SCIENTIFIC COMMITTEE
EIGHTEENTH REGULAR SESSION

ELECTRONIC MEETING
10-18 August 2022

PRELIMINARY REVIEW OF AVAILABLE INFORMATION ON BIODEGRADABLE FADS

WCPFC-SC18-2022/EB-IP-13

FAD Management Options IWG

THE FAD MANAGEMENT OPTIONS INTERSESSIONAL WORKING GROUP SIXTH SESSION

EMAIL CORRESPONDENCE
11 July – 22 July 2022

PRELIMINARY REVIEW OF AVAILABLE INFORMATION ON BIODEGRADABLE FADS

FADMO-IWG-2022-WP-01 (Rev.02)

Prepared by the FADMO-IWG Chair and the Secretariat

I. BACKGROUND

1. In November 2020, the FAD Management Options Intersessional Working Group (FADMO-IWG) finalized a draft *Guidelines for non-entangling and biodegradable FADs*[1], which was forwarded to the Commission.

2. In the SC17 online discussion forum, there was general support on strengthening the existing provisions to reduce entanglement on FADs and more work is needed for the use of biodegradable materials in FADs. At TCC17 and online discussion forum, there was general support for the use of non-entangling and biodegradable FAD materials and research on the development and application of suitable biodegradable materials in FAD construction including the use of locally available materials.

3. In 2021, the FADMO-IWG recommended (WCPFC18-2021-FADMO-IWG5-01):
   - the use of biodegradable materials on the construction of FADs to reduce the number of synthetic debris in the environment but acknowledged that more research is needed on the development and application of suitable biodegradable materials and FAD designs in FAD construction including the use of locally available materials;
   - that CCMs continue to encourage its flagged vessels to use available biodegradable materials on FAD construction; and
   - that Commission considers developing a definition of "biodegradable FAD", ideally in consultation with other t-RFMOs.

4. Noting the report and recommendations of the FAD Management Options IWG, the Commission established a prohibition on the use of mesh net for any part of a FAD, from January 1, 2024, and agreed to further consider other issues related to FADs (biodegradable FADs, the impact of FADs, and FAD numbers)[2] .

[1] FADMO-IWG-04-2020-WP-02; Attachment K, WCPFC17 Summary Report.
[2] Paragraph 141, WCPFC18 Summary Report

5. The Commission adopted a revised Tropical Tuna Measure (CMM 2021-01) at WCPFC18 in December 2021 and tasked the Scientific Committee to provide specific recommendations on other issues (Paragraphs 19):

> *19. The Scientific Committee shall continue to review research results on the use of biodegradable material on FADs and shall provide specific recommendations to the Commission in 2022 including on a definition of biodegradable FADs, a timeline for the stepwise introduction of biodegradable FADs, potential gaps/needs and any other relevant information.*

6. To date, the FADMO-IWG has not specifically considered the issues specified in paragraph 19 of CMM 2021-01. However, these were scheduled to be considered during June - October 2022 in the FADMO-IWG Chair's work plan (Attachment A, WCPFC Circular 2022/25 dated 11 May 2022). This includes reviewing available reference materials related to the i) definition of biodegradable FADs, ii) timeline for the stepwise introduction of biodegradable FADs, iii) potential gaps/needs and iv) any other relevant information. The purpose of this paper is to provide relevant information related to such other issues for the IWG participants to assist SC18's further consideration and development.

II. AREAS FOR DISCUSSION RELATED TO BIODEGRADABLE FADs

A. Definition of Biodegradable FADs

7. In this paper, two possible definitions of 'biodegradable FADs (ISSF and IOTC definitions) and two definitions of 'biodegradable' (ISSF and IATTC definitions) are provided below for SC's consideration in developing a recommended definition to the Commission as appropriate.

a) ISSF definition

8. The International Seafood Sustainability Foundation (ISSF) defines "biodegradable FADs" as:

> "*Biodegradable fish aggregating devices (bio-FADs) are made with natural materials like bamboo and cotton. In contrast, traditional FADs are constructed of plastic and other materials that can persist in and pollute the oceans*."
>
> In this context, the ISSF defines "Biodegradable" as follows:
>
> *The term "biodegradable" is applied to a material or substance that is subject to a chemical process during which microorganisms in the environment convert materials into natural substances — such as water, carbon dioxide, and decomposed organic matter — that are non-toxic for the marine environment. The time required for biodegradation of different materials varies.*

b) IOTC definition

9. The IOTC definition for biodegradable FADs considers the definition by, Zudaire et al. (2018)[3] and included in Zudaire et al., (2021)[4], at which it discussed biodegradable FAD current status and prospects. This definition was also presented at the second meeting of the joint tRFMO FAD Working Group (Anon., 2019), and takes into consideration aspects like type of materials and configuration, the environmental impacts, durability and functionality, and practical and economic viability, as follows:

