Report of the 2nd IOTC Ad Hoc Working Group on FADs

Zoom Online, 4 – 6 October 2021

DISTRIBUTION:
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ACRONYMS

AFAD	Anchored Fish Aggregating Device
ALD	Abandoned, Lost or Discarded
CECOFAD	Catch, effort and ecosystem Impacts of FAD fishing
CMM	Conservation and Management Measures (of the IOTC; Resolutions and Recommendations)
CPCs	Contracting Parties and Cooperating Non-Contracting Parties
CPUE	Catch per unit of effort
DFAD	Drifting Fish Aggregating Device
EMS	Electronic Monitoring Systems
EPO	eastern Pacific Ocean
FAD	Fish Aggregating Device
FOB	Floating Object
IOTC	Indian Ocean Tuna Commission
ROS	Regional Observer Scheme

KEY DEFINITIONS

Bycatch	All species, other than the 16 species listed in Annex B of the IOTC Agreement, caught or interacted with by fisheries for tuna and tuna-like species in the IOTC area of competence.
Discards	Any species, whether an IOTC species or bycatch species, which is not retained onboard for sale or consumption.
Large-scale driftnets	Gillnets or other nets or a combination of nets that are more than 2.5 kilometres in length whose purpose is to enmesh, entrap, or entangle fish by drifting on the surface of, or in, the water column.

STANDARDISATION OF IOTC WORKING PARTY AND SCIENTIFIC COMMITTEE REPORT TERMINOLOGY

SC16.07 (para. 23) The SC **ADOPTED** the reporting terminology contained in Appendix IV and **RECOMMENDED** that the Commission considers adopting the standardised IOTC Report terminology, to further improve the clarity of information sharing from, and among its subsidiary bodies.

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

Level 1: ***From a subsidiary body of the Commission to the next level in the structure of the Commission:***

RECOMMENDED, RECOMMENDATION: Any conclusion or request for an action to be undertaken, from a subsidiary body of the Commission (Committee or Working Party), which is to be formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g., from a Working Party to the Scientific Committee; from a Committee to the Commission). The intention is that the higher body will consider the recommended action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally this should be task specific and contain a timeframe for completion.

Level 2: ***From a subsidiary body of the Commission to a CPC, the IOTC Secretariat, or other body (not the Commission) to carry out a specified task:***

REQUESTED: This term should only be used by a subsidiary body of the Commission if it does not wish to have the request formally adopted/endorsed by the next level in the structure of the Commission. For example, if a Committee wishes to seek additional input from a CPC on a particular topic, but does not wish to formalise the request beyond the mandate of the Committee, it may request that a set action be undertaken. Ideally this should be task specific and contain a timeframe for the completion.

Level 3: ***General terms to be used for consistency:***

AGREED: Any point of discussion from a meeting which the IOTC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 or level 2 above; a general point of agreement among delegations/participants of a meeting which does not need to be considered/adopted by the next level in the Commission's structure.

NOTED/NOTING: Any point of discussion from a meeting which the IOTC body considers to be important enough to record in a meeting report for future reference.

Any other term: Any other term may be used in addition to the Level 3 terms to highlight to the reader of and IOTC report, the importance of the relevant paragraph. However, other terms used are considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3, described above (e.g., **CONSIDERED**; **URGED**; **ACKNOWLEDGED**).

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EXECUTIVE SUMMARY

The 2nd Indian Ocean Tuna Commission's (IOTC) Ad Hoc Working Group on FADs was held Online on Zoom from 4-6 October 2021. A total of 93 participants (48 in 2017) attended the Session. The list of participants is provided in Appendix I. The meeting was opened by the Chairperson, Dr Gorka Merino from AZTI, Spain, who welcomed participants and formally opened the meeting.

The following are the complete recommendations from the WGFAD02 to the Scientific Committee which are also provided in Appendix V.

WGFAD.01 (para 109) The WGFAD **RECOMMENDED** that once suitable data becomes available a study coordinated by the Chairs of this WG should be undertaken to estimate the maximum sustainable number of dFADs that could be deployed in the IO area and that this should be presented to the SC in 2022. This study could be comparable to the one conducted in the EPO and presented in document IOTC-2021-WGFAD02-06. While also taking into account the application of the precautionary approach.

1. Opening of the meeting

1. The 2nd Indian Ocean Tuna Commission (IOTC) Ad Hoc Working Group on FADs was held Online on Zoom from 4-6 October 2021. A total of 93 participants (48 in 2017) attended the Session. The list of participants is provided in Appendix I. The meeting was opened by the acting Chairperson, Dr Gorka Merino from AZTI, Spain, who welcomed participants and formally opened the meeting.

2. Adoption of the Agenda and arrangements for the Session

2. The WGFAD **ADOPTED** the Agenda provided in Appendix II. The documents presented to the WGFAD are listed in Appendix III.

3. The Secretariat was requested to provide some clarity on the selection of the interim chair for the current meeting. The Secretariat explained that the previous WGFAD meeting (in 2017) was co-chaired by the Chair of the Commission and the Chair of the Scientific Committee. In the absence of an existing WGFAD Chair, with the expectation that the meeting was going to be highly technical/scientific in nature, the Secretariat contacted the Chair of the SC regarding his availability to Chair the current meeting. As the SC chair was not available, he and the Secretariat agreed that the next logical choice would be the Chair of the WPTT as the WGFAD reports to the WPTT and the WPEB (as per its TOR in Res 15/09). Dr Merino was asked by the Secretariat if he could stand in to help organise the October WGFAD meeting, and despite the short-notice he kindly agreed to assist. The Heads of Delegations endorsed this arrangement when they met on 8 September.

4. The WGFAD then **REQUESTED** that Dr Shiham Adam, the vice-Chair of the WPTT serve as acting vice-Chair for the current WGFAD meeting. Dr Adam duly accepted this responsibility.

3. The IOTC process: outcomes, updates and progress

3.1 Resolution 15/09 – Terms of Reference

5. The WGFAD **NOTED** paper IOTC–2021–WGFAD02-INF01: Resolution 15/09 on a Fish Aggregating Devices (FADs) Working Group.

3.2 Outcomes of the 25th Session of the Commission and previous decisions of the Commission in relation to FADs

6. The WGFAD **NOTED** that at the time of the onset of the meeting, the Commission report had not been adopted and therefore no official document outlining the outcomes of that meeting was available for presentation. The Secretariat **INFORMED** the WGFAD that the Commission report had been adopted just after the start of the meeting and provided participants with the text from the Commission report that related to the work of the WGFAD.

7. The Secretariat **HIGHLIGHTED** 3 key discussion points arising from the Commission that guided the development of the agenda for the current WGFAD meeting. These points were:

> *"(Para 32). The Commission **NOTED** the valuable contribution a small working group made to the Commission's deliberations on Proposal E. However, the Commission also **NOTED** that there were three main issues that could not be agreed on during the Session, these included: 1) the availability of scientific data to determine FAD limits by considering both the Precautionary approach vs scientific evidence-based approach, 2) limits on FAD numbers and 3) supply vessels; and ultimately, there was no consensus on the adoption of the proposal.*
>
> *(Para 33). The Commission **NOTED** that the Ad Hoc FAD working group will be convened in October 2021 and may provide further insight on these matters."*

3.3 Resolution 19/02 on FADs

8. The WGFAD **NOTED** paper IOTC–2021–WGFAD02-INF02: Resolution 19/02 Procedures on a Fish Aggregating Devices (FADs) Management Plan.

9. The WGFAD **NOTED** how, notwithstanding the fact that the Resolution refers to both drifting and anchored FADs, its paragraph 2 is *de facto* limiting its applicability to drifting floating objects only due to its noting that the Resolution shall apply to purse seine vessels fishing on Drifting FADs with no specific mention of Anchored FADs.

10. The WGFAD **NOTED** that terminology and references/comments made in the meeting of the Ad-Hoc WG, are in no way to be interpreted as indicating that a proposal has or has not been adopted by the Commission

4. Review of data available at the Secretariat on FADs

4.1 Review of the statistical data available for FADs

11. The WGFAD **NOTED** paper IOTC–2021–WGFAD02-03 which provided an overview of the various data assets received by the IOTC Secretariat and specifically relating to information on Floating Objects (FOBs), including: catch-and-effort by school type (form 3-CE), details on monthly FOB activities by CPC (form 3-FA), geo-spatial data on deployments of FOBs for the years 2018-2019 (form 3-FD), geo-referenced data on the effort exerted by supply vessels (form 3-SU) and individual daily buoys positions (form 3-BU).

12. The WGFAD **CONGRATULATED** the Secretariat for the work, **NOTING** that some of the data sets were only made available just prior to the meeting.

13. The WGFAD **NOTED** the currently standing definition of FOB types and FOB activity types in use at the IOTC Secretariat, in particular how these focus on specific elements of FOB-fishing operations (e.g., presence of nets as well as of tracking devices on FOBs) and differ from other internationally adopted classifications (e.g., Catch, effort and ecosystem Impacts of FAD fishing (CECOFAD)).

14. For these reasons, the WGFAD **ACKNOWLEDGED** that further clarity is needed by CPCs to correctly interpret the Secretariat classifications and the corresponding reporting requirements and **REQUESTED** that these aspects be further discussed either intersessionally through a small working group, or in other IOTC scientific fora such as the WPDCS.

15. The WGFAD **NOTED** that purse seine catches of tropical tunas in the Indian Ocean correspond to roughly 10% of purse seine catches across all oceans (as indicated by catch data up to 2019 retrieved from the FIRMS Global Tuna Atlas) but that contrary to other oceans, the vast majority of IOTC purse seine catches are on FOB-associated schools, which has also an impact on the average size of the fish caught.

