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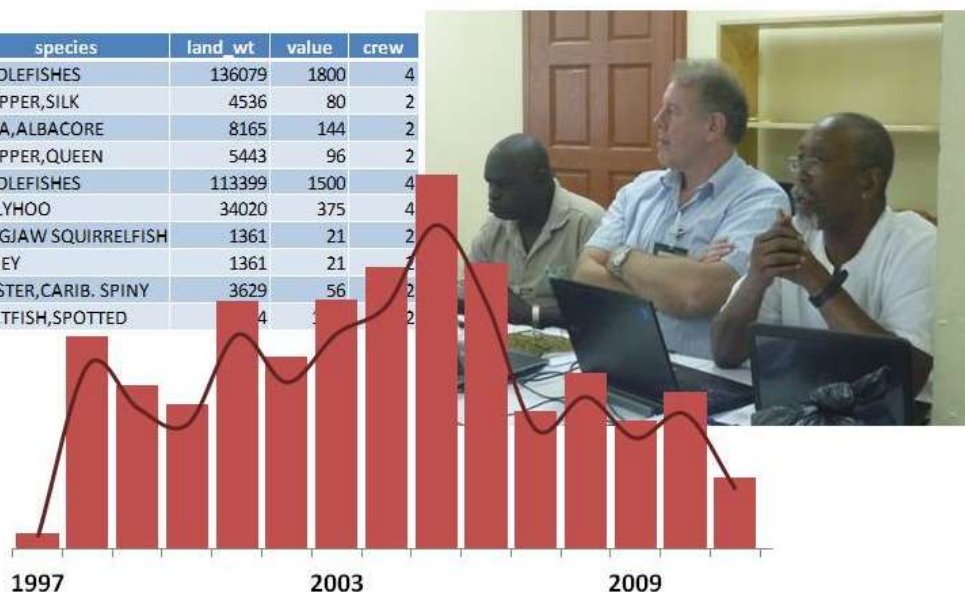
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Report of

WORKSHOP TO DEVELOP STRATEGY TO STRENGTHEN CAPACITY IN CRFM STATES IN THE AREA OF FISHERIES STATISTICS AND INFORMATION

year	species	land_wt	value	crew
1997	NEEDLEFISHES	136079	1800	4
1997	SNAPPER,SILK	4536	80	2
1997	TUNA,ALBACORE	8165	144	2
1997	SNAPPER,QUEEN	5443	96	2
1997	NEEDLEFISHES	113399	1500	4
1997	BALLYHOO	34020	375	4
1997	LONGJAW SQUIRRELFISH	1361	21	2
1997	CONEY	1361	21	2
1997	LOBSTER,CARIB. SPINY	3629	56	2
1997	GOATFISH,SPOTTED	4	2	2



10 – 12 February 2014
St. Vincent and the Grenadines

CRFM Secretariat
Belize 2014

CRFM Technical & Advisory Document - Number 2014 / 1

**Report of Workshop to Develop Strategy to Strengthen Capacity in
CRFM States in the Area of Fisheries Statistics and Information, 10-12
February 2014, St. Vincent and the Grenadines**

CRFM Secretariat,
Belize 2014

CRFM TECHNICAL & ADVISORY DOCUMENT – Number 2014 / 1

Report of Workshop to Develop Strategy to Strengthen Capacity in CRFM States in the Area of Fisheries Statistics and Information, 10-12 February 2014, St. Vincent and the Grenadines

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ACRONYMS AND ABBREVIATIONS

ASM	Annual Scientific Meetings
CARICOM	Caribbean Community
CARIFIS	Caribbean Fisheries Information System
CCCFP	Caribbean Community Common Fisheries Policy
CERMES	Centre for Resource Management and Environmental Studies
CFRAMP	CARICOM Fisheries Resource Assessment and Management Program
CFO	Chief Fisheries Officer
CIPR	Caribbean Information Communication Technology Research programme
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLME	Caribbean Large Marine Ecosystem
CPUE	Catch Per Unit of Effort
CRFM	Caribbean Regional Fisheries Mechanism
DMTWG	Data, Methods and Training Working Group
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GIS	Geographic Information System
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICT	Information Communication Technology
IFREMER	L'Institut Français de Recherche pour l'Exploitation de la Mer/ French Research Institute for Exploitation of the Sea
IUU	Illegal, Unreported and Unregulated fishing
NMFS-SEFSC	National Marine Fisheries Service – South East Fisheries Science Center
OECS	Organisation of Eastern Caribbean States
OSPESCA	Organización del Sector Pesquero y Acuícola del Istmo Centroamericano / Central American Fisheries and Aquaculture Organization
UF	University of Florida
UNU-FTP	United Nations University – Fisheries Training Programme
UNU INWEH	United Nations University – Institute for Water Environment and Health
UWI	University of the West Indies
WECAFC	Western Central Atlantic Fishery Commission

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The CRFM is grateful to the UNU-FTP, Iceland, for funding the Workshop, and for the time and expertise of the four professional staff, 3 from UNU-FTP (Iceland) and one from UNU-INWEH (Canada) who participated in the Workshop discussions. The CRFM is also grateful to the representative of CIPR at the University of the West Indies, St. Augustine Campus, as well as fisheries officers in CRFM Member States, who gave their time and expertise in ensuring the success of the Workshop.

The contribution of the following persons is acknowledged in their capacities as principal rapporteurs for the present report: Cheryl Jardine-Jackson - overall rapporteur for section 1; June Masters - overall rapporteur for section 2; Elizabeth Mohammed - overall rapporteur for section 3; Peter A. Murray - overall rapporteur for section 4, and for the proposed strategy options provided in Appendix 4 of the report.

Ms. Pamela Gibson provided essential administrative support in compiling the various report contributions, and conducting general editing and quality control tasks.

EXECUTIVE SUMMARY

CRFM, in collaboration with UNU-FTP, convened a 3-day Workshop to review the status of statistics and information management, and to make recommendations for strengthening capacity for improved performance by CRFM States in the future. The Workshop brought together a group of national, regional and international fisheries experts, working on various aspects of statistics and information management.

Workshop discussions were informed by a number of working and reference documents, as well as oral presentations covering, *inter alia*: consideration of CRFM legal, policy and institutional framework; developments and performance of various CRFM and CRFM/UNU-FTP initiatives in statistics and information, including training courses, annual scientific meetings, CRFM technical working groups, and use of databases; the typical characteristics of current national statistics and information systems; evolving demands in terms of management advice; data analysis options for limited data situations; and incorporation of ICT tools.

National and regional capacity building options were considered, taking into account the nature of the supporting framework at both the national (Country) and regional (CRFM) levels, and various other management and management information needs, such as stakeholder involvement, better communication and reporting support, and optimised application of ICT tools. Four Working Group sessions were held during the Workshop to evaluate the issues and needs at the following 4 main levels within the management system: field sampling and data collection; database management and manipulation; data analysis and meaningful reporting; monitoring and evaluation of performance of statistics and information. The outputs of the 4 Working Groups were presented and discussed briefly during the final plenary session. As such, the working groups results have been compiled into a working matrix and prepared as a 'stand-alone' reference document titled *Proposed intervention points and actions for Strategy for capacity building to strengthen fisheries data and information management in the CRFM*. This reference document is included as Appendix 4 of the present Report.

1. OPENING OF WORKSHOP AND MEETING ARRANGEMENTS

The overall Objective of the Workshop was to agree on new strategies and approaches for the management of fisheries statistics, data and information in the context of the Caribbean Community Common Fisheries Policy; and, to determine preferred modalities for the provision of training and technical assistance in support of these strategies and approaches.

The CRFM Secretariat's Deputy Executive Director, Dr. Susan Singh-Renton, served as Chair for the Workshop. Dr. Singh-Renton welcomed all and noted that the Workshop will be working towards two specific outputs: a workshop report and a strategy document. It was noted that persons had been invited in their capacities as experts in their own right.

Workshop procedures and hours of work were discussed and agreed to. The draft Agenda was reviewed and adopted without amendments. The Workshop also reviewed a version of the agenda with specific rapporteuring allocations; the rapporteuring allocations were accepted without amendments. The agreed principal rapporteurs were: Cheryl Jardine-Jackson - section 1; June Masters - section 2; Elizabeth Mohammed - section 3; Peter A. Murray - section 4.

Following this, participants introduced themselves and shared information on their roles and experiences in data management and use. The Agenda and List of Participants are given as Appendix 1A and 1B, respectively.

2. REVIEW AND DISCUSSION OF SEVERAL RELEVANT ACTIVITIES/REPORTS

2.1 The CRFM context

Presentation Summary

The Workshop received a presentation giving an overview of the history and development of CRFM, and its initiatives and successes in the area of statistics and information. Participants were referred to Working Document STATS WSHOP/FEB 2014/ WORK DOC 2.1 (provided in Appendix 2A of this report), which contained the full text of the presentation. The presentation began with information on the establishment and objectives of the CRFM, and some details of the provisions of CRFM's legal agreement in respect of management and usage of statistics and information. In addition, the presentation reviewed the implementation of such provisions since the establishment of the CRFM, particularly the work covered during the execution of CRFM's First Strategic Plan that ended in 2011, and also the subsequent period of 2011-13. The progress achieved under key initiatives, such as establishment by the Caribbean Fisheries Forum of several CRFM technical working groups, the annual scientific meetings, and support for a common national database format (CARIFIS), was highlighted.

The presentation also provided details of the outcome of a recent performance review of CRFM, which had commended the efforts of the CRFM and the Secretariat regarding several activities, with special mention of the efforts and progress made by the CRFM technical working groups and the annual scientific meetings, and CRFM's facilitation of a range of capacity building activities. The performance review had also made specific recommendations for improvement, including, *inter alia*: broadening analyses to provide more holistic management advice, establishment of a formal system for commitment and feedback from Member States in respect of management actions and management performance; continuation of capacity building activities, as well as affording opportunities for inter-agency and inter-regional exchanges on best practices. The Performance Review also emphasized the importance of increasing CRFM's efforts in education and training, so as to nurture responsible fisheries management practices.

Information was then provided regarding efforts to address recommendations of the recent performance review, and how the organizational-level recommendations had been incorporated into CRFM's Second Strategic Plan that would cover the period 2013-2021. It was noted that the Second Strategic Plan provided new formulations, based on present day situations, to give ongoing attention to priorities identified and remaining since the First Strategic Plan. The Second Plan also took account of the additional obligations of CRFM in respect of a number of key legal instruments, of CRFM and international origin, which had emerged in recent years. In view of this, the presentation pointed out that the Second Strategic Plan identified several strategic objectives, all of which required a solid statistical and information base to inform work planning and decision-making. Monitoring and evaluation of the Second Strategic Plan was also expected to involve the collection and analysis of data. The full text of the presentation is given in Appendix 2A.

Discussion

1. There appeared to be a lack of willingness to provide data as it implied executive-level decision making responsibility/ability on the part of CRFM Secretariat. It was also noted that the current role of CRFM was an advisory one.
2. Specific terms in the presentation should be defined to allow all participants to fully understand the context of the presentation, especially as regards acronyms. Based on the response of countries regarding data sharing data, it appeared as though it was not done in the manner expected or outlined in the agreements highlighted in the presentation.
3. Regarding the level of importance placed on fisheries at the national level, it was stated that the fisheries industry was not seen as important as other industries. It was also felt that the proportion assigned/calculated as the contribution of fisheries to GDP was low and as a result the fishing industry did not receive the level of attention or investment it required. GDP as a measure of the value of fisheries was examined and it was generally agreed that GDP was not a very good measure of the value of the fishing industry. The Meeting therefore agreed that there was need for an economic assessment and valuation of goods and services from fisheries.
4. Enough was not being done with regards to the analysis and use of the fisheries data and information that was currently available. In the past, countries only produced national annual landings statistics and a national report and Member States were encouraged to do more with the data, to reflect the true nature of the fishing industry.
5. It appeared that Member States did not fully understand that the CRFM Secretariat functioned in a technical and advisory capacity to support fisheries management decision-making at the regional level. Consequently, there was reluctance to provide data and information to the Secretariat. Issues regarding data quality may also contribute to the apprehension on the part of Member States in providing such to the Secretariat. Some Member States expressed the view that they frequently welcomed assistance from the CRFM Secretariat to help improve, provide guidance, but not to control the work of their respective Fisheries Divisions.

2.2 UNU-FTP capacity assessment exercise and report

Presentation summary

The workshop received a powerpoint presentation titled "Training Needs Assessment in Fisheries Divisions in the CRFM Member States". A Training Needs Assessment was conducted in October 2013 in the Fisheries Divisions of the CRFM member states. The findings indicated strong competency in

various fisheries administration activities, fisheries management, awareness building, and communication with stakeholders. Low competency was observed in Environmental Monitoring, Quality Assurance, and Aquaculture. Training options in fisheries at university level are few, and fisheries staff rely on short courses and “on-the-job” training to improve their professional skills. The training activities vary greatly among FDs. Few of the fisheries officers have academic training and the staff of the FDs has mainly received training in various Fisheries Management issues which reflects their competency in fisheries management. The FDs identified, as a priority, training in Data Collection and Management, Fisheries Management, and Project Formulation and Planning, but put little emphasis on Fishing Gear Technology, Quality Assurance and Aquaculture despite the fact that these are areas of low competency and have been identified as priority areas in the CRFM strategic plan. The study identifies the need for training in the areas of data management, quality assurance, and aquaculture, and recommends regional scholarship programme for fisheries studies, establishment of a research fund to promote research and education in fisheries in regional universities, and that a capacity building strategy is made both nationally and regionally. The powerpoint presentation is given in Appendix 2B.

Discussion

1. In the Capacity Assessment “other training” should be qualified as, although not identified in the formal system (MSc, BSc), officers of Fisheries Departments gain knowledge and experience from on-the-job training, short courses and field experiences. Such training and experience may be equivalent to a university degree but was not so recognized in the formal sense. This placed such persons at a disadvantage as they may not meet the established pre-requisites for entry to more advanced university programmes.
2. The high staff turnover at Fisheries Departments was a challenge in respect of investment in training. Some Fisheries Departments may also not be aware of existing training programmes and opportunities. For example, in the OECS, certain Community Colleges were designated the centres of excellence in certain fields but this was not properly publicized.
3. Although aquaculture was listed prominently in the new CRFM Strategic Plan (2013 to 2021), and was globally recognized as the avenue for improving food security and in the capacity assessment exercise was identified as the area of least competence of Fisheries Departments of the region, few Chief Fisheries Officers identified aquaculture as an area for capacity-building. The meeting was reminded that OECS Member States had in the past taken a policy decision that aquaculture should be undertaken at the subsistence level only, because of land availability, tenure and water issues, as well as the perceived competition with agriculture for land. However, perhaps this situation may change if there was opportunity for mariculture.
4. There seemed to be a disconnect between senior management staff and junior staff assigned to technical work (data management and analysis) in respect of communication and use of the technical information provided. Although senior managers called for more data and information they did not appear to use the data and information provided in their decision-making. Poor communication and networking between senior management and those responsible for data and information have also had negative impacts on the quality of advice given.
5. The process by which persons were selected for training was also discussed and was thought to be flawed. The meeting suggested that training should be offered based on competency, inclination, portfolio at the Fisheries Department, general succession planning (a leadership issue) and directed by policy.
6. Concern was also expressed that the capacity needs assessment focused on permanent staff only. However, data collectors were often not hired on the permanent establishment and, while not

being very well remunerated for their job even though they collected critical data for decision-making purposes, they (and at times other persons similarly employed) were often on the staff long enough and carried out duties of a type that they might be considered permanent. Well-trained permanent staff however, can address any respective data quality issues. Further concern was expressed at the apparent fragmentation and weak leadership of the fisheries management process in the region. In some cases there was a lack of legislation, in others there may be policies or FMPs which were not being used to guide the management process.

2.3 Performance of Stock Assessment Course

Presentation Summary

A powerpoint presentation titled “(A Biased) Recollection of the Statistics/Stock Assessment Course” provided participants with an overview of the CRFM/UNU-FTP/UWI Statistics/Stock Assessment Course. The presenter noted that this was the second phase of a two phase stock assessment workshop. The first phase was held in Barbados where students were provided with the theoretical background and were asked to undertake a stock assessment over a period of a year. The presenter considered that the skill to work independently on quantitative data may be a hindrance in the region. Most of the technical work was done in Excel, which had a limited capacity in delivering results/graphs in natural science where the variance in the data was just as important a property as the mean or the sum. Pasger (a software developed for use in fisheries data) was also introduced to the group. The presenter commented on the data and the stock assessment work brought to the second phase of the workshop, and noted that learning fisheries science will be best advanced by practice and doing the stock assessments which will build the skills. The teaching materials used for the workshop are still available on the website as a text and it may be worthwhile investing in developing it further. The presentation is given in Appendix 2C.

Discussion

1. The software used in the stock assessment course was mostly limited to EXCEL (designed for Accountants, not scientific analysis). There was need for a tool to facilitate exploratory analyses on fisheries related or fishery-independent data (though not necessarily proceeding to the level of stock assessment).
2. Officers who had participated in the course were not allowed sufficient time to practice and utilize the skills learnt because of the heavy workload and wide portfolio of Fisheries Departments as well as the very limited human resources. This pointed to a lack of institutional support which was a difficult problem to address. It also appeared that the training received was not being used at the CRFM Annual Scientific Meetings. Perhaps the short-course could be designed along the annual workflow of the CRFM Scientific Meetings to explore the utility of approaches on the ground.
3. While some participants were motivated, there was variation in the level of skill among them, with some not being technically inclined. There appeared to be an issue in terms of the selection of persons for training as sometimes the selection was not informed by their technical capability, level of competency or inclination, or portfolio at the fisheries department. It was suggested that self-motivation and initiative were required to foster learning within the public service (Fisheries Department) environment.
4. There was no clear indication that the training had resulted in improvement of the quality of data produced for analysis at the CRFM Scientific Meetings.

5. There was need for identification of specific data and information requirements at the regional and national level to direct the data collection efforts.

2.4 CARIFIS Survey Report and recommendations of CARIFIS DGroup

Presentation summary

The Workshop received a presentation on CARIFIS and the CARIFIS DGroup and participants were referred to Working Document STATS WSHOP/FEB 2014/ WORK DOC 2.4 titled “CARIFIS Survey Report and recommendation of CARIFIS DGroup. The full text of the Working Document is given in Appendix 2D.

The presenter updated participants of the Survey carried out in 2011. A brief description of why this survey was necessary was given as well as the problems countries faced in operating the CARIFIS database. Some countries stopped using CARIFIS because of bugs within the system which they were unable to fix. They utilized the Access database and Excel spread sheets to store fisheries data. The survey and the recommendations from the survey were presented to the Caribbean Fisheries Forum.

The Forum recommended activities had included:

- a. Develop and implement a clear path for providing assistance to the Member States for retrieval / recovery of the data now residing in the CARIFIS databases.
- b. Determine the ongoing and planned initiatives in the region addressing data and information acquisition and management.
- c. Undertake an assessment to determine the data and information needs at both the regional and national levels.
- d. Seek technical assistance and expert advice on suitable systems (databases to accommodate the identified needs at both the national and regional levels).
- e. Develop proposals in coordination with Member States to mobilize funds.
- f. Assist Member States to develop modern programmes/databases in a more suitable implementation of SQL.

Discussion

1. Issues with the CARIFIS database made it difficult for countries to use it, for example there were bugs within the system which remained unresolved. As such countries reverted to the formats that they were comfortable with. Some Member States had started utilizing the Access database to store fisheries data. However, Access can only handle a limited amount of data and was only seen as a quick fix at this point. Development of a database was a national responsibility and countries should agree to move away from FoxPro and use SQL with the assistance and guidance of CRFM. It was also suggested that each country take the CARIFIS frame and develop it to meet their individual needs. In some countries where resources were not available to develop CARIFIS, the CRFM could provide assistance. However it was difficult to address CARIFIS problems since there was a lack of resources at present.
2. Users of the program appear to want to use only software with which they were comfortable; but users should be cognizant that when dealing with data two things must be possible - the ability to share information and the basic rule of data management. It was therefore suggested that whatever database countries developed, they must follow the basic rules of data management, and should be able to accommodate data sharing.

2.5 Activities and Recommendations of the CRFM *Ad Hoc* Working Group on Methods and the current CRFM Working Group on Data, Methods and Training

Presentation summary

The Workshop received a presentation giving an overview of the history and development of the two CRFM working groups that had given special attention over the years to problems in the areas of data, analysis methods, and since 2009, in the area of training in data analysis. Participants were referred to Working Document No. STAT WSHOP/FEB 2014/WORK DOC 2.5 (provided in Appendix 2E of this report), which contained a table of recommendations that had been produced by the annual scientific meetings, and in particular by the two working groups dealing with analysis methods, during the period 2004-2013.

The presentation noted that these recommendations were a direct reflection of the issues and priorities requiring attention, as identified by the experts involved in the process. For the purposes of the tabular format of the relevant Working Document, the recommendations were categorized as follows: data quality; methods of data analysis; quality of stock assessments; general. However, the presentation noted some interesting patterns in the recommendations over the years. Many areas of training were requested, most common among them being requests for training in the use of excel and R for data manipulation and analysis. Additionally, options for ensuring data quality, completeness, and data sharing were also common among the recommendations, including data recovery, national database management, establishment of a regional database, and linkages with other databases such as FISHBASE. There was also a recommendation that the UNU-FTP statistics and assessment course be repeated. In concluding, the presentation noted that the CRFM Secretariat had also tried various formulations for delivery of the required training, and that the present Workshop needed to bear this in mind in determining the way forward. Specific details of the various recommendations were provided in Working Document No. STAT WSHOP/FEB 2014/WORK DOC 2.5 (see Appendix 2E).

Discussion

1. It was suggested that participants should only be funded to attend the scientific meetings and other regional training sessions if the data and other inter-sessional work was prepared prior. Perhaps the Scientific Meeting could revert to working on very basic datasets so as to ensure availability and good quality data that would facilitate more advanced analyses.
2. It appeared as though Scientific Meeting participants did not share the work done and experiences from the workshop with their counterparts at home.
3. The amount of effort put into quality checks from the industrial side of fisheries was queried and it was pointed out that usually only basic catch and sales data were provided.

2.6 Performance of the six-month training programme offered by UNU-FTP

Presentation summary

A brief synopsis of the six-month training programme offered by UNU-FTP was provided in a powerpoint presentation titled “UNU-FTP and the Caribbean”. The cooperation between UNU-FTP and the CRFM Secretariat dates back to 2007 when the first fellows from the CRFM member states came for the 6 months training programme by the UNU-FTP in Iceland, but Cuba has been a partner country since 2000. Today 14 fellows from the CRFM Member States have been trained in Iceland and 15 Cubans, and five short courses on three topics (leadership, project cycle management, and stock assessment) have been developed and implemented in the region in cooperation with Caribbean fisheries experts and regional universities. All of the countries have benefitted from the short courses delivered in the region but the

number of participants from the countries varied. The cooperation with CRFM has been successful over the years and there is a will for a long term relationship in all areas of the UNU-FTP. The powerpoint presentation is given in Appendix 2F.

Discussion

1. The two main challenges faced by the programme in relation to the Caribbean students were individual issues and access to data. It appeared as though the definition of and expectations for “data” or “to provide data for assessments” might be different between the UNU-FTP and the participants, as participants seemed to think that a few months of data could be sufficient for stock assessment (the Caribbean was not found to be as data poor as the Pacific countries). The meeting learnt that one of the best candidates at the training came from the region, however they continued to experience challenges with participants from the region. It was noted that the challenges differed for individual persons however some challenges specific to the Caribbean participants included:
 - Participants having no idea of what to expect.
 - Access to data
 - Participants finding the training difficult
 - Some being unclear as to what they wanted out of the training
 - Meeting the standard set out in the program
2. It was pointed out that the course was an intense one and the fellows were expected to display professional behavior and be strongly motivated. The meeting was asked to put forward some of the possible reasons for Caribbean students continued challenges on the programme. Some feedback from persons who attended the training included:
 - A change of environment that required quick adaptation.
 - There must be mental preparation to new environment.
 - The distance does not make it possible to respond to family emergencies back home.
3. One reason for hosting the programme in Iceland was that it was felt that the change of environment would cause persons to focus on the task at hand, as they were away from the distractions and demands of being at their place of employment. There was need to revisit the selection process to ensure that the most suitable persons were selected to attend training and more UNU-FTP involvement in the recruitment process in the region was probably required. It was also possible that some of the students might not have had the necessary foundation on which to build. Suggestions on how to combat the issues facing the Caribbean students included: the course could be split into two phases so that there would be two three months phases which would lessen the burden of being away for six months at any one time; and the exploration of distance learning.

2.7 Performance of CRFM Annual Scientific Meetings (format and outputs) and associated DGroups

Presentation summary

The Workshop received a presentation on the performance of the CRFM Annual Scientific Meetings, and participants were referred to Working Document STATS WSHOP/FEB 2014/ WORK DOC 2.7 (provided in Appendix 2G of this report), which contains the full text of the presentation.

The CRFM Annual Scientific Meeting (ASM) serves as a forum for the meetings of five resource working groups for major commercial species (conch and lobster; shrimp and groundfish; reef and slope

fish; large pelagic fish, and small coastal pelagic fish) as well as the Data, Methods and Training Working Group (DMTWG). Through the DMTWG participants have also received training in use of various assessment methodologies, statistical and stock-assessment related software. There is also opportunity for collaboration with international consultants (contracted for the meeting) as well as regional technical officers towards improving the quality of data and information used for fisheries management decision-making.

The ASM's mandate has been expanded to integrate ecological, socio-economic and environmental data into its species/stock/fisheries assessments but still faces a challenge in the use of traditional assessment methods due to significant deficiencies in sampling programmes for basic fisheries data (catch and effort), data quality control checks and data management and analysis. Consequently, there is need to review and modify sampling strategies to better reflect the components in the region's multi-species, multi-gear and multi-fleet fisheries. Reconstructing historical time series catch and effort data remains critical due to their utility in validating assessment models and consequently improving the quality of assessment outputs and management recommendations. Rationalization of biological data collection programmes is also necessary from a regional standpoint. In both cases (catch and effort and biological data) minimum data requirements should be identified and a standard format developed for submission of data to the ASM. National fisheries authorities already collect demographic and socio-economic information through their registration and licensing systems and incentive programmes but a mechanism is required for accessing such data, if not already computerized, and efforts made to explore their usefulness for management decision-making. Developing new, or strengthening existing, institutional linkages nationally could facilitate access to a wide range of data (trade, socio-economic, demographic, national census, environmental) already available nationally and restructuring of national data collection programmes to increase their efficacy in fisheries management, particularly in light of the resource-limiting situation in most national fisheries authorities. The quality of management advice provided by the ASM is impacted by, among other things, the poor quality of data contributed for analysis/assessments, a situation which is reported annually, along with recommended actions, by the respective working groups. The continued reluctance to share data and information in the region has severely constrained the ability of the ASM to build on past efforts in data analysis and stock assessment. A regionally agreed data and information policy is critical to addressing this situation. Currently, the CRFM Secretariat uses the DGroup facility to share documentation with Member States, however, the full utility of this ICT tool for active discussion on management issues has not yet been explored. The full text of the presentation is given in Appendix 2G.

