



Food and Agriculture  
Organization of the  
United Nations

SLC/NFIA/R1403 (En)

FAO  
Fisheries and  
Aquaculture Report

ISSN 2070-6987

## WESTERN CENTRAL ATLANTIC FISHERY COMMISSION

Report of the

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### FIFTH MEETING OF THE CFMC/OSPESCA/WECAFC/CRFM/ CITES WORKING GROUP ON QUEEN CONCH

San Juan, Puerto Rico, 13–14 December 2021



**Cover photograph:**

Queen conch in spawning period (© Cinvestav IPN - Mérida).

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Required citation:

FAO. 2023. *Report of the fifth meeting of the CFMC/OSPECSA/WECAFC/CRFM/CITES Working Group on Queen conch, San Juan, Puerto Rico, 13–14 December 2021*. FAO Fisheries and Aquaculture Report, No. 1403. Western Central Atlantic Fishery Commission. Barbados. <https://doi.org/10.4060/cc5094en>

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ISSN 2070-6987 [Print]  
[ISSN 2707-546X [Online]

ISBN 978-92-5-137771-0  
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## PREPARATION OF THIS DOCUMENT

This is the report of the fifth meeting of the Caribbean Fishery Management Council (CFMC), Central American Fisheries and Aquaculture Organization (OSPESCA), Western Central Atlantic Fishery Commission (WECAFC), Caribbean Regional Fisheries Mechanism (CRFM) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Working Group on Queen Conch. This meeting was held in a hybrid format, with most attendees participating virtually and several attendees participating in-person in San Juan, Puerto Rico, from 13 to 14 December 2021.

The meeting was kindly hosted and organized by the Caribbean Fishery Management Council (CFMC) with technical and financial support from the United States National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), and the Western Central Atlantic Fishery Commission (WECAFC).

This final report provides a record of the meeting's proceedings as well as the adopted recommendations.

## ABSTRACT

The fifth meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen Conch (QCWG) was held in a hybrid format. The meeting was hosted in San Juan, Puerto Rico from 13 to 14 December 2021, but most attendees participated in the meeting remotely. The following members and regional partner organizations participated: Bahamas, Belize, Colombia, European Union, France (on behalf of Guadeloupe and Martinique), Honduras, Nicaragua, Saint Vincent and the Grenadines, the United States of America, the Western Central Atlantic Fishery Commission (WECAFC), the Caribbean Regional Fisheries Mechanism (CRFM), the Caribbean Fishery Management Council (CFMC), the Organization for the Fishing and Aquaculture Sector of the Central American Isthmus (OSPESCA). The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Gulf and Caribbean Fisheries Institute (GCFI), the Regional Committee of Marine Fisheries and Marine Aquaculture of Guadeloupe (CRPMEM) the United Nations Conference on Trade and Development (UNCTAD), Food and Agriculture Organization of the United Nations (FAO), and the Wildlife Conservation Society (Belize). Experts were also in attendance from the Scientific, Statistical and Technical Advisory Group of the Queen Conch Working Group (QCWG/SSTAG).

Discussions focused on the progress made towards implementation of the Regional Queen Conch Fisheries Management and Conservation Plan and recommendations adopted at the 17th meeting of the Commission in 2019. Participants learned about collaborative work on Queen conch, especially at the regional level, and an overview of the intersessional activities undertaken. These include development of training modules for estimating population densities and annual catch quotas of Queen conch, FAO's initiatives towards decent work in the fisheries sector, an FAO study on the health and safety of dive fisheries for key species in the region, a genetic project to identify stocks and design and implement a protocol to trace illegally harvested Queen conch in trade, a collaborative Blue BioTrade project aimed at improving sustainability and traceability for Queen conch in several WECAFC Member Countries, and development of a user manual and educational materials for Queen conch aquaculture in the Caribbean.

The meeting adopted several recommendations, including the following key recommendations:

1. **Genetic toolkit to trace illegal Queen conch in trade** – Develop a genetic toolkit and regional strategy to trace illegally harvested Queen conch across the Caribbean.
2. **Prioritize genetic identification of Queen conch** – Establish a task force – comprised of members from the QCWG and Regional Working Group on IUU fishing – to intersessionally draft a recommendation prioritizing genetic identification of Queen conch to improve traceability and combat illegal, unreported, and unregulated (IUU) fishing of Queen conch in the region for potential endorsement by the Commission at its 18th meeting.
3. **Simplified guidance for making non-detriment findings (NDFs)** – Create a simplified guidance to assist WECAFC members in the making of non-detriment findings (NDFs) as required for export of Queen conch under CITES. It was recommended that this guidance be tested and could potentially provide a useful case study at a global CITES workshop on NDFs planned for 2023.
4. **Training on Queen conch stock assessment modules** – Provide training on the use of modules for the assessment of Queen conch stocks through a regional conference to fisheries officers across the Caribbean.

- 5. Promote decent work and health and safety in the fisheries sector** – Prepare a recommendation on the promotion of decent work, health, and safety in the fisheries sector for potential endorsement by WECAFC at its 18th meeting.

The QCWG also endorsed the following recommendations for the Working Group members, QCWG/SSTAG, subregional partners, and other organizations as appropriate:

1. continue monitoring implementation of the Regional Queen conch Fisheries Management and Conservation Plan and provide advice as needed to address any identified gaps;
2. report on progress on implementation of relevant CITES and WECAFC decisions and outcomes of the QCWG at relevant CITES and WECAFC meetings;
3. continue review and consideration of options for the development of a transparent “chain of custody” procedure to track catches from their harvest location to their eventual destination;
4. support fishers and fisheries administrations in addressing the decent work, employment and safety-at-sea problems in the Queen conch fisheries, with the engagement of fisher organizations to the greatest extent possible;
5. support publication of FAO’s study on the health and safety for key species in fisheries using scuba diving in the WECAFC region and its proposed project;
6. elaborate a series of technical documents on conversion factors that need to be applied and updated when members report Queen conch production and trade data across the region;
7. conduct two pilot studies for determination of fishery production as the basis for further analysis of the long-term sustainability of Queen conch and its associated fisheries;
8. expand the collection of socio-economic information to analyse the contribution of Queen conch fisheries to income, livelihoods, and trade;
9. investigate and consider the impacts of climate change on the Queen conch resources and the fishery;
10. investigate the ecological and biological impacts of pollution on Queen conch resources;
11. determine priority next steps to implement education and outreach as stated in the Regional Queen conch Fisheries Management and Conservation Plan; and
12. consult with the Blue BioTrade Project on [joint] activities to improve the sustainability and value chain of Queen conch.



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## ABBREVIATIONS AND ACRONYMS

BNT	Bahamas National Trust
CANARI	Caribbean Natural Resources Institute
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CF	conversion factor
CFMC	Caribbean Fishery Management Council
CLME+	Caribbean and North Brazil shelf Large Marine Ecosystem
CPUE	catch per unit of effort
CRFM	Caribbean Regional Fisheries Mechanism
CRPMEM-IG	Comité régional des pêches maritimes et des élevages marins de Guadeloupe
EAFM	ecosystem approach to fisheries management
EEZ	exclusive economic zone
ESA	Endangered Species Act
FAD	fish aggregating devices
FAO	Food and Agriculture Organization of the United Nations
FMP	fisheries management plan
GCFI	Gulf and Caribbean Fisheries Institute
GEF	Global Environmental Facility
HACCP	hazard analysis critical control points
ICM	interim coordination mechanism
IGO	Intergovernmental organization
ILO	International Labour Organization
INPESCA	The Nicaraguan Institute of Fisheries and Aquaculture
IUU	illegal, unreported and unregulated fishing
MARENA	Ministry of Environment and Natural Resources
NDF	non-detriment finding
NGO	non-governmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTAC	National Total Allowable Catch
OECS	Organization of Eastern Caribbean States
OIRSA	Regional International Organization for Plant Protection and Animal Health
OSPESCA	Organization for the Fishing and Aquaculture Sector of the Central American Isthmus
PCM	permanent coordination mechanism
QC	Queen conch
QCWG	Queen conch Working Group
RPOA	Regional Plan of Action
RWG-IUU	Regional Working Group on illegal, unreported and unregulated fishing
SAG	Scientific Advisory Group
SAP	Strategic Action Programme
SICA	Central American Integration System
SNP	single nucleotide polymorphisms
SOMEE	The State of the Marine Environment and Associated Economies
SSTAG	Scientific, Statistical and Technical Advisory Group
TAC	Total Allowable Catch Limits

TNC	The Nature Conservancy
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
USVI	United States Virgin Islands
VMS	vessel monitoring systems
WCS	Wildlife Conservation Society
WECAFC	Western Central Atlantic Fishery Commission

## Background and objectives

1. The joint Working Group was first established by the 14th session of the Western Central Atlantic Fishery Commission (WECAFC) in February 2012. This meeting was organized with support from the Caribbean Fishery Management Council (CFMC) and the United States of America National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service.
2. The Queen conch Working Group (QCWG) last met 16–17 December 2019 in San Juan, Puerto Rico.
3. Discussions at the QCWG meeting focused on strengthening national, regional and international efforts and commitments for the management, conservation, and trade in Queen conch in the Western Central Atlantic. Participants also discussed the status of implementation of the management goals agreed in the *Regional Queen conch Fisheries Management and Conservation Plan*, which remains a matter of priority.
4. The meeting adopted the following five recommendations:
  - **Data collection/transparency** – Recommend that when countries conduct studies, the data be stored in hard copy and digital copy to have a good record of the work and guide any standardizations.
  - **Diver safety** – Recommend a regional study be conducted in select countries with regard to the status of diving technique in WECAFC region; this would capture the efforts that have been made and actions that have been taken on occupational safety in the region.
  - **Domestic consumption** – Recommend Member Countries document the level of domestic consumption of Queen conch and support a study on this topic.
  - **Queen conch stock assessment manual** – Recommend that CFMC support an update and expansion of the methods presented in the Queen conch stock assessment manual published by CFMC in 2008, particularly looking at sampling designs that include representation of their entire population and establishment of sustainability criteria when defining production and export quotas (e.g. adult density, 8 percent or less of exploitable standing biomass, etc.), provide a digital version of the manual, and provide training on use of the manual in English, Spanish, and French to be posted online in order to reduce the cost of having broad participation of key fisheries officers across the Caribbean.
  - **CITES Resolution on Queen conch** – Recommend WECAFC and CITES work collaboratively on a draft CITES resolution that could be considered at the next meeting of the CITES Animals Committee and the next meeting of WECAFC.
5. Additionally, the Scientific, Statistical and Technical Advisory Group of the Queen conch Working Group (QCWG/SSTAG) offered several priority recommendations that were endorsed by the group.
6. The objectives of the fifth meeting of the QCWG were to continue monitoring implementation of the *Regional Queen conch Fisheries Management and Conservation Plan*, learn the status of implementation of the recommendations developed by the Working Group and the QCWG/SSTAG, and discuss other items for collaboration called for in the Terms of Reference for the Working Group. Meeting objectives also included discussion of the progress of activities called for in the Workplan for 2019–2021 and the implementation of Recommendation WECAFC/XVII/2019/12 on Improved Compliance with Trade Measures for Queen conch and Recommendation WECAFC/XVII/2019/13 on Queen conch Conversion Factor adopted at WECAFC17.
7. Other purposes of the meeting were to discuss advancements and challenges towards decent work in the fisheries sector, the status of the health and safety in diving for Queen conch harvesting in the WECAFC region and develop recommendations as deemed appropriate by the Working Group.

8. Lastly, the QCWG met to develop a new workplan for 2021–2024, consider the Working Group’s inputs to the 2022–2027 strategic plan of WECAFC, and discuss the process for development of new terms of reference, consistent with a standardized template for all the WECAFC Working Groups.
9. The QCWG meeting was conducted under the leadership of the Working Group Convener and meeting Chair, Ms Maren Headley from CRFM. Several recommendations were adopted by the Working Group, including development of a genetic toolkit and regional strategy to trace illegally harvested Queen conch across the Caribbean, creation of simple guidance for the making of non-detriment findings (NDFs) (required for export under CITES) and establishment of national conversion factors for stock assessments.

### **Participation**

10. The fifth meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES QCWG was held in a hybrid format (with in-person and virtual attendance) with most participants attending virtually due to the COVID-19 pandemic/restrictions/crisis. The meeting was attended by officers of national institutions, entities, and authorities responsible for implementation of policy, legal, and operational aspects of fisheries management and/or implementation of the Regional Queen conch Fisheries Management and Conservation Plan in the WECAFC region. The following countries and regional partner organizations participated: Bahamas, Belize, Colombia, European Union, France (on behalf of Guadeloupe and Martinique), Honduras, Nicaragua, Saint Vincent and the Grenadines, the United States of America the Western Central Atlantic Fishery Commission (WECAFC), the Caribbean Regional Fisheries Mechanism (CRFM), the Caribbean Fishery Management Council (CFMC), the Organization for Fisheries and Aquaculture of the Central American Isthmus (OSPESCA). The Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) also participated. See Appendix A for the list of participants.

### **Funding**

11. The meeting was kindly hosted by the Caribbean Fishery Management Council (CFMC). The meeting also received support from the United States National Oceanic and Atmospheric Administration’s (NOAA) National Marine Fisheries Service (NMFS).

### **Opening of the meeting**

12. The meeting opened with introductory remarks from the Convener of the QCWG, Ms Maren Headley from CRFM; Ms Yvette Diei Ouadi from FAO/WECAFC; and Mr Miguel Rolón, Executive Director of CFMC.

### **Election of chairperson for the meeting**

13. Ms Maren Headley offered to act as Chairperson. Ms Laura Cimo from NOAA’s NMFS acted as rapporteur.

### **Introduction of the working group and adoption of the agenda**

14. Ms Headley discussed the purposes of the meeting, which were to continue monitoring implementation of the *Regional Queen Conch Fishery Conservation and Management Plan* and discuss the implementation of recommendations of SSTAG. Other meeting purposes were to consider progress made in completing activities identified in the previous Workplan and implementation of recommendations to improve compliance with trade measures for Queen conch and recommendation on Queen conch conversion factors adopted at WECAFC17, discuss

advancements and challenges towards decent work in the fisheries sector, and learn about the status of the health and safety in diving for Queen conch harvesting in the WECAFC region. She explained the expected outcomes of the meeting are to update and revise the Workplan for 2022–2024, develop a timeline for implementation of outstanding recommendations, and make recommendations on diver safety and other recommendations as deemed appropriate.

15. She introduced the meeting agenda, which was adopted with one change requested by Colombia to have their presentation first under agenda item 11. The amended agenda is shown in Appendix B.

### **Update of WECAFC work on Queen conch and overview of intersessional activities**

16. The WECAFC Secretariat, Ms Yvette Diei Ouadi, discussed the intersessional Workplan and status of implementation.
17. Specifically, she highlighted the work of the SSTAG, including two workshops that were held in 2019 and a training in Belize. The complete reports of the 2019 workshops containing detailed information are available as Appendices C and D of this report. The WECAFC Secretariat noted that reports of the meetings are available and have been posted on the common drive that was shared with all meeting participants. She also mentioned that several funding proposals have been prepared in support of activities called for by the QCWG. She explained that there is a project funded by the European Union to improve statistics for Queen conch that will begin in January 2022. She also noted that work is ongoing in collaboration with the CITES Secretariat to help mobilize resources.
18. The WECAFC Secretariat shared the update that a report on implementation of the *Regional Queen conch Fisheries Management and Conservation Plan* and its recommendations were endorsed. The table was circulated to QCWG members. She reminded participants of the QCWG that the plan has been translated into Spanish and French, and these translated versions have been available since 2020.
19. The WECAFC Secretariat emphasized the importance of increasing awareness and capacity building to promote safety-at-sea, including in the dive fishery for Queen conch. Noting the discussion of these issues at the last meeting of the Commission, FAO has launched a study of the dive fishery that will be presented later at the meeting. She requested feedback, recommendations, and priority actions to be considered at the 18th meeting of the Commission (WECAFC18). She updated the QCWG on other relevant projects that were supported by FAO in the region, including projects on climate change adaptation, bycatch, and safety-at-sea.
20. Ms Headley recommended that all the stakeholders continue to work towards implementing the management measures while recognizing the national contexts and differences in human and financial resources. It is imperative that countries seek both financial and technical assistance through collaborative partnerships to improve the implementation of the management measures.
21. The following management measures remain a priority:
  - improvement of catch and effort monitoring programmes;
  - development of national conversion factors;
  - NDFs for export of Queen conch meat and its by-products; and
  - traceability of Queen conch throughout the value chain.
22. At the conclusion of the presentation, Ms Stefania Vannuccini (FAO) requested that any updates in CFs be shared with FAO. When CFs are not available for a country, she noted that FAO uses the regional CF.

## **Queen conch fisheries management plan implementation status in selected Member States of the Central American Fisheries and Aquaculture Organization**

23. Mr José Infante (Regional Director, OSPESCA) highlighted OSPESCA's work on Queen conch and traceability systems. There has been an initiative to formulate a regional plan for the OSPESCA countries. Work is underway on updating the registration of vessels at regional level. He explained that work is also under way to establish a pilot system for the incorporation of a VMS system for small-scale vessels that harvest Queen conch.
24. According to Mr Infante, exports of Queen conch from OSPESCA countries in 2019 was 1 349 metric tonnes in terms of volume with a value of USD 19.4 million. He noted that it is important to improve data collection and statistical analysis of Queen conch in the region using the regional conversion factor. He also cited the importance of strengthening the WECAFC's work on the recommendations and the management of fisheries for this important species.

## **Queen conch fisheries management plan implementation status in selected Western Central Atlantic Fishery Commission Member States**

### *Colombia*

25. Mr Heins Bent (Colombia) explained that Colombia has a National Plan for Queen conch under administrative review that is awaiting approval. As a precautionary measure, there is a management strategy mandated by law. Queen conch can only be captured in the archipelago in San Andres (Providence and San Carolina Island) with appropriate population density. A quota of 9 tonnes was set between 2019 and 2020. Mr Bent highlighted a catch limit of up to 100 individuals/hectare, noting that quotas are assigned below the total allowable catch limit to have a precautionary management approach.
26. He informed the QCWG that educational campaigns to prevent the capture of juveniles and respect protected areas have been developed to avoid the species from becoming more vulnerable.
27. With respect to traceability, fishers receive training and are required to register catch where products are landed. Fish and wildlife authorities work with the police to prevent catch in protected zones and return juveniles. There is no international trade in Queen conch, so Colombia does not have an NDF for Queen conch. Queen conch is locally fished and consumed domestically.
28. Mr Bent shared the update that Colombia has a study to determine the CF for Queen conch. They currently have a proposal and will share the results of the study. He noted that this is a joint effort with the National Agriculture Authority and CITES Authorities. The proposal is focused on sampling in two areas in the sunflower biosphere.<sup>1</sup>
29. The standardized CFs that are currently used by Colombia are: 5.6 (dirty meat), 11.2 (semi-clean), and 15.6 (clean meat). In comparison to the results from other countries in the region, he noted that Colombia uses values that are comparable in all categories (dirty, semi-clean, and clean). The CF for Colombia is within range of the total CFs for the Caribbean as reported by FAO. He asserted that these data were shared with CITES.
30. In terms of scientific advances, Mr Bent noted that Colombia has been conducting research on Queen conch. Since 2003, there have been expeditions every two years and the results are used for the establishment of quotas and development of conservation and management measures for the

<sup>1</sup> See this link for more details: <https://en.unesco.org/biosphere/lac/seaflower>

species. The results of abundance studies showed that there is the highest distribution in Serrana Bank. He noted that researchers worked in deeper areas in 2019 and found 1.6 to 62 individuals/hectare. Mr Bent offered to share the information once it is published.

31. He highlighted achievements of Colombia's Action Plan, including the fact that fishing remained open throughout the year, and provided a basis for decision making. Mr Bent noted that there is only local, artisanal fishing, and there is a fishing registry. Fishers and boats are required to have permits to help track effort. Mr Bent also highlighted an underwater study and microplastics study.
32. In terms of challenges, he asserted that economic resources are limited for continued monitoring and to address illegal fishing. Mr Bent asserted the need to strengthen fisheries landings data collection, and monitoring, control and surveillance (on land and at sea). Other needs include ecological studies to see the effect of climate change, larval studies, improved communication channels across the region, and quotas for management and conservation.
33. At the end of the presentation, Ms Karen Gaynor (CITES) requested clarification on Mr Bent's statement that Colombia's national CFs were sent to CITES. She informed him that the CITES Secretariat has no record of receiving information on CFs and suggested that information could be shared with her directly. Mr Heins responded that the information was sent to the Colombian CITES Authorities, but he offered to send the CFs to Karen.
34. Mr Felipe Ballesteros (Colombia) noted the importance of research studies done in 2021 and emphasized the value of studies that are underway to assess the impact of the hurricane. In response, Ms Headley noted the frequency of natural disasters in the region and stressed the importance of assessing the impacts.

### ***Bahamas***

35. Ms Candice Webb notified the QCWG that Bahamas is making progress towards use of the regional CF (7.9) and that this CF is under consideration. However, the Bahamas is currently using FAO's CF of 7.5. She noted the challenge due to the variability in location of the Queen conch, biological and cleaning practices throughout various islands in Bahamas.
36. She cited new regulations where the mean weight data will be collected. Under the 2020 New Fisheries Act, fisheries will be required to have conch landed with shell and will be required to keep a data log. In terms of other management measures, Ms Webb mentioned that Bahamas has implemented a closed season and cited the following measures that were put forward after a measures survey was conducted in 2019:
  - landing conch in shell;
  - 14 mm lip thickness;
  - ban compressors for harvesting;
  - ban export of meat;
  - ban harvesting of foreign vessels; and
  - recreational vessels – no more than 10.
37. With respect to NDFs, she discussed there are efforts to improve data collection and incorporate density studies, but there they have a large area to cover. NDFs will not be needed since no commercial export of meat will be allowed in 2022. However, she noted that a quota for 2021 will be allowed.

38. In terms of other requirements, Ms Webb stated that all processors and exporters are required to have a license, and exporters are assigned a portion of the national quota. All commercial vessels 15 feet or greater in length must be registered. Scuba is banned and the use of hookah is controlled. An air compressor is only allowed during the lobster season with a license.
39. She explained that patrolling is done and improving thanks to the Department of Marine Resources and the Royal Bahamas defense force. Radar has been installed and they are working to address IUU fishing. A vessel monitoring system (VMS) pilot is being conducted in collaboration with TNC and testing is underway.
40. In terms of education and outreach, Bahamas is working with non-governmental organizations (NGOs), such as “Conchservation” in collaboration with Bahamas National Trust (BNT).
41. Ms Webb explained that the national management plan is under revision. Traceability systems are in place, but their comprehensiveness varies by plant. She also shared that habitat maps are available based on low resolution remote sensing imagery, and co-management strategies are in place, especially within Marine Protected Areas (MPAs). She cited several other accomplishments, including the Queen conch management measures survey in 2019, research projects, use of FishPath (a decision support tool) and Queen conch expert workshops with the Nature Conservancy (TNC) to support stock assessment and data collection strategies. She also cited a BNT project in two communities focused on community-based management and alternative livelihoods using conch shells in the construction industry. The Bahamas has also acquired nine new vessels for their Defense Force, implemented a drone system, and has achieved greater collaboration.
42. Ms Webb noted the management challenges of staff capacity with competing tasks and limited training opportunities. She also highlighted the selection of cost-effective, strategic systems and competing goals. She cited the problems of having large areas to monitor, poaching, financial constraints, few technical staff, and the lack of NDFs that further incorporate best scientific information.
43. At the conclusion of her presentation, Ms Prada asked for information on the impacts from Hurricane Dorian. Ms Webb responded that there are ongoing studies that are examining Queen conch populations based on impacts. However, they did not receive any concrete analysis. This is expected next year when studies conclude.

### ***Belize***

44. Mr Mauro Gongora provided updates from the QCWG December 2019 meeting in Puerto Rico after noting that the Queen conch fishery in Belize is the second most important fishery in the country. 95 percent or more of its fishers are licensed and are regulated. In 2020, Belize exported 325 996 kg. of conch meat, valued at USD 4.8 million. A biennial stock assessment was used to determine total allowable catch limits (TACs), and a quick survey is done annually. Management was improved by innovative rights-based fisheries management approaches, with the designation of eight fishing areas for licensed fishermen.
45. He noted that harmonized, simplified categories of QC meat CFs have been implemented. There has also been improvement in the country’s catch and effort monitoring programme through the collection of fishery dependent catch data and a CPUE database. The Fisheries Department analyses a five-year running average to observe trends, and a technical team assesses the observed trends relative to the Queen Conch Management Plan Adaptive Management Framework (AMF). Any actions needed are implemented in accordance with the AMF.

46. Mr Gongora explained the size requirements for harvest of Queen conch, noting that the shell length should not exceed seven inches. For conch meat that has been processed as clean, the weight should exceed three ounces. He also stated that there is a closed season in place between 1 July and 30 September 2022. Belize also has a quota system in place.
47. With respect to the making of NDFs, Mr Gongora cited that there is enough data for the export of Queen conch and its products. In 2019, Belize proposed a subregional cooperation project in the development of an NDF for Queen conch that was planned to take place in 2020. Although this project never materialized, he expressed hope to be able to secure resources for a subregional workshop to develop an NDF for Belize, Honduras, and Nicaragua. According to Mr Gongora, the development of a subregional NDF is still a priority and will be pursued in 2022.
48. Mr Gongora explained that the Specialized Conservation Compliance Unit of the Belize Fisheries Department conducts weekly at sea and on land inspection, and there are new greater fines under Belize's Fisheries Law. He also stated that most vessels are less than 30 feet in length, although a few vessels are larger. These vessels are not currently required to use VMS. However, Belize is collaborating with the Wildlife Conservation Society (WCS) on a pilot project; based on the project, Belize will decide whether to require VMS on vessels.
49. In terms of education and outreach in Belize, Mr Gongora noted there is a new programme planned for 2022 that seeks to further cooperation with the domestic tourism industry to reduce illegal fishing. The programme will not be just directed to fishers, but to the public and businesses that purchase conch meat directly from fishers.
50. Belize implemented a national level Queen conch conservation and management plan that was updated two years ago. Mr Gongora explained that an adaptive management framework is incorporated that provides scenarios with the appropriate management response. He asserted that it is an active management plan that will continue to be implemented and updated.
51. To support traceability of Queen conch, catch data is collected monthly (by fishing area submitted by captains of fishing vessels). Challenges exist in data process and analysis are being addressed through digital catch data submission with support from WCS. Mr Gongora noted that Belize is also working with TNC on a fishery improvement project on lobster that will include Queen conch. He expressed hope that in 2022 they will see improvements in terms of traceability throughout the value chain. He also cited collaboration with Oceana on a new project titled, "Fish Right, Eat Right" that will look at the process from when fish is caught to when it is consumed. Customers will be able to look at a barcode and see all the information on the fish that is caught. He noted that this is being done on a pilot basis. He noted that the project is still at the early stages of testing the electronic system. However, Belize will look to implement the project at a larger scale if the pilot is successful.
52. Mr Gongora also explained the work being undertaken to create habitat maps in collaboration with NGO partners. He stated that Belize is working with NGOs that we have signed agreements with to develop maps for Queen conch. He noted that the fishing locations are known, and under the proposed work in 2022, an analysis of deep-water Queen conch will be conducted and compared to shallow water Queen conch to assess if there are genetic differences.
53. He explained that Belize is working with NGOs to help manage three out of four MPAs using co-management strategies, and they will continue to support this work.
54. Mr Gongora discussed the Queen conch landings in Belize, citing that annual production fluctuated from under 111 130 kg in 1989 to 498 951 kg in 2019. He highlighted a generally increasing trend in production. Although he would like this to continue, noting the sensitive nature of the fishery, he explained that Belize will be applying the precautionary principle to Queen conch fishery.

55. There was discussion of a recent national Queen conch survey on population structure in 2021, noting that Queen conch with shell lengths of 146 and 162 mm were found at the highest frequency. He shared that there were similar findings in 2020. Mr Gongora stated that among the size classes, 65 percent will be available to the fishery or will become available to the fishery.
56. With respect to Belize's implementation of WECAFC's recommendations on Queen conch, Belize Customs Officers are trained on conch meat and byproduct identification to help improve trade control. Legal acquisition is implemented through licensing of fishers and vessels authorized to fish in eight designated fishing areas. For Queen conch export, exporters must show compliance with domestic measures.
57. In terms of gaps and management needs in Belize, Mr Gongora cited the following:
- Consistent high annual recruitment but determining where conch originates for deep water stocks is priority for 2022.
  - Determination of sources of shallow water conch is fundamental and will be pursued.
  - Genetic study to assess the relationship between deep water and shallow water stocks is a priority.

### ***Saint Vincent and the Grenadines***

58. Mr Kris Isaacs explained that the Queen conch fishery is very important in Saint Vincent and the Grenadines, with approximately 45 fishers. He explained that the fishers prefer fishing for Queen conch between May and August (the closed season for lobster), and most of the meat is exported. Queen conch accounted for 63 percent total fisheries exports in 2020. He informed the QCWG that the airport opening enabled an increase in exports.
59. Mr Isaacs provided an overview of fisheries regulations of 1987. The Queen conch shell must have a minimum size of seven inches and the total meat weight no less than eight oz (225 g) after removal of the digestive gland. All Queen conch must be landed with flared lips. Persons wishing to export conch must have an appropriate CITES form signed by the Chief Fisheries Officer.
60. According to Mr Isaacs, a desktop review to assess Queen conch populations across Saint Vincent and the Grenadines is ongoing. A new decision support tool, FishPath, is being used to conduct an analysis on the Queen conch value chain. He updated the group that Saint Vincent and the Grenadines had expected to do research on NDFs and CFs for Queen conch, but they faced challenges.
61. He explained that they would like to expand their MPAs, noting that there are currently ten conservation areas, but enforcement is a challenge. The only prohibition in these conservation areas is spear fishing. Mr Isaacs stated that Saint Vincent and the Grenadines would like to enhance the designation of MPAs.
62. With respect to monitoring and traceability, he shared that trial work on satellites is ongoing with French support. Devices have been installed on some vessels with mobile applications where catch reports of artisanal fleets can be uploaded. He explained that the project is in a pilot phase right now, but they are hoping to expand to 200 vessels with this system to improve traceability within fishery depending on results.
63. In terms of challenges, Mr Isaacs cited the following:
- COVID-19 pandemic/restrictions/crisis limited in field research.
  - April 2021 volcanic eruption; still in recovery and determining next steps.

