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REGIONAL MANAGEMENT OPTIONS FOR QUEEN CONCH WITH IMPROVED SCIENTIFIC APPROACHES CONSIDERED



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Prepared by:

MRAG, under contract to the ACP Fish II Project, on behalf of the Caribbean Regional Fisheries Mechanism (CRFM) Secretariat

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FOREWORD

In 2013, the EU-sponsored ACP Fish II Programme commissioned a study titled ‘Support to improve and harmonize scientific approaches required to inform sustainable management of queen conch (*Strombus gigas*) by CARIFORUM States’. The study was executed by MRAG on behalf of the CRFM Secretariat, and upon completion, a Final Technical Report was submitted to the ACP Fish II Programme that contained 4 major outputs of direct interest to the CRFM: a regional review of scientific and management approaches to the management of queen conch; 5 country mission reports or case studies that were used to inform the regional review; a regional management options paper that was developed based on the regional review and country cases studies, and; the report of a workshop held to validate the other 3 major outputs.

To make the 4 major outputs more readily identifiable as CRFM-approved, and also more easily available to the various CRFM publics, they have been extracted from the original Final Technical Report submitted to the ACP Fish II Programme, and reproduced as CRFM Technical and Advisory Documents 2013/11 (regional review and cases studies), 2013/12 (workshop report) and 2013/13 (regional management options).

The CRFM Secretariat acknowledges the contribution of the EU-sponsored ACP Fish II Programme in this endeavour.

LIST OF ACRONYMS

ACP	African Caribbean Pacific
CARIFORUM	Caribbean Forum of ACP States
CDS	Catch Documentation System
CFMC	Caribbean Fisheries Management Council (US Caribbean)
CITES	Convention on the International Trade in Endangered Species
CLWG	Conch and Lobster Working Group
CNFO	Caribbean Network of Fisherfolk Organization
CPUE	Catch Per Unit Effort
CRFM	Caribbean Regional Fisheries Mechanism
DR	Dominican Republic
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FMP	Fisheries Management Plan
GIS	Geographical Information System
HCR	Harvest Control Rules
IUU	Illegal, Unreported and Unregulated Fishing
MCS	Monitoring Control and Surveillance
MPA	Marine Protected Areas
OSPESCA	Organization for Fisheries and Aquaculture Sector of the Central American Isthmus
UNCLOS	United Nations Convention of the Law of the Sea
VMS	Vessel Monitoring Systems
WECAFC	Western Central Atlantic Fishery Commission

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Introduction

The objective of this paper is to set out management options agreed at the EU ACP Fish II / CRFM queen conch workshop which took place 6-8 June 2012 in Kingstown, St. Vincent and the Grenadines. The paper provides a brief outline of the purpose, benefits activities, roles and responsibilities for each option.

This paper is synthesis of the main results from national case studies, the regional analysis, and the regional workshop carried out under this ACPFish II project. There were 5 case studies that covered the range of variability in queen conch management in the CARIFORUM region: Haiti, DR, Bahamas, Belize, and Grenada. The regional workshop gave a wider view of problems and solutions for the case studies and other countries with significant queen conch fisheries or exemplary fishery management systems. The outputs from the regional workshop that directly informed this paper are summarized in Appendix 1.

The management options address all the requirements for an integrated harvest strategy. A harvest strategy consists of four components: 1) data collection 2) analysis 3) decision-making 4) applied control. These four components form a feedback loop so that the management controls applied to limit fishing can be adjusted based on the evaluation provided from the data and analysis. The management options focused upon in this paper are those which the workshop believed would be most likely to succeed as long as sufficient resources were made available to implement them. The management options have been divided into data, analysis and management (decision-making / controls).

The management options presented address a number of recommendations made by the Queen Conch Expert Workshop (Miami, USA, 22-24 May 2012), as reviewed, amended and validated by the Working Group on Queen Conch of the Caribbean Fisheries Management Council (CFMC), the Organization for the Fisheries and Aquaculture Sector of the Central American Isthmus (OSPESCA), the Western Central Atlantic Fishery Commission (WECAFC) and the Caribbean Regional Fisheries Mechanism (CRFM), and expressed in the Declaration of Panama City (25 October 2012) and the CITES Resolution (CoP 16; 3-14 March 2013).

Data Collection

Develop Regional Conversion Factors¹

Purpose

Improve catch estimates and share consistent statistics by providing accurate conversion among measures of landings at different processing levels.

Benefits of Outcome

Catch data and reporting will be improved, and measures would be standardised through the region. This would allow more accurate monitoring and more effective control in the conch trade, particularly if combined with a Catch Document System.

¹ CITES Resolution CoP16 3-14 March 2013 Com. I.5 (Draft) paragraph 16.CC a) “in coordination with the (WECAFC) Working Group on Queen Conch, develop conversion factors at different levels of processing of *S. gigas* for standardization of data and reporting instruments on the catch and trade in meat and other products;”

Activities

The conversion factors will need to be estimated in each country from data collected at landing points covering a wide range of sizes of landed conch. The data can be analysed and results published at the CRFM CLWG annual meeting. Clear definitions will be required for the different levels of processing applied by industry, so defining standardised processing levels should form one of the activities.

Roles and Responsibilities

Data collection and data management will be the responsibility of national government fisheries scientific authorities. Analysis can be completed through the CRFM CLWG at the scientific meeting, and the published results disseminated through the CRFM network.

Develop a Catch Document System (CDS)²

Purpose

To improve control and enforcement within the conch trade and reduce Illegal, Unregulated and Unreported (IUU) fishing. In this regard, the proposed CDS also addresses a key provision of the Castries Declaration on IUU fishing.

Benefits of Outcome

The initiative would significantly reduce the opportunities for IUU catch entering trade within the CARIFORUM region. Expansion of the system beyond CRFM would greatly increase its utility.

A CDS would also allow greater control to be applied through export quotas and would be compatible with EU and CITES documents. For greater efficiency, a single system could therefore be developed to serve these various international reporting requirements.

