

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA



Thirty-third meeting of the Animals Committee
Geneva (Switzerland), 12 – 19 July 2024

Species conservation and trade

Aquatic species

QUEEN CONCH (*STROMBUS GIGAS*)

1. This document has been prepared by the Secretariat.
2. At its 19th meeting (CoP19; Panama City, 2022), the Conference of the Parties adopted Decisions 19.233 to 19.236 on *Queen conch* (*Strombus gigas*), as follows:

Directed to Range States of Strombus gigas

19.233 *The range States of Strombus gigas are encouraged to:*

- a) *collaborate to implement the Regional Queen Conch Fisheries Management and Conservation Plan, and develop national Queen Conch Fisheries Management and Conservation Plans, as appropriate;*
- b) *continue to collect data on weight of S. gigas by processing grade in order to update and improve the regional conversion factors, and establish or update national conversion factors, taking into account the spatial variability and characteristics of the species;*
- c) *collaborate in developing and implementing joint research programmes at the sub- regional or regional level to support the making of non-detriment findings that take into account all fishing mortality, promote relevant research and capacity-building activities through regional fisheries management entities and mobilize financial resources for data collection;*
- d) *promote and collaborate in developing and implementing public education and awareness programmes regarding the conservation and sustainable use of S. gigas;*
- e) *continue to collaborate in exploring ways to enhance the traceability of specimens of S. gigas in international trade, including, but not limited to, catch certificates, labelling systems and the application of genetic techniques, and consider sharing relevant experiences with the Secretariat, Parties and the Standing Committee, as appropriate, in the context of discussions on traceability systems for trade in CITES-listed species;*
- f) *collaborate on combatting illegal, unreported and unregulated (IUU) fishing activity;*
- g) *share relevant experiences on traceability systems for specimens of Strombus gigas;*
- h) *share information concerning illegal trade in queen conch, including surveillance and enforcement activities, as appropriate; and*
- i) *provide progress reports on activities a) to h) to the CFMC/OSPESCA/WECAFC/CFRM/CITES working group on queen conch.*

Directed to the Secretariat

19.234 *The Secretariat shall continue to collaborate with the Food and Agriculture Organization of the United Nations (FAO), the CFMC/OSPESCA/WECAFC/CRFM/CITES working group on queen conch, WECAFC, UNCTAD, OECS and other relevant international organizations, and, subject to external funding:*

- a) *provide assistance to range States of *S. gigas* in order to enhance the capacity of their CITES Management and Scientific Authorities, fisheries authorities and other stakeholders to implement the Regional Queen Conch Fisheries Management and Conservation Plan and national management plans and make scientifically robust non-detriment findings;*
- b) *provide assistance to range States of *S. gigas* on relevant enforcement issues and report new developments in this regard to the Standing Committee, as appropriate.*
- c) *monitor the development of traceability systems for queen conch and report relevant developments to the Standing Committee, as appropriate; and*
- d) *provide updates on relevant activities of the CFMC/OSPESCA/WECAFC/CRFM/CITES working group on queen conch to the Animals Committee and the Standing Committee, as appropriate.*

Directed to the Animals Committee

19.235 *The Animals Committee shall consider any reports from the Secretariat under Decision 19.234, paragraph c), and any other relevant available information and make recommendations for the conservation and management of queen conch for consideration by the Standing Committee, as appropriate.*

Directed to the Standing Committee

19.236 *The Standing Committee shall consider any reports from the Secretariat under Decision 19.234, paragraph c), and any recommendations coming from the Animals Committee and make its own recommendations to the Parties and to the Conference of the Parties to improve implementation of the Convention for queen conch, as appropriate.*

Implementation of Decisions 19.233 and 19.234

3. The Secretariat reported in document [AC32 Doc. 39](#) that it took the opportunity provided by meetings of the CFMC¹ /OSPESCA² /WECAFC³ /CRFM⁴ / CITES Working Group on Queen Conch (QCWG) to collect information on the implementation of Decision 19.233 to allow it to report under paragraph d) of Decision 19.234.
4. As reported to AC32, the sixth meeting of the QCWG was held in San Juan, Puerto Rico on 16 March 2023. Several range States and regional partner organizations participated, including Bahamas, Belize, Jamaica, Panama, the European Union, France (on behalf of Guadeloupe and Martinique), Honduras, Nicaragua, Saint Lucia, the United States of America, WECAFC, CRFM, CFMC and OSPESCA. The CITES Secretariat participated in the meeting remotely. Details relating to the objectives of the meeting and a summary of the discussions were reported to AC32 (see document AC32 Doc. 39). An [advance draft copy of the report](#) from the sixth meeting was made available at the 19th session of the Western Central Atlantic Fishery Commission (WECAFC 19) held in September 2023.
5. The 19th session of the WECAFC Commission endorsed an amended Recommendation WECAFC/XVIII/2022/3 on *Increased Efforts In The Implementation Of The Regional Queen Conch Fisheries*

¹ Caribbean Regional Fisheries Mechanism

² Central American Fisheries and Aquaculture Organization

³ Western Central Atlantic Fishery Commission

⁴ Caribbean Fishery Management Council

Management And Conservation Plan In The WECAFC Region, which is presented in Annex 1 to the present document.

6. The Regional Queen Conch Fisheries Management and Conservation Plan has been endorsed by all range States, but there has been limited progress in terms of its implementation. As a result, many of the activities outlined in Decision 19.233 to 19.236 are either ongoing or remain to be implemented. The Secretariat is of the view that it is important that this work continues and that the Animals Committee and the Conference of the Parties continue to monitor its progress.

Queen conch NDF project

7. Thanks to funding from the United States of America , the Secretariat collaborated with the Gulf and Caribbean Fisheries Institute (GCFI) to develop simplified NDF guidance for queen conch. This guidance was developed following an intense consultation process that included a range of Queen conch Scientific and Statistical Technical Advisory Group (SSTAG) experts, other independent experts, the CITES Secretariat and representatives from seven countries (Bahamas, Belize, Honduras, Jamaica, Grenada, Nicaragua and St. Vincent and the Grenadines) that are, have been, or are preparing to start exporting products of this species.
8. The development of the draft simplified NDF guidance for queen conch would not have been possible without the sustained collaboration and dialogue between the development team and the representatives of the CITES Authorities from the participating countries involved in exporting queen conch. These interactions led to the development of a robust document in terms of how to assess conch resources and exports from the scientific perspective and how to interpret and apply this guidance from the perspective of the range States extending over various areas of expertise, from fisheries officers to environmental ministries/secretariats and independent consultants.
9. Two hypothetical case studies on queen conch were conducted to test the process and were presented at the CITES NDF international expert workshop in December 2023.
10. The current final draft guidance is available in English and Spanish; it comprises a descriptive guidance document (see Annex 2) and an associated Excel file (Annex 3) to facilitate the determination of a positive, negative, or conditional NDF.
11. With further funding from the United States of America, the Secretariat intends to conduct online training workshops (in English and Spanish) for all queen conch range States on the application of the NDF guidance. Range States will be invited to test the guidance in the field and provide feedback on its usefulness and any challenges faced, so that a final workshop can be held to discuss the findings and suggest possible improvements to the guidance. The Secretariat has funding available to provide targeted support to a limited number of range States to test the NDF guidance. A Notification to the Parties will be issued inviting range States to indicate their interest in receiving targeted support. Priority will be given to range States that are trading or intend to trade in queen conch.

Queen conch genetics project

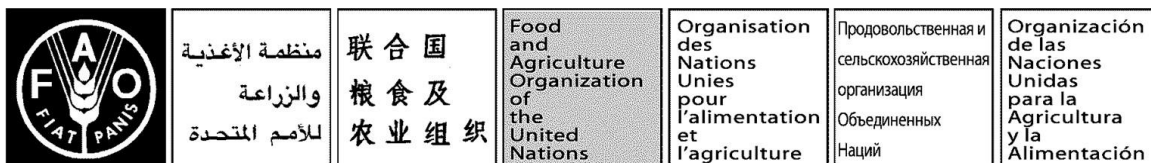
12. Concerning paragraph b) of Decision 19.234, the Secretariat reported to the Animals Committee in document [AC32 Doc. 39](#) on a project involving the University of Rhode Island and the Gulf and Caribbean Fisheries Institute (GCFI) that will through a pilot phase test genetic variation as a way to identify illegal, unreported and unregulated (IUU) fishing with steps geared towards:
 - a) identifying genetic discontinuities across populations/stocks in different islands or nations;
 - b) finding the molecular markers that allow distinction of the different populations/stocks; and
 - c) developing a molecular assay that uses the molecular markers to identify product caught by IUU fishing.
13. The objective of this work is to use the new genetic approaches [RadSeq] to understand and quantify genetic variation across the Caribbean using samples collected by collaborating nations/islands. It will identify and clarify the geographic and genetic limits of the various stocks distributed across the Caribbean. Genetic markers associated with differences among the different stocks will then be selected and validated and a protocol designed to identify and trace illegal queen conch.

14. This approach has been supported by the CFMC/OSPESCA/WECAFC/CRFM/CITES Queen Conch Working Group. Through this pilot phase, which is partly funded by the Netherlands through the CITES Secretariat, the connectivity among conch populations using high-resolution genetic data is being explored, thereby identifying the unique genetic profile of each population. Importantly, this approach will provide the baseline information to trace the international trade in queen conch products, thus identifying those originating from IUU activities.
15. The Secretariat issued Notification to the Parties [No. 2023/123](#) on 2 November 2023 inviting range States of queen conch to participate in this genetic project through the provision of sample material.
16. A progress report from the pilot phase of this project, which was completed in December 2023, is presented in Annex 4 to the present document. It is expected that the second phase of the project will include the following outputs:
 - a) The development of a detailed catalogue of all the species' genetic variation across all sampled locations. It is understood that the genetic information generated will be uploaded into a server supporting broader scientific work, following standard protocols, after authorization of the participating countries.
 - b) The development of a catalogue of all critical Single Nucleotide Polymorphisms (SNPs) to identify samples from different stocks. This catalogue will be used to generate an SNP chip array for easy genotyping to identify IUU fishing.
 - c) A workshop with all participating nations explaining the main results, issues identified during the project, and how to implement the results in the identification of IUU fishing.
 - d) The preparation of a final technical report including the fine-scale population structure derived from different stocks present across the participating nations, the levels of genetic diversity in the population, and the SNPs identified that contribute most to the geographic population differentiation of each stock. The report will be prepared using plain language that will make it easier for the public to understand.
17. It is estimated that the next phase of the project will take about 2 years and will require funding estimated at approximately USD 250,000. This work could contribute to Decisions 19.233 paragraphs e) and f) and to provide assistance to range States in terms of Decision 19.234 paragraph b). The Secretariat has secured a limited amount of funding through the United States of America to contribute towards the next phase of this important project.

Recommendations

18. The Animals Committee is invited to:
 - a) note this report; and
 - b) propose the renewal of Decisions 19.233 to 19.236 on *Queen conch* (*Strombus gigas*) to the 20th meeting of the Conference of the Parties.

AMENDED RECOMMENDATION WECAFC/XVIII/2022/3 ON:
INCREASED EFFORTS IN THE IMPLEMENTATION OF THE REGIONAL QUEEN CONCH FISHERIES
MANAGEMENT AND CONSERVATION PLAN IN THE WECAFC REGION



WESTERN CENTRAL ATLANTIC FISHERY COMMISSION (WECAFC)

**Endorsed Amended Recommendation WECAFC/XVIII/2022/3 On Increased Efforts
In The Implementation Of The Regional Queen Conch Fisheries Management And
Conservation Plan In The WECAFC Region**

Cover note

“Managing queen conch fisheries presents a broad range of challenges, including the complex biology of the species, uncertainty of catch and effort data, illegal trade, weak surveillance and enforcement mechanisms, unsustainable fishing practices, and even the frequency of severe dive accidents impacting on the quality of life and living conditions of entire towns. Problems in the fishery are dynamic, adding to the complexity of the issues which fishery sector managers have to face and for which they typically do not have enough human, technical and/or financial resources^[1].” “Queen Conch fisheries are believed to be fully developed in most areas, and that the alleged increase in levels of illegal fishing often occurs due to a lack of knowledge, awareness and enforcement^[2].”

The need for coordinated management of the queen conch has long been recognized by fisheries scientists and managers in the Wider Caribbean region. The Regional Queen Conch Fisheries Management and Conservation Plan provides a set of management measures that can be applied at the regional or sub-regional level for the sustainability of queen conch populations, the maintenance of a healthy fishery and the sustenance of fishers and fishers’ communities. As the Plan is progressively implemented, improvement in the long-term governance of queen conch fisheries across the Caribbean is expected, as stated in strategy 4B of the Strategic Action Plan (SAP) of the “Sustainable Management of the Shared Marine Resources of the Caribbean Large Marine Ecosystem (CLME) and Adjacent Regions.”

The 14 management measures recommended in the Regional Queen Conch Fisheries Management and Conservation Plan were analyzed by experts participating in the Second Meeting of the WECAFC/CFMC/OSPESCA/CRFM Working Group, held in Panama from 18 to 20 November 2014.

^[1] Prada, M. C.; Appeldoorn, R. S.; Van Eijs, S. & Pérez, M. M. 2017. Regional Queen Conch Fisheries Management and Conservation Plan. FAO Fisheries and Aquaculture Technical Paper No. 610. Rome, FAO. 70 pp.

^[2] Theile, S. 2005. Status of the queen conch, *Strombus gigas* stocks, management and trade in the Caribbean: A CITES review. Proc. Annu. Gulf Caribb. Fish. Inst., 56: 675–694

Implementation status of the 14 management measures have been discussed at the Third and Fourth meetings of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on queen conch respectively held in 2018 and 2019. In general, Member States have made improvements in the management of their queen conch fisheries at the national level through implementation of the measures. However, given the differences in scales, gear types, products, markets and geographic locations of Member States, harmonization of management measures at the regional level has not occurred yet. The degree of implementation of the Regional Queen Conch Fisheries Management and Conservation Plan was preliminarily evaluated using quantitative values collected in 2019-2020, and the Queen Conch Working Group found that some progress was made.

To help address the issue of illegal, unreported, and unregulated (IUU) fishing, it is important to note the management measure for traceability of queen conch throughout the value chain identified in the Regional Queen Conch Fisheries Management and Conservation Plan. Traceability can be advantageous by helping to ensure that seafood caught by legal versus illegal fishing practices can be distinguished, allowing legally harvested products to fetch higher prices^[3]. This management measure is also aligned with the objectives of the Regional Plan of Action to Prevent, Deter and Eliminate IUU Fishing in WECAFC Member Countries (RPOA-IUU) (2019-2029). These objectives aim to prevent, deter and eliminate IUU fishing in the area of competence of the WECAFC through effective information-sharing and regional cooperation; and contribute to promoting the effective conservation, management and development of the living marine resources in the WECAFC area, in accordance with the FAO Code of Conduct for Responsible Fisheries.

The Fifth meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen Conch was held during 13-14 December 2021 convened in-person in Puerto Rico and virtually. The purposes of the meeting were to continue monitoring the implementation of the Regional Queen Conch Fisheries Management and Conservation Plan, and to discuss implementation of the Recommendations developed by the Working Group and the Scientific, Statistical and Technical Advisory Group (SSTAG), as well as other items for collaboration called for in the Terms of Reference for the Working Group. Meeting participants also discussed progress on Improved Compliance with Trade Measures for Queen Conch and Recommendation WECAFC/XVII/2019/13 on Queen Conch Conversion Factor adopted at WECAFC17, as called for in the Work Plan for 2019 – 2021 and the implementation of Recommendation WECAFC/XVII/2019/12. An updated Work Plan for 2021-2024 was also developed. The Fifth Meeting of the Working Group agreed that any gaps in implementation of the management measures in the Regional Queen Conch Fisheries Management and Conservation Plan should be addressed, and continued monitoring of the implementation status was required. There was also discussion about the ongoing issue of IUU fishing and the possibility of using genetic techniques to determine the origin of Queen Conch products. The Fifth meeting agreed that the Queen Conch Working Group should liaise with the IUU Working Group to develop a joint recommendation to address IUU fishing in queen conch fisheries in the region.

The Sixth meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen Conch was held on March 16, 2023 in Puerto Rico and online. The purposes of the meeting were to monitor the implementation of the various queen conch recommendations and resolutions, and continue monitoring implementation of the Regional Queen Conch Fisheries Management and Conservation Plan. The progress of activities as called for in the Work Plan for 2022 – 2024 were discussed and some additional activities were added. A review of the CITES CoP19 decisions and recommendations was also provided. COP Decision 19.233 calls for Range States to provide progress reports on activities to the CFMC/OSPESCA/WECAFC/CFRM/CITES working group on queen conch. This led to an amendment in the Working Group Recommendation.

^[3] Prada, M. C.; Appeldoorn, R. S.; Van Eijs, S. & Pérez, M. M. 2017. *Regional Queen Conch Fisheries Management and Conservation Plan*. FAO Fisheries and Aquaculture Technical Paper No. 610. Rome, FAO. 70 pp

It is expected that additional human, technical and financial resources will be required by the Members and the WECAFC Secretariat in order to continue supporting the implementation of the management measures outlined in the Regional Queen Conch Fisheries Management and Conservation Plan.

Failing to approve this amended recommendation will undermine the sustainable management and conservation of the queen conch resource and hinder the development of genetic tools to help combat IUU fishing in the queen conch fisheries.

Action items

1. Continued support for implementation of the QC regional management and conservation plan

The Western Central Atlantic Fishery Commission (WECAFC),

RECALLING that the objective of the Commission is to promote the effective conservation, management and development of the living marine resources within the area of competence of the Commission, in accordance with the FAO Code of Conduct for Responsible Fisheries, the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication and to address common problems of fisheries management and development faced by members of the Commission;

RECALLING the establishment of the WECAFC Working Group on Queen Conch by WECAFC 14 in 2012;

REAFFIRMING the commitments made by Queen Conch Range States at the sixteenth meeting of the Conference of the Parties to CITES (CoP16, Bangkok, 3–14 March 2013) to implement the Decisions on “Regional cooperation on the management of and trade in the Queen Conch (*Strombus gigas*)” agreed at CoP16;

FURTHER REAFFIRMING Recommendation WECAFC/16/2016/1 and the Decisions 17.285–17.290 related to queen conch adopted at 17th Conference of the Parties to CITES (CoP17, Johannesburg, 24 September–4 October 2016) (see FAO Technical Paper No. 610), calling upon WECAFC members to implement the Regional Queen Conch Fisheries Management and Conservation Plan;

COGNIZANT of the fact that National CITES Management Authorities are required to make a “Legal Acquisition Finding” before issuing an export permit for queen conch and noting that a resolution on guidance to CITES Parties for making Legal Acquisition Findings was adopted at CoP18 (Geneva, Switzerland 17–28 August 2019).

ALSO COGNIZANT of COP 19.233 Decision directed to Range States of *Strombus gigas* which calls for Range States to provide progress reports on activities to the CFMC/OSPESCA/WECAFC/CFRM/CITES working group on queen conch;

RECALLING the outcomes of the Third and Fourth meetings of the CFMC/OSPESCA/WECAFC/CFRM/CITES Working Group on Queen Conch, respectively held in Panama, 30th October- 1st November 2018 (with support from the European Union, NOAA Fisheries and FAO); and in San Juan, Puerto Rico, from 16 to 17 December 2019 (with support from NOAA Fisheries and FAO_ that);

RECALLING that the Commission adopted Recommendation WECAFC/16/2016/1 “on the regional plan for the management and conservation of Queen conch in the WECAFC area – addendum to recommendation WECAFC/15/2014/3 on the management and conservation of queen conch in the WECAFC area; and Recommendations WECAFC/17/2019/12 on improved compliance with trade measures for Queen Conch and WECAFC/17/2019/13 on Queen Conch conversion factor.

NOTING with concern the limited implementation of the conservation and management plan for QC to date and that some WECAFC Members are facing significant challenges in implementing the plan.

NOTING the Regional Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated (IUU) Fishing in WECAFC Member Countries (2019-2029) which was developed by the Joint WECAFC/CRFM/OSPESCA Regional Working Group on IUU (RWG-IUU) Fishing and endorsed at the 17th Session of the Commission;

RECALLING that the RPOA-IUU Fishing sets out 28 measures and actions to prevent, deter and eliminate IUU fishing in the Wider Caribbean Region and to fulfil the WECAFC Members' obligations in the capacities as port, flag, coastal and market State under the aspects of Policy and legal framework, MCS and operations, Regional information-sharing and cooperation Capacity development;

ADOPTS in conformity with the provision of Article 6 (h) of the Revised Statutes of the WECAFC the RECOMMENDATION that:

Given the importance of evaluating the degree of implementation of the Regional Queen Conch Fisheries Management and Conservation Plan, the qualitative values collected in 2019-2020 should be updated with additional data from all countries in the Wider Caribbean participating in the queen conch fishery using the information presented at the 2021 Working Group meeting. The update on the implementation status should be completed by April 2024 and a progress report provided to the CITES Secretariat. Monitoring the plan's implementation should be done on an annual basis to increase communication, coordination, and planning towards the application of ecosystem-based approaches to fisheries of this valuable resource.