Discussion

1. Whether or not consideration could be given to having the Annual Scientific Meeting biennially instead of annually, as this would provide a longer inter-sessional period for the collection, correction and cleaning of data was queried. There were 17 Member States, but all countries would not necessarily need to assess their stocks every year.
2. Annually countries are requested to advise the Secretariat, in advance of the Scientific Meeting, of their priority species and related management issues, so as to facilitate planning and guidance of the technical analyses. This approach has not always worked.
3. Over the years, the category of persons attending the Scientific Meetings have shifted from technical officers to Managing personnel.
4. The collection of biological data had ceased in most of the CRFM Member States due to the discontinued support under the previous CARICOM Fisheries Resource Assessment and Management Program (CFRAMP) as well as the inability of national fisheries authorities to acquire the necessary resources to sustain such programmes.

5. The WECAFC had employed the strategy of inviting the Directors of Fisheries to the last two days of deliberations and had secured commitment from them to implement the management advice provided. However even with those commitments, the Officers did not implement the required advice on return to their respective jurisdiction (strategy did not work).
6. Whether or not the report presented had already been shared with the managers/ Forum, and if so what was the response of the Forum was queried. The response was that the issues raised in the working document had already been raised with the Forum (at various sittings of the Forum). However the comprehensive working document presented to the workshop became available for this workshop and thus had not been presented (as this document) to the Forum. Also the CRFM Performance Review acknowledged that the lack of directive by the managers have affected the work of the Scientific Meeting.
7. Policies on data issues were formulated by the Ministerial Council on advice from the Fisheries Forum, however the CRFM Ministerial Council and Forum did not take steps to ensure that the data was provided to CRFM Secretariat. It was felt that the solutions for the problems with the Scientific Meeting were clearly outlined, but the directives and commitment to act seemed to be missing. So much so that during the inter-sessional period the Secretariat was left to act on its own, even though there were many demands made of the Secretariat at the Meetings of the Ministerial Council and Forum, and the Secretariat needed help with the regional work of the CRFM.
8. In some cases the fisheries staff did not actively participate in the assessments being done at the Scientific Meetings, but allowed the consultant to do the work by him/herself, and this meant that knowledge was not being transferred to the fisheries staff. It was also felt that the consultant's time should not be used to clean data, and so the data should be cleaned before being given to the consultant.
9. The Secretariat had asked that a priority list of species to be assessed, be developed by each Member State. This was done by most of the Member States, however over the years some of the species that were listed for assessment have not been assessed and some species were assessed in consecutive years; for example, the seabob of Suriname and Guyana.
10. The Scientific Committee was a good idea as the voice of the committee would be strong especially when speaking at the international level. The committee could also facilitate the training of a core set of persons.
11. Other suggestions for improvement in the format of the ASM included requirements for the technical Working Groups to develop time-bound work plans, to present fisheries analyses and stock assessment directly to the Forum and to build technical linkages with fisheries-related working groups of other organizations in the region. In addition, consideration should be given to the structures of other organizations which provide fisheries management advice.

3. CONSIDERATION OF PRESENT AND EMERGING FISHERIES INFORMATION DEMANDS

3.1 Use of “limited” data for economic analysis and fisheries management purposes

Presentation summary

A powerpoint presentation titled “Use of limited data for economic analysis and fisheries management purposes” was received by the Workshop. Given the limited human and financial resources, it is necessary to bear in mind the costs and benefits of data collection. The data collection costs can include: organization and management, collection, and storage. The benefits of data collection can include more accurate models and improved decision making. The net benefits of data collection reach a maximum at the optimal complexity point. This point can change throughout time as the costs and benefits can change. More complex modeling is therefore not always better. Risk and uncertainty should be incorporated into the model choice as the net benefits of a simple model can be greater when risk is low compared to a complex model. Similarly, the net benefits of a complex model can be greater when uncertainty is low compared to a simple model.

The Surplus Production Model (SPM) deals with the entire stock, entire fishing effort and the total yield obtained from the stock to estimate the Maximum Sustainable Yield (MSY). Data requirements are thus less for SPM than for other models. With a simple regression it is possible to obtain estimates of a linear function which can be used to calculate the effort level which maximizes sustainable yield, give an indication of stock size, predict yield as a function of effort. The simple regression can potentially also be used to assess the effort that maximizes long term profits. The presentation is given in Appendix 3A.

Discussion

1. The resources are shared, fisheries are multi-species and multi-gear. Consequently, consideration should be given to standardization of the measure of effort among fleets and countries and maintaining the respective time series of data.
2. A case was made for increased use of economic analysis in providing management advice due to focus on a key element of management – net profit – decisions are often made from an economic rather than a biological standpoint.
3. Within the forum of the CRFM Annual Scientific Meetings the Schaeffer Production Model has been utilized, with the fishing trip being used as the sole measure of fishing effort. Dr Paul Medley had included in his analyses Bayesian approaches for addressing uncertainties in the carrying capacity (k) and intrinsic growth rates (r). Dr Juan Carlos Seijo included economic considerations in a previous biological assessment model. However, the quality of time series data is uncertain. During the early years of the CARICOM Fisheries Resource Assessment and Management Programme (CFRAMP) about two years of biological data were collected by countries and used in some of the initial analyses at the CRFM Scientific meetings. However, the length-based methods were heavily criticized in favour of age-based models and consequently, due also to limited resources, biological data collection was discontinued and use of the surplus production model was reverted to.

3.2 Data management and realistic analysis of fisheries data for "stock assessment" purposes

Presentation Summary

A powerpoint presentation titled “Realistic analysis and Data Management” provided the workshop with details about data management and analysis of fisheries data for stock assessment purposes. Fisheries

science is a quantitative field that covers diverse areas. Achieving an assessment based on some analytical model should be considered as only one element within this field and not as a goal in itself. Good understanding of the development, status and driving forces within a fisheries are a prerequisite when inference is made with respect to likely development and status of the biological stocks.

Increasing competence and skills in fisheries analysis could be achieved by using a step-wise approach. Deliverables along such a route need to be carefully defined (to make them achievable) taking into consideration the current knowledge and technical level. The first deliverable could be a detailed analysis of the development, status and importance of the fisheries as a whole. This analysis could include an evaluation of the current sampling design. Important part of the objectives could be increasing the competence and skills in statistical data analysis, making inferences (connecting the dots), reporting and presentation. The powerpoint presentation is given in Appendix 3B of this report.

Discussion

1. One major conclusion was that the main bottleneck was at the database development and management level, mindful that although tremendous data existed, accessibility remained a critical issue. However, it was noted that there may be bottlenecks at the basic sampling level which required revisiting elements of sampling design methodology and data quality.
2. A case was made for focus on database management – which is a highly specialized field, with a proposed option being the move towards a platform-independent, web-based format. In such a case the front-end can be modified to suit each country's preference since the experience had been that the format of new databases tended to be a deterrent to their use if they differed considerably to what countries were accustomed.
3. In the case of Suriname, there was some reluctance of data entry persons to learn about and use a new database system. There was comfort in falling back to familiar, simpler systems rather than dealing with the challenges of a new system. This inevitably resulted in discontinuation in the use of the new system (See possible solution at 3.5.2 a). This situation appeared common in the regional experience with CARIFIS, i.e. database failure was often due to lack of foresight and planning for future information needs.
4. Suriname currently also focused on the use of GIS and location-based fisheries management and their databases as important tools to assist with the visual representation of fisheries data. It was recommended that GIS data also be transferred to a database management system. Suriname had also explored the use of ArtFish to improve sampling design methodology.
5. It was recommended that further consideration be given by the workshop as to how the DMTWG could be used as a forum for discussions on improvement in sampling design so as to acquire more robust estimates of catch and effort. The Scientific Committee, if approved, could be charged with the responsibility to take forward the ideas, elaborate on them and set targets for implementation.
6. The need for harmonization of procedures for reporting shared data should be addressed.
7. It was important to know the data inputs to stock assessment models in order to modify data collection accordingly.

3.3 Examining a typical national fisheries information system – types of data collected, types of analyses and reports, data quality management, database used, database management

Dominica

Presentation summary

An overview of the fisheries information system of Dominica was provided in a powerpoint presentation titled “Dominica’s National Fisheries Information System”. The Fisheries Division of the Commonwealth of Dominica has the mandate of managing the living marine resources within the maritime boundaries of Dominica. To do so, it employs methodologies to capture fisheries information. Data collected include fish catch and effort data, fisher and fishing vessel registration and socio-economic data of fishers and related industry groups. Some of these datasets are geo-referenced to allow for the spatial component of fisheries management. Reporting is done regularly and by request, based on the type of report required. A Microsoft Access database is used for data entry and storage, with regular backups to multiple locations.

However, there are a few challenges within this system. Data collection is sometimes hampered by uncooperative fishers, poorly compensated data collectors and inadequate supervision of data collection activities. Incomplete registration forms and sporadic vessel inspections compound the difficulties. Furthermore, the data management staff is limited to basically two persons with varying levels of competency in the field of fisheries information management. They also perform other duties outside of their portfolios.

By way of possible solutions, the Fisheries Division intends to develop its first Fisheries Information and Data Management Plan to help document workflows and processes and prescribe best practices. Regular training sessions for data collectors are planned along with more frequent field visits and supervision. Data collection forms and books are being redesigned to improve and expedite the collection and data entry process. There are plans to computerize the registration process, move the database to an SQL platform which will allow for improved performance and scalability. The Fisheries Division also intends to continue training its staff in the area of fisheries information and data management. The powerpoint presentation is given in Appendix 3C(i).

St. Lucia

Presentation summary

The workshop received a presentation titled “Data Collection System of St. Lucia” and participants were referred to Working Document STATS WSHOP/FEB 2014/WORK DOC 3.1(b), (see Appendix 3C(ii)). The Department of Fisheries is generally satisfied with the current sampling plan in terms of the quality and regularity of the data collected. Since the implementation of the first data collection system, there have been considerable refinements and revisions in an effort to satisfy the information required for decision making and sound management advice.

The main aim of the data collection system is to monitor the status of the fish stocks that are being harvested; however, the data collected is limited to fish landings and performing simple analyses. Biological information on a limited number of single species fisheries have been collected through short term projects but this has not been on a consistent basis. Information is also collected on registration of fishermen and vessels, scuba diving establishments, sport fishing vessels, speargun fishers and license data on fishing vessels. The two main databases used to store and manage the data collected are Trip Interview Program (TIP) and Licensing and Registration System (LRS). Data and information integrity checks are performed on all data and information.

There is need to modify the existing sampling strategy and associated sampling plan to take into account changes in the fishery and to improve the accuracy of estimates derived from analysis of the data

collected. There is also need to collect species-specific biological data as well as biophysical and ecological data related to the species as applicable. Recommendations for improvement of the sampling plan are provided. The full potential of the data collection system has yet to be realized due to human resource and financial constraints. The full text of the working document is given in Appendix 3C(ii).

St. Vincent and the Grenadines

Presentation summary

A powerpoint presentation titled “Examining a Typical National Fisheries Information System” which provided information about the fisheries information system of St. Vincent and the Grenadines was received by the Workshop.

A proper fisheries data collection system is vital to the future development of the fisheries. To properly manage and sustain the fisheries for future generations, a reliable fisheries information system must be developed to make data available for informed fisheries management decisions.

In St. Vincent and the Grenadines (SVG), a data collection system and sampling program of twenty-one (21) sites was implemented to collect necessary data. A database was developed to store data and to generate reports which give information on the social and economic status of the fisheries, the types of fisheries and the types of boats engaged in the different fishing activities.

Over the years the data collection system and the sampling program have been reviewed and management measures adopted to ensure the collection of reliable data, proper database management and the use of reliable databases. A cycle was developed outlining the fisheries statistical process in order to evaluate the progress of the data management system in SVG.

Proposed solutions to current challenges include developing a Data Collection Procedures Manual and strengthening fisherfolk co-operatives through consultations, training and technical support thereby enhancing co-management. The powerpoint presentation is given in Appendix 3C(iii).

Discussion

1. Despite the differences in the magnitude of catches of different countries in the region and limitations as regards data quality, as well as resource limitations, there appear to be sufficient data which can be used to populate a regional database and which can be analyzed to provide information for management.
2. Issues regarding insufficient human capacity for future expansion of data collection programmes remained. Consequently there was need to rethink the existing sampling strategies and to redeploy existing resources in a more effective way. In the case of Suriname there was a move towards automation of certain tasks so that the limited staff could be deployed to more critical areas.
3. There is need to undertake on-the-ground data quality checks for the artisanal fishery in some cases.
4. There still remained a need to standardize data format across countries, particularly for shared resources.
5. The apparent lack of confidence in data quality resulted in hesitance to analyze existing data and apprehension to provide information on the fishery based on the data. However, collecting more data would not necessarily solve this situation. Existing data should be analyzed and the respective caveats stated upfront in the outputs of such analyses.

6. There is need to gain greater confidence in basic data analysis and a commitment to improving the current situation to improve on data quality.
7. Standard reports for management of the respective data collection, data entry and management systems should be produced.
8. Stakeholder feedback on the data collected is critical to achieving buy-in, motivation, etc.
9. The use of open-source scripts should be considered in database development and management.
10. There is need for improvement in the quality of information presented in the national reports.
11. Efficient use is not being made of the ASM to facilitate data analysis – there is reluctance to bring data to meetings to be able to address management questions.
12. There is need to develop the understanding of the fishery and associated resources so as to inform the sampling strategy.

3.4 Current and future data requirements

Presentation summary

The workshop received a powerpoint presentation titled “Current and Future Data Requirements”, which examined present and emerging fisheries information requirements. Determination of present and emerging fisheries information demands requires consideration of not only the required skills; but, these must be predicated on standards or methodologies previously accepted by States in the context of regional fisheries data and information management. As the demands for management advice expand to address the ecosystem-based approach and risk management, the main capacity needs, in the regional context, are: improvement in data management skills, specific statistical skills; conducting general fishery and specific stock assessment analyses; if CARIFIS is installed/updated, training in SQL; development appropriate fisheries management plans; and, information management. The landing of catches in foreign countries, due to more lucrative economic prospects, creates a challenge for data collection. A number of capacity needs exist in terms of meeting international requirements for data; however, these needs would be met by addressing the abovementioned regional needs. The most common data that FAO ask for annually from the Caribbean were indicated. The specific annual reports required for ICCAT contain specific, separate sections on fisheries, research, management and inspection activities and may optionally include appendices containing additional information pertinent to those sections. Information presented in Annual Reports is to be divided into: Information on Fisheries, Research and Statistics and Management implementation. The relevant forms are available on the ICCAT website. While some of the data required by ICCAT may address types of monitoring that we do not routinely do, they are beginning to feature more with ICCAT such as observer programme data and trade data. These developing areas are worthy of consideration at some point. The powerpoint presentation is given in Appendix 3D.

Discussion

1. There is a need for CFOs to have confidence in and to encourage their staff. At the level of the ASM, broadening the range of possible analyses while lowering the technical level of such analyses can help both to provide basic information for management as well as to boost confidence of participants.
2. There is need for CFOs to appreciate that stock assessment information is not the only information of importance to stakeholders.

3. The landing of catches in foreign countries, due to more lucrative economic prospects, create a challenge for data collection. In the case of Suriname the decision was taken to use CPUE, rather than total catch, as a proxy of biomass.
4. There is a challenge for Fisheries Departments to simultaneously execute both roles as data collector and regulator.
5. There is need to focus on strengthening fisheries information and communication at both the national and regional levels.
6. In the collection of additional data (besides catch, effort and biological data) consideration should be given to data and information that already exists and to partnering with other agencies.
7. Despite requirements for permits for the conduct of fisheries research (e.g. OECS protocol), there is little enforcement. Consequently, a considerable amount of research has been conducted by foreign entities, which remain either unknown to Fisheries Department and/or if known, the results remain inaccessible to the region and consequently is not considered in management decision-making.

3.5 Networking and using ICT to enhance collaboration in data collection, analysis and management

3.5.1 Some Experiences with Coastal Community Engagement & Communication

Presentation summary

A powerpoint presentation titled “Some Experiences with Coastal Community Engagement and Communication”, which looked at engaging local fishing communities and fisherfolk organizations in data and information collection and management was received by the workshop.

An impediment to attaining effective region wide fisheries management in the Wider Caribbean Region (WCR) is incomplete capture of artisanal catches taking place at numerous often remote sites and not always entering a clear commercial market. One way to improve data collection at these sites is by engaging local fishing communities and/or small fisherfolk organizations. Decentralized and more community-based approaches to coastal management have proved to be effective in other areas around the world. We present some lessons learned from UNU INWEHs experiences,—on engaging coastal community groups in the collection of coastal bio-physical data and on building a network for data collection, analysis and management. A key element in achieving community participation in fisheries data collection and management is the creation of a sense of ownership. This takes time. Current awareness of local fishing communities on fishery issues and their capacity in collecting fisheries information is overall low. In order to establish a willingness of these communities to participate and cooperate in reporting catches to fisheries officers a strong level of trust first needs to be built between these groups. This means engaging with local fisher groups over a sustained period of time at the grassroots level, through community consultations that are informal frank and open and are not dominated by the authorities. Preferably these consultations are led by a local community member or group that already has a good rapport with a particular coastal community. Furthermore, adequate feedback to the community needs to be ensured including how community concerns and recommendations are being addressed. Awareness and capacity must be built on the need for collection of catch and effort data, the value of management and the fact that fisheries staff are trying to help fishers improve their catch. Success will also depend on local settings such as community social structure, culture and location.

Finally it is important to recognize what type of information a community can realistically collect for management purposes. The powerpoint presentation is given in Appendix 3E(i).

Discussion

1. The issue of trust between local groups and representatives of the respective authorities is critical to effective consultation with stakeholders, including buy-in and support for the management measures proposed. In this regard the identification of “Champions” in the field was critical.
2. It was suggested that due to challenges in human resource availability, in particular the hire of fisheries data collectors, collection of data by fishers or local community groups should be considered as an option. In this regard it was noted that consideration will have to be given to data quality control.
3. Issues regarding training of fishers and development of trust so as to facilitate their contribution to fisheries data collection were discussed. Given the limited financial resources it was recommended that consideration be given to non-financial incentives to fishers to collect data; and, the creation of ownership.
4. The importance of providing regular feed back to the fishermen and communities involved
5. Most staff of Fisheries Departments do not possess the requisite training and skills in mediation, negotiation, etc. required to effectively facilitate stakeholder consultations or to effectively communicate information in general to stakeholders (the majority of technical staff are trained in biology).

3.5.2 Enhancing Data Collaboration, Analysis and Management

Presentation summary

The use of ICT tools in fisheries data collection and management was highlighted in a powerpoint presentation titled “Enhancing Data Collaboration, Analysis and Management”. With the growing demand for data and a system to support proper collection and sharing, information communication technologies (ICTs) can be viable tools for data collection in fisheries management. Its support of real time communication allows it to automate many operations providing faster collection of datasets and communication from field agents to governing organizations and other stakeholders. It offers data quality, security and can flexibly provide functions across dispersed geographic locations and countries that exhibit different preferences and user demands, while still harmonizing the data sets collected into a regional dataset. Furthermore ICTs can help evaluate results that can in the future support evidence based decisions, policy modification and effective resource management. The powerpoint presentation is given in Appendix 3E(ii).

Discussion

1. The use of online database systems can be approached on a phased basis. It was noted that apprehension concerning use of a new system by data entry personnel can be averted by having the front end developed in line with what such persons are already accustomed to using.
2. The use of online database systems is supported on the basis that the software is open-source and technical assistance is widely available. In addition, there are ample security measures in place and access to data in various forms can be controlled. Consequently a number of problems in management are easily solved.

3. The initial cost to set up the system is high due to the requirement for development of partnerships and on the ground support to first identify the information requirements and articulate the research and design aspects of the database.
4. If addressed regionally, the use of ICT tools to facilitate data entry (by data collectors) on site can be cost-cutting in terms of payment of staff (data entry at office), notwithstanding the initial investment in and maintenance of hardware. Concerns were expressed however, in respect of data quality control, notwithstanding that there can be built-in quality control checks to the system.
5. In the use of ICT tools for data entry there will be need to train data collectors but the system could be designed to provide on-the-spot training through online demonstration videos.
6. The Software Development Life Cycle was critical in ensuring system feasibility and maximizing utility. It was estimated that for a regional database the development was likely to be less than a year. It was recommended that a prototype be developed by the UWI, Department of Electrical and Computer Engineering for presentation to the Caribbean Fisheries Forum at its meeting in April 2014. As well, the possibility of developing a more formal relationship with the UWI, St Augustine for assistance with database issues should be explored.
7. The online solution to database systems had wide applicability – e.g. tourism and agriculture.
8. Concern was expressed as to how problems which arise can be addressed expeditiously. In this respect it would be necessary to designate a maintenance team which can make the necessary changes in real time communication. The Database Manager need not be located at the CRFM office physically but can be based elsewhere. In respect of the Data Manager role, a case was made for the hiring of the Programme Manager for Statistics and Information. In such a case the Programme Manager, responsible for the regional database, can also provide support at the national level.
9. It was clarified that with respect to the selection of a national database, the Forum advised that this decision was for the national fisheries authorities. If such authorities decide to proceed with the use of CARIFIS then the CRFM Secretariat is mandated to provide the necessary support.

4. DISCUSSION AND DEVELOPMENT OF DRAFT STRATEGY

4.1 Identification and national and regional capacity building options

1. Discussion on this topic ensued primarily in the working groups and is captured in the *Proposed intervention points and actions for Strategy for capacity building to strengthen fisheries data and information management in the CRFM* (see Appendix 4). A number of actions were identified that were, in the main, related to Strategic objective A: *Information on status and trends in the fisheries and aquaculture sector* of the provisional Strategic Plan for the CRFM. To varying extents, the proposed actions also relate to the other strategic objectives of the CRFM; in particular, as they are relevant to the reporting function.
2. It was noted that possible implications of less frequent meetings include a risk of continued progress in the scientific approaches and analyses conducted, a risk in continued funding commitments since the ASM is funded from the CRFM's core budget, likely nonchalant approach of technical staff to devote efforts to practicing what was taught and to preparation of data for analyses as well as impacts on the scientific credibility of the CRFM in the wider scientific

community. This, also mindful of the fact that the Performance Review of the CRFM had identified the ASM as one of the major strengths of the mechanism.

3. The meeting also considered the results of CRFM's most recent performance review, that identified institutional capacities of CRFM Member States to be a major weakness affecting the overall performance of the CRFM as an organization.
4. Issues regarding training of fishers and development of trust so as to facilitate their contribution to fisheries data collection were discussed, including issues related to buy-in and support for the management measures. Given the limited financial resources it was recommended that consideration be given to non-financial incentives to fishers to collect data.
5. It was thought that the use of online database systems can be approached on a phased basis. It was noted that apprehension concerning use of a new system by Data Entry personnel can be averted by having the front end developed in line with what such persons were already accustomed to using. The use of online database systems was supported on the basis that the software was open-source and technical assistance was widely available; in addition, there were ample security measures in place and access to data in various forms can be controlled. Consequently a number of problems in management were easily solved. It was considered important to evaluate utility and cost options of online technologies as "backend" for database, including centralized management and maintenance of database; this will also address issues of availability/ accessibility/ utility of existing data and also support mainstreaming.
6. In speaking to the issue of a revised database platform, participants recognised the need for performance and functional tests, including development of a prototype. It was thought that if addressed regionally, the use of ICT tools to facilitate data entry on site can be cost-cutting by reducing the need for data entry staff at office, notwithstanding the initial investment in and maintenance of hardware. There was a concern, however, in respect of data quality control, notwithstanding that there can be built-in quality control checks to the system.
7. It was thought important to pursue and access training opportunities, which would accommodate training of officers with experience that would be considered equivalent to required pre-requisite qualifications for higher level training. It was also the view that persons responsible for data analysis jobs should be supported to be able to access an agreed minimum level of training.
8. Participants discussed the need to facilitate earlier screening of data for analyses at scientific meeting. It was agreed that if the standard of data for scientific meeting improved, this should generally improve what was produced for other end-users; so this was used as basis for discussion on the assumption that what was done for this use would benefit others.
9. There was a recognised need to facilitate more inter-sessional activity by the working group on data and methods, especially with regard to screening. It was the view that consideration should be given to whether the group for screening data should be made up of different persons to those who are responsible for providing the data, i.e. participants at scientific meeting, given that self-auditing is not considered efficient. It was thought that this smaller group could include persons from academia and would be a core group working within the methods working group.
10. Participants noted the need to determine the frequency of assessment of a given species, in addition to giving consideration to the length of time over which assessments were being done on any given species. Consideration should be given to meeting the data requirements for meaningful update of assessments already conducted and the need to utilize limited resources

more effectively to be able to assess the range of commercially important species identified by CRFM Member states. This would also provide more time for collection of time series of data on the given species until the next time it was up for assessment; consideration should also be given to the consequential data needs.

11. The need to facilitate recognition of importance and, consequently, place more resources for data collection staff was emphasised. The view was that this will contribute to making data collection more attractive against the backdrop of the turnover of data collection staff.
12. There was also the stated need to improve communication in-country to ensure that decisions at the regional level get “translated” into action at the national level. For example, ensure that staff meetings include discussion of outputs/decisions/recommendations of regional and other non-national meetings; these need to be incorporated into the work programmes of department/divisions.

4.2 Preparation of national strategies and action plans for sustainable data collection, analysis and dissemination (key elements and needs)

Discussion on this item was understood to be something to be done at the national level, hence no specific discussions ensued other than what was carried out within the working group and are therefore implicit in the *Proposed intervention points and actions for Strategy for capacity building to strengthen fisheries data and information management in the CRFM* strategy.