[3] https://www.iotc.org/sites/default/files/documents/2018/10/IOTC-2018-WPTT20-22.pdf
[4] https://www.ldac.eu/images/AZTI_ISSF_BIOFADs_IOTC-2021-WGFAD02-09.pdf

"A biodegradable dFAD would be composed of non-netting form renewable lignocellulosic materials (i.e., plant dry matter - here describe as natural material) and/or bio-based biodegradable plastic compounds, prioritizing those materials that comply with international relevant standards or certification labels for plastic compostability in marine environments. In addition, the substances resulting from the degradation of these materials should not be toxic for the marine and coastal ecosystems or include heavy metals in their composition. This definition does not apply to electronic buoys attached to dFADs to track them."

c) IATTC definition

10. At the 6th Meeting of the IATTC Ad Hoc Working Group on FADs during May 12-13, 2022, the working group adopted several recommendations related to biodegradable FADs for consideration by the IATTC at its annual meeting in August 2022. In particular, the working group discussed the challenges of constructing a FAD with 100% biodegradable materials and opted to recommend a definition of "biodegradable" rather than a definition for "biodegradable FAD," as well as developed several preliminary categories to be considered in the gradual implementation of biodegradable FADs. The WCPFC may consider adopting a similar definition for biodegradable and similar categories of biodegradable FADs.

- "*Non-synthetic materials*[5] *and/or bio-based alternatives that are consistent with international standards*[6] *for materials that are biodegradable in marine environments. The components resulting from the degradation of these materials should not be damaging to the marine and coastal ecosystems or include heavy metals or plastics in their composition*."
- **"**The different categories to be considered in this gradual implementation process are (These definitions do not apply to electronic buoys attached to FADs to track them):
  - Category I. The FAD is made of 100% biodegradable materials.
  - Category II. The FAD is made of 100% biodegradable materials except for plastic-based flotation components (e.g., plastic buoys, foam, purse-seine corks).
  - Category III. The subsurface part of the FAD is made of 100% biodegradable materials, whereas the surface part and any flotation components contain nonbiodegradable materials (e.g., synthetic raffia, metallic frame, plastic floats, nylon ropes).
  - Category IV. The subsurface part of the FAD contains non-biodegradable materials, whereas the surface part is made of 100% biodegradable materials, except for, possibly, flotation components.
  - Category V. The surface and subsurface parts of the FAD contain nonbiodegradable materials.

  These categories are preliminary and will be examined by the IATTC scientific staff and presented to the Commission."

B. Timeline for the stepwise introduction of biodegradable FADs

11. In general, the Commission members seem to support a gradual, stepwise, introduction of biodegradable FADs in the WCPO tuna fisheries. In 2021, the FADMO-IWG received several suggestions from its members on ways moving forward for the implementation of biodegradable FADs. These are reflected in WCPFC18-2021-FADMO-IWG5-01, Attachment D.

[5] For example, plant-based materials such as cotton, jute, manila hemp (abaca), bamboo, or animal-based such as leather, wool, lard.

[6] International standards such as ASTM D6691, D7881, TUV Austria, European or any such standards approved by the Members of the IATTC.

- *Acknowledging the current difficulties for the implementation of fully biodegradable FADs as biodegradable materials for all FAD components are not available yet (e.g., floating parts); a stepwise process, including a timeline, towards the implementation of fully biodegradable dFADs should be considered based on the current state of the art of materials available, similar to ISSF's classification for FAD entanglement risk (ISSF, 2019).*
- *Various projects on non-entangling and biodegradable FAD trials will take place in the WCPO, starting in early 2022. Both, the project by SPC for non-entangling and biodegradable FAD trials (SC17-2021/EB-IP-02) and the project by ISSF, SPC and NOAA to test Jelly-FADs[7] will end in late 2022. The results of those trials and other useful trials in other oceans, fleets could start trialling biodegradable FADs before or in early 2023. Those trials would allow the identification of non-entangling and biodegradable FAD structures suitable for fishing for the different parts of FADs designs. It is noted that the research on biodegradable designs continues and may have progress in the end of 2023, early 2024.*