16. The WGFAD **NOTED** the assertion from the Secretariat that there is little to no data available on fisheries operating on anchored FADs to which some participants **EXPRESSED** concern. This lack of data is thought to be due to generalised issues with reporting, and also due to the current formulation of IOTC Res. 19/02 that explicitly limits the provision of FOB-specific data fields to fisheries on drifting FOBs only.

17. For this reason the several participants **URGED** CPCs with such fisheries to provide georeferenced catch-and-effort data on sets recorded on anchored FADs (in agreement with IOTC Res. 15/02) as a minimum standard to facilitate the work of the IOTC Scientific Committee.

18. The WGFAD **ACKNOWLEDGED** that the IOTC Secretariat disseminated new data sets specifically for this working group, and that these include collated versions of IOTC forms 3-FA, 3-FD, and 3-SU as

well as an aggregated data set with information from IOTC form 3-BU, whose preparation and dissemination at its current level of resolution was formally acknowledged by all purse-seine fleets fishing on floating objects in the Indian Ocean.

19. The WGFAD **NOTED** that the results of a preliminary analysis show potential mis-interpretations of the data collection and reporting requirements of IOTC form 3-FA (activities and sets on FOBs), that might have rendered the data provisions for some CPCs and years unsuitable for scientific analysis.

20. The WGFAD **NOTED** that FOB deployment data reported through IOTC form 3-FD (for the years 2018 and 2019, in agreement with IOTC Res. 19/01) appear to be reasonably complete and accurate, and as such they can provide an overview of the densities of FOB deployments for the years concerned, while also **RECALLING** that the underlying data reporting requirement is no longer active as it applied only to data for the years 2018 and 2019.

21. The WGFAD **ACKNOWLEDGED** the difficulties in comparing the efforts (as number of sets on FOBs) received by the IOTC Secretariat through IOTC form 3-CE (as per IOTC Res. 15/02) and IOTC form 3-FA (as per IOTC Res. 19/02), due to lack of standardization in the reporting of purse seine effort units for FOB-associated fishing operations.

22. At the same time, the WGFAD **RECALLED** that the IOTC Scientific Committee has already recommended to the Commission that purse seine fleets provide the number of sets as the main effort unit (see SC22 report, para. 127) and **REQUESTED** all concerned CPCs to also apply this same criterion to their historical effort information, in order to harmonize the data available to the IOTC Secretariat and facilitate scientific analysis by the IOTC scientific community.

23. The WGFAD **NOTED** the preliminary results of the analysis of supply vessels efforts (data received through IOTC form 3-SU) and **ACKNOWLEDGED** potential discrepancies between this source of information and the data on active supply vessels recorded in the IOTC AVL (Active Vessels' List), **RECALLING** the importance for CPCs to maintain an accurate list of their active purse seine and supply vessels, as this is crucial for determining the completeness and accuracy of all other FOB data submissions.

24. The WGFAD **NOTED** that some FOB-related data for the Seychelles purse seine fishery (e.g., FOB deployments between 2015 and 2018, effort of support vessels in 2014, 2015, and 2017) have not been submitted to the Secretariat and that Seychelles will liaise with the IOTC Secretariat to address the issues and fill the data gaps.

25. The WGFAD also **NOTED** with concern that no information on daily buoys position was received from the Republic of Korea, and **REQUESTED** the CPC to comply with the requirements of IOTC Res. 19/02 at their earliest availability.

26. Furthermore, the WGFAD **REQUESTED** that other fleets that have reported active purse seine vessels to the IOTC during 2020 and 2021 (I.R. Iran and Kenya) to clarify whether or not these vessels fish on floating objects or deploy instrumented buoys at sea and, if so, to report the activities on FOBs and the daily position of all instrumented buoys followed by their vessels to the IOTC Secretariat in agreement with IOTC Res. 15/02 and 19/02. The WGFAD further **NOTED** that Indonesia did not submit details on monthly FOB activities through form 3-FA with the rationale that their purse seiners are only fishing on anchored FADs for which they believe the Resolution 19/02 does not apply as a result of its paragraph 2 as discussed above.

27. The WGFAD **NOTED** the request from the SC to share the daily buoys position received by the IOTC Secretariat (after their anonymization to guarantee business confidentiality) for scientific purposes to provide guidance to the IOTC and **RECALLED** that IOTC Res. 19/02 currently limits the usage of

this data to the verification of compliance aspects only (i.e., to determine if vessels are exceeding the maximum daily number of active buoys followed).

28. For this reason, the WGFAD **ACKNOWLEDGED** that consensus shall be reached among concerned CPCs to guarantee that said information could be formally and effectively used for scientific purposes, and that mechanisms are considered to eventually give access to this information in a similar way to what has already been done with tagging data in the past or for the operational catch and effort data shared within the longline collaborative workshops devoted to the development of standardised CPUE time series.

29. The WGFAD **NOTED** a suggestion that avenues could be explored to increase the credibility and transparency in reporting this buoy position data such as cross-validation through the use of VMS records or through an independent third-party (e.g., IOTC Secretariat) who would act as an auditor of the quality of FOB-related data to complement the work being done by national scientists.

30. The WGFAD **NOTED** the indication from the Secretariat that most fisheries data submitted to the IOTC Secretariat are derived from self-reporting by fishers and that data from industrial purse seine fisheries are thought to be of good quality. The buoy position data are being directly produced by the satellite companies while AZTI (Spain) has been acting as an independent third party for FOB-related data in the case of the purse seine fleets from EU,Spain and Seychelles for the most part and IRD (France) also carries out numerous checks on EU,France dFAD data quality and has always found them to be of high quality.

31. **RECALLING** that some purse seine fleets have reached almost 100% coverage of their fishing operations through a combination of on-board scientific observers and Electronic Monitoring Systems (EMS), the WGFAD **ACKNOWLEDGED** that data from human observers can indeed be a viable option to increase the overall credibility of self-reported FOB information, while data from EMS still requires further development to become an adequate substitute to human observers (e.g., difficulties in collecting details of dFAD designs, buoy identifiers, etc.).

32. The WGFAD **NOTED** that while human observers do collect some data on the design, components and non-entangling nature of dFADs, these data have not been exported to the IOTC Regional Observer Scheme (ROS) database due to the absence of dedicated fields in the currently used format of data submission for purse seine fleets (i.e., ICCAT ST09) and, therefore, the WGFAD **RECALLED** the need to develop a procedure to export from the ObServe tool all data fields defined in the current version of the ROS database and re-export all historical data for the period covered by IOTC res. 11/04.

33. The WGFAD **NOTED** that the classification of FOBs into categories may depend on the objectives of each study and that the availability of detailed information on the design and components of the FOBs provides a flexible approach to defining classes according to these objectives.

34. The WGFAD **NOTED** that observer data hosted in national databases may be subject to constant validation procedures, modifications and corrections and that such updates should be propagated into the ROS regional database to reduce differences between datasets compared with their source of extraction as much as possible.

35. The WGFAD **NOTED** that the proportion of catch made on natural FOBs vs. dFADs is not considered to be accurate by the IOTC Secretariat in the IOTC databases but that some useful information on the composition of FOBs at sea in the Indian Ocean between 2006 and 2018 can be found in the recently published paper IOTC-2021-WGFAD02-INF11.

36. Finally, the WGFAD **DISCUSSED** the possibility of regularly disseminating the datasets prepared for this working group, including those that are either deemed as inaccurate (collation of IOTC forms 3-

FA) or still subject to stringent usage requirements (aggregated version of IOTC forms 3-BU, currently to be used for compliance purposes only), and **AGREED** that there is a need to bring this issue to the attention of other IOTC working parties such as the WPDCS.

37. **NOTING** the indication by the IOTC Secretariat of the heavy workload due to directives from the Commission which resulted in additional meetings (data-preparatory as well as new ad hoc working groups) being scheduled for 2021, the WGFAD **NOTED** the IOTC Secretariat's request to increase the staff capacity.

5. Review of Definitions and Management Plans across Tuna RFMOs

5.1 Outcomes of the Joint tuna RFMO meeting Working Group on FADs

38. The WGFAD **NOTED** paper IOTC–2021–WGFAD02-INF03 on the Joint t-RFMO FAD Working Group Second Meeting, held in May of 2019. No abstract was provided by the authors.

39. The WGFAD **NOTED** the recommendations from the Joint t-RFMO FAD Working Group on a range of issues related to FAD management including but not limited to: harmonisation of definition, data collection, marking and tracking, indicators, research, mitigation measures, and sustainability.

40. The WGFAD **NOTED** that the harmonisation of definitions across t-RFMOs has been progressing very slowly due to the fact that the technical discussions for individual definitions are time-consuming and have not been prioritised in the meeting agenda. The WGFAD **AGREED** that the harmonisation of definitions/classification is important for better understanding the dynamics of the dFAD fishery.

41. The WGFAD also **AGREED** that the development of a shared common minimum standard across the t-RMFOs is important for dFAD management. However, the WGFAD **NOTED** that the minimum standard implemented by each t-RFMO is largely dependent on their own conservation and management measures which are independent amongst t-RFMO.

6. Management Measures of FAD Management Plans

6.1 Towards setting FAD limits in the t-RFMOs

42. The WGFAD **NOTED** paper IOTC–2021–WGFAD02-12 on Towards true FAD deployment limits in the t-RFMOs, including the following abstract provided by the authors:

"All four tropical tuna RFMOs (t-RFMOs) have adopted provisions related to the proliferation of fish aggregating devices (FADs) in use by purse seine operations. Addressing the growing numbers of FADs in use has been a challenge for the t-RFMOs, as a review of the existing measures shows they are not restrictive at the fleet level and would allow a considerable number of purse seine operators to increase their FAD use. The need to consider development of science-based limits on the deployment of the devices was a key conclusion of scientists at the 2017 Global FAD Science Symposium as well as participants at the 1 Meeting of the Joint t-RFMO FAD Working Group that same year. To transition those provisions to true limits, the t-RFMOs should develop management objectives that clearly identify their goals for impacted fisheries. We offer options for management objectives including avoiding adverse impacts to tropical tuna populations (via a proxy measurement of catch-per-unit-of effort of purse seine operations) and limiting impacts to habitat from FADs that become marine debris."