Genetic work utilizing the Single Nucleotide Polymorphisms (SNPs) technique or other similarly advanced genetic techniques should be considered in order to develop appropriate and validated genetic markers. The SNPs technique has the potential to identify spatial distribution of the species, and thus would provide useful information for queen conch connectivity and traceability. This scientific work could help determine if queen conch in trade has been illegally harvested and support the development of Legal Acquisition Findings, which are required for the export of queen conch under CITES. The SNPs technique also has the potential to map the genes and provide information about population genetic structure and thus allow for identification of spatial variability (or distribution) of the species.

WECAFC Members are strongly encouraged to participate in the development of this genetic work. In order for the genetic work to be statistically robust, at least 15 countries would be required to provide genetic samples of queen conch.

The Queen Conch Scientific, Statistical and Technical and Advisory Sub-group (SSTAG) should liaise with the Regional Working Group on IUU Fishing to further strengthen activities to counteract IUU fishing of queen conch and advance implementation of the 28 measures and actions identified in the RPOA-IUU fishing.

**CITES Non-detriment Findings guidance
for Queen Conch**

**A ten-step process to support CITES Scientific Authorities
making science-based non-detriment findings (NDFs)
for queen conch, a species listed in CITES Appendix II**

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Prepared under contract for the CITES Secretariat by the Gulf and Caribbean Fisheries Institute

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The *CITES Non-Detriment Findings Guidance for queen conch* is freely available at www.cites.org.

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This guidance has been developed by the CITES Secretariat in response to Decisions at the 18th and 19th meetings of the CITES Conference of the Parties (Geneva, 2018 and Panama, 2022).

The Secretariat thanks the GCFI staff and contributors from the Scientific and Statistical Technical Advisory Group (SSTAG) of the CFMC⁵ /OSPESCA⁶ /WECAFC⁷ /CRFM⁸ / CITES Working Group on Queen Conch (QCWG) and the queen conch range States, who facilitated this work.

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⁵ Caribbean Regional Fisheries Mechanism

⁶ Central American Fisheries and Aquaculture Organization

⁷ Western Central Atlantic Fishery Commission

⁸ Caribbean Fishery Management Council

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CITES NON-DETRIMENT FINDINGS FOR QUEEN CONCH

INTRODUCTION

The queen conch (*Aliger gigas*, *Lobatus gigas*, *Strombus gigas*) is a large marine gastropod endemic to the Caribbean Sea. The species has been subjected to intense fishing pressure, particularly during the last four decades, and as such it is considered one of major bio-ecological, cultural, and economic value. Live animals, meat, shells, operculum, pearls, and other parts and derivatives are commodities highly appreciated in the national and international markets.

The queen conch fishery is considered one of the most valued fisheries in the Wider Caribbean region, with the white conch meat being its most traded product. Queen conch are most often pursued by diving with compressed air (scuba or hooka). The fishery ranges from small-scale artisanal fishers to large-scale industrial vessels carrying up to 100 divers. In some cases the fishery is mixed, with artisanal fishers serving industrial vessels, or with both scales operating but often in different areas or serving different markets. Due to this diversity, managers face tremendous challenges in estimating the total production of conch products. Available databases are incomplete and/or incomparable. A significant problem is that many countries lack and/or do not apply fishery-specific conversion factors to relate the volume of all conch products to a uniform measure, such as number of individuals captured. With numerous and widespread landing places from the small-scale fisheries, national queen conch consumption often is neither monitored nor included in catch statistics. The subsistence and locally marketed catch can be highly significant, thus reiterating the importance of considering both industrial and artisanal fishing operations.

With its listing in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II in 1992, exports of all queen conch specimens became the first large-scale fisheries species to be regulated by this convention. Within the natural geographic range of the queen conch, only Anguilla, Haiti, and Turks and Caicos are non-CITES Parties/territories.

The CITES database indicates that in 2020, approximately 1.6 million of kilograms of queen conch meat fillets (of unknown degree of processing grade) were traded internationally, a significant increase compared to that of 1993 (0.3 million kilograms). With the current value of these fillets estimated at around US \$26/kg, the total value of this trade is quite significant. Additionally, also traded internationally in 2020 were approximately 257,000 conch shells (US \$5-50 each) and more than 2,000 conch pearls (US \$1,000-10,000/pearl). Given queen conch's listing by CITES listing and the economic level of this trade, the sustainability of queen conch populations supporting this trade requires attention equal in scale.

Under the provisions of the Convention, international trade is allowed, but regulated. It requires that the CITES Management Authority⁹ of an exporting State issue an export certificate. This certificate first requires a Legal Acquisition Finding (LAF) granted by the Management Authority, indicating they concluded that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora. Then, the Party's Scientific Authority¹⁰ must grant a positive Non-Detriment Finding (NDF), indicating that exports are not detrimental to the survival of the species. These conditions are laid down in [Article IV of the Convention](#).

Through NDFs, CITES Scientific Authorities evaluate the risks and uncertainties relative to the long-term sustainability of the species' wild populations, including the maintenance of its role in the ecosystem, based on the best technical and scientific information. For this, it is the responsibility of the within-country CITES Scientific Authority (responsible for stock assessments, annual non-detrimental quota definitions and interpretation of exploitation status) to have the expertise/capacity to understand stock assessment methods and the statistical validity of data available and that is required by the methods, the uncertainties surrounding

⁹ CITES [Management authority](#) is responsible for: (a) grant permits and certificates under the terms of the Convention; (b) communicate with the CITES Secretariat and other Parties; (c) determine the applicability of exemptions; (d) responsibility for confiscated live specimens; (e) consult the CITES Scientific Authority before issuing an export permit for specimens of species in Appendices I & II, among other responsibilities.

¹⁰ CITES [Scientific authority](#) is responsible for advising the Management Authority whether export of specimens would be detrimental to the survival of the species in the wild and advises the Management Authority on other scientific matters.

this information, and thus its sufficiency for the purposes of NDF determination, as well as identifying crucial knowledge gaps needing to be filled or updated as the fishery evolves, which may include the development of new products using queen conch parts. Frequently, however, many of these functions are provided by the local fisheries authority, which then makes recommendations to the CITES Scientific Authority. In these situations, the latter is still responsible for reviewing, understanding, and analyzing any recommendations made to it before advising the CITES Management Authority regarding the level and suitability of exports.

As information improves, the quality of the NDF assessments should also improve. The production of NDFs is supposed to be a dynamic, adaptive process that confronts the limited capacities a Party faces when identifying population trends, thresholds and establishing mitigation risks. An NDF must promote the introduction and application of a precautionary approach relative to the risks of growth and recruitment overfishing and non-fishery factors also affecting production, such as habitat loss or climate change.

CITES organized a dedicated [international expert workshop on NDFs](#) (Cancun, 2008) to analyze the process, strengths, difficulties, and challenges authorities faced when making a NDF. A case study of the [queen conch NDF developed by Colombia](#) was presented, as part of the section on aquatic invertebrates. Recommendations from the workshop identified many unresolved challenges. As a consequence, at CITES CoP 17 (Johannesburg, 2016), Parties recommended increasing the collaboration in developing and implementing joint research programs at subregional or regional level to support the making of [NDFs in CITES-listed species](#), including the queen conch. At the same time, the CITES Secretariat was recommended to enhance the capacity of their CITES Management and Scientific Authorities, fisheries authorities, and other stakeholders to implement the Regional Queen Conch Fisheries Management and Conservation Plan and apply the NDF guidance. NDFs can be done for different purposes, for instance scientific (S), commercial (T), medical (M), educational (E) uses, among other codes recognized by CITES.

Following CITES [Decision 17.285](#) and the Western Central Atlantic Fishery Commission (WECAFC) [recommendation at its 16th meeting](#) (Guadeloupe, 2016), the WECAFC Secretariat agreed to work collaboratively on the following four topics: (a) support implementation of national queen conch fisheries management and conservation plans developed in 2016 and 2017; (b) provide simplified guidance in making non-detriment findings (NDFs) for trade in queen conch; (c) confirm that the regionally adopted conversion factors for meat processing are used, or alternatively (and preferably), that national level conversion factors are used; and (d) quantify queen conch production and trade statistics for 2015 and 2016, preferably in nominal weight (live weight).

The need to strengthen CITES Scientific Authorities regarding the making of non-detriment findings for trade, and on any other technical matters continues to be relevant for queen conch, as consigned at the [CITES CoP 19 Doc.77](#), Decision 19.BB. This decision invited Parties to continue working on the above four topics, while expanding the call to include developing public education and awareness programs, enhancing the traceability of queen conch specimens in international trade, and collaborating on combatting illegal, unreported and unregulated (IUU) fishing. The success in these efforts to overcome the variety of complex challenges associated with this fishery requires the effective involvement of multiple stakeholders at the national level and among the Standing Committee /Animals Committee and the CITES Secretariat.

While there is no standard model or format when making an NDF, CITES provides concepts and non-binding guiding principles to the scientific authority for the preparation of NDFs ([Res. Conf.16.7](#)), highlighting how the core elements of any NDF need to consider how data requirements should be proportionate to the vulnerability of the species concerned, as well as the importance of adaptive management, including monitoring. The CITES Secretariat recently compiled the majority of the NDF guidance documentation on the dedicated [CITES NDF webpage and associated database](#).

The construction of a collaborative NDF simplified guidance for queen conch was initiated back in 2014, at the [second meeting of the CFMC/OSPESCA/WECAFC/CRFM Working Group on Queen Conch \(Panama, 2014\)](#). A proposal for making simplified NDF guidance was presented by Mr. Van Eijs, based on a shortened table, which included a limited number of key variables and indicators that could serve as a basis for quick assessments. The proposal contained up of 10 information categories, divided into 57 subcategories to make the complex queen conch ecology more accessible. Although the subcategories closely follow the checklist of the International Union for Conservation of Nature (IUCN), they were extended to be more in line with those issues that have, directly or indirectly, a bearing on the sustainable exploitation of queen conch as a

commercial resource. The experts at the meeting recommended that, in the absence of data, the precautionary approach had to be applied, and that the lack of information is not a justification to continue fishing.

This document was considered as a guideline and one of the tools available to provide inputs to an adaptive management plan. However, it was never formally adopted, remains unpublished, and has not been widely used. Thus, CITES Parties continue to demand support in making simplified NDFs for queen conch.

In response to those claims, the CITES Secretariat continues to search for support for Parties in the process of making simplified NDF guidelines in queen conch commercial fisheries through consultations with experts and Range States. For that, the CITES Secretariat has signed the Small-Scale Funding Agreement (S1-32QTL-000033 US-NOAA 2020) with the Gulf and Caribbean Fisheries Institute ([GCFI](#)). A key goal in this was to secure the participation of representatives from the Scientific, Statistical and Technical Advisory Group (SSTAG) of the CFMC/OSPESCA/WECAFC/CRFM/CITES working group on queen conch (QCWG). The CITES Secretariat is directed to collaborate with the QCWG and its SSTAG under [Decision 19.234](#).

This document presents for queen conch products an approach or guidance to NDF determination that could be considered simple in that it leads CITES Scientific Authorities through a standard process consisting of discrete steps that are each approached through a series of short questions. This format was closely modeled after the existing NDF simplified guidance for timber (version 3.0 of the CITES [Non-detriment Findings for Timber](#) – Guidance for EU-member States). That nine-step process went through an extensive, multiyear development and review process aimed at generating a standardized mechanism to record and process the information required and available to a CITES Scientific Authority in order to make an adequate NDF. For queen conch, the current product is the result of a collective effort that integrated the knowledge and experience of a group of well-recognized queen conch experts and managers as well as a group of fisheries officers of the region's main exporters, including Nicaragua, Honduras, Jamaica, and Belize.

The result of this effort is a 10-step plan consisting of two documents. The first is the guidance manual, which gives a short overview of the role of the species in the environment, the effect of queen conch's complex biology on the assessment process, and potential sources of information useful for these assessments. For each step, the guide introduces a rationale to better understand the concept, proposes key underlying questions to be addressed, and presents a potential list of indicators (with explanations) for the CITES Scientific Authority to consider in making its analysis and decisions. For each indicator, three levels of risks/concerns (low, medium, or high) are presented and defined. The second document consists of 10 spreadsheets (1/Step) that facilitate the evaluation of risks and concerns concerning queen conch biology, harvest and trade, as well as their potential mitigation through management. These spreadsheets consist of boxes that can be simply filled in and evaluated for quality of information.

This Guidance is not intended to automatically generate the NDF-decision of a Scientific Authority. It provides a standardized mechanism to record and process the information required and available to make an assessment. It is this approach that is considered to be simplified. However, it must be remembered that the assessment of any marine population, and that of the queen conch in particular, is not simple due to the high demand for information, which is not always available. Thus, throughout this process it must be recognized that the less information available relative to the fishery and the queen conch resource, the greater the degree of uncertainty and the greater degree precaution required. Nevertheless, the approach is adaptive in that management can identify key gaps needing improvement to reduce uncertainties in future assessments.

QUEEN CONCH ASSESSMENT PREREQUISITES

In preparing a NDF assessment for queen conch, it is important to understand some unique aspects of queen conch biology, but also to understand the nature of queen conch fisheries in order to appreciate how information can be obtained and how useful it can be, both during the assessment and in identifying gaps that may need to be filled in future assessments.

Role of Queen Conch in the Environment

Article IV Paragraph 3 of the CITES Convention text states that in making an NDF, a key element is "that the export of specimens of any such species should be limited in order to maintain that species throughout its

range at a level *consistent with its role in the ecosystems in which it occurs*". An NDF pertains to the definition of perceived risks that export of specimens may not achieve the nondetrimental condition stated in Article IV Paragraph 3 of the Convention. Thus, it is not sufficient that a level of sustainable harvest for queen conch can be achieved, but that its ecological role must also be maintained. The full ecological role of queen conch has not been determined, but two important roles of queen conch in the food web have been demonstrated.

First, juvenile queen conch, once they emerge from the sediment at about age 1, start to feed on algae and detritus on the sediment, epiphytes on seagrass blades, and on demersal macroalgae. Nursery areas can support thousands of juveniles, and the combined feeding activities process the substrate, generally keeping it clear of large algal overgrowth. This, in turn, makes the habitat more suitable for settlement and survival of new larval recruits, thus helping to perpetuate the habitat health and conch productivity. Disruption to established nursery areas, either by the impacts of onshore activities (e.g., dredging, smothering, siltation, turbidity), by harvesting juveniles, or by recruitment overfishing can thus lead to habitat degradation and loss of the productive capacity of the population.

Second, queen conch serve as prey over their entire life span for a wide variety of species, including gastropods, octopus, crustaceans (particularly crabs and spiny lobster (*Panulirus argus*)), fishes, sharks and rays. Over 150 species are known to feed on queen conch, with most of the predation occurring on the juvenile stages when shell length is short and shells are thin. However, nurse sharks (*Ginglymostoma cirratum*) and spotted eagle rays (*Aetobatus narinari*) are known to feed extensively on even larger juveniles and adults, while large sea turtles can break adult shells and the giant hermit crab (*Petrochirus diogenes*) can attack adults and use the empty shell as shelter. As above, a decline in the productivity of queen conch through the disruption of recruitment processes or the density of juveniles within nursery area will have impacts that radiate throughout the food web and affect the production of species at higher trophic levels. Spotted eagle rays are considered a near-threatened species by the International Union for Conservation of Nature (IUCN), while all sea turtles are listed on Appendix I of CITES.

Marine populations with larval distribution are thought to be characterized by source/sink dynamics, where some areas are net exporters of queen conch larvae and other areas are net recipients of larvae. However, the spatial scale at which this occurs is not well known. Recent genetic studies show spatial differentiation of conch populations at large spatial scale within the region, but other studies suggest these dynamics may occur at quite local scales. Thus, queen conch larval connectivity among jurisdictions may be important for sustaining regional productivity, and as such spawning stocks should be maintained at a level sufficient to fulfill this ecological role. Nevertheless, this guidance explicitly assumes that each jurisdiction is responsible for maintaining its own spawning stock at a level sufficient to support the recruitment needed to maintain queen conch productivity and its role in the environment. Within this guidance, a country may not assume that its source of recruits is from outside its jurisdiction, or even from uninvestigated subpopulations within its jurisdiction (e.g., deep water populations).

Assessments and Queen Conch Biology (Conch are not finfish!)

An important point underlying the guidance provided in this document is the difficulty in assessing the status of exploitation and abundance of conch populations, and this results from some unique aspects of queen conch biology and their fisheries. In turn, these affect management imperatives necessary for conserving conch populations and maintaining their productivity and ecological functions.

The most obvious difference between conch and, for example, finfish is that conch show determinate growth in shell length. At about the onset of sexual maturation conch cease growing in shell length. They then produce their characteristic pink flared shell lip, and subsequent shell growth occurs in the form of thickening of the shell lip. Several key properties result from this change. First, there is no single measure that can relate shell size to age. While shell length is indicative of juvenile age, it is not related to adult age. Instead, shell lip-thickness can be used as a proxy for adult age (Figure 1, Table 1). Another important outcome is that adult shell length (and thus maximum size and flesh weight) is fixed at the time of sexual maturation, and from this it is likely that fecundity also is fixed at the time of maturation. Thus, while larger conch will be more fecund, older conch will not necessarily be highly fecund. In fact, as shell thickening continues with age, shell cavity volume decreases, causing a decrease in gonad weight in old conch. Conch are known to live up to 30 years, and may live substantially longer. As a result, the management imperative of preserving the mega-spawners (i.e., Big Old Fat Fecund Females: BOFFFs) is not simple to implement. However, such mega-spawners could variously be identified as those that show 100% maturity at a given lip-thickness (e.g., > 20 mm LT) (Figure

3), or those adults with shell length > 70% of the cumulative adult length distribution (Figure 4). Further complicating any assessment is that conch growth, and hence size at maturation can be greatly influenced by habitat conditions (Figure 2). Thus, a population may exist as a patchwork of localized subgroups each with its own growth and reproductive characteristics, and this may introduce a significant degree of variability into any attempt to develop a generalized model of productivity that could be associated to a unit of stock.

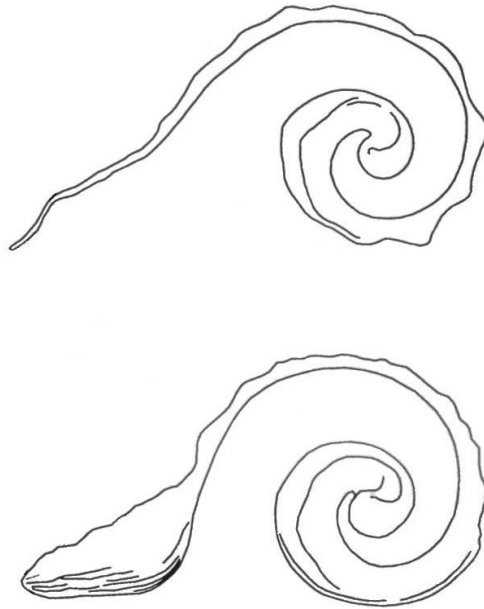


Figure 1. Cross section of queen conch shells showing the change in thickness of the shell lip over time. Top: newly flared shell lip, 4 mm thick. Bottom: shell of a mature adult approximately 1.8 years after flared lip formation: shell lip is 27 mm thick (Appeldoorn 1988).



Figure 2. Variation in shell size at maturation in adult queen conch.
 Left: shell length 186 mm, lip-thickness 16 mm. Right: shell length 265 mm, lip-thickness 20 mm.

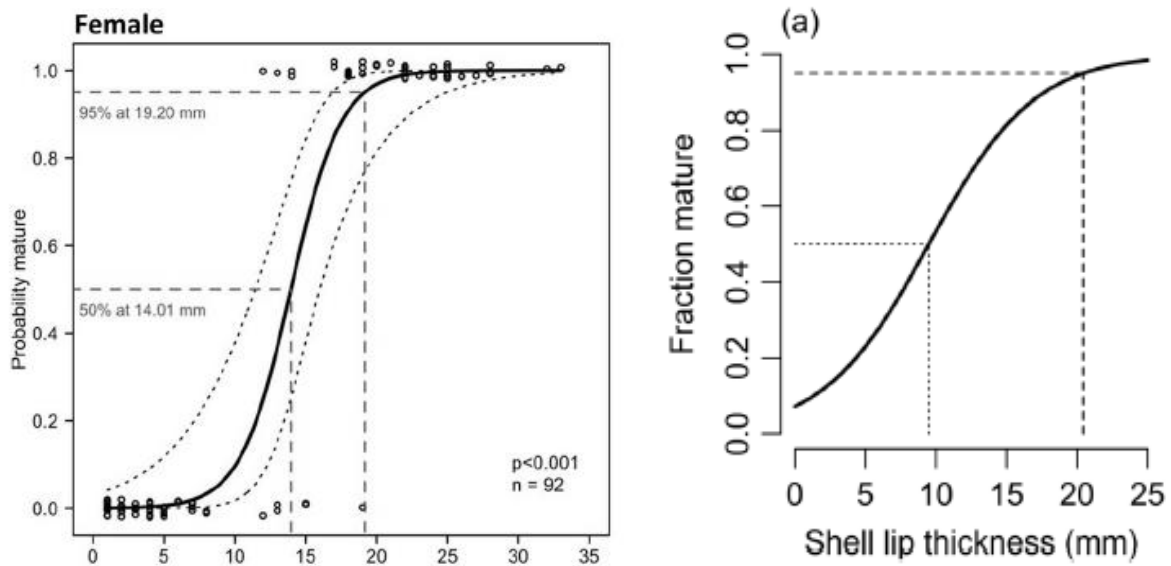


Figure 3. Conch maturity related to shell lip-thickness.
 Right: maturity based on examination of gonad tissue (Foley & Takahashi 2017). Left: maturity (both sexes combined) based on development of external sex organs (Tewfik et al. 2019). Studies conducted in two distinct habitats and fishing areas in Belize, Port Honduras Marine Reserve and Glover's Reef marine Reserve, Belize.

