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WESTERN CENTRAL ATLANTIC FISHERY COMMISSION (WECAFC)

Project GCP/SLC/223/EC – ***Improving ecosystem approach to fisheries by advancing fish spawning aggregation information gathering and increase of public engagement in the WECAFC region***

Joint workshop (Virtual) of the WECAFC Spawning Aggregation Working Group and Fisheries Data and Statistics Working Group - Pilot Implementation of the WECAFC Regional Fish Spawning Aggregations Management Plan

July 2024

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Food and Agriculture Organization of the United Nations

WESTERN CENTRAL ATLANTIC FISHERY COMMISSION

FAO Fisheries and Aquaculture Report

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Report of the

JOINT WORKSHOP (VIRTUAL) OF THE WECAFC SPAWNING AGGREGATION WORKING GROUP AND FISHERIES DATA AND STATISTICS WORKING GROUP

PILOT IMPLEMENTATION OF THE WECAFC REGIONAL FISH SPAWNING AGGREGATIONS MANAGEMENT PLAN

15–16 July 2024

FAO Fisheries and Aquaculture Report No. xxxx XXX/XXXX/XXXXX
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Preparation of this document

Joint Workshop of the WECAFC (Western Central Atlantic Fishery Commission) Spawning Aggregation Working Group and Fisheries and Data Statistics Working Group - Pilot Implementation of the WECAFC Regional Fish Spawning Aggregations Management Plan, which was held virtually from 15 to 16 July 2024.

This meeting was organized by the Secretariat of WECAFC and included the participation of 34 people in total from eight WECAFC member countries, five partner organizations as well as working group conveners and officers from the Food and Agriculture Organization of the United Nations (FAO).

This report provides a record of the meeting's proceedings, in particular, the findings and recommendations.

Abstract

This is the report of the Joint Workshop of the WECAFC (Western Central Atlantic Fishery Commission) Spawning Aggregation Working Group and Fisheries and Data Statistics Working Group - Pilot Implementation of the WECAFC Regional Fish Spawning Aggregations Management Plan, which was held virtually from 15 to 16 July 2024.

This meeting was organized by the Secretariat of WECAFC and included the participation of 34 people in total from eight WECAFC member countries, five partner organizations as well as working group conveners and officers from the Food and Agriculture Organization of the United Nations (FAO).

The objectives of the workshop were to:

1. define list of monitoring, evaluation and management operations for which standardized methodologies are required;
2. propose best practice/most practical and feasible methodologies for each operation;
3. define corresponding data entry, storage, retrieval and analysis structures:
    a. Monitoring data
    b. Fisheries data
    c. Socioeconomic data
    d. Traditional knowledge
4. propose rules specific to spawning aggregations for data access and sharing taking into consideration policies developed by the FDS-WG in context of the WECAFC Data Collection Reference Framework (DCRF) and presented in the first meeting of the FDS-WG in 2018; and
5. review and recommend biological measures and conversions as relates stock assessment and management of Nassau Grouper and Mutton Snapper.

Final plenary sessions were held to discuss:

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Acknowledgements

This document was prepared by Ms Nancie Cummings, Convener of the WECAFC Fishery Data and Statistics (FDS) Working Group, with assistance from Aureliano Gentile (FAO, NFISI), Bracken van Niekerk (FAO, NFISI), Myles Phillips (World Conservation Society[WCS]) and Ms Yvette Diei Ouadi, from the WECAFC Secretariat of the Food and Agriculture Organization of the United Nations (FAO/WECAFC).

Abbreviations (section to be finalised)

Day 1: Opening of the Meeting

1. Ms Nancie Cummings, convener of the Fisheries Data and Statistics Working Group (FDS WG) of the Western Central Atlantic Fishery Commission (WECAFC) welcomed the participants to the meeting and indicated that this meeting would focus on the pilot implementation of the Regional Fisheries Spawning Aggregation Management Plan (RFSAMP).
2. Ms Cummings noted that the main objective of this technical workshop was to advance the ecosystem approach to fisheries via information gathering and increased public engagement. She noted that presentations on fishery-dependent data collection methods and stock assessment needs, discussions on the regional database, data access policies, the project's communication strategy, and recommendations for next steps would be given. Documents list was made available in the FAO website at https://www.fao.org/fishery/en/meeting/41466.
3. It was further noted outcomes of the meeting will also contribute to review and enrichment of the WECAFC Data Collection Reference Framework (https://www.fao.org/documents/card/en/c/cc5049en Version 1.0), notably Appendix 6 "***Biological References***" when developing NG and MS spawning aggregation protocols and key to project objective 1.6.

Election of chairperson and rapporteurs

4. Ms Nancie Cummings was appointed to chair the meeting. Resource staff of the FAO graciously offered to take notes during the meeting.

Adoption of the Agenda

5. The agenda was adopted without changes.

Introduction to RFSAMP pilot project and presentation of workshop objectives - Myles Phillips (primary author) presented by Nancie Cummings, FDS WG Convener

6. The RFSAMP was finalized in 2020 after years of development. The RFSAMP was twinned with the "Big Fish" Public Engagement Campaign, which is central to the approach for implementation of the RFSAMP.
7. The RFSAMP was designed with a focus on mutton snapper and Nassau grouper but is meant to be indicative of management measures for any FSA-related species.
8. The six objectives of the RFSAMP are:
    - to increase the availability of information for and understanding of NG and MS population status to build support for FSA protection;
    - to determine the current status, including presence and fish abundance, location/timing of known FSAs and identify those in most of protection;
    - to develop regionally consistent/harmonized monitoring frameworks and protocols to collect key biological, trade and other socioeconomic information associated with NG and MS, both during and outside of FSA seasons/areas;
    - to increase the availability of information for and understanding of NG and MS population status to build support for FSA protection;

- to determine the current status, including presence and fish abundance, location/timing of known FSAs and identify those in most of protection; and
- to develop regionally consistent/harmonized monitoring frameworks and protocols to collect key biological, trade and other socioeconomic information associated with NG and MS, both during and outside of FSA seasons/areas.

9. Endorsement of the management plan and campaign by WECAFC in 2022 (WECAFC 18) resulted in two new recommendations to the commission by the Spawning Aggregations Working Group (SAWG) and the submission of a proposal for a pilot project to the European Union's Directorate General for Maritime Affairs (DG-MARE).
10. The new recommendations advocated for the creation of a coordination committee and the elevation of the Nassau grouper and mutton snapper to WECAFC Group 1 Reference list of aquatic species in the Data Collection Reference Framework (DCRF), raising their institutional priority for data collection and management support to member states.
11. The RFSAMP includes a roadmap for adoption and implementation, comprising 16 actions for implementation within the short (within three years), medium (within five years) and long term (within ten years). Activities could be commenced at any time and many would be conducted simultaneously.
12. The pilot project, titled "*Improving ecosystem approach to fisheries by advancing fish spawning, aggregation information gathering and increase of public engagement in the WECAFC region*" was approved and commenced in 2023. The pilot project aimed to implement key short- to medium-term priority actions in three countries to test assumptions and determine the realities *in situ*. The pilot project was implemented in three (3) components led by different groups.
13. Component 1 was outsourced to the Wildlife Conservation Society (WCS) under a Letter of Agreement and would involve the compilation and update of information about FSA management in the three pilot countries (Belize, Bahamas and Cuba). This component sought to determine priority sites, investigate barriers and opportunities to synchronization of closed seasons across member states, evaluate management effectiveness for FSAs in each country, and identify areas for where each country could benefit from WECAFC's support.
14. Component 2 was led by the FAO in close collaboration with WECAFC Fisheries and Data Statistics Working Group (WG) and evaluated the prospect of regional standardization of monitoring protocols and data management. Much of the work focused on the operationalisation of WECAFC's Data Collection Reference Framework (DCRF) and Information System (WECAFIS).
15. Component 3 funded outreach activities under the Big Fish Public Engagement Campaign. Led by BelugaSmile Productions, this component launched the Big Fish Digital Hub and associated social media campaign in September 2023. A recent update to the Hub went live on 17 June 2024.
16. Reports from each pilot country had been drafted at the time of the meeting and would be completed by mid-July. The information collected would be used to inform overall recommendations for implementation of FSAMP.
17. It was noted that data needs for the pilot project can either build on the existing framework or contribute to new components of the DCRF. The knowledge gained in this project will also be used to inform Appendix 6 of the iDCRF (Biological References), key to project objective 1.6.

18. The objectives of this technical workshop included:
    a. defining list of monitoring, evaluation and management operations for which standardized methodologies are required;
    b. proposing best practice/most practical and feasible methodologies for each operation;
    c. defining corresponding data entry, storage, retrieval and analysis structures:
        i. monitoring data;
        ii. fisheries data;
        iii. socioeconomic data; and
        iv. traditional knowledge.
    d. proposing rules specific to spawning aggregations for data access and sharing taking into consideration policies developed by the FDS-WG in context of the WECAFC Data Collection Reference Framework (DCRF), and presented in the first meeting of the FDS-WG in 2018; and
    e. reviewing proposed standards for collection of data needed to define biological measures and conversions as relates stock assessment and management of Nassau Grouper (NG) and Mutton Snapper (MS).

Fishery-independent (FI) methodologies for Fish Spawning Aggregations (FSAs) - Ms Yvonne Sadovy

21. Yovnne Sadovy presented information on the fishery-independent (FI) methods currently used to evaluate Fish Spawning Aggregations (FSAs). She noted that the methods were variable (e.g. visual (UVC (Underwater Visual Census), photography, remote video), biological (tagging, reproductive studies), acoustic (passive, active), hybrid (ROV[Remotely operated vehicles], AUV [autonomous underwater vehicles]) and local/fisher knowledge) and that flexibility with method selection was integral based on a variety of variables including location, species, questions and capacity (conditions, funding, manpower, experience, safety. Further, a wealth of information documenting specific pros and cons of these methods existed for FSAs.
22. The presentation addressed the importance of survey design when conducting FI assessments. Factors identified as integral to project success included: determining where to survey, whether the surrey covered the full geographic unit for the FSA, temporal period to survey (including moon phases, etc.) the need to collect data from multiple time periods to account for natural variation
23. UVC- several design factors included:
    a. need to ensure experienced divers to identify target species;
    b. using GPS towed/real-time kinematic positioning systems [RTK]);
    c. employing safety diving protocols/often challenging field conditions;
    d. obtaining fish sizes/biomass data from stereo-video cameras;
    e. photograph/video to directly record colours/behaviours, and for outreach;
    f. tagging can assist estimating fish numbers/assessing individual behaviours (e.g. site fidelity/time on site, etc.);
24. Remote visual census surveys (RVC)- factors for considerations noted were:
    a. remote UVC can be highly technical/expensive and requires extensive training to ensure quality data;
    b. equipment needs thus costs are greater-battery limitations; lighting dependencies; time-consuming to assess footage;
    c. can be challenging to determine fish numbers;
    d. well-suited for less accessible/deep sites when UVC not possible; and

e. valuable if fish easily disturbed and for extended periods and when difficult for diving.