4.3 Awareness raising to improve support for fisheries data collection and management (needs)

1. It was noted that deliberations of the four Working Groups to address issues of capacity strengthening for field sampling and data collection, database management and manipulation, data analysis and meaningful reporting and monitoring and evaluation of performance statistics and information would have already highlighted issues of relevance to these agenda items. The key points identified would be further developed and circulated for review in the *Proposed intervention points and actions for Strategy for capacity building to strengthen fisheries data and information management in the CRFM*.
2. It was recognized that there was some degree of overlap in the points identified by the four Working Groups and that these would be consolidated and placed in logical order in the *Proposed intervention points and actions for Strategy for capacity building to strengthen fisheries data and information management in the CRFM* Draft Strategy document.

The following are some suggested amendments to the outputs of the four Working Groups:

1. The responsible party (Member State, CRFM Secretariat, etc.) would be identified for each action listed.
2. *Strengthening Capacity in Field Sampling and Data Collection*
 - a. Include a last point regarding update of legislation to make the provision of data and information by resource users mandatory. Note that the proposed actions under this component were not listed in order of priority or logical progression.
3. *Strengthening Capacity in Database Management and Manipulation*

- a. with reference to development of partnerships to reduce costs for database management – it was noted that while the partnerships will reduce cost in the initial stages (to identify stakeholders, needs, data inputs, etc.) that there was need to build partnerships for further assistance and consequently consideration should also be given to maintenance costs.
 - b. the issue of a revised database platform could be further developed in respect of partnership arrangements for maintenance purposes. It was clarified that the testing referred to was in respect of functional testing of database management and performance in the new/revised database platform.
4. *Strengthening Capacity in Data Analysis and Meaningful Reporting*
 - a. Include a new point in respect of utilization of current technologies for distance learning as well as regional training centres for upgrading skills. In this regard there was need to build relationships with institutions that currently existed and can provide the relevant training.
 - b. It was suggested that the point about more holistic analyses to be performed during the scientific meetings and that related to increasing the competence and skills in statistical data analysis should be the focus for the 2014 CRFM Scientific Meeting.
5. *Strengthening Capacity in Monitoring and Evaluation of Performance of Statistics and Information*
 - a. The screening of data should be prioritized. It was suggested that independent assistance (e.g. from academic institutions) may be co-opted under the Working Group on Data, Methods and Training to screen country data. Some degree of knowledge on fishery operations would be a necessity for those assigned to this role.
 - b. Regarding the development of a mechanism for evaluating performance and use of data it was noted that a new point could consider the issue of dedicated staff time within the fisheries departments for the screening of data and in general, dedicated staff time to facilitate the execution of inter-sessional activities of the various CRFM Working Groups.
6. It was noted that awareness raising issues already raised in deliberations of the four Working Groups would be highlighted accordingly.
7. The meeting was reminded that all summaries of individual presentations were to be submitted by the end of the respective week. Both the report of the workshop and the draft strategy document were to be circulated by the end of February 2014 for review and comment.
8. Participants were advised that the draft strategy would need to be further refined after review of the workshop participants to give consideration to the prioritization of activities, the resources required and timelines. The draft strategy would be presented to the Forum in April 2014 for consideration and implementation through the CRFM's biennial work plan. As well, consideration would be given to the role of the UNU-FTP partnership arrangement in terms of capacity development for implementation of the strategy. In addition, the strategy document will be used to inform any refinements in future programmes with key institutional partners (e.g. UNU, UF, etc.).

APPENDIX 1: AGENDA and LIST OF PARTICIPANTS

A. Draft Agenda

1. Opening of Workshop and meeting arrangements.
2. Review and discussion of several relevant activities/ reports:
 - 2.1. The CRFM Context
 - 2.2. UNU-FTP capacity assessment exercise and report
 - 2.3. Performance of CRFM/UNU-FTP/UWI Statistics/Stock Assessment Course
 - 2.4. CARIFIS Survey Report and recommendations of CARIFIS Dgroup
 - 2.5. Activities and recommendations of the CRFM Ad Hoc Working Group on Methods and the current CRFM Working Group on Data, Methods and Training
 - 2.6. Performance of Six-Month training programmes offered by UNU-FTP
3. Performance of CRFM Annual Scientific Meetings (format and outputs) and associated Dgroups
4. Consideration of present and emerging fisheries information demands including:
 - 4.1. Use of "limited" data for economic analysis and fisheries management purposes
 - 4.2. Data management and realistic analysis of fisheries data for "stock assessment" purposes Examining a typical national fisheries information system – types of data collected, types of analyses and reports, data quality management, database used, database management Current and future data requirements Networking and using ICT to enhance collaboration in data, collection, analysis and management
5. Discussion and Development of Draft Strategy:
 - 5.1. National and regional capacity building options, taking into account the need for:
 - 5.1.1. Mainstreaming and routine support for maintaining quality of statistics and information activities
 - 5.1.2. Sharing of best practices
 - 5.1.3. Strengthening collaboration with resource users
 - 5.1.4. Possible new format for CRFM scientific meeting and activities of the DMTWG
 - 5.1.5. A regional statistics and information system/ provider
 - 5.1.6. Use of ICT tools
 - 5.2. Preparation of national strategies and action plans for sustainable data collection, analysis and dissemination (key elements and needs)
 - 5.3. Awareness raising to improve support for fisheries data collection and management (needs)
6. Adjournment.

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APPENDIX 2: WORKING DOCUMENTS AND PRESENTATIONS RELATING TO AGENDA ITEM 2

A. Key Relevant Context and Background

Legal Agreement Establishing the CRFM

CRFM is a regional fisheries body established in CARICOM Heads of Government by a formal Legal Agreement signed by 8 governments in February 2002 (CRFM, 2002). CARICOM member states and associate members of CARICOM are eligible for membership in the CRFM. At present, there are 17 member states of the CRFM, all of which are developing states, with some being poor states by international standards, and several being small island states. Any State or Territory of the Caribbean Region is able to apply for Associate membership of the CRFM, if it able and willing to comply with the obligations of the CRFM Agreement.

Objectives of the CRFM

The CRFM Legal Agreement lists the following three objectives:

1. The efficient management and sustainable development of marine and other aquatic resources within the jurisdictions of Member States.
2. The promotion and establishment of co-operative arrangements among interested States for the efficient management of shared, straddling or highly migratory marine and other aquatic resources;
3. The provision of technical advisory and consultative services to fisheries divisions of Member States in the development, management and conservation of their marine and other aquatic resources.

The CRFM Legal Agreement's Provisions Regarding Statistics and Information

The CRFM Agreement further notes certain general principles to be followed in pursuit of the above objectives, including maintaining biodiversity using the best scientific approaches to management, managing fishing capacity to ensure resource sustainability, encouraging use of precautionary approaches, educating and training our societies about responsible fisheries exploitation, facilitating appreciation of the contribution of fisheries to human well-being. All these principles stipulate access to and usage of data, information, and knowledge.

Among the Agreement's provisions for the role of the Ministerial Council, there is a provision that addresses the need for efficient management, conservation, and development of the region's fishery resources, and several others that identify the appreciation of human resource training, attainment of competence in research and management, and data and information exchange for nurturing cooperation among states in respect of shared issues. Provisions for the roles of the Forum and the Technical Unit (CRFM Secretariat) are intended to support the compliance of the provisions noted above.

Regarding the functions of the Technical Unit (CRFM Secretariat), there are 19 provisions. Ten functions require CRFM Secretariat staff to gather, have access to, and make use of data, information, and knowledge on fisheries matters. One function requires the Secretariat to provide support for enhancing the institutional capacity of Member States in 7 areas of the industry: (i) policy formulation; (ii) economics and planning; (iii) registration and licensing systems; (iv) information management; (v) resource monitoring, assessment and management; (vi) education and awareness building; (vii) harvest and post-harvest technologies.

CRFM Performance Regarding Statistics and Related Activities

First Strategic Plan – This Plan covered the period 2003-2011, had identified 9 priority programme areas of which two areas made direct reference to the need and intended use of statistics and information. These programme priorities were noted specifically as: (i) research and data analysis for policy formulation and decision making, and (ii) resource assessment and management. The first Strategic Plan also identified specific sub-programmes under these 2 priority programme areas, of which only 1 sub-programme focused directly on ‘improvement in data collection and management systems’, and 7 other sub-programmes would have depended on statistics and information inputs. To deliver the programme priorities of the First Strategic Plan, the Technical Unit established specific technical programmes: Fisheries management and development, research and resource assessment and statistics and information. Under the First Strategic Plan, CRFM established the annual scientific meetings, various technical Working Groups (Resource Groups, as well as an Ad Hoc Working Group on Methods that evolved into the current Working Group on Data, Methods and Training). Scientific meeting reports are presented annually to the Forum, but at present, are not regularly presented to the Ministerial Council. The Caribbean Fisheries Information System (CARIFIS) database software was also introduced for use at the national levels, informed by expert working group consultations aimed at elucidating CRFM Member States’ needs and expectations.

CRFM Performance Review - An independence performance review of the CRFM was completed with assistance from FAO and WECAFC in 2012 (CRFM 2013a), so as to inform the way forward and the development of CRFM’s Second Strategic Plan for the period 2013-2021.

The Performance review noted the according to the structure and activities of the three arms of the CRFM, its Secretariat has to be ‘*instrumental in accomplishing the bulk of the work, and consequently achieving the objectives set for the CRFM*’. The review further noted that the Secretariat is only arm that is ‘*operational on a daily basis, while the other two meet occasionally with large time intervals in between*’ (CRFM 2013a).

Regarding data collection, analysis and sharing of data, the Performance Review noted the efforts regarding CARIFIS and the scientific meetings, as well as the challenges faced at the national and regional levels within CRFM in making the best use of these tools/ activities. Of the recommendations noted, the following are noted her for informing the present strategy: the establishment of a regional database, timely reporting of data and information to the Secretariat, and investment of time and resources by countries for ensuring a sound technical information base and supporting the related CRFM efforts, i.e. CARIFIS and the annual scientific meetings.

Regarding research and resource assessment, the Performance Review noted several recommendations, all of which should be considered for informing the present strategy. In summary, these consider: the importance for the CRFM technical working groups to develop time-bound terms of reference with associated plans and budgets; the need for the management advice from the scientific meetings to be more specific in respect of each working group and to be informed by the national fisheries management plans; the desirability for working group conveners to be directly involved in presenting their outputs to the Forum; the need for the working groups to be directly in contact with donors and other RFB working groups within the region to facilitate joint efforts where mandates are overlapping.

The Performance Review also highlighted a concern that quantitative assessment of fishing capacity and fishing methods, and hence their impact on sustainable use had not yet featured prominently in CRFM activities, although this was a guiding principle of the CRFM Agreement. In respect of this, the relevant recommendations were: production by CRFM of a regular, updated regional stock and fishery status report; preparation of regional management plans; production by CRFM of a regular, updated report on

exploitation levels using ‘traffic-light approach’ indicators, and; inclusion of non-commercial species in the regional analyses to facilitate a more holistic approach for obvious reasons.

Regarding the monitoring and evaluation of management performance, the Performance review noted particular weaknesses, including no system of formal feedback from member States on use of management advice and no system for binding commitment. Recommendations were made to address these weaknesses include: production of more streamlined and easily understandable scientific advice; adoption of formal procedures to evaluate management performance relative to the advice generated; prioritization of advice for small-scale fisheries management because of the paucity of data; incorporation of social, economic, and environmental (including climate change) risk data and information for more effective and meaningful uptake on the ground.

Additionally, the Performance Review recognized the need for the CRFM to begin developing options to include additional required elements in the management process, including *inter alia*: the precautionary approach; the ecosystem approach to fisheries management; inclusion of marine biodiversity issues into the scientific advice; capacity to monitor fish quality and safety, market and trading activities; environmental risk management; an effective system to combat, reduce and eliminate Illegal, Unreported and Unregulated (IUU) Fishing, consistent with the CRFM’s own 2010 Castries Declaration on IUU Fishing and the related provisions of international agreements.

Regarding capacity building activities, CRFM has facilitated a range of capacity building activities. The Performance Review noted the importance of continuing such activities, as well as affording opportunities for inter-agency and inter-regional exchanges on best practices. The Performance Review also emphasized the importance of increasing CRFM’s efforts in education and training, making use of all available media and modalities, for the purpose of promoting appreciation for the value and necessity of responsible fisheries management.

Present Status and Directions, with Emphasis on Statistics and Information Aspects

Second Strategic Plan - Following the 2012 independent review of CRFM’s performance, a Second Strategic Plan was developed (CRFM 2013b). The Plan has since has been adopted provisionally by the Ministerial Council, pending formal adoption by the CARICOM Heads of Government of the CARICOM Community Common Fisheries Policy (CCCFP), the implementation to which it is closely linked. Many of the priorities identified in the First Strategic Plan require ongoing attention by the CRFM, and have therefore been included in the Second Strategic Plan with new formulations to reflect the present day situations. The Second Plan specifically takes into account the obligations of CRFM in respect of:

- The CRFM Agreement;
- The CCCFP;
- The Castries Declaration on IUU fishing;
- Formal cooperation arrangements to established with other RFBs in the region (joint working groups with WECAFC and the CRFM-OSPESCA Joint Action Plan);
- Regional cooperation projects, e.g. CLME+ project;
- International Agreements such as those of FAO, ICCAT and CITES.

In addition to the three objectives provided in the CRFM Agreement, the Second Strategic Plan incorporates the following two additional objectives that are agreed under the CCCFP:

1. The prevention, deterrent and elimination of illegal, unreported and unregulated (IUU) fishing, including by promoting the establishment and maintenance of effective monitoring, control, and surveillance systems;

2. The integration of environmental, coastal and marine management considerations into fisheries policy so as to safeguard fisheries and associated ecosystems from anthropogenic threats and to mitigate the impacts of climate change and natural disasters

Similarly, in addition to the guiding principles provided in the CRFM Agreement, the Second Strategic Plan includes the 6 fundamental principles identified under the CCCFP that serve to strengthen governance aspects.

Taking into account recent developments and commitments that have broadened CRFM's objectives, the Second Strategic Plan identifies the following three Strategic Goals:

- 1) Sustainable management and utilization of fisheries and aquaculture resources in the Caribbean region for the benefit of future generations.
- 2) Improve the welfare and sustainable livelihoods of fishing and aquaculture communities in the Caribbean region, by providing income and employment opportunities in fisheries and aquaculture sectors.
- 3) Ensure the Caribbean population has at all time sufficient safe and nutritious fish that meets the dietary requirements and is needed for an active and healthy life.

To address the strategic goals, 7 strategic objectives and 2 functional objectives are identified and elaborated in the Second Plan.

The Strategic objectives are:

1. Information on status and trends in the fisheries and aquaculture sector;
2. Research & Development;
3. Sustainable management of fisheries resources;
4. Sustainable use of fisheries resources;
5. Sustainable development of aquaculture;
6. Adaptation to climate change and disaster risk management in fisheries;
7. Capacity building and institutional strengthening;

The Functional objectives, included to define the required enabling environment that also takes into account efficiency in time and costs, are listed as:

1. Effective collaboration with member states and stakeholders;
2. Efficient and Effective administration.

Arguably all strategic objectives require a good supporting statistical and information base to inform work planning and decision-making. Monitoring and evaluation of the Second Strategic Plan will also involve the collection and analysis of data.

References

- CRFM, 2013a. Report of the CRFM Independent Performance Review. CRFM Management Report. CRFM: Belize City. 79pp.
- CRFM, 2013b. 2nd Draft CRFM Strategic Plan (2013 – 2021). CRFM Administrative Report. CRFM: Belize City. 39pp.

B. Training Needs Assessment in Fisheries Divisions of the CRM Member States

Slide 1

Training Needs Assessment In Fisheries Divisions of the CRFM member states

Workshop to Develop Draft Strategy to Strengthen Capacity
in CRFM States
In the Area of Fisheries Statistics and Information
10 -12 February 2014, CRFM Secretariat

Slide 2

Caribbean Community Common Fisheries Policy (CCCFP)

- Common fish stocks (straddling and migratory fish stocks, crustaceans and mollusks)
- Common interests
- Sustainable use of resources
- Collection of information
- Sharing information
- Qualified people at all levels

Training Needs Assessment

- Internet survey of regional Universities
- Unstructured interviews and discussion with senior staff of FD and CRFM
- Regional reports and former TNA study (1992)
- Questionnaire: on-line survey
 - 17 FDs and CFOs
 - 12 responses
 - Full-time permanent staff

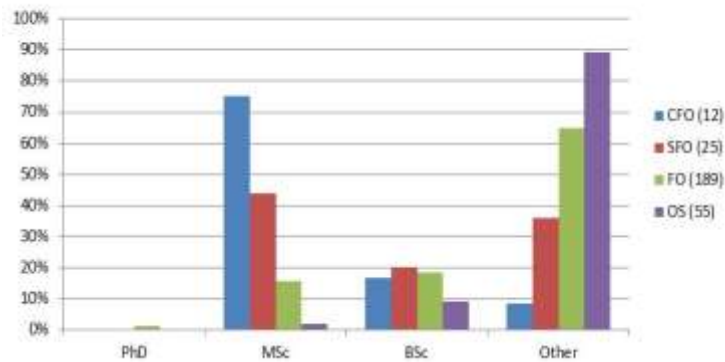
Anguilla*	St. Vincent and the Grenadines*
Barbados*	Trinidad and Tobago*
Belize*	Turks and Caicos*
Dominica*	Jamaica
Grenada*	Surinam
Guyana*	Bahamas
Montserrat*	Haiti
St. Kitts and Nevis*	Antigua and Barbuda
St. Lucia*	

Results

- Regional universities have limited focus on fisheries – mainly on general biology and marine ecology
- Financial obstacles for people seeking university education (unless accessing local university)
- FDs rely on „on-the-job“ training through
 - local training workshops
 - regional training courses (short)
 - medium term training (CRFM agreements)

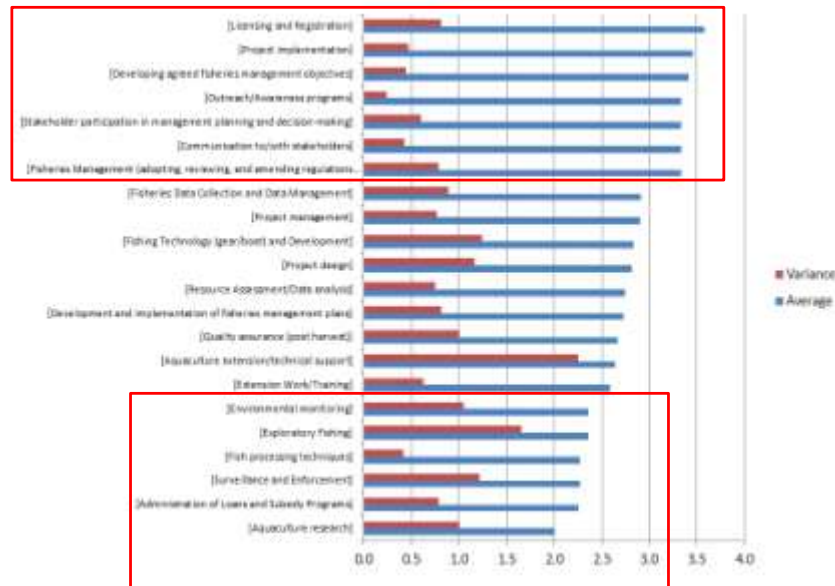
Results (cont)

Staff education:

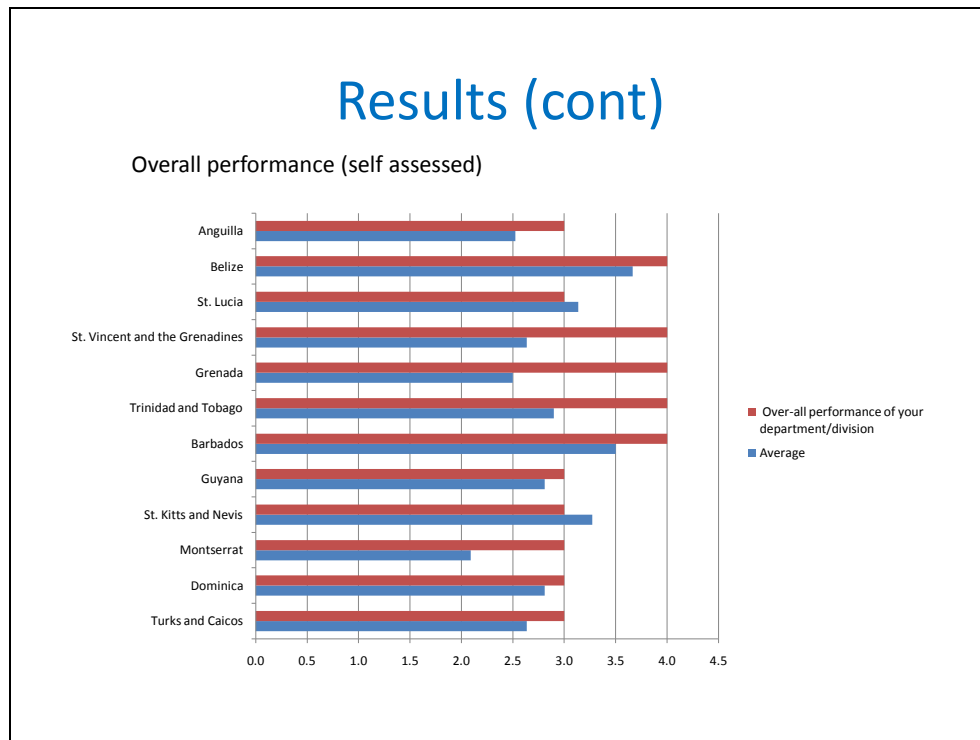


Results (cont)

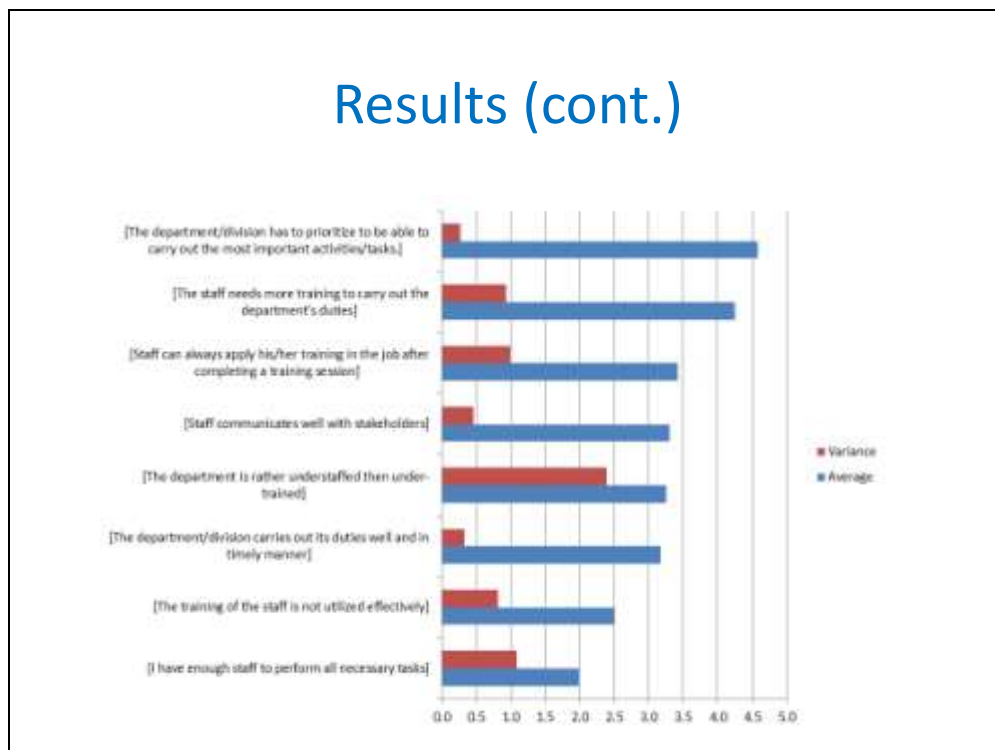
Competency:



Slide 7



Slide 8

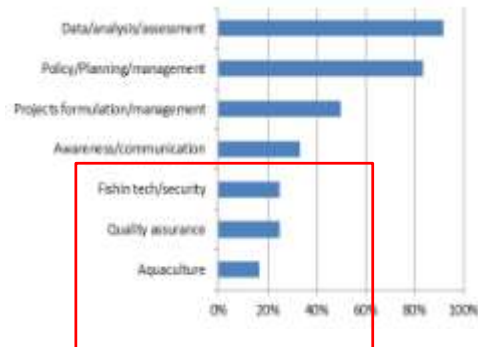


Results (cont)

Received training:

- Fisheries Management – planning
- Policy formulation
- Assessment
- Various short courses/workshop in connection with on-going projects

Self assessed training needs:



CRFM Strategic Plan

- Focus areas
 - **Information** on **status** and trends in the fisheries and aquaculture sector
 - Research & Development
 - Sustainable management of fisheries resources
 - Sustainable **use of fisheries resources**
 - Sustainable development of **aquaculture**
 - Adaptation to climate change and disaster risk management in fisheries
 - **Capacity building** and institutional strengthening

Conclusions

- Several training options, but the training is unorganized (except for project related training)
- Limited long-term training in fisheries
- <20% of FO and >60% of SFO with a university training. Need to upgrade basic education
- High competency of FDs in „fisheries management“, “project implementation”, and “awareness and stakeholders work”

Conclusions

- Low competency in „fish processing and quality assurance issues“ “fishing technology” and “aquaculture”

Recommendations

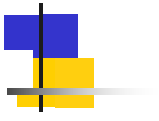
- Training in Data Analysis and Management
 - Identified by CFOs
 - Strategic area of CRFM
 - Important for decision making in fisheries management
 - Required/demands by international community
- Training in Quality Assurance and Fish Handling
 - Food safety (SPS) and Food security
 - Value adding (more value)
 - May reduce pressure on marine resources
 - CRFM strategic area
 - For export (touristic)
 - Reduces import of fish to the region

Recommendations

- Analyse aquaculture potential (*training*)
 - Increase in production
 - Suitable species (local)
 - Processing
 - Feed production (*training*)
 - Growth experiments (selective breeding) (*training*)
 - Broodstock management (*training*)
 - Suitable sites – regional production
 - Business aspects – aquaculture management (*training*)
- Research funds
 - For regional studies (focus on fisheries - innovation)
 - Supports universities
- Scholarships (fund)
 - Promote education in fisheries
 - Regional needs
 - Helps poorer/underfunded FDs
- Capacity building strategy
 - Regionally
 - Nationally

C. Performance of CRFM/UNU-FTP/UWI Statistics /Stock Assessment Course


Slide 1



(A biased) recollection on the statistics/stock assessment course

Einar Hjörleifsson
9.2.2014

Slide 2



The initial concept

- A course on fisheries science and stock assessment
- Phase 1: Cover all the basis
- Phase 2: Intersessional assignment followed by second meeting
 - Refreshment/refinement on topics covered in the 1st phase
 - Workshop:
 - Completion of intersessional work
 - Presentations and discussions
- Emphasis initially made:
 - Finding/getting appropriate educational regional institute involved.
 - Using regional data as examples/case studies.