Activities

A system would be needed in countries that export or import conch that would allow them to report trade. The document system would be co-ordinated by CRFM and would require a technician to be appointed to run the system as well as to provide long term support and maintenance. The CRFM would need to house a database to manage the documents and the annual reporting on trade that would be required each year. The system would require the different verification procedures at national and regional levels to be co-ordinated.

Roles and Responsibilities

National responsibility would be to issue a catch document and report documents transit at import and export. Regional responsibility would be to monitor all trade and report on regional trade.

Improve Data Management

Purpose

To improve software tools for data management throughout the data collection systems.

² CITES Resolution CoP16 2013 Com. I. 5 (Draft) paragraph 16.DD “Range States of *S. gigas* should collaborate in exploring ways to enhance the traceability of specimens in international trade, including, but not limited to, catch certificates, labelling systems and the application of genetic techniques.”

Benefits of Outcome

Use of software tools will increase efficiency in data management and routine tasks, and make reporting more accurate. Data is less likely to be lost and can be shared easily. Maintaining good quality data underpins any harvest strategy.

Activities

All fisheries must use suitable data management software. In most cases, this is a database, but could incorporate spreadsheets as part of the system. Various software tools are useful for specific tasks. These include, but are not limited to, queries to obtain data from databases in standard format, software linking or transferring information between sources (e.g. Excel to Access or Excel to Word) and other types of automation. Activities would cover 1) identification of suitable tasks which can be automated 2) development of the appropriate software tools to complete the task 3) dissemination of the tools to users with appropriate training where necessary. Note that users may not only be Government staff, but would include staff working in the fishing industry.

Roles and Responsibilities

There is a national responsibility to ensure staff members have suitable experience and training to carry out to use software and tools for data management. Software tools may be developed nationally for specific tasks (e.g. Bahamas), but should be made available throughout the region. Regional support could be provided given development of adequate capacity and expertise within CRFM.

Require Mandatory Reporting by Processors, Buyers and Sellers³

Purpose

To improve coverage of catch and effort reporting.

Benefits of Outcome

The initiative would improve coverage of catches and fishing effort. Catch reporting is fundamental for the harvest strategy and any improvements will reduce risks to the fishery. The greater the coverage the better, but at the very least mandatory reporting should be applied to all businesses which export conch. Basic recording of catch and effort would meet the requirements of a number of international instruments defining good practice (e.g. *FAO Code of Conduct para. 7.4.4, UNCLOS Article 61*).

Activities

If possible, reporting should be developed in computerized form, which would minimize costs.

Industry should be made aware of the importance of these data. It may be necessary to link provision of the data to exports (see CDS above), but this would limit coverage. Mandatory reporting may require additional national legislation, but may also be made possible through a condition on fishing or processing licences.

Roles and Responsibilities

Implementing mandatory reporting would be primarily a national responsibility. It may be necessary to provide for penalties to encourage compliance.

³ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 43.

Improve Trip Sampling⁴

Purpose

To provide accurate estimates of total landings from trip interview sampling programmes.

Benefits of Outcome

A rigorous sampling programme would provide good estimates of total landings. This is important in those countries where there are significant artisanal catches of conch that are consumed locally, and are not processed or purchased by larger businesses. Good estimates of total catch form a critical component of most effective harvest strategies. Basic recording of catch and effort would meet the requirements of a number of international instruments defining good practice (e.g. *FAO Code of Conduct para. 7.4.4, UNCLOS Article 61*).

Activities

Many countries operate some sort of sampling program for fishing trips. Appropriate design must vary from island to island, but in all cases should be based upon as rigorous a statistical design as possible so that the total landings can be estimated. Each country that cannot estimate total landings from their current reporting and sampling program should look to design and implement a programme which is sustainable and statistically rigorous which can estimate total landings.

Roles and Responsibilities

The primary responsibility lies with the national fisheries departments to ensure that accurate and appropriate statistics are obtained from their fisheries through adequate sampling programs or reporting. National fisheries departments can look for technical support from other countries and CRFM or other regional organisations.

Improve Fishing Effort Data⁵

Purpose

To provide feasible methods for fishery-specific effort data collection, and options to calibrate existing effort data.

Benefits of Outcome

Standardised catch-per-unit-effort (CPUE) can provide a valuable abundance index to monitor stock size. CPUE is a simple abundance index which can be provided at greater frequency and lower cost than visual surveys. They may not replace visual surveys entirely in all fisheries depending on their harvest strategy.

Activities

Fishing effort can be obtained in a number of different ways as part of routine reporting. Activities can be combined with obtaining catch data, such as through mandatory reporting (e.g. logbooks or vessel monitoring systems), trip sampling as well as through vessel registers and licences. Minimum data reporting will need to be defined for each fishery.

Roles and Responsibilities

Primary responsibility for each fishery will lie with the national scientific authority. CRFM should provide technical support where requested.

⁴ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 43.

⁵ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 34.

Sample Standard Biological Data from Landings⁶

Purpose

To monitor sex, size in conch populations across the region and evaluate regulations on landings size.

Benefits of Outcome

Size composition data can be used to improve stock assessments and scientific advice, as well as evaluate controls that are designed to improve size composition of the catches.

Activities

Periodic sampling of unprocessed landings should provide biological information required. Measures should be standardised across the region so that data from different fisheries can be compared and analysed together, improving scientific results. More specific activities would need to be arranged through international co-operation, such as the CRFM Conch and Lobster Working Group.

Roles and Responsibilities

Primary responsibility for data collection for each fishery will lie with the national scientific authority. CRFM should provide technical support where requested.

Analysis

Develop an “Operating model”⁷

Purpose

To provide guidance on and test harvest strategies and stock assessments.

Benefits of Outcome

The model can be used to guide development of the harvest strategy and evidence that it is sustainable, based on the best scientific information available. The model would be able to use all available biological information, which would be particularly useful for fisheries which have insufficient data for traditional stock assessment approaches.

