Report of the IOTC ad hoc Working Group on FADs

Madrid, Spain, 18 April 2017

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ACRONYMS

AFAD	Anchored Fish Aggregating Device
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
CPCs	Contracting parties and cooperating non-contracting parties
CPUE	Catch per unit of effort
CECOFAD	Catch, Effort, and eCOsystem impacts of FAD – fishing
DFAD	Drifting Fish Aggregating Device
FAD	Fish Aggregating Device
IOTC	Indian Ocean Tuna Commission
SC	Scientific Committee, of the IOTC
WPDCS	Working Party on Data Collection and Statistics

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 first Session of the Indian Ocean Tuna Commission's (IOTC) ad hoc Working Group on FADs (WGFAD01) was held in Madrid, Spain on 18 April 2017. A total of 48 participants attended the Session. The list of participants is provided at Appendix I. The meeting was opened by the co-Chairpersons, Dr Ahmed Almazrui (Oman, Chair of the Commission) and Dr Hilario Murua (EU,Spain, Chair of the Scientific Committee) who welcomed participants to Madrid.

The WGFAD **NOTED** that there is currently room for different interpretation in the definitions of some of the categorisations used in the FAD data submission form 3FA with regard to the FAD type and FAD visits (e.g. whether the FAD with a net category includes the use of rolled nets or deployments are only related to the first deployment and/or include replacing of FAD tracking device or re-deployment), which affect the reliability and accuracy of the results in relation to the number of active FADs estimated in the paper due to double-counting of deployments (i.e. different assumptions and interpretations will result in different estimations). Given the need for consistent nomenclature, the WGFAD **RECOMMENDED** the WPDCS and SC review and revise the categories and harmonize these with the CECOFAD categories and definitions. In particular, the WGFAD **ADVISED** that any further revision to FAD visit types classification should allow a clear identification of the number of active FADs at the resolution required for FAD data submission to the Secretariat (one month, 1°x1° grid cells).

The WGFAD **NOTED** that the reported FAD data are complex and need further exploration to be able to fully interpret the results, as there may be a number of issues that affect the estimation of the number of active FADs such as the interactions between fleets (e.g. situations in which a FAD is deployed by one fleet and retrieved by another) and/or interpretation of the FAD visit definitions (deployment, retrieval, visiting, etc.) which may need to be considered. The WGFAD **RECOMMENDED** the SC discuss the methodology for the estimation of the number of active FADs at sea from the data currently submitted.

NOTING that Resolution 15/08 provides a start date for the implementation of non-entangling FADs, but no end date, the WGFAD **RECOMMENDED** that this Resolution is revised in the near future to include a date by which non-entangling FADs should be fully implemented.

*"To reduce the entanglement of sharks, marine turtles or any other species, the design and deployment of FADs shall be based on the principles set out in **Annex III**, which will be applied gradually from 2014" (Resolution 15/08, para. 4).*

NOTING the differing levels of entanglement potential of FADs, the WGFAD **RECOMMENDED** the need for a definition of non-entangling FADs.

NOTING the joint tRFMO working group meeting taking place directly after the IOTC working group meeting, the WGFAD **RECOMMENDED** the SC and Commission consider if and when it will be appropriate to hold the second meeting for the IOTC.

The WGFAD **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WGFAD01, provided at Appendix IV.

1. OPENING OF THE MEETING

1. The first Session of the Indian Ocean Tuna Commission's (IOTC) ad hoc Working Group on FADs (WGFAD01) was held in Madrid, Spain on 18 April 2017. A total of 48 participants attended the Session. The list of participants is provided in Appendix I. The meeting was opened by the co-Chairpersons, Dr Ahmed Almazrui (Oman, Chair of the Commission) and Dr Hilario Murua (EU,Spain, Chair of the Scientific Committee) who welcomed participants to Madrid.

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 WGFAD01 are listed in Appendix III.

3. DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE AD HOC WORKING GROUP ON FADS

3.1 Resolution 15/09 – Terms of Reference

3. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–03 which outlined the main aims and objectives of the Working Group as established by the Commission.

"The objectives of the ad hoc working group on Fish Aggregating devices (FADs) would be the following:

- *To collect and compile information about past and present numbers of buoys and FADs, changes in FAD-related technology and activities of supply vessels;*
- *To review the requirements of collection of data on FADs established in Resolution 15/08 in order to assess the necessity for revision;*
- *To assess the effect of FAD's density and spatial distribution on the behaviour, distribution and species composition of the tuna schools;*
- *To assess the developments in FAD-related technology notably with regards to:*
  - *changes in catchability due to technological improvement;*
  - *using FAD and buoys marking and identification as a tool for monitoring, tracking and control of FADs;*
  - *reducing FAD's ecological impacts through improved design, such as non-entangling FADs and biodegradable material.*
- *To evaluate ways to improve the use of information related to FADs in the process of stock assessment, particularly in the standardisation of catch per unit effort, and in ecological risk assessment for non-target species;*
- *Through an active exchange of views, to identify management options, including the regulation of deployment limits and characteristics of FADs, and activities of support vessels;*
- *To assess the consequences of these management options, in conjunction with other fleets fishing mortality components, on IOTC-managed species and on the pelagic ecosystems" (Resolution 15/08).*

4. The WGFAD **NOTED** the objectives of the Commission and **AGREED** to provide advice on the types of data requirements and analyses needed to provide management advice to the Commission.

3.2 Decisions of the Commission related to FADs

5. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–04 which outlined the main outcomes of previous Sessions of the Commission, specifically related to the work of the WGFAD and **AGREED** to consider how best to provide the Scientific Committee with the information it needs, in order to satisfy the Commission's requests, throughout the course of the current WGFAD meeting.

