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MoP-10-08

Report of the Joint Meeting of Parties and Scientific Committee Workshop on Harvest Strategy Pre-assessment of the Southern Indian Ocean Fisheries Agreement (SIOFA)

The SIOFA Secretariat on behalf of the SIOFA Scientific Committee

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Abstract

The first Joint Meeting of Parties and Scientific Committee Workshop on Harvest Strategy Pre-assessment of the Southern Indian Ocean Fisheries Agreement (SIOFA) (WSHSPA-2023) was held 17 – 18 March 2023 at the premises of the Spanish Institute of Oceanography, Santa Cruz de Tenerife, Spain, in a hybrid virtual/in-presence format.
The following paper contains the official report of the Workshop, as adopted during the meeting and transmitted to the 8th meeting of the SIOFA Scientific Committee (SC8). Recommendations contained in this paper are SC8 recommendations to the SIOFA MoP.

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Recommendations

- The SC endorsed the recommendation in paragraph 15 of the Workshop report that the MoP **consider** establishing a process for regular dialogue between the MoP and the SC for the development of harvest strategies, held in conjunction with either the MoP or SC meetings.
- The SC endorsed the recommendation in paragraph 31 of the Workshop report that the MoP **request** the advice of the SC on additional SIOFA species that would be amenable to the development of monitoring programmes and harvest strategies.
- The SC endorsed the recommendations in paragraph 32 of the Workshop report that the MoP **consider** recommending the development of harvest strategies for orange roughy and toothfish as a first step, but also consider the development of harvest strategies for alfonsino and other primary SIOFA species.
- The SC recommended that the MoP **adopt** interim stock-specific reference points for orange roughy (all assessment units) and alfonsino (all stocks) as follows (with B0 denoting pre-exploitation spawning stock biomass): Target = BMSY using a proxy of = 0.4*B0, and a Limit = 0.2*B0 (common surrogates used in other regions) with a probability of being above the target at least 50% of the time, and a probability of being above the limit of at least 90% of the time. The SC recommended that the MoP note that the proxies for MSY have been proposed for operationalising target reference points based on the assumption that the assessment methods would calculate depletion better than MSY, but that other equivalent operational targets may be appropriate depending on the assessment method used.
- The SC recommended that the MoP **adopt** interim stock-specific reference points for toothfish (all management units) as follows (with B0 denoting pre-exploitation spawning stock biomass): Target = 0.5*B0, and Limit = 0.2*B0 with a probability of being above the target at least 50% of the time, and a probability of being above the limit of at least 90% of the time. The SC noted that the toothfish stocks in Williams Ridge and Del Cano Rise are likely to be part of a straddling stock with toothfish in the CCAMLR area and recommended that the MoP **note** the need to ensure alignment with the CCAMLR decision rules when operationalising the above interim reference points.
- The SC recommended that the MoP **adopt** the following candidate Harvest Control Rules (HCRs) as interim management for the above stocks and as management for all other stocks:
    - Maintain catches at present levels (unless there is evidence of a marked downward trend in the resource) until sufficient further informative data becomes available for meaningful improvements to the existing assessments. Where not previously defined for specific stocks, the SC recommends the present level be defined as the average (mean) of the 5 year period 2018–2022. For orange roughy, SC7 agreed that recent levels referred to the average of the last six years of that assessment (2015–2020).