- Government is looking at the blue economy as a pillar to move growth forward; management measures need to be in place to attract foreign investment and partnerships.
  - There is an absence of formal arrangements for “at sea” joint patrols with enforcement agencies; there is an agreement, but there is interest in having a standard operating procedure (SOP) with an approved schedule that is more formalized.
64. Ms Diei Ouadi requested an update regarding enforcement challenges within the framework of IUU fishing. She noted that FAO/WECAFC have been supporting an interagency MOU to have coordination for these activities across many agencies that are involved and asked if there has been any progress. According to Mr Isaacs, through Fisheries, Coast Guard, and CRFM, there would have been regular meetings. He explained that they are looking to put in place Procedures to work as a Task Force for enforcement and resource management. He stated that a SOP has been developed and is under review. He expects some form of formalization will be done next year.
65. Ms Gaynor stated that she was not aware of the export increase linkage to the airport. She cited two new licensed operators that have increased their exports from Saint Vincent and the Grenadines and asked if Mr Isaacs was aware. She asked whether this increase was mirrored by an increase in harvest, whether most is exported, and if there is an NDF to show that the export is sustainable. She explained that these are the questions CITES is likely to ask when looking at the trade data. Ms Gaynor stated that it would be useful to provide this information, which could ideally prevent having Saint Vincent and the Grenadines included in the Review of Significant Trade process under CITES. She expressed interest in working with Mr Isaacs on this issue. Mr Isaacs responded that they have two big foreign investments working with the opening of the airport. With market access, this has paved the way for foreign investment to increase partnerships with industry. He noted that Saint Vincent and the Grenadines have not moved forward with an NDF. He expressed optimism that there is funding to get some guidance for the establishment of a new NDF and assistance with enforcement. He affirmed that the presentation from CITES was very timely and good news.

### *United States of America*

66. Ms Maria Lopez-Mercer (United States of America) provided a summary of Queen conch meat grades and the market, noting that CFs are not available for United States jurisdictions:
- Puerto Rico has 80 percent (clean) meat; sold as partially clean meat.
  - United States Virgin Islands has approximately 75 percent or fully clean.
  - St Thomas harvests queen conch only for personal consumption, otherwise it is imported from St. Croix, Anguilla, Saint Vincent and the Grenadines.
  - In St Croix, most (98 percent) meats are prepared and sold as partially clean with approximately 75 percent clean (veined some mantle, reproductive organ, eyes attached, but guts and operculum removed) and fully cleaned, which is worth approximately 1–2 USD/lb more.
67. Ms Lopez explained that the United States of America has separate state and federal jurisdictions, and the federal government does not have management authority over state waters. In United States federal waters, Queen conch occurs only in Florida, United States Virgin Islands (USVI), and Puerto Rico. Queen conch fishing is allowed in state waters of Puerto Rico (0–9 nautical miles) and in the United States Virgin Islands (0–2 nautical miles). Fishing is prohibited in state waters of Florida. In the United States EEZ, fishing is only allowed in the Lang Bank Area off the east coast of St Croix. Fishing is closed in the remainder of USVI, P and FL. With respect to the harvest season, fishing is prohibited year-round in the mainland United States state and federal waters. The fishing season in USVI runs 1 November to 31 May and closes 1 June (or when the quota is met). The fishing season in Puerto Rico runs from 1 November to 31 July.

68. She explained that the shell and meat are required to be landed intact in USVI. In Puerto Rico, however, fishers are allowed to shuck on the vessel due to safety issues. Ms Lopez noted that compliance is best monitored at the dock but there are limits to monitoring capacity. As alternative management approaches, she cited that the federal government, Puerto Rico, and USVI collect commercial catch reports submitted by fishers as a condition of their license. She informed the QCWG that recreational landings are not tracked, but Puerto Rico and the USVI are working to implement a recreational fishing license. Implementation was delayed by funding issues in Puerto Rico, but the USVI initiated a voluntary recreational landing reporting system.
69. According to Ms Lopez, there is not enough data to understand the status of Queen conch populations. Fishery independent assessments were highlighted in Puerto Rico, St. Croix, and the Florida Keys Tract. She also highlighted a programme to determine the age structure of Queen conch.
70. She briefly discussed the negative impacts from Hurricane Maria in 2017. In Puerto Rico, there was destruction of the Queen conch habitat along the West Coast. As a result, fishers worked in deeper waters, resulting in fishers requiring treatment in hyperbaric chambers. She also mentioned the increase in price to 9 USD/pound in 2018 from 6.5 USD/pound in 2016, which resulted in increased total revenue compared to 2015 and 2016.
71. Ms Lopez shared an update on NMFS' ongoing review of Queen conch under the United States Endangered Species Act. She provided a timeline of the following important dates:
- February 2012: NMFS received petition to list Queen conch from WildEarth Guardians.
  - November 2014: NMFS determined listing was not warranted (79 FR 65628).
  - July 2016: WildEarth Guardians filed suit challenging the decision.
  - August 2019: The court vacated the "not warranted" determination and remanded the decision back to NMFS.
  - December 2019: NMFS announced the initiation of the new Status Review and requested information from the public (84 FR 66885).
72. Ms Lopez informed the QCWG that a status review team was convened looking at ecology and biology of the species. She noted that there were three independent peer reviews. NMFS anticipates that determination on whether Queen conch may warrant listing under the United States Endangered Species Act to be published in May 2022. She provided contact information for Ms Calusa Horn and Ms Maggie Miller and a website for more information.
73. She provided a summary of United States Queen conch management relative to the *Regional Queen Conch Fisheries Management and Conservation Plan*. According to Ms Lopez, no CF has been developed, but the United States of America expects to be working on its development in the future. She noted that it would be beneficial to add Queen conch to recreational fishing report schemes. She explained that Queen conch closures in the United States of America are not synchronized with those of the plan. She explained that the United States of America has not developed an NDF for Queen conch since it is only an importer, not an exporter. Ms Lopez explained that licenses are required for commercial fishing in Puerto Rico and USVI. Although recreational licenses are not required, there is work towards development of a recreational license and data collection. It is prohibited to use hookah when fishing for Queen conch, citing the valid safety concerns about use of this gear. She shared that enforcement is a concern. In United States waters, most vessels are under 10 m.
74. With respect to education and outreach, Ms Lopez informed the group that NMFS sponsors the Marine Resource Education Program to educate all fishers on science, management, regulations and how to get involved in decision making in Puerto Rico and USVI. She also explained that

CFMC has an outreach and education advisory Panel. In terms of traceability for Queen conch, she explained that the United States of America does not export this species but monitors commercial catch and enforcement of management measures. Habitat maps for Queen conch have been created by NOAA's National Center for Coastal Ocean Science (Biogeography Branch). She highlighted several papers that are evaluating fishery potential for Queen conch, including Baker *et al.* (2016); Doerr and Hill (2018); Delgado and Glazer (2020); Stoner and Appeldoorn (2021).

75. According to Ms Lopez, at the federal level, NMFS implemented a Queen conch Fishery Management Plan in 1996 that was updated in 2005. This management plan will be replaced by island-based FMPs, which will include measures for Queen conch. These island-based FMPs will be tailored for each island's unique characteristics. If there are any other federal measures proposed and supported by science, those will be included in the plans through the fishery management Council process. In the United States of America, fisheries management is based on a co-management strategy, where fishers are directly involved in decision making through District Advisory Panels, cooperative research, community involvement; public scoping, public hearings, and CFMC meetings.
76. Ms Lopez shared an update on the status of United States implementation of the recommendations on Queen conch that were adopted at the last Commission meeting. With respect to WECAFC Recommendation 2019/12, she noted that the United States of America has adopted 2017 HS codes. She explained that the United States Fish and Wildlife Service provides identification training for Queen conch to inspectors and provides updated trade information when there are new trends (such as Queen conch pearls) on imports of Queen conch into the United States of America. The United States Fish and Wildlife Service also provides localized training and have inspectors at designated points of entry since CITES is included on Appendix II of CITES.
77. Regarding WECAFC 2019/13, Ms Lopez stated that although there has been no United States development of CFs, they are of great interest.

### ***Martinique and Guadeloupe***

78. Mr Jerome Baudrier (Ifremer, French Research Institute for Exploitation of the Sea) informed the QCWG that the Queen conch fisheries are in the southeast of Martinique, the southeast of Guadeloupe, Marie-Galante, Les Saintes, and La Desirade.
79. He explained that fishers use bottom nets and engage in free diving. In terms of the number of fishers and those engaged in free diving, he provided the following statistics:
  - fishers: 179/984 in Guadeloupe, 53/1053 in Martinique (2019); and
  - vessels: 99/748 in Guadeloupe, 28/901 in Martinique (2019).
80. Jamaican fisheries are an important source of importation, according to Mr Baudrier. He explained that there is a catch monitoring programme in France, referred to as "FIS" that uses a multidisciplinary approach. Data is collected from the French fishing fleet, vessel owners, and crew data. Data is collected on gear and target species, effort, and fishing zone per month per vessel. He showcased catch monitoring in the French Antilles, which was implemented in 2006, using data from a variety of sources. Data are stored in a database and used to make sampling to estimate catches and efforts. Summary reports are published yearly on the IFREMER website.
81. Mr Baudrier stated that catches were 50 tonnes in Martinique (average value from the years 2018–2019–2020, live weight) and more than 100 tonnes in Guadeloupe, but Queen conch fishing did not re-open at the end of 2020 in this territory to protect the stock. Actually, an average of 300 tonnes per year was caught in Guadeloupe during the period 2019–2020. There is an ongoing work to improve precision on catch reporting.

82. He informed the QCWG that stock monitoring has been conducted in Martinique and Guadeloupe but stated that new QC surveys needed to assess current status of the stock.
83. With respect to CFs, Mr Baudrier explained that the last survey was conducted in Martinique in 2014 on 210 animals. The CFs are provided below by processing grade:
- without shell – 5.6;
  - removal of operculum and visceral bag – 8.6;
  - only white meat – 15.0; and
  - removal of visceral bag – 8.4.
84. He noted that it would be useful to compare with Guadeloupe.
85. The relevant local regulations (decrees) were also provided for both Martinique and Guadeloupe, accompanied by a summary of the management measures in place. A closed season is in place from 1 January to 30 June in Martinique, and from 1 January (for animals less than 25 m) or 1 February (for animals greater than 25 m) to 30 September in Guadeloupe. Recreational fishing is prohibited in Guadeloupe.
86. Mr Baudrier explained that the use of scuba or other respiratory equipment is prohibited, and use of the trammel net has been prohibited in Martinique since April 2020. Minimum size requirements are also in place. Shells have a formed hole, be at least seven millimeters thick, with a minimum conch meat of 250 g. Recreational fishers can harvest up to three Queen conch maximum in Martinique. He also noted that there are marine protected areas and areas where fishing is prohibited.

### *Nicaragua*

87. Mr Luis Emilio Velasquez (Nicaragua) explained that Queen conch is very important in the Nicaraguan Caribbean and that it is a very commercially important species. He noted that there were 1 183 fishers in 2016, and the current number of fishers remains similar. He stated that the fishery is industrial (with eight vessels) and artisanal (includes 400 vessels). Commercial vessels have 26 canoes for divers and trips are between eight and 12 days. All the vessels use scuba, tanks, and in the case of artisanal fishers, either scuba gear or hookah are used. Some divers are free divers and they dive at lower depths.
88. According to Mr Velasquez, CFs were calculated in 2007 in collaboration with FAO. The CFs are 1.00 for 100 percent clean, 0.69 for 50 percent clean (with only skin), and 0.38 for Queen conch without processing - 0.38.
89. He explained that Nicaragua has its own management plan for Queen conch, and there is a need to implement the *Regional Queen Conch Fisheries Management and Conservation Plan*. Since 2004 to 2005, Nicaragua has had its own programme for data collection, with sampling on vessels and at processing plants. Mr Velasquez asserted that the sampling is being conducted to corroborate the CFs being used, noting that their conch is quite large. Weight measurements corroborate that adult specimens of Queen conch produce three fillets at 0.454 kg.
90. In terms of regulatory measures, Mr Velasquez informed the QCWG that the quota is 1 500 000 pounds. (650 tonnes) of clean meat. He stated that Queen conch must have a lip thickness of 9.5 millimeters (minimum) to reproduce. Therefore, the length must be 200 millimeters or 9.5 millimeters in terms of lip thickness as a minimum size. He explained that they previously used minimum weight of fillets in the past. However, he explained that this was not pursued since it was deemed best to work

with the conch live with its shell. He shared that Nicaragua has had an annual closed season from 1 June to 30 September since 2005. He briefly discussed the monitoring efforts in the last few years with respect to the amount of fillet samples, weights, and number of individuals.

91. Mr Velasquez noted that between 2009 and 2018, Queen conch landings increased. During 2010, he asserted that interest in Queen conch was minimal, and that lobster was the resource with effort due to its high value. When interest in Queen conch fishing grew, there was a lack of information about its distribution. He explained that Nicaragua began to do studies and increased the request for quotas from CITES. Studies were conducted to justify the annual quota of 680 388 kg. (650 tonnes) of clean conch meat. He highlighted that this quota has been caught annually. Beginning in 2013, he asserted that there was important participation by artisanal fishers in this fishery, and now most landings are by artisanal fishers.
92. According to Mr Velasquez, scuba fishers from Mesquite in 2004 learned the Honduran technique to find Queen conch on the seafloor and can find where Queen conch are distributed. He cited their national law that sought to standardize efforts to try to diminish accidents and regulate this fishery. A reconversion scuba study has been done, but they are also looking for better practices, such as avoiding diving at such deep depths. He noted the 1993 National Health and Safety Regulation was applied to scuba diving. In 2005, a joint team sought to regulate scuba diving for sea cucumbers and Queen conch to address safety concerns. He explained that 1 546 individuals have been trained with a focus on fishers in the Caribbean. In 2006, a proposal to protect divers (Law 613) entered effect and in 2007 it became effective for the entire country to regulate conch fishery and other fisheries for commercial purposes using scuba diving. As a result, the number of accidents has diminished.
93. In terms of other safety measures, he explained that a scuba identification card must be issued to divers. He highlighted a water transport directive which requires a work contract be signed with each sea worker: divers, small boat operators, and all those who work in artisanal fish markets. Operators must ensure that all who participate in the fishery (conch and all other marine resources caught with scuba) have social security. This action has not been rolled out. All persons who catch resources must use certified equipment by the authority who regulates the activity. Regulators, masks, mouth pieces, and hauling of tanks may be subject to further regulation for deep water diving. There are also requirements for medicinal oxygen tanks. Tanks must be certified. There is a directorate that reviews equipment before each fishing season.
94. Mr Velasquez emphasized the obligation to have first aid training. He asserted that many vessels have trained personnel so in case of an accident, they can be given assistance. Any work-related or illnesses must be reported. In the case of serious accidents, they must indemnify the workers and be registered by the Labour Ministry. Medical checkups are required (at least once/day) for scuba divers. They must perform their own depression exercises.
95. There has also been investment in satellite tracing for any vessels greater than 15 m in length. Some of these vessels remain up to 12 days at sea and are deemed semi-commercial vessels. Mr Velasquez explained that this complies with endorsed Central American regulation (OSPESCA) OSP-08–2014 to address IUU fishing. There is geolocation near protected areas. There is notification of a violation, and enforcement personnel are sent out to intervene. He asserted that this is an effective way to conduct surveillance in protected areas.
96. Mr Velasquez also showed a map of the main Queen conch fishing grounds. He noted that scientific research is conducted in the entire area and showed artisanal fishing canoes, and a biologist conducting sampling and measurements. He showed a vessel with 26 canoes that are lowered to the fishing area where the boat is anchored. He stated that some vessels take up to three trips to find Queen conch.

97. At the conclusion of the presentation, Ms Prada stated that Nicaragua extracts the most Queen conch. Noting the pending discussion on scuba diving at the meeting, she congratulated Nicaragua for their work. She requested that they advance the registration of artisanal catch, citing that it is as important or more important than commercial fishing. All countries have limitations to have proper documentation and she requested hearing about Nicaragua's experience.
98. Mr Velasquez responded that artisanal fishing has important participation in the Queen conch fishery, citing 60 percent. Due to the remoteness of fishing grounds, he explained that Queen conch is not consumed domestically, or any domestic consumption is minimal. Most of the catch is exported. There must be information from the point of catch to the recipient and processing plants. He noted that Nicaragua has assigned quotas for exports. He explained the required documentation registration information that must be shared. He asserted that exports exert every effort to share information since every two years quotas are distributed. The best quotas go to those who are registered and share their information; they are the ones who get the quotas. A lot of fishers want to participate in the quotas, but everyone cannot be allowed to participate. In terms of scuba accidents, he explained that they are seeking information to find out which communities the fishers come from to have better data on participation from artisanal fishers.
99. Ms Diei Ouadi expressed her interest in knowing to which insurance programmes the fishers must apply to, how the insurance system works, how effective it is, and when it starts. She suggested this programme may be an important inspiration for other countries with dive fisheries in the region.
100. Mr Velasquez responded that the government met with business owners and they are obliged to register scuba divers in their insurance programme. They have to determine that the divers are certified and trained, as required. If not, they cannot fish, which provides a stimulus to comply. Businesses must register all scuba divers, or they would be in violation.
101. Ms Diei Ouadi emphasized that governments must provide protection to their fishers. She explained that social security is paid partially by employers; fishers get discounted from their earnings under the Social Security Act where social safety nets best practices are well established. When fishers have any problems or need for health services, they are given services more quickly since they have rights to medication. This helps boat owners so there is no loss of workers.
102. Mr Suazo (Honduras) expressed his willingness to participate in an NDF workshop and a forum where all relevant issues can be discussed and agreed upon.

### **Introduction of the FAO technical paper "User manual on Queen conch aquaculture: hatchery and nursery phases"**

103. Ms Megan Davis (Florida Atlantic University, Harbor Branch Oceanographic Institute) provided an overview of a new manual that has been released on aquaculture of Queen conch. She explained that she leads the Queen conch laboratory, where they are seeking to grow conch and have been working for over 40 years. She informed the QCWG that the Queen Conch Aquaculture manual was published in English in December 2020, and the Spanish version was just recently published thanks to FAO. Ms Davis stated that the fisher operated pilot-scale Queen conch hatchery and nursery aquaculture facility was a project funded by a Saltonnestall-Kennedy NOAA Fisheries grant.
104. The location of the project is Naguabo, Puerto Rico, and its goal is to assist restoration of the Queen conch fishery in Puerto Rico by producing Queen conch in a fisher-operated aquaculture facility. The objective of the project is to produce value-added markets with chefs and restaurant owners. She showed multiple hatcheries where work is ongoing or planned: Curaçao, Puerto Rico, and a mobile hatchery in Bahamas. Ms Davis explained that they are working with BNT on a project to grow out of Queen conch for the protection of the breeding stock.

105. According to Ms Davis, they are using the manual for outreach. It was shown at a Fishers Exchange in November–December 2021 with BNT. There have been visits and discussions in Puerto Rico, Jamaica, Bahamas, and Guadeloupe, with potential hatcheries over the next year or two. She noted that Colombia, Venezuela (Bolivarian Republic of) and the Dominican Republic expressed excitement about the project.
106. Ms Davis explained that a number of online education tools is in development. They are in the process of developing “eConch” which provides virtual learning modules in three languages. She noted that the FAO manual will be a handbook with an English manual; a French manual will be available soon. There will be eight different modules for growing Queen conch. The eConch video production will include the development of five professional quality instructional videos, which should be completed in January/February 2023. She explained that there will be beta testing of the eConch course to solicit feedback on the modules. They will be shared with groups throughout the Caribbean before being launched to a wider audience to assist with understanding. She expressed hope this will help with stewardship of Queen conch throughout its life cycle.
107. The next steps and opportunities for the project include: 1) printing and distribution of the Spanish FAO Queen conch aquaculture manual, 2) translation of the Queen conch aquaculture manual into French, and 3) assistance with the training programme, eConch, an online course for growing Queen conch.
108. Upon the conclusion of the presentation, Mr Rolón (CFMC) offered to help with distribution of the manual. He requested that Ms Davis share the resources with Christina from CFMC so they can be uploaded on the website and social networks that they have. He explained that the Council has a digital format for anything that is needed. Mr Rolón expressed his congratulations on the work.
109. Ms Headley asked if the manual could be used for another shellfish, and if so, she requested examples. Ms Davis responded that the manual could also be used for mangrove oyster, welk, and other oyster and clam species. She explained that microalgae used for sea urchin food could be used for other invertebrates. She explained that there is an FAO publication within the manual that discusses other potential species in the Caribbean for aquaculture.
110. Ms Diei Ouadi inquired whether there was interest in having the manual translated into French. She stated that she could envision having the publication translated into French and asked French representatives from Ifremer if there would be interest in translation of the document. Mr Baudrier responded there is interest. He offered to share this information with colleagues who would likely be interested in having the manual translated. Ms Headley noted the need for Ms Davis to follow up with Ifremer on this topic.
111. At the commencement of the second day of the meeting, Ms Headley summarized the first day’s discussion. She noted the updates from the WECAFC Secretariat on the collaborative work on Queen conch, especially at the regional level, and an overview of intersessional activities. A large number of activities were undertaken in fulfillment of the current Workplan and recommendations stemming from the 17th meeting of the Commission. Highlights include the significant amount of work by the SSTAG, a study on the health and safety of diving was also undertaken, and a collaborative Blue BioTrade project that has been initiated by UNCTAD towards improved sustainability and traceability for Queen conch in several WECAFC Member Countries.
112. The CITES Secretariat highlighted the relevant decisions adopted by CITES on Queen conch and provided important information on funding that will be available to help ensure the development of NDF guidance next year. There are hopes this will be tested at a regional meeting and could provide a useful case study at a global CITES workshop on NDFs planned for 2023. She brought

to the attention of WECAFC members that due to the high volume and increases in trade in Queen conch, this species could be considered in the “Review of significant trade” process under CITES at its next Animals Committee meeting in 2023.

113. The QCWG was provided with several useful updates on intersessional tasks completed by the SSTAG. These tasks included development of a technical document with scientific recommendations on priorities that countries consider when developing conversion factors for Queen conch meat; the convening of a workshop in Belize to improve data collection and analysis for the determination of annual quotas and other management actions for sustainability. The QCWG learned of several proposals developed by the SSTAG for the improvement of statistics, criteria and simple guidance for NDFs, and genetic identification of populations at the country level that will contribute to addressing the illegal trade in Queen conch. Members provided updates on the status of the development of conversion factors.
114. Members of the QCWG presented on the status of implementation of the *Regional Queen Conch Fishery Conservation and Management Plan*, and two recommendations on Queen conch that were adopted at the last Commission meeting related to improved compliance with trade measures and conversion factors for Queen conch. The QCWG learned of several areas where progress was made towards improved management of Queen conch, such as through the establishment of science-based catch limits in some Member Countries and several pilot programmes aimed at improving public awareness of Queen conch or enhancing monitoring and surveillance. The development of national conversion factors remains a goal for many countries, yet some countries demonstrated progress. Challenges highlighted during the country presentations include a lack of financial resources for fisheries data collection, field research, and enforcement programmes. Several members noted the COVID-19 pandemic/restrictions/crisis and natural disasters have diverted resources and hampered initiatives related to the conservation and management of Queen conch. A few countries expressed difficulties with the making of NDFs as required for the export of Queen conch under CITES.
115. With respect to future activities, several members highlighted pending work towards the development of national conversion factors, the establishment of NDFs, and interest in subregional collaboration and cooperation, such as through a subregional workshop towards the development of an NDF for Belize, Honduras, and Nicaragua. Addressing illegal fishing was highlighted as a key issue by several members to help achieve the sustainability of Queen conch. Nicaragua provided updates on requirements for those diving for Queen conch.
116. Finally, the QCWG heard about work that has been undertaken to advance Queen conch aquaculture in the WECAFC region, including the development of a user manual in English and Spanish, development of educational modules, and online education tools.

### **Overall responses on the degree of implementation of the Queen conch regional management plan**

117. Ms Prada provided general information about the historical variation in the Queen conch meat production. She explained that there is not a clear idea of production at the regional level. Ms Prada showed a graph of FAO statistics (expressed as nominal weight minus the weight of the animal plus the shell). She explained that conch shells can be between 80–90 percent of the weight. As an animal matures, other encrusting organisms attach to the shell that add to the weight of the animal. She highlighted the contrasts between FAO data and data available in the CITES database and explained that the lack of knowledge of processing grades makes it very difficult to quantify the amount of Queen conch harvested and in trade.

118. She acknowledged the determination at the last meeting of the QCWG that a new CF should be developed. According to Ms Prada, the meat of the whole animal (including its reproductive and digestive organs) was determined to be most appropriate for weight. Due to the biology of the species, she noted the difficulty of fisheries management and stock assessments to determine sustainability of the fishery. While we need to improve our understanding of the sustainability of Queen conch fisheries, she asserted that we also need to understand the economic importance of Queen conch within the wider Caribbean. She emphasized that we cannot estimate the economic value of the fishery without information on the fishery. The amount of exports differ from the amount of imports of Queen conch in the CITES database. It is difficult since the only data we have is related to exports and the majority of Queen conch is locally consumed and is not reflected in the trade data.
119. In her discussion of the degree of implementation of the regional plan, Ms Prada highlighted the goals of the regional management plan and its implementation. She shared a table with the status of implementation of the 14 management actions and explained that it shows where countries are meeting the goal of the regional measure, where some actions have been taken, and where little action is being undertaken. She highlighted Belize, Jamaica, and Nicaragua for their implementation. Ms Prada explained the table shows that the plan is being implemented but improvements are needed; there is a lack of application of some recommendations and more data is needed. She emphasized the need to continue working and be able to make improvements in implementation. She also suggested that it would be useful to update the responses from countries on the degree of their implementation.
120. Mr Baudrier offered to check with local staff regarding the status of implementation of the management plan in French Guyana and communicate through email.
121. Ms Diei Ouadi expressed her interest in hearing whether there have been improvements based on information presented last year and at this meeting. Ms Prada stated that the process to monitor implementation is dynamic and she will be working to update the tables. She offered to have the SSTAG work with countries to provide updates.
122. Ms Cimo asked for a recommendation that the QCWG continue to improve implementation of the *Regional Queen Conch Fishery Conservation and Management Plan* and track the progress of implementation during the intersessional period. She emphasized that this should be continued.
123. Ms Gaynor echoed the United States of America's comments. She asked if the table could be updated with the information provided by the countries yesterday and other countries who were intending to attend the meeting. She stated that it would be useful to provide this information to the CITES CoP and may be useful for discussion of a CITES resolution on Queen conch.
124. Ms Headley suggested this item be added to the Workplan of the QCWG.
125. Mr Rolón reiterated that it would be useful to keep this activity in the Workplan. He recommended that the QCWG have a list of what countries need to implement this management plan to help identify needs, mechanisms under CITES, and scientific work that is needed. He noted that progress has been slow in some areas. He thanked Martha for her hard work and requested engagement with those countries who have not provided the information that is needed.
126. Mr Isaacs supported the interventions asking that updates be made to the table on implementation of the management plan.

## **Review of the activities of the Scientific, Statistical and Technical Advisory Group:**

### **a) Updated modules of the Queen Conch Manual aimed to illustrate the procedures in estimating population densities, landings and fishing effort and estimation of annual catch quotas**

127. Mr Nelson Ehrhardt reminded the group that the training modules on the Queen conch manual, which was originally developed by CFMC, were conceived by the QCWG. Recommendations from QCWG were to improve technical capacity with respect to:

- effort statistics (Module I);
- density estimates (Module II); and
- methods to establish quotas that are non-detrimental (Module III).

128. He discussed that the modules were created for the establishment of annual quotas to protect the species under Appendix II of CITES. This is to be done by the integration of information and statistical methods and mathematical models in three independent modules that work together. Designed as a self-teaching tool, available in English and Spanish, so that all stakeholders interested in Queen conch exploitation can take the modules. He noted that future training needs should be discussed. He informed the QCWG that the format of each module is identical: 1) what is the problem that needs to be resolved, 2) why do we need to resolve it, and 3) how do we resolve it.

129. Mr Ehrhardt provided a brief explanation of each module.

- Module I – Focuses on landings and fishing effort estimation; its purpose is to help estimate landings. This is considered with fishing data. There should be information on the origin of landings and training should be provided in terms of determining landings statistically. Training is provided on the methods for determining CFs and the statistical process to integrate CFs for estimates of commercial landings. He emphasized the need for CFs, noting that a large sample is needed over different localities. Otherwise, data could be erroneous.
- Module II – Focuses on training in density estimates and contributes to Module III. He noted that sampling efforts by scuba or other methods vary, especially for offshore stocks.
- Module III – Focuses on the methodology used to determine non-detrimental Queen conch quotas. It is aimed at exclusively addressing the survival of the species, not economic exploitation. The aim is to protect the survivorship of the species in CITES Appendix II and integrate information from Modules I and II. He noted the problem of having to adjust models to accurately estimate the degree of exploitation and emphasized that the valuation of data is fundamental.

130. Subsequently, Mr Ehrhardt provided an overview of some of the issues and challenges with data from some of the WECAFC Member Countries. With respect to the Turks and Caicos, he noted there is a long series of landings data all year for dynamic production models. However, he stated that the impact of the Allee effect on unknown surpluses needs further investigation. He asserted that if stock is already exploited, this model is not desirable. Another problem he noted with production is the calculation of exploitation and biomass estimates.

131. In terms of Bahamas, Mr Ehrhardt stated that there is significant market information. He showed the relationship between the index of fishing pressure and the density of mature Queen conch (numbers/hectare). This was contrasted with a model of the relationship between total mortality and population density (numbers/hectare) relative to the level of critical density.

132. According to Mr Ehrhardt, the models have been designed as a self-teaching tool. He showed the methods used and their applications. He asserted that an enormous effort has been made to create and test these modules. Development of these modules has been thanks to the support and

enthusiasm of Miguel Rolón (CFMC). In closing, he shared an update that the modules are being translated into English.

133. Ms Headley noted that this has been a work in progress and welcomed translation of the modules into English.
134. Ms Prada added that the work includes a technical document, and educational videos will accompany the production of the document to facilitate use by those who are not as familiar. This will be a multimedia tool that the group of experts will seek to advance in the coming years so there is awareness of these methodologies.
135. Mr Velasquez thanked and congratulated Mr Ehrhardt for his effort. He expressed his belief that this information will be very useful to have better management of the resource. He claimed that the modules have been highly useful in their daily activities.
136. Mr Rolón suggested that training on the modules with a small group of interested country representatives be included in the Workplan. He offered to have CFMC host a Zoom meeting to share information on the modules. Alternatively, he suggested that the information could simply be provided as a hard copy. To have a dynamic process, however, if there is agreement, he recommended that Mr Erhardt present on the modules during a conference. The videos that will be put together will be available for people to use in Spanish with English subtitles or vice versa with the participation of technical experts. He offered to have CFMC cover the costs of the logistics of such a conference and suggested this could be done over the next two to three years.
137. In response to Mr Rolón's offer, Ms Headley stated that this would be a useful activity to include in the workplan and expressed hope that countries will take advantage of the opportunity to participate.
138. Mr Velasquez expressed great interest in the modules, and particularly those related to improving management of Queen conch. He shared his hope that Belize and Honduras would participate. He asserted that all QCWG members have an interest in advancing our efforts to improve our methods and management, and it would be important to implement the management plan.
139. Mr Ballesteros (Colombia) stated that the training is crucially important. He affirmed that Colombia is highly interested in Mr Rolón's proposal and would be interested in participating. He expressed his optimism that this will be helpful for the species and will certainly be of interest to the other countries.

