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## **WESTERN CENTRAL ATLANTIC FISHERY COMMISSION**

**Report of the**

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### **FIRMS-WECAFC REGIONAL WORKSHOP ON RECREATIONAL FISHERIES STATISTICS IN THE CARIBBEAN**

**The Commonwealth of the Bahamas, 20–22 June 2017**



*Cover photo:* Courtesy of Captain Stuart Simpson (2016)

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Report of the  
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The Commonwealth of the Bahamas, 20–22 June 2017

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
Subregional Office for the Caribbean  
Bridgetown, 2018

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## **PREPARATION OF THIS DOCUMENT**

This is the report of the FIRMS-WECAFC regional workshop on recreational fisheries statistics in the Caribbean, organized by the Food and Agriculture Organization of the United Nations (FAO) and held in Nassau, the Commonwealth of the Bahamas from 20 to 22 June 2017.

The Recreational Fisheries Statistics workshop was hosted by the Government of the Commonwealth of the Bahamas and moderated by Mr Roy Bealey, Coordinator of the Caribbean Billfish Project (CBP), and Mr Raymon van Anrooy, Secretary of the Western Central Atlantic Fishery Commission (WECAFC). Technical coordination and facilitation for the workshop was provided by Mr Yann Laurent, Fisheries Information System Expert (FIAS). Administrative and logistical support was provided by CBP and WECAFC, and coordinated by Mrs Luisan Rogers, Liaison Assistant for the CBP.

The workshop was made possible thanks to financial support from the Global Environment Facility (GEF)-funded, World Bank-implemented project, P128437: Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (ABNJ). This report contains a summary of the presentations, discussions, and conclusions of the workshop.

**FAO Western Central Atlantic Fishery Commission. 2018.**

*Report of the FIRMS-WECAFC regional workshop on recreational fisheries statistics in the Caribbean. Nassau, The Commonwealth of the Bahamas, 20–22 June 2017.*

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#### **ABSTRACT**

The WECAFC-FIRMS regional workshop on Recreational Fisheries Statistics in the Caribbean was supported by the Caribbean Billfish Project, which is a component of the GEF-funded, World Bank-implemented, Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (ABNJ) Project, and is being executed by the WECAFC Secretariat at the Subregional Office for the Caribbean of the Food and Agriculture Organization of the United Nations (FAO). The Ministry of Agriculture and Marine Resources of the Bahamas Government kindly hosted this workshop, which was held at the Bahamas Agricultural Industrial Corporation (BAIC).

There is a need to develop recreational fisheries data collection and fishery statistics capacities in the Caribbean. Improving nations' abilities to inform the sustainable management of valuable fish stocks, through robust data analyses, will yield socio-economic dividends for current and future citizens. The Caribbean Billfish Project seeks to improve regional recreational fishery data collection and analysis capacities in order to inform the ongoing improvements to the management of billfish and other stocks at national and regional levels.

The workshop brought together 38 representatives from 13 Caribbean countries and overseas territories' fisheries departments, regional fisheries bodies, fisheries technical advisory institutions, non-governmental organizations, various fishery statistics specialists and other relevant stakeholders. Participants' knowledge of regional fishery data challenges and their capacities to address these challenges effectively were developed over the course of the workshop.

Within the Caribbean, recreational fisheries currently represent a largely untapped resource for valuable data capture. This fishery subsector is very capable of providing invaluable data to genuinely inform effective fisheries management. However, national fishery authorities tend to either not recognize the opportunity, or struggle to engage effectively with this fishery sector for data capture. This workshop emphasized the opportunities at hand for citizen science, holistic fisheries data capture and management, and described effective data collection and analysis methodologies from other regions. Participants then prioritized the regional data collection needs collectively, from both recreational and artisanal fleets, and agreed on technicalities for digital data systems applications – including the use of SmartForms, a pilot version of which is expected to be implemented during the Caribbean Billfish Project.

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## ABBREVIATIONS AND ACRONYMS

ABNJ	Areas Beyond National Jurisdiction
ASFIS	Aquatic Sciences and Fisheries Information System
BAIC	Bahamas Agriculture Industrial Corporation
BFMIS	Billfish Fisheries Management Information System
CBMC	Consortium on Billfish Management and Conservation
CBP	Caribbean Billfish Project
CC4Fish	Climate Change Adaptation in the Eastern Caribbean Fisheries Sector Project
CFMC	Caribbean Fishery Management Council
CLME+	Caribbean and North Brazil shelf Large Marine Ecosystem
COP21	21 <sup>st</sup> Conference of Parties
CPUE	catch per unit of effort
CRFM	Caribbean Regional Fisheries Mechanism
CWP	Coordinating Working Party on Fishery Statistics
DEVCO	Directorate-General for International Cooperation and Development
FAD	fish aggregating device
FAO	Food and Agriculture Organization
FIRMS	Fisheries and Resources Monitoring System
FMIS	Fisheries Management Information System
GAFA	Google, Apple, Facebook, Amazon
GEF	Global Environmental Facility
ICCAT	International Commission for the Conservation of Atlantic Tunas
IGFA	International Game Fish Association
IUU	illegal unreported and unregulated
JICA	Japan International Cooperation Agency
NOAA	National Oceanic and Atmospheric Administration
MRIP	Marine Recreational Information Program
NGO	non-governmental organization
ODK	Open Data Kit
OSPESCA	Organización del Sector Pesquero y Acuícola del Istmo Centroamericano (Central American Fisheries and Aquaculture Organization)
RIP	Regional Indicative Programme
RFMO	regional fisheries management organization
SDG	Sustainable Development Goal
SEPEC	Sistema del Servicio Estadístico Pesquero Colombiano (Colombian Fisheries Statistical Service Information System)
TNC	The Nature Conservancy
t-RFMO	tuna Regional Fisheries Management Organization
UN	United Nations
USD	United States Dollar
VME	vulnerable marine ecosystem
WECAFC	Western Central Atlantic Fishery Commission



## INTRODUCTION

1. The FIRMS-WECAFC regional workshop on recreational fisheries statistics in the Caribbean, of the FAO/Caribbean Billfish Project (CBP - GCP/SLC/001/WBK), was held in Nassau, the Commonwealth of the Bahamas, 20–22 June 2017. This workshop was the 6th meeting of the joint WECAFC/CRFM/OSPESCA/CFMC Working Group on Recreational Fisheries. This meeting brought together 38 representatives from 13 Member Countries and overseas territories, partner organizations and other key stakeholders involved in the delivery of the project, and ensured a common understanding of the project's objectives, inputs, outputs, planned activities and outcomes, as well as the roles and responsibilities of all project partners.
2. The objective of the CBP is to develop business plans for one or more long-term pilot projects aimed at the sustainable management and conservation of billfish within the Western Central Atlantic Ocean region. Completed business plans will incorporate the economic, technical and environmental rationale required to attract investment involving private and public capital.
3. The Caribbean Billfish Project comprises four overarching components:
  - i. generating value and conservation outcomes through innovative management;
  - ii. strengthening regional billfish management and conservation planning;
  - iii. a functional and responsive Consortium on Billfish Management and Conservation (CBMC);
  - iv. business plans developed for pilot investments in sustainable management and conservation of billfish.
4. The Caribbean Billfish Project was formally endorsed by the World Bank in February 2015. The project is a component of the Global Environment Facility (GEF)-funded, World Bank-implemented Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (Areas Beyond National Jurisdiction - ABNJ) Project.
5. The principal objectives of this workshop on Recreational Fisheries Statistics were:
  - i. to review the data collection strategies and methodologies currently in use for recreational fisheries;
  - ii. to outline best practices and define minimum data requirements for the recreational fisheries of Caribbean nations;
  - iii. to finalize an agreed format and input sequence for prioritized data capture through the developing SmartForms software;
  - iv. to develop agreed policies and standardized processes for the collection, analysis and use of the Caribbean recreational fisheries data held within a centralized regional database;
  - v. to improve the capacity of participants to implement modern data collection programmes for recreational fisheries effectively;
  - vi. to investigate opportunities in the SmartForms template in order to collect comparable data effectively from other fisheries that capture billfish species, and explore potential feedback mechanisms.
6. Expected outputs included:
  - an agreed strategy for recreational fishery data collection, to improve the accuracy of billfish stock assessments and investigations of the influences that Fish Aggregating Device or FADs have upon CPUE indices;

- a customized SmartForms template, developed in-workshop, structured to effectively address data concerns that hinder effective billfish stock assessments at the regional and ICCAT (International Commission for the Conservation of Atlantic Tunas) levels, and technically endorsed for regional use;
- an agreed strategy (at the technical level) for data storage and use, which will benefit from FAO capacities, developed to streamline the provision of scientific knowledge about the current stock status, as well as the harvest rates of highly migratory pelagic fishes, thereby informing regional fisheries management;
- an implementation strategy outlined for the regional promotion of data collection through the developed SmartForms application.