    - Implementing an Fstatus-quo harvest strategy, which varies catches up or down in proportion to the results from continued collection of some measure or index of abundance.
    - Implementing a harvest strategy based primarily on some multiple of a proxy value of FMSY or BMSY, while noting that other proxies or proxy values may be appropriate for some stocks, for instance those in the CCAMLR decision rules for toothfish.
- Regarding paragraph 38 of the Workshop report, the SC recommended that the MoP **request** that SC9 hold discussions on the development of generalised approaches for stock maintenance and rebuilding approaches (if needed) and present the outcomes of its discussions to MoP11.
- The SC endorsed the recommendation in paragraph 41 of the Workshop report that the MoP **consider** additional objectives such as bycatch, fisheries impacts, benthic impacts, etc., as part of its harvest strategies, and that the SC be requested to provide advice to the MoP based on the objectives set by the MoP.
- The SC endorsed the process for the setting of management objectives recommended in paragraph 43 of the Workshop as follows:
    - As a first step, the Meeting of the Parties (MoP) proposes potential management objectives in generic terms and, if possible, specific for each species and their stocks.
    - The SC develops potential performance indices based on the management objectives proposed by the MoP.
    - The SC identifies any objectives that are incompatible with each other and where trade-offs would need to be considered.
    - The MoP considers the performance indices recommended by the SC, and identifies those to adopt, and which should be excluded or further refined by the SC.
- The SC endorsed the recommendation in paragraph 45 of the Workshop report that the SC consider a wide range of options for stock monitoring programmes; prepare a table (e.g., as shown in Table 2), with the scientific uncertainty, relative costs, and applicability by stock/fishery of the various options; and present this to the MoP for the MoP to decide on the appropriate monitoring programme for each stock.
- The SC recommended that the MoP **note** that Table 2 is only an example that has been included for illustration purposes and that the specific rows and species will likely differ following the SC's discussions and scientific evaluations at SC9.
- The SC endorsed the recommendation in paragraph 48 of the Workshop report that the MoP **request** the SC evaluate the different stock assessment options, based on the level of data available, for all species that were potential candidates for harvest strategies.
- The SC endorsed the recommendation in paragraph 55 of the Workshop report that the MoP **request** the SC determine potential performance indicators for each of the management objectives once the MoP has decided on the management objectives.
- Regarding paragraph 56 of the Workshop report, the SC endorsed the approach for the development of harvest strategies and the timeline for the implementation of pre-assessments, assessments, management objectives and implementation of harvest

strategies proposed by the Workshop (Table 3). The SC noted that ecosystem considerations under Step 1.1 Specify management objectives could include bycatch and benthic impacts. The SC noted that Step 4.2. Adopt appropriate harvest strategy and Step 5.1. Implement management changes based on HCR should happen in the same year and recommended that the MoP begin preparations, which may take several years, for Step 5.1., to minimize the delay between the two steps.

- The SC endorsed the recommendation in paragraph 58 of the Workshop report that the SC, at its 2026 meeting, aim to formally propose final Harvest Strategies to the MoP. The SC noted that if adopted by the MoP in 2026, the Harvest Strategy could be used for formulating the SC's scientific advice from 2027.
- Regarding paragraph 59 of the Workshop report, the SC noted that the proposed timeline for the implementation of pre-assessments, assessments, management objectives and implementation of harvest strategies should include responses to exceptional circumstances, such as dropout or breakout rules as mentioned in paragraph 51 of the Workshop report, and recommended that the MoP **consider** what such responses might be.
- Regarding paragraphs 61 and 62 of the Workshop report, the SC noted the importance of regular dialogue between the MoP and the SC to ensure smooth and timely progress in accordance with the timeline, and endorsed the recommendation that a one or two-day joint MoP-SC workshop on harvest strategy pre-assessment be held in 2024. As for the timing, the SC requested that the MoP **consider** whether the workshop should be held immediately preceding SC9 or immediately preceding MoP11, noting that the latter may facilitate greater participation by managers.
- The SC developed draft objectives and Terms of Reference for the joint MoP-SC workshop on harvest strategy pre-assessment and recommended that the MoP **consider** them for adoption (Annex C).
- The SC endorsed the recommendation in paragraph 65 of the Workshop report that the MoP **consider** an agenda item on harvest strategies at its annual meeting this year and consider, as part of that, inviting the Pacific Community (SPC) or other experts to give an overview of harvest strategies and appropriate software tools (such as the SPC AMPLE Shiny App or other similar HCR tool). The SC believed that such a demonstration could be beneficial for the MoP and tasked SC Chair to liaise with the MoP Chair about this matter.
- The SC endorsed the recommendation in paragraph 67 of the Workshop report that the MoP **consider** requesting the SC to develop interim ad-hoc harvest control rules that could be used for managing stocks, including for example, harvest control rules that adjust any future catch limits based on trends in CPUE or other stock status indicators.

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Southern Indian Ocean Fisheries Agreement
Accord relatif aux Pêches dans le Sud de l'Océan Indien

Report of the Joint Meeting of Parties and Scientific Committee Workshop on Harvest Strategy Pre-assessment of the Southern Indian Ocean Fisheries Agreement (SIOFA)

Spanish Institute of Oceanography, Santa Cruz de Tenerife, Spain / Hybrid Format

17 – 18 March 2023

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Agenda item 1 – Opening

1. The Workshop was convened by Mr Alistair Dunn, Chair of the Scientific Committee (SC), who welcomed the participants (**Annex A**).