**b) Proposal for Queen conch genetic study and regional collaboration strategy**

140. Ms Diana Beltrán (University of Rhode Island) presented a proposal entitled, "Developing a toolkit for the traceability of illegal and unreported Queen conch fishery trade across the Caribbean" on behalf of herself and Mr Carlos Prada (University of Rhode Island). She presented that the Queen conch is a critical local food source, has a cultural value for Caribbean people, and makes a significant part of their economy. The product is exported from over 25 Caribbean nations and territories. Unfortunately, Caribbean countries have experienced the decline of this resource throughout the range primarily due to overfishing and habitat loss.
141. In 1992, severe exploitation of the Queen conch fishery in the Caribbean resulted in the species being under trade control and listed in Appendix II of CITES. By 2004, the trade in Queen conch was suspended by CITES Authorities based on evidence of declining stocks or lack of practical management in the Dominican Republic, Haiti, Honduras, Antigua and Barbuda, Barbados, Dominica, and Trinidad and Tobago. To slow down population decline, nations have

developed fishing regulations that have grown over time and differ among them ranging from little regulation to a complete ban on fishing in Florida and Bermuda. However, even after strict harvest regulations such as closed areas, catch quotas, closed seasons, size and age limitations, declines of the populations continue steadily. The primary source of this continuing decline is IUU fishing. To detect products of IUU fishing, traceability and determining illicit trade are essential.

142. After a brief overview of IUU fishing, Ms Beltrán shared that the Queen conch (*Aliger gigas*, formally *Strombus gigas*) fishery provides food security and economic development to over 25 nations in the Caribbean, mostly considered developing countries. This fishery offers over USD 80 million annually to the region's economy. The extensive maritime area across the region represents a fisheries management challenge, and IUU fishing is a severe problem. Cooperation across nations with concerted efforts and tools is urgently needed. She asserted that one such effort is the development of a methodology that allows identifying the source of IUU fishing so that vigilance and management priorities are reinforced in those locations most affected by this illegal activity.
143. According to Ms Beltrán, a key aspect of identifying products of IUU fishing is to understand whether populations of the Queen conch around the different islands and nations represent separate units of management, or instead, they behave as a single fishing stock. One way to differentiate among fishing stocks or management units and follow illegal trade is by understanding the population genetic structure of wild populations. She explained that genetic differentiation could come in at least two ways: either the differentiation occurs among geographically sampled populations or phenotypically different individuals. She discussed their plan to study both in populations across the Caribbean, noting that the study represents a fundamental step in understanding the dynamic population structure of *A. gigas* in the region.
144. To identify the source of IUU fishing, she and her colleague propose to develop a molecular tool kit using high-throughput genomic sequencing. The approach will initially identify the different stocks across the Caribbean, the geographical scale of each of those stocks, and whether the different stocks cross boundaries across nations. Then, to differentiate among fishing stocks and follow illegal trade, they will identify genomic signals unique to each locality. Unique genomic signals in each population develop as a function of genetic exchange (i.e. gene flow). For instance, if populations from different geographical locales do not exchange genetic material, unique genetic signals (i.e. population structure) develop over generational scales, generating a fingerprint that allows the identification of each of those stocks. Because each genetic fingerprint is unique, it will enable tracing back confiscated IUU fishery and identifying the source population in the future.
145. She stated that the novelty of the approach is that they will use genome-wide variation to extract the key molecular markers (i.e. Single Nucleotide Polymorphisms) associated with identifying Queen conch populations. Genome-wide variation provides the highest resolution available to identify signals of genetic differentiation. While the initial work is highly technical, the end product will be an easy-to-use platform that management agencies of the participating countries can implement locally. The project will also provide a collaborative forum to follow IUU fishing, increasing local and regional capacity building to manage marine resources, enhancing the protection of marine biodiversity and fisheries resources.
146. In closing her presentation, Ms Beltrán asked whether countries could share their interest in the work. She stated that she would like to know who believes this information is important for moving ahead. In response, Mr Gongora expressed interest.
147. Mr Rolón asked about the timing. Specifically, he inquired how long it would take to have a kit for the countries to use to process and determine the origin of the Queen conch, and how much

would it cost for a country to implement. Ms Beltrán explained that they are trying to develop for the countries and need to collect the samples. She noted that they must wait about a year and a half to have the final results.

148. Mr Rolón recommended this work be included in the QCWG's workplan. To address origin and identify IUU fishing, he asserted that this is a step in the right direction. CFMC is interested in this work over the next few years. He offered the Council's assistance or information and encouraged her to communicate with Ms Prada as Coordinator of the QCWG.
149. Ms Prada shared her observation that several decades ago, there was only one population of Queen conch, according to the data. With microsatellite data, it appears that there could be multiple populations. Now, with the new tool (SNP), we can determine populations/stocks. She explained that the SSTAG proposal is aiming to increase collaboration among the countries and asserted the need to join financial and technical resources of universities and fisheries ministries. Beyond having the interest of countries, she expressed the need to consider within the country a plan for taking the samples within a relatively small timeframe. She provided the example that four months of sample collection will require 8–12 months for analysis. She also noted that the work requires cooperation throughout the region, as well as financial, logistical and technical support. She requested feedback from the CITES Secretariat on the development of a traceability tool and invited continued discussion and integration of resources.
150. Ms Headley agreed that this would be a very important study. She asserted the need to start liaising with the 15 countries identified and emphasized the need and help engage with donors, universities and CITES. Mr Rolón expressed the need for the QCWG to endorse this proposal. You can take to the agencies to move this work forward. He explained the need to identify contact points to help with data collection so it can be collected through the WECAFC Secretariat or Martha. He also emphasized the need to work on practicalities and invite countries to consider and endorse the project to move forward. He noted that CFMC is willing to help. He explained that the Council has been working on this issue and can offer a tool for the countries to help with the identification of IUU fishing in the Caribbean.
151. Mr Ballesteros expressed confidence that Colombia could benefit from this tool. He stated that the country has some populations that are more discrete, so they are very interested and will investigate how we can participate in the project.
152. Mr Bob Glazer (GCFI) explained that at this point in the state of knowledge on connectivity, the real value is in traceability in his opinion.
153. Ms Gaynor expressed her interest in genetic work. She explained that a donor has provided funding to address enforcement issues. She suggested that there is endorsement of the project and stated that it would be very useful to have an indication of the number of countries engaged and a statement that countries will assist them with enforcement in their countries. She expressed her opinion that it would be very helpful to help address illegal trade issues in the region.
154. Mr Velasquez asserted that this tool would be very helpful to help us control IUU fishing and glean an understanding of the origin of the stock in many regions. He believes that many larvae of Nicaragua's Queen conch resources go through Belize and noted it would be useful to know their interdependence. He expressed interest in participating in this study.
155. Ms Heloise Mathieu (*Comité Régional des Pêches Maritimes et des Elevages Marins de Guadeloupe*, or CRPMEM-IG) asked if there were other studies on isotopic signature. She explained that in the French West Antilles, they are working on a stable isotope methodology to determine Queen conch origin but do not have results yet. She encouraged contact to be made and

there could be collaboration with other countries. Ms Beltrán explained that isotopes are usually used when you are looking for differentiation, but genetic information is more precise since you can see population and habitat information.

156. Mr Isaacs expressed support for the genetic project and endorsed a statement from the QCWG on its importance in the region. Mr Gongora also supported the project and use of the technology to combat IUU fishing. He expressed interest in collaborating with Guatemala, Honduras, and Nicaragua. Mr Suazo expressed interest in the regional project with Belize and Nicaragua.
157. Ms Diei Ouadi recognized the importance of the study for ecological connectivity, legality, and to help IUU fishing. She encouraged countries with IUU fishing of Queen conch to be part of this study and suggested that there be liaising with the Regional Working Group on IUU fishing (RWG-IUU). She explained that there was an effort to create a regional programme, which was postponed to the next funding cycle. Whether within this project or another mechanism, WECAFC would like to encourage Member Countries to support this programme. She suggested there could be a recommendation to WECAFC18 to harmonize this technique and table this as a priority action to be supported by the Commission. Ms Headley and Mr Rolón agreed that this endorsement be reflected in the record.
158. Ms Diei Ouadi suggested that we have a specific recommendation that is aligned with the new template created. Upon liaising with RWG-IUU, she recommended that a Task Force could work on a draft recommendation to circulate to the group to address intersessionally. She noted that the Scientific Advisory Group (SAG) will be meeting in March or April of next year and could review a recommendation. Ms Headley tasked the QCWG to create a small Task Force with members from this QCWG and RWG-IUU to develop a recommendation for WECAFC18 intersessionally. Ms Prada agreed to form a Task Force to work on development of a recommendation for WECAFC18. She offered to circulate a draft recommendation on the importance of the genetic work.

### **Review of Queen Conch Scientific, Statistical and Technical Advisory Group (SSTAG) activities, upcoming plans, and recommendations**

159. Ms Prada noted the recommendations made during discussion of the previous agenda item. She offered to reach out to other countries to plan a meeting to start using the training modules.
160. With respect to NDF work by the SSTAG, she noted that technical guidance work will start soon. Started contacting those who worked in previous efforts so we can continue collaboratively.

### **Advancements and challenges towards decent work in the fisheries sector**

161. Ms Daniela Kalikoski (FAO Fishery Industry Officer) provided an overview of FAO's advancement of decent work and challenges in fisheries. She noted that decent work refers to productive work for women and men in conditions of freedom, equity, security and human dignity. She explained that the right to decent and safe work is a right that belongs to every fisher, fish farmer and fish-worker. Ms Kalikoski noted that the International Labour Organization (ILO) has an international agreement in place, and that their approach involves four pillars:

- employment and enterprise development;
- social protection;
- standards and rights at work; and
- governance and social dialogue.

162. In terms of “deficits” and issues in need of addressing, she pointed out the following:

- low earnings, labour productivity;
- data and policy gaps;
- lack of coherence between fisheries management rules and labour rights;
- poor occupational safety and health throughout value chain;
- widespread use of child labour;
- limited access to social protection and low level of organization and participation;
- fish-worker rights to freedom of association and collective bargaining ignored and violated and low level of organization and participation;
- human trafficking, slavery, abandonment, deaths, and debt bondage;
- ineffective labour regulation;
- flags of convenience and IUU fishing – trying to make connection; and
- vulnerable migrant labour.

163. Ms Kalikoski shared that FAO’s work will focus on social protection and international instruments to regulate this sector. She highlighted the International Maritime Organization (IMO) International Convention on Standards of Training, Certification, and Watchkeeping for Fishing Vessel Personnel, which establishes basic requirements for training, certification, etc. She informed the group that FAO is working closely with IMO.

164. She also noted ILO 2007 Work in Fishing Convention Number 188, which seeks to regulate fishing conditions. Specifically, this instrument covers the following:

- decent conditions of work regarding minimum requirements of work onboard;
- conditions of service;
- occupational safety and health protection;
- medical care and social security; and
- stipulates countries’ obligations and develop regulations to establish on board procedures for the prevention of occupational accidents, injuries and diseases, considering specific hazards and risks on the fishing vessel (Article 32).

165. Ms Kalikoski also cited the Agreement on Port State Measures to prevent, deter and eliminate IUU fishing as an instrument that lays down a minimum set of standard measures for parties to apply when foreign vessels seek entry to ports or when in their ports. She also explained that the Cape Town Agreement of IMO lays down minimum standards. Although it has not entered into force yet, it is in the process of negotiation.

166. Acknowledging that these are important instruments, she explained that this issue is a huge challenge for the following reasons:

- need cohesion between fisheries management and development policies;
- operators cut corners with safety and labour costs;
- women are not recognized in many places and do not have access to benefits that they are entitled to;
- generally, there is low rate of enforcement of ILO core labour standards and sector specific standards (only ratified by 17 states);
- small-scale fishers are left outside of legal protection;
- ILO Convention Number 188 captures capture but not the onshore post-harvest sector;
- low level of awareness, political commitment, and cross-sectoral coordination between relevant authorities (labour departments attend the meeting so there is lack of coordination with the fisheries departments); and
- COVID-19 pandemic/restrictions/crisis exacerbated the situation since fishers are without jobs and income.

167. For awareness of the QCWG, Ms Kalikoski shared that FAO is working with IMO and ILO towards advocacy and adoption of instruments internationally and nationally by:

- raising awareness of stakeholders on the legal framework;
- promoting regional dialogues on safety, working condition and IUU fishing;
- looking for partnerships and joint work with key stakeholders; and
- capacity building.

168. In terms of progress, she explained that FAO met with OSPESCA, identified issues at the subregional level, and highlighted a declaration on priorities. In particular, the social pillar was highlighted, with the goal of establishing a set of policies and programmes aimed at preventing or protecting all people against poverty, vulnerability and social exclusion.

169. FAO is trying to provide assistance with:

- Social assistance. This was one of the most urgent policies that was applied to protect the poor but were conditional for fishers; fishers were provided assistance if they entered in other programmes, etc.
- Social insurance. Contributory measure that makes sure fishers have access to certain benefits, such as pensions and health insurance.
- Labour market interventions. Build skills and enhance capacity for employability.

170. According to Ms Kalikoski, Chapter 6 of the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries calls for social and economic development of small-scale fisheries so they can enjoy human rights, including access to social protection for adequate living and decent work. She noted that there is good documentation in the Caribbean of labour conditions and lack of access to basic human rights. FAO is bringing this issue forward in different fora. The matter was discussed twice at the Forum of Parliamentarians of Fisheries and Aquaculture of Latin America and the Caribbean. She highlighted studies of shrimp and groundfish and Queen conch fisheries and asserted it is important that international standards are implemented.

171. She provided the following examples of social protection intervention:

- can erratic child labour by regulating activities, noting that diving was an activity of concern at the ILO meeting;
- establish minimum standards;
- reward or incentivize formalization to support interventions that enhance protection;
- ensure fisherfolk are covered in case of employment injury, unemployment, loss/theft of equipment, etc.; and
- strong social insurance is key for accountability purposes, especially considering fishing is one of the most dangerous industries.

172. Several illustrative examples of interventions for fishers were provided by Ms Kalikoski in Peru, Costa Rica, Colombia, and Brazil. These include compulsory insurance for small-scale fishers, supplemental risk insurance, and creation of a cooperative to obtain legal recognition and establish a sustainable workplan to help legalize fishing (that was previously being done illegally) and provide access to healthcare, retirement pensions and social security. She highlighted an unemployment benefit programme in Brazil that reaches low income and self-employed fishers. Ms Kalikoski observed that during closed seasons, this helped compliance since fishers were compensated for four months. She noted that the greater the exposure to the programme benefits, the higher percentage of kids enrolled in school, which helped the household in terms of finances and education

173. In closing, Ms Kalikoski shared some key messages of the work being undertaken. First, she asserted the importance of this work, which was recognized as a priority in the COFI 2020 Declaration and the need for FAO to continue collaboration with other agencies on expanding social protection and dealing with labour conditions within the fisheries sector. She explained that most instruments are not fully adopted or implemented at the national level. She cited poor enforcement or labour legislation, infringements on small-scale fishers' rights, child labour and barriers to access social protection, including lack of updated fisheries and social registries.
174. To improve the situation, Ms Kalikoski believes there is a need for coherence between fisheries management and social development, citing Brazil as a good case study. She suggested a decent work and social protection plan within WECAFC that addresses safety at sea. She shared that FAO is trying to elevate these issues at Regional fishery management organizations and regional fishery bodies with promising responses so far. She recommended training and capacity building on labour laws and vocational skills, strengthening organizations and trade unions to empower political participation in the sector and beyond, and improving information and registry of fishers to ensure inclusion and access to social protection. For operators who do not meet criteria, she suggested they could lose their license.
175. Mr Isaacs informed the QCWG that Saint Vincent and the Grenadines partnered with FAO to look at the importance of social protection plans in artisanal fisheries. Under the project, they looked at barriers to providing social protection to fishers and drafted an action plan. He explained that they endorsed the importance of social protection and thanked FAO for the work they are doing and expressed hope that FAO will do more in the region on this issue.
176. Ms Kalikoski commended the study and would like to find ways to continue supporting Saint Vincent and the Grenadines with the plan. She noted the impacts of the hurricane and hopes that FAO can continue providing support for this work.
177. Ms Diei Ouadi thanked her colleague for the studies in the region, such as the study on Queen conch. She noted the importance of this work and recommended this be brought forward to the Commission. She explained that the current Strategic Plan has no reference to decent work. There were concerns about this issue raised at the last Commission meeting. She noted that this is an opportunity to provide clear recommendations to the Commission. For the new terms of reference for the QCWG and template for recommendations, the QCWG recommendations should be reflected in one set of recommendations under which you can have several issues listed. Ms Diei Ouadi suggested that there could be a link between IUU fishing, social protection, and genetic connectivity work in a set of recommendations to be prepared that bring the issues of social protection and safety-at-sea to the attention of the Commission. She requested the assistance of Ms Kalikoski in the development of such a recommendation, and Ms Kalikoski agreed to assist and provide support.
178. Ms Headley noted this is a useful point and agreed that the QCWG develop one recommendation on the list of various issues discussed today, including the genetic study and elements of social protection and decent work.

**Report of the study on “The health and safety in the dive fisheries of key species in the WECAFC region” and actions for attention for the Queen conch Working Group**

179. Ms Claudia Beltrán (FAO Consultant) noted that both WECAFC17 and the 4th meeting of the QCWG developed recommendations regarding dive fisheries and the implications for communities and fisheries resources. She explained that FAO did a regional study in 2020 that analysed use of SCUBA, hookah, and apnea (free diving) in the Queen conch and sea cucumber fisheries. Interviews were conducted in Honduras, Nicaragua, Dominican Republic, Colombia, Mexico, Bahamas, Jamaica, and Saint Lucia.

180. Based on the study results, scuba and hooka are gears used. There have been thousands of deaths and muscular and other health problems in the dive fishery for Queen conch. Fishing is done in very deep areas in the case of Queen conch. She noted that some countries have prohibited the use of scuba, but many fishers refuse to stop using this method since autonomous diving is very profitable.
181. According to Ms Beltrán, Queen conch, lobster and sea cucumber have high demand. Scuba accidents tend to happen in areas without access to decompression chambers. She explained that diving is usually a family business, with between 8–12 dives per day, and in some cases, divers use alcohol and drugs. She explained that scuba is used in fisheries for Queen conch, lobster, and sea cucumbers destined for Asia (Hong Kong, mainland China, Singapore, and Republic of Korea). Sea cucumbers are exported; they are exported to Asia and Asian communities in the United States of America. There is an illegal fishery that is not reported. She also noted that in the Dominican Republic, sea cucumber fishing is prohibited but records of exports are registered. There is significant illegal trade in these species.
182. Ms Beltrán asserted that the problem is in the fishing communities and countries in the region. She asserted that there is no coordination at the national or regional level on regulations in place (such as those of OSPESCA). She listed several relevant laws, policies and regulations:
- OSPESCA 02/2009;
  - Declaration St. George CRFM/2015;
  - Spiny Lobster Management Plan (MARPLESCA) (endorsed by OSPESCA 2018, WECAFC 2019); and
  - National Plans (listed several countries in the region).
183. According to Ms Beltrán, there is a question of how to address challenges and help scuba divers. She highlighted the need to recognize the activity as risky. She stated that the highest rate of accidents is in Central America: Honduras, Nicaragua and Dominican Republic. She explained that illegal fishing gear is used and recommended the development of practical guides in different languages (including creole and mastic). Ms Beltrán also suggested the design of an application for cell phones with safe diving protocols and maps of hyperbaric facilities that provide rapid communication with the authorities. She explained that divers often cannot get back to the shore quickly; they need to be able to communicate and request help. She also cited the need to provide another option to diver fishers – so the dive fishery is not their only economic option – and they can change their behavior.
184. A project on the health and safety in the fishery for key submarine species in the WECAFC region was introduced that seeks to improve the work conditions in dive fisheries. Its aims are to promote and positively influence the harvest decisions and prioritize the protection of life and health of the fishers and secure safe conditions for occupational safety. Ms Beltrán explained that the project is proposed for five years, but she noted that finding donors is a challenge. Countries that would benefit include Colombia, Dominican Republic, Haiti, Honduras, and Nicaragua.
185. At the conclusion of the presentation, Mr Alex Tewfik (SSTAG member) reiterated the dangers of shallow water dive fishing, including free diving, and increased health risks. He emphasized that protecting shallow water resources will protect divers, regardless of what techniques are used. Ms Beltrán agreed, noting that there are problems with free diving, but it is less risky than using scuba.
186. Ms Prada asked about hyperbaric pressure facilities operating in the region. She asked about the access to infrastructure at landing sites where there are injured divers. She explained her concern that hyperbaric treatment costs are high and asked whether to improve the infrastructure

that is already available. She suggested that perhaps fishery earnings could be used to create a fund dedicated to deal with payment of treatments and increase security in diving. Ms Beltrán responded that when there is an accident, there are costly treatments. She asserted that captains and boat operators assume the costs of accidents but do not know what to do. She suggested that the creation of a fund could perhaps be a private effort.

187. Ms Kalikoski asked whether there are any organizations to deal with these problems. She explained that she is working in Colombia on aquaculture and in Mexico with artisanal fishers where, in the absence of social protection rights, revolving funds were very helpful for addressing health issues, funerals, and other things. It has been very successful and most likely will be scaled up to include other communities and would be worthwhile to explore. Ms Beltrán responded that there are diverse organizations in Honduras and in Nicaragua. In terms of Colombia and Costa Rica, she noted that they have greater access to social security since it is a right. But in other Caribbean countries, this is not the case. Fishers have access to hospital treatment but generally do not go to get help. If they get sick, they take aspirin, but do not understand the health issues. They do not want to waste their time. She noted the misconception that fishers are poor and do not make a lot of money. However, the value of the fisheries do not reflect the value of someone's life. That is why relative to fishing snapper or grouper, the cost for lobster is much higher. You can make a lot of money, but there is a lack of training on the health risks.

#### **Facilitated discussion: CITES resolution on Queen conch**

188. As an introduction, Ms Gaynor pointed out the difference between resolutions in CITES versus decisions. She explained that a resolution is more permanent in nature, guiding Parties on implementation over many years. In contrast, decisions are short-term, time bound with specific instructions to a Party, Secretariat, etc. Resolutions are long-term, but she explained that they must be submitted by a Party. The QCWG could not submit a resolution to CITES. Given the lack of time to discuss the draft resolution at the meeting, she recommended that the QCWG review the draft resolution created at its last meeting and she offered to provide general comments.
189. Upon review of the draft resolution text, Ms Gaynor noted that the document largely reflects the decisions on Queen conch that were adopted at the last meeting of the CoP. She stated that the preamble of the resolution should set the scene and provide context. The preamble for such a resolution should include paragraphs on the importance of Queen conch; highlight concerns (e.g. overfishing, IUU fishing, etc.); acknowledge positive work; note the roles of other relevant multilateral environmental agreements, bodies and agencies, as well as other relevant Resolutions (e.g. Resolution Conference 16.7 on NDFs); recognize the needs of Parties; and note any other relevant initiatives (e.g. Blue Biotrade Project, RWG-IUU, etc.). It should specifically mention the *Regional Queen Conch Fisheries Management and Conservation Plan*.
190. Ms Gaynor explained that a resolution directs rather than instructs. She noted that there is duplication in the tasks of the draft resolution. She suggested that it would be useful to instruct range States, organizations, and donors to assist range States with funds, enforcement, population assessments, habitat management and restoration, among others. She explained that a draft resolution can call on the CITES Secretariat to improve collaborations. She also stated that the resolution could instruct the CITES animals Committee to draw its attention to scientific issues and instruct the CITES Standing Committee to draw its attention to any enforcement issues. She offered that this would provide permanent instruction to keep Queen conch on the CITES agenda while decisions only provide time-limited guidance.
191. She suggested looking at the existing CITES resolutions for inspiration and provided several useful suggestions.

192. Ms Gaynor expressed her hope that she provided some ideas and guidance for a draft resolution that could be submitted to the next CoP. She informed the QCWG that the deadline for submission of a resolution would be 17 June 2022.
193. Ms Headley agreed that the QCWG could work on the resolution intersessionally and have a range State introduce for consideration at the next CITES CoP.

### **Update on the Blue BioTrade project**

194. Mr Alexander Girvan (Coordinator – Blue BioTrade Project) provided an update on the Blue BioTrade Project, which is being supported by UNTAD, CITES, Organization of Eastern Caribbean States (OECS), and the European Union. He stated the project’s objective is to help OECS Member States to maximize benefits from the production and trade of Queen conch. In his presentation, he provided an overview of the steps of the project and the main activities that have been completed. These activities include:
- stakeholder mapping;
  - draft St Lucia case study;
  - Saint Lucia Validation workshop; and
  - draft Grenada case study.
195. Next, Mr Girvan provided a brief overview of the Saint Lucia case study, noting that 13 interviews were conducted. Based on the results, Saint Lucia is a net importer of Queen conch with a value of USD 1.35 million. He asserted that there is active trade between Saint Lucia and the French Caribbean territories; Saint Lucia imports Queen conch that are re-exported. He cited many challenges, including the lack of a Queen conch stock assessment, the investment needs for the Hazard Analysis Critical Control Points (HACCP) certification and facilities upgrade, internal coordination for CITES reporting (he noted the disconnect between the CITES Authorities and Fisheries Ministry), and fishers leaving the industry due to diving risks.
196. In terms of the value chain of Queen conch, he explained that the conch pearls are being discovered, but the value captured in OECS is limited. Pearls are sold at a low price and re-auctioned in the United States of America). He informed the group that by-products (trimmings, operculum, shell) remain an issue across the region. The use of shell is limited, but it represents a resource that could be used for other valuable products.
197. Mr Girvan highlighted several opportunities for Saint Lucia, including the application of the BlueBioTrade principles to facilitate legal and sustainable trade and the sale of “high quality” mature deep water St. Lucian conch. He explained that Saint Lucia could be a legal port of export given its linkage to the French Caribbean and the European Union if there is creation of an association. He recommended that Saint Lucia could maximize the value of its by-products and reduce waste. Fishers could be trained to understand the value of pearls, which need to be auctioned within the subregion. His perception is that re-entry is a strong incentive and could mitigate the risk of illegal trade in Queen conch. He also noted there would be creation of a “cluster” where the costs of monitoring (stock assessments) and enforcement are shared. He also noted that the costs of certification to access external markets could be shared.
198. In terms of recommendations, Mr Girvan suggested that Saint Lucia create an European Union export task force. He advised that the country could become a regional point of processing and export, and that there could be education and centralization of the sale of Queen conch pearls. He suggested completion of a stock assessment and a BioTrade self-assessment tool. He also recommended that large processors seek HACCP certification.

199. Subsequently, Mr Girvan provided a summary of the study of Grenada. He explained that there is limited and declining investment due to the CITES trade suspension. He noted that there is informal trade with Saint Vincent and the Grenadines and Trinidad and Tobago. He explained that there is a green market trade that has strong potential. However, he noted that the lack of a stock assessment and the informal landing sites pose challenges. He asserted that Grenada should address the CITES trade suspension by completing a stock assessment in collaboration with other countries. He also cited the need to capitalize on the country's processing capacity and add value to existing products. In particular, he suggested that they capitalize on high value markets. He also recommended investment in a secondary landing site, among other actions.
200. With respect to future activities, Mr Girvan informed the QCWG that Saint Vincent and the Grenadines case study should be completed in approximately February 2022. By May 2022, they should develop an OECS BioTrade Action plan. If there is support for the plan, there is more likely to be investment (health and safety, gear, etc.). He expressed the need for political support.
201. Mr Girvan shared that he is seeking finances for a regional stock assessment, which should be an OECS stock assessment. The focus would be on Saint Lucia, followed by Saint Vincent and the Grenadines, and then have work in Grenada. The costs could be shared, and this would help regularize methods and assist with comparisons. The assessment would be done by the United Nations Environment Program. He explained that he is speaking with experts from Belize and has developed a proposal for a stock assessment with idea of training on dives and field studies. He estimates the cost to be between USD 100 000 and USD 400 000.
202. In terms of other potential activities, Mr Girvan has submitted a concept note application to the Caribbean Biodiversity Fund for the Subregional Conch Nursery in Saint Vincent and the Grenadines for USD 2 million. He expressed hope to find additional funding to help in the subregion.
203. In closing, Mr Girvan spoke of other potential actions and opportunities that could benefit the region. Specifically, he highlighted the creation of "economic clusters," where there is a geographic concentration of business suppliers and associated supporting institutions in a particular sector. This is composed of producers, service providers, and suppliers. He cited several advantages to this approach, including that it reduces business transaction costs, promotes healthy competition through innovation, and is more dynamic in responding to global market changes. He also mentioned "horizontal clusters," where there are connections between manufacturers of complementary products, noting that there are opportunities across OECS to share transportation, processing, research and marketing costs. Finally, he discussed "vertical clusters" between providers and manufacturers, to improve relations between fishers and exporters.
204. At the conclusion of the presentation, Ms Mathieu stated that countries are interested in market access via the French islands since the Euro is stronger than the Caribbean dollar. However, she explained the problem is that there is no compatibility with rules. Queen conch comes from Jamaica and does not have the same season. Therefore, you can find Queen conch in the market when fishing is closed to the locals. This could create an unstable market. She also cited that there are different costs of living. The local market becomes unstable when there are products from Asia or other areas. Fresh products enter the market, but most are frozen and sold in supermarkets. The production costs are different. This presents an opportunity, but we need to think of our local fishers who could be negatively impacted. In response, Mr Girvan asked for more information about the availability of products when there are closed seasons. He stressed that this needs to be flagged as an entry point for illegal products. When the fishery is closed and the Queen conch fishery is in other areas, buyers could purchase and then pretend it was landed. With respect to Martiniquan stocks of Queen conch, he asserted that the domestic supply is not enough, which is driving imports from Saint Vincent and the Grenadines and Saint Lucia. Importation is being displaced by

imports from Jamaica. There was further discussion of these issues, including confirmation that there is greater demand for Queen conch beyond what is domestically available. However, there were concerns about sustainability if the Queen conch are exploited in other regions. Ms Mathieu suggested that if there is demand, it may be more appropriate to increase the price and people need to be aware that this is a luxury product. Mr Girvan agreed that smaller producers need to get a higher price. He provided the example that Queen conch in Saint Lucia from deeper waters should have a higher price. If prices increase, however, it increases the incentive for illegal trade. Only those who pay will have access, so there needs to be an increase in monitoring and enforcement costs, noting that there is rampant illegal fishing.