The 1st phase

- 1st phase:
 - General overview:
 - Fisheries of the world, patterns of exploitation, ...
 - Fisheries ecology
 - Community structure, processes, life history traits – and effect of fishing, ...
 - Basic biostatistics
 - Summary statistics (central measure and variance), , exploratory analysis, sampling theory, the principal concept of models.
 - Quantitative fisheries biology
 - Age, growth, mortality, production models, statistical catch at age, ..

Last two bullet points included practical training exercises.

Material and time table, see: <http://fishvice.hafro.is/doku.php/crfm:start>



The 2nd phase

- The meeting was conducted as a workshop.
- A portion of the participants that attended the 1st phase attended the 2nd phase.
 - There were also some newcomers
- A portion of 1st phase participants invested in some intersessional work
- Issues:
 - Accessibility to clean, properly formatted, long historical data seem to be a hurdle.
 - Skills in independent efficient quantitative investigation and summarization of data.
 - Technical expertise mostly limited to one software (Excel)



Have we completed our journey?

Is the only thing left to do now not practice, practice,
practice, practice?

D. CARIFIS Survey Report and Recommendations of CARIFIS DGroup

1. At the time of the survey (2011)
7 of the 17 CRFM Member States operated CARIFIS
and the CARIFIS system was not operating efficiently on VISTA and Windows 7.
2. The results showed that there was great dependence on Microsoft Excel (MS Excel) for storing fisheries data in the of CRFM Member States, as 12 of 16 and 13 of 17 reported using MS Excel for storing vessel registration data and/or fisher registration data and/or catch and effort data.
3. Whether or not CARIFIS should be upgraded was discussed at the Forum.
The Forum reaffirmed that the Foxpro database of CARIFIS is obsolete; and accepted the recommendation of the IT specialists that the best way forward was to move towards the development of a modern programme in a more suitable implementation of SQL.

The Forum recommended activities included:

- g. Develop and implement a clear path for providing assistance to the Member States for retrieval / recovery of the data now residing in the CARIFIS databases.
- h. Determine the ongoing and planned initiatives in the region addressing data and information acquisition and management
- i. Undertake an assessment to determine the data and information needs at both the regional and national levels.
- j. Seek technical assistance and expert advice on suitable systems (databases to accommodate the identified needs at both the national and regional levels).
- k. Develop proposals in coordination with Member States to mobilize funds...
- l. Assist Member States to develop modern programmes / databases in a more suitable implementation of SQL.

See resource document#.....for discussions held on the CARIFIS DGroup as a first attempt to address the Forum recommendations.

Other Findings from the survey (computerization of fisheries data)

4. 15 of the 16 responding Member States store information from the fisher and vessel registries and fish catch and effort data of their respective countries, in a computerised form. One Member State did not have a fisher and vessel registry (Montserrat) and one Member States did not have fish catch and effort data stored electronically (Anguilla). Anguilla has since started to input some of their catch and effort data.
5. 9 of the 16 Member States stored data on export of fish
6. 7 of 16 Member States stored fish import data and fish biological data in a computer system (mostly Excel spreadsheets).

7. Socio-economic and environmental data are stored least frequently.
Discussions held on the CARIFIS DGroup as a first attempt to address the Forum recommendations.

on July 3, 2013
Morning June

All is well. In cayman collecting data. Was at an overseas territories lion fish strategy meeting. I am looking to see if I could get them to pay for the data base for us that is the UK government. As a joint OT,s project. I have asked manish for a Skype call latter to discuss. The othe islands are interested as they don't have proper data base.

Thank you for the support.

Regards
Alwyn

May 22, 2013
Dear June

Please be reminded that not all countries are using carifis. Why should we attempt to do this when first of all he said it did not work and secondly there is word on work of carifis?

Pat

on May 22, 2013

I have personally seen this software that Adriel created and I like it very much. It is well detailed etc.. I would have used it.

Shellene Reynolds-Berry
Jamaica, West Indies
Cell: (876) 420-8293
Facebook: Shellene Reynolds
Skype: shellyberry1/brighteyes99

on May 21, 2013

Note that using Access to get at CARIFIS through the ODBC will not work where there is no Foxpro ODBC driver - which is all later versions of Windows software (certainly the 64bit versions). Because Foxpro is now obsolete, I don't think that there will be one, but maybe someone knows of a work-around. If anybody has any suggestions, I would be grateful to hear about it.

Paul G

on May 21, 2013

The Following Message is from Dr. Paul Medley.

Just a few comments...

I strongly suspect MS Access would not be able to handle the complex data structure CARIFIS has, and would not be likely to be a good platform for a full CARIFIS database. However, I have used it successfully for national data where it can be streamlined for a particular data set.

MS Access is a lot simpler than many database front ends, and can be easy to use. I have to admit I hate the forms

for data entry which seem very clunky. However, the query system and the ability to write macros make getting at the data once its in pretty easy. Queries still have to be simple though, since the db engine appears very unsophisticated.

Nevertheless, I think now there is a big advantage in trying to use software such as Excel/Access which staff in fisheries departments might be familiar with. Otherwise fisheries departments will be entirely dependent on external IT support, which has proved to be a stumbling block for most countries.

On the otherhand, countries want quite sophisticated data queries, so MySQL may be necessary. Difficult problem to solve. Good luck!

Paul Medley

on May 21, 2013

Thank you, June - I agree with most of Paul's comments - on top of the sophisticated queries come the requirements I noted in both Jamaica and Bahamas for intranet and internet (web interface) access to the fisheries database, including sharing of certain tables with third parties - this in my opinion completes the case in favour of MySQL - best regards, Paul G.

E. Activities and Recommendations of the CRFM Ad Hoc Working Group on Methods and the Current CRFM Working Group on Data, Methods and Training

Recommendations in respect of data quality and management submitted by the First Scientific Meeting and subsequently, by the CRFM Ad Hoc Methods Working Group & CRFM Data, Training and Methods Working Group

Source document	Recommendations: Data Quality	Recommendations: methods of data analysis	Recommendations: quality of Stock Assessments	Recommendations: General
Report of the First CRFM Scientific Meeting, 22-30 June 2004, St. Vincent and the Grenadines. <i>CRFM Fishery Report</i> No. 11.				(i) Shared access of data was an issue - no regional database. Regional database was recommended
Report of the Second CRFM Scientific Meeting, 13-22 March 2006, Trinidad & Tobago. – First Meeting of the Ad Hoc Working Group on Methods. <i>CRFM Fishery Report</i> – 2006, Volume 1, Suppl. 2		(i) Establish socio-economic reference points when conducting assessments. Scoring methods, such as RAPFISH could be useful in this regard. (ii) Recruit someone specializing in socio-economic analyses to advise the WG. (iii) Regarding training requirements to assist with analysis, immediate training in the use of Pivot Tables and EXCEL and Solver		(i) Develop an inventory of Caribbean fisheries databases and research. Inventory should include all the types and sources of data on fisheries in the region. (ii) To address the issue of discontinuity with data collection, develop a framework for harmonized sampling programmes in the region. The framework should establish the minimum biological sampling required to be able to characterize the catch

		and in the methods used for standardizing CPUE was considered most beneficial to countries.		<p>composition of the main commercial fisheries.</p> <p>(iii) Develop a framework for establishment of a centralised repository for regional fisheries data and information.</p> <p>(iv) Develop regional database of life history parameters following the format used by FishBase.</p>
<p>Report of Third Annual Scientific Meeting, 17-26 July 2007, St. Vincent & the Grenadines. – Second Meeting of the Ad Hoc Working Group on Methods. CRFM Fishery Report – 2007, Volume 1, Suppl. 2</p>	<p>(i) All countries should be requested to list what historical data are available. Staff of T&T Fisheries Division are to draft a template for collection of the information on historical data. The template should be reviewed and finalised during the next Scientific Meeting</p> <p>(ii) Countries should contribute</p>	<p>(i) The Secretariat should investigate effective ways of facilitating training of fisheries officers in data analysis.</p>		

	data to FISHBASE and CEPHBASE and other similar databases. The Secretariat should collaborate with FISHBASE staff to explore the possibility of providing IHSBASE search results at a regional level.			
Report of Fourth Annual Scientific Meeting, 10-20 June 2008 – Report of the Third Meeting of the Ad Hoc Working Group on Methods, Grenada, 27-30 November 2007. <i>CRFM Fishery Report – 2008, Volume 1, Suppl. 2.</i>				(i) The establishment of a Permanent WG on Data and Methods. (ii) Re-establishment of the regional fish age and growth laboratory at IMA.
Report of Fifth Annual Scientific Meeting, 09-18 June 2009. <i>CRFM Fishery Report – 2009.</i> (Section 6. Meeting of Working Group on Data, Methods and Training (DMTWG))	(i) Collection of fish hard parts for age and growth analysis. Internet options for training fisheries staff in sampling of fish hard parts would be explored by staff of the regional fish age and growth laboratory at the IMA.	(i) The use of ECOPATH as a tool for addressing ecosystem management issues should be explored during future meetings of the Resource Working Groups, whose members would need to pursue some initial training. (ii) Noting the open and Free online access to		

	<p>(ii) Training in data management, including management and maintenance of field sampling programmes, as well as of computerized databases;</p> <p>(iii) Training in data manipulation.</p>	<p>the statistical software <i>R</i>, as well as <i>R</i>'s growing capabilities including its interface with <i>Excel</i>, it was recommended that fisheries staff participating in the annual scientific meetings be trained in the use of <i>R</i>.</p>		
<p>Report of Sixth Annual Scientific Meeting, 07-16 June 2010. <i>CRFM Fishery Report – 2010</i>. (Appendix 6: Report of the First Meeting of Working Group on Data, Methods and Training (DMTWG))</p>		<p>(i) The Working Group recommended that the following options for continuing R-training be explored by the Secretariat to the extent possible: (i) use of online conferencing, (ii) a training session at the start of the 2011 scientific meeting, or (iii) a separate training session conducted inter-sessionally.</p> <p>(ii) The basic course in R should not be repeated exactly in 2011, but</p>		

		additional/ advanced training in R should be pursued during the next scheduled training session.		
Report of Seventh Annual Scientific Meeting, 16-24 June 2011, St. Vincent & the Grenadines <i>CRFM Fishery Report – 2011.</i> (Appendix 7. Report of the Data, Methods and Training Working Group (DMTWG))		<p>(i) It was proposed that a one-week training session be held in “R” with the target audience being data management personnel. It is recommended that the CRFM Secretariat seek additional funding to facilitate this training programme which would be conducted outside of the Scientific Meetings.</p> <p>(ii) For the 8th Scientific Meeting, it is recommended that the day and a half training session be reinstated to address training in the use of MS Excel with emphasis on tools specific to data analysis.</p> <p>(iii) Each country should conduct a training needs assessment and submit to CRFM prior to the</p>		

		next Scientific Meeting.		
Report of Eighth Annual Scientific Meeting, 20-30 June 2012. <i>CRFM Fishery Report – 2012.</i> (Appendix 8. Report of the Data, Methods and Training Working Group (DMTWG))	(i) The Suriname representative indicated that though he had previous knowledge of data cleaning techniques, at the recently concluded UNU-FTP/ Gov Iceland / CRFM stock assessment workshop he was introduced to more advanced techniques, and would therefore like to request that the group be provided with training in data cleaning techniques.		(i) The group also agreed that the two week stock assessment course that was provided through the UNU-FTP/ Gov Iceland / CRFM partnership should be repeated.	(i) The representative from Dominica suggested training in technical writing which would include interpreting data. (ii) The Montserrat representative suggested that, if it was agreed that CRFM would move forward with the upgrading of CARIFIS; then Member States would need training in CARIFIS use.
Report of Ninth Annual Scientific Meeting, 10-14 June 2013. <i>CRFM Fishery Report – 2013.</i> (Section 5.6. Data, Methods and Training Working Group (DMTWG))		(i) The Meeting agreed that there was need for training in Visual Basic.		

F. Performance of Six-Month Training Programme Offered by UNU-FTP

Slide 1

UNU-FTP and the Caribbean

Workshop to Develop Draft Strategy to Strengthen Capacity in CRFM
States
In the Area of Fisheries Statistics and Information
10 -12 February 2014, CRFM Secretariat

Thor Asgeirsson
UNU-FTP deputy director

Slide 2

UNU-FTP

- Institutional Capacity Building Activities
- 6 months training programme in Iceland (fellowship)
 - Quality Management of Fish Handling and Processing
 - Stock Assessment
 - Fisheries Policy and Planning
 - Sustainable Aquaculture
 - Fishing Technology
 - Management of Fishing Companies and Marketing
 - APPLIED RESEARCH PROJECTS
- Short course development in partner country
- Workshops and conferences
- Scholarships (post-graduate) for MSc and PhD studies in Iceland for former fellows

Slide 3

Fellowships to Caribbeans (including Cuba)

Caribbean fellows (including Cuba) - 29 (Cuba 15)



Slide 4

Short courses/workshops in the Caribbean

Number of participants in UNU-FTP/CRFM short courses (n=102 70:32)



Way forward

- Long-term commitment (4-5 years)
- 3 fellowships per year (only one in 2013)
- Improved selection of fellows (part of national long term strategy)
 - Based on needs
 - Part of fisheries development (national)
 - Motivation (skype interviews)
 - Applied project (bring data/information)
- Short course
 - Need based
 - 2-3 people from each country (limited number of countries)
 - Local partners (universities – training institutes)
- Scholarships?
 - Commitment!!
- Follow-up
 - Consultancy
 - Sabbatical

G. Performance of CRFM Annual Scientific Meetings (Format and Outputs) and Associated DGroups

The CRFM Annual Scientific Meeting (ASM) serves as a forum for the meetings of five resource working groups for major commercial species (conch and lobster; shrimp and groundfish; reef and slope fish; large pelagic fish, and small coastal pelagic fish) as well as the Data, Methods and Training Working Group (DMTWG). Since its establishment in 2012, the CRFM/WECAFC Working Group on Flyingfish in the Eastern Caribbean has also held joint meetings with the Working Group for small coastal pelagic fish. The ASM has been convened nine times since 2004 and, guided by the Terms of Reference of the respective Working Groups, has served as the forum for *inter alia*, the sharing of data, discussions on improvements in data collection and assessment methods, the conduct of preliminary analyses of fisheries data as well as stock assessments, review of scientific documents and provision of technical advice as regards management, statistics and research. Through the DMTWG participants have also received training in use of various assessment methodologies, statistical and stock-assessment related software. The reports of the respective Working Groups are subject to peer review at the plenary session of each ASM. There is also opportunity for collaboration with international consultants (contracted for the meeting) as well as regional technical officers towards improving the quality of data and information used for fisheries management decision-making. Such networking extends also to regional and international agencies such as the UWI (CERMES), NMFS-SEFC, IFREMER, Universidad de Oriente (Venezuela), Virginia Institute of Marine Science, Institute of Marine Affairs, among others.

Reference is made to the *Report of the CRFM Independent Review (Reference Document 1)* in respect of the performance of the CRFM ASMs in general. In examining the performance of the ASMs the following suggestions are put forward for discussion in addressing some of the constraints or limitations identified:

FORMAT:

Roles of Chief Fisheries Officers and the Forum - Chief Fisheries Officers and the Forum as a technical body should take a more active role in the selection of species/fisheries/resources to be assessed and the frequency of such assessments at the national and regional levels respectively – ensuring that the selection of species etc. is guided by policy, management priorities and objectives as well as data and information of acceptable quality that have been subject to preliminary analyses. As well, Chief Fisheries Officers should ensure that country representatives at the ASM possess the requisite skills and experience to meaningfully contribute to the discussions and analyses so that there is advancement in the approaches used and improvements in the quality of assessment results and associated management advice. Chief Fisheries Officers,, having endorsed the report of the ASM as members of the Forum, also have a critical role in ensuring that the resources are provided to address the research, statistical and management recommendations arising from the ASM in their respective countries. Currently Chief Fisheries Officers and the Forum as a collective technical body do not appear to be devoting sufficient attention to the above matters.

Criteria for selection of species/fisheries/resources for assessment in a given year – Consideration should be given to the submission of detailed work plans (with implementation schedule) by the respective Working Groups and achievement of specific milestones (such as collation of data from respective countries, cleaning of data, conduct of preliminary analyses such as trends in landings, fishing effort, CPUE, etc) within the given time in the selection and prioritisation of species etc. to be assessed in any given year. Such an approach will facilitate more efficient use of the expertise of Consultants contracted for Scientific Meetings as well as the resources allocated for the Work Programme of the CRFM.

Chairmanship of Working Groups: The mechanism for selection of Working Group Chairs and the requisite skill and experience are to be addressed. The Chair's role should be formalized by a Terms of Reference. Along with the traditional role, the Chair should also be responsible for ensuring that copies of the data, model and other resource materials used by the respective Working Group are lodged with the CRFM Secretariat and reporting on the progress of the inter-sessional activities of the Working Group. This approach would facilitate continuity and advancement of the analyses of the Working Group, particularly when there are changes in country composition and/or country representatives in the Working Group from year to year. Since the Chair is responsible for coordination of inter-sessional activities among countries then the Chair by necessity must be identified at least one year in advance. For this reason consideration should also be given to designating a specific term of office for the Chair. As well, consideration should be given to having the Chair selected from among those countries for which the particular resource is of high commercial importance, due to the country's vested interest in the resource and greater inclination to designate a member of staff full-time to this issue.

Technical skills and experience of participants: Advancement of assessment approaches and the quality of outputs of the Working Groups have at times been hindered by the level of technical skill and experience of participants. Notwithstanding the DMTWG's responsibility to deliver training, some prior basic training in data analysis is expected for meaningful contribution to data analyses at the ASM. Consequently the training offered at the ASM should be at intermediate and advanced levels, with focus on the particular assessment methods to be utilized at the meeting. Consideration could be given to the role of the DMTWG in delivery of basic training outside of the fora of the ASM and availability of resources for this purpose. Training alone however, is no guarantee of skill and expertise. Mindful of the severe staffing limitations and range of activities under the portfolio of national fisheries authorities it is unrealistic to expect that several members of staff can attain expertise in research and statistics. Such expertise comes with both training and practice. For this reason consideration should be given to designating at least one member of staff at the respective Fisheries Department as focal point for the ASM. Such member of staff should be committed entirely to research and statistics, for coordinating national activities aligned to inter-sessional activities of the respective Working Groups, including preliminary data analyses, and training in basic data analysis to other members of staff. Such a designated (senior) member of staff could serve as a working group chair and/or a member of the proposed Scientific Committee. In time junior staff, having received basic training, with demonstrated aptitude can be considered for participation at the ASM, as part of the national fisheries authorities' succession-planning in the area of research and resource assessment.

Uptake and utilisation of training received by ASM participants: There is need to ascertain the reasons for the poor uptake and practical use of training (outside of the ASM setting) received by participants, during the DMTWG and in working with Consultants hired to assist with the conduct of assessments. The consequence of this situation is that participants lack the confidence, skill and experience to conduct or lead fisheries/stock/resource assessments. This results in ineffective use of the time and expertise of consultants during the meeting. It is likely that due to limited staffing technical officers are required to address a wide portfolio within the fisheries departments and consequently they are without the time to practise what was taught. However, issues of interest and competence may also come to bear. (See suggestions in respect of Chairmanship of Working Groups and Effective use of Regional Expertise).

Effective use of Regional Expertise: To date, there is still heavily reliance on the services of international consultants at the ASM. Certainly, given the various training opportunities (at Undergraduate and Graduate Levels) received by members of staff of the national fisheries authorities, by now, there should be a pool of competent regional expertise upon which the CRFM can rely. Persons receiving training should be obligated to share such training and experiences, both nationally and regionally, and to assume lead roles at the ASM (perhaps in the capacity of Chair). The DMTWG presents such a forum for delivery of training at the regional level.

Data Collection, Management and Analysis: While these matters are to be addressed in detail under Agenda Items 3 and 4 the following should be noted. The ASM is called upon to consider non-traditional approaches to assessment that integrate ecological, socio-economic and environmental data into its analyses. Yet, there still remain deficiencies in sampling programmes for catch and effort data, in data quality control checks and management and analysis of such data for the application of traditional assessment approaches (Addressed under Agenda Item 2.5: Activities and recommendations of the CRFM Ad Hoc Working Group on Methods and the current CRFM Working Group on Data, Methods and Training). Biological sampling programmes have come to a halt in several countries. Efforts to improve fisheries data collection, management and analysis must therefore by necessity examine past efforts in this regard and address the challenges faced.

Perhaps the most common challenge is the limited human and financial resources allocated to national fisheries authorities, a situation which may not improve in future. While the national fisheries authorities have the mandate for fisheries management and therefore the collection of fisheries catch and effort and biological data fall within their purview, the collection of social, economic and environmental data may rest with other national agencies. Albeit, national fisheries authorities, through their licensing and registration systems, may already collect demographic and socio-economic information on fishers which, if well managed, can also serve as a valuable source of information. It is however recommended that consideration be given to strengthening existing or building new institutional linkages so as to rationalise the collection of the required range of data on the fisheries sub-sector from a national perspective. Here capacity-building issues extend beyond the national fisheries authorities.

Regarding catch and effort data collection programmes there is need to review and modify sampling strategies so that the data collected are representative of fishing activities (all fleets, gear, fishing areas, IUU, etc.). Consideration should also be given to reconstructing historical time series of catch and effort data due to their utility in validating assessment models and consequently improving the quality of assessment outputs and management recommendations. Rationalisation of biological data collection programmes is necessary from a regional standpoint because of the sheer magnitude of resources required in obtaining the required samples. In both cases (catch and effort and biological data) minimum data requirements should be identified and a standard format developed for submission of data to the ASM. [See *CRFM Data Policy Outline in Appendix 8, page 161 of Report of Third Annual CRFM Scientific Meeting – SVG – 17-26 July 2007 – Volume 1*]. There is need for capacity building in data collection as well as analysis of raw data to estimate total catch and effort and biological parameters required as inputs to assessments. In respect of age and growth studies it should be noted that a Memorandum of Agreement exists between the Secretariat and the Institute of Marine Affairs for this purpose. Re-activation of age and growth studies should be directed by recommendations of the various Working Groups with an integrated regional biological data collection programme.

Data and Information Sharing: Sharing of data and information continues to be a problem at different levels, from sharing among participants of the same country to sharing among countries within the same Working Group and sharing in general with the CRFM Secretariat. International Consultants, due to their critical role in the assessments, have access to country data and information, to which the Secretariat is not privileged (indeed there is currently no obligation to do so). This situation continues to hinder regional progress. While there is currently no regional database, there is nevertheless a need to store the cleaned datasets and models used so that they can be easily accessed for future reference. The CRFM ToolBox was developed for this purpose but has, to date, not been well utilized. The continued reluctance to share data, points to a need to fully develop and implement the CRFM's Data and Information Policy: an activity which, unfortunately, has been deferred until endorsement of the Caribbean Community Common Fisheries Policy. [See *CRFM Data Policy Outline in Appendix 8, page 161 of Report of Third Annual CRFM Scientific Meeting – SVG – 17-26 July 2007 – Volume 1*].

CRFM Scientific Committee - While the Resource Working Groups of the CRFM are formalized within the Mechanism, established by the Caribbean Fisheries Forum to coordinate research and assessment of the five major resource categories, consideration should be given to whether or not a formal body should be established to: oversee the activities of these Working Groups; report to the Forum; establish formal scientific networking arrangements and partnerships with the international scientific community; and communicate the findings of regional research and assessment at international fora. The activities of such a body will foster empowerment of fisheries authorities in the region and a sense of ownership of the scientific outputs as well as facilitate exposure to current advancements in research that may lead to new and improved approaches to assessment and management of fisheries in the region. In the absence of such a body the PMRRA undertakes some of the responsibilities outlined above. *[See Proposal to establish a CRFM Scientific Committee – Terms of Reference of CRFM Scientific Committee in Appendix 4, page 173 of Report of Fifth Annual CRFM Scientific Meeting – SVG – 09 to 18 June 2009 – Volume 1]*

OUTPUTS:

At the plenary session the activities of the respective working groups, results of analyses, recommendations and inter-sessional work plan are presented for peer review. Such presentations are given in MS powerpoint format and are guided by the report format. *[See Proposed Format of Assessment Reports Prepared by Working Groups in Appendix 3, page 24 of Report of First Annual CRFM Scientific Meeting – SVG – 22 - 30 June 2004 – Volume 1]*. Working Group Chairs collaborate with the respective WG members to write the report of the working group. Participants exhibit varying levels of skill in report writing and the format proposed is not always followed. Much of the writing of the technical component of the report is still left to the Consultants, presumably due to the lack of capacity and/or confidence. The report of the plenary sessions and full reports of the CRFM Resource Working Groups (containing technical details of the assessments/analyses) are published as Volume 1 of the Scientific Meeting Report and the management summaries as Volume 2. National reports of countries are published as Supplement 1 to Volume 1. The guidelines and format for national reports are forwarded in the initial communication to Member States inviting their participation at the ASM. These guidelines are sometimes not followed, resulting in a repeat of information from year to year for some countries.

It should be noted that the quality of the management advice provided in reports of the ASMs is impacted by the poor quality of data contributed for analysis/assessments at the ASM as well as uncertainties in the biology/ecology, stock delineation and the level of stock-sharing in the region. It is also impacted by the fact that management objectives may be unclear or not well defined at the start. Nevertheless the reports of the ASM have been clear on the deficiencies in data and information and recommendations regarding statistics and research which ought to be addressed to improve the situation.