Activities

A Monte Carlo simulation model already exists from 2003 (Valle-Esquivel, 2003⁸), but needs to be updated with current scientific information and implemented in more accessible software. Knowledge of queen conch biology is very good even if data are lacking in particular fisheries. An operating model would allow fisheries to take advantage of this information in a more rigorous way.

Roles and Responsibilities

Development of an operating model could be completed through a single project. Testing and on-going development could be carried out through the CRFM Conch and Lobster Working Group. Although the software and parameter set should be made freely available to anyone to use, update and improve, it is important that an institution or group is identified to take primary responsibility for maintaining versions of the software as well as make it available to interested parties.

⁶ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 47.

⁷ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 60.

⁸ Valle-Esquivel, M. Aspects of the Population Dynamics, Stock Assessment, and Fishery Management Strategies of the Queen Conch, *Strombus gigas*, in the Caribbean. PhD Dissertation. University of Miami, Coral Gables, Florida, USA. 338p.

Develop and Share Conch Assessment Tools

Purpose

To apply analysis tools for the assessment of conch stock status and establish harvest reference points for each fishery.

Benefits of Outcome

Methods suitable for the analysis of the available data on conch fisheries could be implemented in R or a widely available software platform. These could most likely be provided as a set of scripts and functions that produce standard analyses and outputs.

Activities

This requires setting up a software tool box in an accessible software platform, such as R, so that stock assessment techniques are available through the internet to scientists across the region. The scientists involved in stock assessments in the region would need to develop and maintain the tool box. There would need to be a training component to ensure the tool box was used appropriately.

Roles and Responsibilities

The activities of these scientists would need to be co-ordinated by through the regional scientific organisations. The most suitable would be the CRFM Conch and Lobster Working Group. The working group should also be responsible for organising training and ensuring the correct application of the methodologies.

Independent Expert Review of the Harvest Strategy⁹

Purpose

To reduce errors and hence create greater confidence in the management system in terms of the collection of data, analysis and decision-making, and also to make the process more transparent.

Benefits of Outcome

An independent peer review process would improve the transparency and credibility of harvest strategies. It should also lead to on-going improvements to the strategies themselves.

Activities

Regular independent reviews of stock assessments and analyses would be carried out by the CRFM Conch and Lobster Working Group (CLWG) with appropriate expert support. The assessment and results from the review would be published by the CRFM Scientific Meeting. Terms of reference for such reviews will need to be agreed.

Roles and Responsibilities

The primary role should be the CLWG to set up such a system and apply it at the request of individual countries. The scientific authority in each country should request a review of components of its harvest strategy as appropriate.

⁹ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 67.

Spatial and Habitat Data Collection and Analysis¹⁰

Purpose

To undertake GIS mapping of conch grounds and associated marine areas and habitats as well as to develop appropriate data sources where necessary.

Benefits of Outcome

Where countries intend to include spatial management (e.g. MPAs) as part of the conch harvest strategy, this might be informed by appropriate data and analyses. With increased availability of appropriate data and analytical tools, this should lead to better management of conch fishing grounds and associated critical habitats.

Activities

Activities may include both data collection and data analysis. Support for appropriate spatial data collection would include, but not limited to, information on conch abundance and catch distribution as well as habitat information. For analyses, it would be desirable to develop and/or use existing geographical information system (GIS) methods which would help visualize in map form the distribution and abundance of conch and characterize critical habitat types.

Roles and Responsibilities

Collection of data, through abundance surveys for example, would be the responsibility of national scientific authorities. In 2013, regional training is being carried out in abundance surveys. Analyses could be conducted or reviewed at CRFM CLWG meetings. Development of methods and software would remain the responsibility of national institutions, but could be distributed through regional mechanisms.

Socio-economic Analysis of Conch Fisheries

Purpose

To incorporate socio-economic information in the management and planning processes.

Benefits of Outcome

The harvest strategy would incorporate socio-economic issues, so that these are taken into account alongside conservation issues.

Activities

Activities may include both data collection and data analysis. Currently, there are no standard methods to analyse socio-economic data so that the resulting information might be treated consistently with the biological information. Therefore, both methods and appropriate data types would need to be identified. Once developed, software tools would be required with procedures for maintenance and training.

Roles and Responsibilities

Multidisciplinary research is required to develop methodologies, which would have to be undertaken by research institutes.

¹⁰ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 79, 81.

Management

Adopt a Regional CRFM Regulation for Meat Weight¹¹

Purpose

To deter the illegal capture and exportation of Queen Conch to support the effective management of the resource within the region.

Benefits of Outcome

A regulation would aid countries in enforcing their own minimum meat regulations and reduce risks to conch fisheries by discouraging the trade in small immature conch.

Activities

A regulation would consider the following:

- Standardized regional minimum meat weight for Queen Conch landed in each country (with provision for justified exceptions such as Belize, where the fishery is based on sub-adult individuals as opposed to adult conch).
- Precise definitions of processing levels (see Develop Regional Conversion Factors).

In developing a regulation, it will be important to consider other regional and international initiatives, such as the OSPESCA lobster regulation. It is important that any regulation fits into a broader approach to the management of queen conch beyond CRFM countries. Existing systems like those used to enforce CITES requirements for the Queen Conch trade could be employed to implement the regulation. It may be useful to develop and implement a public awareness strategy in collaboration with the Caribbean Network of Fisherfolk Organizations and member organizations in countries.

Roles and Responsibilities

The establishment of the minimum meat weight should be led by the CRFM in collaboration with other Caribbean regional fisheries bodies and other relevant stakeholders. It may be useful to establish a committee, such as that of the Ministerial Council for flying fish, to promote regional conch management initiatives. However, there is a need for national commitment to garner stakeholder (industry, consumers, fishers, etc.) consensus and for implementation.

Adopt a Regional CRFM Regulation for Lip Thickness and Shell Length¹²

Purpose

Enforce a consistent minimum measure of shell size across the region (with provision for justified exceptions such as Belize, where the fishery is based on sub-adult individuals as opposed to adult conch).