2. The Executive Secretary, Mr Thierry Clot, delivered an opening statement on behalf of the Chair of the Meeting of the Parties (MoP). The Chair of the MoP welcomed the participants to the meeting and highlighted the importance of developing effective harvest strategies for the sustainable management of fisheries in the SIOFA Area. He also thanked the Spanish Institute of Oceanography for hosting the workshop and the European Union (EU) for funding it, and expressed his wish for a productive meeting.

3. The Director of the Oceanographic Centre of the Canary Islands, Spanish Institute of Oceanography, Prof. Pedro Velez Belchi, welcomed the participants to the Canary Islands and to the Centre. He expressed the Centre's pleasure to be hosting this series of workshops and the SC meeting and emphasized the important role that regional fisheries management organisations (RFMOs) such as SIOFA play in promoting international cooperation to ensure the long-term sustainable management of oceans and marine resources.

4. The Workshop noted the attendance of Dr Geoff Tingley (Gingerfish Ltd.) at the Workshop as an invited expert.

5. In this report, paragraphs with key recommendations and advice to the MoP and SC have been highlighted in grey.

Agenda item 2 – Administrative arrangements

Agenda item 2.1. Adoption of the meeting objectives and agenda

6. The meeting objectives and agenda (**Annex B**) were adopted as per SC Circular 2023-05.

7. The Workshop welcomed Dr Geoff Tingley, the invited expert to the meeting, and thanked him for providing a presentation (WSHSPA-2023-02) on harvest strategies.

8. The Workshop thanked the SIOFA SC Chair for providing to the workshop the background paper (WSHSPA2023/01), that provided a summary of the decisions and recommendations in MoP and SC reports relating to harvest strategies. The Workshop also thanked Dr Stephen Brouwer, Dr Tiare-Renee Nicholas, and Charles Heaphy for their paper that summarized the Cook Islands SIOFA fishery and data collection (SC-08-INFO-14); and the Delegations of the European Union and France (Overseas Territories) for their paper that characterized the European Union and French Overseas Territories toothfish fishery on Del Cano and the Southern SW Indian ridge in SIOFA Statistical Area 3b (SC-08-INFO-17).

Agenda item 2.2. Appointment of rapporteurs

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

Agenda item 3 – Determination of the workshop objectives and agenda

10. The Workshop agreed that the objective of the workshop was to plan the implementation of harvest strategies for SIOFA fisheries.

11. The SC Chair mentioned a number of SC papers that may provide useful background information about various species, namely:

    i. SC-08-INFO-14 (characterisation of the Cook Islands' orange roughy fishery)

    ii. SC-08-INFO-17 (characterisation of the EU and France (Overseas Territories) toothfish fisheries)

    iii. SC-08-16 (orange roughy fishery summary)

    iv. SC-08-18 (toothfish fishery summary)

    v. SC-08-19 (oilfish fishery summary)

    vi. SC-08-20 (terakihi fishery summary)

    vii. SC-08-21 (hapuka, hapuku wreckfish, and wreckfish fishery summaries)

12. The invited expert, Dr Tingley, presented WSHSPA-2023-02, which provided an introduction to harvest strategy development, including explanations of harvest strategy and manager strategy evaluation (MSE), the benefits and components of MSE, steps on the path to the development of an MSE, performance evaluation of the system, required monitoring, harvest control rules (HCRs), and the roles of scientists and managers.

13. The invited expert also shared the following useful resources for better understanding harvest strategies:

    i. Harvest Strategies Toolkit

    ii. The SPC introductory resources on Harvest Strategies: Introduction to Harvest Control Rules & The AMPLE Shiny App

14. The Workshop discussed how to initiate and facilitate the process of developing a harvest strategy. The Workshop noted that the process should be led by managers, while scientists should provide advice to the managers. The Workshop also noted that the MoP should make the decisions on the harvest strategy objectives, reference points, etc, while the SC should provide scientific advice on the relative costs, uncertainty, and the trade-offs between options.

15. The Workshop noted the benefit of continued discussion between managers and scientists and recommended the MoP consider establishing a process for regular dialogue between the MoP and the SC for the development of harvest strategies.