6. The WGFAD **NOTED** the Conservation and Management Measures (CMMs) adopted by the Commission related to FADs as listed below:

IOTC Resolutions

- Resolution 15/01 *On the recording of catch and effort data by fishing vessels in the IOTC area of competence*

- Resolution 15/02 *Mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)*
- *Resolution 15/08 Procedures on a fish aggregating devices (FADs) management plan, including a limitation on the number of FADs, more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species*
- Resolution 16/08 *On the prohibition of the use of aircrafts and unmanned aerial vehicles as fishing aids*
- Resolution 16/01 *On an Interim Plan for Rebuilding the Indian Ocean Yellowfin tuna Stock in the IOTC area of competence*
- Resolution 16/07 *On the use of artificial lights to attract fish*

4. DESCRIPTION OF FAD FISHERIES IN THE IOTC

7. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–05 describing the use of FADs by the Mauritian purse seine fleet, including the following abstract provided by the authors:

   "Fish aggregating under floating objects has been observed since the prehistoric time. Fish aggregate in considerable numbers around objects such as drifting flotsam, rafts, and floating seaweed. In the evolution of time, fish aggregating devices (FADs) became a man-made object used to attract ocean going pelagic fish such as tuna and associated species. Commercial tuna fishing by purse seiners use drifting FADs to target surface aggregations of tuna fish. A first Mauritian purse seiner, "Lady Sushil" was launched in 1979 and was joined by a second vessel, "Lady Sushil II" eight years later. A third purse seiner, "Cirné", started operations in 1991. However, due to financial problems the vessels were sold off in 2000. In 2013, the Mauritian purse seiner, Belle Rive entered into operation followed by 6 additional vessels in 2014. A total of 7 Mauritian purse seiners operated till 2015 and 5 of them left leaving 2 purse seiners which are presently in operation". – See paper for full abstract.

8. The WGFAD **NOTED** the observer coverage of the Mauritian purse seine fleet was 27% in 2015[1], however, explanation on the representativeness of this coverage was sought given that the majority of catches reported by observer data were based on free school sets while the majority of catch based on logbook data was based on FAD sets.

9. The WGFAD **NOTED** that the FADS used by Mauritius are non-entangling and that trials of biodegradable FADs have been taking place to improve the use of eco-FADs with the objective of reaching 100% in the fishery. There is currently a lack of information on the lifespan of FADs, some of which are made from synthetic materials. However, it was **NOTED** that the non-entangling nature of FADs should be monitored with 100% observer coverage.

10. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–06 Rev_1 on the use of traditional FADs by the Thai fisheries and its applicability for the IOTC area of competence, including the following abstract provided by the authors:

    "The EEZ of Thailand covers 420,280 *km*2*;* 304,000 *km*2*in the Gulf of Thailand (GoT) and* 116,280 *km*^{2} *in the Andaman Sea coast of Thailand (ASCoT). There are* 23 *coastal Provinces surrounding such two main fishing areas, including* 17 *Provinces in the GoT with a coastline of approximately* 2,700 *km (*1,143 *miles) and* 6 *Provinces in the ASCoT covering* 865 *km (*537 *miles) of coastline. The fishing grounds are divided into* 7 *zones,* 1-5 *in the GoT and* 6-7 *in the ASCoT. Purse seiners are the main fleets for fishing* coastal *pelagic fish.*T*he total number of purse seiners is 1,*641 which include 10 m to larger than 25 m boat length. The1,224 boats are operated in *GoT* and the 417 boats are operated in the *ASCoT. The materials and construction of the Thai FADs for purse seining which are usually set in depths ranging from 20 to 50 m. The FAD is composed of bamboo pole, anchor line, weight and coconut leaves. The main fishing grounds of surrounding net were distributed around ASCoT part. The major species caught were Indian mackerel (Rastrelliger kanagurta), Round scads (Decapterus maruadsi), Yellowtail scad (Atule mate), Euthynnus affinis, Auxis rochei and other species constituting 21.71, 20.73, 10.23, 3.22, 1.49 and 42.62 % of the total catch, respectively. The material of Thailand traditional FADs were low cost and fishermen can find in Thailand It's construct from bio-degradable materials. Reduce bycatch or incident catch (Turtle, marine mammals, Sharks) followed by RFMOs conservation measurement".*

11. The WGFAD **NOTED** the lack of information on total numbers of FADs in these fisheries that target the neritic tunas.

[1] fishing days observed

12. The WGFAD **NOTED** that traditional FADs have no nets while commercial FADs have nets attached and that the general life span of the FADs in these fisheries is around 2-4 months after which stranding on the shores may occur.

13. **NOTING** the use of lights in Thai FADs, the WGFAD **RECALLED** the prohibition in Resolution 16/07 *On the use of artificial lights to attract fish*.

14. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–15 on the Spanish logbook system ad requirements, including the following abstract provided by the authors:

    "This document presents a renewed Fish Aggregating Devices (FADs) logbook designed for collecting data within the Fish Aggregating Device National Management Plan undertaken by the Spanish General Secretariat of Maritime Fisheries (Ministry of Agriculture and Fisheries, Food and Environment), in collaboration with the Spanish Institute of Oceanography (IEO - Ministry of Economy, Industry and Competitiveness), which is compulsory for the Spanish freezer purse-seine fleet targeting tropical tuna (yellowfin-YFT, skipjack-SKJ and bigeye-BET) in the Atlantic, Indian and Pacific oceans. The IEO, the AZTI Foundation, the International Seafood Sustainability Foundation (ISSF), the Organization of Associated Producers of Large Tuna Freezers (OPAGAC-AGAC) and the National Association of Tuna Freezer Vessels Shipowners (ANABAC) have held continuous conversations since June 2016 in order to implement this new format for the Spanish FAD logbook, with the following aims: i) solving the issues identified with the previous format, ii) developing easy to follow guidelines for the Spanish fleet and iii) responding to all tuna Regional Fisheries Management Organizations (t-RFMOs) requirements on FAD data collection. A field-by-field analysis has been conducted, pointing out the major problems that have been identified in past versions of the logbook and describing the solutions and improvements adopted".

15. The WGFAD **THANKED** the authors for the work undertaken to extend the collection of data on FADs.

16. The WGFAD **NOTED** that all vessels are now recording this new information and reporting this to the Spanish Ministry of Fisheries who in turn make it available to the *Spanish Institute of Oceanography* (IEO) for analysis.