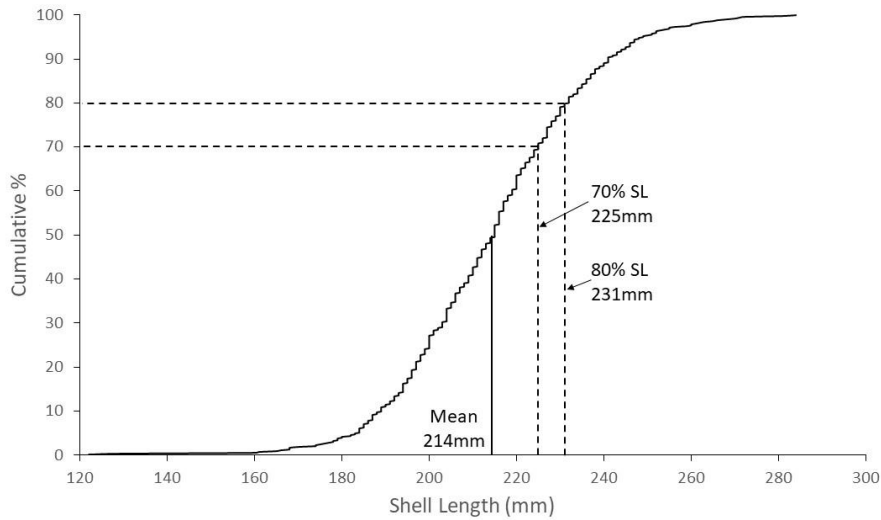


Figure 4. Cumulative frequency distribution of adult queen conch shell lengths from samples around Puerto Rico.

Adults with lengths above a certain % of the distribution would be considered megaspawners that could be protected by a maximum size limit. Shown here are examples of cutoffs set at 70% and 80%. Data from the study of Appeldoorn et al. (2018).

Table 1: Example description of queen conch age classes, adapted from Tewfik (1997). Other classifications can be found in the scientific literature, e.g., Baker et al. (2016). These categories do not necessarily constitute size criteria limits.

Category	Description
Small juvenile	< 150 mm shell length
Medium juvenile	151-200 mm shell length
Large juvenile	> 200 mm shell length, but without flared shell lip
Subadult	Flared lip starting to grow, but not fully developed (lip < 5 mm thick)
Adult	Flared lip is fully formed, with minimal to moderate shell erosion (lip 5-20 mm thick)
Old Adult*	Shell characterized by heavy to serious erosion and heavy fouling (coral, sponges, bryozoans, algae, etc.). Shell lip thick and spines worn/flat. (lip > 20)

*Also referred to as stoned conch

A second unique factor of queen conch biology is that reproduction requires copulation. Given that conch are slow moving, it becomes imperative that high densities of adults be maintained to enable a high chance of male-female encounters resulting in mating and copulation. Furthermore, the ability of conch to copulate and spawn multiple times during the spawning season suggests that sexual facilitation, whereby repeated contact with the opposite sex stimulated gonadal activity and hence fecundity, is important for maintaining high levels of reproductive output. Thus, conservation of queen conch involves another management imperative, that of maintaining the adequate adult densities necessary for successful reproduction. This may be assessed by specific spawning activity surveys (copulation/egg masses) which may be part of a broader population survey (see below) during appropriate times of the year.

The Use and Definition of "Density"

Given that density is an important factor affecting the reproductive potential of queen conch, it is not surprising that several indicators of risk or management measures mitigating risk presented in this Guidance relate to density. However, the value for density is entirely dependent on how density is measured, both with respect to technique and spatial/population scale. Past studies estimated density, variously, over a whole shelf, within a portion of the shelf where conch may occur, within the area where spawning was most likely to occur, or within the core of conch spawning aggregations. Measured baseline densities increase, respectively, across this spectrum. Methods giving localized density estimates best relate density to reproductive activity, but they require a large sample size or targeted allocation, whereas long transects more likely will encounter dense aggregations, but this density is diluted as transects span broad areas without conch. Failure to appreciate how and over what spatial scale density is measured can lead to serious errors in the interpretation and application of density-based indicators. This Guidance uses two such indicators: overall density of the harvestable population and spawning density, i.e., the density of adults on the spawning grounds. Given the effects of both scale and methodology, it is difficult to specify absolute criteria for these. For overall density in particular, it is difficult to relate this to potential spawning impacts.

The most noted study on reproduction and spawning found no reproductive activity (spawning, copulation, pairing) below a density of 56 adult conch/ha, with the percentage of adults engaging in reproductive activity increasing with density until plateauing at about 150 adult conch/ha (Stoner and Ray-Culp 2000, Stoner et al. 2012). This study was limited to an area where spawning was most likely to occur. Based on these results, the Queen Conch Expert Workshop, held in May 2012 in Miami, Florida, recommended a density of 100 adults/ha within the mating area as a minimum reference point for successful reproduction (Prada et al. 2017).

Relating these reference points to overall density is still problematic. The area of the above study was not representative of the whole of the shelf or just that part known to support conch populations. Yet, given the gregarious nature of queen conch, it can be safely assumed that if overall adult stock density, however defined and measured, is about 50 conch/ha or greater over a broad area, there will be multiple locations where the density will be greater, perhaps much greater than that required for reproduction.

A more recent study focused on density within the core of spawning aggregations. Delgado and Glazer (2020) found no mating below a density of 204 adult conch/ha and no spawning below 90 adult conch/ha. Using the precautionary approach, a reference point for minimum spawning population density would be above these values, with desired densities being still higher. Still, some interpretation of field data will be required given differences in survey areas and methods.

Useful Data and Potential Sources

There are a number of different ways to collect information useful for assessing an NDF (Table 2). Not every queen conch fishery would be expected to employ all potential sources of information, but the larger, more industrial-scale a fishery is, the greater would be the expectation that multiple sources of information and detail would be included in any NDF assessment. Regardless, information should be sought from multiple sources as a check against biases inherent in each approach or to ground-truth results by using a small, targeted study to confirm larger data inputs (e.g., self-reported catch reports).

The first method is to conduct in-situ surveys of the conch population. This is a common method and is conducted by free and/or scuba divers surveying transects or fixed area circles. This is a powerful method as it allows the conch population to be assessed directly, and if individual conch are measured for length and lip-thickness the size structure can be obtained for both the population overall and across important localized scales (e.g., relative to habitat type, no-take areas, identifying spawning nursery areas). Using conversion

factors these data can be used to determine a potential harvest quota for the exploitable portion of the population. In-situ water surveys can also note any reproductive activity within any surveyed area and record its position. The efficacy of diver-based surveys is constrained by cost and the limits of safe diving. Boat-towed cameras and remotely operated vehicles are alternative methods when use of divers is constrained.

If in-situ surveys cannot be done, relevant information must be obtained directly from the fishery (see Ehrhardt et al. 2023). This can be approached in a number of ways. For industrial-scale fishing, logbooks can be inspected when the ship reaches port. Here, a critical need is to have reliable landings data. Logbook inspection would provide data on catch (weight), effort, and location, as well as processing grade if the conch meat is pre-processed on board. Use of vessel monitoring system (VMS) data would provide additional information on fishing effort and location, and provide a check on data recorded in logbooks. For artisanal fisheries, fishers can be required to submit catch reports. These could provide information on the number of trips, catch per trip and area fished, while detailing where the catch was sold aiding in traceability.

Information can also be obtained by recording the catch as it is unloaded or as it arrives at a processing plant, which is often the case for industrial scale ships. Catch can be recorded and at least related to number of days at sea. Subsampling the catch would provide the size (weight) structure of the catch, which can be converted to number of individuals using conversion factors. If the reproductive structures (verge in males, egg-groove in females) are still intact, the proportion mature can also be determined. It may also be possible to determine the market destination (local vs export) and the value of the catch, which can be related to demand as a risk factor.

Direct interviews with fishers can be conducted. This is especially viable in small-scale artisanal fisheries. This may be facilitated by a complete fleet census given the disaggregated nature of such fleets at many landing sites. Fishers can provide information on daily catch, fishing effort, fishing ground locations, meat processing level, market destination, and value, and relate any observations they may have on recruitment (nursery areas), reproductive activity and perceived status of the local queen conch fisheries.

Finally, a census of the fishing fleet, fishers and fishing gear can provide valuable information on the catch capacity of the fishery, the effort capacity, and the potential areas of operation.

Other useful information, such as the extent of other natural or human based impacts, the potential for queen conch population connectivity to/from other locations or other relevant information might be obtained from a review of the scientific literature or the results of published government studies.

Data Collection Requirements

While the above methods provide the opportunity to acquire useful information, the statistical quality of that information will depend on how it is collected. Specifically, a properly designed statistical sampling program for the collection of any data will help increase accuracy while minimizing variability, thus reducing uncertainty and maximizing the utility of the data, and thereby reducing the need for offsetting management measures. Guidance specific for queen conch on collecting and analyzing survey data can be found in Medley (2005), Ehrhardt and Valle-Esquivel (2008), and Ehrhardt (2021a,b). Documenting the extent to which an appropriate sampling design, including recognizing units of stock, was employed during data collection should be an explicit part of any NDF assessment.

Conversion Factors

For data consistency and comparability, all queen conch catch and biomass data should be in standardized and well-defined terms. However, conch weights and catch statistics are often given in terms of one or more processing levels. The level of processing of the queen conch meat varies and depends on the marketing system and the final destination (export versus national market) or cultural preferences. Thus, each country has its own standardized processing grades, varying from “dirty meat” (i.e., whole animal without shell) up to 100 percent cleaned (i.e., only white meat). In general, the different grades refer to the level of tissue loss that occurs with processing (Table 3). Additionally, variations in weights among areas can occur because shell length at maturation (final size) can vary widely due to location, densities, or age structure.

The use of different processing grades and variations in population structure among areas requires the use of conversion factors (CF) to express catch and biomass data in uniform and comparable units (Prada et al. 2017). Furthermore, since factors such as density and age structure are affected by exploitation, conversion

factors may need to be recalculated periodically in response to the accumulative population impacts of exploitation over time. For these reasons, country-based conversion factors should be calculated; use of regional conversion factors (FAO 2014, Ehrhardt and Perez, 2023) results in greater uncertainty and should only be used on a temporary basis when local conversion factors are not available.

For management purposes, Prada et al. (2017) and Ehrhardt and Perez (2023) recommend conversion factors be developed for the estimation of landings to flesh weight (=dirty weight) as a standard measure. They also recommend a further conversion to number of individuals per standard unit of weight (kg). This latter measure is fundamental to link exploitation to the potential risk of Allee effects (i.e., reducing density below levels required for sustained reproduction), for using weight-based size structure and population densities as exploitation reference points, for framing Total Allowable Catch (TAC) and annual flesh weight quotas reported to CITES, and for using population density and size structure to develop a weight-based quota or Total Allowable Catch (TAC). Countries may also develop factors to convert weight into live weight (tissue plus shell), as this is the unit used in FAO world statistics; however, with queen conch, the inclusion of the shell weight adds considerable variability to the data such that live weight is not a good predictor of either flesh weight or number of individuals. For this reason, live weight is less useful for stock assessment purposes.

Table 2: Information useful for NDF determinations and the methods from which these can be obtained.

Information Source	In-situ Survey	Dockside/ Processing Plant	Logbooks, Trip Tickets, Catch Reports	Fisher Interviews	Fishery Census	Independent Research
Type of Information						
Population density	X					X
Population size/age-structure	X					X
Catch size/age-structure		X				
Size at maturity	X	X				X
Catch		X	X	X	X	
Effort		X	X	X	X	
Location	X	?	X	X	X	
Processing level		X	X	X		
Reproductive activity	X			X		X
Markets		X	?	X		
Economic Value (ex-vessel)		X		X		
Other Bio-ecological information						X
Population/Genetic Connectivity						X
Natural/Human Impacts	X					X

As with any factor estimation, the precision and accuracy will depend on the quality and quantity of data collected, and again a valid statistical sampling design should be used relative to location, sizes, method of capture, etc. Calculation of conversion factors should follow the regression method of Ehrhardt and Perez (2023) based on the morphometrics of queen conch meat categories. This allows for application of conversion factors by individual size frequencies in the various % clean meat categories of juvenile and adult queen conch.

Trade-offs inherent in NDF Assessments

In developing and reviewing an NDF assessment, it should be realized from the start that there are trade-offs that must be considered between the level of uncertainty and the identified risks that exploitation and export pose for the sustainability of the queen conch population and its role in the environment. The higher the severity of risk, due to the intensity of fishing or the uncertainty of its impact, the greater the requirements will be for information quantity and quality, the role of effective implementation of management regulations, and precautionary measures implemented in absence of better knowledge. The nature of this trade-off should be

well-documented when developing an NDF statement. When little information is available to assess the status of exploitation of queen conch populations relative to benchmarks (e.g., adult population density, population structure harvested), the allowable catch and exports would need to be set comparatively low. In fact, small extractions may be a significant risk if the affected population is small or occupies a small habitat area as a limited buffer is available for mistakes. A corollary of the trade-off between uncertainty and data/management quality is the expectation that the larger the scale of the fishery or the proportion of the population removed, the greater the effort should be in obtaining data from more than one source.

Table 3: Example descriptions of queen conch processing grades.

Processing grade	Description
<i>St. Vincent and the Grenadines</i> (Hutchinson and Girvan 2021)	
Live weight	Complete animal, including the shell
Without processing (dirty)	Complete animal extracted from the shell, meat with skin, viscera, sex organs, digestive organs and operculum/nail
50% clean	Operculum and the visceral bag are removed
75% clean	White meat, with some pink, orange meat only
85% clean	White meat, with some pink, orange meat only, skin on
100% clean	Fillet of white meat only
<i>Belize</i> (Belize Fisheries Dept. 2006)	
Unprocessed	Animal extracted from the shell
Meat (90% processed)	Without shell, operculum, viscera, proboscis, mantle, hard skin, eyes and intestine
Fillet (100% processed)	Only white meat
<i>Honduras</i> (Honduras Dept. Investigation Technology, undated)	
Initial meat weight	Weight of the organism once extracted from the shell.
65% clean	Weight after further removal of the verge, viscera and organs
85% clean	Weight after further removal of the skin
100% clean	Final weight after further removal of the digestive cord

USING THIS NDF GUIDANCE

This document presents a simplified guidance for preparing and evaluating a queen conch NDF, following a 10-step process. The process is designed for the evaluation of risks and mitigations involved in the harvest of queen conch using a series of score sheets where boxes can be simply filled in and evaluated for quality of information. It is recognized that there may be some effort involved in acquiring the available information the first time the guidance is used, but in subsequent annual evaluations, the work would consist only of updating that information, which should be a much more rapid process.

This Guidance suggests ten steps that a Scientific Authority can take to make a science-based NDF. The overall process is shown in Figure 5.

- Steps 1-3 involve the evaluation of whether a detailed, science-based NDF is needed for the queen conch specimens concerned. Early decision (Proceed to Step 9) can be made in some cases.
- Steps 4 and 5 involve the evaluation of conservation concerns and potential biological risks. Assessments at these steps set the context of risk that the harvest, trade and management should be considered against.
- Steps 6 involves the evaluation of harvest impacts relevant to queen conch, particularly within the national jurisdiction or target area.
- Step 7 involves the evaluation of whether the management measures in place are sufficiently rigorous to mitigate exploitation impacts
- Step 8 involves the evaluation of trade impacts relevant to queen conch, particularly within the national jurisdiction or target area.
- Step 9 involves a gap analysis, identifying which existing management measures can reasonably be expected to mitigate the concerns, risks, and impacts identified in steps 4-8.
- Step 10 involves the Scientific Authority's making of an NDF and/or other advice to the Management Authority based on the outcomes of Steps 1-9. To facilitate this, a numerical procedure is presented to score each step and to develop an overall score. Guidelines are given for the interpretation of the overall score relative to NDF advice to be given to the Management Authority

This Guidance is not intended to automatically generate the NDF-decision of a Scientific Authority. It provides a standardized framework to record and process the information required and available to a CITES Scientific Authority in order to make an adequate NDF. The Guidance can be viewed as both a road map and a gap analysis. The order of steps presented in the Guidance acts as a road map, indicating how the CITES Scientific Authority may proceed in collecting information and make progressive determinations where each step may be considered a precursor to those that follow. Proceeding through the steps, the Guidance will show where there are gaps in the information required to address each step. This role is particularly important when assessing whether management measures help to mitigate the impacts of harvest and trade. Management measures are evaluated both on whether they have the appropriate rigor (e.g., enforcement capacity exists) and whether they address the specific risks identified in earlier steps.

Anyone using this guidance should rely on their own experience and judgment; there will not always be agreement with the level of risk this Guidance indicates, and experts may have better insight than a generic tool can provide. However, to the degree possible, those expert insights should be explicitly incorporated into the guidance as part of the information available. Assessing the risks is intended to provide guidance to the level of detail necessary for an informed decision on whether management can ensure that the harvest of and trade in the concerned species is likely to be non-detrimental.

This guidance aims to structure the relevant aspects and information in order to facilitate an individual conclusion on detriment. It should also be noted that the proposed LOW/MEDIUM/

HIGH decisions as depicted in the decision path diagram of each step are only proposals. It may well be that questions further down in the decision path will help assess the correct answer; therefore, it is recommended to look, at least briefly, into all key questions before going to Step 10 and making a decision.

Queen Conch Products

Region-wide, the vast majority of queen conch is exported as meat. However, a number of value-added products have been developed that use parts trimmed off the meat during processing, especially for 100% clean filet, such as conch fritters or soups. Additionally, there is an active trade in queen conch shells and opercula. According to CITES, for an animal included in Appendix II, such as queen conch, the listing explicitly includes not only the whole, live or dead, animal, but also all parts and derivatives thereof. As a consequence, the guidance here is designed to be applicable to all of the above products, first by ascertaining if these other products are fully dependent on the byproduct of the export market for conch meat. If so, they will already be accounted for when using the guidance for assessing the NDF for conch meat exports. If there is not a meat export fishery, or if the products are derived whole or in part by the domestic fishery, then a country wishing to export parts or value-added products of queen conch should provide a full assessment of its domestic fishery demonstrating that landings necessary to produce the value-added parts for export are not detrimental to the survival and ecological function of the species. The approach taken here is for parts and products to be converted to a traditional meat weight equivalent, which then would be analyzed separately or added to conch meat exports. This process is outlined in Table 4.

Not included above are conch pearls, which are of high value and, though rare, are routinely encountered given the high volume of the harvest. Fritsch and Misiorowski (1987) estimated that only one in 1,000 conch have pearls, with only one in 10,000 conch have pearls of gem quality (that would have a high export value), but these proportions may be too high, (i.e., pearls are rarer still, potentially by an order of magnitude) and will depend on what age classes of the population are targeted by the fishery. Pearls are most often found in large juvenile conch, which are subject to harvest in most fisheries.

The process of developing conversion factors for pearls would be exceedingly difficult. While there is direct correspondence between number of pearls and number of conch from which they came, the low probability of encountering a conch pearl, and the covert nature of the harvest and trade, means it will be difficult to develop a representative length structure associated with the harvest of pearls. Given the rare occurrence of pearls, it is implausible that there would be a directed fishery for pearls; therefore, it is assumed here that pearls are a by-product of directed fishing for meat or shells. Given this, the assessment of pearl exports would be folded into the assessment of the export or domestic fisheries for conch meat or shells. As above, if there is no meat export fishery, a country wishing to export conch pearls should provide a full assessment of its domestic fishery demonstrating that landings necessary to produce the pearls are not detrimental to the survival of the species.

Lastly, despite claims going back to the 1930's, there is no evidence of successful conch pearl culture. This includes several recent efforts at laboratories with considerable experience in conch rearing. As a consequence, this guidance does not allow for the case of cultured queen conch pearls.

Table 4. Mechanisms for accounting for non-meat queen conch products.