16. The Workshop noted that one of the major issues for managing the main SIOFA demersal stocks (toothfish, orange roughy, alfonsino) is that they were data-poor and data-limited. The Workshop noted that the lack of information could be addressed by developing more coherent data collection and monitoring programmes as part of a harvest strategy framework. In addition, data gaps could be filled by referencing information about different stocks of the same species under the jurisdiction of other organisations. For example, for toothfish, information could be sought from the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) toothfish stock, while information about orange roughy could be sought from the Australian and New Zealand orange roughy fisheries.

17. The Workshop recommended that the SC provide advice to the MoP on approaches to improved data collection and monitoring programmes that could be considered as a part of a harvest strategy framework.

Agenda item 4 – Management objectives

18. The Workshop noted that management objectives should be guided by the General Principles under Article 4 of the Agreement, particularly (i) the long-term conservation and sustainable use of fisheries resources in the SIOFA Area, (ii) implementation of an ecosystem-based approach to fisheries management, and (iii) management of fishery resources in a manner that ensures that they are maintained at levels capable of producing the maximum sustainable yield (MSY).

19. The Workshop discussed the different types of management objectives, categorised as biological, economic, and social objectives. Biological objectives would concern stock status with regard to specific biological reference points and sustainability. Economic objectives could, for example, include maximising total catch, frequency and size of catch limit changes, maximising fishing opportunity, maximising economic yield, catch rates, fish size, fleet stability, or wider ecosystem considerations. Social objectives could, for example, include the value to individual fishers, cultural values, or the consequences on the trade or life of individuals in the fishing industry.

20. As an example of an economic objective implemented by another RFMO, the Workshop noted an objective set by the Western and Central Pacific Fisheries Commission (WCPFC) to increase catch rates for southern albacore in order to ensure that a larger proportion of vessels would be profitable. (See "Further Analyses to Inform Discussions on South Pacific Albacore Objectives and the TRP" (WCPFC19-2022-15).)

21. The Workshop agreed that for the management objectives, biological objectives should be considered initially in the development of harvest strategies, but also noted that this did not preclude the inclusion of socio-economic objectives either at the same time or once the harvest strategy process was more developed.

22. The Workshop noted that potential management objectives could, as examples, include:

    i. Biological

        (a) Biomass (SSB) fluctuating around the target reference point (for example by ±20%), and

        (b) Biomass above the limit reference point with e.g. a 95% probability.

    ii. Socio-economic

        (a) Catch fluctuating around MSY (or proxy) ± e.g., 10%

        (b) Stable catch limit, i.e., one that does not change by more than e.g., 10% up or e.g., 20% down in any year

        (c) CPUE above a minimum threshold (more useful if there is an economic threshold for industry)

        (d) An average, or a minimum proportion below a threshold fish length (or weight) (useful if there is an industry/market requirement), however, this is usually managed through keeping fishing mortality low to ensure increased size.

23. The Workshop noted that combining a number of different objectives would be appropriate. For example, having the biological objectives i(a) and i(b) at the same time and potentially also combined with the socio-economic objective ii(a).

24. The Workshop noted that some objectives were less likely to work in combination, for example, maximising catch and having small and infrequent catch limit changes is unlikely to result in a workable harvest strategy.

25. The Workshop noted that not only were reference points necessary, but having agreed limits to the risk of breaching the limit reference point would also be required.

26. The invited expert noted that best practice was that the risk of breaching a limit reference point should be low.

27. The invited expert also noted that risk thresholds of between 0% and 5% should be considered for the breaching risk where a limit reference point of 20%B_0 were chosen but higher risk levels could be considered with higher values of limit reference point.

Agenda item 4.1. Candidate stocks for the harvest strategies

28. The Workshop discussed candidate stocks for the harvest strategies and agreed, as a first step, to focus on the three main demersal target species. The Workshop identified toothfish and orange roughy as the most immediate priorities, noting the importance of these fisheries and the relative availability of data among the three main SIOFA demersal stocks. The Workshop also considered alfonsino but, depending on the availability of time and resources, suggested that this be a secondary priority compared to toothfish and orange roughy in light of the limited data available.