Benefits of Outcome

The proportion of juvenile conch in landings may be reduced increasing long term yield, and reducing risk of recruitment overfishing.

Activities

Activities would be similar to those required for drafting a regulation on meat weight (see Adopt a Regional CRFM Regulation for Meat Weight). More than a single regulation may be required to cover different fisheries in the region.

¹¹ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 69.

¹² Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 69.

In the case of shell length or lip thickness, a plastic tool could be developed which could be distributed to improve compliance, enforcement and awareness of the regulation. However, in many fisheries the shell is not landed, so the effectiveness of the regulation may be limited. Other measures, such as those that might be obtained from the operculum, should also be considered.

Roles and Responsibilities

In contrast to the meat weight management option, the trade in conch shells is limited, so the regulation would have to be primarily enforced within the countries rather than at points of import and export. This would limit opportunities for regional support, but nevertheless consistent size limits could be applied on any trade.

Adopt a Regional CRFM Regulation for a Consistent Closed Season¹³

Purpose

Enforce a consistent closed season across the region.

Benefits of Outcome

The enforcement of a consistent closed season should increase compliance, reduce intra-regional illegal trade of conch meat and aid countries in enforcing their regulations. This will reduce the risks of overfishing their conch resource, especially through the protection of spawning stock.

Activities

Activities would be similar to those required for drafting a regulation on meat weight (*see Adopt a Regional CRFM Regulation for Meat Weight*). Consistent closed seasons around the main spawning period already exist in a number of countries (1st July to 30th September). In the final setting of the conch closed season there is need to consider overlaps with lobster closed season and the impact on fishers' livelihoods.

In the case of a closed season, a seasonal closure of international trade should also be considered, to further support compliance. It may be beneficial to delay the trade closure by several weeks so that it does not exactly coincide with the fishing closed season.

Roles and Responsibilities

The establishment of closed season should be led by the CRFM in collaboration with other Caribbean regional fisheries bodies and other relevant stakeholders. As for drafting other regional regulations, it may be useful to establish a committee, such as that of the Ministerial Council for flying fish, to promote regional conch management initiatives.

Fisheries Management Plans (FMP) Completed¹⁴

Purpose

To finalize and have formally endorsed FMPs in all CRFM member states

Benefits of Outcome

The FMPs would define and clarify the harvest strategy. This will inform all stakeholders, including fishery managers and scientists, as well as other interested parties inside and outside the region on how the region's conch stocks will be managed. The FMPs would help implement the management options identified in this paper and should form part of a regional management plan for queen conch.

¹³ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 69.

¹⁴ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 97.

Activities

It is necessary to identify why past initiatives to develop and implement FMPs have stalled, so that constraints can be removed. This may require redesigning FMPs, among other things. The national FMPs should inform the formulation of a regional Fisheries Management Plan for queen conch. Both regional and national FMPs should be made consistent with existing regional management efforts. Activities to support FMP development might include the strengthening of fishermen organizations to facilitate co-management and awareness building. National conch management plans in most member States have been drafted but not signed off. CRFM Member States are encouraged to prioritize the finalization and implementation of conch management plans as directed by CITES CoP 16.

Roles and Responsibilities

This would be a regional initiative through the CRFM to revise and develop FMPs. A regional committee for queen conch could be used to help drive FMP endorsement. There is a national responsibility to ensure stakeholder (industry, consumers, fishers, etc.) involvement in FMP development. The FMP itself should define roles and responsibilities within the fishery, including how the FMP will be kept up to date.

Develop Harvest Control Rules in All Fisheries¹⁵

Purpose

To improve the management response to changes in stock status, by well-defined decision rules linking stock status to specific management actions.

Benefits of Outcome

A harvest control rule can be developed and agreed by all stakeholders, including managers, scientists and fishers, increasing compliance. The management response to scientific advice will be more timely and transparent.

Activities

Appropriate simple harvest control rules must be designed through consultation. Development of harvest control rules depend upon other management options improving data and analysis.

Roles and Responsibilities

Primarily development of harvest control rules will be the responsibility of national fisheries departments. However, CRFM can provide technical support in their development. Once implemented, fisheries departments should be able to sustain them.

Further Development of Management Options

Some or all of the options outlined in this paper will need to be selected and prioritised for further development before they can be implemented. Although participants considered their impact, costs and likely success, activities would need to be designed to address these issues fully.

The selected options should form part of a regional management plan for queen conch. A regional plan would need to include countries that are not members of CRFM and face different problems and solutions, although many of the options presented would help management in non-CRFM jurisdictions as well.

¹⁵ Report of the Queen Conch Expert Workshop, CFMC, 22–24 May 2012. Recommendation para 63.

Appendix 1: Evaluation of Queen Conch Regional Initiatives

The objective of the workshop was to discuss management options for the queen conch fisheries of the region with key fisheries officers from the region, scientists, and experts. An essential exercise to select and prioritize the management options that follow was to divide workshop participants into three groups. The groups discussed management options within the data, analysis and management (decision and control) categories of a harvest strategy respectively. Some management options were provided based on the regional reviews, and others were suggested by participants. Consideration was given to the following issues when evaluating possible options:

- **Objectives** – what should the specific outcome and benefits of the initiative be?
- **Relevance** - to what extent are the initiative’s objectives pertinent to overall regional conch conservation?
- **Effectiveness** - how far might the initiative’s outputs contribute to achieving its objectives?
- **Risks** – what are the main threats that might reduce the initiatives effectiveness?
- **Efficiency** - how economically efficient might the initiative be compared to alternatives that might achieve similar results?
- **Utility** - how does the initiative’s impacts compare with the overall needs of regional conch conservation?
- **Sustainability** - to what extent can the positive changes be expected to be maintained?
- **Acceptance** – to what extent might countries in the region accept the initiative (coverage)?