Conch Product	Base Information	Sourced only from Export Fishery?	Approach
Meat	<ul style="list-style-type: none"> •Meat weights by defined processing grade •Conversion factors for processing grades 	<p>If yes → use total for NDF determination</p> <p>If no → non-export quantity is not applied to export quota/TAC</p>	<p>Numbers/Weights converted to uniform standard, e.g., flesh (=dirty) weight</p>
Opercula	<ul style="list-style-type: none"> •Number or weight of opercula for export •Number of opercula per unit weight of conch meat •Average weight of opercula •Conversion Factor for operculum to meat weight 	<p>If yes → product is already included in the NDF determined for meat.</p> <p>If no → additional product is treated separately as additional meat</p>	<p>Separate NDF not required.</p> <p>Convert numbers or weight of opercula to standardized units of meat weight. Add total to total meat weight when calculating quota or TAC.</p>
Shell	<ul style="list-style-type: none"> •Numbers and weight of shells for export •Average weight/shell •Conversion Factor for shell to meat weight 	<p>If yes → product is already included in the NDF determined for meat.</p> <p>If no → additional product is treated separately as additional meat</p>	<p>Separate NDF not required.</p> <p>Convert numbers or weight of shells to standardized units of meat weight. Add total to total meat weight when calculating quota or TAC.</p>
Value-added (fritters, soups, etc.)	<ul style="list-style-type: none"> •Weight of conch meats per unit weight of value-added products •Average meat weight/conc 	<p>If yes → product is already included in the NDF determined for meat.</p> <p>If no → additional product is treated separately as additional meat</p>	<p>Separate NDF not required.</p> <p>Convert weight in products to standardized units of meat weight. Add total to total meat weight when calculating quota or TAC.</p>

STEP 1 SPECIES IDENTIFICATION

Rationale: why is this step important?

In order to make an adequate non-detriment finding for queen conch, it must be confirmed that the product in trade is queen conch. Correct identification of product/specimens and agreement on scientific names for queen conch in trade are essential to the implementation of CITES recommendations concerning trade and the making of NDFs. Without correct identification at species level a CITES Scientific Authority in a country may be unable to confidently apply the species-related information required to make an adequate NDF. Seafood fraud, the replacement of high valued species with lower valued species is common in the seafood industry, and exporters may be tempted to market alternative species as queen conch. This would not only be fraudulent, it would artificially inflate production and, as a consequence, increase pressure for a high export allowance.

Without examination through genetic testing, edible conch products are nearly impossible to identify to the species level once processing removes the external structures and skin. Frequently, commercial or common names are used for trade. The classification and naming of species is a dynamic process that can lead to uncertainty and lack of consensus about specimen and species taxonomy, and can create confusion between current and previously used names. Because of recent taxonomic revisions queen conch can be labeled under different scientific names. Uncertainty about the identity and taxonomic status of the specimens entering trade can undermine the ability of CITES Scientific Authorities to make an adequate NDF. Therefore, these issues should be addressed in the process of making an NDF.

Key Question

Is the CITES Scientific Authority in the country confident that the queen conch product concerned has been correctly identified and that the correct scientific name has been used?

Guidance

Species Identification

In the first part of this question, the CITES Scientific Authority is asked what is the likelihood that product in trade is correctly identified. The answer may be quite a straightforward YES – based, for example, on previous research or reliable information from the fishery, management authority or specimen source. It is not suggested by this guidance that it is a Scientific Authorities' task to inspect every specimen before making an NDF. Queen conch is known by various common names throughout the region (e.g., Queen conch, Pink conch, Samba, Lambi, Botuto, Fotuto, Carucho, Caracol rosado, Caracol rosa, Caracol pala, Cambombia).

If there are doubts regarding identification, refer to "Useful Sources and Examples of Recommended Information Quality" below. You can refer the application back to the CITES Management Authority and ask them to request the missing information from the trade or consult an expert.

Scientific Names

In the second part of the question, the CITES Scientific Authority is asked if the correct scientific name has been used. CITES adopts Standard References for the names of animals and plants in the CITES Appendices in Resolution Conf. 12.11 which is revised at each CoP. The standard scientific names are consolidated in the Checklist of CITES Species or Species+. The Checklist is an official digest of scientific names. Species+ derives from the same database as the Checklist and is therefore equivalent. These databases are the most accessible source of names to be used on CITES permits. Within CITES, the species is *Strombus gigas*, but more recently other names have been suggested (*Eustrombus gigas*, *Lobatus gigas*) with *Aliger gigas* coming from the most recent revision. Confirm that the labeled scientific name is consistent with CITES usage ([Resolution Conf. 12.11](#) (Rev. CoP19) on *Standard Nomenclature*).

How to Proceed

Use the **Worksheet for Step 1** to record your findings.

If the CITES Scientific Authority is confident with the species identification and use of correct scientific name (or has corrected a simple error or outdated name): → **go to Step 2**

If the CITES Scientific Authority is not confident that the specimen concerned has been correctly identified, and that the scientific name used is compliant with the appropriate CITES Standard and concerns over the species' identity are not easily corrected or resolved:

→ **go to Step 9, Decision 9.1**

Useful Sources and Examples of Recommended Information

CITES References & Sources

- Checklist of CITES Species
- Species+
- Annex CITES Guidelines for management of nationally established export quotas. Conf. 14.8 (Rev. CoP15). Available [here](#).
- Guide to the application of CITES source codes. Available [here](#)
- Guidelines for inspection of captive-breeding and ranching facilities. Available [here](#).
- CITES Resolution Conf. 16.7 [Rev. CoP17] Non-Detriment findings. Available [here](#)
- Ehrhardt, N., and M. Perez. 2023. Priority 1 to improve understanding of Queen Conch conversion factors by reanalyzing existing data. FAO Tech Pap (in Spanish and English). 26p. (In Press)
- Ehrhardt, N. 2021a. Module I: Training on landings and fishing effort estimation in queen conch (*Aliger gigas*) fisheries. Caribbean Fishery Management Council. (in Spanish). 63p.
- Ehrhardt, N. 2021b. Module II. Training on population density estimation in queen conch (*Aliger gigas*) fisheries. Caribbean Fishery Management Council. (in English and Spanish). 70p.
- Ehrhardt, N. 2021c. Training Module III: Training on assessment methods for annual catch quota estimation in queen conch (*Aliger gigas*) fisheries. Caribbean Fishery Management Council. (in Spanish). 72p.

STEP 2 CAPTURED IN JURISDICTIONAL WATERS

Rationale: why is this step important?

Because of Illegal, Unreported and Unregulated (IUU) fishing, queen conch may be caught in one jurisdiction and transshipped to another jurisdiction or harvested outside the target region. If not accounted for, this could be added to the local catch and be used to argue the productivity of conch in the region is higher than it actually is. This could lead to an overestimation of the non-detrimental quota issued by the Scientific Authority and a subsequent decline in the target population.

Any product not acquired within national waters needs to have legal documentation and will by default be associated with a previous NDF from the country of origin. The Scientific Authority needs to account for re-exportation and transshipments, i.e. any product captured outside national waters needs to have the supporting legal local and CITES documentation to enter the jurisdiction.

Key Questions

Is the CITES Scientific Authority confident that the queen conch product concerned was harvested from the jurisdiction's national waters or EEZ, or within the target harvest area, i.e., that IUU fishing has not resulted in conch harvested elsewhere being transshipped into the jurisdiction and added to the domestic production or to the production coming from the target area?

How to Proceed

Use the worksheet for Step 2 to record your findings.

If the Scientific Authority is confident that the queen conch product was legally harvested from the national jurisdiction or target area:
→ **go to Step 3**

If the Scientific Authority has obtained and validated the associated CITES NDF documentation (available from the Management Authority) for any queen conch product legally shipped in from another location:
→ **go to Step 3**

If the Scientific Authority is not confident that the queen conch product was legally harvested from the national jurisdiction or target area, or CITES NDF documentation for imported conch cannot be validated:
→ **go to Step 9, Decision 9.2**

STEP 3 CITES SCIENTIFIC AUTHORITY

Resolution Conf. 10.3 recommends that all Parties designate a CITES Scientific Authority independent from the CITES Management Authority, and that the issuance of permits by a CITES Management Authority without appropriate CITES Scientific Authority findings/review constitutes a lack of compliance with the provisions of the Convention.

In order to move through the assessment stages of this guidance (Steps 4-8), the CITES Scientific Authority will have to be able to conduct its own assessment or analyze and understand an assessment made by another agency (e.g., local fisheries department). It, thus, requires the capacity to assess and understand the biology of conch and the nature of the fishery, and the scientific and statistical methods used for data collection and assessment so that it can make judgements relative to the quality and variability of the data, and the validity of any population or statistical analyses and their associated results and conclusions, including an understanding of the uncertainties of all steps involved. The Scientific Authority may not need to have all areas of expertise among the specific designated members, but it should have timely access to any expertise required that did not reside among the Scientific Authority's members.

Key Questions

Is the local Scientific Authority properly constituted under CITES Resolution Conf. 10.3?

Does the CITES Scientific Authority have the capacity to assess scientific, statistical, biological and fishery information (and their uncertainties) needed to assess and/or non-detrimental harvest rates/quotas?

Guidance

Table 3.1 lists guidelines for assessing the functional capacity of the CITES Scientific Authority. A functional capacity includes having its recommendations adhered to, which can be assessed by examining if past recommendations were followed or not, potentially putting the queen conch population at risk. If the function of the CITES Scientific Authority is severely impacted, any assessment will be compromised and a recommendation of a quota or positive NDF will be questionable at best. The CITES Scientific Authority may reach out to other entities (e.g., universities) and regional or subregional scientific or fisheries organizations to obtain needed expertise during its deliberations. The source and area of external expertise should be explicitly noted.

How to Proceed

Use the worksheet for Step 3 to record your findings.

If the CITES Scientific Authority is properly constituted AND has the capacity to evaluate the scientific, statistical, biological and fishery information necessary to conduct an NDF assessment:

→ **go to Step 4**

If the CITES Scientific Authority is not properly constituted OR does not have the capacity to evaluate the scientific, statistical, biological and fishery information necessary to conduct an NDF assessment:

→ **go to Step 9, Decision 9.3**

REMEMBER: Fully cite the references that you use. Put a reference in the worksheet

Table 3.1 Indicators for the functioning of the CITES Scientific Authority

Indicator	Functional Impact Severity			Unknown
	Low	Medium	High	
CITES Scientific Authority (SA) (Resolution Conf. 10.3)	SA formally constituted and independent of CITES Management Authority (MA)	SA formally constituted but not independent of Management Authority	SA not formally constituted and not independent of Management Authority	
Capacity of CITES Scientific Authority (SA)	SA has the expertise necessary to evaluate the conch fishery, estimate non-detrimental quotas, trade dynamics, and statistics	SA has some expertise necessary to evaluate the conch fishery, trade dynamics, and statistics	SA does not have the expertise necessary to evaluate the conch fishery, trade dynamics and statistics	
Adherence to CITES Scientific Authority (SA) recommendations	SA's determination of non-detrimental quota is adhered to in developing the TAC. SA's recommendations on filling data gaps are addressed	Final TAC is close to but above the SA's determination of non-detrimental quota. Some of the SA's recommendations on filling data gaps are addressed	Final TAC is well above the SA's determination of non-detrimental quota or not functionally related to SA's determinations, Final TAC defined by other non-SA groups. Few SA recommendations on filling data gaps addressed.	

STEP 4 EVALUATE CONSERVATION CONCERN

Rationale: why is this step important?

This step considers *existing* conservation status assessments to document relevant threats and to support evaluation of the severity of conservation concern relevant to the harvest area of queen conch in subsequent steps.

Conservation status assessment is an assessment of the likelihood that queen conch (or local population of queen conch) will become extinct in the near future or that the sustainability of the population and its role in the environment is, or could be impaired. Conservation status assessment systems have a variety of forms (e.g., Red Lists, Red Data Books, threatened species listings) and a range of geographic scope (sub-national, national, regional, or global). Additional information on queen conch may be available from past fisheries assessments, the scientific literature and reports issued by conservation organizations working in the country or adjacent jurisdictions. The conservation assessments act as a risk assessment of the effects of annual non-detriment quotas and will guide the CITES Scientific Authority in the levels of precaution and the level of detail they would require in making a NDF decision; data requirements should be proportionate to the potential risks. *If these risks are unknown – i.e., no conservation status assessments are available, the CITES Scientific Authority should be more precautionary in future steps.*

The definition of assessment criteria and categories describing extinction/sustainability risk also varies among assessment systems. A detailed, well-documented, and up-to-date conservation status assessment may provide information relevant to several of the remaining steps of this Guidance.

Key Question

Considering *existing* assessments of the conservation status of queen conch, what is the indicated severity of conservation concern (i.e., “Low”, “Medium”, “High”, or “Unknown”)?

Guidance

Here the CITES Scientific Authority is asked to search for and review existing conservation assessments, record the geographic scope of the assessment, the threat category and major threats mentioned in the assessment at the time such assessment was carried out, and use them to identify the severity of conservation concerns at the present time. In addition, the user of this guidance is asked to add the source of the assessment and give a relative confidence level for the information used from the cited source. A global conservation status assessment is generally less important than a national or sub-national assessment, which includes the harvested population – it is important to take this into account.

Refer to Table 4.1 “**Factors to Consider: Conservation Concern**” to evaluate the severity of conservation concern for queen conch indicated by existing relevant conservation status assessments.

The CITES Scientific Authority may find information useful for Step 4 (and Steps 5–8) of this Guidance in any existing assessment. If the national population or sub-population(s) of queen conch have been included in more than one assessment system or geographic scope of assessment, the CITES Scientific Authority may select an assessment to evaluate the severity of conservation concern that best combines the following qualities:

- most indicative of the threat of extinction of the national population and sub-populations of queen conch;
- most recent/up to date.

It is not recommended to average the results of several assessments but consider identification of trends.

A high conservation concern should result in a more precautionary NDF, as should an unknown concern.

Table 4.1: Factors to consider: Conservation Concern

Severity of local conservation concern	Example Indicators*
Low	The country's queen conch population has been assessed and is not considered to be threatened . The assessment or listing is based on defined criteria (e.g., IUCN Red List category Least Concern/LC or equivalent categories used in other systems). Past queen conch fishery assessments show that the current harvest does not exceed an overfishing criterion, and no other factors are indicative of any potential problems with the population.
Medium	The country's queen conch population has been assessed and is considered to nearly qualify as threatened . The assessment or listing is based on defined criteria (e.g., IUCN Red List categories Near Threatened/NT, Vulnerable/VU, or equivalent categories used in other systems). Past queen conch fishery assessments show that the current harvest is at or near an overfishing criterion, or that other factors indicating potential problems are evident (e.g., low adult densities).
High	The country's queen conch population has been assessed and qualifies as threatened . The assessment or listing is based on defined criteria (e.g. IUCN Red List Critically Endangered/CR, Endangered/EN, or equivalent categories used in other systems). Passed queen conch fishery assessments show that the current harvest is in excess of an overfishing criterion, or that multiple factors indicate serious problems (e.g., low adult densities, lack of observed spawning, decreasing size structure).
Unknown	<p>Conservation status has not been assessed for the country's queen conch population (e.g., IUCN Red List category Not Evaluated/NE, equivalent categories used in other systems, or absence of any assessment or listing); or</p> <p>Conservation status has been assessed but the severity of conservation concern cannot be determined (e.g., IUCN Red List Category Data Deficient).</p>

* The list of example indicators is not exhaustive and other indicators, guidance values or evaluation methods on the judgement or experiences of individual Scientific Authorities.

How to Proceed

Use the **Worksheet for Step 4** to record your available information corresponding to the factor in Table 4.1 and the assessment of conservation concern.

If no adequate assessments are available: answer “Unknown” and consider that **higher rigor in evaluating Steps 5–8** will be required for a positive NDF decision.

If conservation assessments (can be multiple and at different scales) are available record these in “Conservation status assessments” of the worksheet. Decide on the most relevant assessment to your harvest area and use Table 4.1 “**Factors to Consider: Conservation Concern**” to assess the “Severity of conservation concern relevant to harvest area” (“Low”, “Medium”, “High”, or “Unknown”) (in the second table of worksheet 4).

To support the evaluation of appropriate rigor of existing management measures (Step 8), the conservation concern ranked as “Low”, “Medium”, “High”, or “Unknown” should be transferred to the **Worksheet for Step 8.2**, then → **go to Step 5**

STEP 5 EVALUATE POTENTIAL BIOLOGICAL RISKS

Rationale: why is this step important?

Some queen conch populations are naturally more susceptible to detrimental effects of wild harvest and commercial trade than other populations. In this Guidance, “potential biological risk” is understood to indicate that certain population or environmental characteristics contribute to the risk that wild harvest will be detrimental to queen conch survival. Using these characteristics, CITES Scientific Authorities can identify the particular factors that contribute to higher or lower severity of risk that wild harvest will be detrimental to queen conch survival. *As with the Conservation Status in Step 4, the higher the severity of risk, the greater the requirements for information quality, effective management, and precaution that should be sought for the NDF in Steps 6–9.*

Key Question

Consider the characteristics of the queen conch's distribution, population and habitat that affect the potential risk of harvest to the survival of its wild populations. Is the severity of risk indicated for each of these factors “Low”, “Medium”, “High”, or “Unknown”?

Guidance

In Step 5, biological risks refer to:

- National/sub-national population size and distribution
- Size structure of national/sub-national populations
- Spawning population(s) densities (and sex ratio)
- Vulnerability of nursery and spawning areas
- Potential impact of climate change, natural disasters, and invasive species

Table 5.1 “**Factors to Consider: Biological Risks of Harvest**” provides indicators that affect the risk of wild harvest to queen conch survival and their explanations. Table 5.2 “**Potential indicators of risk**” gives guidance on the risk severity levels for the various risk factors.

Remember: Step 5 is not an assessment of the impact of the harvest. This is done in Step 6. Nevertheless, when evaluating factors in Table 5.2 the more relevant information is to the harvested site the more relevant it is to the evaluation of the potential biological risk in the NDF. The distribution and characteristics of the target species may vary between different ecosystems, which does not always allow extrapolation of data.

How to Proceed

Use **Worksheet for Step 5** to record available information corresponding to each of the factors in Table 5.2 and the assessment of biological risk of harvest.

If no adequate assessments are available: answer “Unknown” and consider that higher rigor in evaluating Steps 6–8 will be required for a positive NDF decision.

To support the evaluation of appropriate rigor of existing management measures (Step 8), summary lists of “Low”, “Medium”, “High”, and “Unknown” biological risk factors should be transferred to the **Worksheet for Step 8.2**.
→ **Go to Step 6**

Table 5.1: Factors to Consider: Biological Risks of Harvest”

Factor	Explanation
Spatial extent/ population size	A small population or one limited to a small area is more vulnerable to overexploitation or impacts from natural/human impacts. However, if high (larval) connectivity (i.e., flow into the target population) is demonstrated the queen conch population could maintain its stability. Note: determining population connectivity is difficult and requires additional research. Management under population connectivity principles is very difficult and possibly requires more complex multinational regional agreements and management principles.
Locations of spawning aggregations	Conch are slow moving, must copulate to spawn, and frequent contact is thought to stimulate gametogenic activity. Therefore, maintaining density within conch spawning areas/aggregations is critical for sustaining conch reproductive output and existing connectivity. If locations are known, they allow for spatial management measures (e.g., no-take areas) to be utilized to prevent recruitment overfishing or habitat destruction.
Spawning season	In many areas, conch will aggregate to copulate and spawn, making them more vulnerable during the time when reproductive activity peaks. Protecting conch during the peak of the reproductive season can aid in preventing recruitment overfishing. Peak conch reproductive activity is usually associated with the warmest seasonal water temperatures, but may be altered at extreme high temperatures. Spawning season is a driving variable generating nonlinear seasonal effects on catchability coefficients. Catchability coefficients, as fractions of a stock being caught per unit of fishing effort, are instrumental in the estimation of exploitation rates and stock abundance. Most fish stock assessment methods applied to queen conch assessments are not applicable for such conditions. In some countries, queen conch fisheries occur during the spiny lobster closed season, which usually coincides with queen conch spawning season. When this occurs, it places additional risk to the queen conch spawning population and catchability is at its maximum.
Locations of nursery areas	Healthy nursery areas, often in waters shallower than used by adult stocks, are necessary for sustained recruitment to the exploitable and spawning stocks. If locations are known, they allow for spatial management measures to be utilized to prevent harvest or habitat destruction.
Known natural no- take areas	Having unexploitable areas with known conch populations is a way to mitigate harvest impacts. Natural no-take areas, e.g., areas too deep to harvest, areas close near military installations (i.e., not closed as a result of fisheries management) can serve this function.
Threats from coastal activities	Extensive coastal development can lead to nearshore habitat degradation due to siltation/ sedimentation and degradation of water quality due to pollution. This can result in reducing the area suitable for conch production, especially of nursery areas.
Increasing water temperature	Extremely high water temperatures are thought to result in reproductive failure in queen conch (e.g., shallow queen conch population in Florida). If temperature increases, the potential for lost reproductive capacity increases, as does the potential for recruitment overfishing.
Natural disasters	Strong storms, heavy rains, or volcanic eruptions have the potential to alter conch habitat quality and possibly recruitment success, particularly at relatively shallow depths (≤ 10 m)
Invasive species/ harmful algal blooms	The invasive seagrass <i>Halophila stipulacea</i> , can rapidly overgrow and replace native manatee grass, <i>Syringodium filiforme</i> , an important component of preferred conch habitat, leading to reduced growth. The influx of large mats of the free-floating brown macroalgae <i>Sargassum</i> into the Caribbean region can result in the smothering of

	nearshore seagrass beds and reductions in water quality that could affect, in particular, shallow conch nursery and spawning areas.
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Table 5.2: Potential Indicators of Risk

Factor	Low	Medium	High	Unknown
Spatial extent/ population size	Conch are abundant and ubiquitous	Conch are common and patchily distributed throughout the area	Conch not common and only found in select areas	
Locations of spawning aggregations	A majority of spawning locations are documented	Some spawning locations are documented	Few to no spawning locations are documented	
Spawning season	The range and peak spawning season are well documented. Lobster harvesting is permitted during peak conch spawning time.	Local spawning range and peak are unknown, but a proxy can be used from a nearby jurisdiction. Lobster harvesting is permitted during expected peak conch spawning time.	The range and peak of the spawning season are unknown. Lobster harvesting is not permitted during months of peak temperature.	
Locations of nursery areas	Areas of high abundance of small juveniles (i.e., nursery areas) are well documented	Some areas of abundant small juveniles are documented	Few to no areas of small juveniles are documented	
Known natural no-take areas	Natural no-take areas with conch > 20% of total conch distribution	Natural no-take areas with conch < 20% but > 10% of total conch distribution	Natural no-take areas with conch < 10% of total conch distribution	
Threats from coastal activities	Little coastal development or pollution evident	Some coastal development is causing localized degradation of habitat and water quality	Coastal development is causing widespread degradation of habitat and water quality	
Increasing temperature	Maximum temperatures are not increasing, and variance is within historic range	Temperatures are increasing, but not during peak spawning period, with variance on the increase from historic range	Maximum temperatures are increasing, especially during peak spawning period	
Natural disasters	Known conch grounds are in areas with low natural disasters impact potential.	Known conch grounds are in areas that experienced natural disasters every 5-7 years	Known conch grounds are in areas with frequent natural disasters (< 5 years)	
Invasive species/harmful algal blooms	Invasive species or algal blooms are infrequent and of little impact on conch	Invasive species or algal blooms occur and have occasional impact on conch	Invasive species or algal blooms are frequent, causing consistent impact on conch	

STEP 6 EVALUATE IMPACTS OF HARVEST

Rationale: why is this step important?