25. Acoustic methods - considerations included:
    a. this technology is becoming valuable approach to assessing numbers and activities with minimum disturbance to fish;
    b. useful for deep sites (beyond safe diving) and for long-term data collection allowing comparisons across years; and
    c. need to visually 'ground-truth' (calibration protocols) and conversions of sound to numbers (biomass) of fish and to fish behaviour(s).
26. Hybrid technologies (ROV, AOV)- considerations were:
    a. increasing number of technologies exists allowing for remote collection of information on FSAs including number, size, biomass;
    b. estimation of fish numbers is challenging requiring ground truthing methods and thus can be expensive and time consuming;
27. Local/fisher knowledge (LEK/FK)- positive factors noted, included:
    a. experience of those living near or working on aggregations;
    b. experience over long periods (veteran/patriarch fishers/workers/biologists/dive guides);
    c. LK/FK provides important opportunity to understand economic/food importance of aggregation fishing/aggregating species;
    d. interviews best if kept short/simple and interviewers experienced/knowledgeable to gain respect/confidence from fishers providing opportunity to improve relationships between stakeholders and scientists; and
    e. personal pictures, fishers social media excellent data sources for improving scientific work/outreach opportunities.
28. Local/fisher knowledge- challenges noted included:
    a. species identification often an issue (lumping/confusing similar species); and
    b. FSA locations may be safeguarded, but information on timing/species/catch volumes can be sought. FSA locations may be CONFIDENTIAL.

Discussion/Questions

29. Ms Cummings reiterated from the presenter's presentation that there is no shortage of manuals and background material providing clear guidance on protocols for sampling and monitoring of FSAs using fishery independent methods (e.g. UVC, acoustics, and biological sampling (e.g. tagging, acquiring of fish sizes) and local and fisher knowledge (LEK). The presenter also noted that there have been recent advancements in use of these tools in particular in the use of lasers to obtain fish size.
30. Mr Taconet (FAO-NFISI) thanked the speaker for a clear and enlightening presentation. He further noted, on the topic of data acquisition and data management, this was clearly important from the perspective of what can be obtained in the field and also shared that these are important considerations. Further he indicated that use of these FI tools can provide a time series of estimates (e.g. densities) and so, comparisons across time (years) can be done.
31. On the topic of local knowledge, Mr Taconet noted the recognition that there has been an increase in availability of 'local knowledge' and this is a topic has been addressed recently at the level of United Nations Decade of Ocean science of the question of "how can these data types be further used in progressing a more sustainable ocean'. An example provided included 'fisher interviews' at which the opportunity to get information on area/size/timing of aggregation was

presented. Also, for fishers with a lengthy experience, some information then could be obtained on trends over time possibly. Finally, the question relating to data access and sharing arose- "who should have access to these data types"?

32. Mr Taconet asked the presenter- can the number of fish be counted (i.e. one by one?) and can this metric be converted to an index of abundance, providing say an 'indicator of stock health'? The presenter responded yes- and gave an example- of how the individual numbers could be converted to totals, further noting factors important to know included the full extent of the aggregation spatially and the timing thus to add credibility to the estimates. Also, the ability to do this depends on species/location/and sampler capability. In the situation, say for a few species and an aggregation/site small enough to dive the entire site, then all the fish can be counted. In the situation where a GPS towed method is used, then density estimates per unit area can be obtained (density per time interval and scaled to total area), but the total area must be known, and the timing must be known; these latter variables are often difficult to quantify with exactness.
33. On the local knowledge Ms Sadovy noted the importance to ground truth the information from the fishers, knowing the full extent of the aggregation (geographically) and the timing ground truthing using divers and/or other experts (e.g. fishery agency staff) is critical to progress using this type data in stock assessment.
34. Martha Prada raised the topic of the impact of climate change on the aggregation (timing/area) on FSAs, looking for clues in increases in temperature, particularly the lower temperature range; as temperature is known to affect the timing/spatial context of spawning. The need to consider these variables in adjusting the sampling protocols (e.g. deeper areas, adjusting season for sampling must be emphasized.
35. Ms Sadovy responded and noted a manuscript recently authored by Mr Brad Erosman, which noted these factors are potentially impacting the location/timing of the aggregation. In addition, she noted that aggregations can shift temporally for a variety of factors and not all are well documented.
36. Antonella Rivera of Coral Alliance, Honduras raised questions regarding use of submersibles in fishery-independent sampling of FSAs. Sampling has been occurring in Honduras since 2021. Due to poor weather and also depth considerations and low visibility (turbid conditions), there has only been sampling near the islands, poor visibility has impacted the capability of divers so, they have been considering other technologies (ROVs, drop cams, etc..). So, are there other FI tools that could facilitate obtaining estimates, even relative estimates of densities/abundance?
37. Ms Sadovy indicated these tools (e.g. RVC) only are providing snapshots so she does not know now how these products relate to total number (abundance) yet; these tools may reflect only an index (perhaps for density) at this point in time; however, she feels the use will improve in time.
38. Ms Sadovy stressed the importance that when making comparisons across year the critical need to compare 'likes with likes'- i.e. the metric (e.g. density, index of abundance, etc.) should be representative if the time of the FSA maximum abundance so knowing when the FSA is at the maximum timing of the year is critical.
39. Ms Sadovy noted also the use of buckets (by fishers in Asia fishing for reef fish) - acoustics could provide more information particularly in situations such as in Honduras. The ROV could facilitate informing the location/timing and possibly spatial extent of aggregation but possibly not necessarily getting to total numbers unless the size of the full aggregation is well known.

40. Ms Sadovy also suggested use of AI (artificial intelligence) and visual recognition patterns could be useful in the future, e.g. panning an area now then coming back in the future to compare trends over time.
41. Mr Taconet noted, going back to the topic of abundance- "when you want to have a full overview of abundance in a single country- do you pay most attention to abundance in a single individual site, in the end in order to have good view of aggregation in one site or do you need to cover all the sites, recognizing that there will be variability spatially"? He noted these are all important factors in addressing an overall sampling plan for monitoring status of FSAs to have a 'good' assessment of the size of the population and its evolution'.
42. Ms Sadovy noted, detailing some personal experience from a few detailed studies (e.g. for Nassau grouper where tagging has been done), that experience shows that once a species begins using a particular site, they usually return to that site again and again. Knowing the number of aggregations would be useful and knowing the number of subpopulations is important, then sampling across several aggregations would help lead to determining totals and then using acoustics possibly as ground truthing tools increasing confidence in final estimations and doing this at multiple aggregations.
43. Ms Sadovy then emphasized that identifying the question being asked and the need, was important here in refining the FI method and the sampling protocols to scale estimates from a single site to the entire FSA, particularly noting that recovery and protection of the species is a critical need. She added that for some species the number of FSAs is still unknown and the timing of them so a need for seasonal protection may be a management need. There could be a need to make reasonable estimates of the number and timing of these aggregations. Marc thanked Ms Sadovy again and noted the need to adapt the 'indicator' to specific questions of interest.
44. Ms Sadovy further noted that due to the biological nature of these species (pelagic spawners, pelagic eggs) she reminded that generally speaking if an aggregation is experiencing significant declines in one area this is strong evidence the species is declining across others, so if monitoring across several sites can be done, then possibly that will provide a good indicator and changes over time can be assessed in a relative way, not necessarily absolute totals, what is missing is information on distribution of these sub-populations across the entire Caribbean. She noted that at least for Nassau Grouper enough information exists to make good, educated guesses.
45. Ms Cummings going back to Ms Sadovy's FI presentation, which presented multiple approaches to monitoring these populations, can the cost benefits be considered in terms of selecting the FI method best for the particular situation? Also, can the methods be evaluated in terms of which provide good information on the variability of results, noting that spatial/temporal variability over time was important?
46. Mr Brian Luckhurst (FSA researcher) raising the topic of 'time of day' when a census/survey was being done was a factor, noting the density (numbers) tended to increase as the time of spawning approached; and also that the visual field tended to decrease thus affecting the estimation.
47. Ms Sadovy recalled her earlier comments on use of remote methods in areas of deepwater; however, she also pointed out here how these tools, for example GoPro cameras, could aid in this scenario where visibility was a factor. and also these methods are relatively inexpensive.
48. Ms Patricia Hubert-Medar-Medar (St Lucia)- inquired if there is technology to allow age at length from these surveys and what have been the results. Are the number of species spawning

at younger ages or is it the older fish spawning more? Ms Sadovy responded that she was not aware where this had been evaluated. One of the issues is that rarely is spawning actually observed since the spawning activity usually is at low visibility (dusk/night) conditions.

49. Ms Cummings- brought up the use of local knowledge again. Noting the importance of using this type of knowledge more in the future. Ms Cummings raised the need to further engage the stakeholders (fishers, leaders, community groups) perhaps taking advantage of the SA (Spawning Aggregations) Communication group within the (SAWG) as a mechanism to further increase information gathering using the tools already set up.

Methods, data sources and findings from pilot countries (Belize and Bahamas)- Myles Phillips

Belize

50. Mr Phillips noted that Nassau grouper was once the most commercially important species in Belize. Aggregations of this species were known to be made up of 30 000 fish on average in the 1950s. One aggregation in Belize, known as Caye Glory or Emily, was the centre of the Nassau grouper fishery and was believed to comprise over 100 000 fish. By the 1980s, FSAs were already showing major signs of depletion, with Caye Glory down from 100 000 to less than 15 000 fish. Between 1980 and 2000, fisheries managers banned the use of fish traps at FSAs, drafted a Nassau grouper management plan and established several of the first marine reserves.

51. By the year 2000, Nassau grouper could only be found in numbers exceeding 1 000 at two of nine traditionally recognized FSA sites in Belize - Northeast Point at Glover's Reef Atoll and Sandbore at Lighthouse Reef Atoll. They were found in low numbers or were considered to be extirpated from seven other sites, including Caye Glory.

52. Since the year 2000, there have been several developments with respect to the management of Nassau grouper, many of them driven forward by simultaneous national and regional projects. In 2001, a national Spawning Aggregation Working Group was formed, with participation from government, NGOs (Non-governmental Organizations) and fisher representatives. In 2003 and 2009, legislation was enacted which resulted in the year-round closure of 13 multispecies FSA zones, and specific protections for Nassau grouper. These protections include a seasonal closure from December to March, size limits (upper and lower) to protect juveniles and large fecund females, a requirement for NG to be landed whole, and a requirement for all filets must retain a skin patch for species identification purposes.

53. More recently, in 2020, fisheries policy was updated with the Fisheries Resources Act. While it did not specifically address FSAs, it increased the fines for infractions, creating a deterrent for illegal fishing. In the same year, a regional project by MARFish/COBI assessed the status and management of FSAs in the Mesoamerican region. In 2022, an UNCTAD Project proposed guidelines for the development of a multispecies finfish management plan for Belize using the fishery basket approach. While the management plan has not yet been drafted, the guidelines make recommendations for management of NG, MS, and other species that use FSAs. The Government of Belize supports special patrols at spawning sites, which are conducted by Coast Guard with support from NGOs.

54. Management of FSAs happens in the context of the national protected areas system. The country is aggressively pursuing 30x30 goals, with 20.5 MPA (marine protected area) coverage in

the Exclusive Economic Zone(EEZ) and plans to achieve 25 percent within the next few years. Replenishment zones, which prohibit commercial fishing, make up about half of the MPA coverage (11.65 percent). Belize has also adopted an area-based management approach known as the "Managed Access Program" to regulate fishing pressure and increase stewardship and has advisory councils for many protected areas which promote equity and inclusion of stakeholders in decision-making processes. Despite this, no national framework for evaluation of FSAs management effectiveness was identified.

55. Mutton snapper has received considerably less attention than Nassau grouper. It is only regulated at Gladden Spit FSA, where it has been exploited since 1950, and there are no national size regulations or national seasonal closure. Fishers require a special "traditional fishing" license at the FSA since 2006, and fishing is permitted two weeks each month from March-June. In a 2008 study, fishers noted declines in profitability of fishing at Gladden Spit.

56. In order to review management effectiveness, the project focal point (Phillips) tried to identify a monitoring and evaluation framework, including targets, indicators and assumptions, reviewed monitoring baselines and programs, modes of evaluation and reporting, and governance adaptations made over time.