205. In closing, Mr Girvan shared a site where more information can be found on the project: <https://unctad.org/project/blue-biotrade-promoting-sustainable-livelihoods-and-conservation-marine-biodiversity>

### **Development of updated (2022–2024) workplan and WECAFC 2022–2027 strategic plan**

206. Ms Headley shared a copy of the 2022–2024 workplan with the membership of the QCWG and solicited input on the document. There were suggestions to include consultation with the Blue BioTrade Project, actions to implement the project proposal on dive fisheries in the region, and funding for a publication on this topic.
207. Mr Rolón noted the need for the Council to evaluate their budget and coordinate with NOAA Fisheries on the Workplan. He highlighted Martha’s work, which is supported by CFMC.
208. Ms Gaynor suggested that the QCWG or SSTAG consider organizing a side event on all the great Queen conch work at the next CITES CoP, including the genetic work and link in the Blue BioTrade. She asserted that if a range State drafts a resolution, side-event would be a good way to gain support for it.
209. After discussion and agreement on the Workplan, Ms Diei Ouadi briefly discussed the 2022–2027 strategic plan for WECAFC. She noted that the Executive Committee met to discuss the plan, and there may be a need to support its finalization. She informed the QCWG that there may be queries or comments to the group to support finalization of the strategic plan.

### **Draft recommendations for WECAFC18**

210. After a brief discussion of potential recommendations for WECAFC18, Ms Diei Ouadi recommended that the QCWG review the template for recommendations. She reminded the group that each working group must use it to present its recommendations.
211. Ms Headley shared the template for recommendations and resolutions for presentation to WECAFC bodies, working groups, and the Commission. The recommendation should include a cover note to assist reviewers of the recommendation and resolution.
212. Ms Prada requested clarification that the QCWG will have a single recommendation to present to the Commission with different activities. She also asked whether there is a need to create a preamble for each activity. Ms Diei Ouadi responded that a preamble is recommended and should be general heading for all the topics in the recommendation. It will be relevant to all the aspects of the recommendation.
213. Ms Headley informed the QCWG that there would be review and discussion of a draft recommendation for the group to consider later in the meeting prior to its conclusion. These recommendations could be considered intersessionally.

## **New terms of reference of the QCWG**

214. Ms Headley noted that the QCWG will need to include information to complete gaps in the template of the new Terms of Reference for the WECAFC Working Groups.

## **Adoption of the meeting report and recommendations for the Western Central Atlantic Fishery Commission**

215. Ms Headley shared some meeting recommendations that could be provided to the Commission for consideration.

### ***Meeting recommendations***

a) Participants at the 5th CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group recognized the importance of evaluating the degree of implementation of the QC regional management and conservation plan. Participants recommended updating the quantitative values collected in 2019–2020 with additional communication among all countries in the Wider Caribbean participating in the Queen conch fishery and using the information presented at the 2021 Working Group meeting. Monitoring the plan implementation would increase communication, coordination, and planning towards the application of ecosystem approaches to fisheries in this valuable resource.

b) Participants at the 5th CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group also recognized the importance to actively work towards counteracting Illegal, Unreported, and Unregulated (IUU) fishing in the Queen conch fishery through region-wide genetic work. This genetic work would utilize the Single Nucleotide Polymorphism (SNPS) technique that would allow for the development of appropriate and validated genetic markers. This has the potential to identify spatial distribution of the species, thus would provide useful information for Queen conch connectivity and traceability. All country representatives present at the meeting agreed to participate in such a project understanding that at least 15 countries would be needed to develop this work. It is recommended that the QC SSTAG liaise with the Regional Working Group on IUU Fishing to further strengthen activities counteracting IUU fishing.

216. Upon presentation of the recommendations, Ms Gaynor requested the text for inclusion in the report to the CITES Standing Committee to help make the case for funding to the donor. She requested the recommendations and meeting report be made available before 7 March 2022 in time for the Standing Committee meeting. In response, Ms Headley offered to share the text of the recommendations.

217. Ms Diei Ouadi noted the request to have the meeting report published by early March. She explained that FAO requires more than one month to go through the quality control for meeting reports. From her experience, she noted that publication by early March would be impossible. She explained that a more realistic deadline would be early April. Ms Gaynor responded that this would be helpful. She can indicate to the CITES standing Committee that the report will be ready before the CoP and can be submitted as an Annex to the document for the CoP.

218. Ms Headley noted that there were no other comments, so the QCWG agreed on the summary of recommendations.

## **Date and place of the next meeting**

219. Ms Diei Ouadi explained that the Commission will meet in the second half of 2022 or 2023, and the meeting could be virtual or in person. If we have support from NOAA Fisheries and CFMC, the next meeting of the QCWG could be hosted in Puerto Rico or Panama with assistance from

WECAFC to help cover travel costs for a few participants. The timing will be forthcoming after the next Commission meeting. She also informed the group that the SAG will be meeting in March or April. If there is a need to address recommendations, she suggested seeking assistance from the Task Force with the Convener to address any comments from the SAG before they are shared with the Commission in advance of the meeting in July.

220. Since WECAFC works closely with CFMC and CRFM, Ms Diei Ouadi requested that Mr Rolón speaks to the likelihood of having a meeting of the QCWG in late 2022 or 2023. Mr Rolón responded that the timing of the next meeting will depend on what the group decides. If the group would like to meet in late 2022 or 2023, he stated that the CFMC is ready to assist. Ms Diei Ouadi suggested that the QCWG propose another meeting in a year (December 2022).
221. Ms Gaynor reminded the group that the CITES CoP will be in Panama on 14–25 November 2022. There is a possibility to have a QCWG meeting on either side of the CoP. That may help with funding since some people may already be in Panama. She also highlighted the possibility of a side event at the CoP to promote Queen conch to the global audience.
222. In response to this suggestion, Mr Rolón reminded the QCWG that WECAFC was supposed to hold a meeting of the Spawning Aggregations Working Group in March in Panama. He proposed the possibility of having both Working Groups meet in Panama. He noted that this would reduce costs, but it would also require more work. He noted that Ms Prada is the coordinator of both Working Groups. He explained that CFMC will adapt to the wishes of the group. He explained that to host another meeting within a year would be too much and suggested the group meet in 2023. He stated that CFMC and NOAA Fisheries will be able to assist depending on the group's decision and confirmed that a meeting could take place around the CITES meeting if this would be helpful.
223. After no dissent was expressed, Ms Headley confirmed that the group should plan on a tentative meeting of the QCWG in November 2022 subject to workload.

### **Closing session**

224. The meeting concluded on Tuesday, 14 December 2021, with the remarks from the convener, meeting host, and WECAFC Secretary.
225. Ms Headley thanked the participants and noted the good representation at the meeting. Ms Diei Ouadi thanked partners, FAO colleagues, and the task force for their hard work. She expressed gratitude for everyone's inputs in their respective areas. She expressed immense appreciation to the Convener for her preparations and effective, efficient work. She also thanked Ms Headley for being convener for two other Working Groups, noting that she has a tremendous amount of work within WECAFC. Ms Diei Ouadi thanked Ms Headley for her dedication and cooperation. She also expressed her gratitude to all the Task Force members for their efforts and great support. She noted that the QCWG cannot do all this preparatory work and all post-actions without partners, including CITES. Finally, she expressed appreciation for the excellent interpretation at the meeting.
226. Mr Rolón wished everyone safe holidays and expressed his hope that the QCWG will be able to meet in person. He acknowledged Christina Olan, Martha Prada, Diana Martino, and Maria Lopez who attended the meeting in person and expressed appreciation for their efforts.
227. The meeting closed at 14.08 hours Atlantic Standard Time.

## APPENDIX A – LIST OF PARTICIPANTS

### Bahamas

WEBB, Candice  
Assistant Fisheries Officer  
Ministry of Agriculture, Marine Resources and  
Family Island Affairs  
Nassau

### Belize

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Fisheries Officer  
Belize Fisheries Department  
Belize City

### Colombia

Autoridad Nacional de Acuicultura  
y Pesca (AUNAP)  
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BORDA, Carlos A.

BALLESTEROS GALIUS, Felipe

### France (Guadeloupe)

CRPMEM  
Basse Terre  
Guadeloupe

MATHIEU, Heloise

VINCENT, Charley

TIN, Christiane

FRANCIL, Hugues

MARIE-REINE, Olivier

EHRSTEIN, Frédérique  
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Basse Terre  
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### (Martinique)

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Tegucigalpa

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Director General

SUAZO CERVANTES, José  
Asesor Despacho Ministerial SAG  
Coordinador Nacional Convención Cites-  
Honduras/Asesor en el equipo técnico legal

CARDONA, Nathaly  
Part of OSPESCA group

### Jamaica

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Director of Marine Branch  
Kingstown

### Nicaragua

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Técnico de la Dirección de Investigaciones  
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### Saint Vincent and the Grenadines

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Fisheries Division  
Ministry of Agriculture, Industry, Forestry,  
Fisheries and Rural Transformation  
Kingstown

**Trinidad and Tobago**

SAMPSON, Kerwin

OTHERS  
 PRESENTERS  
 GAYNOR, Karen

CITES  
 GIRVAN, Alexander  
 BioTrade project

Megan Davis  
 Queen conch aquaculture manual

Diana Beltrán  
 QC SST expert Group

EHRHARDT, Nelson  
 QC SST expert Group

ROLÓN, Miguel  
 Caribbean Fishery Management Council  
 (CRFM)

PRADA, Martha  
 CFMC-WECAFC

HEADLEY, Maren  
 Working Group convener/CRFM

**United States of America**

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 Fishery Policy  
 Office of International Affairs and  
 Seafood Inspection  
 National Marine Fisheries Service/NOAA

DEL MAR LOPEZ, Maria  
 NOAA

ABERCROMBIE, Debra  
 U.S. Fish and Wildlife Service

**Observer**

PHILLIPS, Myles  
 FSA Working Group convener/Belize

**Members of the QC SST Expert Group**

APPELDOORN, Richard

BABCOCK, Elizabeth

GLAZER, Robert

MEDLEY, Paul

PEREZ, Manuel

SHRVLANIM, Manoj

STONER, Allan

TEWFIK, Alexander

VANNUCCINI, Stefania

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BELTRÁN, Claudia  
 FAO Consultant

**CFMC Staff**

MARTINO, Diana  
 Assistant to the Executive-Director

DE LOS A. IRIZARRY, María

## APPENDIX B – AGENDA

**13 December 2021**

### *Morning session*

- 09.00 1. Opening of the session  
Welcome words by:
- Maren Headley, CRFM
  - Yvette Diei-Ouadi, WECAFC
  - Miguel A. Rolón, Executive Director of CFMC
- 09.45 2. Introduction of delegates
- 10.00 3. Election of the Chairperson and rapporteurs
- 10.15 4. Introduction of the Working Group – Convener
- 10.30 5. Adoption of the agenda and arrangements for the Working Group
- 10.45 Break**
- 11.00 6. Update of WECAFC work on Queen Conch and overview of inter-sessional activities
- 11.30 7. Update of CITES work on Queen Conch by CITES Secretariat
- 12.00 8. Overview of Queen conch WG and SSTAG Recommendations and implementation status of the recommendations WECAFC/XVII/2019/12 and WECAFC/XVII/2019/13

**12.30 Lunch break**

### *Afternoon session*

- 13.30 9. Queen Conch FMP implementation status in CRFM Member States
- 14.00 10. Queen Conch FMP implementation status in OSPESCA Member States
- 14.30 11. Queen Conch FMP implementation status in selected WECAFC Member States, degree of conch meat processing, and status of national conversion factor development (**10 minutes each and 5 minutes for questions/discussion**)
- Antigua and Barbuda
  - Bahamas
  - Belize
  - Grenada, Saint Lucia and St Vincent and the Grenadines
  - Jamaica
- 16.00 Coffee break**
- 16.15 12. Queen Conch FMP implementation status in selected WECAFC Member States, degree of conch meat processing, and status of national conversion factor development (**10 minutes each and 5 minutes for questions/discussion**)
- Colombia
  - Honduras
  - Martinique and Guadeloupe
  - Nicaragua
  - United States

- 17.15 13. Introduction of the FAO Technical Paper “User manual on Queen conch aquaculture: hatchery and nursery phases”
- 17.45 End of the first day of the meeting

**14 December 2021**

*Morning session*

- 09.00 Reflection on Day 1 deliberations
- 09.15 14. Overall responses on the degree of implementation of QC regional management plan
- 09.30 15. Review of Scientific, Statistical and Technical Advisory Group Activities
- a) Updated modules of the Queen Conch Manual aimed to illustrate the procedures in estimating population densities, landings and fishing effort, and estimation of annual catch quotas
  - b) Updates on the NDF technical guidance
  - c) Proposal for QC genetic study and regional collaboration strategy
- 10.30 16. Facilitated discussion, recommendations, recommendations for QC SSTAG

**10.45 Break**

- 11.00 17. Advancements and challenges towards decent work in the fisheries sector
- 11.20 18. Report of the study on “ the health and safety in the dive fisheries of key species in the WECAFC region” and actions for attention for the QCWG
19. Subsequent proposal on diving and decent working conditions
- 11.45 20. Facilitated discussion: CITES Resolution on Queen Conch
- 12.15 21. Update on the Blue BioTrade Project

**12.30 Lunch break**

*Afternoon session*

- 13.30 22. Review of 2019–2021 workplan achievements and development of updated (2022–2024) workplan and strategic elements of the QC fisheries to feature in the WECAFC 2021–2027 plan
- 14.00 23. Draft recommendations for WECAFC18
- 15.00 24. New terms of reference of the QCWG
- 15.45 Coffee break**
- 16.00 25. Adoption of the summary report and recommendations for WECAFC
- 17.00 26. Time and location of next meeting
- 17.15 Concluding of the meeting

## APPENDIX C

### QUEEN CONCH WORKING GROUP (QCWG) CFMC/OSPESCA/WECAFC/ CRFM/CITES

#### REPORT OF THE FIRST WORKSHOP OF THE SCIENTIFIC, STATISTICAL AND TECHNICAL ADVISORY GROUP (QC/SSTAG)

23–25 April 2019, Hotel Aloft, Miami, Florida

#### 1. Introduction

This Queen conch expert workshop met in Miami following recommendations gathered at the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen Conch (QC), held in Panama City, from 30 October to 1 November 2018, to progressively implement the Queen conch regional management and conservation plan. This regional plan envisioned the establishment of three subgroups, within the main Queen conch working group: the technical advisory, the outreach and education, and the governance sub-groups. The document also outlined the kind of activities each sub-group could address.

In particular, the technical advisory group, coordinated by Martha Prada, has initiated its exchange of communication using online tools, but in-depth discussions are expected to take place in this first face-to-face meeting. The CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on QC recommended several experts names for the composition of this advisory group, however, it will be ultimately the task of the sub-group to make recommendations about its own composition and other rules and protocols. Every recommendation resulted from this technical advisory group will be then shared with the entire CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group for its final approval.

Funding for the coordination and for this workshop have been provided by the Caribbean Fisheries Management Council (CFMC) and FAO/WECAFC (80 percent and 20 percent respectively). However, it is recognized that there is a need for securing additional funding not only to maintain the group actively working, but in addition to be able to complete recommended actions stated in the regional fisheries management and conservation plan.

Initially, the technical advisory sub-group has been asked to discuss and provide recommendations on four main topics, as follow:

- a) improve scientific guidance on regional conversion factors.
- b) provide initial considerations about the basic information for generation of Queen conch NDF determination.
- c) identify priority research at the regional level.
- d) define its internal protocols on how it will operate and agree on future steps, at least for its first year of work.

Based on those considerations, the agenda was agreed (ANNEX 1), as prepared by the coordinator. She remembered that there have been previous encounters of QC experts aimed to improve collaboration and fisheries management during last decade, which proved relevant in completion of the species regional fisheries management and conservation plan recently adopted. Among them were:

- the collaborative management of the Queen conch workshop in the southwestern Caribbean in San Andres Island, Colombia (July 2008);
- the technical recommendations gathered from the QC expert meeting in Miami (May 2012);
- the establishment of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen conch at the 14th session of WECAFC, Panama (Feb 2012);

- the revision of the QC regional plan during the second meeting of the CFMC/OSPESCA / WECAFC/CRFM/CITES QC Working Group in Panama (Nov 2014);
- the expert's regional recommendations for better QC management in San Andres Island, Colombia (Mar 2015); and
- the establishment of the technical advisory and education and outreach subgroups during the third meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES QC Working Group in Panama (Oct 2018).

This is the reason why the regional fisheries and conservation management of the QC in the Caribbean was built over scientific recommendations. However, technical advice needs to go beyond and develop mechanisms for the plan progressively implementation. In this respect, QC experts recommended to work in the development of one or several proposals aimed to respond to priority recommended actions (see section priority research).

## 2. Methodology

The meeting took place at the Aloft hotel, Brickell, Miami, from 23 to 25 April 2019. It was attended by 11 experts, three observers, and three representatives from regional organizations, as presented in Table 1 and Figure 1. The meeting was conducted in English.

FIGURE 1  
Queen conch technical advisory group in the Miami 2019 expert workshop



TABLE 1  
Participants of the first face to face expert meeting

No.	Category	Last name	Country	Organization
1	FAO/WECAFC	Yvette Diei Ouadi	Barbados	FAO -WECAFC
2	Expert	Alex Tewfik	Belize	Wildlife Conservation Society
3	Expert	Mauro Gongora	Belize	Fisheries Department
4	FAO/Fishries Statistics	Stefania Vannuccini	Italy	FAO- FIAS
5	Expert	Stephen Smikle	Jamaica	Fisheries Department
6	Expert	Renaldi Barnutty	Nicaragua	Fisheries Department (INPESCA)
7	Expert	Manuel Perez	Nicaragua	OSPESCA
8	Expert	Richard Appeldoorn	Puerto Rico	Consultant
9	Expert/coordinator	Martha Prada	Puerto Rico	Under contract to CFMC
10	CITES	Daniel Kachelriess	Switzerland	CITES
11	Expert	Paul Medley	United Kingdom of Great Britain and Northern Ireland	Consultant
12	Expert	Nelson Ehrhardt	United States of America	Consultant
13	Observer	Diana Beltran	United States of America	Genetic researcher
14	Observer	Robert Glazer	United States of America	Florida Wildlife Commission
15	Observer	Elizabeth Babcock	United States of America	UM- RSMAS

### 3. Meeting development Updates from WECAFC

Yvette Diei Ouadi, from WECAFC, mentioned that this meeting is supported by FAO/WECAFC because it was recommended during the third meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES QC working group, and it would allow countries to respond to the new recommendations made on conversion factors, which in turn shall have an effect on how they report QC production and exports to FAO and CITES.

The meeting is also important to evaluate the progress of the QC working group in the implementation of the regional management plan, with regard to the technical and statistics guidance. Recommendation from this workshop will be presented at the next 10th session of WECAFC Scientific Advisory Group that would take place in June 2019 (online).

She recalled that to have expert, frequent interactions, such as one or two face-to-face meetings per year and even more frequent online communications, the group needs to keep a manageable size. For instance, ten individuals are believed to be a manageable size.

### Updates from CITES

Daniel Kachelriess from CITES, acknowledged the closed collaboration CITES have developed in regard to the QC in the Caribbean region, since the species has been listed in CITES Appendix II. In fact, it was one of the first commercial species to be listed under this convention.

He made clear that every QC export would require a NDF (Non-Detriment Finding) and a legal acquisition, however, each country develops their own criteria to base these decisions, with no binding guidance specified in CITES. Thus, expert groups, should develop those guidelines. To counterbalance

this situation CITES conducts significant trade reviews, based on databases, if necessary. Conducted twice in the case of QC. He expressed concerns about the use of scientific quotas, and how in the 2018 meeting, CITES remains that every export would require a requires an NDF, thus the concept of scientific quotas does not apply.

CITES is planning a large NDF workshop for plants and animals, similar that the one developed a decade ago in Cancun, with probably a working group on marine species. Thus, the QC is a good candidate for this analysis. Therefore, a small meeting will take place late in 2019 and a larger one in 2020. In addition, CITES is preparing a report on the sea trade.

Despite, there are not binding recommendations for QC international trade in CITES, they have been working to improve an international trade database, and other issues relevant to the species trade sustainability. However, it is recommended in the long term, to have more independent reviews, thus assuring that countries do not have under the same agency the scientific and the management CITES authorities. And so, in this sense, countries need additional efforts to improve data collection, particularly if they are exporting. Funding again is playing a role in securing viable strategies for maintain good data collection of conch production and exports. Perhaps, this group can make a recommendation about it.

The group discussed that no-binding regulations is also the case for some regional organizations such as the WECAFC and given the fact that this organization is currently going through a transformation process, it is unlikely that they adopt a binding measure. If a party is exporting, it is its responsibility to comply with CITES requirements, including the collection of data.

They also analysed the need for conducting surveys and be able to estimate proper levels of extraction. However, surveys are usually costly and funding mechanisms need to be in place. Several countries already have allocated budgets for this research, other has created an industry fund, while other exclusively on direct participation of the industry. The group recognized that it is important that management authorities require independence and establishing protocols and funding mechanisms is a task that should be addressed in the short term.

Considering that the Queen conch fishery in the region has been usually working based on CITES decisions, which are short term actions in between COPS, for more permanent alternatives a CITES resolution will be needed; and in this process a system for data collection should be in place. At present, there is not time to consider a CITES Resolution for the upcoming 17th COP. Experts recalled that in fact, there is a big problem in data collection not just for export, but also for production which need to include national consumption and IUU fishing.

### **Updates from FAO/Fisheries and Aquaculture statistics (NFISS)**

Stefania Vannuccini, from FAO/FIAS, presented an updated summary of the QC production in the region, expressed in nominal catches, a concept of live weight retrievable. In practical terms, the data is the effectively landed amount plus a conversion factor. The FAO database the Strombid products are dominated by the QC, and they utilized three harmonized codes (0307.82 for live or fresh chilled, 0307.75 for frozen, and 0307.88 for other conch species).

These statistics are based on trade or processing plants, and probably underestimates true production, because not all countries inform their level of processing or have in place national (preferred to the regional ones) conversion factors. The data is presenting for 9 countries (Belize, Barbados, Bahamas, Mexico, Dominican Republic, Honduras, Martinique, Nicaragua and Antigua and Barbuda) that participated in the regional conversion factor project lead by Manuel Perez and presented at the second meeting QC Working Group in 2014. Since then, the database has been completed with information gathered from Anguilla, Antigua and Barbuda, Bahamas, Barbados, Bonaire, Saint Eustatius and Saba,

Belize, British Virgin Islands, Colombia, Cuba, Curaçao, Dominican Republic, Grenada, Guadeloupe, Honduras, Martinica, Mexico, Netherlands Antilles, Nicaragua, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent/Grenadines, Sint Maarten, Turks and Caicos Islands and United States Virgin Islands.

In summary, the data indicated that Nicaragua is the country with the highest production, followed by Mexico, Jamaica, Bahamas and Belize. However, experts noted that in general, it appears that there are anomalous trends (all countries resent similar variations) and indicated that perhaps the inclusion of the shell may lead to huge mistakes. For instance, in Jamaica the QC local consumption significantly increased, so they will close the fishery for one year to get better estimations. In other case, Bahamas reports are likely to represent only 30 percent since it is believed that around 70 percent is consumed locally. Given the complexity of this fishery, there are not comparable trade and production databases. Again, it urges to apply conversion factors for better data and understanding of real patterns.

In addition, it was noted that in the regional analysis of the conversion factors (dirty weight to live weight) three countries (Mexico, Belize, Barbados), out of the nine countries analysed, were clearly separated of the general trend identified for the other six.

In terms of attending the new QC working group recommendation to report without the conch shell, it would make difficult to compare with historical FAO data. However, experts discussed that shell weight in most cases cannot be measured, thus it is advice that for consistency, we need to focus of meat conversion factors and for now use one global value for the conch shell, thus reducing noise in the data. In this way, countries are invited to update their conversion factor to the processing degree in trade, that can be back-calculated to 100 percent dirty meat. A first approximation of an updated regional conversion factor may result from re-analyzing existing data, for a proposal should be presented by some of the experts in the meeting.

## **Processing grades**

Manuel Perez presented on processing grades in Queen conch. As background information he mentioned that the level of processing varies and depends on the marketing system and destination (export versus domestic market) or cultural preferences. Also, in some cases the animal is landed whole in the shell but usually the conch meat is extracted at sea (some processing at sea). Within the commercial sector specific terms are used to describe different processing grades. Each country has its own standardized processing grades, but usually varying from dirty (meat without shell) to 50, 65, 75, 85, 90 to 100 percent cleaned. The terminology used is not yet standardized throughout the region and within the seafood industry. Nominal weight, dirty and 100 percent clean are comparable in OSPESCA countries.

The expert presented a table showing the different processing grades and how the conch is reported in landings in many Caribbean countries. The table confirmed and showed there are different processing grades with different meaning in some cases, e.g. in Antigua and Barbuda what is reported as “dirty” meat is equivalent to 50 percent clean meat in other countries. The description of processing grades, therefore, should be clearly described.

As recommendations, Mr Perez indicated the need to report/update on how the Queen conch is landed and the current processing grades in the industry clearly described. At least, the most important grades and descriptions should be for nominal, dirty (without shell) and marketing grade (export or local). Also, all landings/export/local market units should be clearly defined as in many cases landings or exports are reported in meat weight but without any description of the processing grade. As final questions for discussion, he asked whether the standardization of processing grades terminology throughout the region is possible and whether is it worth considering that standard levels of processing could be defined in regulations and enforced.

## **Conversion factors**

Nelson Ehrhardt talked about the conversion factors, the yield estimations based on population densities, and from landings. Highlighted that conversion factors should be comparable among countries for more accurate and precise information. Thus, providing high quality data for reports and stock assessments. However, it is important to consider the species differences in morphometry.

He recognized the importance of determine exploitation reference points for annual quotas and adopt simultaneous conservation programmes. Considering that meat processing grades can be defined as chaotic, and that conch size varies in a non-linear relationship, it would be difficult to estimate mean values for conversion factors, and so available statistics are uncertain. With the shell inclusion, the uncertainty will certainly increase, because the shell volume can be added with growth (non-linear) but not necessarily to the cavity. In addition, micro or small predators that dead shells attract can affect the shells, especially in those area where they accumulate when left at sea.

The problem is to have good estimates of size frequency or maturity from pieces of meat landed, thus there is need to assess population densities, to assess the stock densities in each fishing ground, and in this way be able to transfer dirty conch to number of individuals. Stock assessment based on conch population density will be also informative of the mating success and allow for determination of reproduction success and recruitment to the fishing production. The inclusion of low and high densities needs to be integrated into the survey design, thus counteracting for the low data situation.

The elaboration of proper NDF (non-detriment findings) relies on the countries possibilities to conduct their fishery independent analysis, accounting for those cases when fishing effort is targeting conch aggregations. In addition, they need to improve their landings reports. Thus, definition and improvement in conversion factors is crucial.

Shell weight estimations is difficult to be properly calculated, so it is good to have an overall conversion factor for the shell estimate, but this factor should integrate conch variations in size.

## **The case of the QC conversion factors and fisheries in Belize**

Mauro Gongora presented the evolution of the QC fisheries management in Belize. Mentioned the report landings at 85 percent clean as has specifically defined in the conch regulations. However, this 85 percent clean is a processing degree not included in the regional conversion factors recommendations. Belize has calculated they national conversion factor in 2014 (7.1 to live weight) with 400 sample size.

In response to the CITES recommendation to include the conversion factors their certificates, would demand the impression of new certificates in 2019, using new serial numbers. They will not include the shell weight as agreed in the last Panama meeting.

However, it is important to remember that the dirty meat recommendation is not in the documentation to be presented at the upcoming CITES COP, and maybe it would not be ready either for the WECAFC COP. To move forward and fast, a consultancy from this group can be developed to attend the issue of additional conversion factors. In this work, the situation of having three countries deviating from the mean can be also analysed. Thus, a proposal for further work based on re-analysis of existing data was agreed.

## **The case of the QC conversion factors and fisheries in Jamaica**

Stephen Smikle from Jamaica presented that their national QC fishery management plan stipulates the development of surveys every three years to estimate the size of the conch population on the Pedro Bank, and from this the standing exploitable biomass, and the National Total Allowable Catch (NTAC), based on a decision rule.

These surveys have been conducted since 1995, when five processing grades were stipulated. They sample in three depth zones and a total of 81 stations. Areas up to 40 ft are mostly fished by artisanal fishers, while from 60 ft and beyond 100 ft are preferred by industrial ones.

From the 2018 survey it was found that the mean exploitable biomass was on average 9 276.787 tonnes, a drastic decline from the 28 020.007 tonnes estimated in 2015 (the highest density in 20 years). It was also found that there were many more areas on the Pedro Bank where were no conch found or that density was lower than the minimum limit of 100 ind/ha established by the international scientific community as required for conch to reproduce sustainably.

Given these observations it is highly likely that the true mean exploitable biomass is closer to the lower confidence level of 3 561.079 tonnes. As such the risk is extremely high that any continued commercial fishing for conch on the Pedro Bank will result in the collapse of the fishery. This Division has explored three policy options and recommended closed the fishery for 1–2 years as the best option available. Several recommendations were also made, including the conduction of partial surveys to determine the soonest possible time for reopening of the QC fishery.

The distribution of the density was the reason for recommending the closure of the fishery, few sites with high density (spawning aggregation) and low values in most places. They were worry about recruitment failure because fishing is taken place in discrete areas, looking at reduce time and area coverage.

The 2018 survey also showed changes in the conch size, when they observed that after maturity, the shell in Pedro Bank was thick and the meat smaller. The adult conch and late juveniles exhibit porous and thick shells, thus, additional monitoring to study this situation is envisioned to see what is going on the conch population. For instance, they are looking at recovery conch density up to 150 ind/ha, conduct more work on spawning aggregation, and thinking in permanent areas for closure, especially those with high juvenile density.

Currently, their conch is exported at the 50 percent clean, but little variations are seen in domestic consumption. Imbedded in the legislation is the 50 percent for establish QC quotas, thus maybe difficult to change this grade. The values for conversion factors have not been updated, and a plan to update the information for the conversion factors is being developed. Since 2011, 500 tonnes of conch fillets are set for export (99 percent to European Union), but the local consumption is on the rising and unfortunately, they do not have this data. So, they are considering increasing the 20 tonnes allocated for national consumption, perhaps up to 100 tonnes.