DGROUPS:

Thus far the level of collaboration and data-sharing etc. among technical officers in preparation for the ASMs has been unacceptable. Given the limited time and resources allocated to the ASM it is critical that these activities occur throughout the year if real strides are to be realized at the ASM. In 2013 DGroups were established for the resource Working Groups to facilitate implementation of their respective inter-sessional activities¹. The intention is to share documents, data and to discuss aspects of data quality, preliminary data analyses and possible assessment methodologies in preparation for the Scientific Meeting. At this time it is premature to assess the success or utility of the DGroups by the resource Working Groups. Currently, the Forum and Executive Committee utilise the DGroups for the purpose of sharing documentation and have not yet explored its utility for regular discussions and sharing of ideas on fisheries management and related issues. Further consideration should be given to management of the respective DGroups and internal arrangements within the Secretariat for this purpose.

¹ DGroups were also established for other entities of the CRFM

APPENDIX 3: WORKING DOCUMENTS AND PRESENTATIONS RELATING TO AGENDA ITEM 3

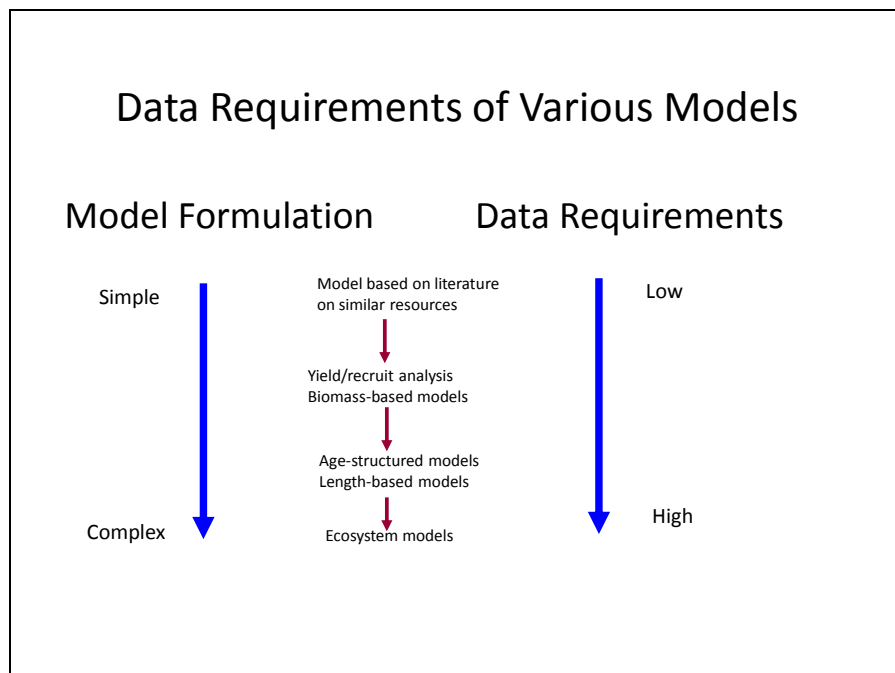
A. Use of Limited Data for Economic Analysis and Fisheries Management Purposes

Slide 1

Use of limited data for economic analysis and fisheries management purposes

Jonas Hallgrímsson
Institute of Economic Studies
University of Iceland

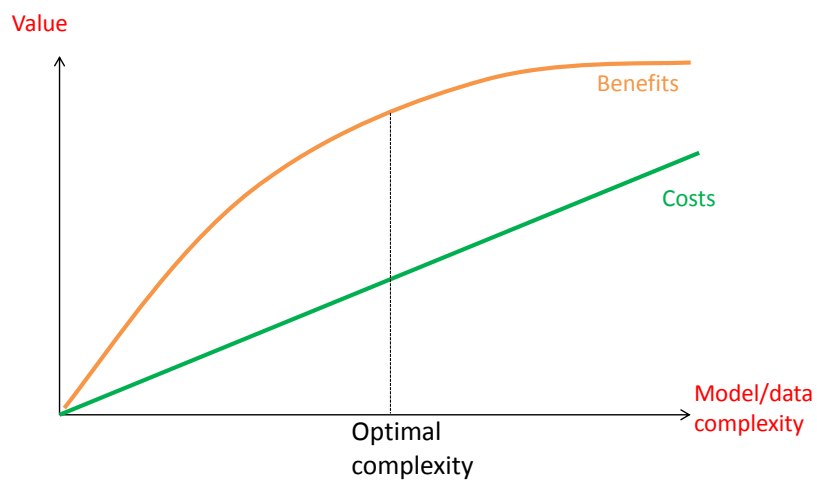
Slide 2

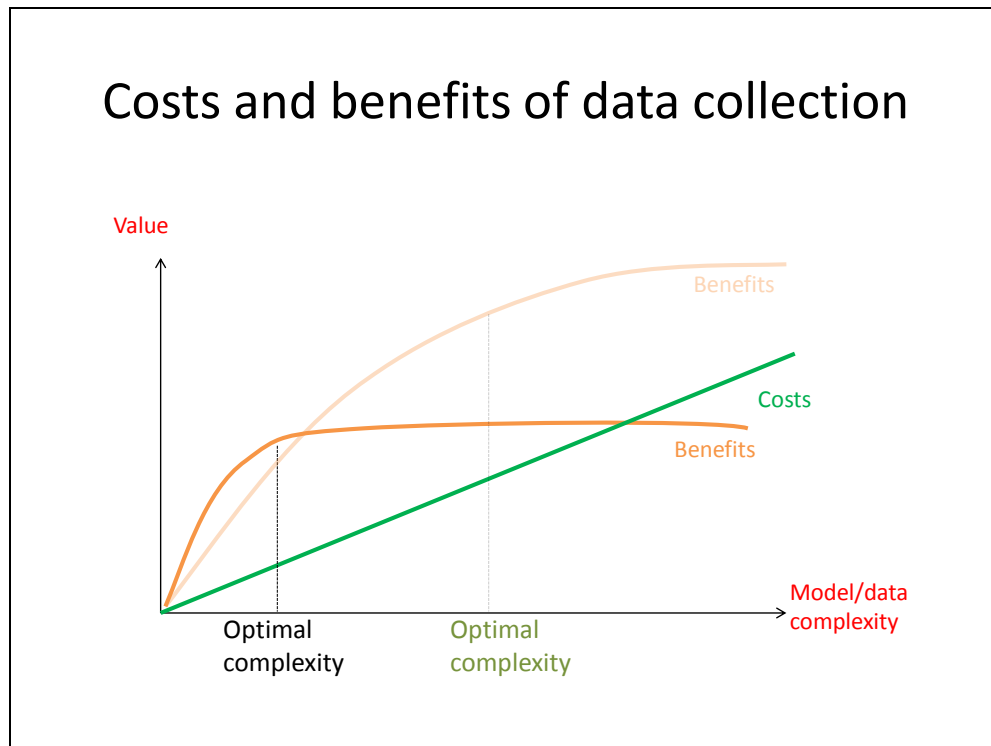


Costs and benefits of data collection

- Costs
 - Organization and management
 - Collection
 - Storage
- Benefits
 - More accurate models
 - Improved decision making
 - ...

Costs and benefits of data collection





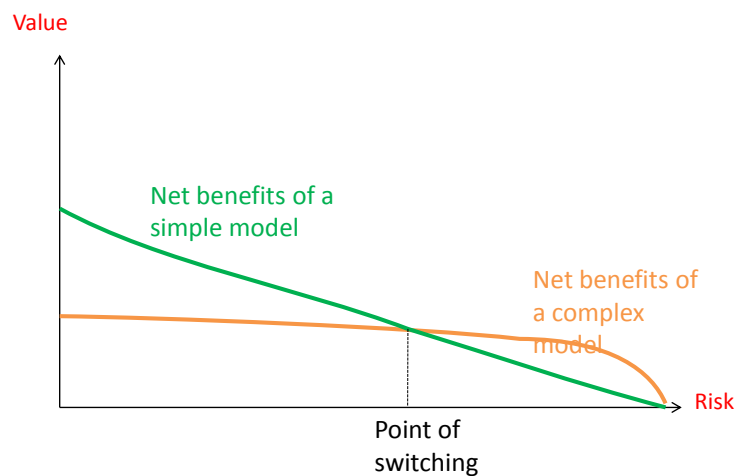
Risk and uncertainty

- Fisheries management is surrounded by risk and uncertainty
 - Risk: the probability of an action leading to an undesirable outcome
 - Example: stock collapses due to bad management
 - Uncertainty: not being able to predict development
 - Example: random recruitment
- Optimal data needs and modelling approaches are affected by both

Risk and data requirement

- More data and better modeling is needed to assess management with increasing risk of
 - thresholds such as stock collapse
 - irreversibilities such as extinction or habitat destruction

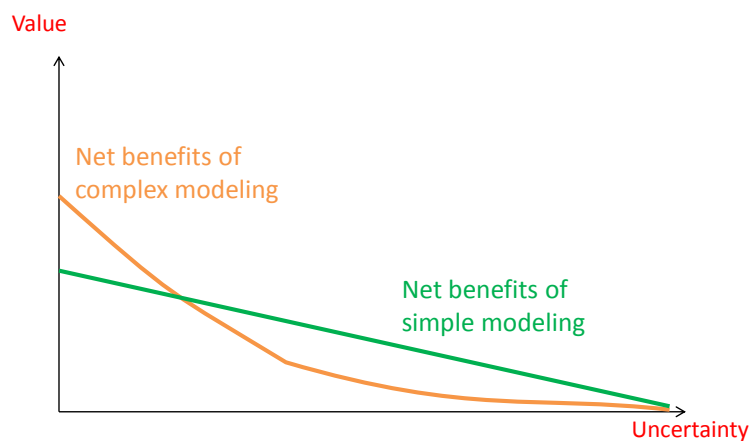
Costs and benefits of data collection



Uncertainty and data requirement

- Data is needed to assess the stochastic properties of the models to better understand development
 - Biological uncertainty: recruitment, natural mortality...
 - Economic uncertainty: prices, costs...
 - If development is dominated by stochastic factors, simple models may suffice

Costs and benefits of data collection



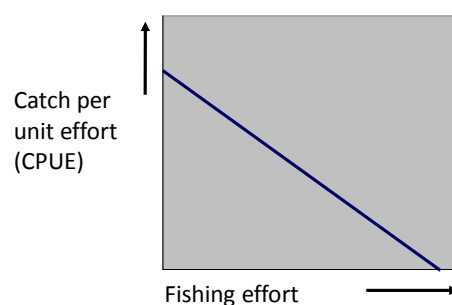
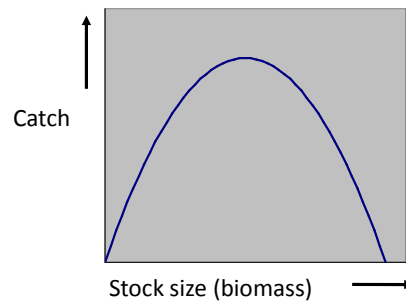
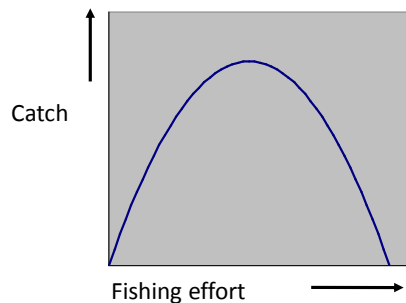
- Also called a Schaefer model
- Deals with the entire stock, the entire fishing effort and the total yield obtained from the stock
- Data requirements are less demanding than for analytical models
- Possible to estimate the Maximum Sustainable Yield (MSY)

- Yield
- Con
- Catl
- Can

Using SPM to estimate MSY

<p>Objective of SPM is to estimate MSY</p> <p>$f_t + b \cdot f_t^2$</p> <p>parabolas with which has its maximum value of Y_t at the MSY level...</p> <p>Effort level $f_{MSY} = \frac{-a}{2b}$</p> <p>Corresponding yield $MSY = \frac{-a^2}{4b}$</p>	<p>The objective of SPM is to estimate MSY</p> <p>$Y_t = a + f_t + b \cdot f_t^2$</p> <p>This is a parabola with which has its maximum value of Y_t at the MSY level...</p> <p>...at an effort level $f_{MSY} = \frac{-a}{2b}$</p> <p>...and the corresponding yield $MSY = \frac{-a^2}{4b}$</p>	<p>The objective of SPM is to estimate MSY</p> <p>$Y_t = a + f_t + b \cdot f_t^2$</p> <p>This is a parabola with which has its maximum value of Y_t at the MSY level...</p> <p>...at an effort level $f_{MSY} = \frac{-a}{2b}$</p> <p>...and the corresponding yield $MSY = \frac{-a^2}{4b}$</p>	<p>The objective of SPM is to estimate MSY</p> <p>$Y_t = a + f_t + b \cdot f_t^2$</p> <p>This is a parabola with which has its maximum value of Y_t at the MSY level...</p> <p>...at an effort level $f_{MSY} = \frac{-a}{2b}$</p> <p>...and the corresponding yield $MSY = \frac{-a^2}{4b}$</p>	<p>The objective of SPM is to estimate MSY</p> <p>$Y_t = a + f_t + b \cdot f_t^2$</p> <p>This is a parabola with which has its maximum value of Y_t at the MSY level...</p> <p>...at an effort level $f_{MSY} = \frac{-a}{2b}$</p> <p>...and the corresponding yield $MSY = \frac{-a^2}{4b}$</p>	<p>The objective of SPM is to estimate MSY</p> <p>$Y_t = a + f_t + b \cdot f_t^2$</p> <p>This is a parabola with which has its maximum value of Y_t at the MSY level...</p> <p>...at an effort level $f_{MSY} = \frac{-a}{2b}$</p> <p>...and the corresponding yield $MSY = \frac{-a^2}{4b}$</p>
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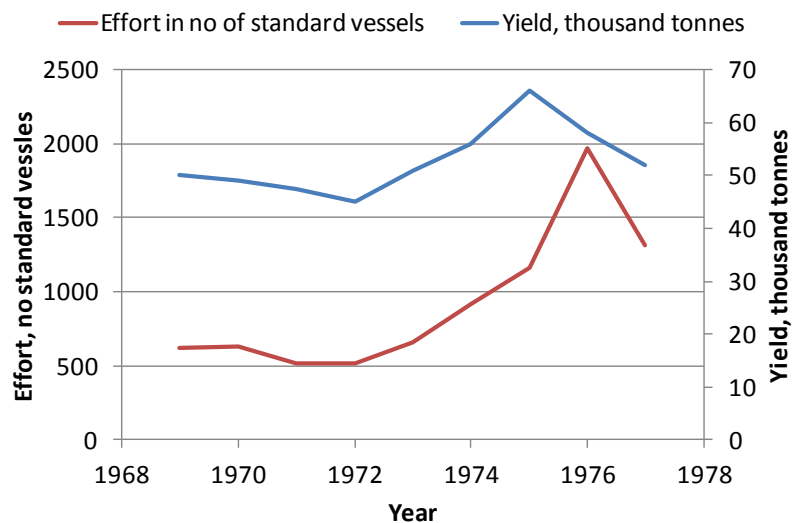
Long term (equilibrium) relationships between Catch, Effort and Stock size Indicators



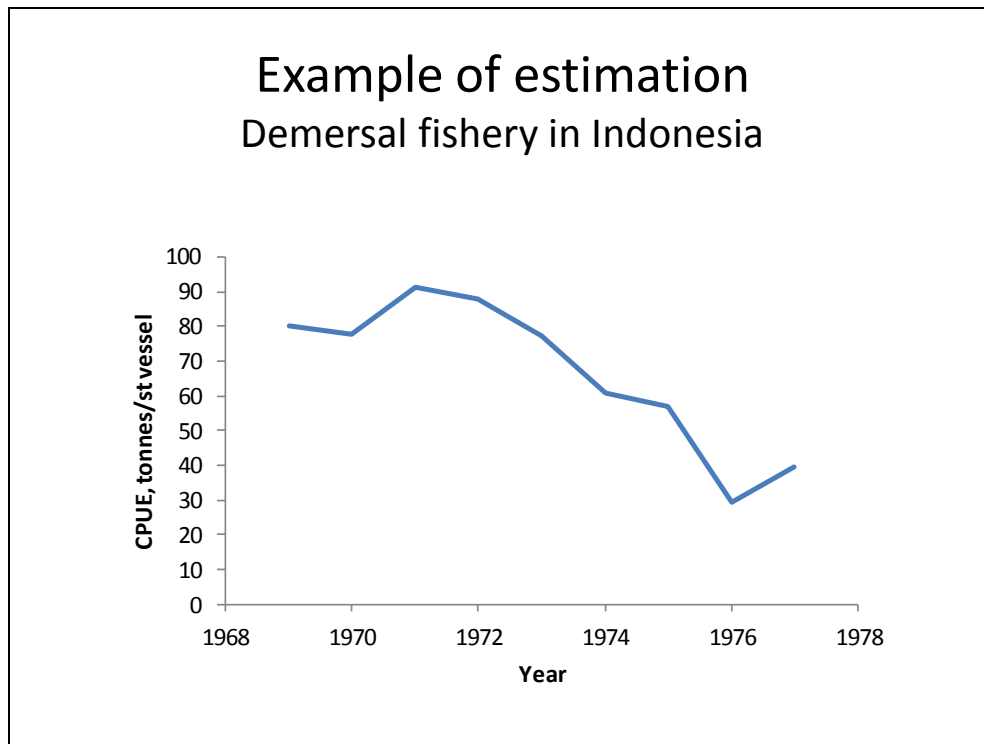
Example of estimation Demersal fishery in Indonesia

Year	Yield, thousand tonnes	Effort in no of standard vessels
1969	50	623
1970	49	628
1971	47,5	520
1972	45	513
1973	51	661
1974	56	919
1975	66	1158
1976	58	1970
1977	52	1317

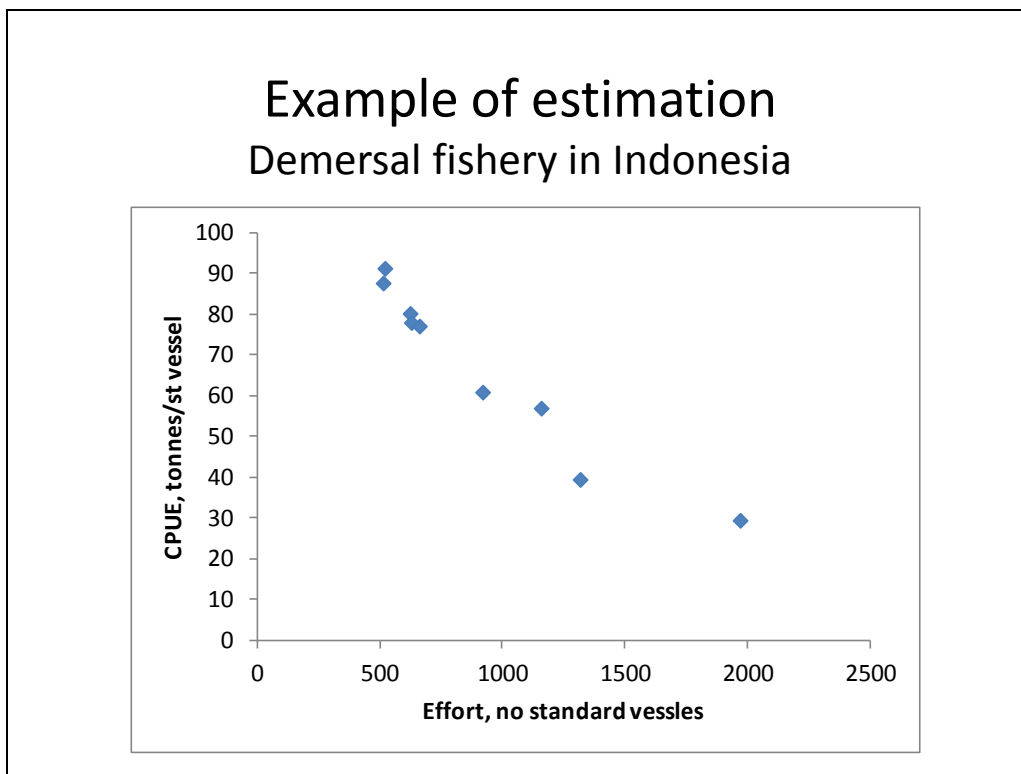
Example of estimation Demersal fishery in Indonesia



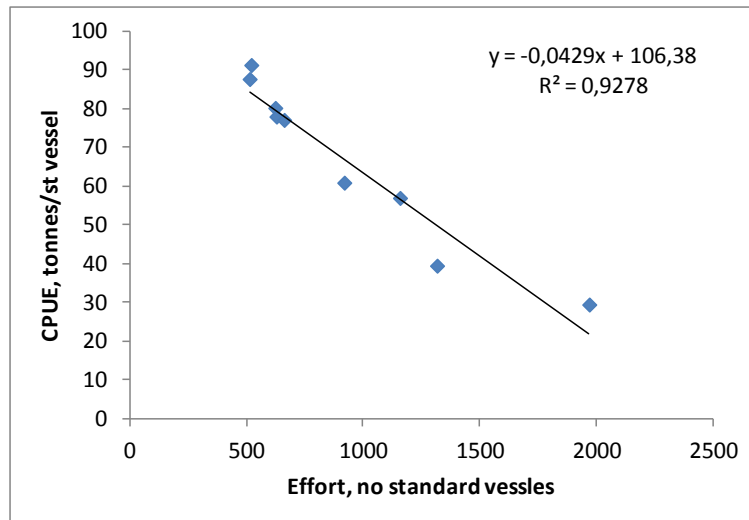
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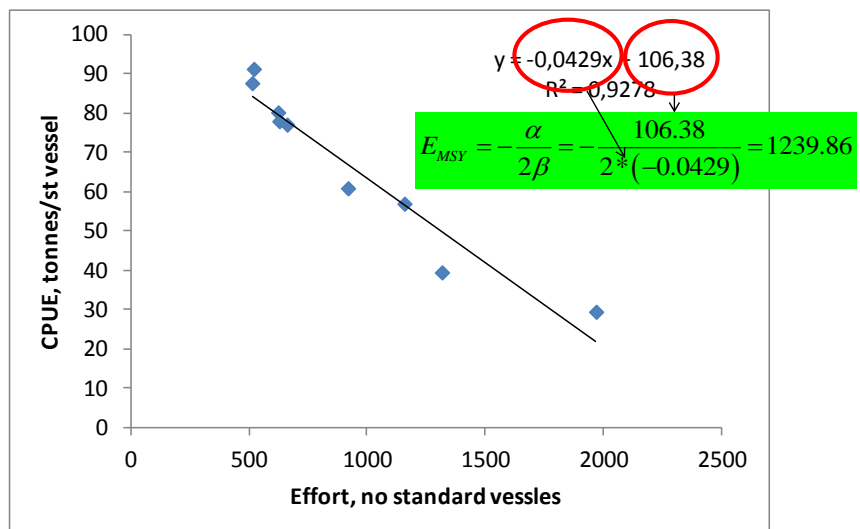
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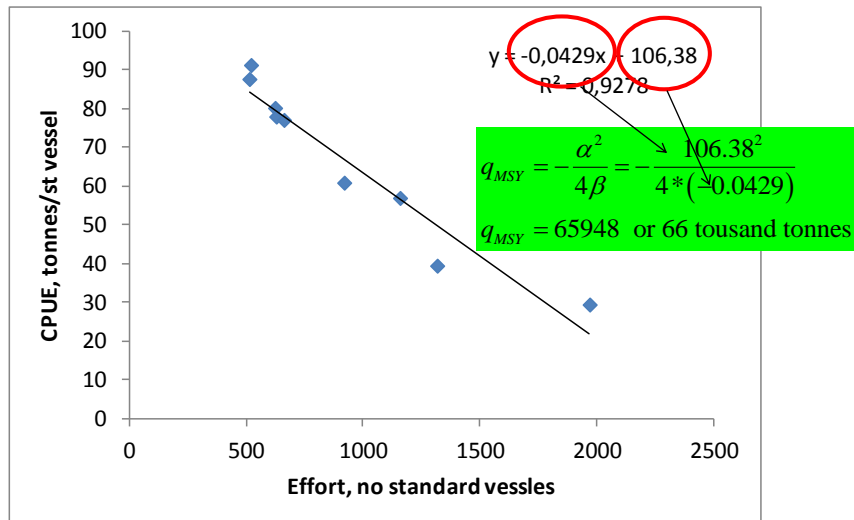
Example of estimation Demersal fishery in Indonesia



Example of estimation Demersal fishery in Indonesia



Example of estimation Demersal fishery in Indonesia



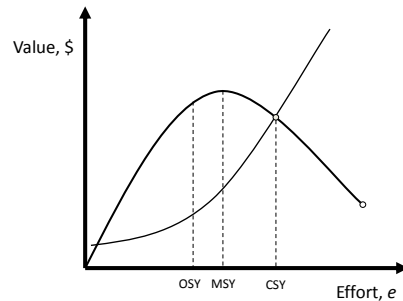
How can we use this?

- We have an indicator of stock size/abundance
- We can find the effort that maximizes yield (MSY)
- We can predict yield as a function of effort
- We can (potentially) assess the effort that maximizes long run profits (MEY)
- We can predict future profits

Predicted profitability

Sustainable Profit function

$$\Pi = pq(e) - C(e)$$



Profits (point estimates)


$$\Pi = pq - C, q \text{ and } C \text{ are point estimates}$$

Quality of SPM?

- How good is this approach?
 - Far from perfect!
 - But a possible good start?
- Benefits of this approach
 - Only need time series for catch and effort
 - Fairly easy and quick calculations (e.g. in Excel)

B. Data Management and Realistics Analysis of Fisheries Dat for ‘Stock Assessment’ Purposes


Slide 1



Realistic analysis and data management

Einar Hjörleifsson
9.2.2014

Slide 2



Fisheries science

- **Fisheries science** is the academic discipline of **managing** and **understanding** fisheries. It draws on the disciplines of
 - biology,
 - ecology,
 - oceanography,
 - statistics,
 - economics and
 - management




Fisheries science and stock assessment

- The ultimate aim in stock assessment is to solve the following:
$$\text{Catch} = \text{Fishing mortality} * \text{Biomass}$$
- So we need measures of two to solve for the third
- Very commonly we only have proxy measures (like cpue indices)
- And we need “link” models:
$$\text{Fishing mortality} = \text{catchability} * \text{Effort}$$
- In order to link proxy measures to the elements in the principal equation we need **time series** of data




Fisheries science and stock assessment

- The solution is based to a large extent on statistical inference and analyses (fish are invisible and moving around)
- Is data hungry
 - If little, poor or sparse data the inference from any model analysis will be assumptions driven with associated high degree of uncertainty.
- There are no quick fixes when it comes to learning fisheries science and stock assessment
 - Basic skills and competence only comes by doing.
- One may need to set the bar / objectives initially low
 - Estimation of stock status relative to msy-reference points (i.e. an analytical assessment) may only be achievable for few, highly valued species



Where to start? From the bottom up?