29. The Workshop discussed how to identify other potential candidate stocks for harvest strategies. As one approach, the Workshop suggested that volume may be a useful factor and considered the top 12 species by volume in the SIOFA Area from 2013-2021 and 2017-2021 (Table 1)

Table 1: The top 12 species by volume in the SIOFA Area from 2013-2021 and 2017-2021

Common name	**Scientific name**	**Total volume 2013-2021 (tonnes)**	**Total volume 2017-2021 (tonnes)**
Splendid alfonsino	*Beryx splendens*	39 497	20 988
Oilfish	*Ruvettus pretiosus*	38 160	26 921
Scads nei	*Decapterus* spp	11 910	1 575
Saurids	*Saurida* spp	10 155	1 709
Orange roughy	*Hoplostethus atlanticus*	9 538	5 227
Portuguese dogfish	*Centroscymnus coelolepis*	6 391	3 391
Threadfin breams nei	*Nemipterus* spp	4 705	681
Sharks, rays, skates, etc. nei	*Elasmobranchii*	4 631	3 325
Violet warehou	*Schedophilus velaini*	3 435	1 705

Black cardinal fish	*Epigonus telescopus*	3 218	1 891
Bigeyes nei	*Priacanthus* spp	2 566	207
Kitefin shark	*Dalatias licha*	2 037	657

30. The Workshop suggested that other factors to consider could be data availability and therefore the ease with which a harvest strategy could be developed, what surveys have been or could be done for different stocks, and fleet size.

31. The Workshop recommended that the SC be requested to provide advice to the MoP of additional SIOFA species that would be amenable to the development of monitoring programs and harvest strategies.

32. The Workshop recommended that the MoP consider recommending the development of harvest strategies for orange roughy and toothfish as a first step, but also consider the development of harvest strategies for alfonsino and other important SIOFA species based on advice from the SC.

Agenda item 4.2. Stock reference points and rebuilding plans

33. The Workshop recalled that at the SC6 meeting, the SC recommended that the MoP consider interim reference points, for scientific reporting purposes only, for orange roughy, alfonsino, and toothfish as follows:

    i. Orange roughy and alfonsino: Target = BMSY using a proxy of = $0.4*B_0$, and a Limit = $0.2*B_0$ (common surrogates used in other regions)

    ii. Toothfish: Target = $0.5*B_0$, and Limit = $0.2*B_0$ (reference points adopted by CCAMLR)

34. The Workshop noted that reference points used by other organisations for species that are also present in the SIOFA Area could be considered. A reference point that is suitable for a species in one region is likely to also be suitable for the same species in another region.

35. The Workshop noted that a commonly used reference point is one based on B_{MSY}, F_{MSY}, or a proxy at $0.20*B_0$ with a 10% threshold of breaching the limit.

36. The Workshop noted that adoption of reference points was a key part of the development of harvest strategies and that interim reference points could be used while harvest strategies were being developed. The workshop further noted that the choice of reference points may be refined following evaluation of each stock using Management Strategy Evaluations (MSE).

37. The Workshop recommended that the MoP adopt interim reference points as follows.

    i. Stock-specific interim reference points:

    (a) Orange roughy (all assessment units) and Alfonsino (all stocks): Target = B_{MSY} using a proxy of = $0.4*B_0$, and a Limit = $0.2*B_0$ (common surrogates used in other regions) with a probability of being above the target of at least 50% of the time, and a probability of being above the limit of at least 90% of the time.

    (b) Toothfish (all management units): Target = $0.5*B_0$, and Limit = $0.2*B_0$ with a probability of being above the target of at least 50% of the time, and a probability of being above the limit of at least 90% of the time.

ii. Candidate Harvest Control Rules (HCRs) as interim management for the above stocks and as management for all other stocks:[3]

(a) Maintaining catches at present levels (unless there is evidence of a marked downward trend in the resource) until sufficient further informative data become available for meaningful improvements to the existing assessments.

(b) Implementing an $F_{status\text{-}quo}$ harvesting strategy, which varies catches up or down in proportion to the results from continued collection of some measure or index of abundance.

(c) Implementing a harvest strategy based primarily on some multiple of a proxy value of F_{MSY} or B_{MSY}.

38. The Workshop discussed the development of rebuilding plans and recommended that the SC provide advice to the MoP on generic rules for stock rebuilding plans, taking as reference some of the well-developed fishing regimes around the world, that could be considered for inclusion into harvest strategies.

Agenda item 4.3. Frequency of assessments and stock monitoring

39. The Workshop noted that the frequency of assessment and monitoring should be determined based on factors that include the biology of the species, the importance of the fishery, the level of precaution, and the level of uncertainty (e.g., higher frequency for shorter-lived species and vice versa; higher frequency for fisheries that are considered as more valuable, important, or are operating at high levels of fishing mortality; higher frequency for higher levels of precaution or uncertainty).