Additional research is needed to determine the impacts from hurricanes on juvenile, believed to be a serious problem, four hurricanes crossed Pedro bank from 2004 to 2006. The group mentioned how in Florida, this recovery maybe takes two years.

### **The case of the QC conversion factors and fisheries in Nicaragua**

Renaldy Barnuty presented the information on Nicaragua QC conversion factors. He mentioned they have four processing grades (100 percent dirty, 50 percent clean, 98 percent clean and 100 percent clean). They also trade trimmings and operculum resulting from QC processing, and some shells.

In Nicaragua there are seven conversion factors obtained from data collected in 2005 and 2006. In addition, in 2007, they participated in the FAO regional project to estimate conversion factors that include the nominal weight.

Conch fishery begin to increase since 2005, to maximum of 9.9 million of ton (nominal weight) in 2017. High production values have been stable in the past five years, probably because of the expansion of fishing areas granted to Nicaragua by the International Court of Justice. They also conduct QC surveys to estimate the resource abundance.

It is believed that around 20 percent of landed QC is not registered in the total catch, with another 5 percent for family consumption, and 12 percent in local trade. In the new law 489/ 2005 clearly defined that the *Instituto Nicaragüense de Pesca y la Acuicultura* (INPESCA) is the fishing authority and so they will establish conch regulations. They declared a four-month closed season (1 June to 30 September), a minimum size of 200 mm total shell length, and 9.5 mm of lip thickness. Conch export quota has been set at 1 500 000 pounds 100 percent clean meat since 2012.

### **The case of the QC conversion factors and fisheries in Bahamas**

Paul Medley informed about the big concern in the QC fishery there, and so currently, they are revising their harvest strategy, but need to confront the incomplete database on landings (this does not include local consumption). Severe decline in CPUE have been experienced since 2012.

From 20 years of visual surveys (Stoner *et al.* 2018), it is clear that:

- mature density negatively correlated with fishing pressure index (FP);
- mean shell length no correlates with FP;
- mean lip-thickness negatively correlated with FP;
- densities declined significantly over 22 years in a large no-take fishery reserve;
- juveniles rather than mature conch declined in no-take area, with little or no recruitment; and
- in main fishing grounds, densities of adult conch are now below that needed for successful mating and reproduction.

QC populations in Bahamas have undergone serial depletion, and so a wide range of recommendations are being proposed aimed at stock recovery including a broader network of no-take reserves, the landing of the shell, 13 mm lip thickness, the ban of scuba and hookah, a quota for recreational fishing (6 conch/ vessel) and ending exports in 2021.

### **The case of the QC conversion factors and fisheries in Turks and Caicos Islands (TCI)**

Paul Medley also presented the case for TCI, an area biogeographically part of Bahamas, but separated and much smaller area (6 500 km<sup>2</sup> vs 136 000 km<sup>2</sup> <10 m deep), and surprisingly with similar landings 2 500 tonnes in TCI versus 2 696 tonnes in Bahamas (mentioned this make no sense). Local consumption there also appears to be increasing.

TCI differs from Bahamas because compressed air not allowed, has a closed season, have landings data from 1901 to 2019, with all exports recorded, and partial local consumption, two surveys bank-wide in 2000 and 2015, with sporadic biological sampling at landing sites. In general, fishery dependent information in TCI good, but fishery independent information poor.

Two depletion/recovery, one in 1985 due to gear improvements, followed by recovery due to fishers going to Freeport for construction work. The second in 2012 due to increase in CPUE, followed by rapid decline. To counterbalance, they reduced by 50 percent export quota and returned to “normal” levels CPUE again. Reasons for the 2009–2012 decline in CPUE remains unknown, but not reflected in landings data, but perhaps due to hurricane Hanna/Ike 2008, increase in IUU fishing, increase local consumption, more research is needed for better understanding.

For stock assessment, a new version of production model JABA was utilized in an attempt to estimate unrecorded mortality, change in catchability, random effect on the population size. “Serial depletion” is not evident in TCI Bank, which seems relatively very productive compared to the rest of Bahamas.

The group commented about the role in reduction of conch predators can be playing in the conch recovery, that can influence why the model is lacking ability to predict abundance trends. They recall the need to be careful when using models, and so considered that catch should be dirty meat, that conch sizes are needed to determine better production data, and that reproduction needs to be successful.

### **Summary of Glover’s Reef conch fishery**

Alexander Tewfik (coauthors Elizabeth Babcock, Janet Gibson and Richard Appeldoorn) presented the general conclusion of long-term analysis, and mentioned how shell length (SL), currently used to limit individual harvest in Belize is not a good proxy for determining maturity, as SL growth ceases before an individual conch is mature. This research and others have found that lip thickness is the best proxy for maturity. Thus, there is a need to refine the size limits (i.e. size at first capture) for conch in Belize.

Ongoing efforts at regional harmonization of conch management have considered switching to a shell lip thickness minimum, because a lip thickness-based limit would be more likely to protect spawners, and our research supports this concept. It should be noted that minimum conch meat mass does not constitute a reliable indicator of individual maturity, and the use of lip-based regulations will remain problematic where shells are not landed, like Belize. Landing conch in the shell will mean that fewer conch can be transported from fishing grounds and fishers will need a higher price to offset decreased yields. Nevertheless, such measures should be considered.

The protection of juvenile conch would allow increased recruitment of mature animals (i.e. higher age at first capture) to the fishery and spawning stock, supporting the reproductive success of the population, if combined with sustainable levels of fishing effort. The continued use of a shell length minimum may lead to recruitment and growth overfishing over time, diminish the economic yield from the fishery and negatively impact thousands of Belizeans dependent on conch resources.

In further support of a switch to lip-thickness limits, we observed a significant decrease in SL of adults and sub-adults ( $LT \geq 1\text{mm}$ ) in two habitats (PR – patch reefs, SF – sand flats) and both management zones (RZ – replenishment, GUZ – general use) over a 15-year period. These observations were made using the full range of fisheries-independent data collected within SF and PR habitats (2004–2018), where conch in PR were consistently larger than PR vs. SF), may also affect reproduction, the conch fishery at Glover’s Atoll may have selectively removed larger SL animals due to the SL based size limit, thus truncating the SL size distribution of non-juveniles.

The predominance of small phenotype adults in populations, which also display low mating frequencies, has previously been associated to selective fishing pressure compounding the density effect on reproduction. Future research in Belize should include movement dynamics of conch in relation to replenishment zone size and spillover as well as the importance of deep-water conch to shallow water recruitment, which is thought to be limited.

The group highlighted the importance of having independent data and discussed the potential reasons for this declining, recommending further studies on conch fecundity, in fishing and not-fishing zones, and additional information of the deep-water population with poor data. In other areas, such as Florida, research have concluded that local recruitment prevails over long-distance connections; and in Jamaica, highly variable conch recruitment despite fairly stable fishing patterns. Therefore, reproduction success patterns and connectivity of larval dispersal effects across the region needs better attention.

## Group discussion on minimum data collection

The group of experts, led by Paul Medley, analysed the minimum requirements for fisheries managers to meet their obligations, with the following recommendations:

- Fishery-dependent reporting is for scientific and statistics purposes; thus, it is of the highest relevance to have conversion factors allowing for population trends analysis.
- All countries should know what the conch catch and efforts are the minimum required estimations. If local consumption is significant, surveys need to be conducted regularly to improve the catch information, and if possible, its changes with time. Countries should have their own conversion factors in place.
- A system for registry and licensing fishers should be in place for submission of the data.
- At least one index of abundance needed to determine the sustainability of the fishery or alternative to demonstrate mechanisms in place to promote it. The production performance indicators are dynamic.
- Improvement of the traceability system for QC fishery. Traceability is relevant for food safety and to counteract IUU fishing. For instance, Jamaica has one in place for several years now for the European Union markets, and in Belize one shall soon be implemented. Other examples can be seen in Nicaragua in the spiny lobster fishery or the one in Costa Rica one for fish fishery. OSPESCA is developing one for spiny lobster, but still need additional funds and coordination for its implementation. The problem with traceability based on soft money, is that the system collapse once project ended.
- Traceability standardization can heavily increase the cost, thus in the next CITES COP aspects for adaptation of basic definition for standardization will be considered, including lessons from case studies. The use of VMS systems information would help to improve traceability. Additional data can be obtained from processing plants, or vessel registries, but data from artisanal fishing become challenging.
- Reporting from restaurants in Belize proved not as successful as expected for traceability, but probably effective to estimate local consumption. Data on artisanal fisheries demand commitments, and what countries lack.
- Industrial vessels should have a mandatory catch certificates, based on log books and fisheries estimations. Digital reporting is not easy to manage, sophisticate and lots of data to analyse.
- A subregional training workshop looking at harmonize protocols for surveys and further data analysis for determination of catch quotas should be pursued. This kind of event may overcome political limitations and facilitate identification of potential resources that can be shared.
- Surveys can provide a lot more additional information for fisheries management, supporting data environmental data, including the support for genetic and reproduction movements.
- Pearls trade is difficult to trace and understand, thus poor data is available.
- Experts recognized the need to address other aspects different than the biological aspects, but for now are attending the QC working group recommendations.

## Phenotypic and Genomic variation of the Queen Conch (*Lobatus gigas*) in Puerto Rico

Diana Beltrán presented the research that quantified genetic variability in populations of the QC throughout Puerto Rico and evaluated if the presence of the four morpho-types identified by commercial fishermen represented differences in populations, and so deserve independent resource management. 757 specimens were collected across 11 sampling sites. For each specimen, morphometric measurement and tissue samples for genomic analysis were gathered. The genomic data analysed DNA fragments (over 10k SNPs) from 279 individuals.

Their data indicated that at least one of the morphs (“flin”) is substantially different than the others, differences were found in lip thickness and shell length and in its genetic composition. At small scale (only Puerto Rico), the mixture of the populations was seen across the geography range.

This is the first study in reporting genetic differentiation among QC morphotypes. The “flin” phenotype seems to be not only found in Puerto Rico, but also related to the Samba morph in Bahamas, Mexico and Cuba. We suggest a follow up study across the wider Caribbean region for revealing and better understanding the genetic differentiation across the region. In addition, the degree of differentiation between the “flin” morph and the so-called samba conch needs to be addressed. To achieve these objectives, we will require a strong collaboration from scientists and resources managers to contribute with conch samples. The support of the University of Rhode Island for the genetic analysis is available, and so emerging enthusiastic networks can be built.

The group discussed how larval dispersal appears to be not that large as previously thought, and that connectivity among areas can be determined by new genetic technologies. In high connectivity sites proportion of genetic diversity is low and the plot of genetic distance vs geographic distance is a constant line, while on low connectivity situation this plot is a line, with the slope meaning the rate of lack of connectivity. In Jamaica, observations in Pedro, appears that some conch has different potential to become stoned (large), perhaps a function of sponges abundances (predation). However, the impact is not uniform across the local populations. Conch appears to have a great genetic plasticity.

### **Priority research agenda**

Yvette Diei Ouadi led a group identification of a research agenda the conch experts considered relevant. Among them were:

- Compile existing data and reanalysed for updated recommendation on conversion factors.
- Countries that are conducting surveys need to get together and generate guidelines documents, including sampling design and data analysis. It is important to address the entire dynamics of conch reproduction into the survey design.
- A questionnaire for collecting additional conch information, including local consumption, accounting for increase in tourism and populations would be necessary. FAO can contribute with its experiences on determination about parameters should be factored, reduction in exports, or alternative rebuilding stocks measures. The growth in human population and tourism dynamics need to be better understood.
- Need a compendium of those areas in the region where still more quantitative analysis and better understanding of stocks assessments is needed. It is important, to be sure the minimum points are being considered.
- Studies on conch spawning and spawning aggregation to assist the harmonization of management measure, such as close seasons. This can be extended to improve understand the impact of water temperature change.
- Need for more conch genetics identifying populations including eco-toxicology and their effects on meta-populations. Plastics is a growing concern.
- Psychological research link to compliance of regulation, the increase of stakeholders participation in management are both an innovative topic to determine. Some countries are successfully implemented such techniques.
- Studies on economic and fair-trade topics are also needed. Increase in a perceived value of the conch products and added value products would complement this kind of research.
- Selected countries may need help in term in making a NDF and in understanding questions being asked in proposed regional formats. Very often different national CITES authorities. Useful tide to CITES animal committee with the issues of NDF and the working group.
- Linkages to intercommunicate with other working sub-groups stated in the regional plan.
- Enforcement needs to be in place and find mechanisms to effectively access ways to access funds, at national and international level. There is a need to discuss opportunities.

## NDF tables revision

Experts found that the 2014 proposed tables to provide guidelines on a simplify version to generate NDF were too comprehensive, and not much practical, and recommended the use of a flow diagram instead. If so, it would probably demand a different overall approach, and further work. In any case, it would be important to consider a harmonizing of population reference points (i.e.: density or MSY among others).

Additional comments were received regarding the following aspects:

### A. General considerations

- It is important to evaluate data quality and availability for the jurisdiction, thus facilitating the scientific authority assessment.
- Degree on dependence on spawning stocks and larval recruitment either to or from the fishery being examined.
- Access to all forms of fishing mortality including estimation on domestic consumption or international poaching.

### B. Biological characteristics

- Follow recommendations on minimum population density made by experts in the region, to reduce risks of resource overfishing. Estimations should be done in a proper manner.

### C. National status

- Distribution, size/age structure needs to be considered across all viable habitats, which may include current fishing grounds, former fishing grounds, nursery grounds, and spawning grounds. This is critical to correctly evaluate the density threshold, areas that require protection from fishing, correct closed season and the portion of the population under protection in MPA no-take areas.
- The socio-economic impacts need to be considered in a way that protects the needs of local household consumption and tourism and the potential for export and foreign earnings.

### D. Queen conch management plans

- Evaluation of measures focused in protection of juvenile conch, secure spawning individuals, and establishment of no-take zones to enhance larval recruitment and promote spillover.
- Robust mechanisms to counteract IUU fishing and compliance with management regulations.
- Application of an adaptive approach to set indicators for determining population status.

### E. Queen conch fishing

- Total catches must be detailed by processing grade and harvest areas and reasonable estimates of domestic consumption and illegal harvest must be available. Total export quotas must not exceed the total sustainable catch minus both domestic consumption and illegal harvest.
- Harvest control rules are important for population stability, and so needs to be clearly identified.

### F. Monitoring

- Underwater stratified surveys need to be in place and should include nursery and spawning areas.
- Monitoring of proper fishing-dependent parameters are also needed.

## G. Trade data

- Trans-shipments and reprocessing of QC products must be carefully accounted for. The fully standardized and transparent nature of conversion factors is a critical component. A robust traceability system will also support the elimination of illegal trade or exceeding of documented sustainable extractions.

## H. Aquaculture

- A robust traceability system will be an absolute requirement is significant aquaculture production for conch were to be established to eliminate illegal and unregulated trade.

## Protocol

## Conclusions

1. FAO has been working in standardizing the conch production reported data by countries with the use of national and regional conversion factors, to achieve an estimation of a comparable historical data and be able to determine indices of abundances. However, proper conversion factors are difficult to estimate, particularly when the shell weight is included, accounting for a very large proportion of the weight and exhibiting a very large variation through its distribution range. With the new working group recommendation of using a conversion factor to the total weight removed from the shell (i.e. dirty meat) new challenges emerged, not only because the shell weight is a measure that only few countries can conduct, given the fact mostly QC meat fillets are being landed; but also, because countries are may utilizing outdated parameters when their conversion factors to the so different meat processing degrees. For this reason, experts recommend that at minimum countries need to report their conch production allowing for back-calculating to the so-called “dirty weight” and from there to the nominal weight (with the shell weight). The second can be set as a global factor, resulting for re-analysis of existing data, according to statistically tested equality of conversion factors by country groupings and estimate average and standard deviations.
2. In particular, it is recommended that countries define: a) processing degrees in use or degree of cleaning and calculate the proper conversion factor; b) report all landings indicating equivalent units (i.e. x kg of 85 percent clean meat), c) develop a scale of the conversion factor from percentage tissue loss for each processing grade they trade; d) Determine the numbers of conch by unit of weight for each processing grade (weight frequencies can also be used), d) convert production (100 percent dirty meat) to nominal weight, if needed, for FAO statistics. Note that processing grade and conversion factors should be reported to CITES and FAO.
3. There is a need to identify the reason (cause) why in the regional analysis of the conversion factors (dirty weight to live weight) three countries (Mexico, Belize, Barbados), out of the nine countries analysed, were clearly separated of the general trend identified for the other six. In addition, it is necessary to have a complete and clear definition of the various processing grades currently employed of the conch meat by countries and utilized to generate the conversion factors. This will help better understanding of the harmonization process of conversion factors. Ideally, conversion factors should be developed for different processing grades and taking into consideration several criteria such as size, sex, season, and habitat among others. Countries that do not have national conversion factors should give priority to develop their own.
4. Countries should have a mandatory report of their conch production (harvest) and exports, where applicable. This can improve country data quality and introduce estimations of conch local consumption and IUU fishing levels, which appears to be changing with time. Note that harvest reports are different from exports reports.

5. There is need to develop multiple mechanisms to overcome country limitations in conducting conch density surveys in the region. Technical advice on survey design and potential for improve field work collaboration can be provided by the expert sub-group, allowing for harmonization and better understanding of the conch abundances trends.
6. Experts noted that guidance on the management of Queen conch in the context of CITES has been provided either in the form of recommendations by the Animals Committee in the Review of significant trade process or decisions adopted by the Conference of the Parties, both of which are time-bound and expire once implemented. The Experts are of the view that a Resolution on Queen conch under CITES would be helpful to ensure consistency of guidance over time and to make it easier for Parties to find such guidance. Noting that the document deadline for CITES CoP18 has passed, experts recommend starting the drafting of such a resolution under the auspices of WECAFC with a view to submit the resolution to CITES CoP19, scheduled for 2022. Experts recommend that FAO/WECAFC request the CITES Secretariat to inform Parties about this recommendation through an oral update at the upcoming 18th meeting of the Conference of the Parties. Experts further recommend seeking the CITES Animals Committee's view at its 31st meeting, scheduled for 2020, on possible elements of such a draft resolution.
7. To reduce risks and the impacts associated to uncertainty, fisheries managers often rely on surveys that allow the estimation of population densities as reference points (fishery-independent data), among other factors. Despite the relative slow movement of conch, spatial and temporal variations of the conch distribution and densities by depth or habitat strata are observed in long term monitoring. Therefore, experts recommend that countries need to identify long-term research strategies for conducting such density surveys.
8. As a management priority, countries should also need fishery-dependent data to be analysed to get information to develop a harvest strategy and closely monitor data quality (good estimations of total production) and fishery trends. Processing grades and conversion factors are critical for proper catch production estimations.
9. Two recent and long-term studies presented in the meeting are providing indications of a decline in shell size (Belize and Jamaica) which still poorly understood, thus offering an opportunity to develop further research addressing the potential causes, including for instance uncertainty in the reproduction success, impacts associated to intense and more frequent hurricanes, changes in water temperature, pollution, or fishing pressure among other topics.
10. Experts recognized that participation in international scientific and management meetings contribute for developing further collaborative efforts in training and research among countries given the transboundary nature of the Queen conch stocks, shared larval pools and connections in environmental characteristics. Additional collaboration is also needed, to promote that countries comply with international agreements signed, in particular, those addressing IUU fishing.
11. Responding to the QC working group recommendations, this expert sub-group is for now attending to the priority issues identified in the 3d regional QC working group meeting held in November 2018 in Panama related to the biology of conch populations and the effect of exploitation on the sustainability of the resource given data limitations and availability. Nevertheless, it is understood that other social and economic issues also need to be addressed. For this reason, the experts sub-group considers appropriate to invite additional experts to contribute in this area as the scope of discussions expands to data needs and methods required to address social and economic impacts and associated factors related to Queen conch governance at larger scale.
12. On data needs, the experts' subgroup agreed that, at minimum, more reliable data and information should be available, *inter alia*, total catch, an index of abundance (CPUE, densities), size/sex composition of the landings and fishing fleet composition. Vessel Monitoring Systems (VMS) in place, transparency and traceability were considered useful to assess reliability of the data generated.

13. The experts' subgroup agreed to evaluate the NDF forms with an extended time frame (until 10 May 2019) recognizing the complexity of the information is involved. Perhaps an additional online interaction would be needed to address this topic particularly in the case of poor-data quality cases.
14. A recent genetic study has indicated the determination of connectivity patterns in Queen conch using microsatellite-based techniques may still overestimate the degree of connectivity and that more accurate determinations will require the use of newer genetic techniques, such as use of Single Nucleotide Polymorphisms (SNPs). Unfortunately, such studies are relatively new and to date have been conducted only within Puerto Rico. With the potential collaboration of the University of Rhode Island, and scientists and fishery offices in the Caribbean region, a more comprehensive regional study could be conducted, thus ways and strategies for further collaboration are open for future agreements.
15. The group of experts recommended the following initial topics in the development of a research agenda to improve regional Queen conch fisheries management and conservation:
  - a) improve understanding of conversion factors by re-analyzing existing data;
  - b) develop guidelines for conch density survey protocols that could then be standardized across the region (with priority given to those countries already conducting surveys);
  - c) review available landings data (including landings for both export and local consumption) and determine minimum data needs for stock assessment using fishery-dependent data;
  - d) survey design(s) that could be used to estimate domestic conch consumption in the countries where it is important and worth to assess;
  - e) update and summarize information on conch population dynamics, including growth, mortality, habitat quality, and develop a conch population dynamics simulation model suitable for use in management strategy evaluations;
  - f) conduct specific research aimed to increase our understanding of spawning aggregations and reproduction success, including the effects of climate change;
  - g) determine the degree of conch population connectivity by using proper genetic techniques,
  - h) identify mechanisms (social, cultural, behavioral) that can be used to increase stakeholder buy-in and support for the three pillars embedded in the regional plan (Technical and Statistics, Education and Outreach and Governance);
  - i) strengthen the preparation of Queen conch NDFs;
  - j) identification of potential mechanisms for improvement of the regulation's enforcement strategies and assessment of countries capabilities needed for conch stock recovery; and
  - k) increase knowledge and understanding of the Queen conch value chain, in particular, on conch added-value products (e.g. by-products of conch meat processing and the use of the shells), to be able to track its trade.
16. As future first steps (next couple of weeks), proposals on how to develop points a) and b) from the priority research list above will be presented to the group coordinator. In addition, this advisory group would work in identifying potential opportunities to address the remaining topics. A suggested viable funding strategy would be to have project proposals presented by FAO/WECAFC to the GEF or other sources of funding.
17. The group of experts agreed to be identified as the Scientific, Statistical and Technical Advisory Group. It was also agreed to expand its composition and participation depending on issues and subjects to be addressed. A probable participation of up to 20 people (including permanent and temporal) to mainstream a diversity of expertise to better advise on additional biological, social and economic issues was discussed. It was also agreed the participation of a limited number of observers. Recognizing the restricted funds available, it was also agreed that most communication will continue with the same participants in this Miami meeting using online communication tools, but that a second face-to-face meeting, of up to ten people, would be necessary. It was recognized that the experts in this group participate on a personal voluntary basis, and that they do not represent any country or institution. The official language will

mostly be English, but other languages can be used as required. FAO/WECAFC was asked to provide examples of other groups rules and procedures in the region which can guide the further development of this group.

IUU fishing contribution with technical recommendations, i.e. genetics, distribution, etc. governance of IUU fishing can b look at and made some recommendations.

WG made recommendations on IUU. Exchange information, registry. The subgroup needs to agree on the additional tasks.

MP generate a draft protocol for discussion.

## APPENDIX D

### Report of the second workshop of the Scientific, Statistical and Technical Advisory Group (QC/SSTAG)

25–26 November 2019, Hotel Aloft, Miami, Florida

#### 1. Introduction

This document constitutes the final report of the second workshop of the Queen conch Statistical, Scientific and Technical Advisory Group (QC/SSTAG) created in response to the implementation of the QC Regional Fisheries and Conservation Management Plan as agreed in the third meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen conch (QC).

The QC/SSTAG first met in Miami, 23–24 April 2019, thanks to the financial support received from the Caribbean Fisheries Management Council (CFMC) and FAO/WECAFC (80 percent and 20 percent, respectively), and it is being coordinated by Martha Prada. Around 10 experts were initially appointed by the QC Working Group, but accordingly with their internal protocol, its composition is flexible enough to accommodate additional experts depending on the tasked objectives. Recommendations from its first meeting were presented at the WECAF 17 session of the commission, held in Miami 15–18 July 2019.

The second QC/SSTAG workshop took place also in Miami, 25–26 November 2019 and had a similar financial than the first one. This workshop allowed for active discussions and analysis to attend the objectives received from the QC Working Group, as follows:

- a) improve scientific guidance on regional conversion factors;
- b) provide initial considerations about the basic information needed for generation of Queen conch NDF determination; and
- c) identify priority research at the regional level.

In this way the workshop agenda (Annex 1) promoted discussions (Annex 2) and generated specific recommendations needed to facilitate the implementation of actions contemplated in the QC Regional Fisheries and Conservation Plan.

While face to face meetings of experts can be and are complemented with online communications, it is recognized that there is a need for securing additional funding, not only to maintain the group actively working, but also to develop supporting advice on other management actions and to conduct the priority research being identified.

#### Workshop participants

The second QC/SSTAG convened a total of 12 experts, with three of them participating using online communication (Figure 1).

No.	Name	Last name	Country	Organization
1	Maren	Headley	Barbados	CRFM
2	Alex	Tewfik	Belize	Consultant
3	Mauro	Gongora	Belize	Fisheries Department
4	Monica	Barone	Italy	FAO- FIAS
5*	Manuel	Perez	Nicaragua	OSPESCA
6	Richard	Appeldoorn	Puerto Rico	Consultant
7*	Martha	Prada	Puerto Rico	CFMC-coordinator
8	Natalia	Perdomo	Puerto Rico	CFMC-logistical support
9*	Daniel	Kachelriess	Switzerland	CITES
10	Nelson	Ehrhardt	United States of America-Miami	Consultant
11	Elizabeth	Babcock	United States of America-Miami	University of Miami
12	Manoj	Shivlanim	United States of America-Miami	Consultant
13	Diana	Beltran	United States of America-Rhode Island	Genetic researcher

\* = Online participation

FIGURE 1  
Participants of the second meeting the QC/SSTAG held in Miami,  
25–26 November 2019



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### Updates from WECAFC 17 and CFMC 10th regular meeting (Martha Prada)

After welcoming participants, Martha Prada communicated to the group that recommendations generated during this second expert encounter will be presented at the fourth meeting of the QC Working Group, to be held in San Juan, 15–16 December 2019, and so encourage the group to engage in fruitful discussions and generate specific technical recommendations.

She reported that the main four recommendations on conversion factors (CF) generated during the first meeting of the QC/SSTAG were presented at the WECAFC 17 meeting, which took place 15–18 July 2019, in Miami. Those recommendations tackled the need for better country reports on their annual landings using proper CF that would allow back calculations of the animal weight, without the shell (dirty meat), for the various processing states, and the description of how they define as each processing grade used in trade. In addition, data reported also need to be presented in a way that the number of individuals harvested can be determined, to support stock assessments.

During this meeting, the Commission also recommended that the QC/SSTAG address complementarily issues in the Queen conch fisheries, such as impacts from climate change, studies on the marine pollution, and inclusion of more information on socio-economic aspects, all consistent with an ecosystem approach to fisheries.

The work done by the QC/SSTAG was also presented at the 166th regular CFMC meeting, held in St. Croix, 20–21 August 2019. Council members did not have any additional comments.

### **Updates from CITES CoP18 decisions on Queen Conch and some other relevant developments (Daniel Kachelriess)**

The group was informed that the CITES CoP18 (Geneva, 17–28 August 2019) adopted a new set of decisions on Queen Conch, that took into account the revisions made by the QC/SSTAG at its first meeting as presented by Mauro Gongora. These are decisions 18.275-18.280 and can be found in the CITES web page (<https://cites.org/eng/dec/index.php/42100>).

The decisions included an instruction to the CITES Secretariat to continue its collaboration with FAO and the members of the QCWG, including, subject to external funding, support to range States in implementing the Regional Queen conch Management Plan, in particular making non-detriment findings (NDF), and provide assistance to range States on relevant enforcement issues.

CITES CoP18 also agreed on a broad work programme on Non-detriment findings that one or several workshops to improve guidance on NDFs will be organized between CoP18 and Cop19.

The QC/SSTAG should discuss whether or not to recommend to the QCWG the development of a resolution under CITES on Queen conch.

### **Improving understanding of Queen conch conversion factors by reanalyzing existing data (Nelson Ehrhardt and Manuel Perez)**

Regarding Queen conch conversion factors from clean meat landing categories, in 2019 CFMC funded a consultancy aimed to: a) statistically review existing data used in CF estimations for live weight and assess adequacy of the data for estimating new CF (“dirty” meat weight from different processing grades use in trade); b) examine the effects of “dirty weight” on percent clean meat weights to elucidate the statistical validity of using such data under potential QC morphometric effects; c) to provide new CF to “dirty weight” from various percentage processing weights reported by the countries; and d) to estimate a regional average CF for the purpose of reconstructing FAO fishery statistics from average “dirty” weight statistics to live weight (i.e. dirty weight + shell weight). The QC/SSTAG noted the final report submitted by the consultants (Nelson Ehrhardt and Manuel Perez) and accepted the results presented and discussed at this meeting.

Covariance and regression comparisons analysed phenotype (morphometric measures) between various processing levels (i.e. 50 percent clean meat, 85 percent clean meat, 100 percent clean meat) and dirty weight, as well as live weight (animal with the shell) and dirty weight. Variations in the slope of this relationship characterized differences in morphometric growth, while differences in the intercept portrayed the degree of weight reduction due to processing.