17. The WGFAD **NOTED** that while there is a need for detailed information to be collected on FAD characteristics and types for all events, this information may sometimes be lacking, e.g. a setting operation on the FAD of a different fleet for which the characteristics of the FAD are unknown, and hence the forms have to accommodate situations where there is this lack of information.

18. **NOTING** that this new logbook is the outcome of a collaboration between a number of companies which, acknowledging the need for consistency among data collection programmes and the standardisation of terminology and categorisation, aims to standardise the information collected across the different oceans, the WGFAD **SUGGESTED** that the classifications are harmonised with those developed through the EU CECOFAD project.

19. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–16 on the information gap regarding FAD management measures implemented in Indonesia, including the following abstract provided by the authors:

    "Deep-water anchored Fish Aggregating Devices (aFADs), in waters as deep as 2000–5000m, have been a common feature of Indonesia's tuna fisheries since the early 1980s. Presently, the use of FADs has become the dominant practice in tuna fishing in Indonesian Indian Ocean. FADs management measures for the tuna fisheries have not been successfully implemented, mainly due to the information gap including characteristic of tuna fisheries associated FADs. In addressing information gaps to enable improved management, Indonesia and Australia have conducted a joint study as part of a 5 year ACIAR project (FIS/2009/059), including an enumeration program at four key tuna landing ports: Padang (West Sumatera) and Palabuhanratu (West Java). Preliminary findings to date include: (1) FADs in Indonesian Indian Ocean are of two main types include steel pontoon and polystyrene block. Subsurface attractors are most commonly natural materials include nipa and coconut palm branches, (2) Fishing gears include hand-line/troll-line (HL/TR), and purse seine (PS), (3) The proportions of the two main target tunas, skipjack tuna, Katsuwonus pelamis (SKJ), yellowfin tuna, Thunnus albacares, SKJ comprised 30-43% of HL/TL landings of HL/TL boats in Palabuhanratu, (4) Fishing success (as measured by % of FAD visits that yielded catch success) ranged from as low as 35% for HL/TL in Padang to 86% for HL/TL in Palabuhanratu, (5) A large proportion of the SKJ, YFT and bigeye tuna, T. obesus, landed by the FAD-based boats, were juvenile fish, below reported lengths at maturity (L_m) for those species, raising obvious concerns for sustainability of the fisheries".

20. The WGFAD **NOTED** that there is little information on the rate of loss of anchored FADs from the Indonesian fisheries, although some loss is known to occur. While the total number and position of anchored FADs is also unknown, it will be mandatory to report deployment numbers to the government by the end of 2017.

21. The WGFAD **NOTED** that FADs were originally constructed from natural materials but have been increasingly constructed from synthetic materials.

22. **NOTING** the use of lights on boats to attract fish, the WGFAD **RECALLED** that this is in contravention of Resolution 16/07 *On the use of artificial lights to attract fish*.

23. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–19 on FAD fishing in I.R. Iran, including the following abstract provided by the authors:

"About 550.000 Mt. of various fishes have been harvested in 2015 from Persian Gulf, Oman Sea and Indian Ocean by about 8000 boats, 3000 Dhows and 100 ships. These vessels are equipped with different fishing gears to harvest variety of aquatics e.g. Large and small pelagic, Reversal species, Lantern fish and Shrimp, within allowed areas. Only 5 Purse seiners are active in Iran and total catch by 5 purse seiners was 5300 tons in 2015. These vessels used in Iran a few D FADs,) each of the vessels 30 to 50 FADs (has almost caught around 15% obtained by the FAD is done). This report has a review of use the FAD by Tuna purse seiner fishing in Iran".

24. The WGFAD **NOTED** the spatial information presented in the paper that has not been submitted for inclusion in the IOTC catch and effort database and **REQUESTED** I.R. Iran submit this as soon as possible.

25. The WGFAD **NOTED** the FADS are 2-3m in size, made of natural materials and are monitored by vessels, however the lifespan is unknown.

26. The WGFAD also **NOTED** that the relatively low numbers of FADs used by the purse seiners of I.R. Iran is not the consequence of a precise fishing strategy but rather determined by the cost of fuel, affecting the duration and extent of fishing trips.

6. REVIEW OF THE DATA REQUIREMENTS AND INFORMATION AVAILABLE ON FAD (ANCHORED AND DRIFTING) FISHERIES AT IOTC

27. The WPM **NOTED** paper IOTC–2017–WGFAD01–14 Rev_1 remarking on the set of issues identified with the current data reporting requirements, including the following abstract provided by the Secretariat:

"IOTC Resolution 15/08 – "Procedures on a Fish Aggregating Devices (FADs) management plan, including a limitation on the number of FADs, more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species" entered in force on September 10th 2015 and among its objectives it provided details about FAD data collection and reporting requirements (in combination with IOTC Resolution 15/02 – "Mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating non-Contracting Parties (CPCs)"). Data reporting requirements were eventually captured by IOTC Form 3FA_01[2] whose purpose is to provide a convenient data reporting template for all core FAD information as per the Resolutions above. Its current structure represents a good trade-off between the complexity inherent in the nature of the information set and the need for a data reporting template that is simple and flexible enough to be efficiently adopted by CPCs. FAD data received so far by the IOTC Secretariat have been consistently provided through copies of Form 3FA_01, yet – as a consequence of the lack of formal and clear specifications about the type and nature of information to be provided through this form – the data verification and collation processes in place at the Secretariat have highlighted a number of issues common to many data providers. This document provides a first overview of the identified data reporting issues, further clarifications about the classifications adopted for FAD types and FAD visit types and suggestions for CPCs about how these classifications and the overall rationale underlying Form 3FA_01 should be adopted to ensure that the reported information is comprehensive, consistent and as accurate as possible for statistical purposes".

28. The WGFAD **NOTED** paper IOTC–2017–WGFAD01–09 which summarised the standing of a range of data and statistics received by the IOTC Secretariat in accordance with IOTC Resolution 15/02 "*Mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)*" and Resolution 15/08 "*Procedures on a fish aggregating devices (FADs) management plan, including a limitation on the number of FADs , more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species*".