40. The Workshop noted an example of how management objectives may affect the frequency of assessments and monitoring as well. For example, setting a management objective of maintaining the catch limit at a relatively consistent level would result in less frequent assessments.

Agenda item 4.4. Other objectives, including consideration of bycatch, fishery impacts, effort and catch limit mechanisms, etc.

41. The Workshop recommended that the MoP consider additional objectives such as bycatch, fisheries impacts, benthic impacts, etc., as part of its harvest strategies, and that the SC provide advice to the MoP based on the objectives set by the MoP.

42. The Workshop recommended that the SC conduct a review, and compile and summarise the proxies used by other jurisdictions for the main species caught in the SIOFA Area.

Agenda item 4.5. Provision of advice on the management and harvest strategy objectives

43. The Workshop recommended the following process for the setting of management objectives:

i. As a first step, the Meeting of the Parties (MoP) propose potential management objectives in generic terms and, if possible, specific for each species and their stocks.

ii. The SC develop potential performance indices based on the management objectives proposed by the MoP.

iii. The SC identifies any objectives that are incompatible with each other and where trade-offs would need to be considered.

[3] WP SC-06-24 Report on the development of Harvest Strategies for key target species in the SIOFA area.

iv. The MoP considers the performance indices recommended by the SC, and identifies those to adopt, and which should be excluded or further refined by the SC.

Agenda item 5 – Scientific objectives

Agenda item 5.1. Stock monitoring

44. The Workshop recalled that SIODFA presented a paper on the feasibility of acoustic surveys for alfonsino at the SC6 meeting (SC-06-Info-09).

45. The Workshop recommended the SC consider a wide range of options for stock monitoring programmes; prepare a table (e.g., Table 2), with the scientific uncertainty, relative costs, and applicability by stock/fishery of the various options; and present this to the MoP for the MoP to decide on the appropriate monitoring programme for each stock.

Table 2: The scientific uncertainty, relative costs, and applicability by stock/fishery of the various options for stock monitoring programmes

ITEMS	**COST (High/ Med/ Low)**	**USABILITY/ UNCERTAINTY**	**APPLICABILITY BY STOCK/FISHERY**			**AVAILABILITY OF DATA FROM OTHER JURISDICTIONS**		
			ALF	ORY	TOP	ALF	ORY	TOP
Biomass indices								
• Randomised bottom trawl								
• Acoustic surveys of fish aggregations								
• Tagging								
• Standardised commercial CPUE timeseries								
• Plankton survey								
Fish size (length, weight) or age								
• Average size (age)								
• Proportion below a threshold								
• Proportion above a threshold								
Oceanographic parameters								

Agenda item 5.2. Stock assessments

46. The Workshop recalled that the SC has previously conducted stock assessments for orange roughy using statistical catch-at-age models and for alfonsino using biomass production models. The Workshop also noted that there was uncertainty in the assessments of both stocks due to the limited data available.

47. The Workshop noted that many RFMOs have used statistical catch-at-age models, which may potentially be considered best practice, but that alternatives, such as biomass production models, can be used to develop harvest strategies.

48. The Workshop recommended that the MoP request the SC evaluate the different stock assessment options, based on the level of data available, for all species that were potential candidates for harvest strategies.

Agenda item 5.3. Evaluation of harvest control rules

49. The Workshop noted that each management objective would need to have at least one performance indicator.

50. The Workshop noted that performance indicators should be determined once the management objectives are agreed, but this need not be at the same time and could be determined subsequently.

51. The Workshop noted that development of HCRs would also require consideration dropout or breakout rules for situations (e.g., productivity variability, climate change variability, unusual observations, etc.) that would result in HCRs no longer being useful.

52. The Workshop noted the importance of tools such as the SPC AMPLE Shiny App for familiarising managers with how HCRs work in general as well as demonstrating how a specific HCR is operating for a specific stock.

Agenda item 5.4. Provision of advice on harvest strategies

53. The Workshop recommended that the MoP request the SC provides advice on appropriate monitoring programmes that could be used to monitor each stock that was a potential candidate for harvest strategies.

54. The Workshop recommended that the MoP decide on the appropriate monitoring programme for each stock based on advice on potential options that would be prepared by the SC.