- Set up a project/course, e.g.:
- Analyze the development, status and importance of a fisheries and its driving forces.
 - Robust estimates of the total catches (C) and value (\$)
 - Robust estimates of development of overall effort (E)
 - Robust estimates of development of catchability (q)
 - Robust estimates of economical/sociological driving forces
- Along this route one would:
 - Gain competence in analysis of data
 - Gain competence in making inferences (connecting dots)
 - Gain competence/efficiency in data analysis, reporting and presentation.
- Overall incentives for FO? Can we identify something?




How to get from A to Z?


- Sampling strategy and design
- Sampling (collecting data)
- Data entering, data screening
- Data base system and management
- Data extraction
- Data analysis, summarization, ...
- Data reporting/publication

What knowledge is needed at each stage?

Where do you play a role as a scientist/manager?

Where are the major bottlenecks?




 what is a database? <http://en.wikipedia.org/wiki/Database>



The screenshot shows the Wikipedia article 'Database'. Red annotations are overlaid on the text:

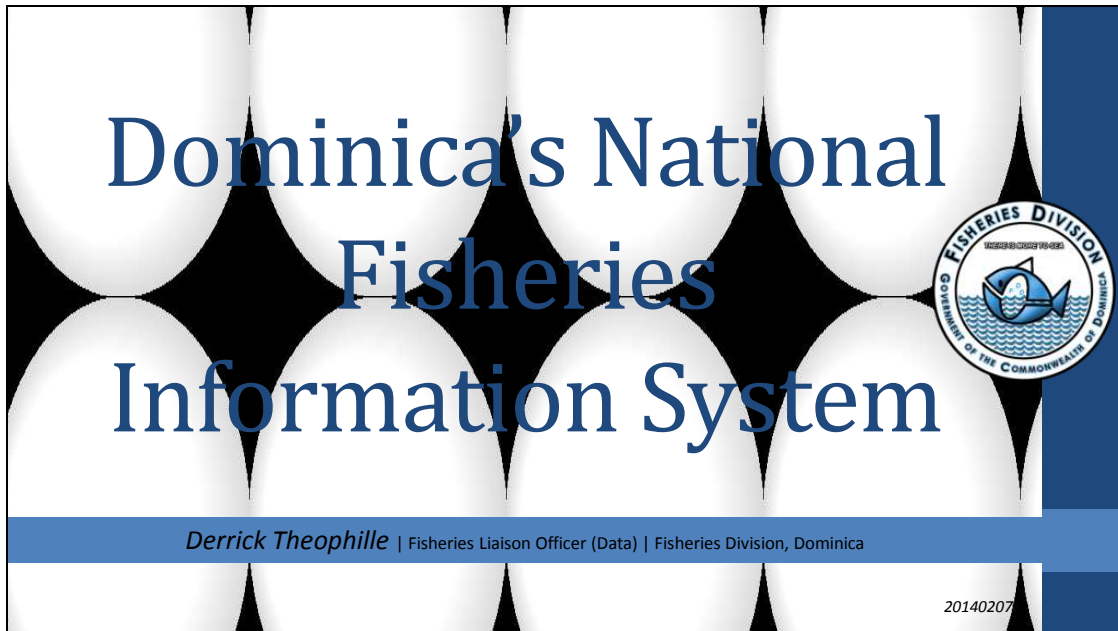
- an organized collection for one or more purposes**
- independent of the technology used (physical storage, computer storage, ...)**
- managed to some level of quality:**
 - accuracy
 - availability
 - usability
 - resilience
- The structure of a database is generally too complex to be handled without its DBMS, and any attempt to do otherwise is very likely to result in database corruption.**

 Database management

- Highly specialized field
- Revision of the current database system:
 - Strongly recommend looking into a platform independent web based format
 - Centralize storage, maintenance and backup
 - A couple of database managers serving many institutes
 - Data entry via xml-interface
 - Data extractions via web-based query
 - By clicking a mouse
 - Via linear coding
 - Access can be restricted or open

C(i). Dominica's National Fisheries Information System

Slide 1



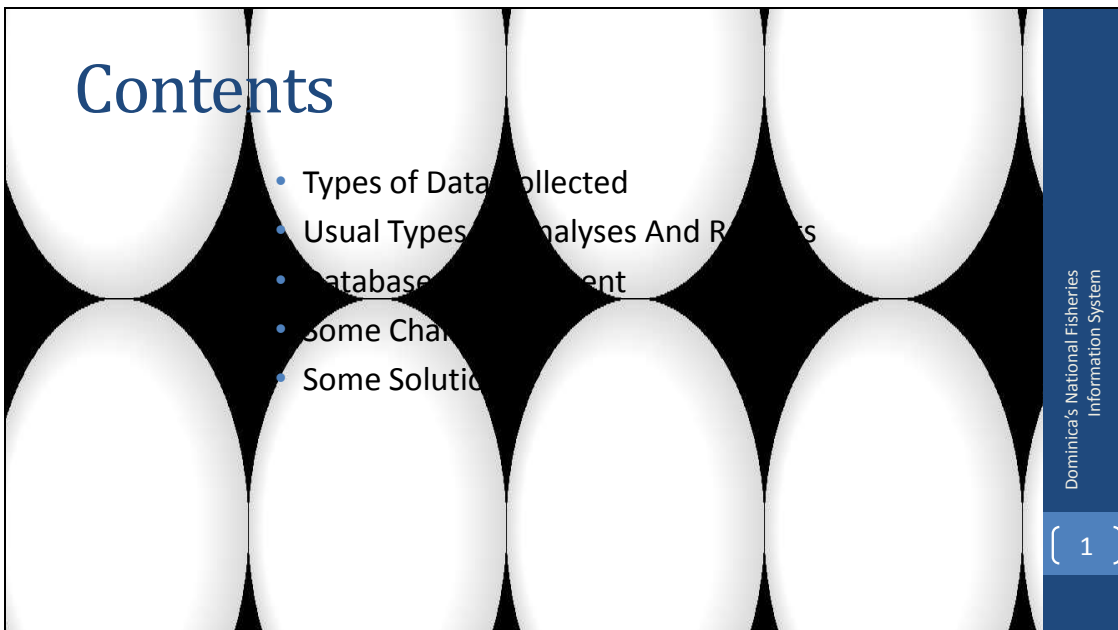
Slide 1 features a background of white eggs on a black surface. The title "Dominica's National Fisheries Information System" is displayed in a large, blue, serif font. To the right is the Fisheries Division logo, which includes a fish and the text "FISHERIES DIVISION", "MINISTRY OF AGRICULTURE AND FISHERIES", and "GOVERNMENT OF THE COMMONWEALTH OF DOMINICA". A blue horizontal bar at the bottom contains the text "Derrick Theophille | Fisheries Liaison Officer (Data) | Fisheries Division, Dominica". The date "20140207" is in the bottom right corner.

Dominica's National Fisheries Information System

Derrick Theophille | Fisheries Liaison Officer (Data) | Fisheries Division, Dominica

20140207

Slide 2



Slide 2 features the same background of white eggs on a black surface. The title "Contents" is in a large, blue, serif font. Below it is a bulleted list of topics. On the right, a blue vertical bar contains the text "Dominica's National Fisheries Information System" and a page number "1" in a white box.

Contents

- Types of Data Collected
- Usual Types of Analyses And Reports
- Database Management
- Some Challenges
- Some Solutions

Dominica's National Fisheries Information System

[1]

Slide 3

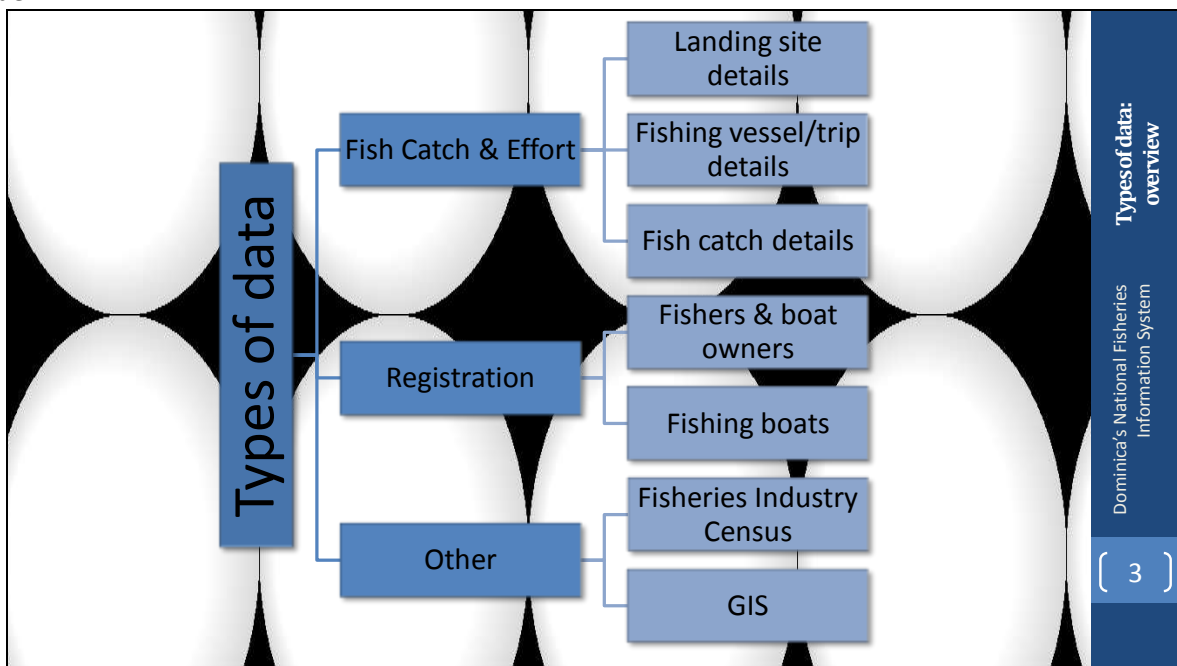


TYPES OF DATA COLLECTED

Dominica's National Fisheries Information System

[2]

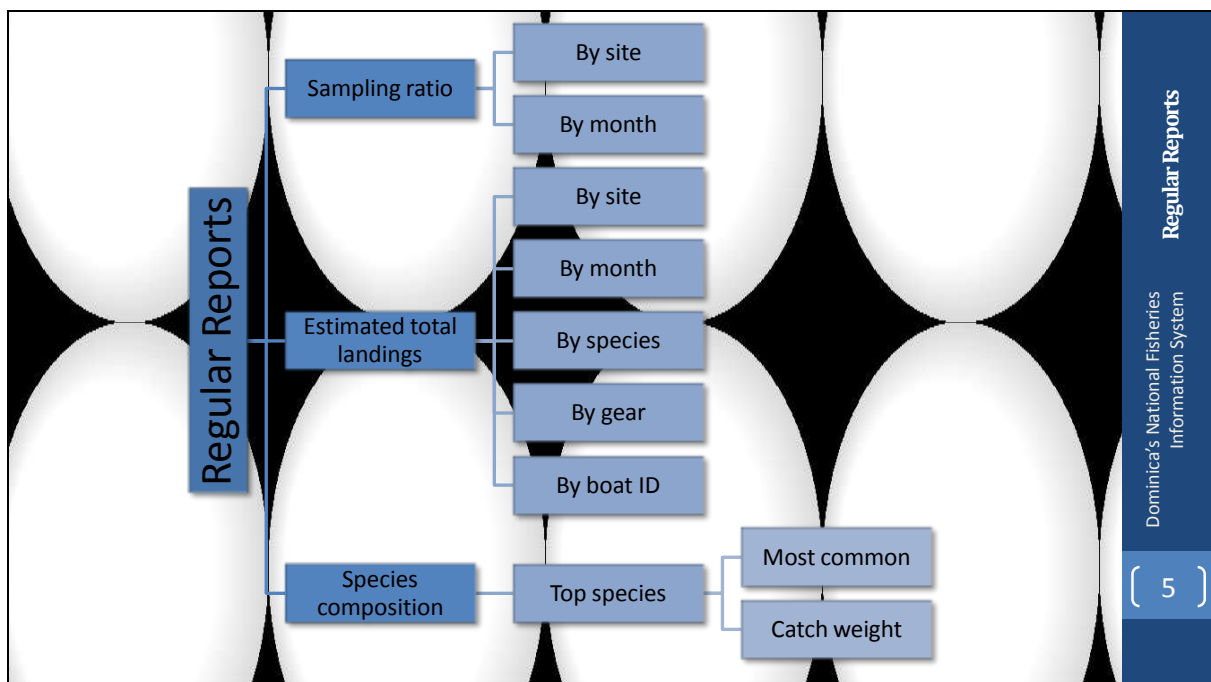
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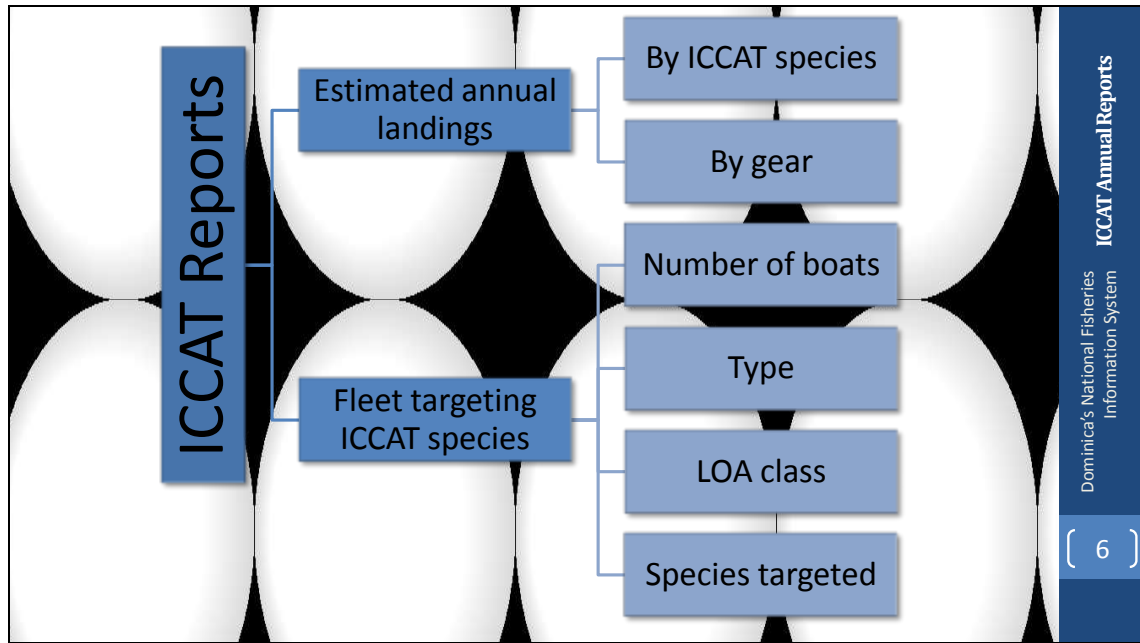
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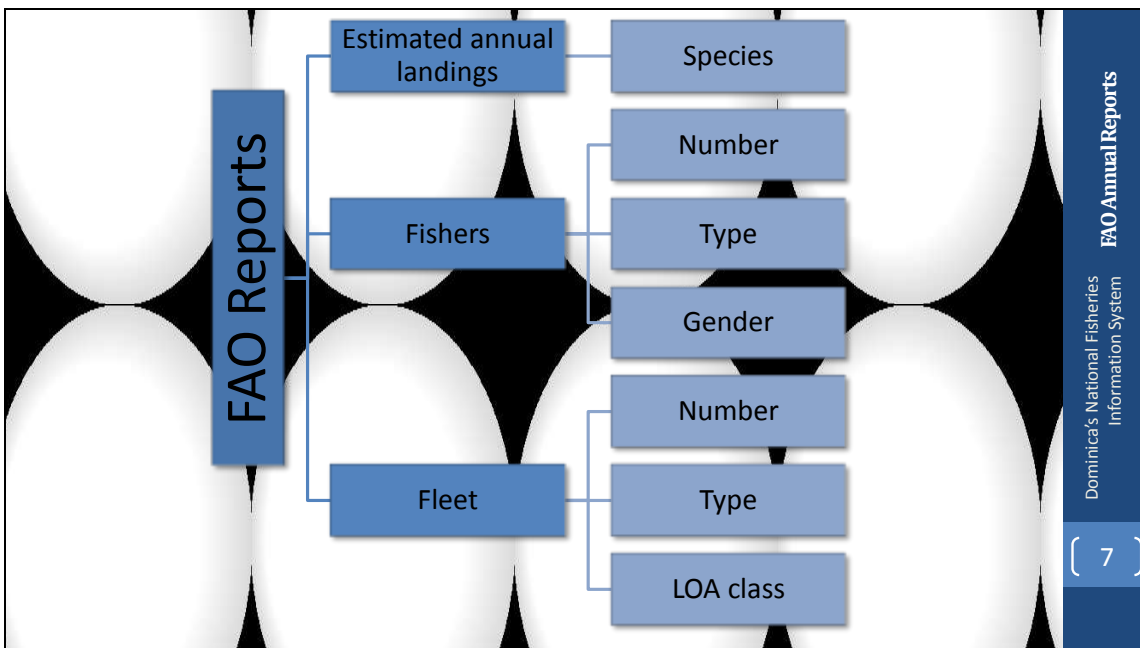
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Slide 7



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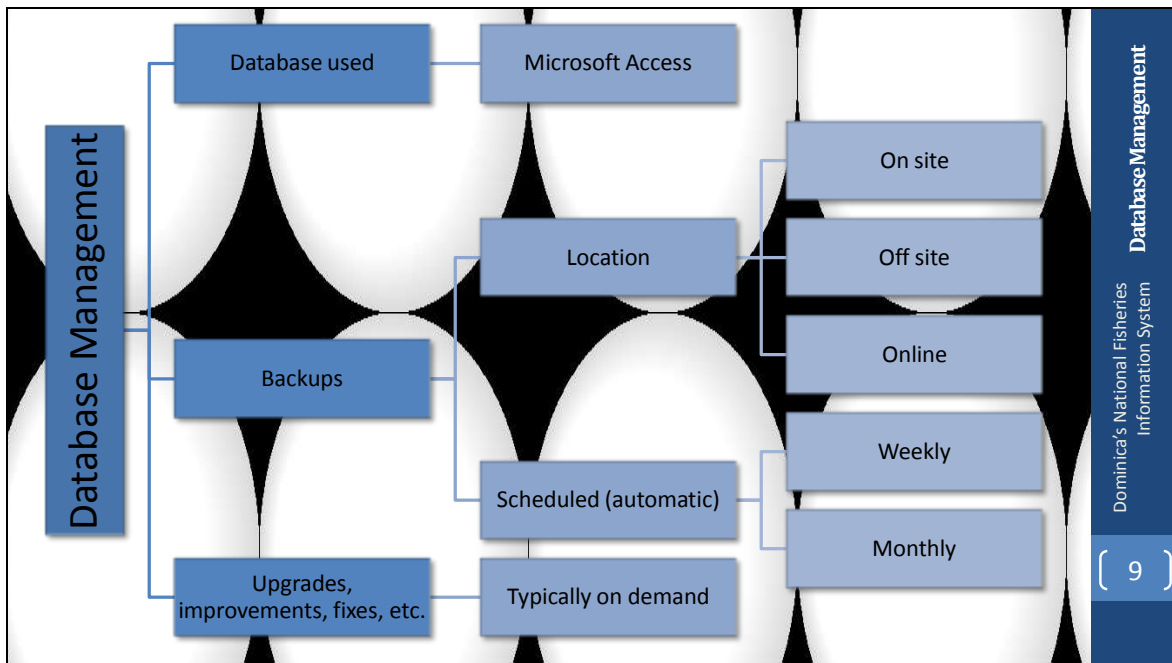


DATABASE MANAGEMENT

Dominica's National Fisheries Information System

[8]