43. The WGFAD **NOTED** the current status of management measures for each of the t-RFMOs and **NOTED** the indication by the authors that that IOTC measures are currently considered by the authors to be on a par with those existing in other t-RFMOs and that all t-RFMOs are trying to address the same issues. The WGFAD **NOTED** that due to the rise in the number of registered vessels

operating in the Indian Ocean, the number of dFADs may actually be continuing to rise despite the dFAD limiting measures due to the fact that these are implemented on a per-vessel basis.

44. The WGFAD **NOTED** that**:**

    a) it is important to define the management objectives for any measures to be introduced as well as considering other strategies that could be used to achieve or complement the primary objective.
    b) currently the main objective is likely to relate to reducing the impact of dFADs on the yellowfin tuna stock but further **NOTED** that a trade-off between different objectives may be required in the future.
    c) dFAD management objectives will need to be integrated into the wider overall fishery management strategy which is adapted as the fishery evolves.

45. The WGFAD **NOTED** that a few participants expressed concern that there are large gaps in the information held by the Secretariat about FAD numbers in the Indian Ocean which may be due to the fact that Resolution 19/02 is considered by some to not apply in full to Anchored FADs (aFADs) due to the wording of paragraph 2 of the Resolution which says that it shall apply to purse seine vessels fishing on drifting FADs (and does not explicitly include aFADs) and therefore these data are not available for public or scientific assessments.

46. The WGFAD **NOTED** that it is important to ensure that future measures are robust so that there is no potential for them to be misinterpreted in such a way that could undermine the ability of the measure's objective from being achieved.

47. The WGFAD **NOTED** the agreement by many participants that it would be useful for the WPM to discuss potential methodological approaches for defining appropriate target numbers of FADs for sustainable exploitation, taking into account the overall selectivity patterns. These improvements and related advice will help to inform discussions between CPCs relating to setting objectives for FAD measures.

48. The WGFAD **NOTED** that tools to evaluate adopted FAD management measures already exist but are currently difficult to monitor and verify but these should become more functional when VMS is improved in the Indian Ocean as it should be possible to have a centralized coordinated system to manage data from VMS and a dFAD monitoring system which can be cross-referenced to ensure the verification and compliance with the management measures.

49. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-06 on Recent purse-seine FAD fishing strategies in the eastern Pacific Ocean: what is the appropriate number of FADs at sea? including the following abstract provided by the authors:

    "Concerns about the ecological impact of recent increases in the use of drifting fish-aggregating devices (FADs) have led to implementation of FAD limits worldwide in purse-seine fisheries targeting tropical tunas. However, quantitative analyses supporting such management measures are needed. Analyses of observer data for purse-seine vessels operating in the eastern Pacific Ocean (EPO) during 2012–2015 were conducted. FAD fishing strategies identified in this analysis were found to vary with distance to the coast. Vessels that operated furthest offshore made a large number of FAD deployments and fished primarily on FADs they deployed themselves. Vessels that operated closest to the coast made the fewest FAD deployments and fished about equally on FADs they deployed themselves and on FADs deployed by other vessels. Independent of the FAD fishing strategy, the

estimated relationship between deployments and sets was increasing but nonlinear, with a reduced rate of return beyond about 200 deployments. An analysis of the relationship between deployments and standardized catch per successful set, however, provided some support for the hypothesis that more deployments may allow vessels to optimize fishing efficiency. These results highlight the complexity of EPO FAD fishing strategies and have management implications for limits on FAD usage globally."

50. The WGFAD **THANKED** the authors for the presentation that provides an overview of the methodological approach used by IATTC to consider dFAD management in the eastern Pacific Ocean.

51. The WGFAD **NOTED** that there is a limit on the total number of active purse seiners in the eastern Pacific Ocean (EPO), and that any measures limiting dFADs or other factors should account for the number of vessels in operation under the relevant RFMO.

52. The WGFAD **NOTED** that there are currently around 140 active purse seiners in the EPO which have been categorized into four size classes, and that the management of dFADs is based on a vessel class-specific limit of the daily number of buoys at sea per vessel, from 450 buoys for the largest vessels (class 6; GT≥363 t) to 70 buoys for the smallest vessels (classes 1-3; GT≤181 t) as well as a time-area closure that takes place every year in the "corralito" where purse seine fishing is prohibited (IATTC 2020).

53. The WGFAD **NOTED** that bigeye tuna is mostly caught on dFADs in the EPO and that a linear positive relationship has been found between fishing mortality and the number of sets on FOBs for this species.

54. The WGFAD **NOTED** that the authors first used a cluster analysis to identify groups of purse seiners characterized by a similar strategy in terms of dFAD use before focusing on the dFAD-oriented vessels for assessing the link between dFAD deployments and numbers of sets on dFADs of known origin.

55. The WGFAD **NOTED** that the overall relationship between the numbers of dFAD deployed and the numbers of sets on FOBs observed in the fleet segments mostly fishing on dFADs was found to be non-linear with an apparent asymptote beyond several hundred dFAD deployments per vessel annually and with a reduced slope (or reduced rate of increase in the number of sets when increasing deployments) beginning at around 200 deployments.

56. However, the WGFAD **NOTED** that several factors, including uncertainties in the data and risks of misreporting following dFAD deployment limits, may hamper the efficiency of a limit on dFAD deployments, so IATTC staff gave preference to limits on object sets and active dFADs at sea due to their more direct link to fishing mortality and concerns regarding practical matters.

57. The WGFAD **NOTED** that IATTC estimated that a 13% reduction in FOB sets could be reached by imposing a 30% reduction in the active dFAD limit reduction for each vessel class, considering that this would be the best way to maintain the number of sets on floating objects at the average 2016-2018 levels. On the contrary, if the status quo is pursued (i.e., number of active FADs for 2017-2019 is maintained) the best option could be to establish Individual Vessel Limits, but also **NOTED** that other options such as fleet-wide limits could be explored.

58. The WGFAD **NOTED** that this study focused on assessing limits on the number of dFADs as one potential measure to limit the impact of FADs on bigeye tuna in the EPO and that a specific study assessing the impact of dFAD limits on yellowfin tuna in the Indian Ocean would be required.

59. The WGFAD **NOTED** that some participants expressed their opinion that appropriate methodologies to assess these limits have been developed and can be found in this paper and that this methodology would require the relationship between the number of dFAD deployments and the number of dFAD sets to be defined along with the relationship between the number of sets and estimates of yellowfin tuna mortality derived from assessment models. In contrast, others suggested that that there is currently no scientific process developed and being applied in any RFMO specifically to develop science-based limits to the number of dFADs deployed.

6.2 Methods to reduce the incidental mortality of FADs

60. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-11 on Developing solutions to increase survival rates of vulnerable bycatch species in tuna purse seine FAD fisheries, including the following abstract provided by the authors:

"One of the principal impacts of FAD fishing is accidental catch of vulnerable species like sharks, mobulid rays, or turtles. In the last decade scientists and purse seine industry have been collaborating to test fishing operation modifications and new release devices for bycatch mitigation. Prevention of ghost fishing by transitioning to non-entangling FADs, with the support of RFMOs as well, is one example. Possible options to avoid capturing endangered bycatch species include near-real time fleet communication systems and use of dynamic ocean models and echo-sounder technology. Once caught in the net, fishing sharks with hook and line to release them out could be evaluated, even if applied only at peak shark zones or seasons. For those animals that arrive on deck, bycatch release devices are being developed and evaluated including shark velcros, manta sorting grids, or hoppers with ramps. These tools are built with crew safety in mind first and also to accelerate release of sensitive bycatch into the water with minimum stressful handling. Given the mounting pressure by society towards sustainable fisheries products and large sectors of the FAD purse seine industry seeking eco-certification, the time is right for adoption of improved selectivity programs and devices. RFMO support by recommending through conservation regulations the implementation of most promising bycatch mitigation strategies and tools can strongly accelerate change towards better practices that help reverse current elasmobranch declines."

61. The WGFAD **NOTED** the concern expressed by some participants over the relatively low fishing impact on sharks incidentally caught on FADs suggested by the study authors whereas other studies such as Filmalter et al., 2013[1] have suggested that the impact of ghost fishing on silky sharks could be as much as 5 to 10 times higher in the Indian Ocean when entangling dFADs are used. However, the WGFAD **NOTED** that the use of non-entangling dFADs without using nets in their construction could effectively prevent ghost fishing on sharks. The WGFAD also **NOTED** that Res 19/02 requires the use of fully non-entangling dFADs without nets from 1st January 2020 onwards.

6.3 Methods to reduce the loss of FADs

62. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-07 on whether Spatial management can significantly reduce dFAD beachings in Indian and Atlantic Ocean tropical tuna purse seine fisheries, including the following abstract provided by the authors:

[1] Filmalter et al., 2013. Looking behind the curtain: quantifying massive shark mortality in fish aggregating devices. Frontiers and Ecology and the Environment, 11: 291-296. https://doi.org/10.1890/130045

"Debris from fisheries pose significant threats to coastal marine ecosystems worldwide. Tropical tuna purse seine fisheries contribute to this problem via the construction and deployment of thousands of human-made drifting fish aggregating devices (dFADs) annually, many of which end up beaching in coastal areas. Here, we analyzed approximately 40,000 dFAD trajectories in the Indian Ocean and 12,000 dFAD trajectories in the Atlantic Ocean deployed over the decade 2008–2017 to identify where and when beachings occur. We find that there is tremendous promise for reducing beaching events by prohibiting deployments in areas most likely to lead to a beaching. For example, our results indicate that 21% to 40% (depending on effort redistribution after closure) of beachings can be prevented if deployments are prohibited in areas in the south of 8◦ S latitude, the Somali zone in winter, and the western Maldives in summer for the Indian Ocean, and in an elongated strip of areas adjacent to the western African coast for the Atlantic Ocean. In both oceans, the riskiest areas for beaching are not coincident with areas of high dFAD deployment activity, suggesting that these closures could be implemented with relatively minimal impact to fisheries. Furthermore, the existence of clear hotspots for beaching likelihood and the high rates of putative recovery of dFAD buoys by small-scale fishers in some areas suggests that early warning systems and dFAD recovery programs may be effective in areas that cannot be protected via closures if appropriate incentives can be provided to local partners for participating in these programs."