12. The current Tropical Tuna Measure also allows a transition period for a couple years and then consider the adoption of measures on the implementation of biodegradable material on FADs in December 2023 (Paragraphs 18-20, CMM 2021-01):

> *18. To reduce the amount of synthetic marine debris, CCMs shall encourage vessels flying their flag to use, or transition towards using, non-plastic and biodegradable materials in the construction of FADs.*
> *19. The Scientific Committee shall continue to review research results on the use of biodegradable material on FADs and shall provide specific recommendations to the Commission in 2022 including on a definition of biodegradable FADs, a timeline for the stepwise introduction of biodegradable FADs, potential gaps/needs and any other relevant information.*
> *20. The Commission at its 2023 annual session, based on specific guidelines defined by the FAD Management Options Intersessional Working Group and advice from SC19 and TCC19 shall consider the adoption of measures on the implementation of biodegradable material on FADs.*

13. For the introduction of biodegradable FADs, it is important to consider factors needed for its full implementation. To achieve this, there is a need to identify key steps to process the introduction of biodegradable FADs and adequate time to be allocated to each step. Some steps may include training of fishers and stakeholders, better understanding of the need for and importance of using biodegradable FADs, trialing of biodegradable FAD designs, and eventually drafting provisions for biodegradable FADs in future guidelines or tropical tuna and other related measures. Another possibility that may be considered is to define the steps in terms of either the percentage, in weight, of the materials used to construct the FADs that are biodegradable or the various components of the FAD that are biodegradable such as the categories identified by IATTC. For example, by date X, at least 25% biodegradable; then by date X+1, at least 50%; by date X+2, at least 75%, and so on. These are preliminary ideas, and more insights are expected from participants on the ways forward.

14. There was also a view that currently a fully biodegradable FAD raft is difficult, as buoyancy needs to be maintained for several months at sea. A stepwise timeline could include: i) encourage the use of biodegradable materials on FAD until its full implementation in x-year (e.g., 2024), ii) fully biodegradable submerged appendages and non-entangling raft with synthetic materials (i.e. buoys) in X+1 year, and iii) fully biodegradable submerged appendages and raft in X+2 years.

C. Potential gaps/ Research needs

[7] A Jelly-FAD is a type of FAD design that reduces the tension and stress of FAD structure so that the lifetime of the FAD increases when organic materials are used instead of plastic. It drifts with quasi-neutral buoyancy and its tail or drogue is made of a three-dimensional shape and placed in the deepest part of the FAD.

15. The FADMO-IWG also received several suggestions from its members on areas of future research (WCPFC18-2021-FADMO-IWG5-01-Attachment C).

- *The design of the FAD is crucial to reduce stress on the structure and increase their lifetime. This is especially important for biodegradable FADs, as materials might be more susceptible to physical stress. The correct assessment of the flotation and weight distribution in the design of the FAD is a crucial factor to extend its working lifetime. If those parameters are not well calculated and placed, the tension and torsion suffered by the structure will result in substantial damages, and the submerged appendage is more likely to detach from the raft — reducing FAD's lifetime and aggregation effectiveness. Results from ongoing studies on new designs such as the jelly-FAD type structure should be reviewed by the SC.* There are ongoing studies related to these areas and progress to these works are detailed in the following papers submitted to SC18 for its review.
    - SC18-EB-IP-17: G. Moreno, J. Salvador, I. Zudaire, J. Murua, J. Pelegrí, J. Uranga, H. Murua, M. Grande, V. Restrepo. The jelly-FAD: A paradigm shift in biodegradable FAD design
    - SC18-EB-IP-01: Escalle et al. Updates from Project 110: WCPFC Non-Entangling and Biodegradable FAD trial*;* which includes a review (in Appendix 2) of all the Non-Entangling and Biodegradable FAD trials that have been performed worldwide, as well as the potential biodegradable materials that could be used.
- *For FADs to drift slowly, the tail or drogue should be three-dimensional and symmetric and should be placed in the deeper part of the FAD.*
- *The physical impact of FAD structures on the ecosystem is proportional to their size. Current dFAD structures are very large and bulky, which makes the logistics for their retrieval and storage difficult. Research to reduce the mass (i.e., size, volume and weight) of traditional and biodegradable dFAD structures is required. This would also reduce price costs in materials per FAD.*
- *Due to the high incidence of dFAD loss through change of hands, sinking, beaching or out-of-reach deactivations, trials of experimental biodegradable dFADs in real fishing conditions need to test great quantities in order to obtain statistically significant results. Fishers when testing individually biodegradable dFADs, should share with scientists, data from echo-sounder buoys attached to biodegradable dFADs (i.e., position and biomass associated), to follow remotely the evolution of the biodegradable FADs that are not visited by fishers, and thus still get results on their performance.*