55. The Workshop recommended that the MoP request the SC determine potential performance indicators for each of the management objectives once the MoP has decided on the management objectives.

Agenda item 6 – Timetable for the implementation of pre-assessments, assessments, management objectives and implementation of harvest strategies for key stocks in the SIOFA Area

56. The Workshop developed an approach to the development of harvest strategies and the timeline for the implementation of pre-assessments, assessments, management objectives and implementation of harvest strategies (see Table XX).

Table 3: Development of harvest strategies and the timeline for the implementation of pre-assessments, assessments, management objectives and implementation of harvest strategies

	SC	MoP
<u>Step 1</u> Define management objectives		1. Specify management objectives: ➢ biological (including ecosystem considerations) e.g., ensuring long-term sustainability and productivity; recovering heavily depleted stocks ➢ socio-economic e.g., maintaining reasonable stability in catches for the industry
	2. Propose reference points based on management objectives: limit reference points (B_{lim} and/or F_{lim}), and target reference points (B_{TARGET} and/or F_{TARGET})	
		3. Select reference points
	4. Characterise the sources and values of uncertainties associated with the estimation of reference points (target and limit)	
		5. Specify acceptable levels of risk to be used in evaluating possible consequences of management actions, and time horizons for fishing mortality adjustments to avoid stock collapse, breaching limit reference point or achieve the target reference.
<u>Step 2</u> Determine appropriate fisheries monitoring regime	1. Identify data collection and monitoring activities required to reliably evaluate resource status with respect to reference points	
		2. Implement data collection and monitoring programme to deliver consistent, high-quality data into the future.
	3. Determine how frequently to monitor (survey and/or assessments)	

Step 3 Develop candidate Harvest Control Rules	1. Propose candidate Harvest Control Rules (HCR): actions for controlling fishing mortality (F) or adjusting catch with respect to pre-defined, stock-specific, precautionary reference points for both biomass (B) and fishing mortality (F) were possible.	
		2. Select HCR
	3. Conditions for Re-Evaluating Reference Points and HCR	
Step 4 Test HCR with MSE	1. Test HCR and compare expected performance of harvest strategies	
		2. Adopt appropriate harvest strategy
Step 5 Implement Harvest Strategy		1. Implement management changes based on HCR
	2. Monitor (survey and/or assessment) and assess stock(s)	
	3. Determine stock status relative to reference points	
		4. Determine if Harvest Strategy delivers the objectives
Step 6 Improve assessment and harvest strategy	1. Review reference points and HCR if needed	
	2. Define research requirements to improve the quantification and evaluation of uncertainty (i.e., risk analysis), as well as methodological developments required to reduce uncertainty.	

57. The Workshop recommended that the SC, at its 2023 meeting, consider adopting the framework of advice with specific reference to data-limited stocks. The SC should also consider potential candidate interim Harvest Control Rules (HCR) for data-limited stocks.

58. The Workshop recommended that the SC, at its 2026 meeting, aim to formally propose final Harvest Strategies to the MoP. If adopted by the MoP in 2026, the Harvest Strategy could be used to formulating its scientific advice in 2027.

59. The Workshop requested the MoP and SC consider and further refine the above proposed timeline given in Table 3.

60. The Workshop requested that CCPs consider the timeline and provide advice to the SC and MoP on contributions they are intending to make to facilitate the development of harvest strategies.

61. The Workshop reaffirmed the importance of regular dialogue between the MoP and the SC to ensure smooth and timely progress in accordance with the timeline, and requested the MoP and the SC to consider how frequently and in what format the SC and MoP should hold such dialogues when refining the above timeline.

62. The Workshop recommended that a one or two-day joint MoP-SC workshop on harvest strategy pre-assessment be held in 2024 immediately preceding SC9 to further the discussion between MoP and SC on the development of harvest strategies. The Workshop recommended that the SC, at its meeting in 2023, develop draft objectives and terms of reference for that workshop for consideration at MoP10.

63. The Workshop noted that the SC could hold species-specific pre-assessment meetings in the intersessional period and recommended that the SC develop a pre-assessment summary and make it available for the joint MoP-SC workshop in 2024.

64. The Workshop noted that the fishery and ecosystem summaries that the SC has been developing are a useful starting point in the harvest strategy development process.