CF were then estimated taking into consideration these regressions of the different percentage clean meat and the average dirty meat category, as follows:

50% clean to dirty weight		CF 95% Confidence interval	
Country	Average CF	Lower	Upper
Bahamas	2.05	1.78	2.43
Dominican Republic	1.69	N.A.	N.A.
Martinique	1.53	1.33	1.80
Nicaragua	1.86	1.78	1.96

85% clean to dirty weight		CF 95% Confidence interval	
Country	Average CF	Lower	Upper
Barbados	1.86	1.42	2.69
Dominican Republic	2.11	N.A.	N.A.
Honduras	2.41	2.17	2.73

100% clean to dirty weight		CF 95% Confidence interval	
Country	Average CF	Lower	Upper
Bahamas	2.76	2.37	3.30
Dominican Republic	3.19	N.A.	N.A.
Honduras	2.73	2.46	3.05
Martinique	2.66	2.30	3.15
Nicaragua	3.06	2.84	3.31

Dirty weight to whole weight		CF 95% Confidence interval	
Country	Average CF	Lower	Upper
Bahamas	3.06	2.84	3.31
Dominican Republic	3.89	Samples with sub-adults only	
Honduras	2.76	2.37	3.30
Nicaragua	2.73	2.46	3.05
Average	5.36	4.69	6.26

The ANCOVA results showed that stocks in Nicaragua, Honduras, Bahamas, Barbados, and Martinique have statistically similar slopes, implying that linear regressions fitted to dirty weight on shell weight are parallel lines. To the contrary, the large dispersion of dirty weight about regression on live weight generated a low degree of association between the variables, which is indicative that Queen conch shell weight is not a good predictor of flesh weight. Therefore, differences in dirty weight-to-whole weight suggest an average regional CF at the live weight level may be lacking precision regarding reconstruction of total catch in live weight for FAO landing statistical purposes. In depth results from this work can be obtained from the CFMC and FAO/WECAFC Secretariat. For the purposes of CITES tracking of harvest in the context of export permits and associated country quotas for long-term sustainability, CF from dirty (uncleaned, soft tissue) to the most common processed forms of conch meats (i.e. 65, 85, 100 percent clean) are the most important. Such conversions are also useful to associate total abundance and biomass from surveys to the recommended 8 percent, or less, harvest levels. Finally, CF may also be useful in determining whether mean meat weights used in various production models are reasonable.

Data from two important QC producing countries, Mexico and Belize, were not validated, and thus not utilized in the analysis. For that, Alex Tewfik mentioned that in a recent research project conducted on Glovers Reef, Belize, information for around 500 individuals could be used for this analysis, and so he offered to help in getting access to this dataset. In addition, Mauro Gongora, from Belize Fisheries Department, mentioned they will have additional data collected in 2019, that can be also utilized for this purpose. On the other hand, data received from the Dominican Republic, contained only small individuals (juveniles), and the sample size was also small, thus while illustrative, it was recommended that to be comparable with other countries, larger individuals need to be collected. It was not possible to have access to raw data collected from Antigua and Barbuda.

The group discussed that variability in CF is going to be related to the sample size, size range, and sex information and the habitat where the animal was collected, data that is not regularly collected when taking field information. They mentioned also the limitations resulting from collecting data from one or two locations versus from several places, which can better characterize a country's variability. To the contrary, available data contained very little information on the locations from where samples were collected. In cases where data came from pre-processed conchs (usually in the industrial fishery) the possibility to introduce noise in the statistical analysis is higher.

#### **QC/SSTAG recommendations:**

1. The new CF for estimating dirty weight from percentage clean meat categories must be reported by countries using CF estimated at country level, and it is recommended that countries use this new CF to report landings data as dirty weight. It is also recommended that countries use the specific CF value or the average for countries that do not have this CF.
2. It is recommended that countries that still do not have CF take the appropriate data and submitted these to the QC/SSTAG for the evaluation of the methodology and for the CF estimation.
3. CF should be re-assessed periodically. An elapsed time between 4 to 5 years is recommended between CF re-assessments, giving attention to fishery expansions that may increase rapidly and effecting the size structures in the stocks. Such data collections could also be useful in providing samples for additional studies, such as genetic connectivity or the use of depletion models based on shell weights.
4. Sample sizes for CF estimation should be between 300 and 400 individuals. Samples should contain the whole range of sizes observed in the areas fished, or at least observed in the landings. Additional information on location is needed, and information on sex and habitat information will be useful. Technical guidance for collecting data on CF can be included in the updating of the existing manual for Queen conch surveys.

#### **Conclusion and recommendations to the QC Working Group. FAO perspectives and additional support. Recommendations for the QC Working Group (Monica Barone)**

From FAO's perspective, it is essential to have QC landings data expressed on live weight to allow comparison among/within countries and obtain consistent studies on national and regional trends. When submitting annual landings to FAO, countries and territories are being requested to report as soon as possible complete with their processing grade(s) or provide the whole historical data series on Queen conch catch in live weight according either to their national or the regionally agreed conversion factors.

In this sense, there is a need to determine how to revise the FAO Statistics once new recommended CF are applied, and how to reduce uncertainty of terminology, and methodologies of processing grades, given the country variability or lack of information either on CF and the processing grade utilized.

The new CF from dirty weight to live weight, implies that currently each country needs to solve the conversion from different processing grades to dirty weight. The average/regional CF (5.36) is currently estimated and available only for the CF from dirty weight to live weight. Moreover, there is more interest, in view to obtain a stand and evaluation of the catch for stock assessment purposes, to promote the CF estimated at National level.

She reported on the main implications on the FAO statistics in the application of the new CF. She presented the list of countries who reported official capture production data to FAO, divided in three groups, depending on the status/declaration of the CF: Countries declaring both the processing grade and the National CF, which were 12 for 2017 statistics, accounting for the 66 percent of the total reported capture production of QC; Countries declaring processing grade and applying the regionally agreed CF. In 2017, the nine countries being part of this group accounted for 26 percent of the total reported capture production of QC. The third group of countries is represented by nine countries not declaring neither CF nor processing grades, and accounting for 8 percent of the total capture production of QC reported to FAO. FAO is transparent in reporting data and CF applied is made available as metadata in the FishStatJ software.

There is a need to determine how to revise the FAO Statistics once new recommended CF are applied, and how to reduce uncertainty of terminology, and methodologies of processing grades, given the country variability or lack of information either on CF or the processing grade utilized.

In addition to all the difficulties mentioned in existing FAO database, Alex Tewfik mentioned that this information also contains huge gaps, because countries are not reporting local conch consumption, which for some countries can be as high as 60 percent of the total landings. This is a critical issue that need to be addressed.

Monica Barone also talked about the need for having indicators demonstrating the implementation of the QC regional plan of action, (e.g. percentage of countries declaring CF and detailed information on processing grade; countries having management measures in place for QG; etc.). Maren Hedley then mentioned that through the CMLE+ project and its Strategic Action Plan there are around four indicators in strategy 4B for enhance governance in the Queen conch fisheries that can be look at, and so shared a document containing this information with the group.

Another aspect to consider is that under CITES, Parties need to report on their annual international trade which is recorded in the CITES trade database. Within that database, there is no field allocated for the reporting of conversion factors and it is unlikely that such a field could be created easily, meaning that information on conversion factors submitted by CITES Parties in their annual reports would currently not be reflected. Reflecting on the goal to have comparable data between countries and databases, the group discussed that one solution may be to ask UNEP-WCMC, the service provider that maintains the CITES trade database, to apply the conversion factors reported by Parties to convert the trade data to a commonly agreed processing grade before entering the data into the trade database. Daniel Kachelriess confirmed that this would be a possibility and that there are precedents for such an instruction. Due to the fact that the definition of 100 percent clean Queen conch meat varies among the countries, the group discussed that a possible standard for CITES export transactions could be the dirty weight. This would require that Parties in their annual CITES trade report provide the relevant conversion factor for their exports to be converted from the various processing grades to dirty weight. In summary, the group discussed that countries should be requested to provide their CITES trade data on QC in dirty weight or provide conversion factors that allow calculation into dirty weight, and a CF to live weight (or using regional CF only from dirty to live weight). The group discussed that this type of instruction could be included in a QC resolution under CITES.

FIGURE 2  
Group picture of workshop on Queen conch population assessments  
workshop held in Belize, 2019



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#### QC/SSTAG Recommendations:

1. further investigate differences in the terminology of conversion factors across countries to validate the national and regional CF for the various processing grades, helping to understand and improve the quality of the FAO production and CITES trade databases; and
2. continue the discussion on CF and the need to use new standards (i.e. dirty meat weight), identifying which criteria would be applied in the future and the importance of countries in obtaining good national CF, in response to the species' variability in growth parameters and processing grades across its distribution.

#### Regional training workshop on Queen conch population assessment in the Caribbean (Elizabeth Babcock)

She presented results from the training on Queen conch population assessments workshop held in Belize 30 July–1 August 2019, with financial support of the WECAFC Secretariat. Representatives from countries conducting surveys were invited, including Jamaica, Nicaragua, Colombia, Bahamas, Honduras and Belize (Figure 2).

The workshop aimed to analyse field protocols for QC density surveys and how the data is used to determine nations' annual quotas. They discussed how to harmonize field and data analysis protocols, so that some recommendation can be applied across the Caribbean. In addition, they explored the potential use of fishery dependent data to develop regional indices of QC abundance and patterns so that existing data can be better integrated into estimation of total allowable catch (TAC) and NDF determinations.

Surveys vary in the depth of surveyed sites, the length of the transects, and other details considered in the survey design. In Jamaica (Pedro Bank) a standard stratified random design is used to estimate total biomass; the potential quota is then calculated with an 8 percent control rule, then reduced by precautionary rules to accommodate uncertainty. Belize captures mostly sub-adults in relative shallow waters; they conduct surveys to estimate total fishable biomass and apply an equilibrium production model method (assuming equilibrium and requiring an accurate estimate of natural mortality) to estimate maximum sustainable yield (MSY) which is used to set their annual quotas. In Nicaragua, the fishery is in deep water and the survey is done on the fishing grounds with a stratified random design. The survey is not the only source of information to determine their quota. In Colombia, the fishery is

small and artisanal, and they no longer export QC; however, the TAC is set based on a control rule. The Bahamas has a mostly shallow water fishery covering many fishing grounds over a large area and the survey samples different areas every year. Thus, the survey is not used to set quotas. In Honduras, the fishery is also comprised of adults in deep water, and surveys are not used to estimate export quotas, which are the same every year (not adjusted for the survey estimate of biomass).

The group concluded that standardizing methods in a short meeting was not achievable, and perhaps there is more opportunity for standardization in the way surveys are reported. For instance, countries should report the total area surveyed, and how the surveyed area was defined (e.g. conch spawning areas, regions of potential conch habitat, etc.) and when the survey is conducted with respect to reproductive seasons. Sample size tends to be small, so it is important to calculate the power and necessary sample size to calculate biomasses with the necessary precision to inform quotas. Some questions to consider in the sampling design were analysed, including changing in the protocols to be more effective when resources are limited.

The group discussed the use of both fishery-independent and fishery-dependent data for setting quotas. They noted that different countries may need to use different methods depending on, for example, how complete their catch data sets are, whether IUU fishing is a problem, and what kinds of data are available. Whatever methods are used to assess population status and set quotas; it is important that countries report the proportion of biomass that is harvested every year (i.e. harvest rate = catch/biomass) to make sure that the harvest rate is below the recommended 8 percent limit by the QC Working Group in 2012.

For setting quotas many data limited methods are available (more than 120 methods are available, for example in the DLM tools R library by Carruthers *et al.* 2018) and some of these may be viable for management of QC in some countries. These methods are powerful, but they have been designed for fish with different growth and some may not work for conch having 2-phase growth. The inclusion of the Allee effects would require extra work to be integrated into these models. Management strategy evaluations should be used to test these methods before applying them.

The use of non-equilibrium surplus production models fitted to time series of abundance is an alternative for assessment and setting quotas, which requires complete annual catch data along with an index of abundance. This may be viable in some countries, especially if information on life history and conch habitat were used to improve the estimates of the population growth rate ( $r$ ) and carrying capacity ( $K$ ) parameters. On the other hand, the length-based methods are not recommended for this species with 2-phase growth (use across the fishery, it would assume a low degree of habitat-based growth variability) except for those areas where sub-adults are targeted. Perhaps weight converted catch curves may be effective (See Valle and Ehrhardt QC manual).

In depth information on the Belize city meeting is available in the technical report along with additional tutorials and other documentation.

The group discussed whether stock assessments are necessary for making an NDF. It seems that if a sustainable fishery management plan is in place, this could be the basis for NDF. In this sense, less data intensive methods may also be sufficient for an NDF. Many assessment methods depend on adequate catch data, which may not be available given the large amount of IUU fishing for QC, and domestic use of QC in some countries. Statistical good design population surveys can be a sound basis for tracking abundance and setting quotas, even in the absence of adequate catch data, but they are expensive. There is a need to recover the cost of surveys from the fisheries. Indicator-based methods are useful because they start with current conditions and do not require historical data.

Given the uncertainty in whether QC occurring below fishing depths are a source of recruitment into the fisheries, there is a need to survey deep water areas in some countries.

Surveying in deeper areas is challenging, and available methods may vary within certain depth ranges. Using Nitrox, 30–40 m is still within the limits of diving, but it is not recommended to dive deeper than that. In deeper waters, ROVs may be needed, although video data may not be as accurate as diver counts. In shallow waters, millions of empty shells are left behind from the fisheries, and it may be difficult to differentiate shells from live conchs by using remote sensing technologies. This may be less of a problem in waters below fishing depths or in sandy habitats where within six months dead shells will probably be covered by sand, according to Richard Appeldoorn's experience in Puerto Rico. Live conch may also avoid areas with large amounts of empty shells at least temporarily.

Destruction of juvenile-habitat by deposition of empty shells in the search for Queen conch pearls is another phenomenon that needs to be considered. In Belize for instance, a significant number of empty legal size conch shells (sub-adults) are found in nursery grounds, although recruitment in the past 19 years is consistent.

### **QC/SSTAG recommendations**

1. Promote harmonization in reporting on the fraction harvested and conch population abundance indices from QC surveys, thus facilitating the determination of the national stock status.
2. Develop guidelines for conch density survey protocols that could then be standardized across the region (with priority given to those countries already conducting surveys), that include information on the habitat type, depth, size/age classes.
3. Filling data gaps including the identification of sink and source locations, spawning grounds, and a genetic study to determine connectivity, and traceability should be a priority.
4. Evaluating the presence and reliability of existing data by country. Perhaps a proposal, at the subregional level, can be developed. FishPath ([fishpath.org](http://fishpath.org)) is a useful tool for evaluating data availability, capacity and fishery characteristics to determine which assessment and management strategies are feasible.
5. Habitat and environmental conditions need to be considered in surveys and assessment. The distribution of density is important and may change with climate change. Providing maps that visualize spatial distributions of QC density across each nation's fishing grounds over time is important to understand changes in population dynamics and fisheries.
6. Private sector (industry) can generate transparent mechanisms for conducting QC surveys. In addition, collaboration with other sectors is essential for more efficient way to perform field work.

### **Proposed manual updates and strategies for improvement methods to estimate annual extraction quota. Ad hoc stock assessment expert group (Nelson Ehrhardt and Elizabeth Babcock)**

The available stock assessment manual developed by Ehrhardt and Valle in 2008 and published by CFMC needs to be updated to integrate all the new agreements and requirements, in fulfilling the objectives as CITES Appendix II listed species. The establishment of harvest quota needs to integrate the international trade (export) and the local consumption, and there is a need to consider that not all Caribbean countries and overseas territories are Parties to this Convention. CITES specify that Parties are responsible for the enforcement of the species regulations, and so they must determine the export quotas that are not detrimental to the species based on what they consider an appropriate sustainability criterion. In this framework, that is important to be able to provide technical support to countries in properly determining their annual quotas, based on minimum sustainability criteria, for instance, the 56 ind/ha in spawning grounds, which may vary depending on the habitat type. The review of significant trade is a process through which the CITES can review the national process and can also provide technical guidance to the Convention Parties.

Mauro Gongora mentioned that in Belize they use several indicators to determine how the conch population is performing, and they consider this adaptive management strategy based on past performance is functioning well. He mentioned that they are happy to adapt it with other criteria applicable sustainability criteria. The Group suggested a review of such indicators to seek validation and potential application of the Belize experience.

Estimation of conch density needs to be related to the extent of the fishing ground in the process of estimating the conch quota. There is a need to understand the real scale of population connectivity to determine the degree of local and regional dynamics. VMS data may provide interesting data to understand the extent and variations in fishing areas. Thematic habitat maps can help in understand these processes.

The group agreed that total annual quotas should be based on formally defined sustainability criteria, and recommend that such criteria be studied, assessed, and integrated to the non-detrimental catch estimation methods that should be included in the updated stock assessment manual. The QC Working Group already had adopted the recommendation of 100 individual conch per hectare on spawning grounds as a sustainability criterion. However, the update of this manual is a good opportunity to develop cost efficient guidance to countries facilitating implementation of better sustainability criteria in setting up their national and export quotas.

#### **QC/SSTAG recommendations:**

1. update methods in the existing Queen conch stock assessment manual and address issues related to the establishment of sustainability criteria when defining production and export quotas (i.e. adult density, 8 percent or less of exploitable standing biomass);
2. implement a stock assessment software that is as simple as possible to more effectively promote the use of the recommended methods; and
3. address online training regarding the stock assessment methods and quota estimation algorithms to reduce the cost of having broad participation of key fisheries officers across the Caribbean.

#### **Proposal for studies on QC genetic connectivity (Diana Beltrán)**

Diana Beltrán described the work done in Puerto Rico using genome wide variation across four Queen conch morphotypes identified by local fishermen. She found differences among morphotypes using Single-Nucleotide Polymorphism (SNP's) and test if phenotypic differences between conch morphs are associated with genomic variation. To better understand the quantitative differences among morphotypes, she measured lip thickness and shell length for each individual across 757 conchs. She found lip thickness differentiation among four morphotypes ( $p = 2e-16$ ;  $p < 0.05$ ). Similarly, shell length varied across morphotypes ( $p = 2e-16$ ;  $p < 0.05$ ), with the Flin phenotype being the smallest and most differentiated.

Flin individuals had significantly thinner lips and were the smallest (between 12–17 cm); their shell is thicker and heavier, less space between whorls, and they often have longer spines compared with the other three morphs. The Flin morphotype shares numerous characteristics with an identified phenotype in Mexico, Cuba, Turks and Caicos, and Bahamas called Samba. A few hypotheses related to the Samba phenotype include: 1) limited food, 2) habitat availability, or stressful conditions and 3) high fishing pressure.

To test if phenotypic and geographic variation is correlated with genetic segregation, Beltrán used genome wide variation using 21 861 SNPs across 277 individuals. She found genetic differentiation among morphotypes as inferred from multivariate analysis such as: 1) Principal component analysis (PCA); 2) Discriminant analysis of principal components (DAPC), 3) analysis of molecular variance (AMOVA) and 4) fixation indexes ( $F_{ST} = 0.001$ ;  $p = 0.001$ ). The SNPs data highlights the differentiation

between Flin and non-Flin morphotypes. Dr Beltrán's results were successful given the power of the test, which analysed large portions of the individual's DNA. Unfortunately, results cannot be compared at the regional basis, because this is the only genetic analysis done using this technique. All others include the use of microsatellite variants, which cannot be compared across studies.

To identify the conch genetic connectivity across the Caribbean, a new project needs to be developed, which shall offer the opportunity to:

- 1) quantify connectivity patterns for neutral and adaptive SNPs (variants) for each morph across the Caribbean. An opportunity to test for the first time if genomic variation is segregated across the Caribbean;
- 2) test if phenotypic differences between morphs are associated with genome wide variation by identifying alleles correlated with morph variation;
- 3) test if variation in latitude correlates with variation in allele frequencies to understand if some alleles might be moving northward to colder environments as seawater warms; and
- 4) test if genetic variation has changed in the last 200 000 years. Using these techniques, Dr Beltrán can estimate populations sizes through time and test if populations have contracted or expanded as a result of climatic variations associated with glacial cycles that have changed seawater temperatures and sea levels.

In addition to the main objectives, Dr Beltrán's genomic data will be publicly available and deposited at the NCBI and will provide the baseline data to design protocols to stablish the traceability of conchs from different Caribbean regions/islands to identify illegal trade.

To develop Dr Beltrán's project, she requires access to samples throughout the Caribbean, and from each location at least 10–15 adult individuals per morph will be needed. Conch shells will be collected along with tissue samples. Conchs will be measured morphologically, and tissue samples processed to generate genomic libraries.

To accomplish her work, Dr Beltrán has already secured some funding from the University of Rhode Island. URI will provide: a) Materials for tissue samples, preservation and storage, b) materials for DNA extraction (DNA extraction kits, plasticware and chemicals), c) use of laboratory equipment, library quality control through a tape-station, d) SNPs libraries or, whole genome low coverage genotyping (1x–2x), e) the cost for sequencing of ~ 500 conchs, along with bio-informatic computer and software, f) three months of salary for one laboratory technician to help Beltrán during library preparation, and g) one summer month of salary for a professional analyst to help Beltrán during data analysis. To match her funding from URI, she is requesting: 1) her salary as the principal investigator for 18 months, 2) a second month for a professional analyst and 3) the cost of collecting the samples. URI is open to explore additional collaboration with other partners in the region or elsewhere.

#### **QC/SSTAG recommendations:**

1. The QC Working Group identified the genomic work with connectivity of the different morphs across the Caribbean as an example of the scientific gaps relative to manage and protect QC populations and how they will be affected by climate change. The QC Working Group encouraged the development of a proposal to better estimate costs and needs.
2. The QC/SSTAG recommended that the genetic work first focus on locations in which commercial fisheries that export QC operate in common, particularly the areas fished by Colombia, Jamaica, Honduras and Nicaragua, as this would also demonstrate the practicality of using genetics to determine small-scale population structure of interest to management and its practicality for traceability. Alternatively, additional funding could be found to increase the sample size in this area within her original proposal.

## **Revision and analysis of existing guidelines for making NDF for QC exports (Martha Prada)**

In preparation for this discussion, Martha Prada prepared two flow charts, based on the Mexico diagrams presented at the Second QC Working Group. Mauro Gongora mentioned how Honduras, Nicaragua and Belize agreed to a subregional cooperation for developing guidance in the preparation of QC NDFs. Thus, the frame of this structure is very important for a NDF workshop being planned for early next year in Honduras and technical recommendations from this group would be highly appreciated.

Monica Barone commented that there are some repetitive topics in those charts, and they need to add space for addressing risk when information is not available, thus it was recommended to update the way the flow charts are being presented. Manuel Perez also commented that countries need to be consulted to address what are their realities and resource limitation in obtaining the necessary data for performing good NDFs, and so it was recommended that this be discussed in the December meeting.

Daniel Kachelriess suggested to include the timeline for having final recommendations on the NDFs and informed the Working Group that there will be one or more workshops on non-detriment findings organized between CITES CoP18 (2019) and CoP19 (2022) that would present opportunities to look at other NDFs for marine species and share experience and knowledge more broadly. An advance draft can be presented at the CITES Animals Committee and receive their guidance too.

During the discussion on the making of NDFs, several references were made to the original listing proposal for Queen conch, and Daniel Kachelriess explained to the group in that context, that since Queen conch was listed in 1992, the guidance on listing criteria in Resolution Conf. 9.24. (Rev. CoP17) had been revised by the Conference of the Parties, making the information in that original listing less relevant today. In addition to the biological criteria, trade criteria also need to be considered, and it was further explained that in CITES there are not automatic proposals for listing species, but only proposals received from Parties. The overarching objective is to ensure that trade is not detrimental to the survival of the species. Thus, criteria definition is essential, thus recommendations made in the past from experts and adopted at the second QC Working Group needs to be revisited.

### **QC/SSTAG recommendations:**

The group discussed more on how to proceed for the evaluation of the NDF procedure rather than on the concrete procedure, agreeing on the followings:

- 1) The diagram for the NDF should be evaluated step by step, aggregating the points that are referred to annual or longer considerations to distinguishing the routine procedures related to singular trade operations. Moreover, the application to national examples can help in testing the applicability of the proposed model. Mauro Gongora, Fisheries Department of Belize, offered to chair a subgroup for continuing the discussion for providing a revised draft version of the diagram by the next meeting of the QC WG planned in Puerto Rico from 18–19 December 2019. Other suggested members of this subgroup were Maren Headley and Martha Prada.
- 2) As the NDF starting point of the diagram refers to the determination of the annual quota and therefore of an export quota, and considering that a CITES “export permit shall only be granted when a CITES Scientific Authority of the state of export a Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species”, the group considered fundamental to clarify the theoretical but fundamental definition of the QC fisheries sustainability, to guide in the allocation of the quota, which include definitions of what are healthy populations (all life history stages), sustainable levels of production and associated export quotas which account for considerable local consumption Appeldoorn. Richard Appeldoorn, Alex Tewfik and Nelson Ehrhardt were suggested to be part of this group.

## Analysis of socioeconomic aspects in the QC fishery (Manoj Shivlani)

He made a comprehensive description of various socioeconomic topics in the QC fishery, with particular references to Bahamas and Puerto Rico. He mentioned how this species is tied to the local communities in terms of income, livelihoods, trade, and identity, and how the current decline in QC stocks may demand different management strategies and information needs. Conch fishers are generally identified as small-scale fishers operating out of traditional and historical fishing communities, even when engaged in industrial activities in exporting countries or working in well-built processing plants, which may also serve small scale producers. Small-scale fishers participating in the production and trade are impacted by variations in the species' abundance and demand. Prices can remain high based on supply conditions, due to the high demand from the tourism sector.

He presented some estimations about trip costs, where fuel represents the highest proportion. In addition, he talked about fishing vessel characteristics and described the diving operations consisting of hookah, scuba, or free diving. However, due to a reduction in QC abundance, fishers have progressively shifted to dive in deeper waters and more frequently (additional bottom time is required to search and remove conch meat from the shell). Diving is also a serious problem for some communities, and it appears that decompression episodes did not dissuade fishers to dive, even with moderate disability.

Fishers are usually multispecies fishers, although habitat conditions do limit the number of species targeted, especially in relation to conch habitat. In places like Puerto Rico, hand-lines are often used as secondary gears on a trip or seasonal basis. Reports from Puerto Rico, described how hurricane Maria in 2017 generated extensive damage to sea grass, resulting in losses in landings, fewer trips, and deeper water dives (to 115–130 ft). In fact, price of conch meat in western PR increased from USD 6.50/pound to USD 9.00/pound from 2016 to 2018 due to supply disruption.

Fishers' perceptions concerning regulatory approaches vary. In some regions there is support for additional measures, while in other regions fishers are completely against new measures. Concerns on regulations are due to uncertainty over how long expected benefits will take place, and what alternatives are available. Open access throughout most of the Caribbean leads to competition and increases IUU fishing concerns.

Socioeconomics strongly shape political will, so strong understanding of socio-ecological system, especially in terms of setting the socioeconomic incentives towards more sustainable harvest and management is needed. Without a better understanding of socioeconomics, management changes will be met with pushback. Education would help in this regard and the case of conch conservation (<https://bnt.bs/science/conchconservation/>) and Community Conch ([www.communityconch.org/](http://www.communityconch.org/)) in Bahamas were mentioned.

The group analysed the complex socio-economic structure in the industrial fisheries, like in the case of Honduras, where there are a lot of complaints about competition arising from having different seasons with lobster fishery in offshore fishing grounds; to deal with this situation, maybe a special management structure is needed. On the other hand, local consumption in many countries is significant and driven by foreign tourists, and so there is strong connection between fishers and restaurants. In another example, Mauro Gongora mentioned the difficulties in getting information on small quantities of conch used for family consumption because the product is usually not sold in small quantities; the minimum amount sold through the formal market is 5 pounds (the export unit). To increase transparency and traceability it was mentioned that there is a need to use proper terminology when determining what local consumption really is.

CITES is currently seeking case studies that demonstrate the value of sustainable use for livelihoods and other socio-economic aspects. Conch fisheries in Belize may a good example. This trade is dominated by exports, but it may be important to determine how important this fishery is for small scale fishers,

which is in fact a topic of discussion right now, and is creating a big debate, and that is why more case studies are encouraged.

### **QC/SSTAG recommendations:**

1. Identify mechanisms (social, cultural, behavioral) that can be used to increase stakeholder engagement and support for the 3 pillars embedded in the regional plan (Technical and statistics, education and outreach and governance). The development of case studies with different characteristics, e.g. high vs low capacities, successful cases vs non-successful cases, are recommended to be prioritized.
2. Improve the data on socioeconomics in this fishery, including aspects of local communities, local consumption and trade to be included in the quota setting. Continue the CRFM socio-economic data compilation
3. For those non-exporting countries, the QC/SSTAG can provide technical recommendations in order to increase the sustainability of the fishery, taking into account different aspects related to the socioeconomics of the QC fishery, food security, and local consumption among other topics.
4. Continue to improve sustainable conch fishing to maintain more stable production and benefits to local communities in the long term, considering aspects of conservation, captures and trade network.
5. The lack of safety diving in the QC and lobster fishery needs to be further addressed, with evaluations of the progress achieved from initiatives in place, to counter this health problem in local communities.

### **Research priorities (Richard Appeldoorn)**

The following recommendations are the QC/SSTAG consensus on research priorities and are in addition to the specific recommendations presented above within the specific issues analysed during this meeting.

- There is a need for countries to report their annual conch landings along with their processing grades to be able to utilize the proper conversion factors. Efforts in developing new conversion factors may be null if landing statistics are not available.
- Survey protocols need to be developed in collaboration with experts on statistics and in light of what models will be used for analysis to ensure that the resulting data fit the model. Allocating sampling sites systematically is recommended so that thematic habitat maps can be generated. Future studies should attempt to do a power analysis, so that number of sites and allocation among strata can be optimized and the abundance/biomass estimate will be more precise.
- For surveys in depths within 30–40 m, nitrox diving offers an effective approach. For deeper areas, camera-based (drop cameras, towed cameras, remote operated vehicles) surveys would be required. There are advantages and disadvantages of each method, and there was interest among the QC/SSTAG to explore these further.
- Review and provide proper guidance on compiling landings data (including both export and local consumption) and determine minimum data needs for stock assessment using fishery-dependent data. Emphasis was given to have countries provide reliable landings data, estimates of local consumption, and IUU fishing. The last two can be obtained by special surveys, including trip tickets, site and phone surveys, and weekly inspections.
- Update and summarize information on conch population dynamics, including growth, mortality, habitat quality, and develop a conch population dynamics simulation model suitable for use in management strategy evaluations. Results would provide the basis for conducting management strategy evaluations (MSEs) using the available Data Limited Models (DML) tools.
- Conduct specific research aimed to increase our understanding of spawning aggregations and reproduction success, including the effects of climate change. The QC/SSTAG emphasized the importance of maintaining spawning aggregations and reproductive success, yet the factors affecting these are poorly known and difficult to assess. Some information could come from fishery independent surveys, but this would again depend on the purpose and target of the surveys.

- Improvement of the regulations, enforcement strategies and assessment of countries capabilities is needed to improve stock management. QC/SSTAG recommended exploring the use of Fishpath to identify data availability and capacity, which could then be matched to potential assessment mechanisms. In addition, it is recommended that a gap analysis be conducted for the legal (=regulatory) framework of countries. This would require a review of each countries' framework and management plans.
- Increase knowledge and understanding of the Queen conch value chain, in particular, on conch value-added products (e.g. by-products of conch meat processing and the use of the shells), to be able to track its trade. The trade in conch pearls is particularly valuable yet unknown. For example, fishers from Belize report that pearls are disproportionately found in small juveniles, which would incentivize fishing for juveniles, but it was also reported that pearls were found in the Honduras sampling, which was only of adults. It was noted that Megan Davis of Harbor Branch (Florida Atlantic University) has worked with culturing conch pearls and may be able to address issues of how long it takes for pearls to develop and in what size conch are they found. For CITES permits, it would be valuable to document that pearls were coming from licensed fishers.