The following initiatives were discussed as priority for the development of harvest strategies in the region. Where appropriate, scores were given by participants (☺1-5☹) the scale of problems and importance of solutions identified in the text, with the objective of helping prioritise options.

Data

Name	Conch Data Overview	Score (☺1-5☹)
General Description	<p>Our Data Group represented a set of countries that are still struggling with data collection. Thus, their problems are somewhat similar, and for all of them the fisher is the Point of Contact.</p> <p>Countries felt that total landing data was one set of data, but catch and effort was another data set that could “easily” be collected as well.</p> <p>The problems that affected total landings were the same that affected catch and effort.</p>	
Objectives	All persons agreed that data for total landings is a desirable objective, although there were problems.	
Effectiveness	<p>All countries felt that the Fisher was the point of contact, for data collection.</p> <p>Data collector systems are not working well. Data collection is not being implemented in a random, stratified, statistical way. Therefore it is impossible to estimate raising power.</p> <p>Because of CITES there is some good data collection for exports, but a great deal of other necessary data were being missed.</p> <p>For some of the countries, sites were not visited, and for others, the numbers of fishers was unknown.</p>	4

	The end result is that for most countries total catch was unknown, and for others the amount of data being missed was unknown. Only a few countries had accurate estimates of total catch.	
Risks	<p>Risks threatening to reduce the effectiveness of data collection systems included the diversity of ;</p> <ul style="list-style-type: none"> a) Types of vessels b) Size of vessels c) Landing points d) Fishing grounds e) Types of gear used. <p>Capacity of organizations was an issue.</p> <p>Also, in some cases, IUU fishing could be confusing landings and production and therefore management.</p>	4
Efficiency	<p>Most persons felt that for the resources that they had they were getting a fair amount of data not only for conch but other species as well.</p> <p>Further, this same system could be used to collect other types of data like fishing effort.</p>	3
Utility	The countries felt that most, data collection systems were not fully scaled or designed to the task. Thus the data were not being used to inform management in the way intended, though for exports the data were good.	3
Sustainability	The problem among countries was that there were staff shortages for collecting all data types. Therefore, continuity of management was being negatively affected.	5
Acceptance	<p>The countries agreed that the fishers felt that data collection was a good thing and were willing to supply the data.</p> <p>They also strongly felt that acceptance by the countries also meant that there should be support provided in order to collect the data and that this part was not working well.</p>	4

Name	Regional Conversion Factors	Score (☺1-5☹)
Description	Regional conversion factors among different processing levels would be determined and harmonised as far as possible, without compromising the accuracy of catch data. The conversion factors can be estimated from data using appropriate statistical models.	
Objectives	To improve catch estimates and share consistent statistics.	
Effectiveness	Estimation and publishing of accurate conversion factors would minimise the effect of processing (cleaning stage) on data quality, improving assessment and enforcement. However, this will not deal with any other issues that affect data quality.	1
Risks	The main risk is failure to collect proper data, leading to poor, inconsistent estimates. This can be avoided by improving the data	1

	collection system. This involves clear definition for example percentages of cleaning meat and having adequate sample size, covering a wide variety of sources.	
Efficiency	Development of estimates should be straightforward and efficient. The main cost would be the collection of the data which would be from a wide variety of sites.	1
Utility	The activity will be important to obtain accurate catch estimates for assessment and to enforce catch quotas and reporting throughout the trade.	1
Sustainability	Once estimates are published, there is no cost associated with their use, and therefore costs, except for updating estimates, will be negligible.	1
Acceptance	This is a requirement within the CoP 16 CITES resolution.	1

Name	Catch Documentation System	Score (☺1-5☹)
Description	The CDS would expand on the CITES and EU catch certificates and should replace them. Unique codes would be used for each shipment and would link a shipment with the vessel trips which landed the conch. The certificate would be issued by the national authority on import and export, but the certificate would be verified (data assurance) by CRFM which would maintain a database and report on the CARICOM trade in conch annually. (Member countries would report on their own conch trade).	
Objectives	To improve control and enforcement within the conch trade and reduce IUU and opportunities for IUU.	
Effectiveness	The initiative should improve monitoring, control and enforcement within CARICOM countries, but would not cover non-CARICOM countries or internal trade.	1
Risks	The system would depend upon a functional database management system which would operate across the region. Lack of funding, change of priorities, training, demand for use and also expertise within CRFM and countries might make the system difficult to maintain, leading to a breakdown in the system's control.	1
Efficiency	The system would require a data manager to be recruited at CRFM with associated costs. However, there would be few alternatives to apply control in this sort of system.	1
Utility	The CDS initiative would significantly reduce the contribution made to unsustainable practice by those countries that take part. Expansion of the system beyond CRFM would greatly increase its utility.	1
Sustainability	The system would require long term support and maintenance, which in turn would require commitment from the region.	1
Acceptance	Countries would need to <u>give up some control over their own fishery ?</u> and international trade as they would need to consult with the regional body on export and import. Countries would need to commit funding to the system to make it work, especially those countries exporting	5

	conch.	
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Name	Improving data management	Score (☺1-5☹)
Description	Provide tools to improve data management: so that data can be provided from the industry in electronic form, databases can be used to manage data	
Objectives	To improve data management within countries, improving software and ensuring all data are computerized.	
Effectiveness	A lack of software tools is not the only problem in data management, but if software tools are introduced over time, these can deal with specific problems.	1
Risks	Lack of training would prevent these tools from being used properly. Standardized hardware would be required throughout the chain (steps in data collection & entry).	1
Efficiency	Use of software tools will increase efficiency in data management and routine tasks.	1
Utility	Maintaining good quality data underpins any harvest strategy, but a successful harvest strategy depends upon other components which are currently not being implemented in many countries.	1
Sustainability	Once accepted, software tools used in the region become embedded and therefore should be sustainable with periodic updating of both hardware & software tools.	1
Acceptance	Any software tool that increases efficiency would be widely accepted, once staff members understand how to use it.	1