### **OPENING OF THE MEETING**

7. The meeting was hosted by the government of the Commonwealth of the Bahamas, at the Bahamas Agriculture Industrial Corporation (BAIC) premises. Opening remarks were delivered by Mrs Rena Glinton, Permanent Secretary of Agriculture and Marine Resources on behalf of the Hon. Renward Wells, M.P., Minister of Agriculture and Marine Resources. Welcoming remarks were then delivered by Mr Raymon van Anrooy on behalf of FAO/WECAFC.

### **ATTENDANCE**

8. Representatives of the following States attended the meeting: Antigua and Barbuda, the Bahamas, Barbados, Colombia, Costa Rica, Cuba, Dominica, Guyana, Nicaragua, Panama, Saint Kitts and Nevis, Saint Lucia and the United States of America. Representatives of the following organizations were present: Caribbean Fishery Management Council (CFMC), Caribbean Regional Fisheries Mechanism (CRFM), Organización del Sector Pesquero y Acuícola del Istmo Central Americano (OSPESCA), Conservation International, The Nature Conservancy (TNC), the University of Miami and WECAFC/FAO. A list of all participants and observers can be found in Appendix 1.

### **ELECTION OF CHAIRPERSONS AND RAPORTEURS**

9. The workshop consisted of various technical sessions and an overall chairperson was therefore not formally selected. However, Mr Edison Deleveaux, Acting director of the Bahamas Department of Marine Resources, acted as Chairperson during the plenary sessions. Mr Yann Laurent acted a rapporteur, supported by Mr Roy Bealey.

### **PROJECT BACKGROUND**

10. Mr Raymon van Anrooy presented the background of the Caribbean Billfish Project. He started with an introduction of the Western Central Atlantic Fishery Commission (WECAFC), describing its mandate, the area it covered and its membership. He highlighted the declining trend in landings noted within Area 31 (Western Central Atlantic) from 1985 to now. The total fish landings per year declined in that period from 2.5 million tonnes per year in the mid-1980s to around 1.4 million tonnes in recent years. He added that Area 31 is one of the top five most overexploited fisheries regions in the world. He explained that the Caribbean Billfish Project was developed as a response to the reduction in billfish (marlins, sailfish and spearfish) stocks in the Caribbean and broader Western Central Atlantic Ocean. He also provided additional information regarding the general status of this region's fish stocks, and the trends noted in various Caribbean fisheries.
11. The Caribbean Billfish Project was developed by the joint WECAFC/CRFM/OSPESCA/CFMC Working Group on Recreational Fisheries during the 2012–2014 period, through various participatory workshops. The project was endorsed by the 15th Session of WECAFC in 2014 and approved by the World Bank in early 2015.

12. The Caribbean Billfish Project (CBP) is a component of the GEF-funded, World Bank-implemented project, P128437: Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (ABNJ) (GCP/SLC/001/WBK). The recipient countries are the members of WECAFC. The starting date was 23 February 2015 and the project will end on 31 December 2018. The total project budget is USD 1 949 220.
13. The overall project's long-term goal is to, "recapture lost wealth and contribute to sustainable livelihoods in the Western Central Atlantic region through investment in economically, technically and ecologically feasible billfish fisheries management and conservation". The specific objective is, "to develop business plans for one or more long-term pilot projects aimed at the sustainable management and conservation of billfish within the Western Central Atlantic Ocean".
14. Mr van Anrooy gave information on: the project context; its work at the regional level to prepare a Regional Billfish Management and Conservation Plan for review and endorsement by CRFM, OSPESCA, WECAFC and ICCAT in 2018; various regional capacity-building sessions held by the project; and he gave an overview of the studies conducted by the project so far.
15. He stated that this regional workshop was expected to contribute to achieving Project Result 3.2: "A regional billfish management information system established by the Consortium on Billfish Management and Conservation (CBMC) and hosted at the WECAFC Secretariat". The workshop would specifically address project activity 3.2.2 and support the other activities under project result 3.2, as follows:
  - 3.2.1: Draft a recreational fisheries data collection scheme, including information forms, for annual reporting by states to FAO for testing in the WECAFC region.
  - 3.2.2: Organize a regional capacity building workshop on recreational fisheries data collection, with emphasis on billfish catch and landings data, information collection and analysis.
  - 3.2.3: Establish a regional fisheries management information system (FMIS) for billfishes, in support of regional management plan implementation and the pilot projects.
  - 3.2.4: Collect, analyse and disseminate billfish management information, using FAO systems and collaborative protocols with partners.
16. The objectives for the workshop and its expected outputs were presented and agreed upon.

## **ADOPTION OF THE AGENDA**

17. Mr van Anrooy presented the draft agenda for the regional workshop, which was endorsed by participants as presented. The Agenda is included as Appendix 2.

## **DEFINITION OF RECREATIONAL FISHERIES**

18. Following the presentation some delegates asked how FAO defines recreational fisheries; according to the FAO Technical Guide 13 on recreational fisheries, the practice is defined as: fishing of aquatic animals (mainly fish) that do not constitute the individual's primary resource to meet basic nutritional needs and are not generally sold or otherwise traded on export, domestic or black markets.<sup>1</sup>

## **DAY 1 PRESENTATIONS: EXAMPLES OF RECREATIONAL FISHERIES MONITORING**

Data collection in the context of recreational fisheries: the motivations, challenges, and modalities that encourage the provision of information from this diverse sector

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<sup>1</sup> See <http://www.fao.org/docrep/016/i2708e/i2708e00.pdf>