29. The WGFAD **NOTED** that this is the first time the FAD data submitted to the Secretariat have been presented and provide an opportunity to review the data reporting requirements, refine these further, discuss the type of analyses that these data may be useful for and agree on methodologies to use in future.

30. The WGFAD **NOTED** that where multiple, related datasets are submitted by CPCs to the IOTC there should be consistency among these. The datasets are currently subject to a number of routine checks for consistency by the Secretariat and where issues arise, these are reviewed and discussed with the data providers. A number of issues

[2] http://www.iotc.org/sites/default/files/documents/2016/12/Form_3FA.zip

were identified with data submissions provided through form 3FA, which did not match the log school catches reported for the catch-and-effort dataset. To that end Secretariat is in ongoing communication with CPCs to rectify the issues.

31. The WGFAD **NOTED** that although these were data provided through official channels to the IOTC there appear to be some discrepancies between the data presented by the Secretariat and the data held by scientists and industry which need to be resolved, The WGFAD **AGREED** the Secretariat would liaise with representatives at the working group as well as with the data providers to rectify these and to revise the information provided in the paper accordingly, where necessary.

32. The WGFAD **NOTED** that the observer data on FADs that have been reported to the IOTC are aggregated at the level of the vessel trip, while the data submitted through form 3FA are aggregated by month and by 1°x1° grid cells, which limits the amount of cross-checking that can be done by the Secretariat and so this is best verified by individual CPCs holding the fine scale logbook and observer data.

33. The WGFAD **NOTED** that there is currently room for different interpretation in the definitions of some of the categorisations used in the FAD data submission form 3FA with regard to the FAD type and FAD visits (e.g. whether the FAD with a net category includes the use of rolled nets or deployments are only related to the first deployment and/or include replacing of FAD tracking device or re-deployment), which affect the reliability and accuracy of the results in relation to the number of active FADs estimated in the paper due to double-counting of deployments (i.e. different assumptions and interpretations will result in different estimations). Given the need for consistent nomenclature, the WGFAD **RECOMMENDED** the WPDCS and SC review and revise the categories and harmonize these, with the CECOFAD categories and definitions. In particular, the WGFAD **ADVISED** that any further revision to FAD visit types classification should allow a clear identification of the number of active FADs at the resolution required for FAD data submission to the Secretariat (one month, 1°x1° grid cells).

34. The WGFAD **NOTED** that the reported FAD data are complex and need further exploration to be able to fully interpret the results, as there may be a number of issues that affect the estimation of the number of active FADs such as the interactions between fleets (e.g. situations in which a FAD is deployed by one fleet and retrieved by another) and/or interpretation of the FAD visit definitions (deployment, retrieval, visiting, etc.) which may need to be considered. The WGFAD **RECOMMENDED** the SC discuss the methodology for the estimation of the number of active FADs at sea from the data currently submitted.

35. The WGFAD **AGREED** that with the current level of aggregation of data submissions required under form 3FA it is not possible for the Secretariat to monitor, through data submitted via the said form, whether fleets are complying with FAD limit specified in Resolution 16/01 and that indeed, according to Resolutions 15/08 and 16/01, it is direct responsibility of CPCs to ensure their compliance with CMMs.

36. The WGFAD **NOTED** the paper also provides a summary of the datasets submitted for bycatch including species such as marine turtles.

37. The WGFAD **THANKED** the Secretariat for conducting these preliminary exploratory analyses on the FAD data submitted to IOTC with the aim of initiating discussion on how the regional summary level information can best be analysed and used, and whether modifications in the type of data submitted and category definitions might be needed. However, due to the caveats and uncertainties identified in the paper, the WGFAD **AGREED** that CPCs provide consolidated datasets before any analysis and interpretation be made and presented, and that such analysis be conducted by the Secretariat in conjunction with interested scientists of the CPCs.

7. REVIEW AND ASSESSMENT OF DEVELOPMENTS IN FAD RELATED TECHNOLOGY, USE AND MITIGATION

38. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–10 which provided a review of the evolution in the adoption rate of non-entangling FAD designs in different fleets and oceans, including following abstract provided by the authors:

> *"Traditionally drifting FADs (dFADs) have been constructed with large mesh from purse seine netting to cover the raft and form most of the underwater hanging appendix. Unexpected high shark entanglement levels in dFADs were first detected in a study conducted in the Indian Ocean between 2010 and 2012. Some fleets have taken important mitigating actions to prevent "ghost fishing" since, by phasing out high entanglement risk FADs (HERFADs) and adopting non-entangling FADs (NEFADs), constructed without*

netting, and lower entanglement risk FADs (LERFADs), which have net but of small mesh (e.g. <2.5 inch) or tied up. These alternative FADs were initially designed by fishers in collaboration with scientists. The use of NEFAD have been supported by FAD entanglement-mitigating measures adopted by RMFOs like ICCAT (Rec. 16-01) and IOTC (Res.15/08), or recommendations by IATTC (C-16-01). The WCPFC has no FAD entanglement-preventive recommendations at present. This paper shows the degree of use of NEFADs and LERFADs in the Atlantic, Pacific and Indian Oceans, from information gathered during skipper workshops and purse seine vessels visits in port".

39. The WGFAD **NOTED** that while the recommendations in the paper focus on sharks, they will also benefit turtles for which entangling is also an issue.

40. **NOTING** that Resolution 15/08 provides a start date for the implementation of non-entangling FADs, but no end date, the WGFAD **RECOMMENDED** that this Resolution is revised in the near future to include a date by which non-entangling FADs should be fully implemented.

*"To reduce the entanglement of sharks, marine turtles or any other species, the design and deployment of FADs shall be based on the principles set out in **Annex III**, which will be applied gradually from 2014" (Resolution 15/08, para. 4).*

41. **NOTING** the differing levels of entanglement potential of FADs, the WGFAD **RECOMMENDED** the need for a definition of non-entangling FADs.