Name	Mandatory reporting by processors	Score (☺1-5☹)
Description	Designated processors, buyers and sellers would be required to complete and submit reporting forms to fisheries departments.	
Objectives	To improve coverage of catch and effort reporting	
Effectiveness	The initiative would improve coverage, but still not cover all catches. The proportion that could be covered with this requirement would vary from country to country.	1
Risks	The mandatory requirement may not be enforced, and designated businesses required to report, may not expand significantly.	1
Efficiency	If reporting was in computerized form, the initiative would have low cost. Backup of data is vital whether electronic or hardcopy. Paper forms would need to be entered in the computer, which could be expensive.	1
Utility	Catch reporting is fundamental for the harvest strategy, but may not be the only critical component in many countries.	1

Sustainability	Once in place, systems like this have demonstrably worked well in the region.	1
Acceptance	If industry is consulted, they may not wish to provide these data. It may be necessary to link provision of the data to exports (see CDS above), but this would limit coverage. This may require additional national legislation.	1

Name	Improve effort measurement	Score (☺1-5☹)
Description	Provide feasible alternatives for fishery-specific effort data collection, and options to calibrate existing effort data.	
Objectives	Standardize effort to estimate CPUE (necessary as relative abundance index, and important input for most stock assessment and simulation models)	
Relevance	Effort is a good proxy for fishing mortality; important to understand trends in fishing pressure, and CPUE is an indicator of relative abundance. Trends in CPUE help to identify shifts in abundance.	1
Effectiveness	Each country's data are different, but in most, multi-specific, multi-gear fishery, effort is recorded. Proposing a standard effort unit, recording effort by fishery (gear and species), and developing calibration methods will help to take advantage of existing data.	1
Risks	These are difficult to implement on the ground: fishers may not be able to determine the targeted effort by species or are not willing to provide more detailed data. It may not be possible to disaggregate existing effort records by gear/species without additional assumptions or information. Standardization of effort may require experiments to determine relative fishing power and allocation of effort among species.	1
Efficiency	It is somewhat more expensive to collect fishery-specific effort (see Risks above).	1
Utility	Very useful for all stock assessment analyses.	1
Sustainability	Once implemented, can be maintained at no cost, other than completion of more detailed data forms.	1
Acceptance	Fishers in the region need to provide the data for effort standardization and effort estimation. Fisheries organizations also need to agree that this effort is important enough to collect.	1

Name	Standardize Biological data from landings, processors, or biological studies	Score (☺1-5☹)
Description	Set standard for biological data needed in analyses.	
Objectives	Estimate sex ratio, ratio of sexual maturity, age structure, morphometrics by country and for region. Need to standardize measurements of all these variables.	

Relevance	Info on size/ age structure, sex-ratio, maturity is necessary to understand population structure & dynamics. Comparable data can help to estimate comparable parameters among stocks in the region. Maintaining size structure could be one important conservation objective.	1
Effectiveness	Standardized definitions, forms and data will make data comparable.	1
Risks	Not all countries can collect the same information, so data collection will depend on funding, staff & training, and nature of the fishery.	1
Efficiency	If biological data are in place, there is some additional cost to update periodically.	1
Utility	Regional sharing of biological data is not of absolute importance, but consistent gathering of information from each fishery would be important.	1
Sustainability	Once implemented, can be maintained with additional cost from time to time.	1
Acceptance	Fishers need to agree to provide biological data periodically, given that such data collection take time and may involve special requirements.	1

Analysis

Name	Develop “Operating model”	Score (☺1-5☹)
Description	A Monte Carlo simulation model that represents all current knowledge on the biology and ecology of conch population dynamics.	
Objectives	To provide guidance on and test harvest strategies and stock assessments.	
Effectiveness	Knowledge of queen conch biology very good, so scientific advice testing should be valid if part of a good review system.	2
Risks	Technically the method may be complex and software difficult to use, so the tool may not be available for all fisheries without training.	3
Efficiency	The method may avoid expensive data collection and be appropriate for assessment in smaller fisheries.	1
Utility	It is important as it allows development and evaluation of harvest strategy quickly without waiting for research and data collection.	1
Sustainability	The simulation tool would be in R (or similar widely available platform) and should be made freely available. Maintenance costs would be minimal, although ideally new research should be incorporated should it become available. It may depend upon one or two dedicated people to maintain it however.	2
Acceptability	Conch producing states would appreciate these new management tools.	2

Name	Develop/share conch assessment tools in R (risk analysis)	Score (☺1-5☹)
Description	Stock assessments methods suitable for conch could be implemented in R, or similar widely available software, so that they are available through the region for use on conch data that are available. These could most likely be provided as scripts and functions that produce standard analyses and outputs.	
Objectives	To use tools developed to assess conch stock status and establish harvest reference points for the fishery.	
Effectiveness	Good results could be achieved, but would be dependent on proper model selection and appropriate and accurate data.	2
Risks	Unavailability of suitable data sets, limited technical capacity to use/apply software programs and to interpret results.	3
Efficiency	There would be a low development cost. Use of the tools should be free, although some maintenance may be necessary.	2
Utility	In line with current concepts of best practices in fisheries management.	2
Sustainability	Once the tools and technical capacity are successfully developed then it is expected that use of the tool will continue in the future.	1
Acceptability	Highly beneficial and thus very acceptable.	1

Name	Independent Expert Review	Score (☺1-5☹)
Description	Regular independent review of stock assessments and analyses would be carried out by the CRFM Conch and Lobster Working Group. The assessment and results from the review would be published by the CRFM Scientific Meeting.	
Objectives	To facilitate transparency and improve credibility, and to obtain constructive feedback.	
Effectiveness	Effectiveness will depend on robustness of the expert review and an appropriate response.	1
Risks	Whether appropriate external technical experts are available or not may undermine the process.	2
Efficiency	If stock assessment tools and results are not systematically validated, the value of such work is diminished.	1
Utility	It is important to ensure appropriateness of stock assessments for sound management of the conch fishery.	2
Sustainability	CRFM CLWG peer review is sustainable, but involvement of external experts in the review process will vary. External experts are routinely available as members of the CLWG.	1
Acceptability	It should improve the accuracy and credibility of the scientific advice to conch fisheries, which should increase the value of research in the region.	1