16. It was also suggested that additional research into FAD-relevant oceanography, drift, entrainment, connectivity and ecosystem impacts are important. In the context of biodegradable FADs, understanding how biodegradable FADs might break up and be differently impacted by currents over their lifetime will be important. Characteristics linked to the biodegradable FADs, such as drogue characteristics are also key parameters to monitor.

17. Noting other views that progress has been made on the concept of non-entangling FADs, the gradual disintegration of FADs including those with biodegradable parts will continue to pose an unquantified risk to cetaceans. Non-synthetic rope would certainly be an improvement as it would disintegrate in time and reduce risk. However how long various non-synthetic materials take to degrade in the marine environment is unknown. Research on how these ropes would degrade would be useful including potential research into known lifespan of potential components of a 'weak link' approach to FAD disintegration to promote sinking.

18. There was also a suggestion that research on biodegradable FADs will need to be incorporated into the stepwise timeline – as the outcomes of these research will be fundamental to decisions on biodegradable FADs. Such considerations would include: i) What are the implications of the use of biodegradable materials for the design of an effective FAD (e.g. size, depth); ii) What linkages can be made to improve tracking of FADs – for example to ensure retrieval of electronic buoys once a FAD is no longer functional due to degradation; iii) How accessible and affordable are alternative biodegradable materials; and iv) Need to ensure that new biodegradable FAD designs do not contribute to navigational hazards.

19. Other sources of information related to potential gaps include:

- Roadmap to Biodegradable Plastics - Current State and Research Needs: https://pubs.acs.org/doi/10.1021/acssuschemeng.1c00801
- Dempster T., Taquet M., 2004, Fish aggregation device (FAD) research: gaps in current knowledge and future directions for ecological studies. Rev. Fish Biol. Fish. 14, 21–42
- In 2022, the Ad-Hoc Permanent Working Group on FADs (FADWG) at the IATTC SAC 6th FADWG meeting recommended to "revise, as needed, IATTC data collection methods and tools, including fisheries observer data, so that the gradual implementation of biodegradable FADs in the EPO can be effectively monitored" which is a common potential gap at different RFMOs.

20. The IWG participants may review other relevant information and provide any proposal or comments related to gaps and research needs for the process and future implementation of the biodegradable FADs in the WCPO region.

D. Any other relevant information

21. The IWG participants may share any other relevant information they may have for the construction, introduction and implementation of biodegradable FADs.

E. Guidelines for Biodegradable FADs[8]

22. Below are the existing *Guidelines* prepared by the FADMO-IWG, which is noted in Paragraph 20, CMM 2021-01:

GENERAL GUIDELINES:

✓ FADs designed with non-entangling materials and constructed with biodegradable materials are the FAD designs with the least possible negative impact on the ecosystem

✓ New FAD designs should also focus on mitigating impact when disintegrating, beaching or sinking if lost or abandoned.

✓ FAD recovery activities are encouraged to reduce FAD loss and abandonment.

BIODEGRADABLE FADs

✓ Acknowledging that more research is needed on the development and application of suitable biodegradable materials in FAD construction including the use of locally available materials, CCMs should continue to encourage its flagged vessels to use available biodegradable materials to the extent possible in FAD construction.

[8] Will be reviewed and updated when new information becomes available

FAD Structure	BIODEGRADABLE	
Raft	✓ Encourage the use of natural and/or biodegradable materials such as bamboo, balsa wood, and other natural materials or in their absence, use of bio-based and biodegradable compounds complying with international standards that degrade without causing impact on the ecosystem. ✓ While noting that no feasible biodegradable replacement seems to be currently available, the use of plastic buoys [~~and containers~~] for flotation should be reduced as much as possible; for instance, reduce the weight and volume of the FAD structure.	 
Tail	✓ Encourage the use of natural and/or biodegradable materials such as cotton ropes and canvas, manila hemp, sisal, coconut fibre, other natural materials. In the absence of such materials, encourage the use of bio-based and biodegradable compounds complying with international standards.	