42. The WGFAD **NOTED** papers IOTC–2017– WGFAD01–12 and IOTC–2017– WGFAD01–11 Rev_1 which presented the main results of the Spanish Best Practices programme, including the following abstracts provided by the authors:

IOTC–2017– WGFAD01–12 *"About half of the tropical tuna caught worldwide annually is fished by purse seiners mainly using fish aggregating devices (FADs). These devices, although being a very effective fishing tool, are also controversial due to their potential impacts on the ecosystem. In order to decrease impacts and improve the long-term sustainability of the fishery, the two Spanish tuna purse seiner associations, ANABAC and OPAGAC, established in 2012 a voluntary agreement for the application of good practices for responsible tuna fishing activities. The aim of this agreement is to use best fishing practices by reducing mortality of incidental catch of sensitive species (sharks, rays, mantas, whale sharks, and sea turtles) and the use of non-entangling FADs. The good practices defined in this agreement also comprise: best releasing practices for sensitive fauna, 100% observer coverage, continuous training of fishing crew and scientific observers, and the implementation of a FAD logbook. Moreover, the system also includes a Steering Committee to review the progress and functioning of the program and continuous monitoring and data analysis by the independent scientific body AZTI. In order to monitor and assess the level of compliance of these good practices, a monitoring system was implemented, and is continuously evaluated, in all the vessels of the ANABAC and OPAGAC fleets (64 purse seiners and 23 supply vessels), including Spanish and other flags, operating globally in 4 tuna RFMOs areas (ICCAT, IOTC, WCPFC and IATTC). The monitoring is based on specifically designed forms and in-situ data recorded by trained scientific observers, and more recently, also by electronic monitoring systems. Fishing practices are assessed for each vessel every semester and results are used to provide scientific advice and identify correction mechanisms (i.e. when no-compliance is observed corrective actions are suggested to vessel owners/captains). These results also allow the Steering Committee to fine-tune the program. The Code of conduct as well as the verification mechanisms are presented and discussed in this document".*

IOTC–2017– WGFAD01–11 Rev_1 *"About half of the tropical tuna caught worldwide annually is fished by purse seiners mainly using fish aggregating devices (FADs). These devices, although being a very effective fishing tool, are also controversial due to their potential impacts on the ecosystem. Since 2012, Spanish tuna freezer organizations OPAGAC and ANABAC have and voluntary self-regulated code for responsible tuna fishing. This agreement aims to decrease impacts and improve the long-term sustainability of the tuna fishery, with particular emphasis on FAD-related issues. The code promotes best fishing practices by reducing mortality of incidental catch of sensitive species (sharks, rays, mantas, whale sharks, and sea turtles) and the use of non-entangling FADs. In addition to that, the agreement is based on the following points: 100% observer coverage, continuous training of fishing crew and scientific observers, implementation of a FAD logbook, creation of a Steering Committee and continuous monitoring and data analysis by the independent scientific body AZTI. In order to monitor and assess the level of compliance of these good practices, a system of monitoring and verification has being implemented since late 2014, and*

is continuously evaluated, in all the vessels of the ANABAC and OPAGAC fleets (64 purse seiners and 23 supply vessels), including Spanish and other flags, operating globally in 4 tuna RFMOs areas (ICCAT, IOTC, WCPFC and IATTC). The verification is based on specifically designed data-collection forms and in-situ observations recorded by trained scientific observers, and more recently, also by electronic monitoring systems (see the other document in this meeting by Lopez et al. to get details on the system of verification). Although several research institutes are involved in the program (e.g. IEO, Ocean Eye, SFA, TAAF, CSP…), AZTI is in charge of coordinating data collection and its posterior analysis by specifically developed R routines and programs. Significant results of the first two years of the Code of conduct are presented and discussed in this document". - see paper for full abstract.

43. The WGFAD **AGREED** that entanglement potential should be considered over the lifetime of the FAD as a continuous variable rather than just a point in time, given that sharks that get entangled in nets may break off and sink over time.

44. The WGFAD **NOTED** that the numbers of sharks caught are particularly low compared with previous findings which may be explained by the use of the new non-entangling FADs.

45. The WGFAD **NOTED** the presentation on good practices implemented by the Orthongel purse seine fleet in relation to FAD fishing, including the following abstract provided by the authors:

"FAD fishing is part of the activity of tropical tuna purse-seiners and FAD management can therefore not be neglected. It is the conviction of the French and Italian fleet gathered in Orthongel. Since 2010, the producer organization has contributed to improve knowledge and management of different FAD-fishing-related aspects. This has been possible through a full transparency with scientists (providing all data related to FADs and increasing to 100% the observer coverage) as well as interviews with captains. For French boat-owners and captains, management is needed because the recent accelerated use of FAD (and supplies) is threatening not only the sustainability of the exploitation and/or vulnerable species but also the economic model of the fleets which strategy is based on a balanced targeting of free and associated schools. Good practices related to FAD fishing have been initiated by the French fleet in the beginning of the 2010s. The first actions were the replacement of all DFADs by non-entangling DFADs (completed in 2012) and the identification and adoption of best practices to reduce sharks, rays and turtles incidental mortality without altering crew security conditions. Next steps led us to base the building of DFAD in workshop on land and to experiment biodegradable DFADs. After imposing on themselves a limitation of FADs, Orthongel and its member boat-owners have promoted the adoption of limits by the tuna RFMOs and consider that it is now important to improve definitions, data collection, control and compliance of measures adopted by the RFMOs".

46. The WGFAD **NOTED** paper IOTC–2017–WGFAD01–18 which presented new methods combining acceleration logger and acoustic pinger data to measure fine scale movement of tunas associated with FADs, including following abstract provided by the authors:

"Mitigating small tuna by-catch in FADs fishery is an urgent task for sustainable fishery. Developing practical method for mitigating by-catch, the knowledge on the reaction of fish he fishing gear (FAD, net) is necessary. New "Hybrid fish tracking method", which is combination of dead reckoning and acoustic telemetry, was introduced and tested in the FAD fishing site. Out of ten occasions that we tagged tunas with package of data logger and pinger4 fishes were successfully recaptured. As the results showed fine scale trajectory of tuna, the new method is considered to be good tool for understanding tuna behaviour around FAD and net".