63. The WGFAD **CONGRATULATED** the authors for the study which provides some perspective on ways to reduce dFAD loss and environmental impacts through spatial dFAD deployment closures and dFAD recovery programs.

64. The WGFAD **NOTED** that the study found benefits to spatial dFAD deployment closures in areas and seasons which are thought to lead to a high risk of beaching and that the suggested dFAD closures were generally spatially connected, compact and in areas of marginal importance to the fishery, suggesting that they could be closed to dFAD deployments with relatively minimal impact on the fishery.

65. The WGFAD **NOTED** that around 20% of all lost FOBs in the EU,French and associated flags purse seine fishery passed within 50 km of ports and that this would provide a good opportunity for developing and implementing recovery programs, **NOTING** the major seasonality in dFAD loss with a peak occurring in November due to changes in fishing strategy and zones of activity at a time when ocean circulation favours dFAD drift out of the fishing grounds of the north-western Indian Ocean during that period.

66. The WGFAD **NOTED** the interest of Lagrangian particle models to simulate the drift of dFADs in near-surface currents of the Indian Ocean and the good ability of the models to predict basin-scale densities and short-term (5-10 days) individual dFAD positions, the models however quickly showing large separation distances between observations and predictions, i.e., ~200 nm after 25-30 days.

67. The WGFAD **NOTED** that the study on dFAD deployment spatial closures included data up to 2017 and that there have been some recent changes to the operations of the EU,Spanish fleet in response to Resolution 19/01 with movement to areas away from the suggested spatial dFAD deployment closures which could help to reduce the rate of dFAD beaching. The WGFAD **ENCOURAGED** the authors to update the analysis with more recent data.

68. The WGFAD **NOTED** that the study did not assess the impact of the implementation of dFAD spatial closures on the magnitude and species composition of purse seine catches and **ENCOURAGED** the authors to undertake such an assessment.

69. The WGFAD **NOTED** that IOTC data reporting form 3-BU could be altered to allow CPCs to provide information on how buoys are being shared and provide information on any changes to fishing efficiency.

70. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-08 on A polluter pays principle for drifting FADs – how it could be applied? including the following abstract provided by the authors:

"The use of drifting fish aggregating devices (dFADs) continues to threaten endangered, threatened, and protected species (ETP), as well as the broader marine environment in the form of marine litter and abandoned, lost, and discarded fishing gear (ALDFG) that can damage fragile coastal ecosystems. In the Indian Ocean, as in all other ocean regions, there is an urgent need to improve the management of dFADS, primarily to reduce catches of juvenile tropical tunas, but also to help mitigate the other ecological impacts associated with drifting FADs, including marine plastic pollution, ghost fishing and the bycatch of turtles, sharks and marine mammals. The lack of transparency in how dFADs are deployed, tracked and retrieved and the lack of responsibility dFAD owners take for the ecosystem and habitat damage and the pollution caused by these devices is of great concern. The 'polluter pays' principle is the commonly accepted practice that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. It is part of a set of broader principles to guide sustainable development worldwide - formally known as the 1992 Rio Declaration. This paper suggests that compensatory mechanisms should be developed, which incorporate and implement a Polluter Pays Principle, so that Indian Ocean coastal states are not saddled with the financial cost burden associated with the removal of derelict dFADs from the ocean. Such a compensatory mechanism should also provide coastal states with a framework for compensation for the ecosystem and habitat damage caused by dFADs."

71. The WGFAD **NOTED** that a recent study in the Western and Central Pacific Ocean (Escalle et al., 2020[2]) found that large numbers - which potentially can reach up to 90% - of dFADs are never retrieved after deployment and that such data are lacking for the Indian Ocean.

72. The WGFAD **NOTED** that there is a need to quantify the contribution of dFADs to marine pollution and ecosystem damage in the Indian Ocean, while also **NOTING** that fleets should be in compliance with MARPOL Annex V and the London Convention.

73. The WGFAD **NOTED** that the quoted figures on the proportion of juvenile tuna caught around dFADs related only to yellowfin and bigeye tuna, as almost all skipjack caught in dFAD sets are adults.

74. The WGFAD **NOTED** that while some progress is being made in terms of fleets adopting biodegradable FAD materials and designs, with some variability between companies, there is still work required to roll these out across the wider Indian Ocean region.

75. The WGFAD **NOTED** that there were decreases of between 40% to 81% in the amount of synthetic materials used in the construction of the prototypes of biodegradable dFADs designed and built as part of the BIOFAD project compared with non-entangling dFADs.

76. Some participants **SUGGESTED** that a polluter pays mechanism should be developed and applied throughout the IOTC Area of Competence as an urgent means of building accountability and

[2] Escalle, L., Muller, B., Hare, S., Hamer, P., Pilling, G. and the PNA Office. 2020. Report on analyses of the 2016/2020 PNA FAD tracking programme; WCPFC-SC16-MI-IP-14.

encouraging purse seine fleets to comply with MARPOL V, the London Convention and other international marine pollution legislation.

77. The WGFAD **SUGGESTED** that a study should be conducted to assess the extent of the use of biodegradable and non-entangling dFADs in the purse seine fishery and the quantity of organisms entangled in non-entangling dFADs so as to understand the effectiveness of these designs as entangling mitigation measures.

78. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-INF12 on Ghost fishing mortality and habitat damage from Abandoned, Lost or Discarded (ALD) drifting FADs, including the following abstract provided by the authors:

"The most economically efficient method of catching surface schools of tuna is by purse seine with drifting fish aggregating devices or dFADs for short. Thousands of dFADs are deployed every year throughout the tropical ocean for the purposes of attracting and congregating tuna (Lopez et al. 2014). dFADs have come a long way in terms of their development with modern dFADs having the capability to be monitored in real-time via satellite, its position and the amount of fish aggregated under it (Maufroy et al. 2015). Use of dFADs in purse seine fishing has become so pervasive that in 2019 close to 40% of the world's five million tonnes of tropical tuna (skipjack, yellowfin and bigeye) were caught on dFAD sets (Restrepo, 2021). In 2019, PS gear contributed 44% of the more than 1.04 million MT of tropical tunas caught from the Indian Ocean. Of this, almost 70% of catches were taken from dFAD sets, a proportion much higher than the global average dFAD use. Species wise, in 2018, 99% of skipjack catches were from dFADs (IOTC–WPTT22(AS) 2020).

A major concern associated with the use of dFADs is the widespread use and numbers of dFADs getting abandoned, lost and discarded (Gomez et al. 2020). Of all the types of marine litter, abandoned, lost or discarded fishing gears (ALDFG) represent the greatest threat to marine life as they continue capturing, entangling, and killing a variety of marine species through what is termed "ghost fishing"." – see paper for full abstract

79. The WGFAD **NOTED** that direct comparisons between the Indian Ocean and Western and Central Pacific Ocean may not be straightforward as the oceanography and topography as well as fleet composition and strategies of the purse seine fisheries vary significantly between the two oceans, **NOTING** however that information available from other RFMOs and areas may provide some insight into the expected levels of dFADs abandoned and damage to sensitive ecosystems from beaching events.

80. The WGFAD **NOTED** that there are three distinct levels of requirements for observations at sea, i.e., RFMO, Flag State, and fishing operators, and that the EU purse seine fleet has implemented a self-voluntary observer program covering 100% of the fishing activities since 2015 based on a combination of onboard human observers and EMS, with the observation data analysed by a private company contracted by the operators. The WGFAD **NOTED** that these at-sea observations form the mechanism used to verify that FADs being deployed from vessels are non-entangling and therefore they do not represent any risk to bycatch entanglement.

81. The WGFAD **ACKNOWLEDGED** the initiative and interest of an approach based on third-party verification but **RECALLED** that data collection is only the first step of dFAD management.

82. The WGFAD **NOTED** changes were made to dFAD designs, changing them to be non-entangling, after a scientific study conducted in 2013 (Filmalter et al., 2013) indicated the high rate of entanglement

of silky sharks in previous dFAD designs. This assertion from the authors indicates that such studies and management measures have led to positive changes. The WGFAD **SUGGESTED** that it would be beneficial to update the study undertaken by Filmalter and further **SUGGESTED** that a study is conducted to confirm that changes in dFAD designs are effective at reducing entanglement, as well as identify potential other sources of entanglement of marine animals.

83. The WGFAD **ACKNOWLEDGED** that a certain amount of time is required to conduct scientific studies and that the precautionary approach should be applied while studies are being conducted in order to provide a fast response to issues.

1.1 Viability of construction of biodegradable FADs, definitions and realistic timeframes including options

84. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-09 on Biodegradable dFADs: Current Status and Prospects, including the following abstract provided by the authors:

"Until recently, dFAD structure, materials and designs have remained quite rudimentary and virtually the same since their discovery, characterized by the increase of the dimensions and prevailing heavy use of plastic components. Biodegradable materials are called to be an important part of the solution, as they can faster degrade in the environment, free of toxins and heavy metals, reducing their lifespan, and preventing them from accumulating in sensitive areas once they are abandoned, lost or discarded. During last decades, regulatory measures at tRFMOs have advanced in the gradual implementation of biodegradable materials in dFAD constructions together with other measures limiting the number of active dFADs and the use of netting materials. However, more clarity is needed starting with a standardised definition of biodegradable dFADs among tRFMOs, to provide operational guidance. Research with those natural and synthetic materials is required, along with updated data collection for monitoring standards, as well as alternative and complementary actions need to be explored to contribute to minimising dFAD adverse effects on environment. Acknowledging the current difficulties for the implementation of fully biodegradable dFADs a stepwise process towards the implementation of fully biodegradable dFADs should be considered."