In this step impacts of harvest to the wild population (“target population”) need to be considered. These are the most important impacts of the trade and the assessment. Harvesting of queen conch may be detrimental not only to the national population, but also to the species’ ecosystem and other species that depend on it. CITES Scientific Authorities can identify and evaluate these impacts by considering the best available information about the harvest practice used and harvest intensity.

The greater the severity of wild harvest impact on the queen conch’s target and national population, as well as the ecosystem concerned, the greater are the requirements of information quantity and quality, management rigor, and precaution that CITES Scientific Authorities should apply to the NDF.

Key Question

Considering the impacts of all ongoing harvest and all other threats (e.g., including IUU fishing, habitat degradation, and climate change) on queen conch survival, is the severity of harvest impact on target populations, the national population, and on the ecosystem “Low”, “Medium”, “High”, or “Unknown”?

Guidance

In this guidance the terms “target population” and “harvest population” are equivalently used to describe the harvested populations that are the subject of the respective export application; whether already under a harvesting regime or planned to be harvested. However, the boundaries of a management area may not necessarily comply with the natural boundaries of the population. In practice, harvesting typically targets only a portion of population; an example of this is restricting harvesting to those queen conch found within the depth range exploitable by divers (and this depth would vary depending on whether compressed air was used versus free diving).

Step 6 looks at the actual impact of the harvest rather than potential impacts. For queen conch, harvest impact is usually closely linked to existing fisheries management systems (see Step 8) and cannot necessarily be considered in isolation. In Step 6 the impact of harvest on the target population, on the national/sub-national population and on other species in the food web is evaluated. The impact of harvest on the target population is the best indicator to evaluate the effectiveness of the management system. Nevertheless, the management system will be assessed separately in Step 8, in order to identify possible gaps or define conditions to be met for a positive NDF. Table 6.1 lists parameters and indicators that are most relevant to evaluate the impact of harvest on queen conch. *The most reliable information will come from long-term and frequent monitoring of the harvested population, and such studies should be publicly available or at least attached to the NDF.*

The higher the severity of risks identified in Steps 4 and 5 are, the stricter are the requirements for information quantity and quality, management rigor, and precaution that should be applied for in this step.

This guidance recommends putting emphasis on the scale of the harvest population (e.g., the target management area). Although the boundaries of a management area do not necessarily comply with the natural boundaries of the population, this is often the scale for which most detailed information is available and similar management measures apply. Nevertheless, in queen conch there can be spatial separation between shallow water nursery areas (e.g., backreef sea grass beds) and the distribution of large juveniles and adults (e.g., deeper forereef sites), or even spawning populations within mesophotic depths (> 30 m), so assessments should recognize and account for these potential distributional differences and the connections (conch ontogenetic shifts and spawning migrations) between them during the assessment process.

Table 6.2 "Factors to consider: impact of harvest" assists evaluating the severity of harvest impact **of harvest on national/sub-national population and on ecosystems**. The factors and indicators defined in Table 6.1 use information on the harvest practices and population trends in a simple ranking of impact severity: "Low", "Medium", "High", and "Unknown". Reliable data on national/sub-national population as well as on impacts on ecosystems and other species may not be available. *In the absence of sound inventory data, arguments need to be valid and sufficiently convincing to favor a positive evaluation.*

In fisheries, the area targeted, management goals, assessment methods, and the fishing methods used should be outlined in a specific queen conch management plan. In the absence of a species-specific plan or species-specific regulations, the jurisdiction’s general fisheries regulations would apply.

Any mid to long-term fishing operation that constantly reduces the stock is detrimental to the species survival. In other words, the sustainable weight of queen conch planned to be harvested should not exceed the productive capacity of the remaining population. Therefore, the basic condition that should be met when evaluating the harvest impact should be whether harvested numbers or weights (i.e., for both local use and exports) plus other losses (e.g., estimates of IUU fishing) are not exceeding average recruitment.

How to Proceed

Use the **Worksheet for Step 6** to record available information corresponding to each of the factors in Table 6.2 and the assessment of impact of harvest.

If general information on harvest impact is available but is not fully convincing and/or has important gaps or if no adequate assessments are available: answer “Unknown” and consider that higher rigor in evaluating Steps 7–8 will be required for a positive NDF decision.

To support the evaluation of appropriate rigor of existing management measures (Step 8), harvest impacts and their severity of “Low”, “Medium”, “High”, and “Unknown” rigor should be transferred to the **Worksheet for Step 8.2**. → **Go to Step 7**

REMEMBER: Fully cite the references that you use. Put a reference in the worksheet “Step1_Identification” and fully cite it in the worksheet “Sources_used” where you can also include a confidence level for each.

Table 6.1: Relevant parameters for evaluating harvest impacts on queen conch, including factors mitigating harvest impacts.

Parameter (units)	Explanation
Area (ha, km ²)	The area being managed for conch harvest and the target areas to be harvested in a year are important parameters because stock size is generally calculated on a per hectare basis using inventory data and extrapolated to the entire area. For a more accurate estimation of stock size, information on how much of the area does not constitute appropriate conch habitat, will not be subject to any harvest (reserve), or that is not possible to harvest either under existing fishing technologies or economics of fishing operations is crucial. Representative and well-enforced no-take reserve areas can potentially offset uncertainty in estimations of stock status and fishery impacts.
Minimum size: Shell length (mm) Lip-thickness (mm) Weight (g)	Often a minimum size for harvesting conch is set by national or sub-national law or by fisheries management regulation. Harvesting conch less than this should not happen. This information is used to calculate the legally harvestable (i.e., exploitable) stock size, to evaluate recruitment potential into harvestable size classes and to understand the influence of harvest on the population. Correlated weight limits should be available for the whole organism or defined for all process levels of meat.
Closed Season	Fisheries management for queen conch often defines periods over which the harvest of conch is prohibited. Often this closed period aligns with the peak spawning period for the species to ensure that adequate spawning densities are maintained during this time allowing conch reproductive behaviors (copulation, egg mass formation) to occur unmolested. Understanding the local seasonal reproductive cycle of queen conch will facilitate this alignment.
Total Allowable Catch (mt)	The total allowable catch (TAC) describes the weight of legally harvestable conch that can be harvested annually. Factors such as stock size, stock density, size/age distribution, recruitment and catch per unit effort are often used to generate this figure. For exporting queen conch meat, the TAC is a matter of annual approval by CITES Management Authority based on non-detrimental catch quota recommended by the CITES Scientific Authority.
Number of individuals and density (N total and N/ ha)	This is the basic figure for any extrapolation to exploitable stock size and weight for a population. Density, especially mature conch (e.g., LT > 10 mm, @ 50% maturation) density, is a critical factor affecting spawning potential. Given the uneven distribution of queen conch (i.e., gregarious species) statistically sound inventory data are needed.
Size distribution (% conch per size class)	Length and age are not correlated in adult queen conch. For adult conch (with a flared shell lip), lip-thickness can be used to estimate adult age. The age/size distribution of conch within a population provides information of the current harvestable stock size, the reproductive stock size and about recent recruitment success that will affect the future development of the population. Size distribution gives the % number (and/or weight) of conch in different size classes. Typically, there are 3 juvenile length classes and 4 adult size/age classes.
Harvestable Stock (N or Weight, total or per ha)	This figure is very important because it directly relates to the amount of conch available for harvest, and from which a non-detrimental quota is often recommended by the CITES Scientific Authority. The estimate of harvestable stock size is based on calculations, which at a minimum require the number of conch per area of the target population, and extrapolation of that to total population, the size/age frequency of the population, and the proper conversion factors for relating weight (at different processing grades) to number of individuals.

Size at maturity: Lip-thickness (mm)	To maintain sufficient reproductive capacity to ensure a sustainable harvest, a significant proportion of the adult population must remain after harvest through low harvest rates, no-take areas or inaccessible areas such as deep habitats. Size (i.e., lip thickness) at first maturity is the size at which 50% of the conch are mature. The size (i.e., lip thickness) at which 100% of the conch are mature (lip-thickness > 20 mm) may be termed mega-spawners (BOFFFs), individuals that may contribute disproportionately more to overall fecundity. The protection of some of these individuals may be critical to stable recruitment and connectivity.
Size distribution of harvested conch	The size/age distribution of the catch can be used to estimate the size/age of recruitment, which can be compared to any minimum size/age regulation. A lack of larger/older individuals in the catch, especially mega-spawners, would indicate a high mortality rate and potential recruitment overfishing, particularly if the target population is also the harvestable total population.
Catch per unit effort	Catch per unit effort can be used as a proxy for relative population density or relative population abundance. A decline in CPUE would indicate a decline in population abundance. Note that fishing effort can be challenging to estimate in multi-species artisanal fisheries where conch may be an opportunistic target for lobster or spear fishing activities. Fishing effort also may be challenging in industrial fisheries where mother ship operations undergo transfer of products from smaller vessels as well as catch from their own fleet of dinghies.
Conversion factors	Because the size at maturation (final size) can vary widely due to location (habitat, food resources), because conch can be processed to different levels, the ability to convert processed conch meat back to a uniform measure and back to number of individuals is critical for estimating total catch, and for using population density and size structure to develop a non-detrimental weight-based quota from which to define an annual TAC. Because mean size varies with age structure, which carry vary in response to fishing pressure and recruitment, conversion factors should be updated periodically.
Industrial vs artisanal fishing	Industrial fishing, by definition, involves a concentration of dynamic fishing effort that can carry out pulse fishing by sequentially exploiting and rapidly overharvesting an area and then moving to other areas before necessary management measures can be enacted. While intensive artisanal fishing can easily lead to overexploitation, the build up to this level of exploitation is generally more gradual and not characterized by rapid pulse fishing.
Use of compressed air for harvest	Use of compressed air (e.g., scuba, hooka) allows for a higher fishing power of the fishing effort units relative to free diving, potentially leading to a higher rate of exploitation over extended areas of the queen conch's habitat range, particularly with respect to depth. Deeper areas will have a higher proportion of adults and spawning stock, especially megaspawners, during non-reproductive periods.
IUU Fishing	Illegal, unregulated and unreported fishing within the jurisdiction or target area will reduce the amount of conch that can be legally harvested because this assumed level of harvest must be subtracted from any quota/TAC based on population size. Transshipments of conch into the jurisdiction cannot be used to estimate a non-detrimental quota or TAC

Table 6.2: Factors to consider: impact of harvest.

Indicator	Impact Severity			
	Low	Medium	High	Unknown
CPUE	CPUE unchanged or increases over time, with stable historic variance	CPUE decreases slightly and occasionally over time, with increasing variance relative to normal	CPUE declines steadily over time, with higher variance than normal	
Density	Harvestable population density > 100 conch/ha	Harvestable population density < 100 conch/ha but >50 conch/ha	Harvestable population density < 50 conch/ha	
Spawning density	Spawning density (i.e., mature adults) > 300 conch/ha	Spawning density < 300 conch/ha but > 185 conch/ha	Spawning density < 185 conch/ha	
Average size of conch in the population	Average size well above minimum size. Average size increases over time	Average size significantly above minimum size. Average size is variable but no long-term trend	Average size approaches minimum size. Average size decreases over time	
Size composition of population	Conch found in oldest size/age classes	Some old individuals occur	No individuals found in oldest size/age classes	
Conversion factors	Conversion factors developed locally from statistically valid samples	Conversion factors developed locally, but statistical validity not well documented	Conversion factors developed from average weights in samples of processed products, or regional conversion factors are used	
Recruitment	Many conch observed in the field in the smallest size classes (age 1+)	Some conch observed in the field in the smallest size classes	Few or no conch observed in the field in the smallest size classes	
Distribution of fishing effort	Spatial/depth distribution of effort is constant over time	Spatial/depth distribution of effort changes slightly over time	Spatial/depth distribution of effort changes over time to deeper depths or sites further away	
Size composition of the catch	Size at harvest > size at first (i.e., 50%) maturity. Average size increases over time	Average size at harvest > size at first maturity. Average size is stable over time	Average size at harvest < size at first maturity. Average size declines over time	
Proportion harvested	Proportion harvested ≤ 4 % of exploitable biomass	Proportion harvested is between 4 and 8% of exploitable biomass	Proportion harvested ≥ 8% of exploitable biomass	
Local (non-export) harvest and consumption	Local harvest and consumption are well estimated with variances	Local harvest and consumption are poorly estimated (Std. deviation ≈ estimate)	Local harvest and consumption are unknown, but a range may be given	

IUU Fishing	IUU harvest level can be estimated and is subtracted from allowable catch	IUU Harvest level thought to be low but not subtracted from allowable catch	IUU harvest level high and not subtracted from allowable catch	
Industrial vs artisanal fishing	Artisanal fishing dominates the catch	Both industrial-scale and artisanal fishing contribute significantly to the catch	Industrial fishing dominates the catch	
Use of compressed air for harvest	Use of free diving dominates the catch	Use of both free diving and compressed air contribute significantly to the catch	Use of compressed air dominates the catch	
Reproduction Frequent	Mating, copulation and spawning are frequently reported by fishers/surveyors	Mating, copulation and spawning are occasionally reported by fishers/surveyors	Mating, copulation and spawning are infrequently or not reported by fishers/surveyors	
Spawning areas protected	Known spawning sites are protected	Some known spawning sites are given protection	No protection given to spawning sites	

STEP 7 EVALUATE APPROPRIATE RIGOR OF EXISTING MANAGEMENT MEASURES

Rationale: why is this step important?

Management planning is a prerequisite for legal and sustainable queen conch fishing operations world-wide. For wild-harvested queen conch, non-detrimental trade requires the effective implementation of appropriate and proportional management measures. *The level of management rigor needs to be appropriate to mitigate (= reduce the severity of) the specific harvest and trade impacts identified for the species concerned and its populations.* Therefore, evaluating management measures is the key step toward evaluating non-detriment.

Steps 4–6 of this Guidance support CITES Scientific Authorities in assessing conservation concern, potential biological risk, and harvest impact. These steps also assist the CITES Scientific Authorities in the identification of factors that contribute to the concerns, risks, and impacts.

Existing management measures may mitigate the impacts of harvest; therefore, it is not possible to consider these impacts as independent factors in a non-detriment finding process (for example, if existing management measures are appropriate, harvest impacts will not be “High”. *Therefore, the rigor of existing management measures is inherent in the evaluation of the impacts of harvest in Step 6.*

Step 7 supports use of available information to evaluate whether the management measures in place have the appropriate level of rigor and are effectively implemented to mitigate the identified harvest impacts. Step 7 adds value by reviewing the consistency of individual management measures in detail. In Step 9, management measures identified here will be directly compared to identified harvest (Step 6) and trade (Step 8) impacts.

Key Question

What management measures are functionally in place for the queen conch fisheries and conservation?

Guidance

In Step 7, the CITES Scientific Authority should be fully conversant on the management systems required for queen conch conservation and the systems that are actually in place. Many aspects have already been looked at in Step 6 and can be collected in **Worksheet 7** while dealing with that step.

In addition, answers to the following questions may help:

- What role do fishers, industrial operators, processing plants, and fishing-cooperatives have in the management system and to provide information, and whether that information is provided in a timely manner for effective management?
- What management measures are in place and are they documented (e.g., in a management plan or legislation), are they comprehensive and adequate to the requirements of the queen conch fishery?
- Are there mandatory State checks and controls of fishery operations, transport, processing, exports, etc.?
- Is a credible certification system in place?
- Is monitoring and enforcement conducted to systematically assess the impact of harvesting procedures and also assess whether management objectives have been met?
- Is there a strategy to gather information on IUU fishing affecting the queen conch fishery?
- Are there automatic accountability measures in place that will reduce subsequent harvest levels in the case that the non-detrimental quota or TAC is exceeded.

Table 7.1 allows for the evaluation of potential management measures for queen conch and an assessment if these are effective in achieving sustainable management, relative to their stated goal and the efficacy of their implementation and compliance. CITES Scientific Authorities may need to contact the relevant competent authorities or the managing companies to gather information on most of these questions.

How to Proceed

Use the **Worksheet for Step 7** to record the details of each management measure in place and evaluate their potential effectiveness.

→ go to **Step 8**

REMEMBER: Fully cite the references that you use. Put a reference in the worksheet “Step1_Identification” and fully cite it in the worksheet “Sources_used” where you can also include a confidence level for each.

Table 7.1: Evaluation of potential management measures for queen conch

Management Measure	Documented in law or regulation	Expected conservation impact	Routine monitoring & enforcement	Information sources used	Confidence level (L, M, H)
Quota or TAC					
Minimum size (specify)					
Maximum size (specify)					
Closed season (Months)					
No-take areas of known conch (% relative to total known conch area; season closed)					
Limited entry: number of fishers or quota holders (specify)					
Free diving only					
Catch reports					
Logbook inspection					
Dockside inspection					
Vessel monitoring system					
Certification system					
Accountability measures for when non-detrimental catch quota/TAC exceeded					

STEP 8 EVALUATE IMPACTS OF TRADE

Rationale: why is this step important?

Impacts of wild harvest to the harvested populations (“target population”) has been considered in Step 6. Here the impact of international trade as modulated by domestic consumption is considered. The impacts of trade can be detrimental to the survival of the species concerned. Trade is the potential threat relevant to CITES. Scientific Authorities can identify and evaluate trade impacts by considering the available information about the scale and trend of legal and illegal trade.

The greater the severity of trade impact on the species concerned, the greater are the requirements of information quantity and quality, management rigor, and precaution that CITES Scientific Authorities should apply to making an NDF. In effect, the greater the risk, the more precautionary the decision making should be in the final stages of the NDF process.

Key Question

Considering the impacts of trade on queen conch survival, is the severity of all legal and illegal trade impact on the harvest area population and the national populations “Low”, “Medium”, “High”, or “Unknown”?

Guidance

The impact of all harvest operations on the national/target population were looked at in Step 6. Next, the impact of trade at the harvest area level is examined considering the trade quantities in relation to actual harvest. Then we consider the impact of international trade in relation to that of any domestic trade (including any illegal trade) on the population of queen conch. *The higher the severity of risks identified in Steps 4, 5 and 6, the stricter requirements for information quantity and quality, management rigor, and precaution that should be applied for in this step.*

In some cases, existing management measures may mitigate (= reduce the severity of) trade impacts. Therefore, this Step considers actual impact rather than potential impact. Management measures in their own right were considered in Step 7.

Trade data can reveal mismatches between stated harvest and actual traded volumes. Illegal trade is considered in this step as well.