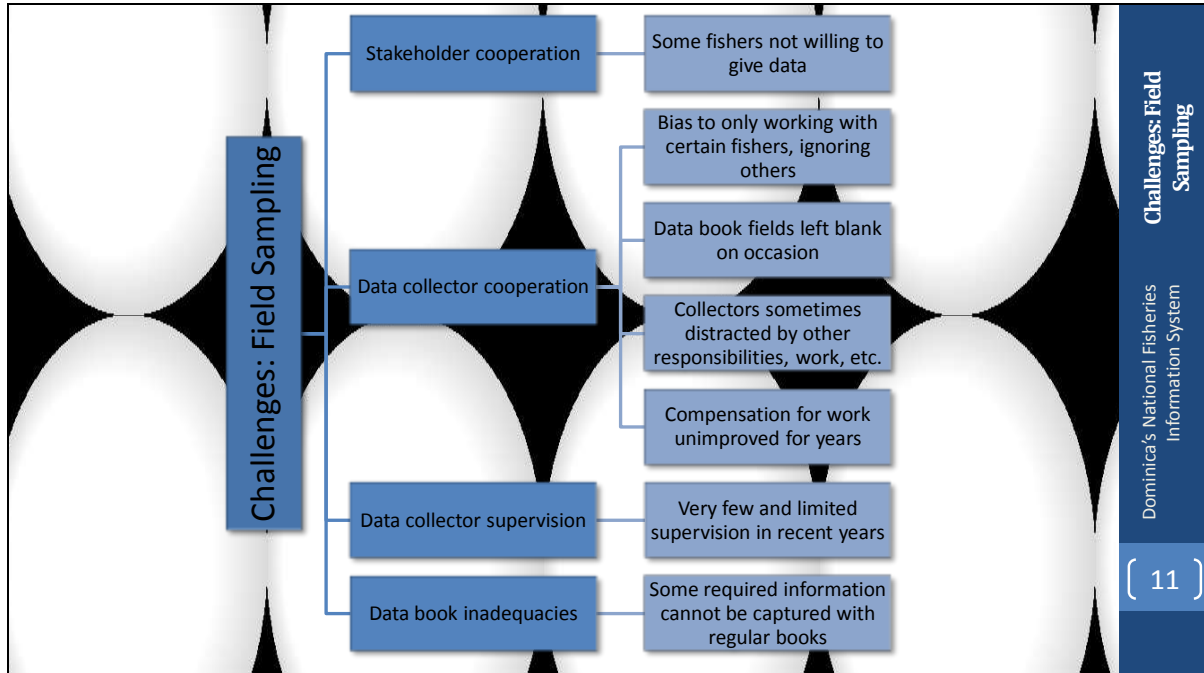
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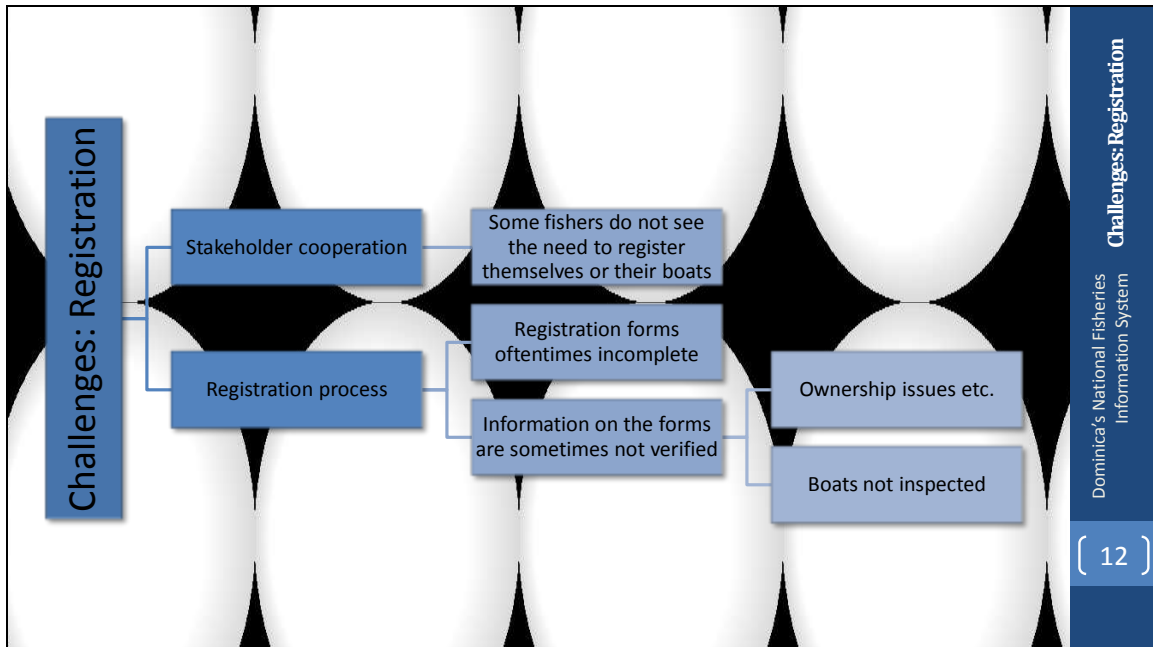
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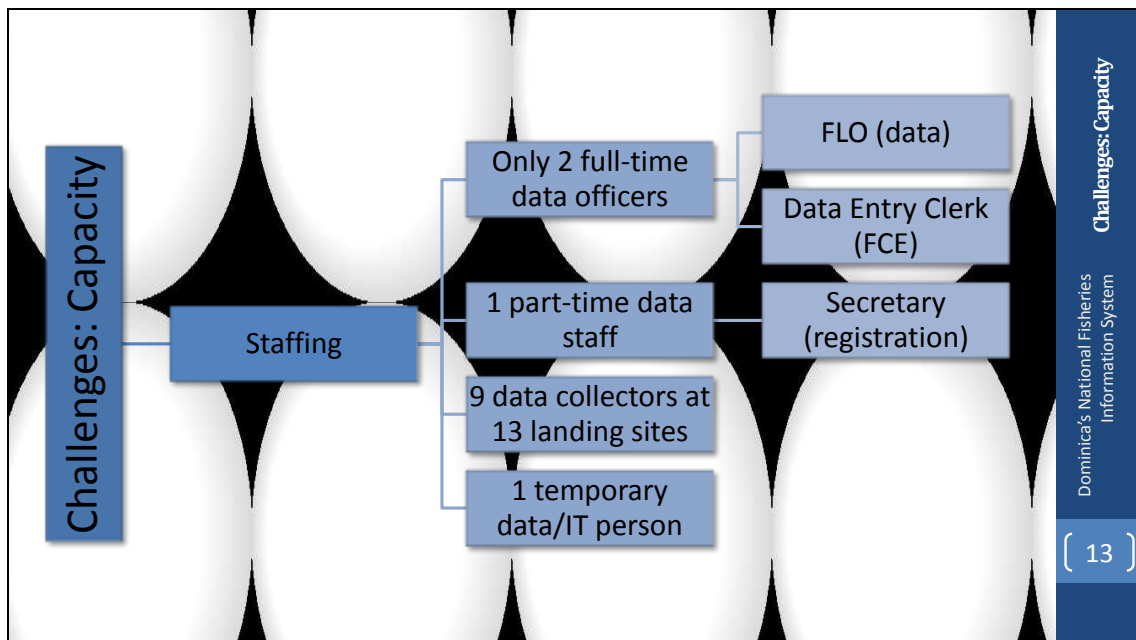
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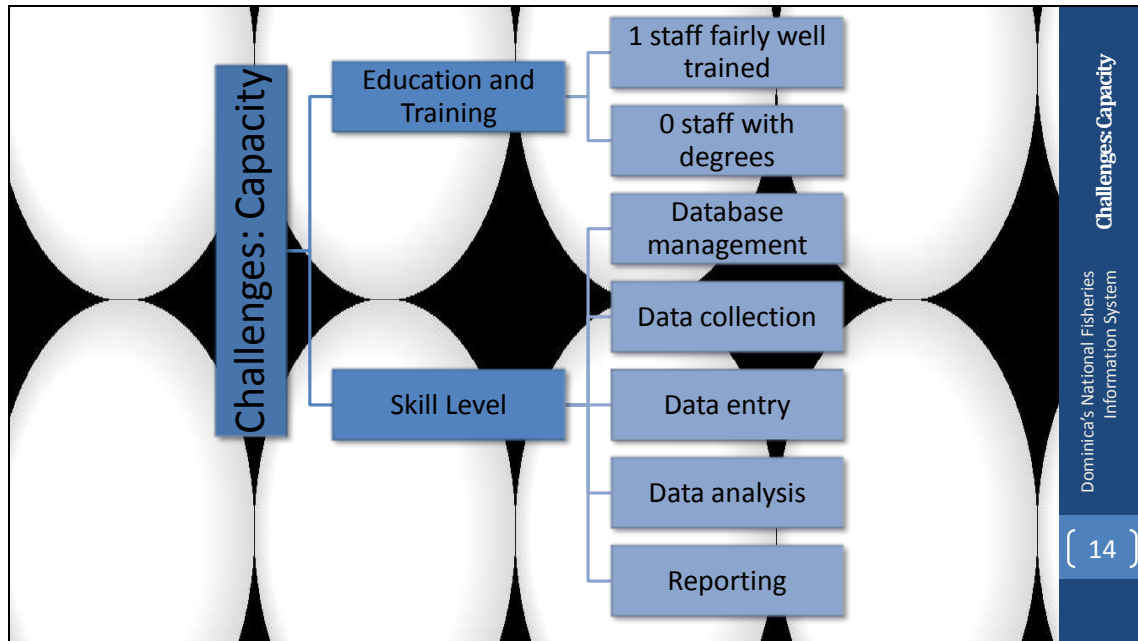
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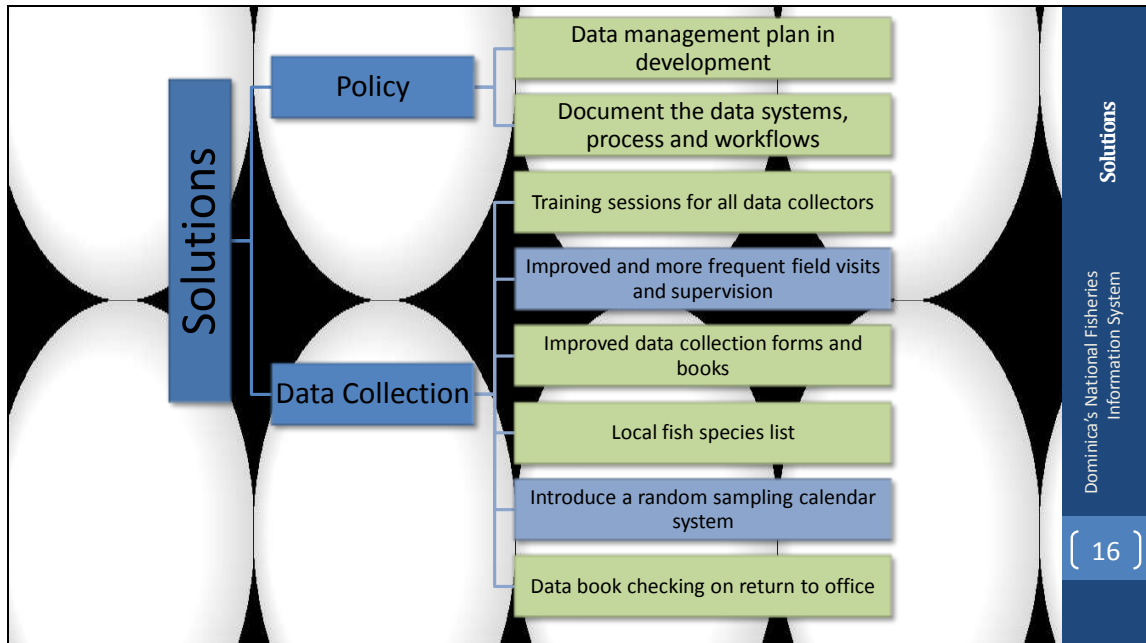
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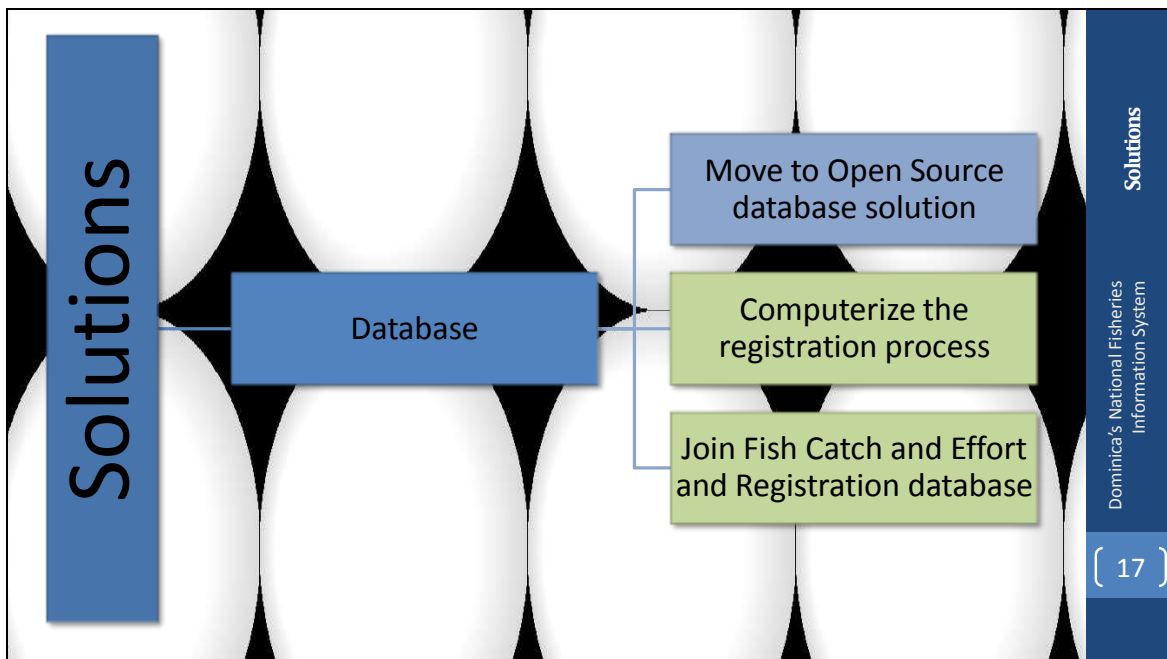
Slide 16



Slide 17



Slide 18



For more information...

- Fisheries Division
 - Roseau Fisheries Complex
 - Roseau, Commonwealth of Dominica
 - (766) 421-1040 (phone)
 - fisheriesdivision@dominica.gov.dm



THANKS FOR LISTENING!

[18]

C(ii). Data Collection System of St. Lucia

The Department of Fisheries is generally satisfied with the current sampling plan in terms of the quality and regularity of the data collected. Since the implementation of the first data collection system, there have been considerable refinements and revisions of the system in an effort to satisfy the information required for decision making and sound management advice. With the present sampling system, data are received on time and thus can be checked and entered regularly. This enables the Department to be current with information about the sector in terms of fish landings and effort applied.

The main aim of the data collection system is to monitor the status of the fish stocks that are being harvested; however, the data collected is limited to fish landings and performing simple analyses. Biological information on a limited number of single species fisheries have been collected through short term projects but this has not been on a consistent basis. There is need to expand the system to include sustainable data collection and analysis to include species-specific biological data as well as biophysical and ecological data related to the species as applicable. The full potential of the system has yet to be realized due to human resource and financial constraints.

The current data collection system includes several components such as gathering information on the weight of various fish species caught and effort applied, in addition, information on the registration of fishermen and vessels, scuba diving establishments, sports fishing vessels, speargun fishers and license data on fishing vessels. The two main databases used to store and manage the data is Trip Interview Program (TIP) and Licensing and Registration System (LRS). Data and information integrity checks are performed on all data and information.

Estimation of total landings

Calculations of the annual fish landings group by major landing site and taxonomic grouping are the main analysis conducted using catch and effort data. These are estimated using the query and reporting features of TIP as well as EXCEL. The following format is used: A raising factor (RF) is calculated for each site every month using the number of vessels observed out fishing each month and the number of sampling days and the number of fishing days each month for sampled sites. For non-sampled sites, RF is calculated using a special formula which includes the number of registered vessel by size and category, the main type of fishing activity conducted. The sampled landings are then extrapolated for each month by the RF for sampled sites, however, for non-sampled sites based on a factor used in comparison with a similar site. Estimation of the total landings for conch and lobsters is done using a slightly different approach since accurate information is not usually obtained at the landing sites.

Limitations

Some of the limitations in the data collection plan include:

- The plan needs to be further refined to include gathering information for non-sampled sites on a regular basis, thus taking into account changes in the fishery and activities at these sites.
- The current system of estimating annual landing for sites not sampled need to be regularly updated to include changes in the fishery and the number of vessels at these sites.
- Limited socio-economic, biophysical and biological data are collected on commercially important species. The outdated programmes (TIP and LRS) currently being used for data entry.
- Human resource constraints with respect to staff allocation and expertises does not allow for specialized data analysis and reporting.
- Difficulties are also encountered in obtaining information in the field since:
 - The fishery is open access and multispecies
 - The gear is non-selective
 - Lobster and conch catches are underreported

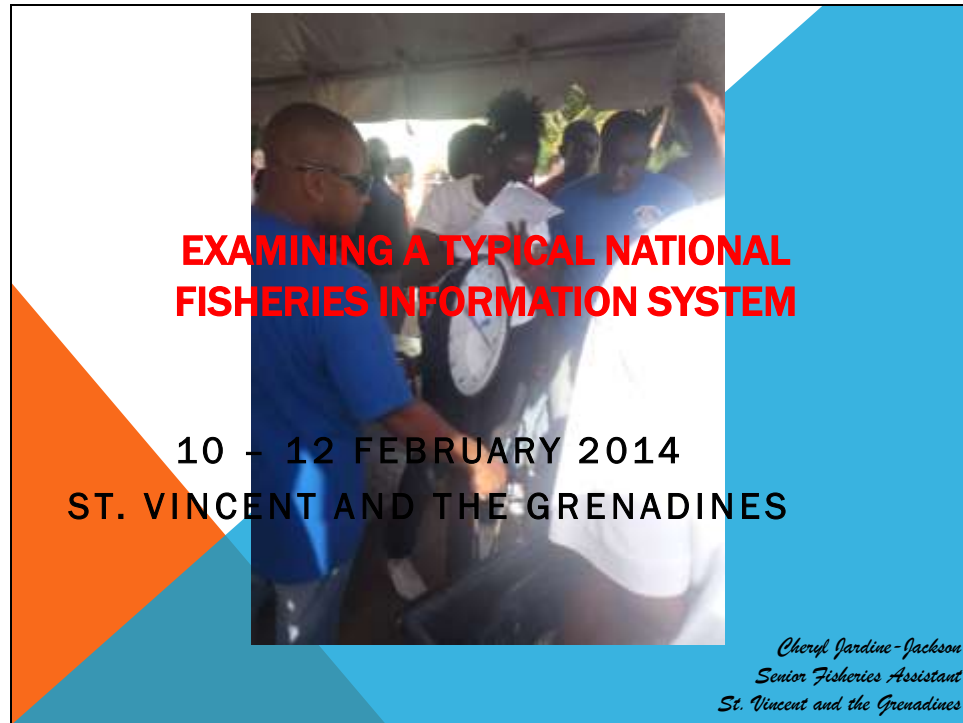
Recommendations

To improve the current sampling plan the following should be implemented:

- Conduct a field survey every three years to update fishery information on the non-sampled sites.
- Implement a continuous biological and biophysical data collection system on selected species; for example, spiny lobster and conch.
- Increase staff allocations to increase the staffing in data management that will include staff expertises in biometrics (biological statistics), research design, scientific reporting and fisheries stock assessment methods.
- As staff turns over there is a need to train data managers in all aspects of data management and quality control, data analysis and reporting, stock assessment.
- The finalization of a fully functional database that supports current and future operation systems.
- The establishment of a regional data collection procedure that focuses on collecting the data relevant for national as well as regional needs; for Example, fisheries stock assessment.
- CRFM to partner with UWI and other universities to assist with collection and analysis of fishery data. Example stock recruitment, habitat quality, etc.

C(iii). Examining a Typical National Fisheries Information System

Slide 1



EXAMINING A TYPICAL NATIONAL FISHERIES INFORMATION SYSTEM

10 – 12 FEBRUARY 2014

ST. VINCENT AND THE GRENADINES


*Cheryl Jardine-Jackson
Senior Fisheries Assistant
St. Vincent and the Grenadines*

Slide 2

CONTENTS
SVG Fisheries Information system
▪ Introduction
▪ Objective
Data Collection System
▪ Overview of data collection system
▪ Types of data collected
▪ Data Collection process
▪ Analysis and Reports
▪ Data Quality Management
▪ Database used
▪ Database Management
Challenges.
- In The Field
- Data Unit
- Fisher folk co-operative
Way Forward


Socio-Economic Data

- ❖ The fishing industry contributes about 1.7% to the GDP of SVG
- ❖ 2,500 full and Part time fishermen
- ❖ 500 vendors, traders, gutters etc
- ❖ 850 registered fishing vessels (CARIFIS 2013)
- ❖ Average cost of fishing vessel with gear: \$15,000.00
- ❖ Estimated investment in the Industry: \$10 million



Claudette Wyllie Photo

Statistics Table

	Weight (lbs)	Value (\$ EC)
Average Annual Fish Landings	1.8 Million lbs	\$ 9.6 Million
Average Annual Fish Exports	0.2 Million lbs	\$ 1.4 Million
Average Annual Fish Imports	1.06 Million lbs	\$ 5.7 Million

Source: Data Unit, Fisheries Division, Ministry of Agriculture & Fisheries (2007 - 2011)

SVG FISHERIES INFORMATION SYSTEM

Introduction

Proper data collection for any harvested fishery resource is one of the fundamentals for successful future development in the fishery. It must be managed and sustained for future generations.



SVG FISHERIES INFORMATION SYSTEM

Introduction

How?

Development of reliable Fisheries Information systems which would make available data that is necessary to facilitate the implementation of appropriate management measures.



SVG FISHERIES INFORMATION SYSTEM

Objective

WHY

to facilitate the appropriate analyses that would aid in providing the necessary support to assist managers in making the correct management decisions.

SVG FISHERIES INFORMATION SYSTEM

Overview

Prior to 1992 – collection of catch data (weights) from Kingstown market.

1992 – implementation of a sampling programme for estimating catch and fishing effort.

1994/95 – Enhancement of the Fisheries Information system to gather economical and social information(Fishers) as well as information on Vessels, Processing Plant, Aquaculture Plant.

Types of data collected

- ☐ Fish Landings (Catch and Effort data)
- ☐ Fish Exports
- ☐ Fish Imports
- ☐ Fish biological data (Length Frequencies)
- ☐ Fishers
- ☐ Vessels
- ☐ Highseas catch statistics

Data Collection Process

Data are collected from all landing sites using a cluster-stratified random sampling methodology .

- ☐ **Landing sites are grouped into Zones (1-6)**
- ☐ **Landing sites are stratified according to status (primary, Secondary, Tertiary) to determine the number of days a particular site should be visited.**
- ☐ **Time schedules are prepared for data collectors, giving the date and time they should visit a particular landing site.**
- ☐ **Data collectors visit landing sites within a given Fishing Zone, approximately 20 days each month.**

Data Collection Process

- ☐ Data collectors conduct fisher interviews (8 hrs per day) to obtain catch and effort information
- ☐ Information is written on prepared catch and effort forms
- ☐ Information is computerized and stored in a reliable database (CARIFIS)
- ☐ Twenty-one (21) out of the thirty-six (36) landing sites are sampled. Of these two (2) are primary sites (Kingstown and Barrouallie); Twelve (12) secondary and seven (7) tertiary sites.
- ☐ Sampling is performed separately within each stratum.

Analysis

- ✓ The data sampling program determined the Catch Per Unit Effort (CPUE) and landings at the landing sites in SVG.
- ✓ Census data are collected at the Kingstown Fish Market only.
- ✓ Landings are estimated using the “Day Effort at a landing site”. Catch Per Day Effort (CPDE) is determined for each of the species, and it is used for estimating the landings.
- ✓ The landings are estimated for each specie using the following data items:
 - Average Catch Per Day Effort (CPDE) for each specie at the sampling site
 - Total Sampling days in the month

Ex.) “Days of Sampling” is 4 days in Mar 2010 at Calliaqua, Total Sampled weight for Tuna is 43 lbs, Average CPDE is $43/4 = 10.75\text{lbs}$; Total Sampling days is “20 days”.

The estimated landing for Tuna at Calliaqua is $10.75\text{lbs} * 20 \text{ days} = 215 \text{ lbs}$

Analysis

- ✓ An estimate of the amount of fish landed in the country is obtained by summing the totals of all the estimates for the individual landing sites plus the census data.

Total landings = census data + Estimates of all landing sites (1 - 6)

e.g Total estimate for January = 775 lbs
Kingstown for January = 400 lbs

Then

Total estimated landings (Jan) = 775 + 400
= 1175 lbs

Reports Generated

Daily catch Recorded at the Kingstown Market

DATE	FISHER/AGENT	SPECIES	WEIGHT	PRICE/LB	VALUE
1/2/2013	Gregory Lewis	robin	1400	4	5600
1/2/2013	Lennie Valery	dolphin	103	9	927
1/2/2013	Lennie Valery	wahoo	188	9	1692
1/2/2013	Eli Slater	robin	2300	4	9200
1/2/2013	Glenmore Hanson	dolphin	60	9	540
1/2/2013	Glenmore Hanson	wahoo	100	9	900
1/2/2013	Eli Slater	robin	1000	4	4000
1/2/2013	Glenmore Hanson	skip jack	160	7	1120
1/2/2013	Joe Harry	wahoo	140	9	1260
1/2/2013	Brian Williams	skip jack	200	7	1400
1/2/2013	Gregory Lewis	robin	500	4	2000
1/2/2013	Anthony Clarke	wahoo	150	9	1350

Reports Generated

Extracted Data from CARIFIS

DATE	MARKING	NAME	SPECIES	GEAR	FISH_GROUND	HOURS
9/2/2013			GRUNT,FRENCH	HAND LINE /(BOTTOM/DRIFTLINE)	LOWMANS	5
9/2/2013			PARROTFISH,BLUE	HAND LINE /(BOTTOM/DRIFTLINE)	LOWMANS	5
9/2/2013			SNAPPER,BLACKFIN	HAND LINE /(BOTTOM/DRIFTLINE)	LOWMANS	5
9/3/2013			GROUPE,NASSAU	PALANGUE /(DROPLINE)	BIABOU	7
9/3/2013			JACK,HORSE EYE	PALANGUE /(DROPLINE)	BIABOU	7
9/3/2013			SHARK,CARIBBEAN REEF	PALANGUE /(DROPLINE)	BIABOU	7
9/3/2013			SNAPPER,BLACKFIN	PALANGUE /(DROPLINE)	BIABOU	7
9/3/2013			TUNA,BLACKFIN	PALANGUE /(DROPLINE)	BIABOU	7
9/3/2013	J8-00056-CA	MAN DINGO	JACK,HORSE EYE	PALANGUE /(DROPLINE)	OFF BEQUIA	7
9/3/2013	J8-00056-CA	MAN DINGO	SNAPPER,BLACKFIN	PALANGUE /(DROPLINE)	OFF BEQUIA	7
9/3/2013	J8-00056-CA	MAN DINGO	SNAPPER,QUEEN	PALANGUE /(DROPLINE)	OFF BEQUIA	7
9/5/2013	J8-00292-IN	BAYSIDE BLUES RETURN	GRUNT,STRIPED	HAND LINE /(BOTTOM/DRIFTLINE)	OFF BEQUIA	5.5
9/5/2013	J8-00292-IN	BAYSIDE BLUES RETURN	JACK,CREVALLE	HAND LINE /(BOTTOM/DRIFTLINE)	OFF BEQUIA	5.5
9/5/2013	J8-00292-IN	BAYSIDE BLUES RETURN	SNAPPER,BLACKFIN	HAND LINE /(BOTTOM/DRIFTLINE)	OFF BEQUIA	5.5
9/6/2013			HIND,RED	BOTTOM LONGLINE	OFF BEQUIA	30
9/6/2013			SNAPPER,BLACKFIN	BOTTOM LONGLINE	OFF BEQUIA	30
9/6/2013			CONCH,QUEEN	SCUBA DIVING	TOBAGO CAYS	0
9/6/2013	J8-00292-IN	BAYSIDE BLUES RETURN	AMBERJACK,GREATER	HAND LINE /(BOTTOM/DRIFTLINE)	OFF BEQUIA	6.5

Reports Generated

Extracted Data from CARIFIS (Continue)

SITE	LAND_WGHT	PRICE	VALUE	EST_WGHT	EST-VALUE
CV_CLARE VALLEY	2	9	18	13.33	120.00
CV_CLARE VALLEY	1	9	9	6.67	60.00
CV_CLARE VALLEY	3	9	27	20.00	180.00
CALLIAQUA	7	9	63	35.00	315.00
CALLIAQUA	43	9	387	215.00	1,935.00
CALLIAQUA	37	7	259	185.00	1,295.00
CALLIAQUA	40	9	360	200.00	1,800.00
CALLIAQUA	24	8	192	120.00	960.00
CALLIAQUA	6	8	48	30.00	240.00
CALLIAQUA	20	9	180	100.00	900.00
CALLIAQUA	28	9	252	140.00	1,260.00
IN_INDIAN BAY	3	9	27	20.00	180.00
IN_INDIAN BAY	1	9	9	6.67	60.00
IN_INDIAN BAY	8	9	72	53.33	480.00
KI_KINGSTOWN	47	9	423	188.00	1,692.00
KI_KINGSTOWN	200	9	1800	800.00	7,200.00
KI_KINGSTOWN	540	8	4320	2,160.00	17,280.00
KI_KINGSTOWN	12	9	108	48.00	432.00

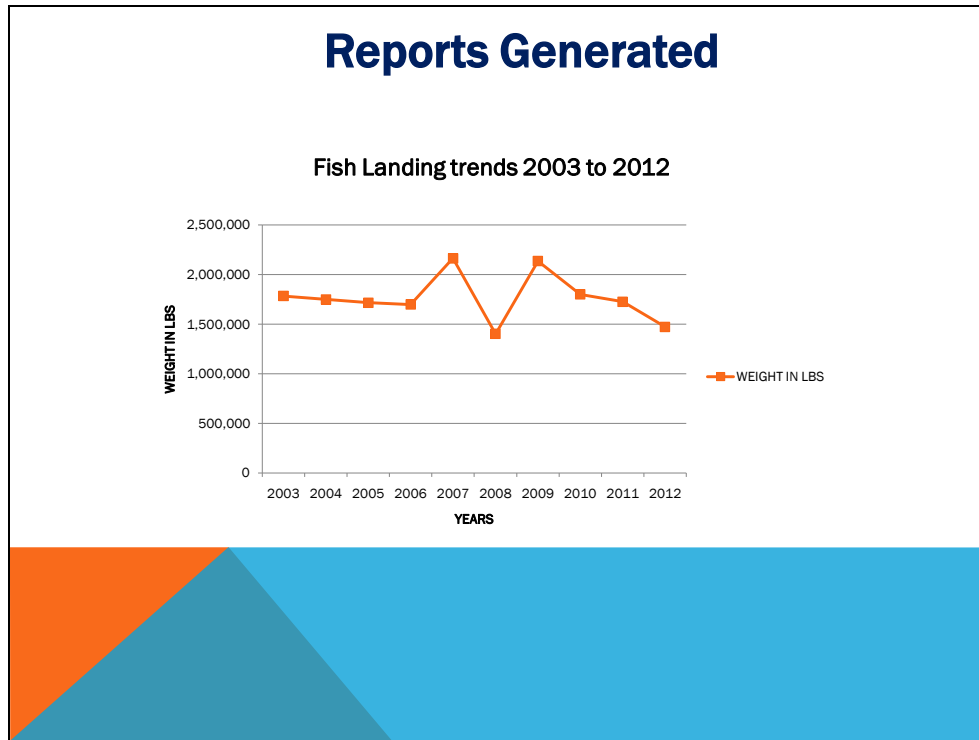
Slide 17

Reports Generated												
Estimated Weights on fish landed by Species Jan – Sept 2013												
COMMON NAME	SCIENTIFIC NAME	SPCODE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
Amberfish	Seriola dumerili	CARADU	428	172	385	128	1,359	1,441	1,626	873	890	7,301
Anchovy	Anchoa lyolcpiis	ENGRE	0	0	0	0	0	0	0	0	0	0
Angelfish	Pomacanthidae	PCAN	0	0	0	0	0	0	0	0	3	3
Balahoo	Hemiramphus balao	HEMIBA	33,250	34,530	21,767	5,975	2,940	2,820	1,536	3,700	13,050	119,568
Barracuda	Sphyracna barracuda	SPHYBA	4,219	3,015	3,746	4,062	3,914	1,736	3,834	944	2,976	28,445
Blare eye	Priacanthus arenatus	PRIAAR	0	0	0	0	0	20	0	0	0	20
Blem	Etelis oculatus	LUTJOC	911	26	355	75	546	49	245	456	2,501	5,163
Blue Parrot	Scarus vetula	SCARCO	2,143	0	0	30	6	13	210	9	7	2,418
Blue Tube (Diapro)	Clepticus parae	LABRPA	965	0	0	595	3,700	300	300	0	500	6,360