19. Throughout this presentation, Mr Roy Bealey explained the intricacies of capturing data from the diverse stakeholders involved in recreational fishing activities. Recreational fishers do not share the same fishing motivations as their commercial fishery counterparts; this requires a different approach for successful data collection as a result. The following points were used to explain the Caribbean context within which recreational fisheries tend to operate at the present time:
- a larger number of Small Island Developing States (SIDS) with tangible terrestrial issues that are generally prioritized – whereas sometimes 98 percent of the country’s territory can be marine area;
  - ongoing fishery capacity development is shifting towards pelagic species and Fish Aggregating Devices (FADs), following overfishing of nearshore areas;
  - billfish species are the primary recreational fishery attraction in the region, and have huge value to the recreational sector;
  - there is a general lack of data available to inform and support fishery management decisions (this is the case Atlantic-wide for billfish);
  - “bycatch” is used as a convenient label by commercial fishers that catch billfish, yet it does not always appear to be the reality. As an example, sailfish represent up to 23 percent of catch in some commercial Caribbean fisheries as a result of directed seasonal targeting: these targeted harvests are considered unsustainable and have dire and direct negative consequences for both recreational and artisanal fisheries.
20. These factors have contributed to an ongoing and intensifying “race to fish” among the multiple fishery sectors that capture billfish species. This “tragedy of the commons” scenario is becoming increasingly prevalent among fisheries worldwide, and does not encourage sustainable actions among fishers. Participation and value estimates for recreational fisheries were then presented, before the diversity of stakeholders partaking in recreational fishing – and their equally diverse motivations for participation – were illustrated and explained. Recreational fishers’ interest in data to improve their catches was then presented in context, with data comparisons which were of interest to this sector; it was also noted that some recreational fishers already keep private data records.
21. Some suggestions to promote effective data capture were then proposed with an emphasis upon data privacy controls, selecting interested and core groups to work with in this very diverse sector and building trust through an appropriate use of gathered data. The overarching need is to ensure the sustainability of stocks through consideration of all fishery sectors’ harvest rates; maximizing convenience for stakeholders to provide the data was also noted as vital to consistent reporting. Recreational fishers tend to appreciate the environment in which they conduct their sport enormously, and some of their target species differ from those of commercial fisheries. Others are greatly influenced by commercial fishing harvests, and recreational fishers are typically eager and willing to assist the sustainable management of fish stocks, if offered an appropriate and effective avenue to do so.
22. A discussion followed, with a discussion on different aspects related to data collection: the legal frameworks which vary from one country to the next, some with no legal provisions for any type of fisheries (e.g. the Bahamas); the importance of fishing tournaments as a source of data; the eagerness of anglers to analyse their own catch statistics; and the need for the ongoing promotion of catch-and-release to anglers. A video was then played to round off the discussion, illustrating recreational fishery activities and promoting catch-and-release.

An overview of citizen science initiatives and the power of data available through recreational fisheries

23. Mr Roy Bealey illustrated some case study examples of recreational fishers, and other users of the aquatic environment, conducting research initiatives that serve to protect the resources supporting their activities. The following definitions of citizen science were provided for primary context:

- a form of collaboration where members of the public participate in scientific research to address real-world problems;
  - the collection and analysis of data relating to the natural world by members of the general public, typically as part of a collaborative project with professional scientists.
24. Some example initiatives were then described, including participation in surveys and other data collections, fish tagging studies, genetics and tissue sampling, hard structure provisions for fish ageing studies, the removal of invasive species, environmental lobbying, and photo provisions for the identifications of marine megafauna such as sharks and whales. The presentation emphasized that effective collaboration can hugely improve the cost-effectiveness of research and even make research that would have been prohibitively expensive to conduct possible.
25. Some examples of results were provided to illustrate the longevity and research significance of effective citizen science initiatives conducted in other regions. It was emphasized that developing trust while seeking genuinely win-win outcomes was key to the successes achieved, and that recreational fishers can be a powerful force for informing fisheries management under the correct circumstances. The importance of effective and regular feedback, of interest to the stakeholders, was also highlighted, in order to ensure lasting buy-in to such initiatives.

#### Sources of bias within data collected from recreational fisheries: implications and resolution options

26. Mr Roy Bealey presented key considerations for proactively avoiding potential data biases that are relevant to recreational fisheries data collection. Recreational fisheries can provide a comparative means of collecting data that is less likely to be influenced by perverse commercial or political interests, but data collection from recreational fisheries can also present its own complications; largely due to the following identified factors:
- inconsistent fisher numbers, techniques, locations, target species, skill levels, fishing frequencies;
  - seasonal influences according to weather patterns, migrations of target species, tourism seasons etc.;
  - size estimates for released fishes can be biased – typically upwards;
  - inconvenient data capture and poor feedback will cause under- or false reporting;
  - Fish Aggregating Devices (FADs) influence the catchability of pelagic species, and they are becoming an increasingly prevalent concern worldwide, including in recreational fisheries.
27. To address the first complication, it was suggested that data be sought primarily from pelagic charter fishing skippers for the following reasons:
- they target a limited number of pelagic species that are also typically of commercial interest;
  - they are skilled and equipped more evenly than the full spectrum of recreational anglers;
  - they fish more consistently over time than others in the recreational fishing sector;
  - their livelihoods depend more directly on healthy fish stocks than many other purely recreational fishers; they therefore have a core financial interest in maintaining stock sustainability;
  - they use relatively standardized techniques within the sector's diverse context.
28. With regard to seasonal influences on catch, the presentation emphasized that knowledge of the fishery is important when interpreting data, which should not be overly “stretched” for results during analysis by making too many assumptions. Knowing the seasons in which recreational fishers target different species, potentially using different gears or techniques, can provide vital

context to data analyses and thus avoid misguided conclusions. Comparisons with parallel commercial fishery data is another important means of verifying and cross-referencing findings.

29. To minimize the likely influences of size estimate inaccuracies – which are particularly pertinent to released billfish – it was suggested that charter skippers should report catch separately from their clients, and estimates should also be recorded prior to the actual weighing of landed fish. Comparisons with commercial catch data in the same or a nearby area could also help to elucidate discrepancies.
30. The means of data capture should be as convenient as possible, it was suggested, in order to encourage data provision from this sector. Recording the time spent fishing around FADs was considered a very important step towards quantifying the hyper-stability of catchability per species seen around FADs. The hope is that by developing the resultant conversion factors within stock assessment models, these may ensure that catch per unit effort (CPUE) values can be drawn back towards pre-FAD levels – again, in order to genuinely reflect trends of stock abundance. Furthermore, this could allow CPUE to reflect more accurate stock abundance/status through future standardization of this core model function across the development of FAD fisheries which target valuable pelagic stocks.

Progress in evaluating and encouraging responsible recreational fishing in Colombia: the need and opportunity for data to inform decisions

31. Mr Juan Pablo Caldas Aristizábal presented his work with recreational fisheries in Colombia. This presentation was prepared in collaboration with María Claudia Diazgrandos and Lia Guillot-Illidge. Recreational fishing is carried out for the purpose of recreation or amusement (Regulatory Decree 1071, 2015) and is performed mainly in freshwater areas and to a lesser extent at sea in coastal areas. A preliminary diagnosis conducted in 2012 illustrated the predominant fishing areas in the Caribbean and Pacific regions of Colombia, the methods and fishing gears used by the fishermen, and the species caught. Most fishers operate informally and no specific system exists to report their catch. In the same year, the national code of conduct for sportfishing was developed; one of its components identifies the need to conduct research and monitoring, which corresponds to the collection and reporting of data. The challenge for an effective collection of information is to ensure all users are registered. The country currently has a good opportunity to implement a data collection format that can be adapted to the SEPEC platform (Sistema del Servicio Estadístico Pesquero Colombiano; the Colombian Fisheries Statistical Service Information System), facilitating the collection and analysis of information from this fishery.
32. A discussion followed the presentation, centring primarily around the time series of pictures showing decreases in fish size at the same pier of a well-known sportfishing club. Several interpretations/explanations were offered for these pictures, but what is most important in a data collection system is to capture trends in stocks and the evolution of their linked fisheries. Overall trends were also deemed capable of eliminating potential false reporting from individuals, and equal trends from commercial fisheries could support conclusions. The variety of recreational fishers and fisheries in Colombia was acknowledged, and it was emphasized that any pilot as part of the CBP should focus on only one type of the angling population, i.e. charter boat captains, as suggested in previous discussions. The introduction of a recreational fishing license was highlighted as a key instrument for data collection in order to enable communications and the monitoring of fishers' activity.

General framework and specialized approaches to monitoring U.S. marine recreational fisheries

33. Mr John Foster gave a presentation describing how marine recreational fisheries in the United States of America are monitored through the Marine Recreational Information Program (MRIP), a collaborative partnership of state, regional, and federal fisheries management agencies. At the national level MRIP provides support, coordination, and guidance for individual state and regional survey programmes. While individual survey programmes vary in their technical approach, many use a complemented survey design. Using this method, separate surveys are implemented to



estimate the individual components needed to calculate total recreational catch. In the simplest case, the mean catch-per-trip is estimated from one survey (usually an intercept survey at fishing access sites) while the total trip count – or total effort – is estimated from a different survey (typically an off-site survey via telephone or mail). Mean catch-per-trip is then multiplied by total effort to calculate total recreational catch.