It is important to source and consider available information on local, national, international as well as illegal trade trends in queen conch (see “Useful Sources and Examples of Recommended Information Quality”). To evaluate trade impact for queen conch appropriately, traceability, or the knowledge of the national chain of custody (including recorded quantities) of the traded queen conch products (e.g., meat, shells, opercula, pearls, trimmings), from harvest to export, is necessary. The CITES Scientific Authority may need to liaise with the CITES Management Authority or other national agencies on this issue. If you have confidence in a robust chain of custody this will greatly facilitate your decision making.

Trade Data

When evaluating trade data consider:

- that in addition to international trade, domestic use and illegal trade (domestic or international) may also exist, so try to obtain estimates of their weight or number, using statistically relevant conversion factors;
- whether trade in queen conch may be taking place under the name of a look-alike species or vice versa; assessing the range of products of queen conch in trade, including derivatives, such as meat, shells, opercula, trimmings, and pearls. All queen conch products are secondary to meat. There will be a linear correspondence between the number of shells or opercula exported and number of animals harvested, but these will already be accounted for through weight values for harvested meat (domestically consumed or for export). The level of trade of all commodities, covered or not covered by CITES, of queen conch should be analyzed, if information is available;
- obtaining and reviewing the conversion factors used in order to evaluate the weight of trade in a uniform manner, preferably at the level of live tissue weight (i.e., excluding the weight of the shell) and to understand the source and robustness of the conversion factors.

Quotas

When checking export levels against an export quota consider:

- The annual catch quota is higher than the annual export quota;
- An annual export quota is not a target and there is no need for a quota to be fully used;
- An export quota applies to wild-taken specimens unless indicated otherwise;
- Verification of the number of specimens or weight (use conversion factors to convert to the standard live tissue weight, for which an export permit has been requested);
- Checking past trade levels to compare against levels for the current year.
- Does the export quota explicitly include or exclude certain commodities?
- For any specific permit application, how much of the annual export quota has been used to date?
- The set up of the export quota takes account of the number or quantity of specimens that are taken from the wild legally or illegally.

Traceability

When evaluating the robustness of the chain of custody consider:

- the level of documentation and control at each step of the chain of custody from the fisher/area to the exported specimens;
- the durability and protection against forgery of marking techniques.

Factors that affect the impact of trade on species survival are elaborated in Table 8.1 **“Factors to Consider: Impacts of Trade”**.

How to Proceed

Use the **Worksheets for Step 8** to record available information corresponding to each of the factors in Table 8.1 and the assessment of trade impact.

If no adequate assessments are available: answer “Unknown” and consider that higher rigor in evaluating Step 8 will be required for a positive NDF decision.

To support the evaluation of appropriate rigor of existing management measures (Step 7), summary lists of “Low”, “Medium”, “High”, and “Unknown” trade impact factors will be transferred to the **Worksheet for Step 9**.
→ **Go to Step 9**

Table 8.1. Factors to Consider: Impacts of Trade

Indicator	Impact Severity			
	Low	Medium	High	Unknown
Weight of exports relative to total catch	Weight of exports is low (< 20%) relative to total catch	Weight of exports is between 20 and 50% of total catch	Weight of exports is above half of total catch	
Weight of exports relative to total population	Exports low relative to population (Steps 4&5)	Exports not low or high relative to population (Steps 4&5)	Exports high relative to population (Steps 4&5). Multiple products exported	
Trend in demand	Demand is decreasing over time	Demand is steady or slowly increases over time	Demand is increasing rapidly over time	
Trend in price per weight	Price per weight is decreasing over time	Price per weight is steady or slowly increases over time	Price per weight is increasing rapidly over time	
Trade documentation (domestic & international)	Documentation of domestic and international trade is complete	Documentation of domestic and international trade is incomplete, not transparent or of limited reliability	Limited documentation of legal domestic and international trade. Documented or proof of illegal trade	
Traceability	Trade chain transparent and robust (at least for the harvest area)	Trade chain difficult to follow	Trade chain neither transparent nor robust	
Mislabelling	Low concern	Some concern	Great concern	
Reporting System for landings/ exports	Monitoring of landings/ exports is sufficiently timely to assess relative to the current declared non-detrimental catch quota or TAC	Monitoring of landings/ exports is sufficiently timely to avoid excessive overage relative to declared non-detrimental catch quota or TAC	Monitoring of landings/ exports is not sufficiently timely to avoid excessive overage relative to declared non-detrimental catch quota or TAC	

STEP 9 GAP ANALYSIS AND SUMMARY OF STEPS 4-8

Rationale: why is this step important?

In Step 7, existing management measures were identified and evaluated if they have the appropriate level of rigor and are effectively implemented to mitigate impacts. In Step 9.1 these management measures are directly compared to the identified harvest (Step 6) and trade (Step 8) impacts to determine their potential to mitigate these specific impacts. Additionally, Step 9.1 will

- Identify possible major shortcomings in the current management
- Provide an overview of the entire NDF-process to inform the final NDF-decision.

Key Question

Do existing management systems adequately mitigate harvest impacts identified for national populations of queen conch?

Guidance

The **Worksheet for Step 9** aims to provide a synopsis of the previous steps. To do this:

1. Transfer the results of conservation concern (Step 4) and biological risk (Step 5) from the **Worksheets for Steps 4 and 5** into the upper part of **Worksheet for Step 9**.
2. Transfer the harvest impacts (Step 6) and trade impacts (Step 8) from the **Worksheets for Steps 6 and 8** into the lower left part of **Worksheet for Step 9**.
3. Place the existing management procedures (Step 7) against those previously identified trade impacts (Step 6) and harvest impacts (Step 8) (now placed in the lower left part of **Worksheet 9**) for which they may mitigate. *Use only those management procedures that currently exist, not all those listed in Table 7.1.* The management measures should be placed opposite the respective trade and harvest impact in the column headed "Management measures". A management measure may mitigate more than one impact, and a single impact may be mitigated by more than one management measure. In fact, the potential management measures can mostly be split into two groups: (1) those designed to limit effort and/or catch; and (2) those concerning monitoring and reporting. Some management measures can target the population broadly while at the same time targeting more specific risks. For example, closing the population from harvest during the peak of the spawning season will lessen overall effort and catch, but also target the need to maintain spawning adults and at the high densities needed for mating and copulation.
4. Evaluate whether management measures in place adequately mitigate the severity of concerns, risks, and impacts, based on Table 7.1 (**Worksheet 7**) and the following conditions for appropriate management rigor (scaled from worse to best):
 - a) Management measures to address the type and geographic scope of the identified concerns, risks, or impacts, do not exist or are unknown to exist.
 - b) Management measures in place address the type and geographic scope of identified concerns, risks, and impacts, but don't have the appropriate level of rigor.
 - c) Management measures in place have, at a minimum, the appropriate level of rigor required to reduce the severity of identified concerns, risks, and impacts, but are not implemented effectively or implementation is unknown.
 - d) There is evidence that the existing management measures have the appropriate level of rigor and are effectively implemented to mitigate the identified concerns, risks and impacts.

This Guidance treats "Unknown" concerns, risks or impacts from the previous Steps as equal to a "High" level of severity, thus requiring high levels of management rigor.

Often not all factors identified in the NDF-process influence sustainable harvest and trade with the same level of impact and sometimes one or several factors can be identified to be of central importance. Use the red dot on top of the Worksheet to indicate key factors of your evaluation by copying it into the respective cell(s) of the column titled "Key".

How to Proceed

Use the **Worksheet for Step 9** to evaluate and record the effectiveness of the management measures listed in the **Worksheet for Step 7** against the biological risks and impacts of harvest and trade. Identify any gaps between the management measures required and those actually in place.

Taking all aspects of the evaluation into consideration, make an overall judgement of whether rigor of implementation of the management in place is appropriate to the severity of harvest impacts, and trade impacts identified. → **Go to Step 10**

REMEMBER: Fully cite the references that you use. Put a reference in the worksheet “Step1_Identification” and fully cite it in the worksheet “Sources_used” where you can also include a confidence level for each.

STEP 10 NON-DETRIMENT FINDING AND RELATED ADVICE

Summary of NDF Process

Steps 1–9 of this Guidance have been structured to guide CITES Scientific Authorities through a series of Key Questions and Decision Paths to make “a science-based assessment that verifies whether a proposed export is detrimental to the survival of that species” (Resolution Conf. 16.7 [Rev. CoP17] Non-detriment findings). These Steps and the related Guidance support various outcomes, depending on:

- Step 1 – whether there are concerns about queen conch identification
- Step 2 – whether there are concerns about the origin of the queen conch landings
- Step 3 – whether the CITES Scientific Authority has the structure and capacity to either conduct or evaluate an assessment
- Step 9 – whether existing management measures identified in Step 7 adequately mitigate (= reduce the severity of) biological risks identified in Step 5 and the harvest and trade impacts identified in Steps 6 and 8. While a failure encountered during any single step through Steps 5-9 can result in the termination of the process and a recommendation of a negative NDF (Figure 5), the CITES Scientific Authority is encouraged to complete the process so as to really understand the problems and gaps in their ability to have a sustainable fishery, even if it will be used only for domestic purposes.

This Guidance supports CITES Scientific Authorities in their task to gather, evaluate, and document relevant information for which the data quality is “proportionate to the vulnerability of the species concerned” (Resolution Conf. 16.7 [Rev. CoP17] Non-detriment findings). This guidance also helps in identifying information gaps and management deficits for further improvements of the sustainable management of the target species.

The final task for the CITES Scientific Authority is to make a positive or negative NDF or related decision, and to advise the CITES Management Authority whether to allow the proposed export of queen conch specimens based on the outcome of the previous steps of this Guidance.

Remember: it is possible to exit early from the 10-Step process at a number of different steps depending on the answers to the key questions. The Decisions below guide the Scientific Authority through the next stage depending on which Step they exited at. **Only one of these decisions applies to a single application.**

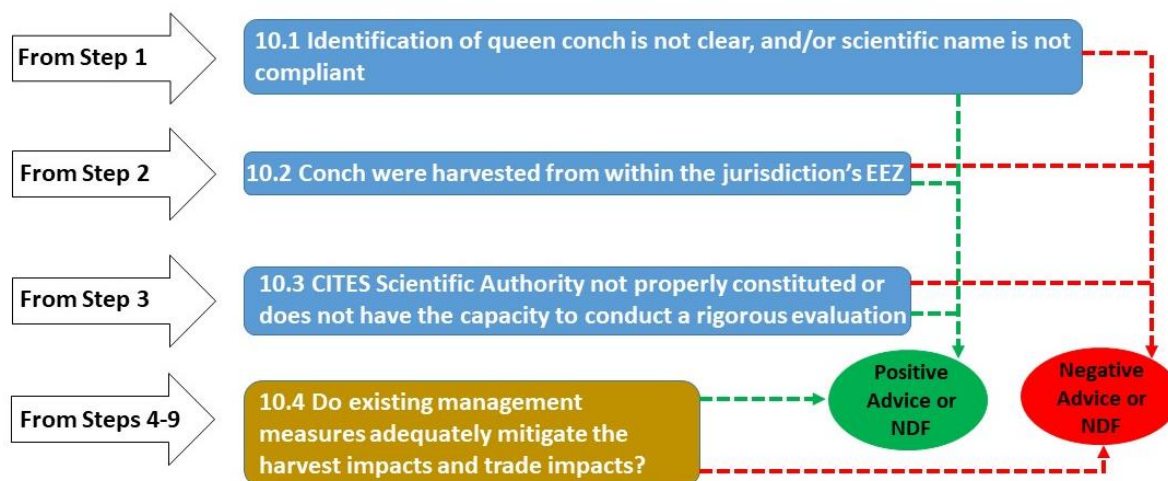


Figure 10.1. Summary of decisions which can be made in Step 10.

Numerical Summary

A numerical summary of Steps 1-9 is calculated using scores for each step. Guidance for scoring each step is given in the Appendix within the context of three different scenarios. One leading to a positive NDF, one leading to a negative NDF, and one leading to a conditional NDF. Use **Worksheet 10.1** to develop a summary score based on scores for Steps 1-9. Note that the resulting overall score and recommended interpretations relative to an NDF determination are there for guidance only. The final decisions made during Step 10 are subject to the interpretation of the CITES Scientific Authority.

**Decision 10.1

The outcome of Step 1 is: The CITES Scientific Authority has determined that the specimen concerned has been deliberately mislabeled misidentified or not been correctly identified, and that the scientific name used is not compliant with the appropriate CITES Standard Reference.

Guidance

In this case concerns over the species' identity were identified by the CITES Scientific Authority and could not be corrected or resolved by consultation with an expert or the CITES Management Authority.

Record the justification for this finding in the **Worksheet "Step10.2_Decision"**, Outcome 10.1.

The CITES Scientific Authority's advice supported by this Guidance is:

→ **Negative decision: Advise the MA that NDF cannot be made.**

If the CITES Scientific Authority decides to make a **positive NDF**, the basis for the finding should be documented and the remaining steps to come to an NDF should be applied.

****Decision 10.2**

The outcome of Step 2, Key Question 2.2 is: The CITES Scientific Authority is not confident that the queen conch product concerned was harvested from the jurisdiction's national waters, or within the target harvest area.

Guidance

In this case, the CITES Scientific Authority has determined that the queen conch, is from outside the national jurisdiction or outside the target area, not a legitimate re-export and therefore should not be permitted for export.

The CITES Scientific Authority's advice to the CITES Management Authority, supported by this Guidance, is:

→ **Negative decision: Advise the CITES Management Authority that NDF cannot be made and that the export permit has to be denied.**

Record the basis for the decision in the **Worksheet "Step10.2_Decision"**, Outcome 10.2.

****Decision 10.3**

The outcome of Step 3, Key Question 3 is: The CITES Scientific Authority is not properly constituted and/or lacks the functional capacity to make an NDF assessment for queen conch.

The CITES Scientific Authority's advice to the CITES Management Authority, supported by this Guidance, is:

→ **Negative decision: Advise the CITES Management Authority that NDF cannot be made and that the export permit has to be denied.**

Record decision in the **Worksheet "Step10.2_Decision"**, Outcome 10.3.

****Decision 10.4**

Step 9, Key Question 9.1 is: Do existing management measures adequately mitigate harvest and trade impacts identified for the populations and sub-populations of the queen conch affected by the proposed trade?

Guidance

For a detailed queen conch NDF, the Key Questions and Decision Paths in Steps 4–8 have supported evaluation of conservation concerns, potential biological risks, harvest impacts, and trade impacts and their severity, using information with a data quality recommended for the severity of concerns, risks, and impacts. Key Questions and the Decision Path for Step 9.1 have supported identification of management measures in place that are relevant to the identified concerns, risks, and impacts, and evaluation of whether existing management measures are sufficiently rigorous and effective to mitigate the impacts identified. In addition, the numerical scoring procedure given in Step 9.2 gives further advice to the CITES Scientific Authority in making their decision.

The Scientific Authority's decision supported by this Guidance is:

- **Positive NDF** if the evaluation of available information indicates “Yes”, management measures in place are sufficiently rigorous and effective, or “Yes” with advice on key management gaps identified in the Worksheet for Step 9.1, Key Question 8.1, to be defined in the NDF.
- **Negative NDF** if the evaluation of available information indicates “No or Uncertain”, management measures in place are not sufficiently rigorous and effective.

Record decision in the **Worksheet “Step10.2_Decision”, Outcome 10.4.**

Conditional NDF and Adaptive Management

The uncertainties, risks and/or data gaps identified in the context of producing NDFs could be approached by applying precautionary conditions to trade. This would allow for corresponding precautionary levels of harvest and associated exports while risks are reduced, gaps in management are addressed, or quality of information is improved. This pragmatic approach offers the opportunity to identify and implement effective management measures, rather than deferring to zero quotas or trade suspensions/bans, though there are circumstances when such stricter measures are needed. Allowing some harvest may be the best source for obtaining the necessary information on the vulnerability of the queen conch resource and the management options best suited to reduce uncertainties in the extent of the resource and its productive capacity.

This approach **should be used sparingly**, as any country newly considering the export of queen conch would already have an established fishery and based on that should have a basis for thinking that exports would not affect the sustainability of the stock. **The use of a conditional NDF in the case of countries with established export harvests should be still more restrictive if there is evidence or suspicion of not having fully worked to adopt CITES standards for improving the quality and quantity of information necessary to assess queen conch population status relative to exports, to reduce uncertainty or mitigate impacts through regulation and enforcement.** Additionally, any conditional NDF should come with an explicit time frame for accomplishing the required conditions, with the length of that timeframe being commensurate with the expected time to accomplish the stated goals. Considering the general vulnerability of queen conch and its age at maturation, in no case should the time frame for queen conch be greater than 3 years.

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GLOSSARY AND ACRONYMS

The descriptions and explanations provided here are not given as legal definitions, but rather for readers to better understand the concepts behind these terms. For many terms it is difficult to craft a definition that would account for all possibilities. Where applicable, the local/legal definition of technical terms and concepts (such as artisanal and industrial) of Range States should take precedence, notwithstanding the definition in the NDF guide.

.....

Adaptive management: A structured approach to decision making, used when there is substantial uncertainty regarding the existing data for fisheries management or/and the most appropriate fishery management strategy, that promotes modification of assumptions and interventions in response to new information based on monitoring, experience, or research.

Artisanal scale fishery: The characteristics of the queen conch artisanal fishery can vary from place to place, even within country. However, typically it is characterized by fishing for conch from small boats with low fishing power (e.g., single, small engines) with a few divers making daily fishing trips, or trips of a few days maximum. The artisanal catch is frequently landed at diverse locations, but individual fishers show strong landing-site fidelity. In some areas, the catch is transferred to carrier vessels.

BOFFFs: Big Old Fat Fecund Females. See Megaspawners.

Catchability: The proportion of the population removed by one unit of effort.

CITES: Convention on International Trade of Endangered Species of Wild Fauna and Flora.

Conversion Factor: an experimentally determined scalar or equation used to back-calculate the equivalent weight of one queen conch product/by-product to that of another or to back-calculate to an equivalent the number of individuals. Conversion factors are used in quota determinations and for reporting catch weight to FAO. For example, conversion factors are used to expand several % processed meat weight categories to total live weight (i.e., flesh + shell weight), or live tissue weight (flesh without shell). Conversion factors can also be used to back-calculate how many conch were used to produce a given weight/number of opercula and shells or a given volume of conch chowder, etc. Conversion factor can used to calculate biomass from surveys that measure the density and individual sizes of conch in the field.

Exclusive Economic Zone (EEZ): This is the zone where coastal nations have jurisdiction over natural resources. The maximum limit is usually 200 nautical miles, but it can be less when it abuts the EEZ of another country.

Exploitable population/biomass: That part of a population subject to fishing. Queen conch located in an area closed to fishing, located in an area where the fishery does not operate, are below any legal minimum size, above any maximum legal size, or otherwise not harvested (e.g., too small to be of economic value) would not be considered part of the exploitable population.

Growth overfishing: The harvesting of individuals at an average size smaller than the size that would result in the maximum yield per recruit.

Industrial scale fishery: Fishing for queen conch that involves the use of large motherships capable of trips lasting weeks and carrying up to 100 divers. Note that motherships can supplement their take by transferring catch from the artisanal fishery or function as carrier vessels that only receive, store and transport conch products from a relatively large number of artisanal-scale fishers. Motherships land their catch as frozen meat at a limited number of ports.

Illegal, Unregulated and Unreported (IUU) Fishing:

Illegal fishing is fishing conducted by national or foreign vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations; conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the States are bound, or relevant provisions of the applicable international law; or in violation of national laws or

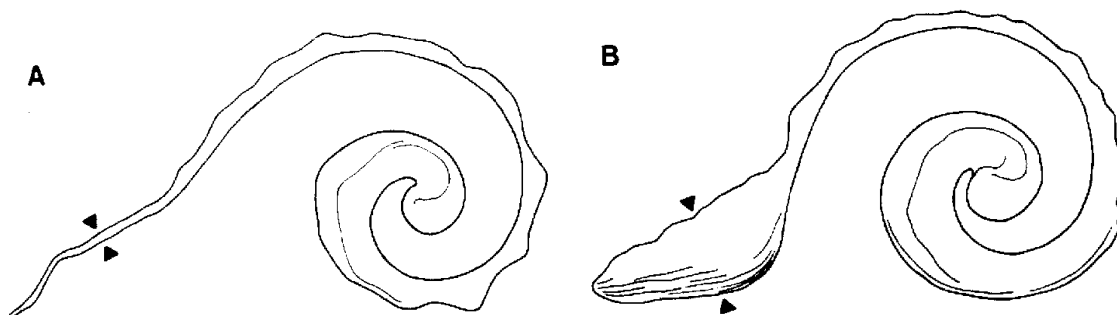
international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.

Unreported fishing represents fishing that has not been reported, or has been misreported, to the relevant national authority, in contravention of national laws and regulations; or fishing undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

Unregulated fishing is fishing in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a State not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.

Legal population/biomass: That part of the population can be legally harvested. Harvesting can be restricted by a minimum size, maximum size, or by permanently closing areas to fishing.