Name	Spatial and habitat analysis	Score (☺1-5☹)
Description	Undertake GIS mapping of conch grounds and associated marine areas and habitats.	
Objectives	To demarcate distribution and abundance of conch and to characterize and map critical habitat types to inform spatial-based management.	
Effectiveness	This work is fundamental for spatial-based management.	1
Risks	Unavailability and/or affordability of equipment, software programs and technical capacity.	4
Efficiency	Will vary according to local management regimes	2
Utility	Provided that initiatives identify critical areas (nursery, spawning sites, etc.)	1
Sustainability	After initial mapping only periodic re-surveys are anticipated.	2
Acceptability	The benefits of this technology will be highly acceptable.	1

Name	Socio-economic analysis of conch fisheries	Score (☺1-5☹)
Description	Evaluation of socio-economic contribution of conch fishing to the livelihoods of fishermen, fishing communities and wider national development.	
Objectives	To incorporate socio-economic information in the management and planning processes.	
Effectiveness	It is important that this component is made effective.	1
Risks	Manpower limitations, willingness of the fishing community to share accurate personal information as required.	3
Efficiency	Cost of collecting this information outweighs potential cost of ameliorating economic shocks that may result from management measures that did not consider these socio-economic issues.	1
Utility	This work has not been done in most countries and would therefore assist to develop and implement management and conservation efforts.	1
Sustainability	Could vary by country but recommended to design and implement systems to ensure routine data collection.	2
Acceptability	Some suspicion expected at start but fishers are likely to comply once they recognize the benefits.	2

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Management

Name	Draft a regional CRFM regulation (as for OPESCA lobster) for Meat Weight	Score (☺1-5☻)
Description	<p>A regulation would contain the following</p> <ul style="list-style-type: none"> • Standardized regional minimum meat weight for Queen Conch landed in each country • Minimum weight stipulation would provide for an exception to countries such as Belize whose fishery is based on sub-adult individuals • Minimum meat weight should be informed by accepted conversion factors • The establishment of the minimum meat weight should be led by the CRFM in collaboration with relevant stakeholders <p>Approaches/Solutions:</p> <ul style="list-style-type: none"> • Establish a conch subcommittee of Ministerial Council similar to what exists for Flying fish to forward the regional conch management priorities. • Look at other regional and international initiatives (OSPESCA, CFMC, WECAFC, CITES) to ensure complementarity and relevance of our regional regulation. It is important to fit into a broader approach to the management of Queen Conch bearing in mind the resource pans the greater Caribbean region to ensure credibility and effectiveness of our regional effort. • There is a need for national commitment to garner stakeholder (industry, consumers, fishers, etc.) consensus and for implementation. • Existing systems like those used to enforce CITES requirements for the Queen Conch trade could be employed to implement the said regulation. • Promote the organization and strengthening of fishermen organizations to facilitate co-management. • Develop and implement a public awareness strategy for Queen Conch within countries in collaboration with the CNFO and member organizations in countries. 	
Objectives	Deter the illegal capture and exportation of Queen Conch to support the effective management of the resource within the region	
Effectiveness	Reasonably effective assuming political will and capacity for implementation is in place	2
Risks	<p>Lack of regional consensus</p> <p>Non-compliance due to lack of stakeholder buy-in (fishers, consumers, industry, etc.)</p>	4

	Lack of political will and capacity for implementation is in place Negative socioeconomic impacts (less production for some)	
Efficiency	The cost of implementation should be low.	2
Utility	Countries whose fishery are geared primarily toward local consumption believe that this regulation will not necessarily be as effective in the overall conservation and management of conch, while other countries which are export-oriented are of the opinion that such a measure would be an effective tool the deterrence of illegal capture and trade	2
Sustainability	High possibly the positive changes can be sustained as long as the system is properly developed and maintain	2
Acceptance	This would be generally acceptable because meat weight limits exist in many CRFM countries already and would tie in nicely with existing management	2

Name	Draft a regional CRFM regulation (as for OPESCA lobster) for shell lip thickness / shell length	Score (☺1-5☹)
Description	<p>A lip thickness regulation would be applied in all CRFM countries, although it may be necessary to allow justified abstentions.</p> <p>Approaches/Solutions:</p> <ul style="list-style-type: none"> • Establish a conch subcommittee of Ministerial Council working group similar to what exists for Flying fish to forward the regional conch management priorities • Look at other regional and international initiatives (OSPESCA, CFMC, WECAFC, CITES) to ensure complementarity and relevance of our regional regulation. It is important to fit into a broader approach to the management of Queen Conch bearing in mind the resource pans the greater Caribbean region to ensure credibility and effectiveness of our regional effort • There is a need for national commitment to garner stakeholder (industry, consumers, fishers, etc.) consensus and for implementation • Existing systems like those used to enforce CITES requirements for the Queen Conch trade could be employed to implement the said regulation • Promote the organization and strengthening of fishermen organizations to facilitate co-management • Develop and implement a public awareness strategy for Queen Conch within countries in collaboration with the CNFO and member organizations in countries 	
Objectives	Improve size composition of landings with respect to both yield and	

	spawner per-recruit.	
Effectiveness	Can only be effective where the shell is landed or traded. Abstentions would undermine the effectiveness of the rule. Where the shell is not landed, which is the majority of the fisheries, the regulation would most likely be ineffective.	3
Risks	Implementation will rely mostly on local enforcement. Non-compliance due to lack of buy-in by stakeholders	3
Efficiency	A regional plastic gauge can be fashioned and distributed to help awareness and enforcement, although this would incur some cost. Efficiency could be negatively affective due to the high costs associated with building local capacity for enforcement	3
Utility	Lip thickness controls would make a significant contribution to conserving conch stocks if the control could be enforced and lip thickness is set at a high enough level.	2
Sustainability	Once implemented and fishers are aware of the regulation, the regulation can be sustained easily.	2
Acceptance	Would be general accepted as an additional management tool	2