85. The WGFAD **NOTED** that the authors proposed four different biodegradable dFAD categories, Category I as the fully biodegradable dFAD design, Category II for which biodegradable materials are used for the whole dFAD with the exception of the floating component, Category III for which the use of biodegradable materials is only limited to the tail and Category IV for which all parts (i.e., raft and tail) are only built partly or with non-biodegradable materials.

86. The WGFAD **NOTED** a question regarding the extent to which 100% biodegradable dFADs are currently available. The WGFAD **NOTED** that many IOTC fleets are close to being able to widely deploy dFADs which come under the Category II (as per the four Category definitions in this paper) for which biodegradable materials are used for the whole dFAD with the exception of the floating component. The WGFAD further **NOTED** that work is still required in order to find well-performing, suitable materials to eliminate the plastic materials used in the floating component of dFADs, meaning that reaching Category I (100% biodegradable dFADs) is currently not possible.

87. The WGFAD **NOTED** that the study did not assess the impact of the additives used in the fabrication of bio-based plastic and the toxicity of microplastics which may be produced as a result of the degradation of these biodegradable plastic compounds that were used in dFAD construction (i.e., bio-based floating elements) during the study.

88. The WGFAD **NOTED** a harmonised definition, across tRFMOs, is urgently needed to establish guidelines and a timeline for biodegradable dFAD construction and implementation, as well as define updated data collection programs.

89. The WGFAD **NOTED** the suggestion that the cost implication of the various categories of dFADs should be assessed as fleets have found that the lifespan of biodegradable dFADs can be very short due to degradation issues so they must be replaced often and this, along with the higher costs associated with the biodegradable materials, can become extremely expensive.

90. The WGFAD **NOTED** a question on whether there is any comparative study that could provide an estimate of the size or weight of the plastic materials used to construct the dFADs with respect to the plastic material used for other fishing gear. The WGFAD further **NOTED** that the dFADs designs, materials and size differ between fleets, regions and oceans. However, some estimates may be available through the BIOFAD project which can provide some crude estimates based on the number of prototype dFADs made.

91. The WGFAD **NOTED** the estimated weight of biodegradable components of dFADs in the three main designs (rope tail, cage and jelly-FADs) as a proportion of the total weight of each dFAD under the Category II ranged from 78% (cage dFAD) to 91% (jelly-FAD). For Category III dFADs these proportions ranged from 17% (cage dFAD) to 41% (rope tail dFAD). Jelly-dFADs do not fall under the Category III so were not analysed.

92. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-10 on The Jelly-FAD: a paradigm shift in bio-FAD design, including the following abstract provided by the authors:

    "Fishers and scientists in the three tropical oceans are investigating different designs of biodegradable FADs (bio-FAD) efficient for fishing. The tactic followed by most fishers is to maintain the same traditional drifting FAD (dFAD) design (submerged netting panels hanging from the raft) but made of organic ropes and canvas. Results of those experiences show that the lifetime of bio-FADs that maintain the traditional dFAD design but made of organic materials, is shorter than that required by fishers. The short lifespan of those bio-FADs is due to the structural stress suffered by dFAD designs traditionally used. Thus, in order to use organic materials instead of the strong plastic and increase the lifespan of those bio-FADs, a paradigm shift is needed. Bio-FAD structures should be re-designed to suffer the least structural stress in the water. The present document aims at (i) summarizing what we learned across the different experiences testing bio-FADs in the three oceans, (ii) proposing a new concept in dFAD design, the Jelly-FAD design, and (iii) providing recommendations to reduce the impact of dFAD structures on the ecosystem and for bio-FADs construction and use."

93. The WGFAD **NOTED** that jelly-FADs will be ready for additional trialling onboard vessels of selected fleets in the Atlantic and Pacific Oceans by the end of 2022 and could be fully implemented by the end of 2023. The WGFAD **NOTED** that the materials used to build these dFADs such as cotton canvas, cotton ropes and bamboo canes should be widely available meaning that the roll-out of this design should be relatively simple. The WGFAD **NOTED** that strong ropes are not required to build this type of dFAD due to the fact that it drifts with neutral buoyancy. The WGFAD further **NOTED** that the length of the dFAD tail, which is composed of a cotton rope with a bamboo cube attached in the deepest part, is not considered to be important as in terms of impact, adding or subtracting metres of cotton ropes would not have a significant effect on the ecosystem as these ropes degrade in one year. The authors recommend that the cube making the dredge which causes the FAD to drift slowly is placed below the mixed layer for optimum performance.

94. The WGFAD **NOTED** that there is no specific recommendation made by ISSF on an optimal length for dFAD tails as it may depend on the depth of the mixed layer in the fishing area and environmental conditions. Fishers use shallower or deeper FADs depending on the area of the Indian Ocean. Thus, the jelly-FAD could be of any length to suit the necessities of the area.

95. The WGFAD **NOTED** that the feedback from fishers to ISSF on this FAD design has been good with them reporting good aggregations under the dFADs and that the jelly-dFADs drift slowly which is thought to aid in the aggregation of tunas. The WGFAD **NOTED** that data from the echosounder buoys attached to this design are currently being analysed to assess their tuna aggregation capacity and the results from this assessment should be available by the end of 2021.

96. The WGFAD **NOTED** that experiments at sea will continue throughout 2022 to improve the jelly-FAD design in terms of further reducing its weight and level of floatation required which will therefore reduce the need for plastic buoys in the jelly-FAD design.

7. Towards a plan for IOTC

97. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-05 Comparing different drifting FAD management options, including the following abstract provided by the authors:

"As one of the main nations advocating for improved management of drifting Fish Aggregating Devices (dFADs), Kenya submits this summary of options available to help sustainably manage tuna stocks and the broader ecosystem damage currently caused by dFADs in the Indian Ocean. The intention of deployment, relative abundance, supported fleets and impact potential of anchored FADs (aFADs) are not comparable, so this paper focuses only on drifting FADs (dFADs) deployed and used by industrial purse seine fisheries."

98. The WGFAD **THANKED** the authors for the presentation and **NOTED** the recommendations made in the paper, further **NOTING** that this was a position statement and so the group did not discuss this paper.

99. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-INF09_Rev1 Minimum Requirements for Responsible Drifting FAD Use, including the following abstract provided by the authors:

"Drifting fish aggregating devices (FADs) deployed by tuna purse seine fisheries have been a driving force behind the doubling of global tuna catches since the 1990s. Universally, the management of drifting FADs is weak, characterised by an absence of responsibility on the part of owners and operators for the impacts of their FADs on ocean ecosystems. This document sets out the minimum requirements for the construction, use and management of drifting FADs, and has been endorsed by well over a hundred NGOs, fishing groups and retailers."

100. The WGFAD **THANKED** the authors for the presentation and **NOTED** the recommendations made in the paper, further **NOTING** that this was a position statement and so the group did not discuss this paper.

101. The WGFAD **NOTED** papers IOTC-2021-WGFAD02-04 and IOTC-2021-WGFAD02-13 in the same presentation.

102. The WGFAD **NOTED** paper IOTC–2021–WGFAD02-04 on What we think you should know about Fish Aggregating Devices, including the following abstract provided by the authors:

"It's a fact, the use of Fish Aggregating Devices (FADs), man-made objects designed and deployed by fishers to attract fish, receives much attention. While FADs contributed to the development of tropical

tuna fisheries during the 1990s, their too extensive use during the following decades, especially the 2010s, has raised major concerns for tunas, non-targeted species and ecosystems.

On behalf of French and Italian fishers targeting tropical tunas with purse seines in the Atlantic and Indian Oceans, ORTHONGEL has always advocated for a sustainable and rational use of FADs. In 2012, our fleet of French and Italian purse seiners adopted for the first time a self imposed limitation of drifting FAD use, that has become mandatory in all oceans since, along with various data provision to managers and scientists. These management decisions were obviously major steps for the sustainability of our fishery. In 2021 however, we realise that FAD fisheries are still a major concern for many stakeholders. Worse, we realise that despite our efforts to be transparent on our use of drifting FADs, very little seems to be understood on that use.

Here, we offer a detailed overview of drifting FADs in tropical tuna fisheries, their use, and their management with a focus on the Atlantic and Indian Oceans that we know best. We hope that you will find the information you need as a manager, NGO, citizen, scientist or fisher."

103. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-13 on How can we efficiently mitigate the impacts of dFADs? including the following abstract provided by the authors:

"While drifting FADs contributed to the development of tropical tuna fisheries during the 1990s, their too extensive use during the following decades, especially the beginning of the 2010s, has raised concerns for tunas, non-targeted species and ecosystems. Though various dFAD management measures have been implemented in the Indian Ocean during the 2010s, the impacts of dFADs remain a serious concern for many stakeholders of the fishery. Here, we review the existing knowledge and management of dFADs impacts, focussing on dFAD impacts that are currently at the heart of the debates in the frame of the Indian Ocean Tuna Commission (IOTC). We propose a methodology for selecting among the dFAD management measures that have recently been discussed in IOTC based on several criteria : their ability to cover several impacts of dFADs, their ability to cover the full lifespan of dFADs, the enforceability of the measure and the absence of potential unwanted consequences. Finally, based on the experience of the French and associated fleet operating in the Indian and Atlantic Ocean, we question the efficiency of current dFAD management in IOTC and provide guidelines and recommendations to ensure that dFAD management measures are applicable and fully effective in the Indian Ocean."