57. Belize was found to have a rich repository of baseline information, with the earliest material on FSAs and the Nassau grouper fishery published as early as the 1940s. Further documentation arose in the 1980s to 1990s and was centred around the ongoing decline of the species and the early management efforts. Between 2000 and 2010, there was a massive increase in the resources devoted to the study of known FSAs and the traditional knowledge of resource users. Finally, in 2022, three previously undocumented FSAs were confirmed in the Cayman Crown region of the Sapodilla Cayes Marine Reserve.

58. While monitoring is widespread, no formal monitoring and evaluation framework was identified. It was proposed that the incumbent multispeciesmultispecies finfish management plan should include indicators which use fishery dependent, fishery independent, outreach and enforcement data to test assumptions and monitor against expected outcomes to evaluate FSA management effectiveness.

59. Multiple types of fishery independent monitoring tools are used in Belize. The visual census method is conducted at the FSA during the spawning season from the third to eighth day after the full moon and yields abundance and size composition data from eight of the thirteen protected sites. This data was stored at the University of Belize Environmental Research Institute in a central repository. Unfortunately, due to funding constraints and obsolescence of the digital database, the information which had been recently recovered was fragmented. Data could also be sought from the organisations which collected them, but in some cases, it was not found to be clean or complete.

60. Laser callipers were used to measure total length of fish at the FSA, and short time series are available from three FSAs. Reef Survey data was collected across the country using the MBRS and AGRRA methodologies and was available from the Healthy Reefs Initiative and the organisations which had collected them. Healthy Reefs Initiative has data from 2006 to 2021 and could be used to look at densities in habitats across the country to see how management has affected the species. There was a caveat on the effectiveness of such a study: adult and megaspawners might not be well represented in fish survey data captured by SCUBA, which is usually done at less than 15 metres. Adults may live deeper according to preliminary analyses.

61. Belize does not have very much fishery dependent data (i.e. data from commercial catches/landings) which can be used to describe FSAs or FSA species. Catch data (frequency in catch, total length, weight, gear) is available from Glover's Reef (2004–2019) and from Turneffe Atoll (2023). Surveys of finfish landings in six coastal communities across Belize landing sites conducted by WCS from 2017 to 2022 was the only other source identified, and could be a robust data stream if adopted nationally. The Belize government was working on instituting a catch log program which, if successful, would provide the most comprehensive source of fishery dependent data in the country. However, at present, outside of the data collected by NGOs, only export data is collected, and domestic sales are not routinely recorded.
62. With respect to enforcement, Nassau grouper infractions are relatively rare in Belize, and stakeholders are well sensitized about regulations, fines and penalties through multifaceted outreach efforts by multiple organisations. Fishers are generally in support of efforts to protect these species but wish they could be more involved in the process and better informed.
63. Night fishing by foreign vessels is considered a key threat to FSAs, and even locals have been known to fish illegally if there is no enforcement presence at the FSAs. Manpower is not considered to be the key problem – the cost of fuel is prohibitive to travelling to distant FSAs regularly.
64. Historical landings and trade data is mostly available in the form of reconstructed catches in peer-reviewed publications. There is a lot of data about Gladden Spit and Caye Glory, but this information does not exist for other FSAs. Another challenge is that historical trade data were not recorded at the species level.
65. The presenter separated sources of information into four categories:
    a. Intra-organisational reports include detailed information on monitoring activities within a specific year or short time period. They were often inaccessible or lost to institutional memory. Where accessible, they provide important context for interpretation of trends.
    b. Interorganisational reports fell under two sub-categories. Reports to donors had similar characteristics to intra-organisational reports. The annual reports and newsletters produced by the Spawning Aggregation Working Group, in contrast, were relatively accessible from members of the working group.
    c. Peer-reviewed publications were identified as the most accessible source of information, and highly effective at preserving information in posterity.
    d. Institutional reports enshrined information and key recommendations as outputs of past projects.
66. Staff turnover is a huge problem in Belize. Information is often lost to institutional memory, and most of the documents which have been produced do not take long term meta-views of the information to date. Management of FSAs in Belize would benefit from the synthesis of short-term reports to provide context for intuitive adaptive management.
67. While much information has been collected and reported on, there have been no changes to FSA-specific regulations since 2009. While most of the regulatory best practices are already enshrined in law for Nassau grouper, there is very limited active regulation of other FSA species. An FSA specific monitoring and evaluation framework would highlight areas for adaptation.
68. An extensive analysis of strengths, weaknesses, opportunities and threats (SWOT) was produced in plenary with Belizean stakeholders. Key findings were extracted and presented below. Notable was the fact that stakeholders saw more opportunities than threats. There is an abundance

of information, political and institutional support for FSA management and a strong collaborative spirit among stakeholders.

69. **Key strengths Belize**
    a. regulations are quite advanced;
    b. political will to support FSA conservation;
    c. positive outlook by fishing community on regulations;
    d. continuity of active management, enforcement and collaborative working group;
    e. fishers generally avoid landing Nassau grouper to avoid penalties; and
    f. an abundance of baseline information on FSA locations/species composition.

70. **Key weaknesses Belize**
    a. inconsistent funding/resource availability;
    b. enforcement gaps;
    c. significant data gaps (esp. fishery dependent);
    d. finfish management plan not operational;
        i. limited attention given to other FSA species
    e. no specific monitoring and evaluation framework/adaptive strategy for FSAs;
    f. limited local capacity/impetus for analysis/publication; and
    g. limited adaptation in management.

71. **Key opportunities in Belize**
    a. local conservation trusts prioritize financial support for FSA protection;
    b. adoption of new technologies and methods;
    c. twenty years of information exists to inform adaptive management (national and regional);
        i. Proposed finfish management plan
        ii. MARFish FSA management recommendations
        iii. WECAFC RFSAMP Pilot
    d. Capacity building and outreach to community and resource user groups for
        i. Greater participation in governance
        ii. Adaptation of resource use practices

72. **Key threats in Belize**
    a. Transboundary illegal fishing;
    b. Effects of climate change, coral-algal phase shift on reefs;
    c. Impacts of coastal development; and
    d. Stakeholder conflict

Findings from FSAMP pilot countries: Bahamas country report – Myles Phillips (taken from input from report of Krista Sherman

73. Large quantities of data exist in the Bahamas, including 141 publications, reports, theses and books on FSA species. There are more than 40 publications and technical reports on Nassau grouper, but only three on mutton snapper. While there has been some work on Nassau grouper FSAs, no work has been done on mutton snapper FSAs. Data on Nassau include AGRRA surveys, FSA monitoring, acoustic telemetry, genetics and passive acoustic monitoring.

74. Of the 74 known FSAs in the Bahamas, 40 host Nassau grouper FSAs and 20 host mutton snapper FSAs. 13 are confirmed to be multispecies. Most of the Nassau grouper FSAs are greatly reduced in size from historical abundances.

75. Several knowledge gaps were highlighted for Nassau grouper and mutton snapper in a 2014 meeting:

Nassau Grouper	Mutton Snapper and Other FSA species
● Stock assessments of Nassau grouper FSAs ● Perceptions of Nassau grouper ● Catch assessments to engage fishers ● Identification of key nursery habitats and threats to habitats ● Movement patterns of Nassau grouper across FSAs ● Identification of multispecies FSAs ● Population connectivity ● Larval dispersal and genetic connectivity ● Geomorphology and oceanography of shelf in relation to FSA sites ● Reproductive biology of Nassau grouper.	● Increased fisher involvement with FSA research o FSA locations o Changes over time ● Mapping FSAs – for potential inclusion within BNPAS ● Exploratory methods for locating FSAs ● Impacts of climate change on the biology & ecology of FSA species

76. Long-term, species-specific national landings data do not exist for most species although commercial landings data between 1994–2022 are available for Nassau grouper. These data show that Nassau grouper landings have declined by ~97 percent over the last 28 years from a peak of 514 tonnes (513 586 kg) in 1997. Over the last seven years, commercial landings data have been reported for mutton snapper and these data show that total landings range from 1.9-9.1 tonnes with a mean value of 6.6 tonnes valued at USD 61 232.30.

77. Stakeholder input was obtained (through in-person workshop) on the 16 priority recommendations for Nassau grouper and mutton snapper conservation.

78. Most of the participants in the workshops did not know about the FSAMP, and for most, this was their first exposure to the 16 actions. They were found to be mostly supportive except for the synchronization of closed seasons. It had taken a long time (1970–2015) to institute the existing seasonal closure (December-February) closure due to regular pushback from fishers. Extension to include March would be an unpopular proposal.

79. There is no closure for mutton snapper, though there were discussions ongoing around implementation of a seasonal closure between 1 May and 30 June.

80. Stakeholders suggested that in the national context, some long-term (within ten years) recommendations could be completed within the medium term (within five years) because of planned or ongoing efforts. The opposite was true for others. It was suggested that Action 3 (Define criteria to prioritise sites for management action/support) should be considered a medium-term activity at the least due to ongoing difficulties with obtaining research permits.

81. Action 12 (non-extractive uses of FSAs) was considered not to be feasible in the context of the Bahamas, as the known FSAs were found in deep water with difficult ocean conditions, making them inappropriate for tourism or casual visitation.

82. Action 6, (collection of socioeconomic and trade data) was considered not to be a priority for the Bahamas.

83. Bahamas faces a number of challenges with respect to management of FSAs. In terms of enforcement and compliance, technical capacity and resources are needed to address IUU fishing. There was also the need to strengthen awareness and enforcement of the Lacey Act, the Port States Measures Agreement, etc. An anonymous reporting system for violations would facilitate greater participation by fishers in enforcement activities. There was also the need for an improvement in strategic communications.
84. In terms of governance, there was a need to strengthen intra and interagency communication and cooperation (DMR, RBDF, DEPP, BNT, BahWEN) and to improve reporting and data management systems (e.g. SBIS). An ongoing GEF project was working to establish a spatial biodiversity information system, but it will be access restricted. For years, new regulations made it more difficult to obtain research permits. This posed an obstacle to monitoring and research activities, which needed to be resolved. Revise legislation that are hindering work on FSAs.
85. Threats to FSA management in Bahamas include nursery habitat loss and/or fragmentation, the expansion of cruise ship ports, including in MPAs and near to FSAs. Finally, SCTLD and other diseases (such as the fish spinning disease observed in nearby Florida) had implications for long term reef function, resilience, and would undoubtedly impact FSA species and fisheries.
86. Funding was being sought to carry out more FSA related activities, including:
    a. strategic surveillance;
    b. sustained investments in training, enforcement;
    c. address research gaps;
    d. outreach to promote compliance with regulations and deter IUUF; and
    e. more targeted outreach materials for adult stakeholders.

Findings from FSAMP pilot countries: Cuba – Myles Phillips (synthesized from the Cuba focal point for the pilot project)

87. Wildlife Conservation Society (WCS) in Cuba has been working on FSA management in-country in collaboration with the Centre for Fisheries Research (CIP) and the Ministry of Food (MINAL).
88. Cuba's distinct fisheries account for the following proportion of the catch:
    a. state owned "industrial" fishery 23 percent (same vessels and fishing gear as artisanal fishery);
    b. artisanal fishery 66 percent;
    c. subsistence 10 percent; and
    d. recreational 1 percent.
89. A considerable part of the commercial catch includes reef-associated species including snappers, groupers, grunts, queen conch, oysters, sea cucumber and spiny lobster.
90. Overfishing of several finfish species was documented by the 1970s and 1980s. Despite several fishing regulations in the 1980s and overall reduction of fishing efforts in the early 1990s due to a major economic crisis, fishery landings did not recover.
91. Catches and maximum size of commercially important reef fish species have declined over the last 40 years due to unsustainable fishing practices and high fishing pressure focused on spawning aggregations. The Nassau grouper (E. striatus) was a valuable fishery before the 1970s

and was considered mostly overfished by the 1980s. Noting, several snapper species, including the mutton snapper, have declined but still retain commercial importance into the present.

