10^{-3} .
European Union – France	Y	**This BFIA presents the historical footprint for the EU-France longlilen Fishery. The fishing areas are concentrated on the Saya de Malha Bank, north east of La Réunion (SIOFA area 8).** A semi-quantitative assessment of the impact of two the EU-France fisheries is presented. This is based on the Impact ratings for different gears proposed by Chuenpagdee et al. (2003). Considerations on the rating as proposed by (Williams et al. 2011b) are also given..	The historical footprint of EU_france longline fishery overlap covers 0.64% of the total SIOFA area. Although this footprint surface overestimates the impacted area when using 1ºx1º, which are not fully impacted by the longlines.	The ratings of benthic habitat and by-catch impacts for each gear class are: Longline-demersal: Physical 2 Biological 2 Hook and line (dropline): Physical 1 Biological 1 The ratings scale is from 1 (very low) to 5 (very high).
France (Territories)	Y	The French BFIA report was realized using the framework provided by the SIOFA. All the required items have been checked and provided in the report, when available. The BFIA calculation was obtained using a spatial analysis, in accordance to the	From 2013 to 2017 6 vessels obtain authorization for their fishing activities using longline or pot gear (Table 1). Impact ratings for different gears were by Chuenpagdee et al. (2003) with rating considerations proposed by (Williams et al. 2011b). The BFIA is evaluated using both a spatial analysis approach and the fishing effort data available for French fleet within the period 2013-2017. Spatial analysis Firstly, the surface of the different bathomes in the whole SIOFA area is considered (Table 5). Secondary, the area of each bathome within each French fishing zone (Table 6) and the area of the fishable bathomes in the	The rattings of benthic habitat and by-catch impacts for each gear class are : : Longline-demersal : Physical 2 Biological 2 Pots and traps : Physical 3 Biological 2 The ratings scale is from 1 (very low) to 5 (very high).

		requirements of the framework. The main limit of the French BFIA is due to the little activity of the French vessels in the SIOFA area. The analysis possibilities, such as stock assessment approaches or VME mapping, are limited due to the data gaps.	whole French fishing zones (Table 7) are calculated. We have considered the limit of 500 meters, upper depth where longline fishing is not allowed. Finally, a French theoretical fishing footprint is obtained (Table 8) which corresponds to the maximum area potentially impacted. Furthermore, the percentage of each bathome of French fishing zones in the SIOFA area is provided. The French theoretical fishing footprint comparing to the whole SIOFA area is 0.22% (Table 8). However, the French theoretical fishing footprint can reach up to 56% when considering the bathomes separately (for example the bathome 701-1000 m, Table 8). Real footprint in the 2013-2017 period The real footprint of the French fleet is calculated for the 2013-2017 period. The data available for the bottom longline operations is used. All the operations are plotted using a GIS software. The whole area covered by the longlines represents a surface of 2679 km² and 0.0099 % of the SIOFA area, which corresponds to the French cumulative impact in recent years (Table 8).	
Japan	Y	Intensity and spatial extent assumed to be small – 3 years of exploratory fishing only. Map of footprint provided.	2012 : density of corals was roughly estimated as less than 1.0 kg / km2 except for 2 hauls (5.8 kg / km2 and 2.8 kg / km2) by calculating from by-catch amount of corals including VME indicators and trawling areas. Assumed very low probability of interactions with VME due to limited operations over only 3 years. No surveys undertaken. No stock assessments. Location of vessels verified through VMS. Catch and effort data collection system also in place. (Doesn't say these applied in 1970s, nor does it say it doesn't). No scientific observer coverage	Japanese bottom trawl exploratory fishing was conducted only three cruises in 1977, 1978, and 2012, thus cumulative impacts is considered as minimal.
Thailand	Y	Analysis of impact of 62 active fishing vessels 2015-2017, primarily otter board trawl, 14 vessels active in June 2016-2017; 7.5%of trawlable area on continental shelf (0.12% of total SIOFA area) – 33,336 sq km, continental shelf and shallow upper continental slope. BFIA is prepared in accordance with the FAO deep-sea fisheries Guidelines	Utlises mandatory levels of observer coverge, move-on requirement (>60k accidental catch of corals and <700 kg sponges), restrictions on some gear, restrictions within footprint defined 2016-2017. Thailand controls their fishing activities in the SIOFA Area of competent and taken all necessary precautionary approach to prevent the adverse impact to the ecosystem. (Section 4.5). Some of those measures include: - limits on total capacity of Thai fleet; - constraints on the spatial distribution of bottom fishing effort; - legal provisions to ensure that bottom fishing will not have significant adverse impacts on VMEs; and - legal provisions ensuring	• Thai fishing ground cover 7.15% of trawlable area mainly on continental shelf or 0.12% of total SIOFA area. This fishing ground was not close to the Benthic Protected Areas (BPAs) that defined by Southern Indian Ocean Deepwater Fisheries Association (SIODFA) even the nearest, Mid-Indian Ridge. So, the fishing activities of