104. The WGFAD **THANKED** the authors for the presentation and **NOTED** the recommendations made in the paper, further **NOTING** that this was a position statement and so the group did not discuss this paper.

105. The WGFAD **NOTED** paper IOTC-2021-WGFAD02-INF17 on Aligned Guidance for Well-Managed FAD, including the following abstract provided by the authors:

"Leading NGOs focused on global tuna stock sustainability agree that fishing on fish aggregating devices (FADs) requires improved management, monitoring, compliance and transparency. The following practices and recommendations are designed to inform and guide tuna RFMOs, Marine Stewardship Council (MSC) certified fisheries with conditions, and commercial processing and harvesting sectors across the supply chain in developing and/or reforming regulations, policies and regimes to ensure FAD fishing is effectively managed. The groups endorsing this document believe these practices can and must be implemented now and will result in substantial benefits to tuna stocks and their ecosystems."*

106. The WGFAD **THANKED** the authors for the presentation and **NOTED** the recommendations made in the paper, further **NOTING** that this was a position statement and so the group did not discuss this paper.

107. The recommendations from these papers have been harmonised and can be viewed in Appendix VI.

8. Wrap up, Summary of Discussions and Recommendations

108. The WGFAD **NOTED** the following recommendation:

109. The WGFAD **RECOMMENDED** that once suitable data becomes available a study coordinated by the Chairs of this WG should be undertaken to estimate the maximum sustainable number of dFADs that could be deployed in the IO area and that this should be presented to the SC in 2022. This study could be comparable to the one conducted in the EPO and presented in document IOTC-2021-WGFAD02-06. While also taking into account the application of the precautionary approach.

9. Election of the Chair

110. **NOTING** the Rules of Procedure (2014), the WGFAD **CALLED** for nominations for the position of Chairperson of the IOTC WGFAD. Dr Gorka Merino (AZTI, EU,Spain) and Mr Abdirahim **Sheik Heile** (Ministry of Fisheries and Marine Resources of Somalia) were nominated, seconded and elected as co-Chairs of the WGFAD.

10. Review of the draft, and adoption of the Report of the 2nd Session of the Ad-Hoc Working Group on FADs

111. The report of the 2nd Session of the Ad-Hoc Working Group on FADs (IOTC–2021–WGFAD02–R) was **ADOPTED** by correspondence.

APPENDIX I
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APPENDIX II
AGENDA FOR THE 2ND AD-HOC WORKING GROUP ON FADS MEETING

Date: 4 – 6 October 2021

Location: Microsoft Teams

Venue: Virtual

Time: 12:00 – 16:00 (Seychelles time)

Chair: Dr Gorka Merino (EU, Spain) **Vice-Chair:** Dr Shiham Adam (Maldives)

1. **OPENING OF THE MEETING** (Chair)
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chair)
3. **THE IOTC PROCESS: OUTCOMES, UPDATES AND PROGRESS**
   - 3.1. Resolution 15/09 –Terms of Reference (Update)
   - 3.2. Outcomes of the 25th Session of the Commission and previous decisions of the Commission in relation to FADs
   - 3.3. Resolution 19/02 on FADs
4. **REVIEW OF THE DATA AVAILABLE AT THE SECRETARIAT ON FADS** (IOTC Secretariat)
5. **REVIEW OF DEFINITIONS AND MANAGEMENT PLANS ACROSS TUNA RFMOS** (All)
   - 5.1. Review of definitions
   - 5.2. Outcomes of the Joint tuna RFMO meeting Working Group on FADs:
6. **MANAGEMENT MEASURES OF FAD MANAGEMENT PLANS** (All)
   - 6.1. FAD numbers
     - Towards setting FAD limits in the t-RFMOs
     - Discussion on determining the appropriate number of FADs at sea.

     Thematic Discussion, steps towards defining FAD limits.
   - 6.2. Ecological impacts of FADs.

     6.2.1 Methods to reduce the incidental mortality of FADs.
     - Release mechanisms and verification

     6.2.2 Methods to reduce the loss of FADs

     6.2.3 Viability of construction of biodegradable FADs, definitions and realistic timeframes including options.

     Thematic discussion, towards reducing ecological impacts of FADs.
7. **TOWARDS A PLAN FOR IOTC**
8. **WRAP UP, SUMMARY OF DISCUSSIONS AND RECOMMENDATIONS** (Chair)

9. ELECTION OF THE CHAIR (All)

10. REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 2nd SESSION OF THE AD-HOC WORKING GROUP ON FADs (Chair)

APPENDIX III
LIST OF DOCUMENTS

Document	Title
IOTC-2021-WGFAD02-01a	Draft: Agenda of the 2nd Ad Hoc Working Group on FADs Meeting
IOTC-2021-WGFAD02-01b	Draft: Annotated agenda of the 2nd Ad Hoc Working Group on FADs Meeting
IOTC-2021-WGFAD02-02	Draft: List of documents of the 2nd Ad Hoc Working Group on FADs Meeting
IOTC-2021-WGFAD02-03	Review of the statistical data on FADs (IOTC Secretariat)
IOTC-2021-WGFAD02-04	What we think you should know about Fish Aggregating Devices (Orthongel)
IOTC-2021-WGFAD02-05	Comparing different drifting FAD management option (Ndegwa S et al)
IOTC-2021-WGFAD02-06	Recent purse-seine FAD fishing strategies in the eastern Pacific Ocean: what is the appropriate number of FADs at sea? (Lennert-Cody CE, Moreno G, Restrepo V, Román MH and Maunder MN)
IOTC-2021-WGFAD02-07	Spatial management can significantly reduce dFAD beachings in Indian and Atlantic Ocean tropical tuna purse seine fisheries (Imzilen T, Lett C, Chassot E and Kaplan DM)
IOTC-2021-WGFAD02-08	A polluter pays principle for drifting FADs – how it could be applied? (Purves M, Shiham Adam S and Bealey R)
IOTC-2021-WGFAD02-09	Biodegradable DFADs: Current Status and Prospects (Zudaire I, Moreno G, Murua J, Murua H, Tolotti MT, Román M, Hall M, Lopez J, Grande M, Merino G, Escalle L, Hamer P, Basurko OC, Capello M, Dagorn L, Ramos ML, Abascal FJ, Báez JC, Pascual-Alayón PJ, Déniz S and Santiago J)
IOTC-2021-WGFAD02-10	The Jelly-FAD: a paradigm shift in bio-FAD design (Moreno G, Salvador J, Murua H, Uranga J, Zudaire I, Murua J, Grande M, Cabezas O and Restrepo V)
IOTC-2021-WGFAD02-11	Developing solutions to increase survival rates of vulnerable bycatch species in tuna purse seine FAD fisheries (Jefferson M, Ferarios JM, Onandia I, Ruiz J, Zudaire I, Moreno G, Murua H, Restrepo V and Santiago J)
IOTC-2021-WGFAD02-12	Toward true FAD deployment limits in the t-RFMOs (Gersham D, Galland G and Holmes G)
IOTC-2021-WGFAD02-13	How can we efficiently mitigate the impacts of dFADs? (Maufroy A and Goujon M)
Information papers	
IOTC-2021-WGFAD02-INF01	Resolution 15/09 On a Fish Aggregating Devices (FADs) Working Group
IOTC-2021-WGFAD02-INF02	Resolution 19/02 Procedures on a Fish Aggregating Devices (FADs) Management Plan
IOTC-2021-WGFAD02-INF03	Joint t-RFMO FAD Working Group Second Meeting
IOTC-2021-WGFAD02-INF04	Aggregation times of tuna schools to FADs estimated by echosounder data (Gómez-Ullate D et al)
IOTC-2021-WGFAD02-INF05	Limiting FAD Sets or total FAD limits – how these options compare (Sustainable Fisheries and Community Trust)
IOTC-2021-WGFAD02-INF06	Testing differences in the associated and non-associated tropical tuna schools fisheries strategy of Spanish fleet from Atlantic and Indian Ocean (Báez JC, Lourdes Ramos M, Deniz S, Rojo V, González-Carballo M and Pascual P)
IOTC-2021-WGFAD02-INF07	Commercial Confidentiality or Avoiding Accountability: The Need for Greater Transparency in Drifting FAD Operations (Ibrahim A et al)
IOTC-2021-WGFAD02-INF08	The myth that current science can inform precautionary FAD limits or FAD set limits (Shark Guardian)
IOTC-2021-WGFAD02-INF09	Minimum Requirements for Responsible Drifting FAD Use (Blue Marine Foundation)
IOTC-2021-WGFAD02-INF10	Turning the tide on FAD beaching (OPAGAC)
IOTC-2021-WGFAD02-INF11	Surface habitat modification through industrial tuna fishery practices (Dupaix A, Capello M, Lett C, Andrello M, Barrier N, Viennois G and Dagorn L)

IOTC-2021-WGFAD02-INF12	Ghost fishing mortality and habitat damage from ALD drifting FADs (Ahusan M and Shiham Adam M)
IOTC-2021-WGFAD02-INF13	Effect of the number of FADs on tuna movements and catchability (Pérez G, Dagorn L, Jauharee R, Dupaix A, Deneubourg JL, Forget F, Filmalter JD, Holland K, Itano D, Adam S, Beeharry SP and Capello M)
IOTC-2021-WGFAD02-INF14	Pacific dFAD retrieval feasibility study (Escalle L, Hare S, Hamer P and Pilling G)
IOTC-2021-WGFAD02-INF15	Recommended best practices for FAD management in tropical tuna purse seine fisheries (ISSF)
IOTC-2021-WGFAD02-INF16	Workshop for the reduction of the impact of Fish Aggregating Devices' structure on the ecosystem (ISSF)
IOTC-2021-WGFAD02-INF17	Aligned guidance for well-managed FAD fisheries (NGO Tuna Forum)
IOTC-2021-WGFAD02-INF18	Highest risk abandoned, lost and discarded fishing gear (Gilman E, Musyl M, Suuronen P, Chaloupka M, Gorgin S, Wilson J and Kuczenski B)
IOTC-2021-WGFAD02-INF19	Detecting Anchored Fish Aggregating Devices (AFADs) and estimating use patterns from vessel tracking data in small-scale fisheries (Widyatmoko AC, Hardesty BD and Wilcox C)
IOTC-2021-WGFAD02-INF20	GTA Fish Aggregating Device (FAD) Management Best Practices (Global Tuna Alliance)

APPENDIX IV
MAIN ISSUES IDENTIFIED CONCERNING DATA ON FADS

Extract from IOTC–2021–WGFAD02–03

The following section is an excerpt of paper IOTC–2021–WGFAD02–03 which provides a summary of the information available on FAD-related data available at the IOTC Secretariat and shows some of the main issues in the data submitted through the IOTC forms 3FA, 3FD, 3CE, and 3SU. The subsection "At-sea deployments" provides a comparison of the annual number of FAD deployments between the forms 3FA and 3FD. The subsection "Sets on FADs" compares the numbers of fishing operations conducted on tuna schools associated with FADs between the forms 3FA and 3CE. The subsection provides a summary of the information on fishing effort reported to the IOTC Secretariat as per IOTC Resolution 15/02.