34. MRIP also supports a number of specialized programmes used to monitor high-priority or rare-event fisheries. Some of these programmes increase sampling efficiency, and improve the precision of catch and effort estimates by drawing from the registers of special permits or licenses required to participate in the fishery. Specialized designs include complemented surveys, such as the Large Pelagics Survey, as well as census designs that make use of smart phone applications for the reporting of combined capture-recapture designs, in order to adjust potential under-coverage and misreporting by anglers.
35. During the post-presentation discussion, questions of survey uptake, accuracy and cost-efficiency were raised. Mr John Foster indicated that uptake from fishers was usually good, although it may require a certain learning curve. Outreach and communication will further improve uptake. Accuracy is usually considered to be good and the intercept survey allows access to complete fishing trip information. Cost-efficiency depends on the survey: the telephone survey from the license database provides good results compared to the Random Digital Approach that tends to have lesser response rates (impact of mobile phone not being included in the public directory). The accuracy of surveys made on a voluntary versus mandatory basis was also discussed. In general, it has no impact on the intercept survey response rate. The general belief is that the more frequently captains are visited or contacted, the more reluctant they are to report. Surveys should be kept short with only key information being requested (minimum data requirements). The cost of surveying is also a crucial dimension to be considered during the design phase. The question of policies was discussed: American survey interviewers make initial policy statements prior to any interview, which is usually well received by fishers. The separation between recreational fisheries and commercial fisheries monitoring in the United States of America was detailed. In the United States of America these two fisheries correspond to two different data universes and consequently have two separate systems in place. This might not be the case in all WECAFC countries, however. Questions were asked on the use of reconstruction methodologies to validate collected data. The use of simulations was acknowledged as important when validating models. Reconstruction processes are used for some species in certain contexts, for example in the Gulf of Mexico.

Considerations while developing logbooks to collect Caribbean fisheries data from the source

36. Mr Yann Laurent presented on the modular approach to logbooks currently being developed in the context of the FIRMS (Fisheries and Resources Monitoring System)–WECAFC partnership. Existing national logbooks developed or implemented in the region were reviewed with existing legislation, and recommendations from Regional Fisheries Management Organizations (RFMOs). Alongside this, a considerable amount of extra-regional documentation (existing logsheets, logbooks, other t-RFMOs recommendations, etc...) was compiled to identify common patterns in the type of information collected through these reports of fishing activities. Specific elements were also noted within their particular context (type of fisheries, specific use of gear etc...). This resulted in the proposed three-tiered modular approach, with a gradation in the complexity of information to be collected. This complexity might be required for stock assessment purposes, but must be balanced with the scale of the burden to be placed on fishers to fill out these reports, as well as the implementation costs.
37. The first tier consists of a core module containing elements which are common to all logbooks, regardless of target species or fishing sector. This core module contains the following pieces of information to be collected:
  - administrative information on the logbook report process [all fisheries];
  - vessel information with two cases [all fisheries];

- Connection with an existing vessel registry: limited information on the vessel is requested; or,
- No connection with an existing vessel registry: comprehensive set of information on the vessel is requested including a list of crew.
- Trip description [all fisheries]:
  - Trip general information
  - Gear used with effort summary
  - Catch summary (with different templates)

The second tier contains detailed information on the fishing activities: it varies from one type of fishery to another and with the linked type of information required (possibly for ICCAT reporting). The proposed modules to monitor fishing activities are:

- Daily Activity: two cases must be considered: daily catches / discards and fishing effort for artisanal fleets, with more detailed information per set / per day for industrial fleets:
- catch and effort summary per day typically for artisanal fleets [small-scale fisheries]; or,
- catch, effort and discards per fishing activity for other fleets [coastal, semi-industrial, industrial]:
  - specific module to record effort per line set
  - specific module to record effort per net set
  - specific module to record effort per trap set
  - specific module to record effort per effort – dive / compressor
  - module to record catch / discards per set (same layout for all type of gears)
  - specific module for FAD use
  - specific module for Recreational fisheries (effort, catch-and-release).
- Biological data (still under discussion if this should form a section of the logbook):
  - length distribution
  - bycatch reporting.

38. The third tier contains additional information such as socio-economic data. Examples of implementation for modules per fishing sector were presented to the workshop: artisanal fisheries, industrial longliners, industrial trawlers and recreational fisheries.

39. In the discussion that followed it was clarified that this modular approach is not specifically targeting the development of paper-based logbooks, but aims to provide logbook guidelines to any country which needs to develop its own logbooks according to national specifications, independent of whether or not they will be based on paper or electronic formats. It was agreed that the name should be changed to avoid confusion: reporting system rather than logbook (book = paper based).

## **DAY 2: BILLFISH STOCK STATUS' AND RELATED STRATEGIES FOR DATA COLLECTION TO ADDRESS FISHERY CONCERNS**

The need for a regional vessel register

40. Following some discussions during the first day of the workshop on the need to establish a regional recreational fisheries register or record, Mr van Anrooy made a short presentation on the subject.

He noted that a regional register of recreational fisheries would have certain benefits for governments and fishers, including:

- provide a useful tool to count/estimate the number of fishers and their catch;
- enable fishers to participate in the conservation of fish stocks/marine environment/ocean;
- help to ensure that recreational fisheries catches are incorporated within regional fishery statistics;
- increase the importance, and profile, of the recreational fisheries sectors' interests within government decision-making processes/planning;
- provide contact details that could facilitate catch/sector surveys, and provide a tool to inform recreational fishers of regulations effectively (such as closed seasons), as well as allow improved involvement of fishers in management/conservation activities.

41. A regional register might have the following characteristics:

- developed on a voluntary basis (as it is impossible to make registration mandatory when current fisheries legal frameworks do not foresee such actions);
- available online – in three languages: simple with limited information, to facilitate participation;
- cost(s) – free;
- renewal: every three years;
- database: regional level (through the International Game Fish Association (IGFA), WECAFC or the CBMC);
- easy to maintain – sublists to be provided to Member States.

42. The benefits for recreational fishers who volunteered to be included in the register could potentially include the following:

- receive timely information from authorities on fishing rules/regulations/statistics/meetings;
- discounts on the purchase of fishing tackle at selected tackle shops;
- reduced membership fee for IGFA or other organizations;
- discounts on fishing tournament participation.

43. Benefits of the proposed register for the organization maintaining the database could be the visibility: e.g. promotion of membership, facilitation of information sharing on fishing rules, news, etc. The database could also be used to target potential clients for tournaments and other relevant activities. The benefits to governments in the region could be, among others: closing the gaps in information about recreational fishing in the nations; facilitate surveys and monitoring of recreational fishers, their activities and catches; obtaining information on non-resident fishers – in addition to the sources from tourism agencies and tournaments; stimulating the organization of recreational fishers into formal associations at the national level so as to function as private sector counterparts to the governments; improved overall communications for better informed facilitation of licensing/regulation of the sector in future.

44. The discussion that followed this presentation noted the benefits of a recreational fishers register, and considered the idea valuable, but some participants believed that it may be too early to develop such a register in their nations. Various participants mentioned that their countries are already trying to establish mandatory licensing and permit schemes for recreational fishers, and that they were not certain whether sufficient fishers would participate in a voluntary scheme sharing information with

IGFA and governments. Due to conflicting views on the subject, the development of a regional recreational fisher register or record was kept on hold.