		and the SIOFA BFIA Standard. The assessment uses the data and information from fishing logbook and observer report of the trawl and trap fisheries during the year 2016-2017. Thailand has adopted the SIODFA BPA restrictions.	that any vessel flying Thai flag is not authorized to fish in any areas that the Meeting of the Parties has decided to close to fishing. Used logbook data, 5% scientific observer reports from June 2016-February 2017, 1 paired trawler, 11 otter board trawlers and 1 fish trap vessel, Saya de Malha bank – from a total of 61 vessels. Adopted a protocol for detection of VMEs evidence drawn from NAFO and SEAFO – 60kg corals and 600 kg of sponges. Move on at least 2 nm for trawler; for longliner, move on 1 nm when 10 kg / 1000 hooks/1200 m longline. Move on 1 nm for fish trap if coral or sponge catch is more than 10 kg. Committed to refresh training for observers and fishermen, EM tools for inspectors reviewing data collection. Requested capacity building	Thai fleet did not impact to any current BPAs. • Although the trawlers targeted demersal fish, the fishing ground was in the area of 0-200 and 200-700 meters that allowed the possibility of catching of pelagic species which move between the water columns e.g. round scad, Indian mackerel. • For this assessment, the two major species, lizardfish (*Saurida undosquamis*) and round scad (*Decapterus russelli*) are analyzed as representatives of demersal fish and pelagic fish species. The average length of lizardfish and round scad is mostly larger than the length at first maturity. • There is no record in logbook and observer report that these fishing activities encounter with Endangered, Threatened or Protected (ETP) species neither marine mammals, corals or sponges and it was suggested that this may be indicative of a lack of VMEs in the Saya de Malha bank area.
Korea	N	N/A		N/A
Comoros	Y	The BFIA focused on two mother vessels and 19 motorized embarkations from 2016 to 2018. VME assessment is less significant in relation to fishing effort and fishing gear used. For this purpose, the constraints on the spatial distribution of its fishing effort are	The competent Comorian authorities authorized these both vessels. The homeport of both vessels is in Mauritius. The information was collected from fishing logs, inspection reports, but also information from the competent authorities of Mauritius. We were also inspired by the Thailand report (2015/2017). Data analyses were carried out in collaboration with many departments in the Directorate-General for Fisheries.	Fishing for both vessels was conducted for 2 years with 4,100 hours on hand line fishing. The impacts are minimal

		not taken into account in accordance with the provisions of paragraph 9 (a) (iii) of CMM 2018/01. Although there is a national plan of observation, the fishing practiced does not require (at least for the moment) the presence of the observers.		

Trawl cumulative BFIA workplan

Task	Responsibility	Timeframe	Days	Resourcing
1. Collate historical spatial trawl data and at finest possible resolution for historic footprint reference period (2000-2015), in collaboration with Secretariat (if required)	Aus, CKI, Jpn, Tha, Secretariat	May 2019		Nil (in-kind)
2. Review and agree to methods for estimating spatial footprint and cumulative impacts, including for example those used in other R(F)MOs	Aus, CKI, Jpn, Tha	June 2019		Nil (in-kind)
3. Implement agreed methodology and prepare draft report in accordance with SIOFA BFIAS	Consultant	July-September 2019	75	39 555 €
4. Finalise report and provide cumulative trawl BFIA to SC5 in accordance with SIOFA BFIAS	Aus, CKI, Jpn, Tha	October-March 2020		Nil (in-kind)

Longline cumulative BFIA workplan

Task	Responsibility	Timeframe	Days	Resourcing
1. Collate historical spatial longline data and at finest possible resolution for historic footprint reference period (2000-2015), in collaboration with Secretariat (if required)	EU, FR-OT	May 2019		Nil (in-kind)
2. Review and agree to methods for estimating spatial footprint and cumulative impacts, including for example those used in other R(F)MOs	EU, FR-OT	June 2019		Nil (in-kind)
3. Implement agreed methodology and prepare draft report in accordance with SIOFA BFIAS	Consultant	October-November 2019	50	26 370 €
4. Finalise report and provide cumulative trawl BFIA to SC5 in accordance with SIOFA BFIAS	EU, FR-OT	November-March 2020		Nil (in-kind)