At-sea deployments

Data on deployments by Spanish-flagged vessels of the European Union fleet are in relatively good agreement overall between IOTC form 3FD and IOTC form 3FA. When considering the breakdown of all deployments by vessel type, though, it is evident how the deployment data reported through IOTC form 3FA are erroneously accounted for exclusively by purse seine vessels (see the FA_PS column in **Table A1**), while the data from IOTC form 3FD indicates an almost even split between FADs deployed by purse seines and supply vessels in 2018 and 2019 (see the FD_PS and FD_SU columns in **Table A1**)

Table A1. Summary of total number of FADs deployed by the Spanish component of the European Union purse seine fleet, as reported through IOTC form 3FD and IOTC form 3FA for the period 2015-2020. DIFF = the arithmetic difference between FD and FA; PS = purse seiner; SU = supply vessel

FLAG	YEAR	FD	FA	DIFF	FD_PS	FA_PS	DIFF_PS	FD_SU	FA_SU	DIFF_SU
EU,ESP	2015		17,176			17,176				
EU,ESP	2016		19,058			19,058				
EU,ESP	2018	10,181	10,167	14	5,979	10,167	-4,188	4,202		
EU,ESP	2019	8,176	8,365	-189	4,845	8,365	-3,520	3,331		
EU,ESP	2020		7,902			7,902				

Data on deployments by French-flagged vessels from the European Union fleet are not in agreement between IOTC form 3FD and IOTC form 3FA. In particular, for the years 2018 and 2019 (when information is available from both sources) the deployments recorded through IOTC form 3FA appear to be severely under-reported (see the DIFF column in **Table A2**). The trend in total number of FADs deployed according to IOTC form 3FA is extremely variable and seems to be on the levels comparable to those reported through IOTC form 3FD only in 2016 and 2020.

Table A2: Summary of total number of FADs deployed by the French component of the European Union purse seine fleet, as reported through IOTC form 3FD and IOTC form 3FA for the period 2015-2020. DIFF = the arithmetic difference between FD and FA; PS = purse seiner; SU = supply vessel

FLAG	YEAR	FD	FA	DIFF	FD_PS	FA_PS	DIFF_PS	FD_SU	FA_SU	DIFF_SU

EU,FRA	2015		97			97				
EU,FRA	2016		3,518			3,518				
EU,FRA	2017		548			548				
EU,FRA	2018	4,464	624	3,840	3,296	624	2,672	1,168		
EU,FRA	2019	3,404	820	2,584	2,433	820	1,613	971		
EU,FRA	2020		3,138			3,138				

Deployment data for the Japanese fleet are available from both IOTC form 3FA and IOTC form 3FD only in 2019, where they show a perfect agreement when limited to deployments from purse seine vessels only (see the DIFF_PS column in **Table A3**). The trends in deployed FADs derived from either IOTC form 3FD or IOTC form 3FA are in agreement with the evolution of the Japanese purse seiners fleet, which has been dramatically reducing operations in the Indian Ocean in recent years.

Table A3: Summary of total number of FADs deployed by the Japanese purse seine fleet, as reported through IOTC form 3FD and IOTC form 3FA for the period 2013-2020. DIFF = the arithmetic difference between FD and FA; PS = purse seiner; SU = supply vessel

FLAG	YEAR	FD	FA	DIFF	FD_PS	FA_PS	DIFF_PS	FD_SU	FA_SU	DIFF_SU
JPN	2013		93			93				
JPN	2014		183			183				
JPN	2015		227			227				
JPN	2016		224			224				
JPN	2017		251			251				
JPN	2018	331			301			30		
JPN	2019	119	69	50	69	69	0	50		
JPN	2020		33			33				

FAD deployment data for the Korean fleet are exclusively available through IOTC form 3FA and therefore it is not possible to substantiate their accuracy with the help of data from IOTC form 3FD: in any case, the total annual number of FADs deployed shows a trend similar to what already observed for EU,ESP, decreasing systematically from a peak level of 1,940 FADs in 2015 to 399 FADs (absolute minimum for the fleet) in 2020 (**Table A4**).

Table A4: Summary of total number of FADs deployed by the Mauritian purse seine fleet, as reported through IOTC form 3FD and IOTC form 3FA for the period 2013-2020. DIFF = the arithmetic difference between FD and FA; PS = purse seiner; SU = supply vessel

FLAG	YEAR	FD	FA	DIFF	FD_PS	FA_PS	DIFF_PS	FD_SU	FA_SU	DIFF_SU
KOR	2014		1,618			1,618				
KOR	2015		1,940			1,940				
KOR	2016		1,749			1,749				

FLAG	YEAR	FD	FA	DIFF	FD_PS	FA_PS	DIFF_PS	FD_SU	FA_SU	DIFF_SU
KOR	2017		1,445			1,445				
KOR	2018		489			489				
KOR	2019		412			412				
KOR	2020		399			399				

The information on FADs deployed by Mauritius as provided through IOTC form 3FA shows a generally decreasing trend from a peak of 929 FADs deployed in 2017 to 408 deployed in 2020. The comparison of data from IOTC form 3FA and IOTC form 3FD for the years 2018 and 2019 shows a perfect agreement in deployments reported by purse seine vessels in 2018, with a mild under-reporting in 2019 (evidence of 53 more FADs deployed by Mauritian purse seiners in IOTC form 3FD, see the *DIFF_PS* column in **Table A5**). The situation is inverted when considering deployments from supply vessels, in which case, there's a slight over-reporting for 2019 and a more marked over-reporting for 2018 (see the *DIFF_SU* column in **Table A5**).

Additionally, Mauritius reported a single record corresponding to a FAD deployment event through IOTC form 3FA in 2013, but this record actually indicated zero FADs being deployed (therefore explaining the blank row for 2013 in **Table A5**), and furthermore was followed by a non-NIL value of the number of sets on FADs: this suggests a potential issue with the provision (through IOTC form 3FA) of both the number of FADs and the number of sets on FAD for the year and flag concerned.

Table A5: Summary of total number of FADs deployed by the Mauritian purse seine fleet, as reported through IOTC form 3FD and IOTC form 3FA for the period 2013-2020. DIFF = the arithmetic difference between FD and FA; PS = purse seiner; SU = supply vessel

FLAG	YEAR	FD	FA	DIFF	FD_PS	FA_PS	DIFF_PS	FD_SU	FA_SU	DIFF_SU
MUS	2013									
MUS	2016		1			1				
MUS	2017		929			346			583	
MUS	2018	600	718	-118	141	141	0	459	577	-118
MUS	2019	893	848	45	252	199	53	641	649	-8
MUS	2020		408			273			135	

Information on FAD deployments for Seychelles is sparse and often inaccurate: data from IOTC form 3FA is available for the years between 2013 and 2019, but for 2015, 2016, 2017 and 2019 all the records related to FAD deployment activities (DD) explicitly indicate zero deployed FADs, while on the contrary reporting a positive number of sets on FADs (without corresponding catches) (**Table A6**). Similarly to what detected for Mauritius, this situation might indicate a potential issue with the provision (through IOTC form 3FA) of the number of FADs and the number of sets on FADs for the years and flag concerned. Furthermore, data from IOTC form 3FD for Seychelles are only available for 2019, and indicate all FADs as exclusively being deployed by Seychellois supply vessels, with no explicit deployment attributed to purse seiners.

Table A6: Summary of total number of FADs deployed by the Seychellois purse seine fleet, as reported through IOTC form 3FD and IOTC form 3FA for the period 2013-2020. DIFF = the arithmetic difference between FD and FA; PS = purse seiner; SU = supply vessel

FLAG	YEAR	FD	FA	DIFF	FD_PS	FA_PS	DIFF_PS	FD_SU	FA_SU	DIFF_SU
SYC	2013		1,354						1,354	
SYC	2014		4,103						4,103	
SYC	2015									
SYC	2016									
SYC	2017									
SYC	2018									
SYC	2019	1,465						1,465		

Sets on FADs

EU,Spain. No effort information as number of sets is available for the Spanish component of the European Union purse seine fleet through IOTC form 3CE, and for this reason it is not possible to analyze how this compares to the same data reported through IOTC form 3FA.