Fish aggregating devices, hyper-stability of CPUE and the intricacy of policy development for sustainable fisheries

45. Mr Nelson Ehrhardt introduced his presentation mentioning the minimal interest in effective billfish stock monitoring shown by many RFMOs and tuna RFMOs (t-RFMO). He highlighted the importance of recognizing that the use of Fish Aggregating Devices (FADs) is growing on a global scale, and that the two issues were directly linked. A scientific description of the ecosystem impacts resulting from FAD use, as well as the history of FAD use since the early 1980s was then detailed, elucidating the current distribution in pelagic purse seine fisheries of 75 percent catch with FAD and 25 percent free school catch. The presentation highlighted that stock assessments are now often made with data from this 25 percent of catches.
46. Given the broad and expanding use of FADs, a potential solution may be to improve the accuracy of population assessments by collecting data through fish monitoring devices attached to the FADs. Hydro-acoustic technologies that are used to find the schools of target fish, such as multi-frequency sonars (echo sounders), can provide information on biomass and size compositions (by species in some cases), given the particular behaviour and distribution of fish below the FAD. This monitoring could also be used to improve the quality and quantity of abundance data.
47. The presentation again emphasized that the concept of hyper-stability must always be considered when monitoring fisheries that make use of FADs: this is the impact that congregation effects resulting from FADs have on catch per unit of effort (CPUE) as an index of stock abundance for pelagic species. FAD-induced, anthropologically inflated catch rates result in an overestimation of stock abundance if CPUE from FAD-oriented fisheries is used in stock assessment models. As mentioned earlier, the aggregation effects of FADs upon pelagic species – and the resultant increase in the catchability (R) of these species – is yet to be unambiguously quantified for inclusion within stock assessment models.
48. FADs represent an unprecedented threat to pelagic fish populations and their linked ecosystems. The impact of obsolete or lost FADs on fish distributions was also described. Some studies have been made in the region of the impact of FADs on fisheries, and the presentation raised the need for more effective FAD regulations, with example requirements presented to the group. The conclusion was that the impact of FADs is poorly understood by authorities, often underestimated as a result, and typically not monitored effectively. This statement is also true for recreational fisheries for which FADs are often used, particularly to improve billfish catch rates.
49. The discussions which followed this presentation highlighted the need to ensure that all FAD effects are fully represented within the developing regional FAD management plan, and further emphasis of hyper-stability effects should be incorporated into the developing Caribbean Billfish Management and Conservation Plan, so as to ensure recognition of concerns by the relevant authorities. It was further proposed that the WECAFC Scientific Advisory Group (SAG) would discuss the impact of FAD fisheries on traditional stock assessment methods at its next session (November 2017) and consider how this could be addressed.

What available data tells us about billfish catch rates, biology and resultant stock status

50. Mr Nelson Ehrhardt presented a review of the existing data on billfish species and their stock status' in the Atlantic, and the WECAFC area in particular. The presentation described key elements required for effectively conducting stock assessments and the typical means of illustrating stock assessment results, including the interpretation of Kobe Plots.
51. The use of biological reference data within simple statistical methods/tools (like Von Bertalanffy growth equations) was expanded upon with some biological length frequency evolution trends noted for stocks under high selective fish pressures. These descriptions were used to highlight the need to revise existing information for billfish species in the light of modern data, which suggest

greatly reduced abundances of large specimens within billfish populations; white marlin was used as an example. It was made clear to participants that managing current stocks by employing the same data collection methods used prior to the drastic population cuts suffered by these stocks as a result of overfishing was a flawed methodology, one likely to cause ongoing overfishing and the depletion of billfish stocks and all their dependant fisheries stocks.

52. The accuracy of assembled billfish data was also questioned: is it genuinely collected randomly? Is the sample representative of the population or does it reflect a snapshot in space and time for a unit of the broader stock? Examples of bias or bad sampling were presented to highlight the crucial importance of defining accurate sampling schemes. With the landscape of effective stock assessment described, the specific billfish case was illustrated with two models: the ASPIC model (with limited data) and the Stock Synthesis model (data rich), commonly used for analyses of tuna stock.
53. Final conclusions were not drawn on stock status' for all billfish species, but key recommendations were made to ensure the appropriate choice and use of statistical models: the importance of accurate statistical data, and the need for more data, over sufficient periods of time (as in the case of American billfish recreational data); the importance of appropriate interpretations of biological evolution when using existing chosen models; and the urgent requirement to account for the effects of FADs, as described in the previous discussion.

Discussion on opportunities for recreational fisheries to fill the data gaps currently hampering ICCAT billfish stock assessments

54. The two presentations on stock assessments and the impact of FADs raised a series of participant questions, resulting in the following conclusions:
1. Long-term data collection is key for effective stock assessments, ideally making use of data from different sources; including recreational fishery data such as institutional (American recreational fisheries surveys), tournament, tourism and trade data can achieve a holistic view of participation and catch.
  2. It is important to review data collection strategies and methodologies for recreational and other fisheries intermittently, in order to ensure the accuracy of the data received, as well as to account for stock-wide influences resulting from selective harvests and climate change.
  3. Robust best practice should be employed in recreational fisheries to limit their impacts upon target species. These best practices should be continually developed with modern knowledge, and awareness of them raised.
  4. The effects of FADs have to be taken into account during all relevant computations of fishery statistics; studies should be conducted urgently to quantify the effects of FAD hyper-stability, ultimately allowing for their incorporation into the currently flawed statistical models and stock assessments.

Description of the expected Fisheries Management Information System (FMIS), analysis opportunities and how the proposed database can link to FIRMS, iMarine, FishStatJ and other relevant data platforms

55. Mr Yann Laurent presented on the conditions required to build a Billfish Fisheries Management Information System (BFMIS). The statistical supply chain was detailed in the context of recreational fisheries, highlighting the specificities of this type of fisheries monitoring: the lack of international guidelines, the variety of existing surveys in developed countries and the quasi-absence of monitoring in developing countries. The challenges, opportunities and risks of a BFMIS were presented to the group, with a major opportunity lying in the development of mobile

applications for anglers – and a challenge for institutions and researchers to access and share these data. The need for a standard approach to data collection was raised and a proposal for minimum data requirements made. These aspects were discussed further during the workshop.

56. A key challenge was also presented to the group with regard to the use of data collected from anglers and fishers: how to move from citizen science to real science, especially in the process of computing collected data to put together robust statistics to guide management decisions. The issue of bias was referred to again, with different populations of anglers in different types of recreational fisheries using different methods and having a different interest in reporting catch and effort data. Building up a BFMIS would require starting from a homogenous population – charter boats – with a pilot phase to develop a mobile application for data collection; with a connection to a centralized database to raise statistics and enable the use of these data (sharing feedback with anglers, formal access use by scientists, etc.).
57. The current lack of official recreational fisheries data/statistics, and the importance of these catches for certain fish stocks were placed alongside one another: any available statistics on recreational fisheries should be available at the national, regional and international levels to support effective decision-making. This requires these statistics undergoing a strict validation process at the national level (addressing all bias) and enabling the sharing and access to these data by ad hoc policies (see following presentation). It also requires the harmonization and standardization of reported data using international classifications (ASFIS for species, for instance) so as to enable the integration of these data into regional or international databases like FishStatJ.
58. A discussion followed the presentation, highlighting the following points:
  1. Type of data to be collected through the mobile application: Mr Nelson Ehrhardt reminded the meeting that the key information to assess with recreational fishing effort is not only the number of fish caught, but also the number of bites, fish raised and fish caught, in order to represent stock abundances most effectively, particularly for billfish.
  2. The precision of fishing area data, so as to maximize data value while preserving fishers' privacy, was also discussed. It was agreed that a grid or broad fishing zone (north/south of the island) is adequate for such reporting. GPS points can be used for the fisher to record his/her trip details, but this information should be converted into a grid position to maintain confidentiality. Mr Yann Laurent mentioned a current activity under the WECAFC-FIRMS phase II project, which had suggested sub-areas and subdivisions for FAO Areas 31 and the northern part of Area 41 (the WECAFC area of competence).
  3. The group discussed the target audience for the mobile application: is it best for the boat captain or the fisher to report? It was recalled that the captain has a broader vision on the recreational fishing activities, especially on the number of bites and raised fish. The overall conclusion was that the skipper should be the primary mobile application user.
  4. User friendliness: several points were raised by participants to ensure efficient and simple interfaces for users: adapting lists of elements to local contexts (for instance, display species' common names per area/country to simplify data entry); the use of graphical elements for user selections (images for species selections or a map for fishing zone selections, rather than drop-down lists, to facilitate convenience and potential use at sea).
  5. The vital importance of feedback to give fishers to analyse their statistics with customized outputs. The discussion also highlighted the need to include economic data to display the socio-economic importance of recreational fishing activities in the region, although it was decided that this would not be addressed during the current project.