Cumulatives BFIA cost

SC ACTIVITY - Trawl cumulative BFIA		
Daily consultant rate (High, Medium or Base)	527,40 €	*
Max number of days (inc. meeting and travel days)	75	
Consultant costs	*39 555,00 €*	
Travel costs (if applicable)		
Maximum flight costs		
Travel/meeting days		
UN DSA day rate including accommodation	278,64 €	**
Travel costs	*0,00 €*	
Outsourcing costs		
Outsource cost 1: *identify*	0,00 €	
Outsource cost 2: *identify*	0,00 €	
Outsourcing costs	*0,00 €*	
Total Maximum Budget	**39 555,00 €**	

SC ACTIVITY - Longline cumulative BFIA workplan					
Daily consultant rate (High, Medium or Base)	527,40 €	*			
Max number of days (inc. meeting and travel days)	50				
Consultant costs	*26 370 €*				
Travel costs (if applicable)					
Maximum flight costs					
Travel/meeting days					
UN DSA day rate including accommodation	278,64 €	**			
Travel costs	*0,00 €*				
Outsourcing costs					
Outsource cost 1: *identify*	0,00 €				
Outsource cost 2: *identify*	0,00 €				
Outsourcing costs	*0,00 €*				
Total Maximum Budget	**27 370,00 €**				
Total cost : Trawl + Longline	**65 925 €**				

* Based on FAO Guidleines Honoraria for Category A High Level Consultants USD 600 per day					
USD 600,00	conversion rate	0,879	equals	527,40 €	
* Based on FAO Guidleines Honoraria for Category B Medium Level Consultants USD 450 per day					
USD 450,00	conversion rate	0,879	equals	395,55 €	
* Based on FAO Guidleines Honoraria for Category C Base Level Consultants USD 600 per day					
USD 300,00	conversion rate	0,879	equals	263,70 €	
** Based on UN DSA rate for France Elsewhere				https://icsc.un.org/	
USD 317,00	conversion rate	0,879	equals	278,64 €	
The employment of Consultants under MS 317 and Subscribers to Personal Services Agreements under MS 319 Guidelines -Revised 15 Feb 2018.					

Work plan and budget (2019-2021) (SERA-WG)					
Species	Activities	Timeline	Responsibility	Budget (EURO)	
				approved (2018-2019) (EURO)	additional budget need to be approved (2019-2020)
Alfonsino	refer to the detail workplan for SA	2019-2020	CP+Secretariat+SERA-WG (Co-chair)(JPN)+ SC Chair + Consultant	38,000 (a)	30,000 (50 working days + travel costs to SERA-WG2) (*)
	Otolith preparation and ageing works	2019-2021	CP	8,000	
Orange roughy	SNP analysis	2019-2021	Australia	5,000	
P. toothfish	Submission of EU-Spain LL data (William's Ridge+ Del Cano Rise) to SIOFA and CCAMLR	2019-2021	EU-Spain		
3 species	Development of T+L Reference points and Harvest strategies	2019-2021	Consultant		30,000 (40 working days + travel costs to SERA-WG2+3) (15,000 x 2 years)
Teleosts risk assessment	Technical work to update analysis and input data to online ERA tool	2019-2020	CSIRO		10,000

(a) Alfonsino SA budget (approved) : Breakdown and Notes		
Activities	Budgets	Note
TS vs length relation	5,000	10 working days
Acoustic data process	10,000	Acoustic data evaluation (10 working days) + data process (total 60 working days: 10 days from this approved budget and 50 days from the additional budget to be proposed. See (*))
SA consultant	23,000	CPUE evaluation(10 working days) + SA (30 working days) + travels costs to SERA-WG2.