47. The WGFAD **NOTED** the large size of the tracking device which may impact fish behaviour as well as developments being done in modifying the device to reduce the size and weight.

8. NEW RESEARCH ON FAD FISHERIES AND ASSOCIATED IMPACTS

48. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–13 which described the development of abundance indices of tropical tunas in the Indian Ocean derived from buoy datasets, including the following summary provided by the authors:

"One of the most important technological developments that have been recently introduced by the purse seine fleet fishing with FADs are the satellite linked echo-sounder buoys. Their generalized use is causing rapid changes in the fishing strategy and fleet behavior (Lopez et al., 2015), as they continuously provide fishers with near real-time information about the accurate geolocation of the FADs and the presence and abundance of tuna aggregations underneath. Consequently, search time (i.e., the time devoted to the searching of tuna

concentrations), the metric traditionally used to reflect nominal effort, is no longer useful. Those changes in fishing strategies and technology make it difficult to evaluate the effective effort of the purse seine fisheries and have therefore hindered the reliable estimation of standardized purse seine CPUE indices (Gaertner et al., 2016). However, echo-sounder buoys have also the potential of being a privileged observation platform to estimate abundances of tunas and accompanying species using fishery independent data (Dagorn et al., 2006; Moreno et al., 2015, Lopez et al., 2013). In a recent work Santiago et al. (2016) discussed methodologies to use the acoustic records of the echo-sounder Buoys of the FADs as a potential source of fishery independent indices of abundance of tropical tunas. Following their approach, this document presents some preliminary results of an overall index of abundance of tropical tunas in the Indian Ocean from 2013 to 2015. This potential source of information may be used by scientist in future stock assessments".

49. The WGFAD **ACKNOWLEDGED** this preliminary study describes a potential method for estimating tropical tuna population abundance indices.

    The WGFAD **NOTED** that while this preliminary study was used for a mixed species group, developments in the capability of buoys to distinguish between yellowfin, bigeye and skipjack are progressing which can be used in future to develop a species-specific indices of abundance. An alternative might be to use species composition data from a different source such as port sampling linked-back to specific FAD sets, however, the potential limitations of this approach were also discussed.

50. The WGFAD **NOTED** the importance of velocity of the water mass in explaining the abundance of the school of fish given the strong interaction between the currents and tuna associated with FADs and further **NOTED** that the density of other FADs that might also be a factor be affecting abundance.

51. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–17 on the size selectivity of tuna purse seine nets estimated from FAD datasets, including the following abstract provided by the authors:

    "Mitigating small tuna by-catch in FADs fishery is an urgent task for sustainable fishery. Although using large mesh net might reduce small tuna catch, its impact is unknown as very few studies has been done on the size selectivity of purse seine nets. To obtain quantitative information on the size selectivity we compared the catch composition from two different mesh size nets. The catch of small mesh showed more catch of smaller fish of 25-35cm FL. The result suggests possible escape of small fish from large mesh openings."

52. The WGFAD **NOTED** that this study attempted to identify means to reduce catches of small bigeye tuna bycatch in FAD sets.

53. The WGFAD **NOTED** that small fish should not be negatively affected through escapement with larger mesh sizes, however, there is no information on post-escape survival level of small tuna escaping the net.

54. The WGFAD **NOTED** that both mesh sizes used in the trials were still relatively small and that trials with larger mesh sizes could be conducted in future.

55. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–08 Rev_1 on the potential environmental impacts caused by beaching of drifting FADs, including the following abstract provided by the authors:

    "*Drifting fish aggregating devices (dFADs) are widely used in tropical tuna purse seine fisheries to aggregate fish and make them easier to catch. The use of dFADs has been associated with a number of potential positive and negative impacts, touching on a range of ecological, economic and social issues. One negative environmental impact of dFADs is that they have the potential to wash ashore and become grounded or beached, potentially causing damage to marine habitats. However, other than anecdotal reports, this issue has received very little research attention to date. The lack of research on this topic means that the problem of beaching dFADs is not well defined, with the risk of beaching events mostly assumed and the extent and severity of impacts uncertain. The aim of this paper is to better characterise the potential problem of beaching dFADs. We examine the potential for dFAD beaching events to occur, which is determined by location of deployment, dispersal patterns, extent of efforts to prevent beaching events from occurring and, to a lesser extent, dFAD design. This discussion is illustrated with a case study examining the spatio-temporal dynamics of dFAD trajectories in the Indian Ocean and estimating the frequency of dFAD beaching events on coral reefs. The potential environmental impacts of beached dFADs are reviewed by looking at wider literature on other abandoned, lost, or otherwise discarded fishing gear, and we offer some thoughts on the classification of dFADs as marine pollution. Finally, we critically discuss a number of possible ways to reduce the number of dFAD beaching events on sensitive marine habitats. This includes regulatory measures, which would be applied by the tropical tuna Regional Fisheries Management Organisations or coastal and island state governments and advances in dFAD design, which would likely come from collaboration between fishing companies, researchers and NGOs/non-profit partnerships. Possible measures include reducing the overall number of dFADs in the water, i.e. though deployment limits, fee structures and reduced fleet capacity, or a localised reduction of dFAD deployments in sensitive areas; reduced lifetime of dFADs, through use of*

entirely bio-degradable materials; and the prevention of dFADs entering areas with sensitive habitats, through recovery initiatives (at sea and inshore) and innovative dFAD design".

56. The WGFAD **NOTED** that alternative dispersal models might be considered to simulate FAD trajectories at fine scales, particularly for shallow areas where currents patterns may be complex. The WGFAD **ENCOURAGED** the authors to consider this in future research using similar simulation-based approaches.

57. The WGFAD **NOTED** that while limits on monitoring and purchasing buoys are applied in the IOTC Area of Competence, it is not clear to what extent these limits restrict the annual number of FADs deployed in the water, due to the use of remnant buoys purchased in the previous year provided that the lifespan is longer than a year.