92. Nassau grouper are captured near to shore, using galvanized wire pots.

93. From 1975 to 1989 the resource was considered overexploited (catches less than 50 percent of the maximum historical catch). From 1990 to the present it is considered collapsed (catches less than 10 percent of the maximum catch).

94. Mutton snapper spawning aggregations have been identified in 13 of the 23 reported multispecies FSA in Cuba. The abundance tendency in mutton snapper aggregations within protected areas is currently unknown.

95. The Centre for Fisheries Research has compiled statistics on the catches of snappers by the state sector and the private sector. The analysis of these data showed a consistent decrease in catches since 1985 and an over-exploited fishery on a downward trend into fisheries collapse.

96. In view of these results, CIP is proposing a new regulatory approach banning fisheries for mutton, lane, cubera, yellowtail, and grey snapper during the reproductive season.

97. New MPAs were proposed after the Law of Environment (1997) in the late 1990s to early 2000s to protect snappers and groupers and to limit fishing and promote ecosystem conservation.

98. According to the National Centre of Protected Areas of Cuba, 84 marine areas have been identified to compose the MPAs system across the archipelago (2014–2020), 50 of which are already legally declared. If all these MPAs were established and were adequately managed, they would protect ~ 25 percent of the Cuban shelf, including ~31 percent of coral reefs, ~24 percent of seagrass beds, and ~35 percent of mangrove forest across the archipelago.

99. Most Cuban MPAs face management challenges including lack of infrastructure, staffing and resources to patrol and monitor. Because fisheries management (outside PAs) and protected area management is conducted separately, there is no unified approach to the monitoring and management of FSAs.

100. To date, there are 23 FSA identified in Cuba; 11 fall within protected areas. In four protected areas, PA staff conduct or have conducted (limited) studies on FSAs. Other PAs do not have a plan in place nor the capacity to monitor FSAs. The remaining 12 FSAs fall outside protected areas, under the purview of Ministry of Food Industry, with only two being managed by Centre for Fisheries Research

101. The management of grouper and snapper fisheries in Cuba is very complex, due to the fact that many species with different productivity levels are caught simultaneously and several types of fishing gear with different yields are used.

102. Several decades of research on aggregating species, with 70 publications exclusive to Cuba and over 100 publications from the Caribbean region and at the global scale that involve Cuba.

103. FSA fishing still occurs in Cuba, and efforts by Centre for Fisheries Research (CIP) are underway to regulate grouper and snapper fisheries with aims to protect FSAs, allow the recovery of species, and foster longer-term prospects for sustainable fisheries.

104. For the Nassau grouper, because of the critical state of its fishery, the consensus for a total fisheries ban was reached. For other species, including the mutton, lane, cubera, yellowtail, and grey snapper, CIP is proposing a new regulatory approach banning fisheries during the reproductive season and the establishment of fishing quotas. These proposals were agreed to be presented to the Fisheries Consultative Commission, the highest national fishery management body.

105. CIP's efforts in leading crucial policies for the protection and sustainability of key grouper and snapper species—such as the permanent ban on Nassau grouper and proposals for temporary bans and quota settings for mutton and other snappers—create an unprecedented opportunity to enhance and expand FSA monitoring in the country.

106. This initiative would require adequate funding and coordinated efforts between CIP and protected areas that host FSAs to develop a comprehensive plan for monitoring and protecting FSAs in Cuba.

107. Enforcing national fishery regulations in Cuba is exceedingly difficult due to:

a. extensive fishing grounds;
b. insufficient funding;
c. lack of staff; and
d. inadequate resources.

108. These challenges are compounded by the comprehensive embargo imposed by the United States, which severely restricts access to crucial enforcement resources (e.g. fuel, boats, etc.). In this challenging context, the most viable strategy is to foster compliance through collaboration with state and private fishing enterprises, subsistence fishers, and coastal communities.

109. A key strategy identified by CIP and other stakeholders to reduce fishing effort is to support aquaculture initiatives and other sustainable or alternative livelihoods, which will necessitate mid to long-term investment support.

110. Key Research Needs in Cuba:

a. evaluation of the status of multispecies FSAs inside and outside protected areas
b. reconciling FSA research protocols and data gathering tools to standardize information and build long term datasets at the local and national levels and following regional standards;
c. identification of key nursery habitats and threats to habitats;
d. movement patterns of Nassau grouper and mutton snapper across FSAs;
e. reproductive biology of Nassau grouper and mutton snapper;
f. population connectivity, especially between MPAs and fishing grounds; and
g. larval dispersal and genetic connectivity.

111. In Cuba, adequate funding is crucial for developing a comprehensive plan for monitoring and conserving FSAs. This plan should include sustained investments in research, training, "soft" compliance approaches, and the development of outreach materials to promote behaviour change, improve compliance with national fishery regulations, and reduce illegal, unreported, and unregulated (IUU) fishing.

112. Beyond securing funding and resources, strengthening collaboration between Centre for Fisheries Research, protected area staff and coastal communities will be essential for the success of FSA conservation efforts.

Proposed template for collecting scientific data related to Nassau Grouper and Mutton Snapper aggregations

113. Ms Nancie Cummings (FDS WG) provided input on the background relating to development of templates for collecting scientific information for Nassau Grouper and Mutton snapper FSAs. It was noted that Nassau grouper and mutton snapper were selected as focal species for the FSAMP. Nassau grouper has been recognised as critically endangered by IUCN and given

conservation priority by multiple international bodies, while significant gaps remain with respect to addressing the status of mutton snapper populations (Near Threatened). Several data and information gaps impede FSAMP implementation including:

- FSA status (i.e. number individuals) is not known for most FSA species or needs updating by country/site/species;
- Species-specific landings data are not available for the mutton snapper in most countries and are lacking for many countries for the Nassau grouper, making it challenging to know the full extent of its landings or to understand trends over time in removals and status of the population;
- FSA spawning locations and timing is not known for many countries/sites or needs updating; and
- Biological information (catch size composition, standards/protocols for individual length and weight collections and references on biological conversions, and life history inputs) are unavailable or require updating- specific to the WECAFC DCRF Task IV.1 and Appendix 6 (Biological references).

114. Ms Cummings noted that to address these gaps, the adoption of standards (i.e. consistent formats and data collection protocols) and references (e.g. targets, conversion factors, growth and maturity schedules) is recommended to provide criteria against which monitoring and evaluation of FSA management can occur. The team generated a list of potential criteria for evaluating standards and the development of relevant templates for each biological measure, for adoption noting factors including sampling area (and spatial resolution)/sampling time of year of collection, size/age range of individual measured, gear of capture, sampling method were important to consider.

115. Recommended standards for the collection of individual observations of length and weight for WECAFC marine resources are needed; these data types needed in order to inform biological measures for conversions and other metrics (e.g. weight-length conversion equations, growth curves and characterizations, length and age at first maturity and at 50percent maturity). Ms Cummings provided a table identifying recommended standards for length and weight as aligned with the relevant section of the WECAFC DCRF Appendix 6 (as follows) and also provided templates for informing biological measures and conversions.

Appendix Table 6.2. [Recommended] Length and weight frequency standard units for use in WECAFC sampling

FreqTypeCode-Standard	FreqType Description	Unit and interval size	Species
TL[1]	Total length	Centimetres (e.g. 1,2,3)	Finfish, elasmobranchs
FL	Fork length	Centimetres (e.g. 1, 2, 3)	Finfish, elasmobranchs
SL	Standard length	Centimetres (e.g. 1, 2, 3)	Finfish, elasmobranchs
CL[2]	Carapace length	Millimetres (e.g. 1, 2, 3,)	Crustaceans (including lobsters, crawfish, shrimps, prawns, stomatopods)
ML	Mantle length	Centimetres (e.g. 1, 2, 3)	Cephlapods, Decapods
PCL[3]	Precaudal length	Millimetres (e.g. 1,2,3)	Elasmobranchs
LT	Lip thickness	Millimetres (e.g. 1,2,3)	Conch
SCLmin	Minimum straight carapace length, notch to notch	Centimetres (e.g. 1,2,3)	Sea turtles
SCLn-t	Minimum straight carapace length, notch to tip	Centimetres (e.g. 1,2,3)	Sea turtles
TBL	Total body length	Centimetres (e.g. 1,2,3)	Cetaceans
WGT	Weight - Round	Grams (e.g. 1, 2, 3,)	All species
HGTW	Headed and Gutted (WGT)	Grams (e.g. 1, 2, 3,)	Finfish, elasmobranchs

TW	Head removed	Grams (e.g. 1,2,3)	Crustaceans (e.g. lobster)

[1] Noting TL is the preferred length type for finfish, cephlapods, and elasmobranchs where possible
[2]CL is preferred length type for crustaceans
[3] Noting use of precaudal length optional for elasmobranchs

116. Recommendations for specific templates to inform Appendix 6 Biological measures, as relates NG and MS were made for:

- Appendix 6.3 - Growth models (references) templates adopted by WECAFC.

Species	WECAFC subarea	Finer resolution of subarea if known	Gear type of collection	Sex	Model used	Model parameters	Reference	Sample size	Length range	Ageing structures	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	3-Alpha code identifying the gears (See WECAFC_DCRF codes xls)	The code for the sex: M (Male), F (Female) F+M (sex combined)	Identification of growth model (e.g., von Bertalanffy, Richards, Schnute, etc.)	Parameter values (i.e., k, tzero, Linfinity - for von Bertalanff). Example is:	Model Reference	Number observations used in the growth model estimation	Range of length observations of the data for which the model parameters were estimated from	Spines, otolothis (whole, stctioned), fin rays, etc.	Are the parameters applicable for entire WCA (Y,N)

- **Appendix 6.4- Conversion factors (references) templates adopted by WECAFC**:
  - 6.4.1 Weight-Length

Species	WECAFC subarea	Finer resolution of subarea if known	Relationship/Model	Reference	Sample size	Length Range	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	Parameter values	Model Reference	Number observations used in the model estimation	Range of length observations the data for which the model parameters were estimated from	Are the parameters applicable for entire WCA (Y,N)

- 6.4.2 Length-Length conversion templates templates adopted by WECAFC:

Species	WECAFC subarea	Finer resolution of subarea if known	Model	Reference	Sample size	Length Range	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	Parameter values	Model Reference	Number observations used in the model estimation	Range of length observations the data for which the model parameters were estimated from	Are the parameters applicable for entire WCA (Y,N)

- **Appendix 6.5 Recommended template to inform values of natural mortality (references) adopted by WECAFC:**

					Natural mortality by sex and age																						
					Age																						Region specificity
3-digit WECAFC species code	WECAFC subarea	Finer resolution of subarea/division if known	Sex	Method	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Reference	Are the parameters applicable for entire WCA (Y,N)

- **Appendix 6.6 Recommended template to inform length at first maturity (Lm) and length at 50percent maturity (L50) adopted by WECAFC:**

Species	Country	Reference year	WECAFC subarea/divison	Gear type of collection	Sex	Length at first maturity	Length at 50% maturity	Sample size	Length at sex changes (if applicable)	References	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	The ISO 3-alpha code of the country under which all vessels operate (refer to the WECAFC_DCRF codes xls)	the year or year series the data were collected from that are reflected in the equation	WECAFC statistical reporting area / subarea divisioi the growth model corresponds to	See WECAFC DCRF codes.xls	The code for the sex: M (Male), F (Female) F+M (sex combined)	The size at which first maturity is observed	The size at which 50% of the observations is mature)	number observations used in the model	size of sex transition	maturity is not estimated through sampling but taken from literature, enter the complete bibliographic reference. If available, please	Are the parameters applicable for entire WCA (Y,N)

117. Specific template parameter inputs for Appendix 6, Biological measures for NG and MS, follow in the next section "Stock assessment needs for biological parameters for NG and MS". It was noted that the templates developed under this project component (2) although developed with specific interest for NG and MS were relevant for all WECAFC species and also would evolve as needed.