Work plan : Activities and time-line of alfonsino stock assessment (SA) (2019-2020) (SIOFA SERA-WG)

ANNEX V

Topics	Activities	Responsibility			2019									2020		
		CP	SERA-WG (Co-chair) (JPN) +Secretariat + SC Chair	Consultant	4	5	6	7	8	9	10	11	12	1	2	3
	Meetings						(a)	MoP6								SERA-WG2+SC5
Acoustic data	Inventory of acoustic survey data	Cook Islands	Coordination of all activities													
	Evaluation of acoustic data by a consultant			(same consultant)												
	Acoustic survey data process by a consultant only if the data are useful for stock assessment								(b)							presentation
CPUE	fine scale data submission (catch+CPUE)															
	Evaluation of CPUE by a consultant			(same consultant)												
Stock assessment	Stock assessment related works by a consultant												SA works			presentation
Biology	Study of biological parameters by national scientists (c)				Results need to be submitted before SA consultant is hired.											presentation

(a) Web discussion by SC HoD (i) if CPUE & acoustic survey data are useful for SA based on results of evaluations and (ii) to make the final budget proposal for MoP6 according to (i).

(b) TS vs length relationship, acoustic data process and other relevant works are included.

(c) Budgets for otolith and genetic works are available.

SIOFA Scientific Committee Operational Work Plan 2018-2021

Updated at SC4

The SIOFA SC Work Plan is agreed by the MoP and provides direction to the SC activities. The SC Operational Work Plan 2018-2021 contains research priorities that are in progress or to be proposed for 2018-2021.

The Operational Work Plan will be reviewed annually by the SC.

Theme	Research activities	Timeline	Responsibility
1. Scientific data standards for the collection, reporting, verification and exchange of data	• Review of current data holdings and other relevant research - through an annual data holdings report from the Secretariat that would include information on the quality control process and any issues identified; data inventories in support of species assessments	• SC4 - annual data holdings report completed by Secretariat (Annex X) • SC4 - data inventory for Alfonsino and Patagonian toothfish completed by scoping studies • Ongoing – annual data holdings report to be provided prior to each SC	• Secretariat
	• Consolidation of historical data from non-CPs, this includes the historical catch data identified through the orange roughy stock assessment	• SC4 – report on progress for data sources identified with respect to orange roughy, alfonsino and species from the Saya de Malha Bank not yet progressed	• Secretariat to write to relevant non-CPs • SERAWG and CPs

Theme	Research activities	Timeline	Responsibility
	• Evaluation of proposed e-monitoring programs for scientific data collection	• SC – if a CP makes a proposal against the Guidelines • SC5 – Thailand to present a proposal for evaluation of e-monitoring	• Relevant CP to make a proposal, SC to review against the Guidelines. • Thailand and consultant (Budget request)
	• Completion of the database to hold observer data and population from submissions	• SC4 - Complete	• Secretariat
	• Development and adoption of standard protocols for data collection, such as age frequency information. Including drawing on the FAO guidelines for protocols for fisheries research and the FAO Deep seas Bottom Fisheries Guideline	• SC4 (not yet progressed) and ongoing	• CPs to propose to protocols to SC for consideration
	• Review of observer data coverage requirements and observer data standards: • Collate background information to consider types and levels of observer coverage in relation to specific research, scientific committee work.	• Data inventory to be completed prior to SC4 – inventory to be completed after submission of observer data and presented at SC5 • Review of investigation at SC4 – initiated at SC4 and work plan developed (Annex X) • PAEWG2 and SEAWG2 to provide advice on observer coverage requirements	• Secretariat to provide inventory prior to SC5 • PAEWG and SERAWG to provide advice to SC5 • SC5 and CPs

Theme	Research activities	Timeline	Responsibility
	• Review of observer data holdings (inventory) of CPs in a consistent template, including collection protocols in place • Investigation of observer coverage type and levels against the requirements of the SC workplan • Work plan described (Annex X)	• SC5 – finalise advice considering information provided through work plan	
	• Broaden use of identifications guides for deepsea sharks to enable better collection of data	• As soon as possible – MoP adopted use of guides (CMM 2018/02)	• CPs to ensure identification guides are in use by observers and crew
	• Smart forms for collection of deepsea shark and benthos data	• SC4 - Progress report on trials – trials on going	• CI to report on outcomes of trials once trials are complete • CPs to consider potential use of Smart forms
	• Periodic review of scientific data standards as and when required	• SC, ongoing as required	• • CPs to propose potential amendments as required, through papers to the SC
2. Advice on vulnerable marine ecosystems	• Contribute information to FAO VME database	• Ongoing	• Secretariat and CPs as appropriate
	• Develop SIOFA definition of VME indicator species: • Consider VME indicator species identified in	• SC5 – SC4 completed with recommendation of VME indicator species (Annex X)	