Lip thickness (LT): In queen conch with a flared shell lip, the measure of the thickness of the lip, typically made in the mid-lateral region in a spot unaffected by plaits, and at a distance of 35-45 mm in from the edge of the lip (See illustration below).



Cross-section of the shell of adult queen conch. Arrows represent position where lip thickness is measured. (A) Recently matured adult, lip thickness = 5 mm; (B) old adult, lip thickness = 27 mm.

Megaspawners: The old, large individuals in a population representing females (i.e. BOFFFs) that are much more fecund because the number of eggs increases exponentially with size and that tend to produce larger eggs of higher survivability, and represent, through longevity, that part of the population with higher overall individual fitness and functioning as a natural safeguard against overharvest and subsequent recruitment failure.

National waters: A Country's marine jurisdiction, usually extending 12 nautical miles from the coast.

Non Detriment Finding (NDF): A science-based conclusion by a CITES Scientific Authority that the export of specimens of a particular species will not impact negatively on the survival of that species in the wild and will maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs.

Precautionary approach: A management regime based on two principles: (1) where there are risks of serious or irreversible environmental damage, regulatory action to alleviate these risks is required even in the absence of full scientific certainty that the damage will occur, and (2) the burden of proof is placed on those who contend that there will be little or no impact on the population or environment in response to a given action.

Quota: The maximum weight of queen conch (defined by processing level) that can be exported. Under CITES, a quota must be scientifically based and be at or below the level where exports would threaten the long-term sustainability of wild queen conch populations or its role in the ecosystem,

Risk: The probability of something undesirable happening.

Source/sink: A *source* is an area or population that exports a significant amount of larval production such that it can sustain a different population or area. A *sink* is an area or population that is dependent upon larval recruitment from another area or population.

Spawning population: That part of a population consisting of fully mature adults. The definition often used is for those individuals that are at or above the size (e.g., lip thickness) at which 50% of the individuals are mature. For queen conch, 50% maturity is frequently at a lip thickness > 10 mm.

Statistical uncertainty: Stochasticity or error from various sources as described using statistical methodology.

Target area: That part of a country's marine jurisdiction in which fishing for export is allowed.

Total Allowable Catch (TAC): The maximum weight of queen conch (defined by processing level, see conversion factors) that can be harvested in a country's jurisdiction from both the domestic and export fisheries. A TAC should be set at a level that prevents overfishing.

Uncertainty: The incompleteness of knowledge about the state or processes of nature

Unit of stock: a fishery management framework that more effectively defines regulations to control fishing mortality over a fraction of a queen conch population that is subjected to exploitation by specific operational characteristics of certain fleets, over certain areas and time.

APPENDIX 1. EXAMPLES OF DECISION MAKING UNDER 3 SCENARIOS

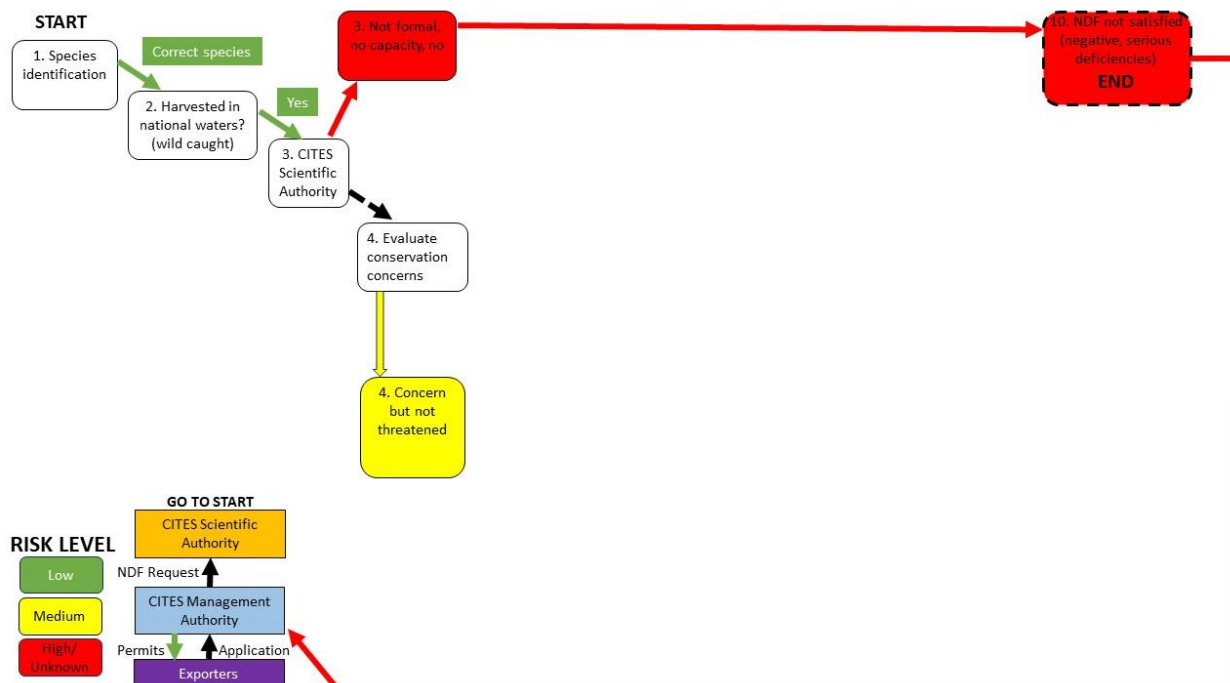
Below are three hypothetical example scenarios representing countries where their knowledge base and capacity to assess the status and risks to the queen conch population differ. These are ordered in terms of increasing capacity. For each, a description of the scenario and the corresponding numerical scoring are given. The following guidelines are used for interpreting the final numerical score out of 18 possible points:

NDF satisfaction levels	Points	Percent
NDF good/satisfied ≥ 14	$> 75\%$	
NDF moderate/gaps 11 – 13	60 - 74%	
NDF poor/not satisfied	≤ 10	$< 60\%$

Scenario 1.

A country that is assessing their potential for export due to a surplus of queen conch in the local markets.

Under this scenario, the country does not have the institutional framework necessary to comply with CITES requirements. The species in the landings is correctly identified by name, and the landings are from national jurisdiction. The CITES Scientific Authority is not formally established and the local country scientific authority are minimally contributing to the assessment of the fishery. While there exist reports in the scientific literature suggesting that the conservation concern of the species is moderate, the lack of institutional framework prevents a valid assessment of the risks and potential impacts of the fishery and product trade. The flow chart in Figure 5 for the 10-Step pathway for making non-Detriment Findings for queen conch is used for this scenario in Appendix Figure 1:



Appendix Figure 1. Flow chart for example Scenario 1

Appendix Table 1. Numerical scoring for example Scenario 1

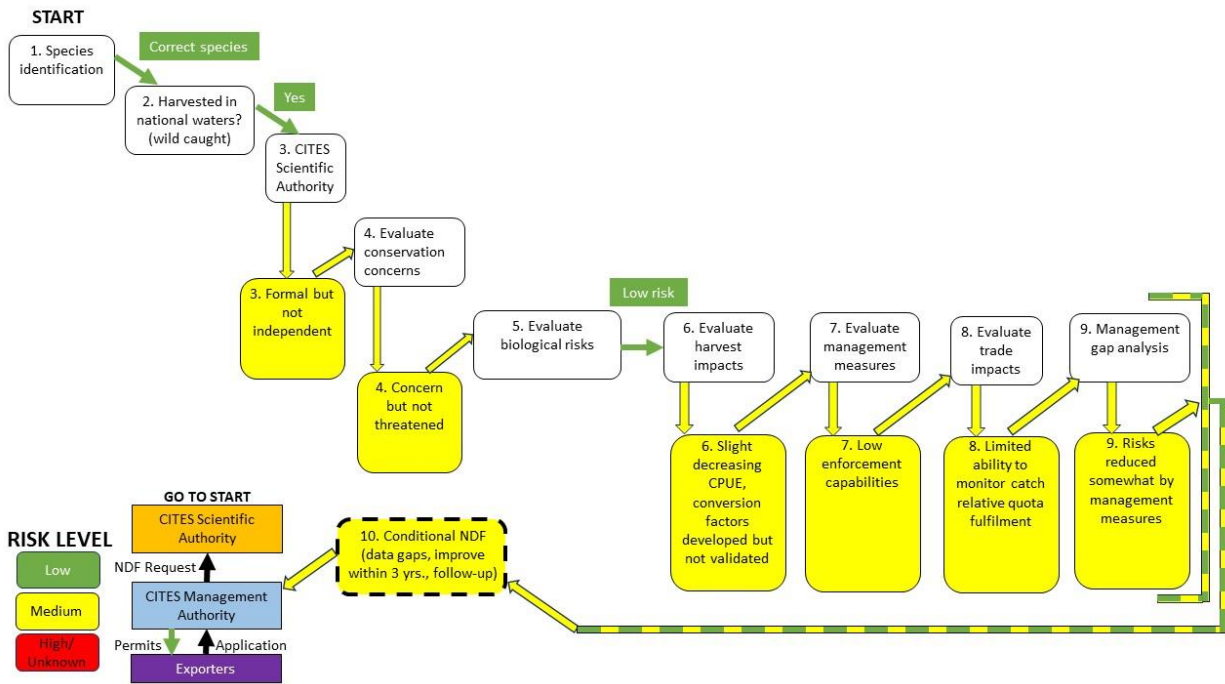
STEP	Level of Risk or Concern*		
	Low (2 Point)s	Medium (1 Point)	High (0 Point)
1. Species Identification	2		
2. Legal Harvest in National waters	2		
3. CITES Scientific Authority			0
4. Evaluate conservation concerns		1	
5. Evaluate biological risk			0
6. Evaluate impacts of harvest			0
7. Evaluate management measures			0
8. Evaluate impacts of trade			0
9. Evaluate mgt. measures relative to impacts			0
Total points (max 18)	4	1	0
	Total Points	Percent	
NDF condition of satisfaction	5	27.778	

Result: The NDF level of satisfaction is only 27.8%. The NDF Condition is not satisfied due to the lack of formal CITES Scientific Authority to evaluate the status of exploitation of the stock and promote annual quotas that are non-detrimental to the survival and ecological function of the species,

Scenario 2.

A fishery with a "modest sized" export capacity and some institutional framework that may cope with some but not all the CITES requirements for the export queen conch.

For this scenario, landings are from the coastal shelf with a significant contribution from artisanal fishing operations and a smaller contribution from some industrial vessels. Species in the landings is correctly identified by name, and the landings are from within the national jurisdiction. The CITES Scientific Authority is formally established but is not independent within the national scientific authority and results of their findings are sent to the CITES Management Authority via the local country scientific authority. The scientific expertise to evaluate the status of exploitation of the species is limited but sufficient to generate understanding of the biological conditions of the stock. The biological condition of the stock is basically known, suggesting some risk, which is coincident with findings in the scientific literature. The impacts of harvest are not well under control as conversion factors are not validated, there is a slight decline in CPUE, and enforcement capabilities by the local fishery authorities is insufficient. Management measures are at an intermediate level such as having annual quotas that are not fully tested but at least are useful to generate legal frames for management. The ability to control the impacts of trade are very limited due to limited personnel to timely control quota fulfillment and stop fishing operations. Existing management measures address some, but not all of the identified risks. The flow chart in Figure 5 for the 10-Step pathway for making non-Detriment Findings for queen conch is used for this scenario in Appendix Figure 2.



Appendix Figure 2. Flow chart for example Scenario 2

Appendix Table 2. Numerical scoring for example Scenario 2

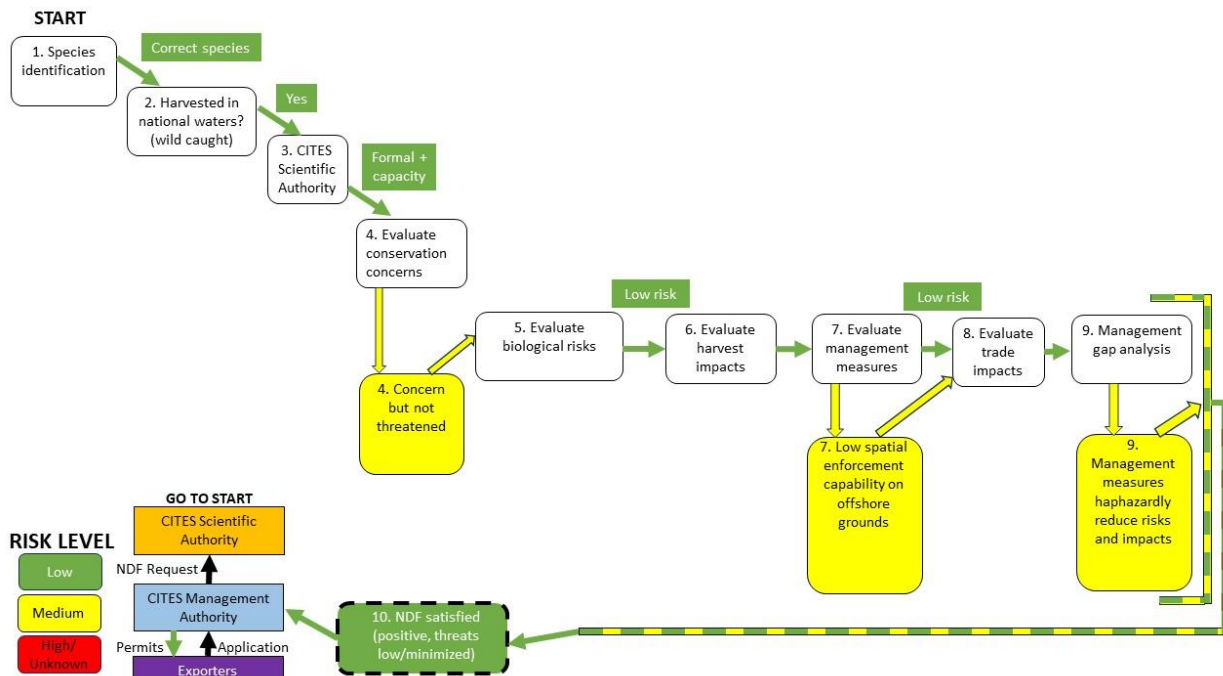
STEP	Level of Risk or Concern*		
	Low (2 Point)s	Medium (1 Point)	High (0 Point)
1. Species Identification	2		
2. Legal Harvest in National waters	2		
3. CITES Scientific Authority		1	
4. Evaluate conservation concerns		1	
5. Evaluate biological risk	2		
6. Evaluate impacts of harvest		1	
7. Evaluate management measures		1	
8. Evaluate impacts of trade		1	
9. Evaluate mgt. measures relative to impacts		1	
Total points (max 18)	6	6	0
	Total Points	Percent	
NDF condition of satisfaction	12	66.667	

Result: The NDF level of satisfaction is only 66.7% due to the existence of high uncertainties in implementation of fishery regulations and enforcement and lack of full capacity to prevent excess fishing.

Scenario 3.

Country with a history of significant queen conch exports, with both industrial and artisanal landings.

Here, the formal institutional framework to comply with CITES requirements for exports is in place. The species in the landings is correctly identified by name, and the landings are from national jurisdiction. The CITES Scientific Authority is formally established and is independent within the national scientific authority and results of their findings are sent directly without interference to the CITES Management Authority. The scientific expertise to evaluate status of exploitation of the species is sufficient to generate understanding of the biological condition of the stock. There is some conservation concern evident in the scientific literature, but generally the biological condition of the stock is known and suggests that risks are low. The impacts of harvest are not fully under control due to insufficient spatial enforcement capabilities in the offshore national fishing grounds by the local fishery authorities. Management measures are at an intermediate to advanced level with annual quotas that are tested and generating support to legal frames for management. The impacts of trade are well established due to sufficient personnel to timely control quota fulfillment and declaring timely fishing season closure. Management measures haphazardly mitigate risks and impacts. The flow chart in Figure 5 for the 10-Step pathway for making non-Detriment Findings for queen conch is used for this scenario in Appendix Figure 3.



Appendix Figure 3. Flow chart for example Scenario 3

Appendix Table 3. Numerical scoring for example Scenario 3

STEP	Level of Risk or Concern*		
	Low (2 Point)s	Medium (1 Point)	High (0 Point)
1. Species Identification	2		
2. Legal Harvest in National waters	2		
3. CITES Scientific Authority	2		
4. Evaluate conservation concerns		1	
5. Evaluate biological risk	2		
6. Evaluate impacts of harvest	2		
7. Evaluate management measures		1	
8. Evaluate impacts of trade	2		
9. Evaluate mgt. measures relative to impacts		1	
Total points (max 18)	12	3	0
	Total Points	Percent	
NDF condition of satisfaction	15	83.333	

Result: The NDF level of satisfaction is 83.3% due to the existence of low risks provided by a well-established arrangement of CITES institutional requirements, implementation of fishery regulations, and sufficient enforcement and controls to prevent excess fishing are in place at the dock side.

Development of a Toolkit for the Traceability of Illegal, Unreported and Unregulated Queen conch fishery trade across the Caribbean through genetic tools, Pilot project, Phase I.

**Umoja Parent Grant S1-32QTL-000033 US-NOAA 2020,
CITES Project No.: S-650**

**Extract from Final Report
January 31, 2024**

Project Identification

Project's Title	Development of a Toolkit for the Traceability of Illegal, Unreported and Unregulated Queen conch fishery trade across the Caribbean through genetic tools, Pilot project, Phase I
Project Manager	Gulf and Caribbean Fisheries Institute

Project Duration	7 months (July 2023 -February 2024)
Location	Wider Caribbean
Partners	University of Rhode Island, Dra. Diana Beltran and Dr. Carlos Prada Caribbean Fisheries Management Council Caribbean Regional Mechanisms and Organization of Caribbean States Country fisheries and environmental officials from Nicaragua, Honduras, Belize, Dominican Republic, Panamá, Jamaica, British Virgin Islands, US-Puerto Rico, US-Florida, Turks and Caicos, St. Vincent, and the Grenadines, Cayman Island, Cuba, Caribbean Netherlands, Colombia, Dominican Republic, the Bahamas, and Mexico.

1. Background

Main Objective [Overall project]

This project consists of 2 phases with the ultimate goal of quantifying the genetic variation of queen conch across the Caribbean and to identify the stocks in the different islands/States or Territories. We will test the hypothesis that different stocks have unique genomic signatures and that genetic distance between stocks increases as geographical distance increases. This will help to facilitate the detection of potential illegal international trade. Specifically, we will look to:

1. *Quantify genetic variation of queen conch across the wider Caribbean region .*

2. *Identify the spatial extent of the queen conch stocks across the sampled locations.*
3. *Validate genetic markers associated with differences among the different stocks and design a protocol to identify and trace international illegal queen conch trade.*

Phase 1 [Pilot project, mostly completed] Specific objectives for Phase 1 (pilot project):

1. *Securing the participation of at least ten interested countries, creating the communication and start the collection of tissue samples, and assisting participants in processing the collection and exporting permits.*
2. *To develop a manual with essential information related to tissue sample collection.*
3. *To create a cloud-based database with all the tissue sample information [field and Lab], including permits obtained.*
4. *To extract DNA for 200 samples, and testing them for genomic library preparation.*
5. *To test the methodology to ensure that the quality of the samples is suitable for extraction of DNA that are suitable for analyses.*
6. *To develop a proposal for the second phase of this project to achieve the ultimate goal of the project.*

2. Results

R1. manual for sample collection was developed in English (Annex 2G) and Spanish (Annex 3G)

The manual describes in a simplified way the sample collection process and covers several topics:

- I. Field sampling techniques
- ii. Sample collection training
- iii. Gender identification
- iv. Shell morphometrics
- v. Data collection techniques

R2. Development of a database of the tissue samples collected.

A project database was developed with all the tissue sample information collected in the field from the samples collected in British Virgin Island, Puerto Rico, Florida, Nicaragua, and Belize. This database contains:

- *Date of collection;*
- *Latitude and Longitude (exact or approximate);*
- *Age estimation (Juvenile or Adult);*
- *Type of tissue sample taken;*
- *Tissue tube label*
- *When available, SL [Shell Length-mm], LT [Lip thickness-mm];*
- *When available, gender ID [F or M]*

and the Laboratory identification sample procedure

- *Lab Identification number.*
- *Date of DNA extraction;*
- *DNA concentration [ng/ul];*
- *Date of Library preparation.*

The database will be updated when new samples are received at the URI. For example, URI is expecting samples from Honduras and potentially two other locations. This database is essential for tracking samples and is essential for the ongoing genetic analysis.

R3. Engaging local stakeholders through training and education

Dr. Martha Prada initiated the communication with selected country/territories representatives. A total of 15 countries agreed to participate. Several online meetings were conducted with interested / secured participants. Dr. Martha Prada to explain the general objectives of the project and the next steps needed. At those meetings and through email conversations, participants were able to receive and return the special prepared sampling kit (under the coordination of the URI) required for the sample collection in the field.