Questions

Ms Patricia Hubert-Medar (St Lucia) - Patricia regarding getting more reliable or more data to conduct these type assessments. If we have this information from (e.g. ideas of maturity and size) would help with managing and doing stock assessment. Ms Cummings noted that Ms Sadovy was referring to fishery independent data and they were UVC and RVC and tagging. Ms Cummings emphasized "we need to be clear that whenever we are sampling- we must clearly indicate that whatever tool we are using that we know what the results are reflective of.

Ms Sadovy noted in some cases it is with the aggregations where we can get these data from (e.g. size). Also, Ms Sadovy noted that for some of the templates presented by Ms Cummings- we need to get creative with. Can we use aggregations to provide indicators of status of the population as a whole? Ms Sadovy noted that we possibly will have to get creative to sample the FSAS to obtain these parameter inputs while acknowledging the data sources (fishery-independent samples).

Patricia also noted in a second question: One of things she is thinking of- regarding the table that indicated the countries. Can all these countries come together and produce a single form, this would help the process, and possibly be more reliable.

Ms Cummings followed with an additional summary of the catch forms in the region noting the Belize form was very simple and did collect length data (e.g. the DCRF task IV data) and could be sufficient to obtain the needed statistics for an assessment.

Mr Taconet noted the topic of standards and data frameworks and making available existing frameworks for particular species. Ms Sadovy reiterated the need to integrate FI data (e.g. density) if it is retained by the group- that is something not in the DCRF current- that is an example of a gap or information missing in the DCRF framework. Another point is needed to distinguish how we collect data in the field- noting Ms Cummings shared the multiple forms for collecting CPUE and lf (e.g. Belize) - currently in DCRF reporting is at aggregate level. Another element is for the WECAFC logbook- it is the most comprehensive framework and provides a tool that can be used to define a form.

Mr Taconet noted re' Ms Medar's question re' can a single form be developed, he shared about the goal of what FAO is trying to implement with CWP standard, start with global level then move to some global case studies. How can we standardize data collection at global level and in the field?

Ms Sadovy- reminding that many of the forms data variables just will not be there because of the nature of the small-scale fisheries. She compared the forms to industrial vs small-scale in operation. She noted that one indicator could possibly be number fish in an aggregation over time and then scaled up to the totals.

Mr Taconet noted we have the framework. Noting we develop frameworks and then the framework must work and be harmonized with other data of other WGs. This WG raised the question of what are the data items that are most applicable to FSAs. So, bycatch and discards may be there but may not be critical for FSAs in terms of determining status.

Some further discussion on Ms Medar's question of can a single form be used for all countries? Mr Taconet shared some reference harmonization work being done with CWP related to standardizing of forms at global/regional/national level.

Stock/Fishery assessment needs for biological measures and conversions (as relates Nassau Grouper and Mutton Snapper)

118. Ms Cummings provided inputs on stock assessment needs for references- specifically focusing on Nassau grouper (NG) and Mutton snapper (MS) the two focal species in the pilot project first presenting some background on data collection and background on the need for collection.

119. Length data observations are needed to:
   a. characterize changes in size structure of population (stock) in space and time, to inform recruitment, allow selectivity by fishery/fleet to be informed, to further inform more advanced stock assessment evaluations using length/weight inputs;
   b. noting the preferred standard length is total length (TL) for finfish and elasmobranchs) - 1 cm units and carapace length (CL) for crustaceans- 1 mm units;

120. Weight observations are needed to:
   a. inform weight-length equations;
   b. inform calculation of mean individual weight from a sample for use in determining total sample weight and catch weight. Calculation of total catch weight is also needed to inform Task I and II statistics of the (WECAFC) DCRF;
   c. investigate the relative condition factor (K) or robustness of a population of fish (Carlander 1977, Williams 2000). As condition factor varies with sex and age of a fish and season it is recommended to consider sex and age (length) in the data collection design; and
   d. Noting the preferred standard weight type is whole weight (1 gram units).

121. Field guidance for length and weight observation collections should consider at a minimum:
   a. importance in season/gear/spatiality- important in length data collection; and
   b. importance in season/sex/ important in weight data collections and type of tools (hanging balance vs electronic scale).

127. Considerations to apply when developing references (standards) was addressed for:
   a. growth- with considerations for model choice and ageing method, range of length in data, sex and gear;
   b. maturity- with considerations for seasonality and sex;
   c. Reproduction schedules (length at first maturity, length at which 50percent of population is mature- Lm, $L_{50;}$ and
   d. Natural mortality- with considerations for age specificity, model choice.

128. Considerations to apply when developing biological conversions:
   a. weight to Length (W-L);
   b. length to Length (e.g. FL-TL, SL-TL, Fl-SL); and
   c. gutted to Whole, processed to whole (live).

129. All references requiring periodic review and updating as relevant
- With considerations for relevant spatial and temporal scales for all references

130. Recommended growth measures for Nassau grouper and Mutton snapper

Species	WECAFC subarea	Finer resolution of subarea if known	Gear type of collection	Sex	Model used	Model parameters	Reference	Sample size	Length range	Ageing structures	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	3-Alpha code identifying the gears (See WECAFC_DCRF codes xls)	The code for the sex: M (Male), F (Female) F+M (sex combined)	Identification of growth model (e.g., von Bertalanffy, Richards, Schnute, etc.)	Parameter values (i.e., k, tzero, Linfinity -for von Bertalanff). Example is:	Model Reference	Number observations used in the growth model estimation	Range of length observations of the data for which the model parameters were	Spines, otolothis (whole, stctioned), fin rays, etc.	Are the parameters applicable for entire WCA (Y,N)
LJN	31.1	Florida	FPO, LHP	F+M	von Bertalanffy, truncated ages 3+	Lt = 861{1 - exp{0.165*{t+1.23}} where Lt =Total length mm and t = years	O'hop 2015 cited in Stevens et al. 2019	13,052	84 - 906, mm TL	sectioned otoliths	
GPN	31.3	31.3.2, Abaco, Long Island, New Providence	FPO, MDV	F+M	von Bertalanffy; Haddon 2001	Lt = 932{1.-exp{0.10 * {t+1.70}}, where Lt = Fork length mm and t = years	Cushion 2010 cited in Stevens et al 2019	176	325.26 - 925.71 mm TL	sectioned otoliths	

131. Recommended weight-length conversions for Nassau grouper and Mutton snapper

Species	WECAFC subarea	Finer resolution of subarea if known	Relationship/Model	Reference	Sample size	Length Range	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	Parameter values	Model Reference	Number observations used in the model estimation	Range of length observations the data for which the model parameters were estimated from	Are the parameters applicable for entire WCA (Y,N)
LJN	31.1	Florida	$W = -18.0306 \times (\text{Fork length})^{3.0275}$, where W = Kilograms and length = Fork length millimeters	Faunce et al. 2015	3,232	215 - 829 mm FL	
GPN	31.3	31.3.2, Abaco, Long Island, New Providence	$W = 4.0 \times 10^{-7} (\text{Length})^{3.2}$, where W = grams and Length = Total length in millimeters	Cushion 2010 cited in Stevens et al 2019	265	325.26 - 925.71 mm FL	

Recommended length-length conversions for Nassau grouper and Mutton snapper

Species	WECAFC subarea	Finer resolution of subarea if known	Model	Reference	Sample size	Length Range	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	Parameter values	Model Reference	Number observations used in the model estimation	Range of length observations the data for which the model parameters were estimated from	Are the parameters applicable for entire WCA (Y,N)
LJN	31.1	Florida	Total length (millimeters) = 10.015 + 1.065 x Fork length (millimeters)	Faunce et al. 2015	1, 511	195 - 784 mm FL	
GPN	31.3	31.3.2, Abaco, Long Island, New Providence	Total length (millimeters) = 2.81 + 1.13 x Standard length (millimeters)	Sadovy and Colin 1995		174 - 695 mm FL	

133. Recommended measures of size at first maturity and at 50 percent maturity for Nassau grouper and Mutton snapper

Species	Country	Reference year	WECAFC subarea/divison	Gear type of collection	Sex	Length at first maturity	Length at 50% maturity	Sample size	Length at sex changes (if applicable)	References	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	The ISO 3-alpha code of the country under which all vessels operate (refer to the WECAFC_DCRF codes xls)	the year or year series the data were collected from that are reflected in the equation	WECAFC statistical reporting area / subarea divisioi the growth model corresponds to	See WECAFC DCRF codes.xls	The code for the sex: M (Male), F (Female) F+M (sex combined)	The size at which first maturity is observed	The size at which 50% of the observations is mature)	number observations used in the model	size of sex transition	If the size at first maturity is not estimated through sampling but taken from literature, enter the complete bibliographic reference. If available, please enter reference data also for Group 2 and Group 3	Are the parameters applicable for entire WCA (Y,N)
LJN	USA	1998-2002	31.1	FPO, LJH	F+M	330 mm TL	353 mm TL	221	NA	Ohop 2015	
GPN	BHS	January 2007 - April 2008, monthly	31.3.2	MD	F+M	406 mm TL	435 mmTL	516	581 mm TL	Cushion 2010	

134. Recommended measures of natural mortality for Nassau grouper and Mutton snapper

					Natural mortality by sex and age																						
					Age																						Region specificity
3-digit WECAFC species code	WECAFC subarea	Finer resolution of subarea/division if known	Sex	Method	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Reference	Are the parameters applicable for entire WCA (Y,N)
LJN	31.1	Florida	U	Lorenzen age specific	0.399	0.273	0.216	0.184	0.163	0.148	0.138	0.13	0.124	0.12	0.116	0.113	0.111	0.109	0.107	0.106	0.105	0.104	0.103	0.102	0.102	Lorenzen et al. (2005)	
GPN																											

135. Ms Cummings concluded by making a request of the SAWG:

136. As relates to the Joint workshop (virtual) of the WECAFC Spawning Aggregation (SA) and FDS (July 2024) WGs (see https://www.fao.org/wecafc/events/en/), the members and key experts are requested to review the updated Appendix 6 v1.01, and recommend biological measures, conversions and standards specific to Nassau grouper and mutton snapper, fisheries spawning aggregations (FSAs) species and/or modifications as needed. In particular, the members and key experts are asked to review the relevancy of the recommended measures, conversions and standards as relates representativeness of the entire WECAFC region. These recommendations are to be further reviewed by the 13th WECAFC Scientific Advisory Group (in 2025) and WECAFC 20 (2025).

Summary of Day 1 findings and recommendations, and Introduction of Day 2

137. Ms Cummings opened Day 2 of the Joint SAWG-FDS workshop providing a brief overview from Day 1 deliberations. She recounted that during day 1 an overview of the RFSAMP including the pilot project background and objectives were provided. An accounting of current FI methods in use for evaluating FSAs was provided which summarized protocols and considerations for using a) Visual (Underwater Visual Census [UVC], photography, remote-video, tagging, gonads), b) Acoustic (passive and active surveys)-abundance, c) Hybrid technologies (ROV, AUV, others), and d) Local/Fisher Knowledge (LK/FK). Then a summary of results from the three pilot countries pertaining to data availability, management and needs as relates implementing the management plan. Day 1 ended with two presentations on the need to develop standardized protocols for collections of basic statistics for length and weight and then recommendations for tools (templates) for use in informing a variety of biological measures needed for stock assessment. Participants were reminded of the request to review the proposed standards for data collection of length and weight data and the specific biological references (for NG and MS) for growth, w-l, l-l conversions, maturation and natural mortality as relevant to the WECAFC region.