Theme	Research activities	Timeline	Responsibility
	other relevant RFMOs or other bodies (e.g. CCAMLR, SPRFMO etc) • Test whether these are appropriate for SIOFA area • Development of pictorial guides to VME indicator species		• Secretariat and CPs
	• Mapping of areas where VMEs are known or likely to occur. Work plan for taxa habitat mapping (Annex X)	• PAEWG2 • SC5	• PAEWG and consultant (Budget request)
	• Bioregionalisation of the SIOFA area according to a spatial analysis approach. Work plan provided (Annex X)	• PAEWG2 • SC5	• PAEWG and consultant (Budget request)
	• Consider benthic sampling protocol for mapping distribution of VME indicator species and predicting benthic community structure	• SC5	• France (Territories) to lead and report to SC for discussion
	• Cumulative impact assessment of SIOFA fisheries: • Refine process to advance, given the disparate nature of information available. • Undertake cumulative impact assessment for	• SC4 – report on progress on cumulative impact assessments for fisheries/gears – work plans developed to progress cumulative assessment of trawls and longline gear (Annex X and X)) • SC5	• Relevant CPs to progress cumulative impact assessments • Review of cumulative impact assessments by SC5

Theme	Research activities	Timeline	Responsibility
	groups of fisheries/gear (eg orange roughy bottom trawling, long lining, Saya de Malh trawl) using a consistent methodology across the gear. • Work plans developed (Annex X and X)		
	• Assessment of likely impact of specific gear types – potential collaboration with ABNJ Deep Seas Project	• Dependent on ABNJ Deep Seas Project timeframe • SC4 advised that this work will be completed in 2019	Secretariat will seek report from ABNJ Deep Seas Project on this work
	• Revise and improve the SIOFA BFIAS	• SC4 – if proposed changes are brought forward – no changes proposed	• CPs to submit papers to propose changes as required
	• Consider proposals for protected areas against the Standard protocol	• As per process in PAEWG ToR	• Proposals from CPs • PAEWG and SC
	• Review of trawl fisheries threshold levels for VME encounters	• SC5	• Relevant CPs
3. Current and historical status of fishing activities	• Scientific impact assessments on demersal gillnet operations	• When provided by the CP proposing to commence demersal gillnet operations	• Relevant CP
	• Spatial extent of historical and current fishing – SC5	• SC4 reviewed Secretariat's data inventory describing the spatial	• Secretariat

Theme	Research activities	Timeline	Responsibility
	specified the maps to be generated by the Secretariat and the work plan (Annex X)	resolution of the historical fishing effort data that has been submitted (paras X-X).	
	• Develop advice on reference periods for effort, footprints and spatial control	• SC5 - Recommendations to the MoP on appropriate SIOFA bottom fishing footprint (by 2020) • SC4 - Recommendations to the MoP on the most appropriate response to the VME encounter (by 2019), SC4 provided advice on the encounter response (paras XX)	• CPs and SC
	• Characterisation of historical and current deepsea shark fisheries (see also theme 5 below)	• If required to refine the ERA for deepsea chondrichthyans	• SERAWG and CPs
4. Stock assessments for key targeted species	• Implement the tiered assessment framework, supported by scoping analyses	• SC4 – consideration of progress on scoping analyses, Scoping analyses completed for toothfish and alfonsino, SC4 reviewed the process made and the link to refining the SIOFA species list (paras XX) • SC5 – consideration of progress on implementation	• SERAWG and CPs
	• Orange roughy: • Stock structure delineation • Age frequency data • Target strength for acoustic data • Development of a draft protocol for the collection of orange roughy	• Annually review catch and effort trends • SC4 – progress reports, SC4 reviewed progress • SC5 – consideration of outcomes	• Stock structure delineation – AUS and CI in collaboration with Victoria University (Approved MoP) • Age frequency data – CI and AUS • Target strength –Draft protocol - CI

Theme	Research activities	Timeline	Responsibility
	age/length frequencies and otoliths		
	• Alfonsino: • Data inventory • Acoustic data preparations (target strength evaluation and acoustic data analysis and review) • Scoping analysis • Age frequency data (otolith aging) • CPUE evaluation • Decision on assessment approach • Stock assessment analysis • Updated work plan provided (Annex X)	• SC4, to provide advice in line with CMM Bottom Fishing (2019), scoping study complete	• SERAWG, relevant CPs and SC (Budget request)
	• Patagonian toothfish: • Data inventory • Scoping analysis • Decision on assessment approach • Stock assessment analysis	• SC4, to provide advice in line with CMM Bottom Fishing (2019), scoping study complete	• Relevant SERAWG, relevant CPs and SC • SC Chair, France (Territories) and relevant CPs to work with the Secretariat to progress collaboration with CCAMLR and relevant states (France, South Africa)
	• Other teleost species, in particular those caught in the Saya de Mahla Bank:	• SC4, to provide advice in line with CMM Bottom Fishing (2019), SC4 reviewed progress on the teleost ERA work with	• SERAWG, relevant CPs