Name	Draft a regional CRFM regulation for harmonised closed season	Score (☺1-5☹)
Description	<p>A regulation would be applied to establish a closed across the region. For management (some countries do not have closed season) and enforcement purposes, the compatible closure would probably need to be applied to trade as well.</p> <p>Approaches/Solutions:</p> <ul style="list-style-type: none"> • Establish a conch subcommittee of Ministerial Council working group similar to what exists for Flying fish to forward the regional conch management priorities • Look at other regional and international initiatives (OSPESCA, CFMC, WECAFC, CITES) to ensure complementarity and relevance of our regional regulation. It is important to fit into a broader approach to the management of Queen Conch bearing in mind the resource pans the greater Caribbean region to ensure credibility and effectiveness of our regional effort • There is a need for national commitment to garner stakeholder (industry, consumers, fishers, etc.) consensus and for implementation • Existing systems like those used to enforce CITES requirements for the Queen Conch trade could be employed to implement the said regulation • Promote the organization and strengthening of fishermen organizations to facilitate co-management • Develop and implement a public awareness strategy for 	

	Queen Conch within countries in collaboration with the CNFO and member organizations in countries	
Objectives	The regulation would reduce fishing mortality directed at conch, and therefore conch landings.	
Effectiveness	The season should be effective in reducing fishing effort directed at conch once the integrity of the closed season is maintained	2
Risks	If trade continued, opportunities for IUU might increase. Such a closed season might not be agreed or fully enforced in all countries. Closed seasons may not be fully effective in reducing fishing effort. For countries with no closure in there could be negative socio-economic impacts.	3
Efficiency	Closed seasons can be efficient in that they are easy to enforce and awareness of the regulation can be rapid. Efficiency could be negatively affected by resource constraints	3
Utility	Closed seasons could make a significant contribution to reducing mortality on conch, particularly if it covers the spawning period.	2
Sustainability	Once implemented, closed seasons become accepted and generally are enforced.	2
Acceptance	Would be generally accepted	2

Name	Require standard format FMPs are finalised for all countries	Score (☺1-5☹)
Description	<p>This would be a regional initiative through the CRFM to revise and develop FMP's within the region.</p> <p>Approaches/Solutions:</p> <ul style="list-style-type: none"> • The ministerial subcommittee would help to drive the endorsement of local and regional FMPs • The national FMPs should inform the formulation of a regional FMP • Both regional and national FMPs should be consistent with existing regional management efforts for Queen Conch • There is a need for national commitment to garner stakeholder (industry, consumers, fishers, etc.) consensus and for implementation • Promote the organization and strengthening of fishermen organizations to facilitate co-management • Develop and implement a public awareness strategy for Queen Conch within countries in collaboration with the CNFO and member organizations in countries 	
Objectives	To finalize and have formally endorsed FMP's in CRFM member states	
Effectiveness	Adoption of simplified format for FMPs as descriptions of the harvest strategy, including roles and responsibilities, would help clarification	2

	and adoption of management plans.	
Risks	Lack of political will (fishery may be of low priority) Availability of resources Lack of stakeholder buy-in Format of the FMP's cannot accommodate needs at the country level	3
Efficiency	This task could be undertaken inexpensively, since expertise is available in the fisheries departments.	1
Utility	This would make a significant contribution to sustainable management	2
Sustainability	FMPs would need to be maintained but once an acceptable format is developed, the initiative should be sustained.	2
Acceptance	Each country would benefit from formally endorsed FPMs thus would be widely accepted.	2

Name	Develop harvest control rules in all fisheries	Score (☺1-5☹)
Description	Harvest controls would link measured indicators to specific well-defined management actions	
Objectives	The HCR would support maintenance of stock status, rebuilding and participation of fishers in decision-making.	
Effectiveness	If implemented, HCRs should be highly effective in maintaining stock status and supporting rebuilding.	2
Risks	HCRs may become too complex or no acceptable HCR may be identified that can be agreed among stakeholders. There are financial constraints and low capacity within fisheries departments for fishery managers to implement, enforce and monitor HCR.	3
Efficiency	HCRs require a decision process to implement them, which would to be set up in many countries. Otherwise costs would be very low. Implementation success would be highly dependent on stakeholder participation	3
Utility	HCRs are critical but not the only component of effective harvest strategies. They depend on good data analysis and design.	3
Sustainability	Once implemented, HCRs should be maintained easily.	2
Acceptance	Generally, it would be acceptable to most fisheries once implemented.	2

Name	Regional vessel monitoring system (VMS) with domestic and central (CRFM) tracking	Score (☺1-5☹)
Description	Installation of satellite based VMS on vessels.	
Objectives	To track activity and location of large conch vessels and monitor legal and IUU activity	

Effectiveness	This measure would not be effective because only Jamaica uses large industrialized vessels and thus would only track a small portion of the regional Queen Conch fishery. We should explore the possibility using emerging technology for tracking (broadband, GPS) in small scale fisheries	5
Risks	Countries with smaller vessels would not be included in the scheme. For small-scale/artisanal fisheries the technology would not economically feasible.	5
Efficiency	Only a small part of the regional fishery would be covered. Would only be effective if an appropriate system is developed	4
Utility	Most countries would not be able to adopt such a programme mainly due to cost	5
Sustainability	Unlikely to be sustained unless an appropriate technology and a reliable funding mechanism is identified	5
Acceptance	Most countries would not be able to adopt such a programme mainly due to cost	5

CRFM

The CRFM is an inter-governmental organisation whose mission is to “Promote and facilitate the responsible utilisation of the region’s fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region”. The CRFM consists of three bodies – the Ministerial Council, the Caribbean Fisheries Forum and the CRFM Secretariat.

CRFM members are Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago and the Turks and Caicos Islands.