58. The WGFAD **NOTED** that traditional FADs with nets used in the past were more destructive than newer FADs that use ropes instead of nets when beaching.

59. The WGFAD **NOTED** the comment made by a participant from the Republic of Mauritius referring to the position of the Government of Mauritius on the Chagos Archipelago, including Diego Garcia. According to this position, the Government of Mauritius does not recognize the "British Indian Ocean Territory" ("BIOT") as noted by the participant when he objected to the denomination used in paper IOTC–2017– WGFAD01–08 Rev_1.

60. The WGFAD **NOTED** the concern of the participant, and the UK's position as articulated in Appendix V of IOTC-2016-S20-R[E], however, considering the technical nature of this meeting the WGFAD **AGREED** that it was not the appropriate forum to discuss issues of this nature.

9. THE POTENTIAL FOR FAD MANAGEMENT PLANS

9.1 Monitoring FADs to comply with Resolution 16/01

61. The WGFAD **NOTED** paper IOTC–2017– WGFAD01–07 on monitoring the number of active FADs used by the Spanish purse seine fleets in the IOTC Area of Competence and the ICCAT Convention Area, including the following abstract provided by the authors:

"The purse seine vessels of the Spanish ANABAC and OPAGAC fleet owners organizations agreed in late 2014 to freeze the number of DFADs by 1st of January 2016. According to that agreement, each purse seine vessel could use simultaneously a maximum of 550 Drifting Fishing Aggregating Devices (dFADs) at any time of the year. This limit to be evaluated through the number of active instrumented buoys, which implicitly established the prohibition of the use of DFADs without buoys. This voluntary agreement also established that the verification of the volume of the daily active beacons used by each purse seiner would be carried out by the independent scientific body AZTI and sanctions were also included in the agreement. Furthermore, in 2015 IOTC adopted the Resolution 15-08 Procedures on a Fish Aggregating Devices (FADs Management Plan that sets the maximum number of instrumented buoys active and followed by any purse seine vessels at 550 at any one time (and 1100 acquired purchased annually). In 2016, Resolution 16-01 on interim plan for rebuilding the Indian Ocean Yellowfin tuna stock in the IOTC area of competence decreased the limit to no more than 425 daily active instrumented buoys per purse seine vessel (and 850 purchased annually)".
– see paper for full abstract.

62. The WGFAD **NOTED** that while buoys may be deactivated and reactivated, under the verification of the FAD limits described in the paper they could only be reactivated once the buoy is recovered and returned to port and, hence, this should not increase the effective number of active buoys used by the fleet.

63. The WGFAD also **NOTED** the extent and completeness of the verification method, including information provided by buoy manufacturers and a unique identifier that is assigned to the buoy in association with a single purse seine vessel. Furthermore, the WGFAD **ACKNOWLEDGED** the implementation of additional control measures that include random on-board checking at port and cross-checking of buoy first activation events with VMS data.

10. RESEARCH PLANS RELATED TO FAD FISHERIES IN THE INDIAN OCEAN

64. The WGFAD **AGREED** that the key areas for future research on FADs include, but are not limited to, the further development of abundance indices using buoy echo-sounder integrated biomass signals, the harmonization of terminology in relation to FADs, and the potential effects of FADs grounded or beached in sensitive coastal areas.

11. OTHER BUSINESS

65. The WGFAD **THANKED** the co-Chairpersons, Dr Ahmed Almazrui (Oman, Chair of the Commission) and Dr Hilario Murua (EU,Spain, Chair of the Scientific Committee) for their joint Chairmanship of the working group meeting.

66. **NOTING** the joint tRFMO working group meeting taking place directly after the IOTC working group meeting, the WGFAD **RECOMMENDED** the SC and Commission consider if and when it will be appropriate to hold the second meeting for the IOTC.

11.1 Preliminary review of the draft, and adoption of the Report of the ad hoc Working Group on FADs

67. The WGFAD **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WGFAD01, provided in Appendix IV.

68. The report of the ad hoc Working Group on FADs (IOTC–2017-WGFAD01–R) was **ADOPTED** by correspondence on 28 April 2017.

APPENDIX I
LIST OF PARTICIPANTS

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APPENDIX II
AGENDA FOR THE AD HOC WORKING GROUP ON FADS

Date: 18 April 2017
Location: Madrid
Venue: ICCAT Secretariat meeting room
Time: 09:00 – 17:00
Chairpersons: Dr Hilario Murua and Dr Ahmed Almazrui

1. **OPENING OF THE SESSION** (Chairpersons)
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chairpersons)
3. **DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE AD HOC WORKING GROUP ON FADs** (IOTC Secretariat)

3.1 Resolution 15/09 – Terms of Reference
3.2 Outcomes of the 20th Session of the Commission and previous decisions of the Commission in relation to FADs

4. **DESCRIPTION OF FAD FISHERIES IN IOTC** (CPCs)
5. **REVIEW OF THE DATA REQUIREMENTS AND INFORMATION AVAILABLE ON FAD (ANCHORED AND DRIFTING) FISHERIES AT IOTC** (Secretariat/CPCs)
6. **REVIEW AND ASSESSMENT OF DEVELOPMENTS IN FAD RELATED TECHNOLOGY, USE AND MITIGATION** (All)
7. **NEW RESEARCH ON FAD FISHERIES AND ASSOCIATED IMPACTS**
8. **THE POTENTIAL FOR FAD MANAGEMENT PLANS** (All)

8.1 Monitoring FADs to comply with Resolution 16/01

9. **RESEARCH PLANS RELATED TO FAD FISHERIES IN THE INDIAN OCEAN** (All)
10. **OTHER BUSINESS** (Chairpersons)