Theme	Research activities	Timeline	Responsibility
	• Apply PSA and SAFE approaches to assess these species	particular focus on the Saya de Mahl Bank (paras X)	

	• Deepwater chondrichtyans:
	  • Ongoing review of sharks catch/bycatch data, including spatial and/or catch rate trend analyses
	  • Review implementation of FAO sharks ID guides
	  • Review effectiveness of measures put in place by MoP, if applicable
	  • Work towards more quantitative assessment of key species of concern
	  • Development of harvest strategies and reference points for species taken in large volumes
		• SC4, to provide advice in line with CMM Bottom Fishing (2019), SC4 reviewed progress (para X)	• SERAWG, relevant CPs

	• Collection, analysis and reporting of essential biological and fisheries information, including: • Age composition data • Length and age • Growth • Reproductive biology	• Ongoing, with priorities determined by species scoping analyses and assessment research plan	• Guidance on priorities from SERAWG

Theme	Research activities	Timeline	Responsibility
	• Maturity ogives • Natural mortality		
	• Determination of biological reference points and associated development of harvest strategies • Work plan at Annex X, that includes the scientists – fishery mangers dialog	• SC5 and SC6 as per the work plan	• SC
5. Advice on the impacts of fishing on associated and dependent species	• Risk assessment of effects of fishing on non-target, associated and dependent species (see also theme 2 above) – through implementation of the tiered assessment framework	• Ongoing	• SERAWG
	• Seek advice from expert groups, such as Birdlife International and the Agreement for the Conservation of Albatross and Petrels, CCAMLR and IOTC, in relation to risk assessments completed for species in the SIOFA Area • Report on seabird bycatch observed in SIOFA fisheries	• SC5, review information on risk of seabird bycatch in the SIOFA Area	• Request input prior to SC – Secretariat could write to ACAP, CCAMLR and IOTC after SC4? • Secretariat to prepare a report on observed seabird bycatch prior to the SC5

Theme	Research activities	Timeline	Responsibility
6. Climate change impacts on fishery resources and ecosystems	• Identification of research activities and development of work plan	• SC5	• CPs • Secretariat to provide advices on ABNJ new phase assistance
7. Any other advice that the Meeting of the Parties (MoP) requests	*This may be updated following the MoP5*		

Work plan for the development of target and limit reference points and a harvest strategy framework

The focus is initially the three key species (orange roughy + alfonsino + Patagonian toothfish)

- To implement this task a consultant (expert) needs to be hired because specialised knowledge and skills are required.
- The consultant should propose plausible candidates for target (TRP) and limit (LRP) reference points and harvest strategies considering life history, biology, ecology and availability of data of three species and also by considering linkage between the reference points and harvest strategies. The consultant should consider other SC advice, paras 174-175.
- A dialog involving scientists, managers and stakeholders should be facilitated to develop a shared understanding of the key concepts and elements of harvest strategies.
- As there needs to be a common understanding and also decision points, the work is planned over two years.

In terms of the harvest strategy development, the consultant shall incorporate the following elements of harvest strategies. Initially, information describing these elements needs to be provided and relevant decisions by the MoP faciliated.

(i) operational objectives;

(ii) Reference points;

(iii) acceptable level of risk of breaching reference points;

(iv) monitoring strategy;

(v) decision rules for achieving reference points; and

(vi) a process for evaluating harvest strategies.

ANNEX X

Activities	Responsibilities			2019			2020									2021					
	Consultant	SERA-WG (Co-chair) (JPN) +Secretariat+ SC Chair	MoP	7		12	1	2	3	4	5	6		12	1	2	3	4	5	6
Meetings				MoP6: SC chair to inform the plan and propose the budget.					SERA-WG2+SC5 initial discussion			MoP7 : First dialogue (managers+ scientists + stakeholders) (0.5 day) to discuss and advise revisions to MoP7					SERA-WG3+SC6 final discussion to select finals			MoP8 : Second dialog (managers + scientists +stakeholders) (0.5 day)
Consultant works to select candidates (EURO 30,000 for 2 years)						1st stage of development			Presentation					2nd stage of development			Presentation			