## References

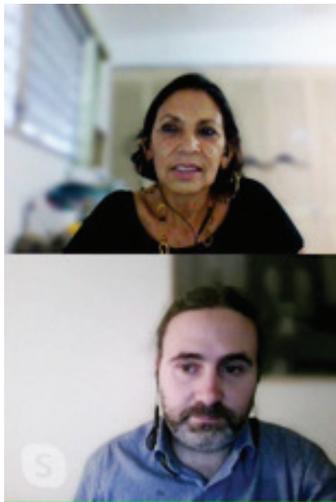
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## ANNEX 1. QC/SSTAG Second Workshop Agenda

Day 1: 25 November 2019			
Time	Topic	Leader	Detailed description
09.00–09.45	Welcome and introduction, updates since first SST advisory group meeting	Richard Appeldoorn	Welcome and introduction
		Martha Prada	Updates from FAO SAG, WECAFC 17, and CFMC meetings
		Daniel Kachelriess (Skype)	Updates from CITES CoP18 decisions on Queen Conch and some other relevant developments
09.45–11.00	Progress on QC conversion factors and group discussion	Nelson Ehrhardt	Summary of consultancy report, strategy for getting additional data, recommendation for increase the use of conversion factors, need for new conversion factors.
<b>11.00–11.15</b>	<b>Break</b>		
11.15–12.30	Continuation of QC conversion factors.	Nelson Ehrhardt & Monica Barone	Conclusion and recommendations to the QC Working Group. FAO perspectives and additional support. Recommendations for the QC Working Group.
<b>12.30–13.45</b>	<b>Lunch</b>		
13.45–15.45	Group analysis of results from training workshop on QC surveys and determination of QC population status	Elizabeth Babcock	Summary of training workshop, group discussion on results and need for additional considerations. Recommendations for sampling deeper environments (30–40 m in depth) and safety protocols. Recommendations for the QC Working Group.
<b>15.45 –16.00</b>	<b>Break</b>		
16.00–16.45	CFMC QC manual updates and how to estimate quotas	Elizabeth Babcock & Nelson Ehrhardt	Proposed manual updates and strategies for improvement methods to estimate annual extraction quota. Ad hoc stock assessment expert group
16.45–17.15	Proposal for studies on QC genetic connectivity	Diana Beltrán	Description of sampling needs, support provided by University Rohde Island, need for additional support. Strategies for feasible progress. Recommendations for the QC Working Group.

Day 2: 26 November 2019			
09.00–10.45	Revision and analysis of existing guidelines for making NDF for QC exports	Richard Appeldoorn & Martha Prada	Comments on simplified NDF scheme, need for documentation on guidelines to be provided, CITES support. Plans and future work. Recommendations for the Working Group.
<b>10.45–11.00</b>	<b>Break</b>		
11.00–12.00	Analysis of socio-economic aspects in the QC fishery	Manoj Shivlani	Summary of the specific need of information, what are the priorities, sources of data, main challenges and risks.
<b>12.00–13.30</b>	<b>Lunch</b>		
13.30–14.00	Continuation of analysis of socio-economic aspects in the QC fishery	Manoj Shivlani	Recommendation for the working group
14.00–15.45	Revision of the research agenda for establishment priorities	Richard Appeldoorn	Revisited list of identified research needs, analysis for identification of priorities needs. Agreements and potential partnerships.
<b>15.45–16.00</b>	<b>Break</b>		
16.00–16.45	Strategies for drafting a GEF proposal for getting additional funding	Group discussion lead by Maren Headley	Agreement on objectives and potential outputs for structuring a regional proposal for the improvement of the QC fisheries and conservation management.
16.45–17.00	The way forward	Maren Headley	Final recommendations and future steps

**ANNEX 2. Workshop picture collection**



## APPENDIX E

### Regional training workshop on Queen conch population assessment in the Caribbean region

**Belize City, Belize, 30 July–1 August 2019**

#### 1. Background

The third meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen conch (QC) was held in Panama City, from 30 October to 1 November 2018 to promote the implementation of the Regional Queen conch Management and Conservation Plan. This regional plan envisioned the establishment of three subgroups, within the main Queen conch working group: a) the technical and advisory, b) the outreach and education, and c) the governance sub-group.

During this 3rd QC Working Group Meeting (FAO 2018), countries made commitments to CITES to advance in the sustainable exploitation of the QC which is included in the convention Appendix II. Among these commitments were the improvement of: a) determination of the status of stock, b) calculation of proper conversion factors and definition of the processing grades in trade as agreed by the QC working group, c) improve control of trade of conch products, and d) regional initiative to develop a simplified guidance in how to conduct NDF determinations. Thus, agreed in continuing working inter-seasonally to attend these recommendations, and so a Scientific, Statistical and Technical Advisory Group was expected to work in these issues.

The Statistical, Scientific and Technical Advisory Group) agreed to initiate its work through online communications and had its first face-face meeting in Miami during the period 23–26 April 2019, thanks to the support of CFMC and FAO/WECAFC. Initial composition of this technical group followed recommendations from the QC Working Group and it is expected to be expanded to address different topics under their consideration as agreed in the Miami meeting.

A recommendation coming out of the recent Miami meeting was that WECAFC (Western Central Atlantic Fishery Commission) needs to communicate to countries the need to identify long-term research strategies for conducting density surveys, as basis for determining the sustainability of the QC fishery. Experts recommended the development of a special workshop dedicated to identifying potential for harmonized field data collection protocols, data analysis, and opportunities for collect information to update conversion factors, initiate studies aimed at understanding the conch reproductive changes and other relevant issues including impacts from climate change, population connectivity patterns, among other priority research needs. In this process and the WECAFC will contribute with the development of such a training workshop looking at developing guidelines on harmonized field protocols, identifying alternatives for more regional collaboration. This report summarizes the workshop results and recommendations.

Given the complex biological process of the QC and the lack of trusted basic fishery dependent data commonly experienced in the QC (*Lobatus gigas*) fishery, the establishment of sound fishery management measures are better fit through field surveys. Initial recommendations on how to conduct this kind of work was developed by Ehrhardt and Valle-Esquivel (2008), with the support of the Caribbean Fisheries Management Council. Later, a comprehensive theoretical and practical training on how to conduct Queen conch visual surveys was given to 12 representatives from 10 CRFM (Caribbean Regional Fisheries Mechanism) countries in 2013 (SOFRECO 2013). Unfortunately, currently only some countries such as Belize, Jamaica, Nicaragua, Honduras, Colombia, Bahamas, Turks and Caicos, and the US are doing QC surveys to determine their national management regimes or to gather relevant information on QC populations.

The regional training workshop brought together key government officials of six out of eight countries conducting QC surveys along with other Scientific, Statistical and Technical Advisory group members to analyse and provide recommendations on a harmonized method to conduct a QC density surveys that would be non-detrimental to the QC population, while addressing related topics on its implementation and data analysis. This was an opportunity to address the issue of limited technical capacity across the region and find ways to develop further collaboration at the sub-regional or regional level.

Participants presented their protocols including all aspects from planning, funding, field work and data analysis. Safety diving, insurances, emergency plans along with composition of the samplers were also included. Dr Elizabeth Babcock from the University of Miami and part of the Statistical, Scientific and Advisory Group was the lead of this training activity and provided in addition information on innovative tools to determine population abundance indices, based on fishery-dependent data.

## **2. Training objectives**

The goal of this meeting was to provide guidelines for a harmonized protocol to conduct a QC density surveys that could conclude in recommendations of an exploitation quota that would be non-detrimental to the population, while addressing related topics on its implementation and data analysis and finding ways for further scientific collaboration.

The specific objectives were to:

A: Analyse QC density surveys protocols being conducted in the Caribbean and data analysis countries are utilizing to determine their annual quotas.

B: Agreed on harmonized field and data analysis protocols that can be recommended for broad application in the Caribbean, including but not limited to QC density, updated QC conversion factors, and sampling for study QC reproduction and connectivity.

C: Discuss potential use of fishery dependent data to develop regional indices of QC abundance and patterns, thus existing data can be better integrated into the NDF determinations.

D: Update existing protocols to estimating total allowable catch, thus appropriate methods and techniques can be applied.

E: Generate guidelines for conducting QC surveys including identification of potential funding mechanisms and establishment of better regional collaborative efforts.

## **3. Details on meeting discussions**

### **3.1 Opening remarks**

Mr Mauro Gongora, Fisheries Officer, Belize Fisheries Department, welcomed the participants to Belize City and explained that the Queen conch Working Group (QCWG) of FAO had prioritized this training workshop as a recommendation during their meeting in Miami in March 2019. This workshop is intended to increase technical capacity in the region.

Mr Rigoberto Quintana, Senior Fisheries Office, Belize Fisheries Department, welcomed the participants, and mentioned the need to harmonize assessment methodologies, and address regional issues such illegal, unregulated and unreported fishing (IUU). The region can improve sustainability of these fisheries.

Ms Melissa Almenderez, Project Officer and FAO National Correspondent, Belize Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development and Immigration discussed the socioeconomic importance of the fisheries sector in the region, and mentioned that other sectors such as agriculture could also benefit from the kinds of networking and methods sharing being done at this meeting for fisheries.

Mr Percival Cho, Chief Executive Officer, Belize Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development and Immigration, discussed the decline in conch landings over the last several decades and mentioned that conch are depleted in some countries and status is unknown in others. There is a need for better regional understanding of conch status. The fishery sector is the main income driver in coastal communities. Science based management incorporating local and traditional knowledge is needed to improve sustainability.

Mr Ramon Carcoma, Fisheries Officer, Belize Fisheries Department, thanked FAO for sponsoring the meeting, and the participants for traveling to Belize to contribute.

### **3.2 Report by Jamaica**

Ms Anginette Murray and Mr Stephen Smikle presented information on how Jamaica conducts their surveys and assessment and management. The survey is done in October/November every 3–5 years beginning in 1994. A tax on conch exports pays the cost, which is around USD 300 000 for one year's survey. The survey has 80 systematically distributed sites, stratified by depth zones (0–10, 11–20, 21–30 m) to maximize sampling in heavily fished areas. Except for the first year in which fishers were used, the survey has only used scientific divers. The method is a belt transect, and the size of the transect has been optimized.

The survey data is used to calculate biomass which is used in a control rule to set the total allowable catch (TAC) quota. The control rule is to remove a maximum of 8 percent of the biomass if the biomass is within the intermediate range, with a closure if the biomass falls below a lower limit, and a maximum quota if the biomass is above the range. The quota can be adjusted downward due to uncertainty in the estimates. This was done last year when the fishery was closed because the biomass was low in 2018. There is a concern about IUU fishing, which may have contributed to the recent decrease in biomass. Maps of density from the survey show that the distribution of conchs has shifted from east to west, perhaps due to environmental changes or due to the distribution of fishing including IUU fishing.

Jamaica reports catches in 50 percent clean and they measure meat weights each year so that the conversions of numbers to biomass are accurate. They calculate total biomass for juveniles and adults using a stratified random sample. They calculate confidence intervals with a bootstrap method because the densities are too patchy to use a normal distribution for the statistics. The control rule is based on fishable biomass, which includes conchs larger than 210 mm shell length.

They also monitor CPUE, but CPUE doesn't generally decrease during the season due to strict fishing regulations.

### **3.3 Report by Belize**

Mr Ramon Carcoma discussed the density survey and assessment methods for Belize. The survey is conducted every two years in August to September to calculate the quota for the opening in October. The surveys are stratified by administrative areas called Managed Access zones, each of which include both fished areas and marine reserves. Only the area that is considered conch habitat is surveyed, based on benthic habitat. Sample size is allocated to zones based on the fraction of total conch habitat

area in each zone. Within each stratum, sampling locations are chosen randomly using ArcGIS. The sample unit is a belt transect, in which two divers either snorkel or dive along the transect counting and measuring all conchs. The survey costs around USD 45 000.

A standard stratified random sampling method is used to estimate the national mean density of legal size ( $\geq 178$  mm shell length) conch for the purposes of CITES reporting. Calculations of total legal biomass are made for the fished areas only, excluding the replenishment zones of marine reserves. Based on this estimate of total legal density in the fishing grounds, they use the equilibrium estimator of Garcia et al. (1989) to calculate maximum sustainable yield (MSY), assuming that natural mortality is equal to 0.5. The rule of thumb that the maximum economic yield (MEY) is 75 percent of MSY is used to set the TAC. The quota is allocated to the fishing cooperatives based on their historical catches.

Belize also uses an adaptive management tool in which they compare monthly landings to the long-term average to determine whether conch abundance is being depleted too rapidly during the season. They monitor the average size of market clean conch meat prepared for export to enforce the size limit; and to determine if the average size has decreased over time.

Based on an adaptive management framework developed in part by the Environmental Defense Fund, Belize monitors performance indicators including total catch, mean shell length in the surveys, density from surveys, and CPUE early in the conch season. These performance indicators and their associated reference points complement the quota calculations.

Belize also uses length-based methods including length corrected average catch (LCCC). Shell lengths have varied over time. Also, density varies between areas, and there may be environmental factors influencing population dynamics. There is a need to validate the mortality and growth parameters.

The deepwater habitat in Belize is believed not to be fished, due to the ban on SCUBA for fisheries. The current survey focuses on the fished, shallow areas, but there is a plan to survey the deeper areas.

### **3.4 Report by Nicaragua**

Mr Renaldy Barnutti presented information on the surveys and assessment methods of Nicaragua. Nicaragua has both commercial/industrial fishers who have up to 26 divers per vessel and artisanal fishers who use sailboats or skiffs. The landings are 40 percent industrial and 60 percent artisanal, but most data come from the industrial fishery. Catch statistics are collected from the commercial vessels at the processing plants. Landings have increased over time; they are measured in 100 percent clean conch. There is a quota. Each fishing company has its own quota share, so they can wait for good prices to go fishing. Information on how much of the quota has been taken is posted on a website so that fishers know when the season is about to be closed.

A survey is conducted every two years to estimate density, size, maturity, and distribution of conchs. The depth range is 7 to 35 m. The survey is done using commercial divers and commercial vessels at locations previously chosen by biologists. Sampling locations are systematic and cover the industrial fishing area. More samples are taken in areas that are expected to have high conch density. The same sites are generally visited every survey. The survey is done in May and December. They calculate density using ANOVA, as well as the method of King (1995).

The survey was done in 2016. The conchs were nearly all adults although divers are asked to look for juveniles. CPUE was 69 pounds/hour 100 percent clean. Shell lip thickness averaged 14 mm and ranged up to 37. Densities were high, mostly over 100 conch/hectare particularly at deep depth. (25–30 m).

There is a need for better data on the artisanal fishery, which may be in different areas but also catches mainly adult conch. In Nicaragua the conchs are all offshore in deep banks; there is no shallow or nearshore fishery.

### **3.5 Report by Colombia**

Mr Anthony Rojas presented information on the conch fishery in Columbia. Columbia has now a small conch fishery in the Archipelago of San Andres. Since 2003 they began to conduct QC surveys, which are used to calculate TAC. Fishery management has included special legal requests in response to a collective suit made by the local fishing community. Because the TAC has been significantly reduced, the fishery is artisanal only, and conch cannot be exported. In addition, a very large and multiuse seaflower MPA has been declared. Survey used either chartered boats or an army vessel. At each station, there are four transects in a plus shape. One fisher and one biologist count animals and measure morphometrics. There is a 20-minute time limit because of the depth. They count conch in size categories: juvenile, subadult, adult. Also, a 100 adult/hectare reference point is used to determine the viability of the fishery. The survey is stratified by benthic habitat. The weighted density calculations are used in a control rule with a harvest rate of 8 percent, which is reduced to 1, 2 or 4 percent to be precautionary and get approval from the legal process. Densities are relatively high in Serrana Bank compared to other archipelago's banks, allowing for a small-scale fishery. However, many are juveniles. Currently the TAC is 9 tonnes of 100 percent clean meat. IUU fishing is probably as much as 10 times higher based on the amount of conch seen in seizures of illegal fishing vessels. There is only one part-time patrol boat in the archipelago, and there is much cross border trade (i.e. archipelago extends for over 180 000 km<sup>2</sup> of potential QC grounds). They are planning to use ROVs to do 30–50 m depth surveys.

### **3.6 Report by Bahamas**

Dr Lester Gittens described survey and assessment work in Bahamas. The conch fishery covers a very larger area with 40 distinct fishing grounds, averaging around 9 m depth. Surveys have been done since the 1980s. The survey is a collaborative effort involving NGOs such as Community Conch and the Shedd Aquarium. A single survey costs about USD100 000. Due to the large area, it is not possible to sample all fishing grounds every time the survey is done, so each survey covers different fishing grounds. The survey is intended to sample representative sites that range from heavily to lightly fished, including both fished areas and marine reserves, ranging from deep to shallow. The survey is conducted in May to June during the peak spawning season, following the methods described by Stoner et al. (2019). The classification of mature animals has recently been changed based on the work of Stoner.

The survey is systematic, based on a grid over the fishing grounds, in which a 100 m by 6 m transect is conducted in the center of each block. Conch shell length and lip thickness are measured, as well as whether conchs are mating. The total numbers are expanded over the area surveyed to get total numbers in the fishing grounds. The number of mating pairs observed increases with adult density; based on logistic regression 50 percent are mating at about 300 adult conch per hectare.

There is relationship between density and fishing pressure when different areas are compared. The surveys are not used to calculate total national biomass, because the survey does not cover all the fishing grounds every year. However, the survey is used to inform a precautionary approach to management. The current NDF is based on landings only, so there is a need to better incorporate the survey. Based on the survey results and fisheries data, there is a proposal to strengthen management, by requiring landing in the shell, regulating the lip thickness in the landings, reducing or eliminating exports, banning recreational fishing by foreign travelers, or banning the use of compressors.

### 3.7 Report by Honduras

Mr Nhering Ortiz Lobo presented information on assessment and management of conch in Honduras. Honduras has a country-specific methods guide and a fishery management plan in addition to the regional management plan for conch. There are 13 industrial fishing companies, each with their own individual quota, which they can fill in as few as 5 trips. There is a size limit and a fishing season, and data are collected on catch and effort. There are also inspectors that go out with the fishing vessels. All vessels have vessel monitoring systems (VMS). The industrial fishers' organization cooperates with data collection efforts. Clean conch is landed in clear plastic bags to facilitate inspection. Landings are labeled with a bar code and tracked from the vessel to the processing plants. The fishery exports 100 percent clean fillets, as well as trimmings and dried operculums. Data are collected on size and weight frequency for morphometric analysis and to calculate the weight conversions. There is a fisheries management commission, which includes the CITES coordinator and the fisheries ministry. There is a code of conduct and best practices guide for the conch fisheries. A project is encouraging women to get involved in handicrafts with conch shells to generate income.

Most landings are adult conchs at 80 to 90 m depth, similar to Nicaragua. It is not known where the juveniles are. The lack of information about juveniles is concerning. There is a need to better understand the sources and sinks for Caribbean conch populations.

Honduras has a fixed CITES export quota. This quota was calculated based on fisheries data using methods by Nelson Ehrhardt (Ehrhardt and Valle-Esquivel 2008). Density data has not yet been used to set the quota, although this may be done in the future.

### 3.8 Report on safety of conch fishers in Nicaragua

Mr Luis Emilio Velasquez reported on efforts to improve the safety of conch divers in the Nicaraguan fishery. The deep-water fishery involves 1 183 fishers, and this fishery, both industrial and artisanal, is important for generating foreign exchange income and jobs in coastal communities. The deep-water fishery started because of the diving skill of the Miskito people, and it targets lobsters and sea cucumbers as well as conch. A 2005 study on the risks involved in deep-water dive fisheries led to a program to encourage fishers to move from diving to traps, and to use casitas (shades) for lobsters.

In 2006, a new law was proposed to ban using scuba or hookahs to dive for lobster and other natural resources. However, the law was unable to be implemented due to lack of alternative livelihoods for divers. Instead, regulations were established to improve the safety of the fishery, including requiring training, equipment and licenses. Fishing vessels are required to have a first aid kit, oxygen and other equipment. The number of fishers is also being reduced as vessels that leave the fishery are not replaced.

### 3.9 Methods for analyzing surveys and fisheries data to inform management

Dr Elizabeth Babcock presented on possible methods to analyse survey data and fishery dependent data to estimate appropriate total allowable catch quotas.

Data from surveys can be used in several ways to set a total allowable catch (TAC). (1) The survey can be used to calculate total biomass, and then the TAC is the total biomass times the target harvest rate. (2) The survey can be used to calculate a time series, which is used (along with catches) in a population dynamics model to estimate population parameters and status. The time series can also be used in a control rule based on performance indicators. (3) Size data (e.g. shell length, lip thickness) can be used to infer status or as indicators.

The kinds of statistical analysis that can be done are determined by whether the survey is random, systematic, or uses the same fixed sites every time, and on whether the survey is stratified. Random

or systematic samples can be used to calculate total biomass using simple or stratified sampling estimators, and to calculate biomass time series. Surveys that use fixed sampling location that are the same every time may be more efficient for calculating changes over time, but they should be analysed with repeated-measures methods, and they may be less effective for calculating absolute biomass if the fixed locations are not representative of the area where conch are found.

If the survey is used to estimate current total biomass, an appropriate total allowable catch for a fishery would be the total harvestable biomass (i.e. those conchs that are legal sized, converted to weight in whatever units are used to monitor the catch, e.g. fillet weight of 50 percent clean weight), multiplied by the target harvest rate. Harvest rate (HR) is the fraction of the biomass available at the beginning of the fishing season (B) that is taken as catch (C) by the fishery ( $HR=C/B$ ). This can be calculated from the instantaneous fishing mortality rate ( $F$ ) as  $HR = \left(\frac{F}{F+M}\right)(1 - e^{-(F+M)})$  where  $M$  is the instantaneous natural mortality rate. Target harvest rates could be based on a rule of thumb such as setting  $F$  equal to  $M$ , or reference points such as  $F_{MSY}$  or  $F_{MEY}$ . An alternative method is to set a TAC from the total biomass is to calculate MSY using the equilibrium estimator of Garcia *et al.* (1989). This method assumes that the current yield and the current biomass are points on the equilibrium yield curve from a production model such as the Schaeffer or Fox model, and that  $M$  is an approximation of  $F_{MSY}$ . These assumptions allow for calculation of MSY, which can be used to set the TAC, perhaps after some precautionary reduction. This method is very sensitive to the value used for  $M$ , and it does not work if the fishery is not at equilibrium, so it is important to calculate the HR to ensure that the TAC is not allowing too much of the biomass to be removed.

If the survey can be used to calculate either mean density, total abundance, or total biomass in each year of the survey, then this number can be used as an index of abundance in each year as an input to a population dynamics model such as a production model. If the survey has fixed locations, or the sampling methodology has changed over time, it may be necessary to standardize the index to avoid bias, using similar methods to those used to standardize fishery catch per unit of effort (CPUE) indices (Maunder and Punt 2004). If total biomass is estimated, it can be entered into the stock assessment model directly, assuming that the biomass estimate is an unbiased estimate of total biomass, normally or lognormally distributed around the true biomass. Mean density can be used as an index, which is assumed to be proportional to total abundance.

For conch, a production model may be an appropriate stock assessment method, which can be used to estimate  $F/F_{MSY}$  and  $B/B_{MSY}$  for every year of the fishery and to project the population into the future under various proposed TACs. The method requires accurate catch data in every year (possibly excepting early years of the fishery), and an index of abundance, which can come from a survey or fishery CPUE. The production model is used to predict the biomass in each year of the fishery as the biomass in the previous year plus surplus production minus catch. The model parameters, including population growth rate ( $r$ ), carrying capacity ( $K$ ) and biomass in the first year ( $B_0$ ) are calculated by fitting the predicted biomass to the observed indices of abundance using maximum likelihood or Bayesian methods. The method of fitting the production model to a time series is preferable to the Garcia *et al.* (1998) method because it follows decreases and increases in biomass over time rather than assuming equilibrium. The method is less prone to bias than equilibrium methods and gives useful information about current status and possible future trends. A time series fit of a production model could be effective for countries that have adequate catch data and at least one appropriate time series. It would also be possible to improve the model fit by incorporating information about the values of the model parameters  $r$  and  $K$  in the form of Bayesian informative priors. A prior for  $r$  can be developed based on knowledge of the life history of conchs. Informative priors for  $K$  are not commonly used in production models; however, such priors could probably be developed for conch because the unfished biomass could be calculated as the product of the area of the conch habitat, the expected unfished density (inferred from surveys), and the mean weight. Bayesian production models in the Schaefer, Fox and Pella-Tomlinson form can be fitted using the JABBA R library (Winker *et al.* 2018). A preliminary version of this model run, done at the meeting using data from Jamaica gave reasonable results. Such production models would be worth pursuing

for countries that have adequate catch data. If IUU fishing is larger relative to the reported catches and cannot be estimated (e.g. as proportional to fishing effort), then production models are probably not appropriate. For conch, it may be necessary to include the Allee effect (depensation) in the production models; the JABBA package is able to do this.

In addition to the previous methods, there are a wide variety of recently developed methods for data limited fisheries, many of which are available in the R library DLMtools (Carrathurs *et al.* 2014, 2016). The tool includes 112 management procedures, which include many different methods for calculating a potential TAC based on fishery dependent and fishery independent data. This tool is relevant for conch because it includes methods that are useful for any combination of available data. For example, a country with good catch data but no abundance index could use a method based on catches only, such as depletion-based stock reduction analysis. A country with poor catch reporting but a good abundance index (perhaps from a survey) could use the index correction method which bases the TAC on the previous year's catch, adjusted up or down based on whether the index is above, within or below a specified mean range. Many methods are available that can set TACs directly from survey estimates of biomass. The tool is useful because it allows users to easily calculate TACs from several methods. However, it should be used with caution, because not all methods are appropriate for a particular fishery. It is important to look closely at the data and parameters required by each method. The tool also allows for simulation testing of management procedures, using management strategy evaluation (MSE) which can be used to determine which methods are most effective at sustaining the fishery according to performance measures such as whether overfishing is avoided and the long-term mean catch. However, it may be necessary to adjust the operating model to include the 2-phase growth of conch, in which conchs grow in shell length only until they reach maturity, after which only lip thickness grows.

Many surveys gather data on size, including shell length and shell lip thickness, and these data may be useful for assessing status of fisheries. Shell lip thickness can be used to determine the fraction of catch that is mature, while shell length can be used to determine whether conchs are growing to their optimal length (the length at which the biomass in a cohort is maximized) (Froese 2004). Methods such as length corrected catch curves, the Beverton-Holt method to calculate mortality from mean length and length-based spawning potential ratio (LBSPR, Hordyk *et al.* 2016) estimate fishing mortality rates based on length frequencies along with information on growth and fishery selectivity. All these methods assume that the length frequency in the population is a result of the tradeoff between mortality and growth, while the length frequency in the catch reflects the length frequency in the population combined with the size selectivity of the fishery. Because of the two-phase growth of conch, methods based on shell length are probably most useful for fisheries that catch primarily juvenile conch, while methods based on lip thickness are most useful for fisheries that target adult conch. Conch is also known to grow to different sizes in different habitats in Belize (Tewfik *et al.* 2019), Bahamas and Jamaica. Because of the complexity of conch growth, size-based methods for conch should be used with caution. However, size-based metrics may be useful as indicators to track changes over time.

### **3.10 General discussion of assessment methods**

There is a general sense that the assessment of Queen conch in the Caribbean can be improved, by improving the use available data from fishery dependent data and from surveys (fishery independent data). In particular, countries that currently have fixed quotas are interested in using assessment methods to adjust the quotas in response to estimate of stock status. However, the appropriate methods to use may vary by country because the countries vary in how much IUU fishing they have, how comprehensive the surveys are, whether fisheries target large juveniles or adults, the depth and spatial extent of the conch fishing grounds and other factors. Thus, assessment methods probably cannot be standardized. However, there is value in sharing approaches, and in standardizing how results are presented. Any country with an estimate of biomass (with and appropriate statistical design and large enough sample size so that the estimate is adequately precise and accurate) should be able to estimate the harvest rate. Many assessment methods can also estimate the degree of depletion (current biomass,

abundance, density or spawning stock biomass relative to unfished). Given some estimate of current status, it is appropriate to use a management control rule in which the desired harvest rate is set as a function of the current density or biomass relative to desired targets. Figure 1 shows an example control rule from Jamaica.

The distribution of conch is patchy with high density next to low, and this needs to be taken into account when calculating abundance indices or fitting population dynamics models, by using appropriate statistical distributions.

Indicator based adaptive management frameworks may be useful. Such methods evaluate the status of multiple indicators (e.g. mean size, CPUE, density) and make small adjustments in the TAC based on whether the indicators are higher or lower than their targets or based on trends in indicators. In-season metrics such as CPUE in the first few months of the fishing season can be used to evaluate whether the TAC should be adjusted (McDonald *et al.* 2017).

It is important to be transparent about how TACs are calculated, and when the fishery is about to close due to reaching the quota or undesirable levels of indicators.

A control rule such as that used for Jamaica might be reasonable for other counties (Figure 1). The quota is generally 8 percent of the harvestable biomass if biomass is within the target range. This is reduced in practice to account for IUU fishing. The biomass reference points are derived from the CITES density targets. Other countries could use a similar logic to generate control rules based on either density or biomass relative to either the CITES reference points or reference points that are estimated specifically for the country based on densities needed for successful recruitment. The control rule can include precautionary reductions in the quota and can take variability into account, for example by using the lower confidence interval of biomass rather than the mean as the estimate of status. The control rule has the advantage of allowing managers, fishers and other stakeholders to see the status of the population relative to targets, so the logic behind the management decision is clear.

To calculate total biomass from surveys to inform control rules or other TAC calculations it is necessary to clarify what the total area is for expansion, whether it is the fishing grounds, or all area in the appropriate depth category, or areas with benthic habitat suitable for conch. Also, biomass must be related to the biomass of legal sized animals, which may or may not be the same calculation as the adult density used for CITES.