10.1 Preliminary review of the draft, and adoption of the Report of the ad hoc Working Group on FADs (Chairpersons)

APPENDIX III
LIST OF DOCUMENTS

Document	Title	Availability
IOTC–2017–WGFAD01–01a	Draft: Agenda of the 1st ad hoc Working Group on FADs	✓ (6 March)
IOTC–2017–WGFAD01–01b	Annotated agenda of the 1st ad hoc Working Group on FADs	✓ (21 March)
IOTC–2017–WGFAD01–02	List of documents of the 1st ad hoc Working Group on FADs	✓ (21 March)
IOTC–2017–WGFAD01–03	IOTC Resolution 15/09	✓ (31 March)
IOTC–2017–WGFAD01–04	Decisions of the Commission related to FADs (IOTC Secretariat)	✓ (31 March)
IOTC–2017–WGFAD01–05	Use of FADs by the Mauritian purse seiners. (S. Bauljeewon)	✓ (3 April)
IOTC–2017–WGFAD01–06 Rev_1	The use of Traditional FADs in Thai Fisheries and the Review of its Possibility to Apply in IOTC area (S. Yawanopas)	✓ (3 April) ✓ (6 April)
IOTC–2017–WGFAD01–07	Monitoring the number of active FADs used by the Spanish and associated purse seine fleet in the IOTC and ICCAT Convention areas. (J. Santiago et al.)	✓ (17 April)
IOTC–2017–WGFAD01–08 Rev_1	Potential environmental impacts caused by beaching of drifting fish aggregating devices and identification of management uncertainties and data needs (T. Davies)	✓ (31 March) ✓ (4 April)
IOTC–2017–WGFAD01–09 Rev1	Summary of regional information available on FADs for the IOTC (IOTC Secretariat)	✓ (4 April)
IOTC–2017–WGFAD01–10	Adoption levels of entanglement-reducing FAD designs by tuna purse seine fleets in different oceans (J. Murua et al.)	✓ (17 April)
IOTC–2017–WGFAD01–11 Rev_1	Main results of the Spanish Best Practices program: evolution of the use of Non-entangling FADs, interaction with entangled animals, and fauna release operations (Lopez et al.)	✓ (11 April)
IOTC–2017–WGFAD01–12	Taking another step forward: system of verification of the code of good practices in the Spanish tropical tuna purse seine fleet operating in the Atlantic, Indian and Pacific Oceans (Lopez et al.)	✓ (7 April)
IOTC–2017–WGFAD01–13	Buoy derived Abundance Indices of tropical tunas in the Indian Ocean (J. Santiago et al.)	✓ (17 April)
IOTC–2017–WGFAD01–14 Rev1	Remarks on issues identified with the current data reporting requirements (IOTC Secretariat)	✓ (31 March)
IOTC–2017–WGFAD01–15	Spanish FAD logbook: solving past issues, responding to new global requirements (Ramos et al.)	✓ (17 April)
IOTC–2017–WGFAD01–16	Information gap on FADs management measures implementation in Indonesian Indian Ocean waters (Widodo, A.A., Wudianto, Proctor, C., Satria, Mahiswara, Natsie, M., Sedana, G.B., Hargiyatno, I and Cooper, S.)	✓ (28 March)
IOTC–2017–WGFAD01–17	Size selectivity of tuna purse seine nets estimated from FAD sets data (Oshima)	✓ (11 April)
IOTC–2017–WGFAD01–18	New method which combines acceleration logger and acoustic pinger to measure fine scale movement of tuna associated with FADs (Oshima)	✓ (11 April)
IOTC–2017–WGFAD01–19	Review of FAD utilization by Tuna purse seiner in Iran (G. Moradi)	✓ (7 April)

Document	Title	Availability
IOTC–2017–WGFAD01–DATA01	Collated information on FAD fisheries submitted to IOTC	✓ (4 April)

APPENDIX IV
CONSOLIDATED RECOMMENDATIONS OF THE AD HOC WORKING GROUP ON FADS

1. (Para. 33) The WGFAD **NOTED** that there is currently room for different interpretation in the definitions of some of the categorisations used in the FAD data submission form 3FA with regard to the FAD type and FAD visits (e.g. whether the FAD with a net category includes the use of rolled nets or deployments are only related to the first deployment and/or include replacing of FAD tracking device or re-deployment), which affect the reliability and accuracy of the results in relation to the number of active FADs estimated in the paper due to double-counting of deployments (i.e. different assumptions and interpretations will result in different estimations). Given the need for consistent nomenclature, the WGFAD **RECOMMENDED** the WPDCS and SC review and revise the categories and harmonize these with the CECOFAD categories and definitions. In particular, the WGFAD **ADVISED** that any further revision to FAD visit types classification should allow a clear identification of the number of active FADs at the resolution required for FAD data submission to the Secretariat (one month, 1°x1° grid cells).
2. (Para. 34) The WGFAD **NOTED** that the reported FAD data are complex and need further exploration to be able to fully interpret the results, as there may be a number of issues that affect the estimation of the number of active FADs such as the interactions between fleets (e.g. situations in which a FAD is deployed by one fleet and retrieved by another) and/or interpretation of the FAD visit definitions (deployment, retrieval, visiting, etc.) which may need to be considered. The WGFAD **RECOMMENDED** the SC discuss the methodology for the estimation of the number of active FADs at sea from the data currently submitted.
3. (Para. 40) **NOTING** that Resolution 15/08 provides a start date for the implementation of non-entangling FADs, but no end date, the WGFAD **RECOMMENDED** that this Resolution is revised in the near future to include a date by which non-entangling FADs should be fully implemented.

   *"To reduce the entanglement of sharks, marine turtles or any other species, the design and deployment of FADs shall be based on the principles set out in **Annex III**, which will be applied gradually from 2014" (Resolution 15/08, para. 4).*

5. (Para. 41) **NOTING** the differing levels of entanglement potential of FADs, the WGFAD **RECOMMENDED** the need for a definition of non-entangling FADs.
6. (Para. 67) **NOTING** the joint tRFMO working group meeting taking place directly after the IOTC working group meeting, the WGFAD **RECOMMENDED** the SC and Commission consider if and when it will be appropriate to hold the second meeting for the IOTC.
7. (Para. 68) The WGFAD **RECOMMENDED** that the Scientific Committee consider the consolidated set of recommendations arising from WGFAD01, provided at Appendix IV.