65. The Workshop recommended that the MoP consider an agenda item on harvest strategies at its annual meeting this year and consider, as part of that, inviting SPC or some other experts to give an overview of harvest strategies and appropriate software tools, including a demonstration of the SPC AMPLE Shiny App or other similar HCR tool.

66. The Workshop noted that the development and implementation of harvest strategies is a medium-to-long-term process and noted that a timeframe of three to five years would be a reasonable minimum period to allow for the development of harvest strategies.

67. The Workshop recommended that the MoP consider requesting the SC develop interim ad-hoc harvest control rules that could be used for managing stocks, including for example, harvest control rules that adjust catch limits based on trends in CPUE or other stock status indicators.

Agenda item 7 – Report adoption

68. The draft convener's report was circulated to participants on 18 March 2023 for comment and adoption via email. The draft was revised and finalized based on the comments received and the final report was adopted via email on 22 March 2023.

69. The workshop convener, Mr Alistair Dunn, thanked all the participants for their positive contributions in progressing the work of the group. On behalf of the Workshop Group, Dr Rodríguez-Alfaro thanked Mr Dunn for his leadership of the Workshop and for guiding the participants in producing an informative and useful report.

70. The convener and the participants expressed their thanks to the Oceanographic Centre of the Canary Islands, Spanish Institute of Oceanography for hosting the workshop, the European Union for funding the Workshop organisation, the invited expert Dr Geoff Tingley and the Secretariat staff for their high-quality work and organisation of the Workshop.

MoP-10-08

ANNEX A: LIST OF PARTICIPANTS

	First name	Last name	Title	Position	Organisation	Email	Attendance	
							In person	Virtual
Convener	Alistair	Dunn	Mr	SC Chair	Ocean Environmental	Alistair.Dunn@OceanEnvironmental.co.nz	✓	
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Secretariat	Thierry	Clot	Mr	Executive Secretary	SIOFA Secretariat	thierry.clot@siofa.org	✓	
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Secretariat	Marco	Milardi	Dr	Science Officer	SIOFA Secretariat	marco.milardi@siofa.org	✓	

ANNEX B: ADOPTED AGENDA FOR THE JOINT MEETING OF PARTIES AND SCIENTIFIC COMMITTEE WORKSHOP ON HARVEST STRATEGY PRE-ASSESSMENT (WSHSPA-2023)

1. Opening
2. Administrative arrangements
   2.1. Adoption of the meeting objectives and agenda
   2.2. Appointment of rapporteurs
3. Determination of the workshop objectives and agenda
4. Management objectives
   4.1. Candidate stocks for the harvest strategies
   4.2. Stock reference points and rebuilding plans
   4.3. Frequency of assessments and stock monitoring
   4.4. Other objectives, including consideration of bycatch, fishery impacts, effort and catch limit mechanisms, etc.
   4.5. Provision of advice on the management and harvest strategy objectives
5. Scientific objectives
   5.1. Stock monitoring
   5.2. Stock assessments
   5.3. Evaluation of harvest control rules
   5.4. Provision of advice on harvest strategies
6. Timetable for the implementation of pre-assessments, assessments, management objectives and implementation of harvest strategies for key stocks in the SIOFA Area.
7. Report adoption

ANNEX C: DRAFT TERMS OF REFERENCE FOR THE JOINT MEETING OF THE MOP AND SCIENTIFIC COMMITTEE ON THE DEVELOPMENT OF HARVEST STRATEGIES

1. The aim of the Joint Meeting of the MoP and Scientific Committee on the Development of Harvest Strategies (Joint-WSDHS) is to promote a science-management dialogue on the development of harvest strategies for SIOFA stocks.

2. The workshop would focus on those stocks identified by the MoP for the initial development of harvest strategies.

3. The Joint-WSDHS would have the following objectives:

    a. To enhance mutual, consistent understanding and capacity building through focused interactions and communications among managers, scientists and other stakeholders on the objectives and outcomes relating to harvest strategies for stocks identified by the MoP for the initial development of harvest strategies. Specifically, to aid

        (i) the ability of managers to drive the process of harvest strategy development and guide the scientific work; and

        (ii) the ability of scientists to efficiently deliver relevant scientific advice.

    b. To facilitate the iterative process of decision making in relation to SIOFA harvest strategies by the MoP.

    c. To identify initial candidate harvest strategy options for development by the Scientific Committee.

4. The Joint-WSDHS meet in 2024, either in conjunction with the SC or the MoP meetings.