As an example of how to calculate total biomass from the surveys, the group looked in detail at how Jamaica does the calculations. The survey design is systematic within three depth strata. Conch are counted in multiple size categories: Small, medium and large juvenile, subadult, adult and stoned conch. The numbers in each size category are multiplied by the mean weight (50 percent clean) of animals in that size category. Total biomass is calculated as the mean density in each stratum, times mean weight times area in the stratum, summed over all strata. The means, variances and confidence intervals are calculated by bootstrap because the densities are patchy rather than being normally distributed. The stratification improves the estimate of the total. The quota is set at or below 8 percent of legal sized total biomass. MSY calculated by the Fox or Cadina method is similar or higher, implying that the 8 percent cutoff is precautionary. The density maps are also important to visualize changes in the population over time.

It is important to incorporate some understanding of IUU fishing into TAC calculations. IUU could in principle be estimated by surveying density before and after a fishing season, to see whether the reported catches (along with natural mortality) explain the observed decrease in biomass or whether substantial IUU catches must have occurred. If such data, or information from law enforcement or trade monitoring indicates that IUU fishing is substantial, then the TAC may need to be reduced, or the season may need to be closed early based on in season monitoring of indicators.

If any new method is used to calculate quotas based on surveys and other data, it would be necessary to implement a new program gradually. This could be done using an adaptive management framework in which, if the science supports a larger quota, the quota is increased slightly, and then the biomass or density is monitored to make sure there isn't a larger decline.

### **3.11 Discussion on standardizing survey methods**

The group discussed whether the design of surveys could be improved and whether the data could be processed and analysed more effectively to reach a management decision for each country.

There was a consensus that survey design will need to be different for each country, based on the number of fishing grounds (from one in Jamaica or 10 in Colombia to 40 in Bahamas), resources available, whether fishing grounds are shallow or deep and other considerations. For example, surveys in deep water are limited by how much time scientists can spend at each site. Nevertheless, it is possible for the survey outputs to be more consistent, for example, in how they describe the area that is expected to be covered by the survey (e.g. just conch fishing grounds, or all areas of suitable conch habitat).

Power and sample size calculations should also be done for each survey to determine whether the current sample size is sufficient to estimate density or biomass with the desired precision. The level of precision needed would depend on how the data are to be used for fishery management. There may be a tradeoff between precision and accuracy in that smaller transects may be more precise (i.e. narrower confidence intervals) while a smaller number of larger transects may be more accurate (i.e. more representative of the mean density in the area).

The design of the survey should be driven by the purpose of the survey. Many surveys are done because CITES has asked for surveys to calculate mean adult density to compare to reference points. The density measured should be consistent with the reference points used by range states to make non-detriment findings as required by CITES, for example by using the same definition of adult conch and covering the same kinds of areas. Since all countries have responsibilities under CITES to show sustainability compared to minimum densities of adults relative to the densities needed for spawning, it should be possible for countries to produce similar density estimates for regional comparison. Surveys could be improved by focusing on how best to estimate densities for this purpose. Since the density targets refer to adults, it would be useful to identify the spawning grounds. Local fishing grounds that are surveyed may or may not include spawning grounds, and not all surveys take place during the spawning season.

There is a need for a regional perspective on the status of conch. Even if surveys are designed differently, it would be useful to have common outputs from the analysis. For example, if all countries presented information on current adult density relative to unfished in known fishing areas, this number would be comparable across countries. Any common metric of status that could be calculated in a consistent way across countries would be useful to evaluate regional trends, provide milestones toward progress and guide research. Such standardization could be done in the context of a conch-focused regional fisheries management organization (RFMO) and such an organization has been discussed.

### **3.12 Conversion factors**

Different countries export conch at different levels of processing, so it is very important that each country have appropriate conversion factors so that exports and landings can be compared in the same units. Also, FAO statistics must be in whole weight (with shell) so it is necessary that all countries make this conversion in a consistent way.

Mr Renaldy Barnutti presented information on a study in Nicaragua on conversion factors. Divers ordinarily do not carry shells to the surface. However, there is a small fishery that keeps whole conchs because they sell the shells. The project involved weighing conchs at each stage of cleaning, from dirty

weight (everything but the shell) to 50 percent clean, to 100 percent clean fillets. To convert to whole weight with shell for FAO statistic, the conversion factors are 9 times the 50 percent clean weight, or 16 times the 100 percent clean weight. The Queen conch expert group prefers to use weight without shells, and these conversion factors were also calculated.

There is need to harmonize methods to calculate conversion factors and descriptions of the conversion factors, so that it is always clear what is meant by 50 percent clean or 100 percent clean. This information is needed for calculating total biomass in the appropriate units for each fishery, and for export reporting. Export data should always be clear about the degree of cleaning, and how the weights should be interpreted.

It was noted that WECAFC is working on updating conversion factors.

### **3.13 Studies on genetics, connectivity, and source/sink dynamics**

There is a need to coordinate regionally to determine population structure. It was noted that Ms Diana Beltran of the University of Puerto Rico is doing a conch connectivity study, and the group agreed that it would be worthwhile to send samples from all fishing grounds to the genetics researchers.

There are several hypotheses about population connectivity in the region. For example, the conch in the shallower fisheries may be recruiting from the spawning stock in the deeper fisheries. However, although there have been some local connectivity studies (e.g. Marquez *et al.* (2013) and some studies in Honduras, Jamaica and Puerto Rico) the population structure and larval connectivity throughout the region is still not well understood. There is a need for more samples from Central America. There is a need to identify spawning grounds, and which areas are sources and sinks. This could be a basis for countries to collaborate on bilateral or regional management activities.

There is also a need to understand how connectivity will change if climate change influences the strength of regional current patterns and more studies of larval dispersal. Larvae may be able to move up and down in the water column so that they can control their movement and generate more local recruitment than would be expected given their long larval duration.

Genetic studies to understand connectivity be combined with the studies that have already been committed to under CITES to understand population structure for the purposes of tracing the source of conch products in the trade. Both biological studies and management can be served by the same research project. If genetics studies are able to improve the traceability of conch product in the trade, this might help estimate IUU catch levels in the region, which would improve the ability of countries to assess and manage their stocks.

The group agreed that a regional study should be done. It is necessary to consult with the genetics scientists who will be analyzing the samples to get details of what the sampling protocol should be (e.g. how large samples should be, how they should be stored, what sample size is needed in each fishing ground). The latitude, longitude and depth of each sample should be recorded to address the question of how deep and shallow conchs are connected and to look for differences among habitats.

The group discussed how such a study could be funded. Ideally, there should be a region-wide fund to support these activities, perhaps under CITES or FAO. The European Union may be source of funds thorough grants for monitoring and managing fisheries in developing countries. There is also a link to climate change.

### 3.14 Concluding remarks

The participants agreed that the meeting was useful because it allowed comparison of methods between countries. It was useful to learn what other countries do, and this was a good first step toward harmonizing methods used in surveys and stock assessment. It is important for the countries in the region to work together to share expertise. Although each country has different local conditions including conch habitat, how fisheries are conducted, whether the fishery is for export or local use, and resources for surveys and assessment, it is desirable to learn from each other. There is also a need to standardize weight conversions and how survey and assessment results are reported. In a future training, it would be useful to bring data so participants can get hands-on practice using the various methods. The group is interested in continuing to collaborate.

## 4. Recommendations

Based on discussions at the meeting, the working group agreed on the following recommendations.

Recommendations on designing, conducting, analyzing and reporting on surveys:

QC density surveys are used by some countries to determine whether they are meeting CITES density reference points. Thus, the survey design and analysis methods should be consistent with this goal. Countries may need to use different experimental designs based on resources available, geography of fishing grounds, and other considerations. For example, transects at deeper sites must be done more quickly, so a smaller area swept may be appropriate. However, the way results are reported could be standardized. Survey reports should give the following information.

1. What is the total area covered by the survey (e.g. all areas within national waters, areas established as conch fishing zones, areas of known high conch density, spawning grounds?). Is this the appropriate area for calculating densities to compare to the density reference points that nations use in making non-detriment findings as required by CITES (e.g. 100 adult conch/hectare)? The defined area must be adequately covered by the survey (either random, systematic or stratified random).
2. When is the survey conducted, during the spawning season when animals are likely to be concentrated in spawning grounds or outside the spawning season?
3. What are the size/maturity categories and how are they defined? If densities are reported for adult conch, how is maturity determined (flared lip? 10 mm lip? other lip thickness? ).
4. What meat weight conversion factor used to calculate biomass from the survey, for juveniles and adults.
5. How the density calculations are done, including variances.
6. Report habitat data, as well as the distribution of conch densities.

To improve the experimental design and analysis of QC surveys, the following questions can be asked.

1. Does the country have its own measurements of the density of adult conchs needed for spawning to use as the basis of reference points, or is it using the existing reference points? Are these reference points appropriate for local conditions?
2. What is the desired precision the estimates of mean density, and what sample size (number of sites) is needed to achieve this under the current sampling design? There may be a tradeoff between precision (low variance) and accuracy (representative samples) determined by whether many small transects are done or a few larger transects.
3. Could either the precision or the accuracy of the estimates of density be improved by changing the sampling design or the sampling protocol (e.g. size of transects, number of divers, number of passes over the transect)?

### Recommendations on assessment:

Countries may use different methodologies to calculate the total allowable catch (TAC) quota or other fishery management measures based on density surveys, catches and other fishery dependent or fishery independent data. However, countries can use a more standardized system of reporting. They could report:

1. Current harvest rate ( $=\text{Catch}/\text{Biomass}$ ), where biomass refers to biomass of QC that are in the size range caught by the fishery, and both catch and biomass are in the same units (e.g. all 100 percent clean or all “dirty weight”). Harvest rate may or may not be set by the control rule used to manage the fishery, but either way it is useful metric of the intensity of fishing pressure.
2. Current status relative to biomass reference points, including spawning potential ratio, or biomass relative to  $B_{\text{MSY}}$ , or density relative to reference points. Any of these may be the basis of a control rule and/or used as a measure of how depleted the population is relative to unfished levels.

The following should also be considered in assessment.

1. When estimates of current biomass are available (from surveys), it is appropriate to calculate the total allowable catch quota as  $\text{TAC} = \text{HR}_{\text{target}} * \text{Biomass}$ . The  $\text{HR}_{\text{target}}$  can be calculated from life history or from precautionary principles (e.g. Jamaica uses 8 percent). If some other method is used (e.g. the Garcia static MSY estimate from production models) to set the quota, the HR should be calculated to make sure it is not too high.
2. There are many tools available for data limited stock assessment, including those in the DLMtools R library (Carruthers *et al.* 2014, 2016). Which methods are appropriate depends on which data sets are available for conch in each country. Care should be taken to look at the assumptions and data requirements for each method before choosing a method or methods to set quotas. A management strategy evaluation (MSE) could be used to run each proposed management procedure and see which are most robust and effective for a particular fishery. However, this may require adding conch-specific details such as the 2-phase growth curve to the operating model used in the simulations. Conch may also be subject to Allee effect, which should be included in the models.
3. Some countries may have catch and CPUE or density time series which would be useful for fitting production models, perhaps with informative priors for  $r$  (based on life history) and  $K$  (based on estimates of unfished density expanded across the fishing grounds). It is important to make sure that appropriate abundance indices are used, e.g. standardizing for repeated measures if the survey does not go to the same fishing grounds every year. Also, this method is most effective if the catch estimates are accurate. If IUU fishing is substantial, it may be necessary to either add an estimate of IUU to the reported catches, use a method that allows for uncertainty in catch, or use other methods that do not require catch data.
4. Given the 2-phase growth pattern of conch, and the fact that their growth can vary by habitat types (Tewfik *et al.* 2019), length-based methods should be used with caution. Methods such as estimation of total mortality from mean length, length corrected catch curves, and length based spawning potential ratio (LBSPR, Hordyk *et al.* 2016) require accurate growth and natural mortality information, so should only be used with a valid local growth equation. Shell length is informative for juveniles, but lip thickness is more informative for adults. These methods probably should not be applied to adult shell length data.
5. Improving the scientific basis of quota setting is a priority for the region. However, it is important not to make large changes in the existing quotas if science supports a larger quota. An adaptive management program in which the quota is adjusted slightly (a few percent per year) to see what effect this has on abundance would be appropriate.
6. Because conch life history may be affected by habitat and environmental conditions, this should be considered in surveys and assessment. The distribution of density is important, and may change with climate change. Providing maps that visualize spatial distributions of QC

density across each nation's fishing grounds over time is important to understand changes in population dynamics and fisheries.

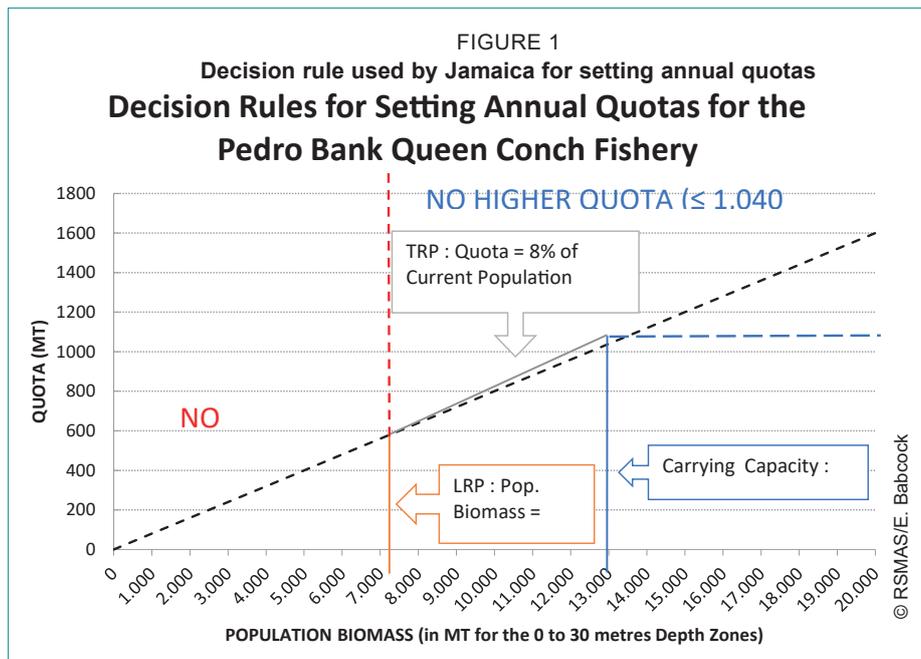
General recommendations:

1. Filling data gaps should be a priority. In particular, there is a need for more information on where spawning grounds are located throughout the QC range, and which areas are sources (i.e. areas that provide larvae to other regions) and sinks (i.e. areas that receive settling larvae from other regions). A regional perspective on conch assessment and management requires this information, since some countries' conch recruitment probably comes from other countries' spawning stocks.
2. There is a need for genetic studies to determine connectivity, and for traceability to help identify the locations and magnitudes of IUU fishing. The group will request guidance from genetics researchers on the appropriate sample sizes and protocol for handling samples so that each country can contribute samples for a regional analysis.
3. There is need to harmonize meat weight conversion factors, including how they are described in landings statistics and in survey biomass calculations.
4. Regular regional bulletins on total catches and status would be useful, using consistent units and terminology.

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## ANNEX 1 AGENDA

WECAFC July 2019

	منظمة الأغذية والزراعة للأمم المتحدة	联合国 粮食及 农业组织	Food and Agriculture Organization of the United Nations	Organisation des Nations Unies pour l'alimentation et l'agriculture	Продовольственная и сельскохозяйственная организация Объединенных Наций	Organización de las Naciones Unidas para la Agricultura y la Alimentación
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<p><b>WESTERN CENTRAL ATLANTIC FISHERY COMMISSION (WECAFC)</b></p> <p><b>Regional Training Workshop on Queen Conch Population Assessment In The Caribbean Region.</b></p> <p><b>Belize City, Belize, 30 July 30 – 1 August 2019</b></p> <p><b>Draft Agenda</b></p>
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<b>Tuesday 30 July 2019</b>		
<b>Time</b>	<b>Activity</b>	<b>Facilitator(s)</b>
8.00–8.30	Registration of Participants	Belize Fisheries Department
8.30–8.45	Welcoming and opening	Belize Fisheries Department
8.45–9.15	The Belize case – QC population assessment	Belize
9.15–9.45	The Jamaica case – QC population assessment	Jamaica
9.45–10.00	Break	
10.00–10.30	The Nicaragua case– QC population assessment	Nicaragua
10.30–11.00	The Colombia case– QC population assessment	Colombia
11.00–11.30	The Bahamas case– QC population assessment	Bahamas
11.30–12.00	Group discussion on case studies	Participants
12.00–14.00	<b>LUNCH</b>	
14.00–14.30	The Honduras case– QC population assessment	Honduras
14.30–15.00	Group analysis on safety, diving, gears & equipment, participation	Nicaragua
15.00–16.00	Approaches used for determination of QC population abundance indices	Elizabeth Babcock
16.00–16.15	<b>BREAK</b>	
16.15–17.45	Approaches used for determination of QC population abundance indices	Elizabeth Babcock

<b>Wednesday 31 July 2019</b>		
8.30–10.30	Group analysis QC survey methods	Elizabeth Babcock
10.30–10.45	<b>BREAK</b>	
10.45–12.00	Group analysis fishery-dependent data analysis methods	Elizabeth Babcock
12.00–14.00	<b>LUNCH</b>	
14.00–16.00	Protocols for estimating QC meat conversion factors	Nicaragua
16.00–16.15	<b>BREAK</b>	
16.45–17.15	Protocols for reproduction studies, genetic connectivity sampling and analysis	Nicaragua
17.15–17.45	Analysis on funding mechanisms	Elizabeth Babcock
<b>Thursday 1 August 2019</b>		
8.30–10.30	Recommendations and agreements for QC surveys	Mauro Gongora/Elizabeth Babcock
10.30–10.45	<b>BREAK</b>	
10.45–12.00	Recommendations and agreements for data analysis	Mauro Gongora/Elizabeth Babcock
12.00–14.00	<b>LUNCH</b>	
14.00–16.00	Recommendations and agreements for use of fishery-dependent data	Mauro Gongora/Elizabeth Babcock
16.00–16.15	<b>BREAK</b>	
16.45–17.00	Workshop evaluation	Elizabeth Babcock
17.15–17.45	Closure	Belize Fisheries Department

**ANNEX 2. LIST OF PARTICIPANTS**

Category	Name	Country	Organization
Expert	Mauro Gongora	Belize	Fisheries Department
Expert	Stephen Smikle	Jamaica	Fisheries Department
Expert	Renaldi Barnutty	Nicaragua	Fisheries Department (INPESCA)
Expert	Manuel Perez	Nicaragua	OSPESCA
Consultant	Elizabeth Babcock	United States of America	UM- RSMAS
Participant	Lester Gittens	Bahamas	Fisheries Department
Participant	Ramon Carcamo	Belize	Fisheries Department
Participant	Myles Phillips	Belize	Wildlife Conservation Society
Participant	Anthony Rojas	Colombia	Fisheries Department
Participant	Jose Julian Suazo Cervantes	Honduras	Fisheries Department
Participant	Anginette Murray	Jamaica	Fisheries Department
Participant	Luis Emilio Velasquez	Nicaragua	Fisheries Department

## APPENDIX F

### (Revised) Terms of reference of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen conch (Period 2019–2021)

#### 1. Scope

The purpose of the Working Group is to support the sustainable management and conservation of Queen conch (*Strombus gigas*) resources and its fisheries in the WECAFC Region. In undertaking its work, the working group will pay due attention to FAO's Code of Conduct for Responsible Fisheries' Article 6.4 of the general principles.

Conservation and management decisions for fisheries should be based on the best scientific evidence available, also taking into account traditional knowledge of the resources and their habitat, relevant regional and international agreements, as well as relevant environmental, economic and social factors. States should assign priority to undertake research and data collection to improve scientific and technical knowledge of fisheries including their interaction with the ecosystem. In recognizing the transboundary nature of many aquatic ecosystems, States should encourage bilateral and multilateral cooperation in research, as appropriate.

#### 2. The goal of the Working Group

Using a multidisciplinary approach, the working group will contribute to the sustainable conservation and management of the Queen conch fisheries and trade. In pursuing this goal, the working group will contribute to the fulfillment of national, regional and international responsibilities and commitments for the management and conservation of and trade in Queen conch and related or interacting species or fisheries in the WECAFC Region under the Code of Conduct for Responsible Fisheries, and in accordance with agreed, documented management goals including ensuring the livelihoods of the people depending on these resources.

In particular, the Working Group will aim to support with technical and scientific advice the implementation of Decisions adopted at the 17th meeting of the Conference of the Parties to CITES on "Regional cooperation and management of and trade in Queen conch (*Strombus gigas*)" (South Africa, 2016), and WECAFC 16 Recommendation (WECAFC/16/2016/1) "on the Regional Plan for the management and conservation of Queen conch in the WECAFC area" (Guadeloupe, 2016) and any relevant decisions that are adopted at the 18th meeting of the Conference of the Parties to CITES and WECAFC 17.

#### 3. Terms of reference (TORs)

Queen conch is a transboundary resource with commercial and economic, as well as ecological, importance for most countries in the Wider Caribbean region. Therefore, these TORs apply at regional and/or national levels as appropriate. The working group, with the support of FAO, WECAFC, CFMC, CITES, CRFM and OSPESCA, will act in an advisory capacity to guide and facilitate the sustainable management and conservation of Queen conch.

#### The Working Group will carry out the following general tasks:

1. compile, analyse and share interdisciplinary available data and information on Queen conch, in thematic areas such as: biology, management of this fishery, socioeconomics and trade, fishing technology, environmental factors, and other relevant areas needed to provide advice for policy and decision-making processes;
2. develop common and modern methodologies for data and information collection for monitoring of Queen conch stocks and promote the involvement of the private sector in data collection;

3. monitor changes in abundance/density of Queen conch stocks and populations in the Caribbean region;
4. review data from the countries and other sources on Queen conch catch and effort and aquaculture production in the range states and monitor changes as appropriate;
5. provide advice on the implementation of national and regional management measures and regulations for Queen conch to countries and regional organizations;
6. establish communication between the members of the working group and interested parties and stakeholders, including the private sector;
7. develop and implement a workplan that will be monitored and evaluated by the WECAFC SAG and Commission;
8. report to CFMC, OSPESCA, WECAFC and CRFM at each of their sessions (on the outcome of each Working Group meeting);
9. further advance and monitor the implementation of the Regional Queen conch Management and Conservation Plan that was adopted by WECAFC 16, CRFM, OSPESCA and CFMC at appropriate levels; and
10. invite selected experts to participate in the Working Group, ensuring that they have the necessary expertise, know-how and experience in areas relevant to the operation of the Working Group and the implementation of these Terms of reference.

### **Mode of operation**

#### 1. Role of WECAFC Member Countries

The members of the Working Group are to play a leading role in the Working Group activities through the following activities and commitments:

- participate in agreed activities of the working group, and ensure the participation of appropriate experts;
- ensure involvement of both CITES and Fisheries Authorities in the work of the Group;
- implement, at the National level, the work identified in the agreed workplan of the Group; and
- host working group meetings on a rotational basis.

#### 2. Role of the FAO/WECAFC Secretariat

FAO Subregional Office for the Caribbean and the WECAFC Secretariat will facilitate and support the activities of the working group by collaborating actively with the partner agencies CFMC, OSPESCA, CRFM and CITES in:

- co-coordinating the activities of the working group (including securing funding for its operation);
- providing a technical secretary;
- providing technical assistance and support to research;
- facilitating training (as appropriate);
- communicate outcomes to WECAFC, CITES, UNEP-SPAW and countries (as appropriate); and
- ensure the participation of appropriate experts and other stakeholders in Working Group Activities.

#### 3. Roles of other Subregional organizations (e.g. CFMC, OSPESCA, CRFM)

Subregional organizations have an important role to play in assisting their Member Countries to participate fully in the activities of the working group by:

1. providing technical assistance and support;
2. facilitating procurement of funding for working group activities;
3. coordination of the activities of the working group; and
4. facilitating the decision-making process at the Subregional level.

## **Role of the convener**

The Convener, in consultation with the Working Group, will:

- formally convene the meetings of the group;
- technically guide the group work and determine subjects to be discussed;
- represent the group in regional and international meetings (as appropriate);
- invite new members and ad hoc experts to participate in working group meeting;
- review and approve publications and messages produced by the working group; and
- take a leading role in securing funding for working group meetings.

## **Communication**

A mechanism for on-going communication among Working Group members (Video conference, Skype and email), is essential to ensure that the work of the group is sustained between meetings. It must include all Working Group members.

The successful functioning of the Working Group also requires that each Member Country of WECAFC and organization/ agency identify a national focal point/expert through which communications will be directed. The outputs of the Working Group will be communicated through Working Group reports to WECAFC, OSPESCA, CFMC, CRFM, CITES, UNEP-SPAW and national fishery and CITES administrations and other relevant entities via the WECAFC Secretariat.

## **Working Group meetings**

The Working Group should meet physically at least once every two years or as needed. The meetings should be of two to five days duration. Meetings should use cost-effective accommodations and institutional facilities and where possible take advantage of other meetings in the region.

## APPENDIX G

### Work plan of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen conch

The QCWG will carry out the following activities in 2019–2021 period:

Activity	Timeframe	Responsible
1. Finalization, publication and dissemination of the Report of the WG meeting in Panama (in hard copies and on-line on <a href="http://www.strombusgigas.com/index.htm">http://www.strombusgigas.com/index.htm</a> and at <a href="http://www.WECAFC.org">www.WECAFC.org</a> ; including the national summary reports)	February 2019	CFMC and FAO with inputs from meeting participants
2. Provide technical and scientific advice to national governments in the region to support the implementation of CITES COP 17 Decisions and WECAFC 16 recommendation WECAFC/16/2016/1 and any relevant decisions that are adopted at the 18th meeting of the Conference of the Parties to CITES and WECAFC 17	January 2019 – December 2021	WG members
3. Report on progress with the implementation of relevant CITES and WECAFC decisions, and the outcomes of the Working Group – at the following: <ul style="list-style-type: none"> <li>• next meeting of the WECAFC Scientific Advisory Group (SAG), November 2018;</li> <li>• 17th session of WECAFC, April/May 2019;</li> <li>• 18th meeting of the Conference of the Parties to CITES, May/June 2019;</li> <li>• 31st meeting of the Animals Committee, January 2020</li> </ul>	In advance of deadlines for reporting required	CITES/Fisheries authorities of QC range States attending these meetings (as appropriate); CITES and WECAFC Secretariats
4. Translate the <i>Regional Queen Conch Fisheries Management and Conservation Plan</i> that was adopted at WECAFC 16 into French and Spanish, disseminate for review, and publish upon completion	January 2019	WECAFC Secretariat
5. Continue increasing awareness and building capacity among fishers on Safety-at-Sea, in particular addressing risk management in compressed air diving for Queen Conch; fisher organizations should be engaged as much as possible for these activities	January 2019 onwards	NOAA Fisheries/CFMC and FAO with the fisheries authorities in the region
6. Continue review and consideration of options for the development of a transparent “chain of custody” procedure to track catches from their catch location to their eventual destination	January 2019 onwards	NOAA Fisheries/CFMC with CITES, WECAFC/FAO and the authorities in the region
7. Further advance and monitor the implementation of the <i>Regional Queen Conch Management and Conservation Plan</i> that was adopted by WECAFC 16, CRFM, OSPESCA and CFMC at appropriate levels	January 2019 onwards	CFMC, WECAFC, and CRFM, OSPESCA and the WG members
8. Encourage countries to implement the <i>Regional Queen Conch Management and Conservation Plan</i> as called for by WECAFC 16	January 2019 – December 2021	CFMC, WECAFC, CRFM, OSPESCA and WG members (national fisheries and CITES authorities)
9. Support national level consultations as needed to discuss Working Group proposed management and conservation measures for building awareness, increasing buy-in and contributing to compliance	January 2019 onwards	WG members (national fisheries and CITES authorities)
10. Support national authorities and fisherfolk organizations to implement the <i>Regional Queen Conch Management and Conservation Plan</i>	January 2019-December2021	WG members (national fisheries and CITES authorities), CRFM, OSPESCA, CITES, CFMC, FAO/WECAFC

Activity	Timeframe	Responsible
<p>11. Operationalize the Scientific and Statistical Sub-Group (SS Sub-group) established in the <i>Regional Queen Conch Management and Conservation Plan</i> that will be responsible for:</p> <ul style="list-style-type: none"> <li>• Identifying countries that lack national conversion factors for Queen conch meat, analyzing available data, assisting with development of national conversion factors for these countries, and reporting back to the Working Group on these factors for their consideration.</li> <li>• Review of existing Queen conch NDFs and guidance in order to develop a simplified template for making non-detriment findings for Queen conch, in consultation with the CITES Animals Committee, dissemination of the template to the Working Group membership for their consideration, and supporting selected countries in applying the templates and sharing the results at the regional level.</li> </ul>	<p>Draft template: November 2018 -March 2019</p> <p>Results and application of template: June 2019 and onwards</p>	<p>CFMC/WECAFC, SS Sub-group membership, CITES</p>
<p>12. The CFMC will hire a consultant to compile existing information and educational resources, with the appropriate authorization and permission, that could be used to meet the objectives of the Working Group</p>	<p>January-December 2019</p>	<p>CFMC/WECAFC Secretariat</p>
<p>13. Consult with the CLME+ project to identify Queen conch fishery needs that can be incorporated into a possible next phase of the CLME+ project and explore potential opportunities for collaboration specifically with respect to contributions to the State of the Marine Environment and Associated Economies (SOMEE) reporting mechanism and the Strategic Action Program Monitoring and Evaluation framework</p>	<p>November 2018 – December 2019</p>	<p>CFMC, the WECAFC Secretariat too and/or the relevant sub-regional partners (CRFM, OSPESCA)</p>

The fifth meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen conch (QCWG), held in a hybrid format, was attended by nine WECAFC members and nine partner organizations. These were officers of national institutions, entities and authorities responsible for implementation of policy, legal, and operational aspects of fisheries management and/or implementation of the Regional Queen Conch Fisheries Management and Conservation Plan in the WECAFC region. The meeting was hosted in San Juan, Puerto Rico from 13 to 14 December 2021, with most attendees participating remotely. Discussions focused on the progress made towards implementation of the Regional Queen Conch Fisheries Management and Conservation Plan and recommendations adopted at the 17th meeting of the Commission in 2019. Participants learned about collaborative work on Queen conch, especially at the regional level, and an overview of the intersessional activities undertaken. Discussions focused on the progress made towards implementation of the plan and recommendations adopted at the 17th meeting of the Commission in 2019. Participants learned about collaborative work on Queen conch, especially at the regional level, and an overview of the intersessional activities undertaken, discussed advancements and challenges towards decent work in the fisheries sector, the status of the health and safety in diving for Queen conch harvesting in the WECAFC region, a new workplan for 2021–2024, considered the working group’s inputs to the 2022–2027 strategic plan of WECAFC, and the process for development

ISBN 978-92-5-137771-0 ISSN 2070-6987



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CC5094EN/1/04.23