EU,France. Effort information as number of sets from the French component of the European Union purse seine fleet is only available through IOTC form 3CE for the years 2019 and 2020, with French institutions responsible for the collation of these data currently liaising with the IOTC secretariat to discuss how to best report historical effort information as number of sets for all available years. When data on FAD sets is available from IOTC form 3CE and 3FA (i.e., for the statistical years 2019 and 2020) they show a tendency at over-estimating the number of sets reported through IOTC form 3FA, although the differences between the two data seem to have reduced over time (from 3,676 to 881 sets of difference in 2019 and 2020 respectively, see the *DIFF* column in **Table A7**).

Table A7: Summary of total number of FAD sets recorded by the Japanese purse seine fleet, as reported through IOTC form 3CE (EF_LS) and IOTC form 3FA (FA) for the period 2013-2020

FLAG	YEAR	EF_LS	FA	DIFF
EU,FRA	2015		2,165	
EU,FRA	2016			
EU,FRA	2017		3,710	
EU,FRA	2018		4,152	
EU,FRA	2019	1,918	5,594	-3,676
EU,FRA	2020	1,898	2,779	-881

While the total number of sets on FADs provided through IOTC form 3CE is stable at around 1,900 sets / year (data originating from logbooks), the same data recovered from IOTC form 3FA shows a higher magnitude and a greater variability over time, although remaining at levels constantly higher than 2,000 sets / year.

When comparing efforts reported through IOTC form 3FA for the Spanish and French component of the European Union purse seine fleet, it appears that the latter has exerted comparable efforts to the former (when not higher, as in the case of 2019). This is partially in contradiction with the known differences in the number of active vessels and the mode of operation of the two fleets (with Spanish-flagged purse seiners remaining more at sea during the year, and performing more sets per day on average) which would suggest the contrary.

The reasons for these differences are unclear, and might potentially depend on national institutions interpreting the FAD sets reporting mechanisms differently from what originally intended for IOTC form 3FA.

Japan. The Japanese purse seine fleet operating in the Indian Ocean has been regularly providing effort information as number of sets from 2014 onward: when comparing data from IOTC form 3CE with the same data from IOTC form 3FA, the differences are minor (when not negligible) for several years - namely 2014, 2015, 2019 and 2020 - and range between 0 and 5 sets of difference detected each year (see the DIFF column in **Table A8**). Conversely, data from IOTC form 3FA for 2015 and 2017 appear to underestimate the annual effort by as much as 50% of the total FAD sets reported by Japan through IOTC form 3CE for the same years.

The number of sets on FADs reported since 2019 by Japan through both IOTC form 3CE and 3FA are in agreement with each other as well as with the available information on the operations of the fleet in the Indian Ocean, which has reduced greatly in comparison to previous years (**Table A8**).

Table A8: Summary of total number of FAD sets recorded by the Japanese purse seine fleet, as reported through IOTC form 3CE (EF_LS) and IOTC form 3FA (FA) for the period 2013-2020

FLAG	YEAR	EF_LS	FA	DIFF
JPN	2013			
JPN	2014	44	44	0
JPN	2015	142	137	5
JPN	2016	139	124	15
JPN	2017	196	104	92
JPN	2018	146		
JPN	2019	9	7	2
JPN	2020	34	32	2

Korea. The Korean purse seine fleet operating in the Indian Ocean has been regularly providing effort information as number of sets from 2013 onward. Unfortunately, there is no corresponding effort information available for the fleet through IOTC form 3FA, and therefore a comparative analysis of the two data sources cannot be performed.

Mauritius. Mauritius has been regularly reporting efforts from its purse seiner fleet as number of sets since 2014, with official data from IOTC form 3CE showing a relatively stable trend in total annual sets on FADs, whose values fluctuate between 421 and 496 sets each year from 2017 onward (**Table A9**). Data from IOTC form 3FA for the fleet are available for 2013 and from 2016 onward, and show variable levels of agreement across time. In particular, effort information from both sources is consistent from 2016 to 2018 (included), with a slightly higher number of sets on FADs reported through IOTC form 3FA for these three years. Conversely, in 2019 and 2020 data from IOTC form 3FA reported a much higher number of sets on FADs than what available from IOTC form 3CE for the corresponding years. The actual reasons for these discrepancies are still unclear, but are likely to be attributed to issues in the interpretation (or reporting) of effort information through IOTC form 3FA.

Table A9: Summary of total number of FAD sets recorded by the Mauritian purse seine fleet, as reported through IOTC form 3CE (EF_LS) and IOTC form 3FA (FA) for the period 2013-2020

FLAG	YEAR	EF_LS	FA	DIFF
MUS	2013		44	
MUS	2014	351		
MUS	2015	273		
MUS	2016	262	271	-9
MUS	2017	496	510	-14
MUS	2018	452	464	-12
MUS	2019	421	1,070	-649
MUS	2020	452	1,356	-904

Seychelles. The Seychellois purse seine fleet has never provided effort information as number of sets through IOTC form 3CE. In fact, this information is only available through IOTC form 3FA (since 2013, with the exception of 2014) and shows a relatively stable trend at around 3,000 sets on FADs per year since 2016, with limited fluctuations that do not seem to suggest a marked decrease in fishing operations from the fleet.

Supply vessels

Data on the effort exerted by supply vessels begun to be regularly received by the Secretariat from the statistical year 2017 onward (**Table A10**), even though IOTC Resolution 15/02 called for its provision starting with the statistical year 2015 (data available for 2014 is the result of submission of historical information from the CPCs concerned). Overall, the information collated from the submitted IOTC form 3SU is far from being considered complete or accurate (**Table A10**), although it has the merit of providing rough figures on the total yearly effort as well as the fishing grounds where the activity from these vessels appears to be more concentrated.

Table A10: Summary of total number of days at sea spent by supply vessels flagged by the major fleets with purse seiners operating, as reported through IOTC form 3SU

FLAG	2014	2015	2016	2017	2018	2019	2020
EU,ESP	1,172.05			2,633.00	2,028.53	2,016.00	1,755.00
EU,FRA					383.00	1,328.59	1,247.67
JPN		20.00	19.00	17.00	20.00	27.00	
KOR				304.00	307.00	298.00	294.00
MUS				382.00	397.00	405.00	425.00
SYC			1,099.00		982.00	863.00	2,550.00

Total	1,172.05	20.00	1,118.00	3,336.00	4,117.53	4,937.59	6,271.67

FAD-tracking data

This global data set covers the period from January 2020 to May 2021, and does not include data for the buoys monitored by the Republic of Korea, which have not yet been submitted to the Secretariat. Also, no information is available from the active purse seiners of I.R. Iran, due to the country being subject to an embargo restricting access to standard satellite communication, while additional information is required from Kenya to clarify if their recently developed purse seine fishery (comprising six vessels of around 50 m LOA and 493 GT each) is actively fishing on floating objects and therefore subject to this requirement.

APPENDIX V
CONSOLIDATED RECOMMENDATIONS OF THE 2ND SESSION OF THE AD-HOC WORKING GROUP ON FADS

WGFAD.01 (para 109) The WGFAD **RECOMMENDED** that once suitable data becomes available a study coordinated by the Chairs of this WG should be undertaken to estimate the maximum sustainable number of dFADs that could be deployed in the IO area and that this should be presented to the SC in 2022. This study could be comparable to the one conducted in the EPO and presented in document IOTC-2021-WGFAD02-06. While also taking into account the application of the precautionary approach. [**ADOPTED**]

APPENDIX VI

CONSOLIDATED RECOMMENDATIONS OF THE DOCUMENTS PRESENTED UNDER SECTION 7

Table A5: Recommendations grouped from the documents presented under Section 7 (IOTC-2021-WGFAD02-05, IOTC-2021-WGFAD02-INF09, IOTC-2021-WGFAD02-13 and IOTC-2021-WGFAD02-INF17). These recommendations were not agreed by all participants of the WGFADs.

Recommendations	**IOTC Situation**
FAD time/area closures	No, but voluntary measures adopted by some fleets
FAD following and purchase limits	Yes (Res 19/02 Para 4)
FAD set limits	No
Biodegradable FADs	Yes (Res 19/02 Paras 17 – 19)
Non-entangling FADs	Yes (Res 19/02 Paras 17 – 19)
FAD bans	No
FAD marking	Yes (Res 19/02 Paras 20-21)
100% observer coverage	No
Phase out use of supply vessels	Yes (Res 19/01 Para 16)
FAD Ownership and Transparency Rules	No
Reporting and availability of FAD operational data	Yes (Res 19/02 Paras 11, 15, 22 and 23)
Prohibition on FAD abandonment	No
Polluter pays system for FAD loss	No
Sanctions for repeated FAD loss	No
Make sure to use the right FAD vocabulary	Discussed by joint TRFMO WG as well as WGFAD
Quantitatively assess the efficacy of dFAD current management measures	Under discussion at WGFAD
Consider the removal of redundant measures to limit the number of dFADs at sea	Ongoing
Avoid unwanted consequences of IOTC management measures	Ongoing
Set gradual and realistic dFAD management time frames	No
Manage all fleets equitably	NA
Require activation of operational buoys, as defined by the joint tuna RFMO FAD 2019 meeting, occur exclusively onboard prior to deployment and develop clear rules for deactivation of FAD buoys at sea	Yes (Res 19/02 Para 4)
Ensure FAD management measures also apply to all vessels engaged in supply and tender activities	Yes (Res 19/02 Paras 2, 4, 7, 8 and 15)
Require catch and effort data reporting by set type with clear definitions	Yes (Res 19/02 Paras 22 and 23)
Require fishing companies to apply science-based safe handling and release practices for marine turtles, sharks, rays, and marine mammals and to test new tools/technology for the safe release of by-catch with special emphasis on vulnerable species	Safe release techniques have been discussed at species level by the SC

Prohibit intentional setting on whale sharks & cetaceans	Setting on whale sharks is covered under Res 13/05 while sets on cetaceans are covered under Res 13/04
Task RFMO scientific committees to define science-based mortality limits for ETP species and ETP reduction targets for FADs	Ongoing