Western Central Atlantic Fisheries Information System (WECAFIS) - Marc Taconet

138. Mr Taconet provided background and status on the **WECAFIS** noting that both the Data Collection Reference Framework (DCRF) and the WECAFIS were endorsed by WECAFC 18 in 2022. Between July 2022 and April 2024, FAO/NFISI worked to operationalise the WECAFIS with financial support from two European Union-funded projects. As a result, WECAFIS has been realised as with two main functionalities 1) as a full-fledged data management and 2) as a information dissemination system, and now hosts information from eight member countries:

- Barbados
- Dominica
- European Union - France
- Nicaragua
- Saint Lucia
- Suriname
- Saint Vincent and the Grenadines
- Trinidad and Tobago

139. Mr Taconet reminded that for the database management component of the WECAFIS, the system provisions for storage of minimum data as defined according to individual tasks of the DCRF including landings, catch, effort, participation in fisheries.

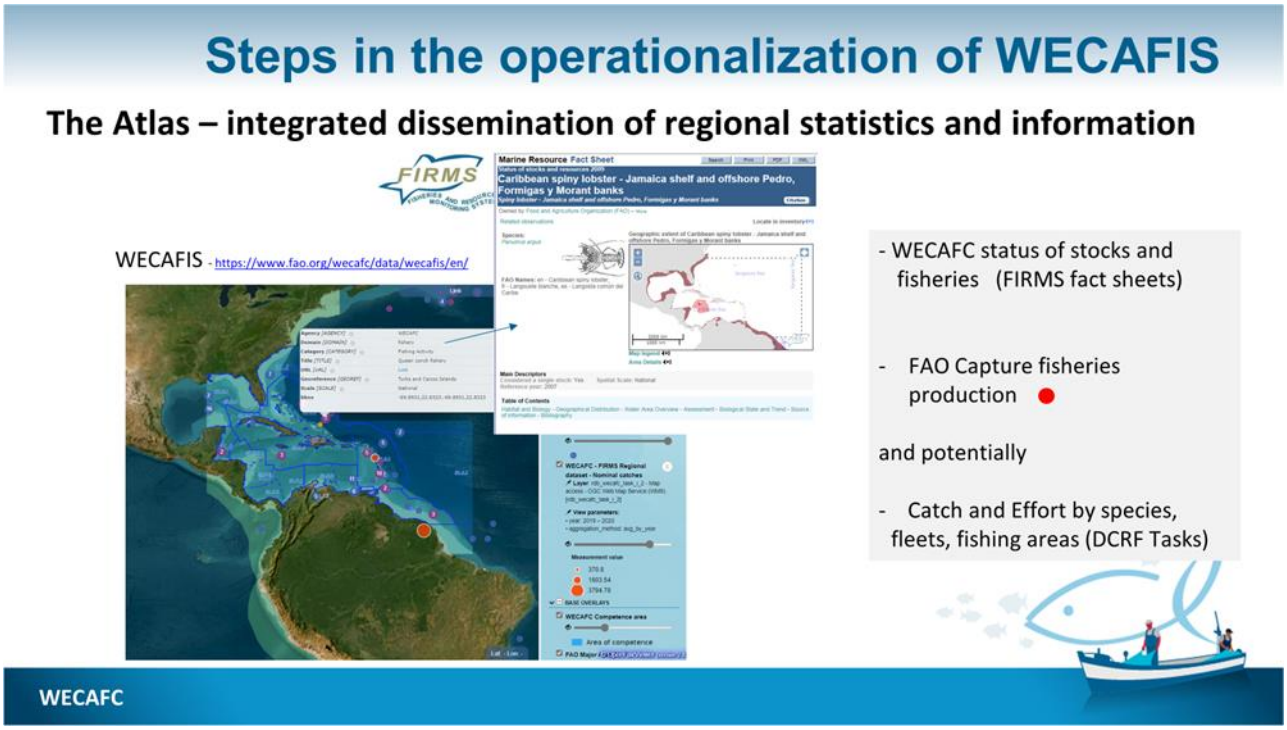
140. Between September 2022 and April 2024 a data call was conducted by FAO-NFISI for the WECAFC region with the goal towards implementation of the WECAFIS. Each country provided data for some 2-4 DCRF tasks each during this first data call.

DCRF tasks provided by 8 countries (April-June 2022)

Country / Territory	Number of Tasks for which data were submitted	Task I.2 Landings	Task II.1 Catch	Task II.2 Effort	Task III.1 Participation in fisheries
Barbados	3	X		X	X
Dominica	4	X	X	X	X
European Union-France	4	X	X	X	X
Nicaragua	2	X			X
Saint Lucia	3		X	X	X
Suriname	3		X	X	X
Saint Vincent and the Grenadines	2	X	X		
Trinidad and Tobago	4	X	X	X	X
Total	**25**	**6**	**6**	**6**	**7**
	LEGEND:	X	Task submitted by country		

and 43 fisheries were inventoried by 10 countries

141. As relates the dissemination module of WECAFIS, 43 fisheries were inventoried by ten countries (with focus on WECAFC priority species). These data were fed into FIRMS, and were used and are summarised in fact sheets and a geospatial dashboard called “The Atlas”. The Atlas presents FAO capture fisheries data, catch and effort by species, fleets, and fishing areas. This data is expected to be validated by the end of June 2024 and will be available for access and download from WECAFIS. This effort is considered good progress towards initial operationalization of the WECAFIS and further progress is considered logical with incorporation of such information as synthesized through this collaborative project between the SAWG and FDS WGs funded by the EU-DGMARE on the two species of spawning aggregation (NG, MS).



142. Mr Taconet noted that WECAFIS serves as a regional database of catch and effort data to support WECAFC stock assessments and will contribute to the pilot of the Coordinating Working Party on Fishery Statistics (CWP) standard for Reference Harmonization (CWP-RH). A proposal is currently in development for alignment with CWP-RH, with the objective to facilitate WECAFC Member countries' multiple international reporting obligations (e.g. FAO, ICCAT, WECAFC). Once validated, the WECAFIS tasks and data collected under the 2022 data call will be published, and WECAFIS will be formally launched and announced via press release. A second call for data will be put out to WECAFC Member Countries by September 2024. The WECAFIS page has been published, and can be accessed at: https://www.fao.org/wecafc/data/wecafis/en/

143. Mr Taconet noted that additionally, that participants could recommend/endorse the inclusion of additional information on SA species for the three pilot countries in this study such as general locations of SA sites, number of sites and general indicative trends on landings such as contained in FIRMS fact sheets which emphasizes information on status of WECAFC stocks and fisheries, the latter providing narratives on the fisheries and stocks. Additionally, minimal information relating to the socioeconomics of these fisheries including number of participants, nynber vessels/boats could be shared and disseminated via this tool.

144. In concluding, Mr Taconet touched on next steps relating to full operationalization of the WECAFIS:

- Launching WECAFIS with a press release
- Proceeding with a second data call - FIRMS and then DCRF Tasks

145. Ms Rivera noted that if data calls are primarily focused on governments, they might be skewed towards industrial fisheries. She volunteered to assist with expanding the call to include local NGOs and academic institutions at field sites (e.g. the Mesoamerican Reef).

Review of data access and sharing policies endorsed by FDS-WG first meeting May 2018

146. Mr Yann Laurent (FAO) presented an overview of Regional Data Access and sharing Policies (RDSAP) endorsed by the first meeting of the FDS-WG (May 2018) and updated in 20xx ,,. The presentation covered four main areas:

a. need for regional data sharing and access policies;
b. the vision and guiding principles behind the policies; and
c. implementation of the RDSAP.

147. Background on the development of the WECAFC RDSAMP may be found at WECAFC Regional Data and Access Sharing Principles. The recognition of the need for having access and to reliable data and statistics to provide evidence based advice for informed management dates to the 1970s. However, this recognition was followed around the 1990s by less emphasis on data collection and data sharing thus increasing the gaps in high quality scientific data for use in stock assessments and further making it more difficult for fishery managers to make well informed management decisions. In fact, some of the regional scientific meetings were .

148. Mr Laurent then outlined the guiding principles behind the development of the RDSAP:

a. principle 1 states that data and information have different status depending on its nature and sensitiveness: confidential or private data vs public data;
b. principle 2 is inspired from the article 12 of the Universal Declaration of Human Rights and ensures protection of confidential data;
c. principle 3 ensures that needed data is shared and accessed by the audience in WECAFC that needs this data to support evidence-based policymaking;
d. principle 4 defines that all users accessing / sharing restricted data must be formally identified.
e. principle 5 stresses that data and information should be accessed and shared in consistent ways: concepts, standards and definitions should remain consistent across the years. Data are exchanged with its associated metadata describing these concepts, standards and definitions, and documenting and highlighting any changes in any of these three domains;
f. principle 6 acknowledges the principle of subsidiarity for data access and sharing policies; National data cannot be accessed and shared at regional level if national data access and sharing policies prevent it (i.e. national policies are more restrictive than the WECAFC ones); and
g. principle 7 imposes that any technical implementation for any data management for the WECAFC has to implement the above principles.
h. Mr Laurent there are three levels of confidentiality and with each there is a corresponding level of security and authorizations:
    - Private data (sensitive) with restricted access: only to WECAFC secretariat – in coordination with CRFM and OSPESCA, WECAFC Countries Members representatives, Scientific Advisory Group, and Working Group members (e.g. logbook data for species working group member) → confidentiality level 1;
    - Semi public (less sensitive) data with less restricted access: Above authorized users and working group attendees and resource persons (e.g. result of country stock assessment model computation → confidentiality level 2;
    - Public data with public access (e.g. regional statistics, regional list of authorized vessels) → confidentiality level 3.

149. Mr Laurent briefly spoked on implementation of the RDSAP in the context of the DCRF and the WECAFIS noting:

a. Data Collection Reference Framework: Definition of minimum data requirement for fisheries management and stock assessment (concept, standards and definition); Data should be accessed and shared (define the copyright and need for citation);
b. WECAFIS: provides the technical environment to manage and publish data defined in the DCRF, and make these data available for access and sharing to the different users (man or machine) according to the RDASP

150. Mr Laurent concluded by asking the SAWG to consider if the RDSAP as explained was in alignment with the SAWG's expectations of data sharing and access policies for data and statistics for SAs?

Questions

Ms Sadovy inquired as to private data such as, for example, specific aggregation site data, could it be that the owner could specify the degree of security to associate with the data.

Mr Laurent responded that yes, and further that the specific WG (e.g. SA in this case) could specify the particular use and confidentiality level, say for a specific concern associated with risk level of identifying a particular site or a conservation risk. Mr Laurent further reminded the group that the DCRF has a specific section that details this topic. He also noted that presently the DCRF is only dealing with public data.

Mr Taconet noted that as relates confidentiality level- this could be associated with the DCRF at the task level and also could be something say a specific WG wanted the data only to be accessed by its group.