Data aggregation options to ensure privacy, reporting periodicity, storage, responsible use and privacy considerations

59. Mr Yann Laurent presented the group with options to manage data sharing and access from the data producer to the data consumer. Data users and consumer groups were presented to the workshop with their respective needs for data sharing and access depending on the type of data produced and/or consumed.
60. Best practices regarding access to individual data by fishers, and access rights to the aggregated statistics – as in formats used for commercial fisheries to maintain sufficient confidentiality – were then presented: individual data must remain confidential, accessible only upon request and authorization by the relevant individuals and authorities (and typically anonymized prior to exchange unless additional authorizations are specifically provided on request). Aggregated data or statistics are usually made public once validated by the relevant national authorities, but it should be made impossible to identify individual skippers in the aggregated data that is made available. It was stated that national legislation must prevail when exchanging data with external entities.
61. The presentation then looked back over worldwide trends for data transparency, using the Transparency in Fisheries Initiative as a case study: <http://fisheriestransparency.org>. In the particular context of data collected from fishers using mobile applications, several options were presented, inspired by the data policy implemented by GAFA (Google, Apple, Facebook, Amazon). Given that skippers were making use of this mobile application voluntarily, it was recommended that the choice of whether or not to allow data exchange with third parties be left open to the application user, while knowing that exchanged data will be anonymous. The group agreed on this proposal.
62. In the discussions that followed the presentation the following points were addressed: the proposal to leave the choice of sharing his/her data to the mobile application user was agreed upon; fishing activity can be monitored in the mobile application for the user's interest only (unless otherwise authorized by the user) thanks to the device's internal GPS, but information on fishing grounds is always to be exchanged using a grid system (grid resolution to be defined).

The importance of, and options for, effective feedback to maintain data provision from recreational fisheries: what data interests recreational fishers?

63. Mr Roy Bealey gave a presentation on the importance of feedback mechanisms to ensure continued use of the data collection applications by recreational fishers. It is believed that consistent feedback to recreational fishers, based on the data they provide, will prove vital to developing a consistent, long-term buy-in to voluntary data provision. Essentially, the project should seek to digitize skippers' ongoing catch records in a format that allows them to glean feedback, through analyses of their data, while also providing them with the opportunity to help inform the sustainable management of the fish they capture. The presentation highlighted that such regular feedback promotes the win-win scenarios sought through collaborations between fisheries management and stakeholders in other citizen science initiatives. Feedback also demonstrates to fishers that the data provided is being used effectively to inform management decisions across all fishery sectors; it can also help to explain and illustrate the importance of providing accurate data (including zero catch day reporting) among data-providing stakeholders. The potential non-reporting of zero catch days, which provides a false impression of higher stock abundance/conditions (through CPUE indices), was used as an example for this feedback, thereby stressing the importance of communication. Another implication which underlined the the importance of feedback provision is that feedback will in turn encourage accurate reporting, because skippers will not want to view statistics based on data which they themselves know is false information.

Participants then addressed the following considerations:

- How often should feedback be provided (deadline commitments should not be missed)?.
- Electronic feedback may be best in the modern era, with continuous updates provided through the individuals' direct access to their private, and aggregated, national or overall datasets (potentially achievable most conveniently through the developing data reporting application)?.
- Is individual feedback absolutely necessary, and if so, how can privacy be ensured and maintained?.
- Should only consistent data providers (skippers) be allowed access to the data, in order to promote the consistent and accurate use of the application?.
- Can the data be used to develop competition between anglers/clubs/countries without compromising data quality (potential incentive to amplify catch rates in competitive sphere)?.
- Should only species of primary interest and commercial value be included?.

64. A summary of comparisons that are typically of interest to recreational fishers was then presented. An example where billfish catch rates were compared according to the lunar phase was used to display recreational anglers' interest in contextualizing their catch rates. Finally, it was suggested that proposed data capture efforts should seek to provide digital data updates automatically as frequently as practically possible, and they should provide as many environmental, meteorological and seasonal overlays as possible to retain skipper interest in the long term. This would naturally be supported if the skippers' databases continued to develop in a way that allowed increasingly complex and informative analyses over time.

### **DAY 3: SMARTFORM FOR SMARTPHONES DATA COLLECTION – WORKSHOP CONCLUSIONS**

Modern data tools for collection and collation: digital data capture and data support available through FAO Rome

65. Mr Anton Ellenbroek, Fisheries Statistics Officer, FAO, Rome, presented slides that explained how data submitted by countries and collaborating institutes are prepared for dissemination through the various FAO sites and related products. FAO expends considerable effort on harmonizing data to meet quality standards and works through the Coordinating Working Party on Fishery Statistics (CWP) for this purpose. The presentation showed examples of cross-boundary information products, such as those on Vulnerable Marine Ecosystems (VME) and Stocks and Fisheries.
66. During the discussion that followed, Mr Raymon van Anrooy encouraged participants to use FAO tools such as FishStatJ to review national data reported by countries, and to raise any issues noted to FAO via email ([Fish-Statistics-Inquiries@fao.org](mailto:Fish-Statistics-Inquiries@fao.org)). He also highlighted that the VME maps available online do not yet include information from the region and that he will request an update.
67. A discussion was held concerning FIRMS (Fisheries and Resources Monitoring System) fish and updates, and it was recommended that stakeholders contact the FIRMS secretariat directly to contribute ([FIRMS-secretariat@fao.org](mailto:FIRMS-secretariat@fao.org)).

Mobile application platforms for fisheries data collection: an introduction to the FAO SmartForms initiative

68. Mr Anton Ellenbroek described a recent initiative supported by the FAO IT department (CIO), which has delivered a prototype version of the SmartForms mobile application platform. The presentation introduced the platform, which combines a customizable forms designer, the actual application, and a linked data hub. The design includes unique features that will ensure that the collected data complies with standards for species and gears, for example, and is formatted to feed



the data hub effectively. The use of this modern system will reduce the costs of data management and analysis significantly, thus improving the capacities of nations to report their fisheries data efficiently and consistently.