At least another three communications with each participant were needed to explain in detail the sample collection procedure. Representatives from Panama, Nicaragua, Honduras, Colombia, the British Virgin Islands, Florida, Belize, The Bahamas, Mexico, St. Vincent and the Grenadines, Jamaica, Turks and Caicos, Cayman Island, St. Lucia, and the Dominican Republic received this training. Additional video calls were sometimes needed to explain the project goals and all the details and precautions to collect tissue samples for genetics analysis. Additional support focused on approaches for requesting the required permits in each country.

The development of this pilot project generated exceptional interest and desire to participate with the added benefit of closing information gaps on genetic connectivity and its potential application to conservation and sustainability. The high degree of involvement and enthusiasm in this project once again demonstrated the great support and respect the CITES Secretariat generates across the Wider Caribbean Region. The availability and support from multiple partners and donors, especially those from the Netherlands, have been the basis for the successful completion of the first phase of the project.

R4. DNA extractions:

We mailed eleven sample collection kits to the participating countries. The kit contains 70 tubes divided into 35 tubes containing DMSO and 35 tubes containing RNA later. All the materials needed for the tissue sample collection were also included. The objective for using two different preservation solutions [DMSO and RNA later] was to corroborate if one of the DNA preservation solutions performed better on DNA preservation.

- We extracted DNA from 200 queen conch tissue samples. We did not find significant differences in the DNA concentration extracted when comparing the two different preservation solutions. This result is significant because it suggests that a relatively inexpensive preservation solution such as the DMSO can be used.
- We have extracted the DNA from four localities including the British Virgin Islands, Puerto Rico (2 locations), Florida, and Nicaragua. We quantified the DNA concentration and quality using Qubit [ug/ul]. Samples from the Virgin British Islands, Puerto Rico, Nicaragua, and half

of the samples from Florida worked well enough to obtain both high quality and sufficient quantity of DNA to be suitable for use in the next step of the library preparation. The DNA concentrations can be found in Excel table as Annexes 4G (English) and 5G (Spanish).

- Of the 35 DNA samples collected in Florida, only 13 were suitable to continue the library preparation from thirteen. The samples had two types of tissues. Some samples had transparent gelatinous tissue likely from the mantle and the others had hard tissue likely coming from the foot. The samples that worked were those from the foot. We will ask our Florida partners for more samples until we receive the 35 samples needed.
- We already proved the concept using samples from Puerto Rico. We developed genomic libraries (similar to the ones we tested in this phase) and sequenced them. We then filtered out single nucleotide polymorphisms [SNPs] that deviate from Hardy–Weinberg equilibrium ($p > 0.01$) in at least two locations from PR. We also eliminated low frequency alleles and identified 79,561 single nucleotide polymorphisms [SNPs] that will be use to test genetic differences among locations.

R5. Phase II proposal

To write and submit a draft proposal for phase II to evaluate genetic connectivity across the Caribbean using the 700 samples collected in phase I.

Collaboration with partners

The project was executed in close cooperation with partner organizations in the Wider Caribbean, their main roles were:

GCFI: The GCFI administered and oversaw the project, focusing on its implementation and progress through completion by attending to administrative and logistical aspects.

URI: Dra. Diana Beltran and Dr. Carlos Prada were the genetic experts and responsible for all technical, and training and educational activities.

The Caribbean Fisheries Management Council (CFMC) provided additional funds to support the technical project guidance and partially contributed with the mailing of the samples.

The Organization of Eastern Caribbean States (OECS) assisted by contacting representatives from the Eastern Caribbean Region and served as technical liaison. CRFM is the Queen Conch Working Group Convener. Active country participants: Panama, Nicaragua, Honduras, Colombia, the British Virgin Islands, Florida, Belize, the Bahamas, Mexico, St. Vincent and the Grenadines, Jamaica, Turks and Caicos, Cayman Island, St. Lucia, and the Dominican Republic.

2. Performance remarks and highlights

Status of implementation

Area	% of implementation	Description
Technical	100%	All expected outputs were achieved, although some internal and external delays resulted in further delays in some of the contemplated activities. Some of the issues were the result of the project starting later than anticipated. However, at the end, the work was completed as expected, and even the integration with countries went beyond the ten countries initially proposed to be contacted and progressively integrated. Details of the challenges and lessons learned are described below.
Financial	100%	The entire budget was allocated and utilized as described in the contract.

Project Expected Results and Activities.

R1: Development of a manual for sample collection (English and Spanish) (100% completion)

The manual was completed in both English (Annex 2G) and Spanish (Annex 3G). The final version is going through graphic design and soon will be ready for distribution.

R2. Development of a database of Queen conch samples collected (100% completion)

Completed. We compiled all the field and laboratory information for each tissue received at the University of Rhode Island.

R3. Educational activities for local stakeholders (100% completion)

The training and education have been completed. However, given the immense interest in becoming a partner in this project, the team is preparing for extended training and education. The Turks and Caicos and the Dutch Caribbean are still in the pipeline. The team intends to continue working with them until the samples finally arrive at University of Rhode Island.

R4: DNA extractions (100% completion)

Completed. We extracted the DNA from four test countries.

R5. Proposal development phase II (100% completion)

Completed. The proposal focuses on testing for genetic connectivity across the Caribbean using the genomic libraries from the samples donated by each participating nation.

3. Challenges and lessons learned

Description of the main challenges:

The project implementation experienced delays from the following situations:

- Formal government enrollment and responses demand time that could vary significantly depending on the country/territory. That may involve multiple levels of approvals prior to the field collection; changes in personnel who are not necessarily fully aware of the CITES protocols, among other reasons.
- Complex documentation could be required to issue national research permits, including the genetic aspects.
- Delay in contracting pushed back the start date of the project.

Additionally, there were challenges that slowed the project implementation, which included the following:

- The GPS geographic information was missing from some samples.
- The process of international mailing was both expensive and, in some cases, unreliable, especially when dealing with samples that need to be kept frozen. In some cases, the multiple interventions taken to counteract potential delays, proved sometimes insufficient, even despite the paying for the fastest delivery option available.
- Depending on the remoteness of the sampling location, additional support was needed to secure high-quality samples for genetic study. Customs departments and freight companies sometimes demand special protocols resulting in difficulties sending sampling kits to several of countries. More targeted strategies to address shipping issues may be needed in the future.

4. Final remarks

In summary, this project was able to:

1. Successfully develop a proof of concept for extraction of high-quality DNA from the Queen conch tissue samples from four localities: British Virgin Islands, Puerto Rico, Florida, and Nicaragua.
2. We are confident that the subsequent steps of genetic library preparation are expected to also be successful, as demonstrated with the Puerto Rico SNPs identification.
3. We are encouraged that additional countries have expressed their interest in joining this project. They are now in the process of obtaining permits and/or collecting samples. All the technical difficulties have been addressed and resolved, and we are now on a successful path.

Finally, we wish to emphasize that without Phase II of this project, the efforts from Phase I will not yield the results of developing the genetic technology and protocols needed to slow down the illegal trade of the queen conch.

6. Annexes

Annex 1G. Manual for sample collection (English version)

Annex 1G - Tissue sample collection protocol

Queen conch (Aliger gigas)

Diana M. Beltrán Rodríguez, PhD University of
Rhode Island

MATERIALS

You will need to prepare some materials in advance, which will help you collect the tissue samples and reduce the chances of contamination during field sampling. Before going to the field, these materials should be labelled and ready to use in a clean room. All these materials were provided to you in the Styrofoam cooler that you received.

1. Styrofoam cooler [use the same I sent you with the materials to return the samples to the University of Rhode Island (URI)]
2. 35 2 ml tubes with DNA/RNA shield
3. 35 2 ml tubes with DMSO
4. One tweezer
5. Latex or nitrile gloves (non-powdered)
6. Metallic blades
7. Ruler
8. Plastic caliper
9. Permanent marker
10. Paper towel
11. Plastic tags
12. Disinfecting Clorox wipes or a wash squeeze bottle with 10% bleach
13. Ice packs – You should include one or more ice packs on the cooler when you return the samples to URI to keep samples cool.

Note: The sample number on the plastic tags (e.g., PR-01) in the pictures and all associated meristic characters must match the identical tissue tube names with DS and DMSO (e.g., PR-01).

A. You should follow these steps if you can get the snail WITH A SHELL before taking any tissue sample.

- A. Please take one picture as shown below:

Photo 1: Make sure the following items appear on the picture.

- a) A number tag.
- b) A ruler or calipers for shell morphometric measurements.
- c) The shell is fully supported on the ground, and the picture focuses on the top of the shell.



B. Also, take one picture as shown below:

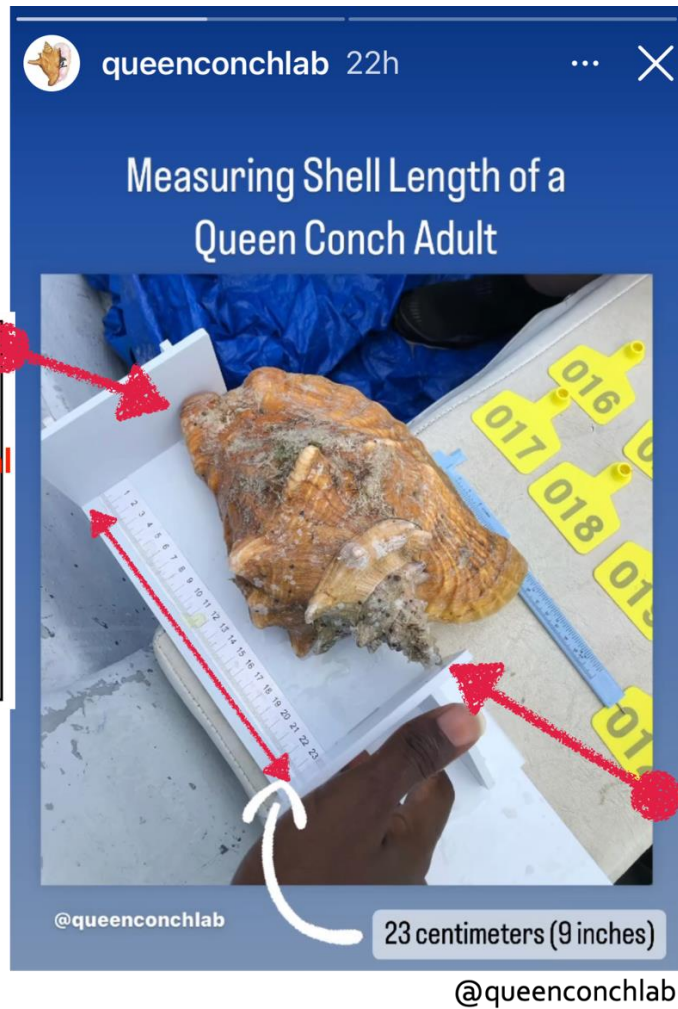
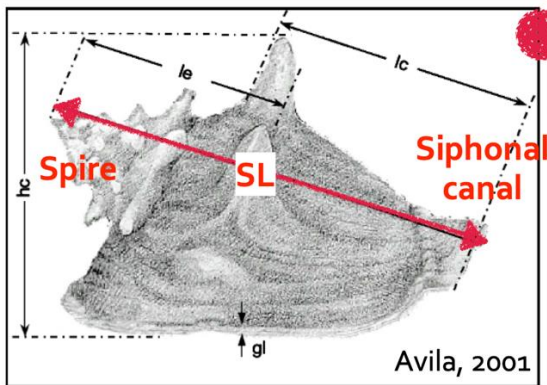
Photo 2: Make sure the following items appear on the picture.

1. A number tag.
2. A ruler.
3. The shell is supported on the ground, and a picture from the top of the shell shows the aperture.

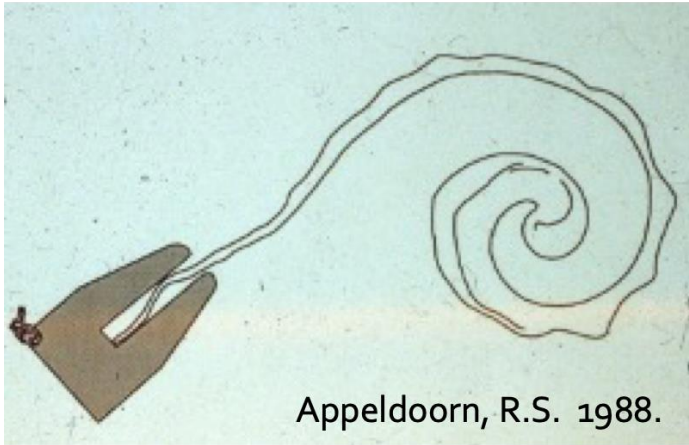


B. Total standard length, Lip thickness measurement, and gender identification:

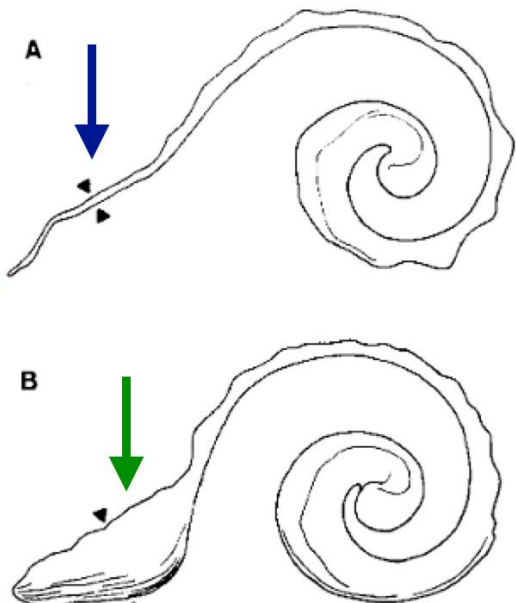
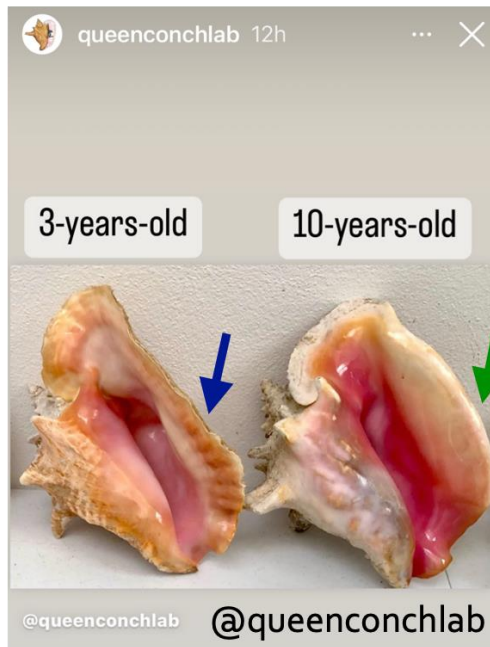
- a) **Total standard length [SL]:** The length between the siphonal canal (anterior end) to the spire (posterior end) (Muller and Stoner, 2013). Record the length in **millimeters using the ruler**. Please refer to diagram below.
- b) If you have a large stainless-steel caliper = Use this item to measure the standard length [SL].



- c) **Lip thickness [LT]:** Measure the flared outer lip in the middle of the aperture (Appeldoorn 1988). Make sure the caliper jaw measures the LT as shown below. Please record the measure in millimeters using the caliper.

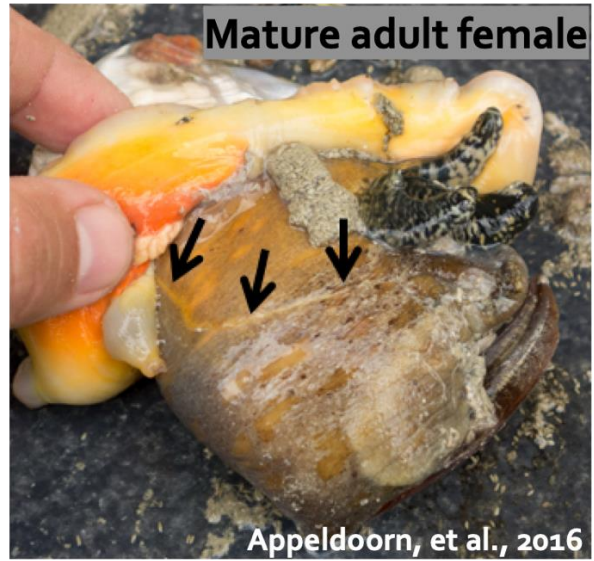


Appeldoorn, R.S. 1988.



Appeldoorn, R.S. 1988.

c) **Gender Identification:** If possible, identify the gender of the organism [presence of verge in males and genital groove in females]. Please also record the development of reproductive structures.



queenconchlab 14h

Curaçao Queen Conch Hatchery 🇳🇵 🐚 💙

VERGE
EGG GROOVE

Funded by the European Union
 Financé par l'Union européenne
 EXPERTISE FRANCE GROUPE AFD
 Implémenté par Expertise France
 Mesures financées par l'Etat français
 GFDRR THE WORLD BANK
 In collaboration with GFDRR
 En collaboration avec le GFDRR

@QUEEN.CONCH.HATCHERY

d) Record the geographic locaQon [geographic coordinates] where the queen conch was collected. Collect the samples from at least two locaQons at least 10 km apart.

- Fill out the provided Excel table with all the recorded informaQon for each sample. Please feel free to add columns as needed.

	A	B	C	D	E	F	G	H	I	J
1	SAMPLE-ID	Collection date	Latitud	Longitud	SL [Shell Length-mm]	LT [Lip thickness-mm]	Gender ID (F or M)	Juvenile or Adult	Tissue sample	Tube number
2	PR-01	11/9/23	41.46527	-73.252285	194	15	F	A	Yes	PR-01
3	PR-02	11/9/23	41.847956	-73.397648	196	18	M	A	Yes	PR-02
4	PR-03	11/9/23	41.805538	-73.470082	197	20	M	A	Yes	PR-03
5										

C. Queen conch tissue collection:

1. Identify a clean, uncluttered work surface of about 2-foot-by-2-foot to prepare your materials. If processing more than five samples, you will also need a small cooler with ice packs.
2. Wash your hands with soap and tap water. Dry them with paper towels and put on disposable gloves. Always **USE GLOVES** to manipulate any item while preparing your materials. If you tear a glove, take a replacement. **DO NOT CONTINUE WITH BARE HANDS.**
3. With the Clorox wipe, wipe the work surface.
4. This is your work area for all remaining steps. If you leave or handle objects outside this space (e.g., bathroom break, phone, etc.), remove and replace your gloves and clean the surface again.
5. For each tissue sample, two vials are needed. The vials are labelled identically (e.g., PR-01 or CU-24). One of the vials has a DNA shield [DS], and the other has DMSO. Please identify the two vials you are using before proceeding with the cut of the organism. Make sure the vials have identical letter-number codes (e.g., PR-01).
6. Use an unused razor blade to cut a meat piece of approximately 2cm³. Try to collect it from the white tissue area. Avoid taking the sample from the mantle or the base of the foot.

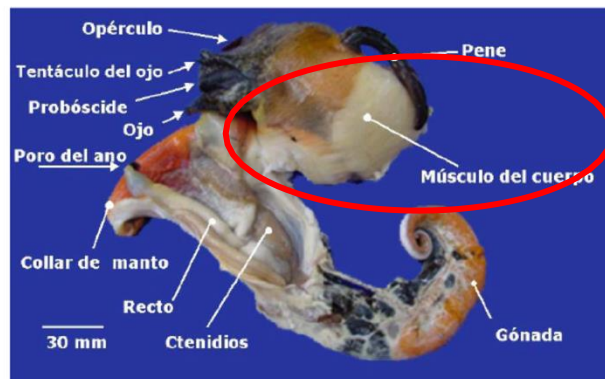


Figura 9. Ejemplar de *Strombus gigas*, macho, abierto a la cavidad del manto.

Avila, 2001

7. Once you have the 2cm³ tissue sample, cut it into two pieces. Using a clean tweezer, place the samples into each of the two vials and close the lid securely. Make sure to disinfect the tweezer between samples with a chlorox wipe so as to avoid cross-contamination. Place one piece in the vial with DNA shield [DS] and the other half in the vial with DMSO. The tissue must be completely immersed in the liquid. The two vials **MUST** have the same letter-number code (e.g., PR-01) for quality control. Place the two vials in the cooler with ice packs.
 8. Before moving to the next sample, clean the tweezers and your gloves with a new Clorox wipe, and change your gloves, if needed.
 9. Repeat the process with the subsequent conch sample.
 10. We need tissues from 35 individuals. **Ideally, the samples will consist of fresh meat**, but they may come from frozen landings that were extracted within one month of collection. Please ensure that the location of harvest of the conch is accurate.
- Note: If you plan to take a few individuals at a time, keep the samples at room temperature for 2-3 hours before moving the vials to a freezer. Then, place the vials in a -20C or -80C freezer until you are ready to send the samples.**
11. Once you finish collecting all 35 samples, place the samples in the box provided with the Styrofoam cooler and two or three ice packs. Contact me immediately. I will send you the shipping label [FedEx or DHL] so you can stick it on the carton. Then, you will schedule the pickup of the package with the company. Remember to include a copy of all required permissions in this package [research, Cites, export, etc.]. Also, make a PDF of all permissions and email it to dbeltran@uri.edu.

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