Big Fish Initiative and Digital Hub – Ana Salceda

151. Ms Ana Salceda provided information on the initiative and the Hub. The campaign's target audiences are the fishers, decision-makers (policymakers, fishery managers, enforcement) and the community (fish consumers), and it has three overarching goals:

a. connect the wider Caribbean community of fishers, governments, scientists, NGOs and other stakeholders around a common message and a common action to sustainably manage these species and protect Fish Spawning Aggregations (FSA) region wide;
b. serve the RFSAMP to reach managernds, decision-makers, fishers, and other stakeholders working to protect FSAs in space and time; and
c. act as the meeting point for All-Things-Big-Fish through the hub, social media platforms and live events, as well as serve as speaker for all the efforts focused on the monitoring and protection of FSAs.

152. The campaign's multimedia approach has led to the development of several products, including:

a. Treasure of the Caribbean documentary film, which has received seven awards at film festivals. Film was key to launching the campaign. It premiered at GCFI in the Bahamas, and screenings have been held in the Bahamas, Belize and Honduras. Further screenings are planned for Puerto Rico, United States Virgin Islands, Guatemala, Mexico and Panama. The team has found strategic partners in each country to be a panel after the film and discuss important issues in each country. In Honduras, for example, there was much discussion on illegal unreported and unregulated fishing.

b. Radio kits (include PSAs) -- focused on banning fishing during spawning seasons for both species-- as well as podcasts.
c. Two short films have been produced in three languages: English, Spanish and French
d. Digital hub (to be upgraded 11 June 112024)
e. Social Media Platforms: Instagram, Facebook, Linkedin and X (Twitter). The campaign has experienced Phase 1 growth of ~2000 percent, with a monthly growth rate of ~35 percent (the average monthly growth rate of organic campaigns is 2.2 percent.) Reached more than 236 000 accounts with the aid of over 50 national and regional partners and collaborators who are sharing our content. Content is diverse, and includes posts, reels, stories, radio and trivia format. Content series have been run on enforcement successes, fisher heroes, scientist spotlights, etc.
f. Posters for both Nassau grouper and mutton snapper
g. Citizen Science Program for fishers and enforcement officials: in collaboration with local partners throughout the Caribbean we are using these materials and partners in workshops and other live events to inform our target audiences on the importance of connectivity and benefits to let species spawn, as well as to engage them in the protection of FSAs.

153. The campaign's sponsors, PBS and Howard Hughes Medical Institute, have been so pleased with the success of the campaign that they will be submitting it to two prestigious Impact Campaign Competitions: Anthem Awards, and the Jackson Wild Special Jury Award.

154. In terms of fundraising, approximately USD 1 300 000 for production of the documentary, radio kits, setup of the digital hub, and to run the social media. The team is actively working to raise funds for:

a. capacity building for fishers;
b. FSA science and monitoring; and
c. communication (Big Fish Campaign).

155. Ms Salceda explained that the next steps for the campaign will build upon the foundation established in 2023–2024. Focus on the United States Caribbean will be intensified, with a short film about the recovery of Nassau grouper at Grammanik Bank. The communication campaign will also integrate with implementation of the FSA Management Plan by working with the pilot countries (Belize, Bahamas, Cuba), using the Digital Hub to continue data collection, and keeping partners informed of implementation. The campaign will increase engagement by strengthening and expanding the Big Fish Community, and through an advocacy campaign which has branches for the three target audiences. Countries need to take initiative and apply the messaging to their realities - they need to take the materials and do their own outreach

156. Finally, 2024–2025 is envisioned as a transition period to a new production team. The main goals are:

a. transition to new production team to continue producing content for the campaign (four people needed);
b. formalize and escalate responsibility of the Communication Subcommittee;
c. continue following 10-year communication strategy to #RecoverBigFish; and
d. fundraise for 10-year plan.

157. The SAWG Chair asked Ms Salceda what she anticipated as the biggest challenge for communications. What is needed to keep in mind to keep this plan running in perpetuity? Ana Salceda noted that funding is the biggest challenge. We have the talent. Communications subcommittee should be formalized. Need to update the membership and work together over the last three months to design a plan to outline responsibilities; the new team members were most crucial. The team has been actively

interviewing and has potential team members, but we need the funding. CFMC and NOAA and SPAW and Executive producers have been helpful.

158. Ms Martha Prada expressed appreciation on behalf of the task force for Ana Salceda's dedicated work and passion, and that it would be difficult to find someone similar with her dedication. With respect to funding she proposed the development of a special fund or provision from countries. Have a few months to consider and invite everyone to form a subcommittee to consider how to move forward in the short term.

159. Mr Miguel Rolon (CFMC Chair) thanked Ms Salceda for her work and inquired on a few issues What happens if nothing after 31 December? Three levels of action you mentioned - can you explain roles?

Ms Salceda explained that the campaign manager/impact producer designs content that will be in different places and knowledge of platforms, social media, and brings the whole team together. Director of the campaign. As I try to find someone with a lot of experience to take over, I have not found anyone with institutional knowledge. There is a person who could be an institutional liaison to connect with SAWG, Task Force. Two people could be doing what I am doing. They could be fundraising. Communications manager - someone is partially doing. I used to write for social media, but that person could do it in coordination with the campaign manager. Video creator does not need to be full time; could be someone hired under contract for content. Production/campaign manager could tell them what to include. This person could make the videos. CFMC - Campaign already endorsed by WECAFC. Campaign manager - need to have a transition between you and the new person. Need to have a new person hired December 1st so there is transition and they can take over in 2025.

Mr Rolon noted- it is good that you are thinking of someone good at fundraising. The CFMC will be starting a new 5-year cycle soon. If I get support, that will give me rationale for at least one year for the manager to be paid for the rest of 2024 and then continue in 2025 to follow up on the campaign. Do not have real commitment from the countries. This was started by the fishers. They are all supportive. We should continue. If we stop, the benefits and value will drop. Believe we have momentum and a digital platform that we did not have before. We have institutions linked with us. The Hub is the key for the following of the campaign but it costs funds. We will talk with Ms Salceda to present to the CFMC to come up with specifics and costs/products. CFMC has been committed. The FMP is good but it is difficult to work with each of the countries. The CFMC Chair is supportive. If the group gives an endorsement to continue the campaign, we can set aside funds to continue the work that Ana started.

Workshop recommendations and the path forward) for implementation of management plan

160. Mr Phillips led the discussion on the workshop recommendations relating to how to move forward with implementation of the RFSAMP management plan in countries either on a volunteer basis or through specific projects. He first recounted the objectives (5) of the workshop:

a. define list of monitoring, evaluation and management operations for which standardized methodologies are required;
b. propose best practice/most practical and feasible methodologies for each operation;
c. define corresponding data entry, storage, retrieval and analysis structures;
d. propose rules specific to spawning aggregations for data access and sharing taking into consideration policies developed by the FDS-WG in context of the WECAFC Data Collection Reference Framework (DCRF), and presented in the first meeting of the FDS-WG in 2018; and

e. review and recommend biological measures and conversions as relates stock assessment and management of NG and MS.

161. A synthesis of the material presented and discussed during the workshop for each objective was made and recommendations followed; the latter are presented in the following table.

Task (Workshop objective)	Change / recommendation made	Decision made and/or question posed	Calendar for implementation recommendation	Participants input
Fishery independent monitoring methods (a,b)				
UVC	Continue to use UVC; however, encourage use of fish finders to verify that main component of aggregation is being surveyed towards ensuring survey is on adults- with considerations for ensuring divers are on the 'full' aggregation;	Can the FI UVC method inform a new template within the DCRF for abundance- Yes; noting there is the question of what the level of confidentiality would be. Focus on short term work- identifying aggregation, confirming the season/sites of spawning	ongoing and Focus on short term work- identifying aggregation, confirming the season/sites of spawning and employing blending of tools as relevant	Using fish finders and acoustics, YS- to ensure core of aggregation is being surveyed; also using towed divers to do this; Can a recommendation be made as to identifying one/two monitoring methods for countries wanting to initiate these tools, maybe but there are many recent ones; the manual from SCRFA serves as a good foundation manual, particularly for understanding the principles, then possibly move to a regional (Meso-America) for refining surveys by location; also to reach out to the scientific technical experts, YS- recommend a mix of manuals; also promoting use of laser calipers; UVC tends to be core method but other tools are brought in; MP incorporated issue with lasers in Belize not confirming what they were seeing from other tools; YS- brought in sometimes - e.g. use of stereo-cameras (see work by Steve Lendfield; as noted a similar issue in Honduras- so using a blending method (UVC + laser_ is a useful approach as not all tools can achieve the results wanted; have technical and resource capacity issues;

				noting ability to deploy hydrophones before storms then can have a good idea of where the fish are. Also, noting stereo-camera is superior to laser caliper; noting need to consider capacity issues and costs in field operation. MT- regarding an abundance template under the DCRF- could inform using UVC- max and mean sighting number (count per day) + any estimate of variance; would need to consider maximum/highest level of confidentiality NC- noting currently there is not a template in the DCRF for this type dats; MT- noting could used UVC data outputs (max count) to inform.
Acoustic	Good to use these tools in particular as ground-truthing of diver samples, passive also			
Hybrid - ROV + AUV, others	ROV too can be used to ground truth FSA location thus good as supplement method			
Local + Fisher knowledge (LEK, FK)	Can facilitate identification of FSAs in time and space and any changes in patterns and to progress interpretation of observations			MT- this information + other information could be used to inform FIRMS fact sheets providing narratives for SAs, and used for status and trends. MP– further input from fishers can better refine previously thought patterns in a variety of topics- ex. In Belize fishers helped to refine thoughts on what sizes are being encountered where and when and also what may be considered as targeting preferences but in reality are not 'targeting' but are really a result

				of movements spatially/temporally and the fisher inputs were critical to the reality. Another ex- samplers not seeing MS in the market- was actually a result of the behaviour pattern of the fish at that point in time and also related to the management regulation (size) for nassau grouper. AT and MP- Reminder to be cognizant of communication language used in the field; reminder of need to have informed consent. BL- attempts to identify local fishers to involve in the field who are both knowledgeable and willing to engage as this will progress not only the knowledge but also facilitate rapport between fishers/science. NC-recommend to utilize the SAWG coordination and advisory groups in reaching out to engage local and fisher groups.
Supplementary data sets (a, b)				MP- noting tendencies (indicators) and not necessarily absolute numbers can be useful; context is very important; MP- noting that other data types can be useful- e.g. 'Reef data' in Belize; not to just look at aggregation data but other data too- reef surveys; also supplemental data includes LEK and FKI
Fishery dependent monitoring methods (a,b)				

Catch landing site surveys (a, b)	Continue to conduct; encourage fisheries offices towards reviewing protocols for site selection towards ensuring landings being surveyed are representative of total production			MP- difficult/complex to get fishery dependent information from most sources particularly at national level- meaning state run (entire country); this to progress knowledge on dependent fisheries across all species; NC- noting concern that we don't necessarily know all sites so we need to be aware that we need to know what proportion of the totals are being sampled; JH- sample major sites; MP- recommendation is to sample major sites so need to characterize distribution paths- variable products are going through in the markets; this complicates the sampling of these small-scale fisheries MT- reminding that catch data (as in DCRF) can be used as indicative of trends in abundance (and pressure) and can provide focus for managers towards where (sites) need attention; NC- need to work with community groups to increase willingness to allow sampling; Belize- used incentives towards this (e.g. fuel); this can be explored in other countries
Catch fishing ground surveys (a, b)	Can provide ground truth for catch validation; similar recommendations as landing site surveys			NC- need to consider whether this is useful in sense of cost effectiveness and whether results are producing desired products. similar to landing site surveys- need to use good communication skills to increase buy-in; also possible use of incentives

160. **Recommended standards for data collection of individual length and weight data for WECAFC Group 1 species.**

Ms Cummings presented a table informing data collection types for individual length and weight observations. These data (length, weight) are needed to develop biological references and conversions.