69. Several points were discussed after the presentation, notably the difference between SmartForms and the Open Data Kit (ODK<sup>2</sup>), another open source tool to build mobile applications. Mr Anton Ellenbroek highlighted several issues with ODK2, such as the lack of synchronization with FAO standard classifications, the lack of feedback opportunity to users and the issue of portability of the mobile application. With SmartForms, the deployment of bug fixes is also very easy, which is not the case for ODK.
70. The issue of the cost and long-term sustainability of the SmartForms platform was raised. Participants were reminded that SmartForms is endorsed by CIO as an FAO corporate tool until the end of 2017 at least. There are several options for the system hosting, which will typically have an associated cost: a direct cost if hosting is paid for on a third-party system like iMarine, or indirect if the hosting is done locally (server, dedicated staff). Costs are not known yet for hosting in iMarine, but the WECAFC secretary indicated that the cost could potentially be supported by WECAFC or through projects like the Caribbean Billfish Project or CLME+ (Caribbean and North Brazil shelf Large Marine Ecosystem) Project, especially in terms of developing manuals and videos to explain and encourage use of the mobile app. It was also noted that FAO cannot compete with private software companies directly, but that companies can use the platform to propose tools to countries.
71. The strategy to pilot the mobile application raised some comments. It was noted that the key to successful roll-out would be the first test session: a high quality of application is key, and must be ensured prior to proof-testing with professional charter skippers. Mr Marcos Hanke kindly offered to be one of the stakeholders to test the developing prototype, as a professional charter boat captain. It was also underlined that the application's success will depend on the simplicity of its user interface(s). Once tested and refined, the app could be customized further, and expanded to support efficient use as the recording platform in recreational fisheries tournaments.

Improving the collection and use of fisheries data in the Caribbean: discussion and endorsement of plans

72. On behalf of FAO, CRFM and WECAFC Mr van Anrooy presented information on the development of a regional project on fisheries and aquaculture data and statistics. He provided some background to the project, detailing the current situation in the region, in which major fisheries target stocks are overfished: the demand for fish is increasing and imports of fish are increasing among Caribbean countries. He noted that there is regional agreement on actions towards: the rebuilding of depleted stocks, conservation of stocks that are close to depletion/being overfished, and improving the management of fisheries at national and regional levels as required. However, for effective fisheries management and conservation decision-making processes, there is a need for a more effective, and greater, provision of data and information, which is currently considered inadequate. The major inadequacies in the provision of data and information for Caribbean fisheries management were presented, and the importance of robust and accurate data and information for fisheries managers, fishers and other fisheries sector stakeholders was outlined.
73. Reference was then made to the European Union Caribbean Regional Indicative Programme (RIP) (2014-2020), which includes, among its specific objectives:
  - 2.1 Improve regional resilience to impacts of climate change and natural disasters affecting sustained economic and social development
  - 2.2 To support regional capacity for the suitable use of natural resources.

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<sup>2</sup> <https://opendatakit.org/>

74. The RIP is a programme between the European Union and the CARIFORUM Secretariat through which funding can be made available in support of achieving the above objectives. FAO and CRFM have developed a concept note for a project addressing these objectives, which has obtained provisional endorsement from the European Commission Directorate-General for International Cooperation and Development (DEVCO) and is currently being developed into a so-called “Action Document”.
75. Mr van Anrooy mentioned that the coverage of the proposed project is largely restricted to CARFORUM countries, but that partnership arrangements with other countries and organizations, including NGOs, would be possible.
76. He mentioned that the project would contribute to the achievement of Sustainable Development Goal (SDG) 14, by the CARIFORM states, as well as COP21 and Aichi targets. He added that fisheries data and information availability has demonstrated a downward trend in the Caribbean over this century: this trend needs to be reversed to address the escalating sustainability concerns visible in most Caribbean fisheries. With limited staff and resources, fisheries managers require other innovative ways to rebuild their fisheries management information systems. Existing projects and programmes have identified the needs and barriers, and made suggestions on how to solve them, and many fishers are interested in teaming up with the public sector to collect data and increase information availability for the purposes of co-management. National support is required to allow such initiatives to develop further and achieve their enormous potential.
77. The draft title, objectives and expected results of the project were presented and discussed by the workshop, and technical endorsement was reached on the following:

Title: Fisheries information technology innovations for resource management and climate change adaptation in the Caribbean (FIT4CC).

Overall objective: To increase resilience to climate change impacts in the CARIFORUM fisheries sector, by building capacity for fisheries management information systems, the sustainable management of shared fisheries resources and the introduction of adaptation measures.

*Expected results at the national level*

Result 1: Improved and more integrated fisheries management information systems in place (in at least eight) selected countries, implementing sound statistical data collection through innovative and efficient methods such as mobile phones and tablets, with fishers involved.

Result 2: Better aquaculture statistics, in order to make informed decisions for management and development of the sector, so as to increase its contribution to socio-economic development and food security through the implementation of a mix of simple data collection mechanisms, networking and the application of innovative IT technologies.

Result 3: Strengthened institutional capacity in fisheries statistical services at the national level in at least eight selected countries thanks to improved policy, legal and institutional frameworks for fisheries.

*Expected results at the regional level:*

Result 4: A regional training and capacity building framework in statistics and stock assessment, including curriculum(s), toolkits, courses and institutional arrangements for the delivery of training and scholarships.

Result 5: A long-term, maintainable CARIFIS-2 software framework tailored and deployed for use by CRFM Member Countries.

Result 6: An education-outreach-communication framework aimed at involving the private sector (commercial and recreational fishers and other stakeholders) in co-managed data collection activities including guidelines, best practices, and a toolkit and library of information assets.

Result 7: An operational regional database hosted by WECAFC, addressing various geographic aims and objectives (e.g. CRFM), including a Regional Vessel Register, IUU vessel list, Catch and Effort statistics for fisheries and stock status monitoring, and biological data for stock assessment.

Result 8: A regional data governance framework underpinned by regionally-endorsed data policies and capacity, to promote a standard, harmonized and cost-efficient approach to regional statistics production, and to operate data flows in support of Fishery Management Plans and joint WECAFC-CRFM-OSPESCA working groups.

*Expected cross-cutting results – Climate Change*

Result 9: Established and functional linkages (in at least five countries) between data and information sources on climate change and fisheries through Decision Support Systems (DSS), which facilitate fisheries management decision-making processes.

Result 10: Advisory services for fisheries stakeholders providing water temperature, water currents, sargassum occurrence and weather information, and forecasts through innovative apps, mapping software and linked databases.

Result 11: Historical time series development on fish landings (volumes, species/biodiversity, fish sizes, including data from recreational fisheries) as well as fish and the trade of fisheries products in the CARIFORUM region since 1970, in such a way as to enable the monitoring of climate change impacts on fish, analyses of trends and facilitate the introduction of climate change adaptation measures.

78. Furthermore, the workshop noted that the project should seek linkages with ongoing projects and related activities in the region, such as the CLME+ project, CC4Fish project, BlueBRIDGE project and iMarine platform, as well as the CRFM-WECAFC working groups and the WECAFC-FIRMS partnership.
79. Draft indicators of success were presented to the workshop as examples, together with a project organigram that received provisional technical endorsement, but would require some additional work to finalize.
80. It was agreed that the FAO-WECAFC and CRFM Secretariats would share the Action Document with the relevant countries for endorsement/comments, and at the same time proceed with a formal submission to the CARIFORUM and the European Union. Various experts offered to assist in the preparation of, and commenting on, the project agreement as required.

Participatory development of an endorsed recreational fishery data recommendation making use of the adjusted SmartForms technology

81. The participants prepared and discussed the conclusions and recommendations of the three-day workshop. The following conclusions and recommendations were endorsed:

## GENERAL CONCLUSIONS AND RECOMMENDATIONS TO WECAFC AND PARTNERS

82. The technical workshop:

- i. reviewed data collection strategies and methodologies being used in the region for recreational fisheries, with a focus on billfish fisheries;
- ii. discussed and provided inputs to the minimum data requirements for Caribbean nations' recreational fisheries management;
- iii. discussed and agreed on using a modular approach for the reporting system (to support paper logbook or e-logbook) development, harmonization and roll-out throughout the Caribbean;
- iv. discussed and agreed on methods and standardized processes for the collection, analysis and use of data from Caribbean recreational fisheries held within a centralized regional database;
- v. finalized an agreed format and input sequence for prioritized data capture through the developing SmartForms software;
- vi. prepared and agreed on a customized SmartForms template to collect comparable data for billfish species and other fishes important to recreational fisheries effectively;
- vii. built capacity on stock assessment and data collection, as well as analysis methods and models in use for billfish fisheries, and improved knowledge of the challenges to billfish stock assessments brought about by the rapid increase in FAD use in fisheries;
- viii. increased the coordination and harmonization between the SICA-OSPESCA and CRFM member countries on the development and use of methods and tools on data collection for research.

83. The WECAFC/CRFM/OSPESCA/CFMC Working Group on Recreational Fisheries made the following recommendations:

- i. The development of a regional database should continue and capacity building (training of users and data analysts) should be organized under the transversal (WECAFC, CRFM, OSPESCA, IFREMER and CFMC) Working Group on fisheries data and statistics in 2018.
- ii. The efforts of Caribbean countries to develop the legislative base for, and implement, a recreational fisheries' permit system should be increased, so as to facilitate targeted surveys and data collection on catches and the number of fishers involved in recreational fisheries.
- iii. The presentation and review of the regional reporting system guidelines, related app and SmartForm software – using a modular approach, and harmonizing data and information collection – should take place at the 8th session of the WECAFC Scientific Advisory Group in November 2017, after which region-wide endorsement should take place in 2018.
- iv. The Fisheries Management Information System (FisMIS) tested in the Bahamas should be made available to other Caribbean countries, using open-source software, and FAO is requested to provide capacity building, technical advice and maintain the system.
- v. SmartForms will be developed according to the minimum data requirements agreed upon during the meeting; particular focus will be placed on developing user-friendly interfaces compatible with use at sea. Tests will be conducted starting with few charter captains; a further roll-out to a larger group of users, potentially including other fisheries sectors throughout the region, will follow.
- vi. The WECAFC Secretariat should contact NOAA and the High Migratory Species group in particular to seek information on their saltwater recreational fishers' surveys, and

investigate the possibility of accessing the data and discussing possible inclusion of questions related to fishing by residents of the United States of America in the Caribbean.

- vii. The IGFA should collect data and information from billfish fishing tournaments in the Caribbean on catches, releases and CPUE in order to enable the development of time series, support stock assessments, and produce information for the regional management and conservation of billfish.
  - viii. Presented information on the influences that fish aggregating Devices (FADs) have upon data, fishery models and ultimate fishery management, should be included in an update of the draft CRFM Subregional fish aggregating device (FAD) Management Plan, before its final regional review and endorsement takes place in 2018.
  - ix. Having endorsed the project concept, the meeting requests support the finalization of the draft project that aims “To increase resilience to climate change impacts in the CARIFORUM fisheries sector, through building capacity for fisheries management information systems, sustainable management of shared fisheries resources and the introduction of adaptation measures” by FAO, and its formal submission to CARIFORUM and the European Union for funding by the latter under the 11th EDF.
  - x. Countries interested in reporting stock status should contact the FIRMS secretariat (FIRMS-Secretariat@fao.org) or WECAFC secretariat (WECAFC-Secretariat@fao.org) to share the information within the FIRMS system.
  - xi. FAO provides support (financial and technical) to countries to strengthen their data collection and analysis capacity in relation to recreational billfish fisheries.
84. The discussions and recommendations from this workshop will also help to inform finalization and effective implementation of the Caribbean Billfish Management and Conservation Plan.

#### **CLOSE OF THE WORKSHOP**

85. The Hon. Renward Wells, Minister of Agriculture and Marine Resources officially closed the workshop by delivering a few words on the importance of Fisheries in the Bahamas, and more specifically recreational fisheries. He emphasized the Government’s continued concern related to the sustainability of marine resources and stressed the fisheries sectors’ importance to the nation’s economy and the overall livelihood of its citizens.
86. Mr Edison Deleveaux, acting Director of the Department of Marine Resources of The Bahamas thanked FAO and the assembled colleagues for organizing the workshop, as well as all the experts for their active participation in the workshop and wished everyone a safe return home.



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**APPENDIX 2: AGENDA**

Regional Workshop on Recreational Fisheries Statistics in the Caribbean  
20-22 June 2017 – BAIC – Nassau, the Commonwealth of the Bahamas

<b>Day 1: Tuesday 20 June 2017</b>	
9.00	Opening remarks
9.15	Participant introductions
9.30	Introduction to the workshop, its expected products and adoption of the agenda
10.00	Data collection in the context of recreational fisheries: motivations, challenges, and modalities that encourage the provision of information from this diverse sector
10.30	Coffee break and group picture
11.00	An overview of citizen science initiatives and the power of data available through recreational fisheries
11.30	Sources of bias within data collected from recreational fisheries: implications and resolution options –
12.00	Lunch break
13.00	General framework and specialized approaches to monitoring U.S. marine recreational fisheries
13.30	Progress in evaluating and encouraging responsible recreational fishing in Colombia, the need and opportunity for data to inform decisions
14.00	Tea break
14.15	Considerations while developing logbooks to collect Caribbean fisheries data from the source
15.00	Discussion of regional data collection opportunities and requirements to provide accurate data, genuine value and resultant lasting interest in data provision from recreational fishers
16.00	Closure of the day
19.30	Welcome reception
<b>Day 2: Wednesday 21 June 2017</b>	
9.00	What available data tells us about billfish catch rates, biology and resultant stock status
10.00	Fish Aggregating Devices, hyper-stability of CPUE and the intricacy of policy development for sustainable fisheries
10.45	Discussion on opportunities for recreational fisheries to fill the data gaps currently hampering ICCAT billfish stock assessments
11.15	Coffee break
11.30	Description of the expected Fisheries Management Information System (FMIS), analysis opportunities and how the proposed database can link to FIRMS, i-Marine, FishStatJ and other data platforms of relevance
12.15	Data aggregation options to ensure privacy, reporting periodicity, storage, responsible use and privacy considerations
13.00	Lunch break
14.00	Participatory development and endorsement of recommended minimum requirements, use and privacy policies for recreational fisheries data to be held by WECAFC
16.00	Tea break
16.15	The importance of, and options for, effective feedback to maintain data provision from recreational fisheries: what data interests recreational fishers?
16.45	Discussion of data feedback options and recreational fishers' interest priorities

17.00	Closure of the day
<b>Day 3: Thursday 22 June 2017</b>	
9.00	Modern data tools for collection and collation: digital data capture and data support available through FAO Rome
9.30	Mobile application platform for fisheries data collection: an introduction to the FAO SmartForms initiative
10.30	Coffee break
10.45	Discussion on the proposed SmartForms mobile application to prioritize needs, ensure usability and user support for the recreational fisheries. Participants can try the app.
12.30	Lunch break
13.30	Discussion on the potential for SmartForms technology to improve data collection in other fishery sectors
14.00	Planned improvements in the collection and use of fisheries data in the Caribbean: endorsement of current plans
14.30	Participatory development of an endorsed recreational fishery data recommendation making use of the adjusted SmartForms technology
15.00	Tea break
15.15	General recommendations to WECAFC and partners
15.45	Wrap up and closing remarks
16.00	Closure of the day

The WECAFC-FIRMS Regional workshop on recreational fisheries statistics in the Caribbean, held in Nassau, The Bahamas, on 20-22 June 2017, was supported by the Caribbean Billfish Project, which is a component of the GEF-funded, World Bank implemented, Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (ABNJ) Project, and is being executed by the Western Central Atlantic Fishery Commission (WECAFC).

The workshop convened 38 representatives from 13 Caribbean countries and overseas territories' fisheries departments, regional fisheries bodies, fisheries technical advisory institutions, non-governmental organizations, various fishery statistics specialists and other relevant stakeholders. Participants' knowledge of regional recreational fishery data challenges and their capacities to effectively address these challenges were developed through the workshop.

The participants discussed data collection methods for recreational fisheries, logbooks use, SmartForms, digital data systems, database development and maintenance and opportunities and recommendations for follow-up capacity building activities and projects.

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