Appendix Table 6.2. Length and weight frequency standard units for use in WECAFC sampling

FreqTypeCode-Standard	FreqType Description	Unit and interval size	Species
TL[1]	Total length	Centimeters (e.g., 1,2,3)	Finfish, elasmobranchs
FL	Fork length	Centimeters (e.g., 1, 2, 3)	Finfish, elasmobranchs
SL	Standard length	Centimeters (e.g., 1, 2, 3)	Finfish, elasmobranchs
CL[2]	Carapace length	Millimeters (e.g., 1, 2, 3,)	Crustaceans (including lobsters, crawfish, shrimps, prawns, stomatopods)
ML	Mantle length	Centimeters (e.g., 1, 2, 3)	Cephlapods, Decapods
PCL[3]	Precaudal length	Millimeters (e.g., 1,2,3)	Elasmobranchs
LT	Lip thickness	Millimeters (e.g., 1,2,3)	Conch
SCLmin	Minimum straight carapace length, notch to notch	Centimeters (e.g., 1,2,3)	Sea turtles
SCLn-t	Minimum straight carapace length, notch to tip	Centimeters (e.g., 1,2,3)	Sea turtles
TBL	Total body length	Centimeters (e.g., 1,2,3)	Cetaceans
WGT	Weight - Round	Grams (e.g., 1, 2, 3,)	All species
HGTW	Headed and Gutted (WGT)	Grams (e.g., 1, 2, 3,)	Finfish, elasmobranchs
TW	Head removed	Grams (e.g., 1,2,3)	Crustaceans (e.g., lobster)

[1] Noting TL is the preferred length type for finfish, cephlapods, and elasmobranchs where possible
[2] CL is preferred length type for crustaceans
[3] Noting use of precaudal length optional for elasmobranchs

161. **Review and recommend biological measures and conversions as relates to stock assessment and management of NG and MS.**

Ms Cummings led the group through a table for the participants to review in the context of recommendations for templates and content recommended for biological references, conversions and standards. For each reference (e.g. growth, reproduction, natural mortality, length-length, weight-length conversions) participants were asked to identify if they endorsed the table structures and then if the content presented for each was applicable for each species and if considered relevant for the WECAFC region currently. Ms Cummings noted that in particular for the content, each individual species WG needed to review the content in the context of relevancy and was reminded that at subsequent WG meetings content could be added, updated, and/or deleted.

Biological References (measures,conversions, standards) (e)	**Decision as to Endorsing proposed Table Structure IY, fully endorse; Partial endorsement (P)- changes noted are: write out)**	**Decision as to Relevance of content to WECAFC region in entirety / specific area**	**Calendar for Decisions**	**Participants input**
Growth	Endorse structure (MT) as WG	Mutton snapper Nassau grouper	Endorsement this meeting; added modifications to be provided within 30 days of this meeting	MT- noting this is a workshop and that it is the WG that has reviewed the table contents specified and can be used by researchers/assessors; further that these parameters can be considered an iterative improvement
L-L Conversion	Endorse structure (MT) as WG	Mutton snapper Nassau grouper	Endorsement this meeting; added modifications to be provided within 30 days of this meeting	MT- noting this is a workshop and that it is the WG that has reviewed the table contents specified and further that these parameters c can be used by researchers/assessors; can be considered an iterative improvement

W-L Conversion	Endorse structure (MT)) as WG	Mutton snapper Nassau grouper	Endorsement this meeting; added modifications to be provided within 30 days of this meeting	MT- noting this is a workshop and that it is the WG that has reviewed the table contents specified and further that these parameters can be used by researchers/assessors; can be considered an iterative improvement
Maturity	Endorse structure (MT)) as WG	Mutton snapper Nassau grouper	Endorsement this meeting; added modifications to be provided within 30 days of this meeting	MT- noting this is a workshop and thst it is the WG that has reviewed the table contents specified and further that these parameters can be used by researchers/assessors; can be considered an iterative improvement
Reproduction	Endorse structure (MT)) as WG	Mutton snapper Nassau grouper	Endorsement this meeting; added modifications to be provided within 30 days of this meeting	MT- noting this is a workshop and that it is the WG that has reviewed the table contents specified and further that these parameters can be used by researchers/assessors; can be considered an iterative improvement
Natural Mortality	Endorse structure (MT)) as WG	Mutton snapper Nassau grouper	Endorsement this meeting; added modifications to be provided within 30 days of this meeting	MT- noting this is a workshop and that it is the WG that has reviewed the table contents specified and further that these parameters can be used by researchers/assessors; can be considered an iterative improvement

Growth characterizations

Species	WECAFC subarea	Finer resolution of subarea if known	Gear type of collection	Sex	Model used	Model parameters	Reference	Sample size	Length range	Ageing structures	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	3-Alpha code identifying the gears (See WECAFC_DCRF codes xls)	The code for the sex: M (Male), F (Female) F+M (sex combined)	Identification of growth model (e.g., von Bertalanffy, Richards, Schnute, etc.)	Parameter values (i.e., k, tzero, Linfinity -for von Bertalanff). Example is:	Model Reference	Number observations used in the growth model estimation	Range of length observations of the data for which the model parameters were estimated from	Spines, otolothis (whole, stctioned), fin rays, etc.	Are the parameters applicable for entire WCA (Yes, No)
LJN	31.1	Florida	FPO, LHP	F+M	von Bertalanffy, truncated ages 3+	Lt = 861 (1 - exp(0.165*(t+1.23)) where Lt =Total length mm and t = years	O'hop 2015 cited in Stevens et al. 2019	13,052	84 - 906, mm TL	sectioned otoliths	Yes
GPN	31.3	31.3.2, Abaco, Long Island, New Providence	FPO, MDV	F+M	von Bertalanffy; Haddon 2001	Lt = 932 (1.-exp(0.10 * (t+1.70)), where Lt = Fork length mm and t = years	Cushion 2010 cited in Stevens et al 2019	176	325.26 - 925.71 mm TL	sectioned otoliths	Yes

Length weight relationships

Species	WECAFC subarea	Finer resolution of subarea if known	Relationship/Model	Reference	Sample size	Length Range	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	Parameter values	Model Reference	Number observations used in the model estimation	Range of length observations the data for which the model parameters were estimated from	Are the parameters applicable for entire WCA (Yes, No)
LJN	31.1	Florida	$W = -18.0306 \times (\text{Fork length})^{3.0275}$, where W = Kilograms and length = Fork length millimeters	Faunce et al. 2015	3,232	215 - 829 mm FL	Yes
GPN	31.3	31.3.2, Abaco, Long Island, New Providence	$W = 4.0 \times 10^{-7} (\text{Length})^{3.2,}$ where W = grams and Length = Total length in millimeters	Cushion 2010 cited in Stevens et al 2019	265	325.26 - 925.71 mm FL	Yes

Length-Length conversion formulae

Species	WECAFC subarea	Finer resolution of subarea if known	Model	Reference	Sample size	Length Range	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	WECAFC statistical reporting area the growth model corresponds to	Local sampling area or WECAFC Subarea Division	Parameter values	Model Reference	Number observations used in the model estimation	Range of length observations the data for which the model parameters were estimated from	Are the parameters applicable for entire WCA (Yes,No)
LJN	31.1	Florida	Total length (millimeters) = 10.015 + 1.065 x Fork length (millimeters)	Faunce et al. 2015	1, 511	195 - 784 mm FL	Yes
GPN	31.3	31.3.2, Abaco, Long Island, New Providence	Total length (millimeters) = 2.81 + 1.13 x Standard length (millimeters)	Sadovy and Colin 1995		174 - 695 mm FL	Yes

Appendix 6.6 Natural Mortality

					Natural mortality by sex and age																						
					Age																						Region specificity
3-digit WECAFC species code	WECAFC subarea	Finer resolution of subarea/division if known	Sex	Method	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Reference	Are the parameters applicable for entire WCA (Y,N)
LJN	31.1	Florida	U	Lorenzen age specific	0.399	0.273	0.216	0.184	0.163	0.148	0.138	0.13	0.124	0.12	0.116	0.113	0.111	0.109	0.107	0.106	0.105	0.104	0.103	0.102	0.102	Lorenzen et al. (2005)	
GPN																											

Appendix 6.7 Maturity

Species	Country	Reference year	WECAFC subarea/divison	Gear type of collection	Sex	Length at first maturity	Length at 50% maturity	Sample size	Length at sex changes (if applicable)	References	Region specificity
3-Alpha code identifying the species (See WECAFC_DCRF codes xls)	The ISO 3-alpha code of the country under which all vessels operate (refer to the WECAFC_DCRF codes xls)	the year or year series the data were collected from that are reflected in the equation	WECAFC statistical reporting area / subarea divisioi the growth model corresponds to	See WECAFC DCRF codes.xls	The code for the sex: M (Male), F (Female) F+M (sex combined)	The size at which first maturity is observed	The size at which 50% of the observations is mature)	number observations used in the model	size of sex transition	If the size at first maturity is not estimated through sampling but taken from literature, enter the complete bibliographic reference. If available, please enter reference data also for Group 2 and Group 3 species	Are the parameters applicable for entire WCA (Y,N)
LJN	USA	1998-2002	31.1	FPO, LJH	F+M	330 mm TL	353 mm TL	221	NA	Ohop 2015	
GPN	BHS	January 2007 - April 2008, monthly	31.3.2	MD	F+M	406 mm TL	435 mmTL	516	581 mm TL	Cushion 2010	

162. Ms Cummings presented recommendations relating to templates for collections of length frequency data, abundance (CPUE) and socioeconomic statistics for spawning aggregation species.

	Recommendations relating to data collection templates for spawning aggregation species			
Task (c, d)	**Change / recommendation**	**Decision/question**	**Calendar for decisions**	**Participants input**
Length frequency	Proposed new Table structure for **Task IV.1,** endorsement/further changes	Endorse proposed new template this meeting or suggest other modifications; Endorse proposed new template	Before end of EU-DG MARE project (60 days) or before next SAWG session or end of this workshop?	MT- evolution of new template is positive; can be additional technical inputs and be part of a larger discussion; nothing current DCRF Task IV.1 is set up for aggregated length frequencies for a class- proposed new template can provision for row by row data
Catch Per Unit of Effort (Abundance)	Possibly extending Belize landings form to add needed fields; need to identify what fields	what is the consensus on the path or can you propose another path? Group needs to review forms and to identify minimum data needed to inform abundance	Before end of EU-DG MARE project (60 days) or before next SAWG session or before end of this workshop or when; could be done intersessionally before next SA WG incorporating a small focus group	MP- good idea to have more discussion with WGs to identify relevant variables; good proposal for now but in reality is extending beyond SAs MT- now need to develop simple model for informing abundance of FSA species similar to efforts by CRFM where a logbook was developed for FAD fisheries; this could inform the optimal/most efficient for FSA fisheries
Socioeconomic		Work to do tabled and final		MT- easiest way is to consider engagement (DCRF Task 3.1)- number vessels, number fishers and this is part of landing sites surreys and registries; is up to WG to take into account

163. Propose rules specific to spawning aggregations for data access and sharing taking into consideration policies developed by the FDS-WG in context of the WECAFC Data Collection Reference Framework (DCRF) and presented in the first meeting of the FDS-WG in 2018.

164. Define corresponding data entry, storage, retrieval and analysis structures.

Wrap-up summary and next steps – Myles Phillips

165. Having gone through identifying best practices in monitoring and evaluation. With regard to management actions, have enough with respect to the project and review relevant actions- these are the short term.

166. The workshop concluded on 16 July 2024 at approximately 14.30 hours.