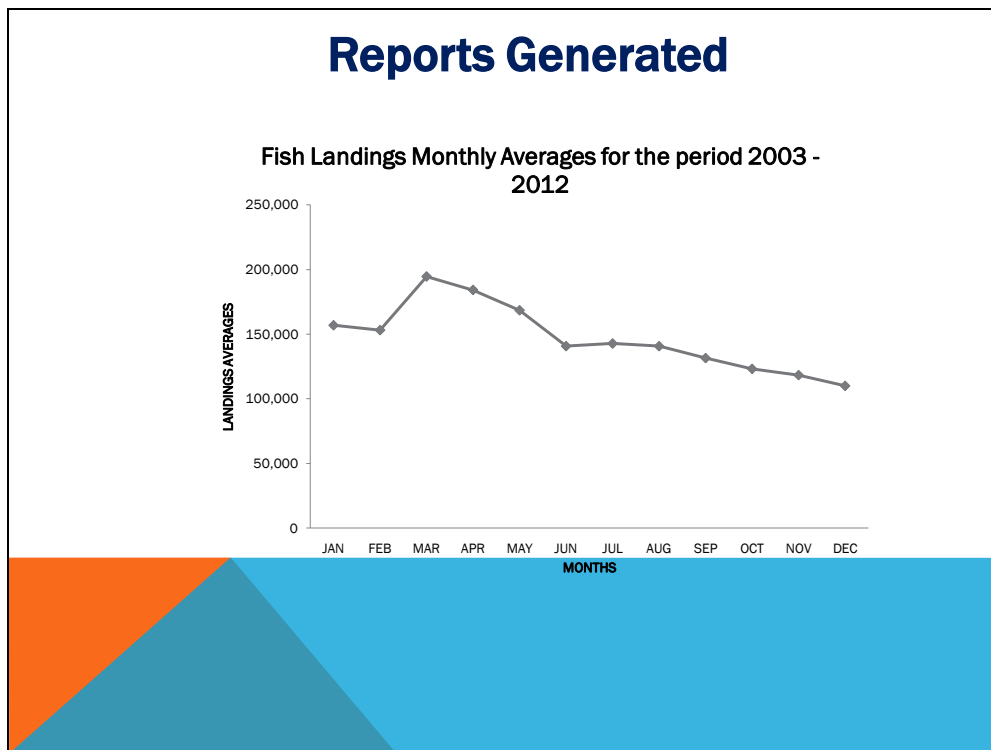
Slide 18

Reports Generated										
Estimated Weights on fish landed by landing Sites Jan – Sept 2013										
NAME	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
ZONE 1										
**NFML	119,321	122,354	157,234	93,945	78,498	77,860	67,560	72,221	76,756	865,749
CALLIAQUA	4,294	4,460	3,650	1,005	3,869	5,876	3,364	5,040	3,595	35,153
CAMDEN PARK	110	0	320	133	0	90	0	0	0	653
GREAT HEAD BAY	0	380	520	0	367	730	0	0	0	1,997
INDIAN BAY	0	130	350	0	293	120	53	210	160	1,316
LOWMANS	2,200	2,200	1,400	3,220	880	107	98	35	0	10,140
QUESTELLES	11,308	3,200	0	10,500	4,400	0	0	0	0	29,408
SUB-TOTAL	137,233	132,724	163,474	108,803	88,307	84,782	71,075	77,506	80,511	944,415

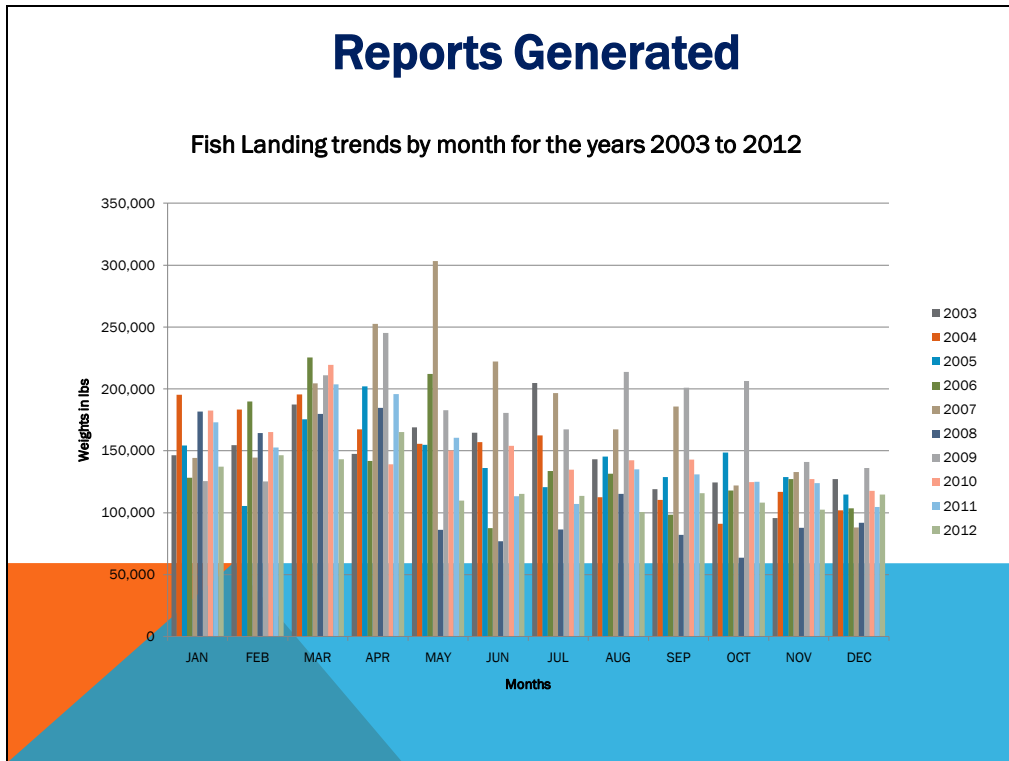
Slide 19



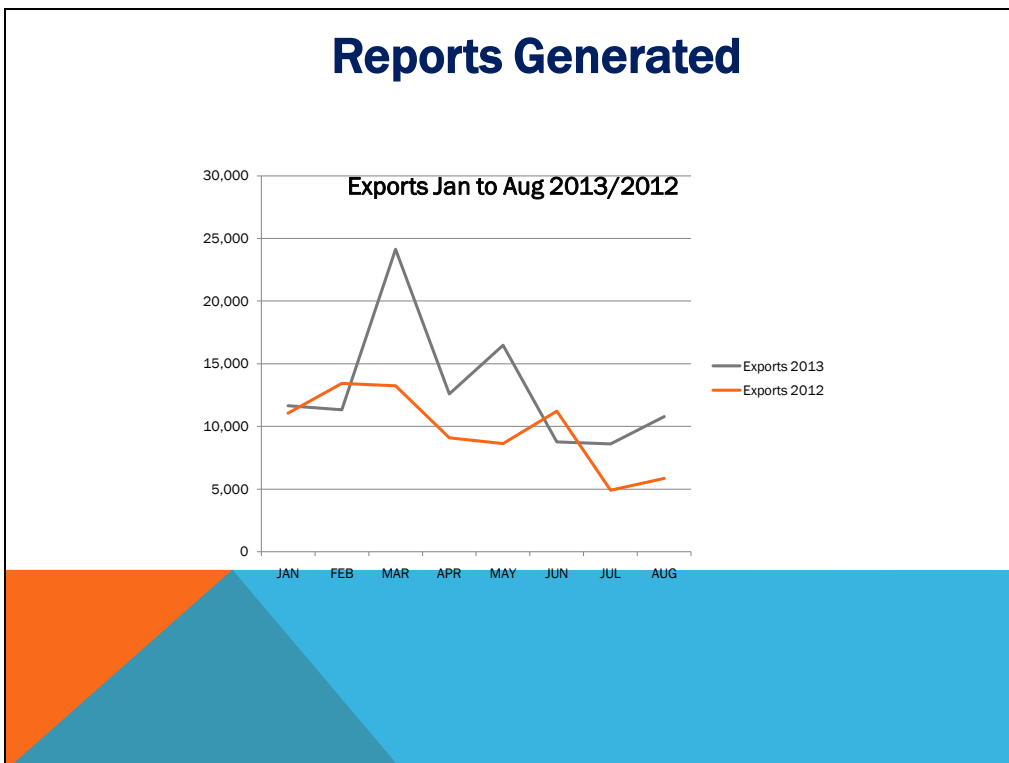
Slide 20

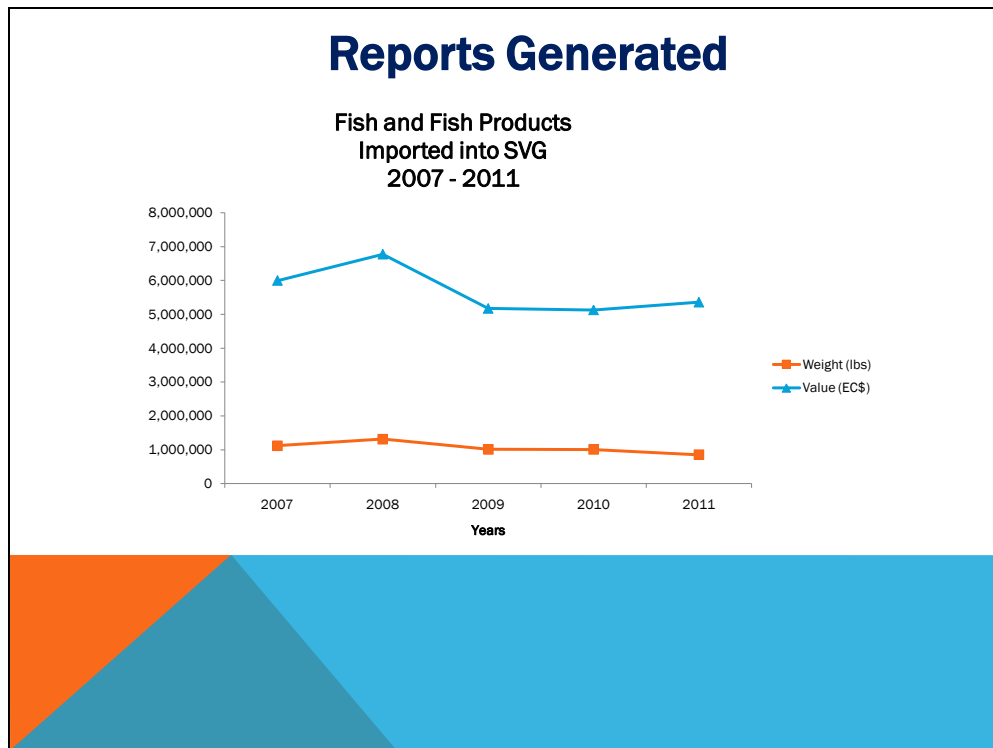


Slide 21



Slide 22





Data Quality Management

Recruit and train data Collectors to collect accurate and unbiased data.

Revise data collection forms (Catch and Effort, Daily Summary, Biological, Registration forms for fishers and vessels) to collect relevant and useful data.

Update database to store information gathered.

Conduct frequent meetings with data collectors to address issues such as

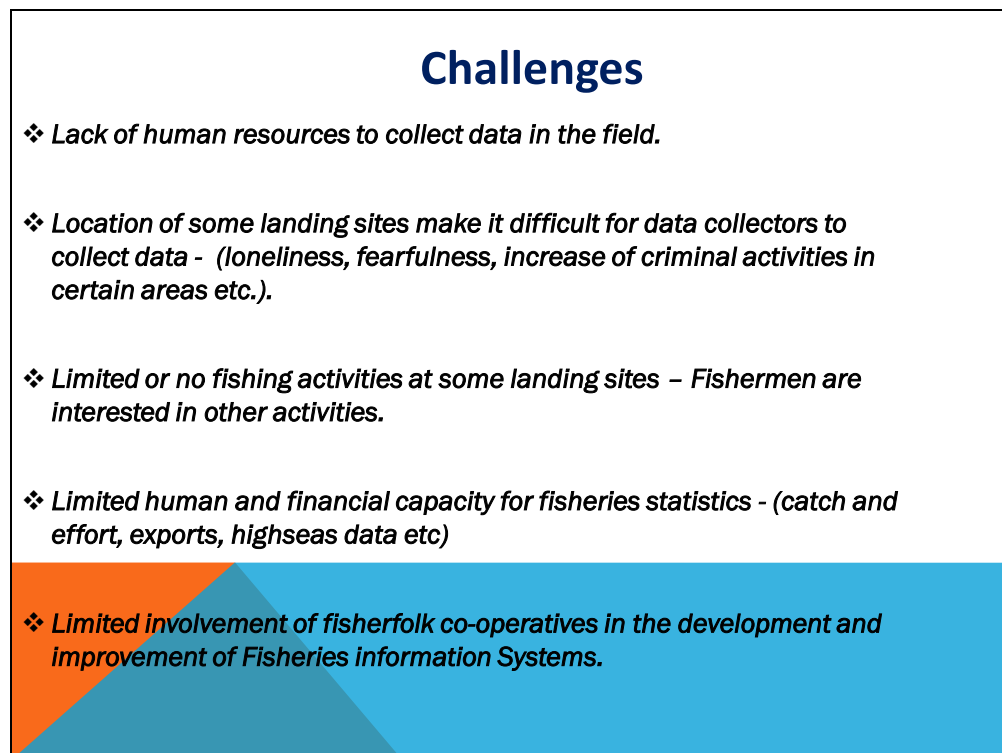
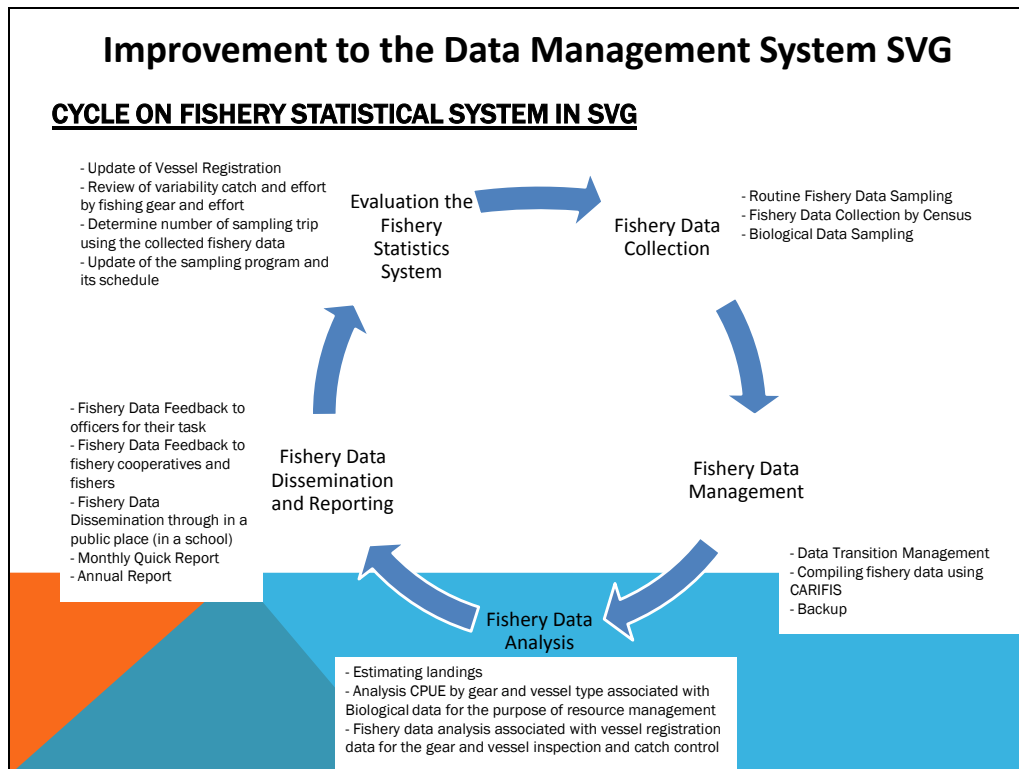
- missing information on forms
- proper species identification
- Clarity of the information given
- Check all forms for errors before entry into the database

DATABASE USED

- ✓ Caribbean Fisheries Information System (CARIFIS) – input catch and effort data, fishers, vessels
- ✓ Microsoft Foxpro – Create queries from CARIFIS Data base
- ✓ Microsoft Excel – Store census data, highseas data, Export data, all other data collected from time to time and creation of reports.

DATABASE MANAGEMENT

- ✓ Ensure that information gathered are entered correctly and stored in a reliable database (CARIFIS)
- ✓ Ensure frequent backup of the database so that there would not be a complete loss of data in the event of a computer crash or invasion of computer viruses.
- ✓ Check database files periodically for loss of data due to file corruption or for any unforeseen circumstances where the database becomes unresponsive/unstable.




Way Forward

- ❖ *Recruit and train data collectors to collect data in the field - Develop a data collection procedures manual.*
- ❖ *Eliminate or limit the number of sampling days for inactive landing sites .*
- ❖ *Increase the human and financial capacity for fisheries statistics*
- ❖ *Strengthen fisherfolk co-operatives through consultations, training and technical support corresponding to the needs identified by the fisheries cooperative to enhance co-management*
- ❖ *Seek to improve business and facility management support for all fishery facilities so that they will in turn provide the Fisheries Division with the data that is needed.*

THANK YOU
HAVE A NICE DAY!

D. Current and Future Data Requirements

Slide 1




CARIBBEAN REGIONAL FISHERIES MECHANISM

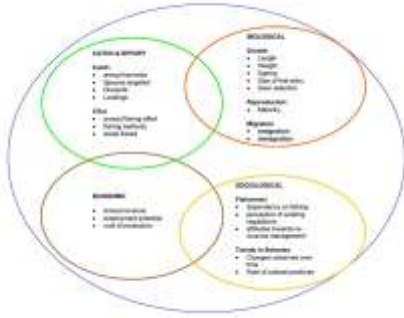
CURRENT AND FUTURE DATA REQUIREMENTS

Meeting on Statistics and Information needs


Slide 2



Determination of present and emerging fisheries information demands requires consideration of not only the required skills; but, these must be predicated on standards or methodologies previously accepted by States in the context of regional fisheries data and information management




- FISHERIES & AQUACULTURE**
 - Species
 - Distribution
 - Abundance
 - Harvest
 - Effort
 - Gear
 - Seasonality
 - Bycatch
 - Discards
 - Mortality
 - Stocking
 - Stocking history
 - Stocking success
 - Stocking failure
- ENVIRONMENTAL**
 - Temperature
 - Salinity
 - Dissolved oxygen
 - pH
 - Turbidity
 - Currents
 - Wave height
 - Wind speed
 - Rainfall
 - Sea level rise
 - Sea level fall
 - Sea level change
 - Sea level rise/fall
- INSTITUTIONAL**
 - Governance
 - Policy
 - Legislation
 - Regulation
 - Enforcement
 - Compliance
 - Monitoring
 - Evaluation
 - Reporting
 - Data management
 - Data sharing
 - Data security
 - Data privacy
 - Data integrity
 - Data accuracy
 - Data reliability
 - Data validity
 - Data consistency
 - Data completeness
 - Data timeliness
 - Data availability
 - Data accessibility
 - Data interoperability
 - Data portability
 - Data transferability
 - Data reusability
 - Data sustainability
 - Data resilience
 - Data robustness
 - Data flexibility
 - Data scalability
 - Data extensibility
 - Data modifiability
 - Data configurability
 - Data customizability
 - Data adaptability
 - Data transformability
 - Data convertibility
 - Data compatibility
 - Data interoperability
 - Data portability
 - Data transferability
 - Data reusability
 - Data sustainability
 - Data resilience
 - Data robustness
 - Data flexibility
 - Data scalability
 - Data extensibility
 - Data modifiability
 - Data configurability
 - Data customizability
 - Data adaptability
 - Data transformability
 - Data convertibility
 - Data compatibility
- SOCIOECONOMIC**
 - Demographics
 - Socioeconomics
 - Culture
 - Education
 - Health
 - Employment
 - Income
 - Expenditure
 - Savings
 - Investment
 - Consumption
 - Production
 - Distribution
 - Exchange
 - Trade
 - Transport
 - Communication
 - Information
 - Knowledge
 - Skills
 - Competence
 - Innovation
 - Creativity
 - Entrepreneurship
 - Leadership
 - Management
 - Organization
 - Administration
 - Supervision
 - Control
 - Coordination
 - Collaboration
 - Cooperation
 - Partnership
 - Alliance
 - Consortium
 - Network
 - Community
 - Society
 - Culture
 - Education
 - Health
 - Employment
 - Income
 - Expenditure
 - Savings
 - Investment
 - Consumption
 - Production
 - Distribution
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 - Trade
 - Transport
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 - Leadership
 - Management
 - Organization
 - Administration
 - Supervision
 - Control
 - Coordination
 - Collaboration
 - Cooperation
 - Partnership
 - Alliance
 - Consortium
 - Network
 - Community
 - Society



Species groups agreed by some Member States:

Pelagic fishes
dolphinfish, wahoo, yellowfin tuna, king mackerel, skipjack tuna, ballyhoo, jacks, robins, blackfin tuna.


Reef fishes
red hind, coney, blackbar soldierfish, doctorfish, yellowtail snapper, longspine squirrelfish, queen triggerfish, nassau grouper.



Species groups agreed by some Member States (cont'd):

Bank and slope fishes
yellow grouper, queen snapper, silk snapper, red snapper, vermillion snapper.

Invertebrates
lobster, conch, whelks.




Regional requirements

The main capacity needs, in the regional context, are listed below:

improvement in data management skills
collection and entering of data.


- Including collection of catch, effort, biological and socio-economic data (understanding of why data is collected and how it is used is an important but often neglected part of this). Not only at “beach side” but also from processing plants and other sources. Socio-economic data might include fishing equipment sales, including oil and fuel, which is useful for bio-economic analysis, monitoring the economic performance of the fishery in terms of value added and profitability



Regional requirements

Socio-economic data variables that are also expected to be collected from trip interviews (after Belize Review of Data Collection report).

<u>Variable</u>	<u>Comment</u>
Socio-economic data	
Fuel: quantity and/or cost	Fuel purchased and used for the day.
Oil cost	Maybe included in fuel cost above
Food cost	Food purchased for the crew
Bait cost	Only appropriate for traps and baited hooks. May be effectively zero if bycatch is used.
Other costs	Any other costs related to the trip
Comments	Any other information specific to the trip, such as breakdown.
Un-landed catch by species	The interview should specifically check whether there have been any discards, such as “trash fish”, small fish and so on.



Regional requirements (cont'd)

train and oversee more staff in collecting information, as well as run the logbook system.

- Would need to also consider training of fishers in completing log-sheets

basics of data management


- quality control
- data screening
- more in-depth understanding of relational databases
- backing-up

reporting

hardware support

specific statistical skills

- sampling and statistical estimation
 - principles of random sampling, stratification, unequal probability
 - sampling and estimation.



Regional requirements (cont'd)

conducting stock assessment analyses

- not an immediate priority, but consideration should be given to developing skills in the long term.

if CARIFIS is installed/updated: training in SQL

development appropriate fisheries management plans

information management

- converting data into useful information (for all levels of stakeholder)
 - Includes development of information products
- information dissemination



International requirements

A number of capacity needs exist in terms of meeting international requirements for data; however, these needs would be met by addressing the abovementioned regional needs.

For example, the most common data that FAO ask for annually from the Caribbean are:


- capture fisheries production;
- aquaculture production;
- production and trade of fishery commodities;
- fish consumption;
- fishery fleets;
- employment in fisheries.



International requirements (cont'd)


In reporting to FAO, countries utilize the following forms:

1. NS1-form for reporting statistics on capture production of fish, crustaceans, molluscs, etc., by species items and major fishing areas
2. Disposition of fishery production (captures and aquaculture - tonnes, live weight)
3. Number of fishers and fish farmers - commercial and subsistence
4. Number of decked vessels / total tonnage and total power by l.o.a. (length overall) and type
5. Number of undecked, powered and not powered vessels, by l.o.a. (length overall) and type
6. FAO/CWP form for reporting statistics on aquaculture



International requirements (cont'd)

The specific annual reports required for ICCAT contain specific, separate sections on fisheries, research, management and inspection activities and may optionally include appendices containing additional information pertinent to those sections.



International requirements (cont'd)

Information presented in Annual Reports is to be divided into the relevant sections to facilitate the extraction and copying of particular information required by the Commission and its subsidiary bodies, namely:

- Information on Fisheries, Research and Statistics
 - Annual fisheries information
 - Research and statistics
- Management implementation
 - Compliance with reporting requirements under ICCAT conservation and management measures
 - Implementation of other ICCAT Conservation and Management Measures
 - Difficulties encountered in implementation of and compliance with ICCAT conservation and management measures



International requirements (cont'd)

The relevant forms are available on the ICCAT website. While these may address types of monitoring that we do not routinely do, they are beginning to feature more with ICCAT such as observer programme data and trade data (Statistical document programmes). These developing areas are worthy of consideration at some point



E(i). Some Experiences with Coastal Community Engagement and Communication

Slide 1

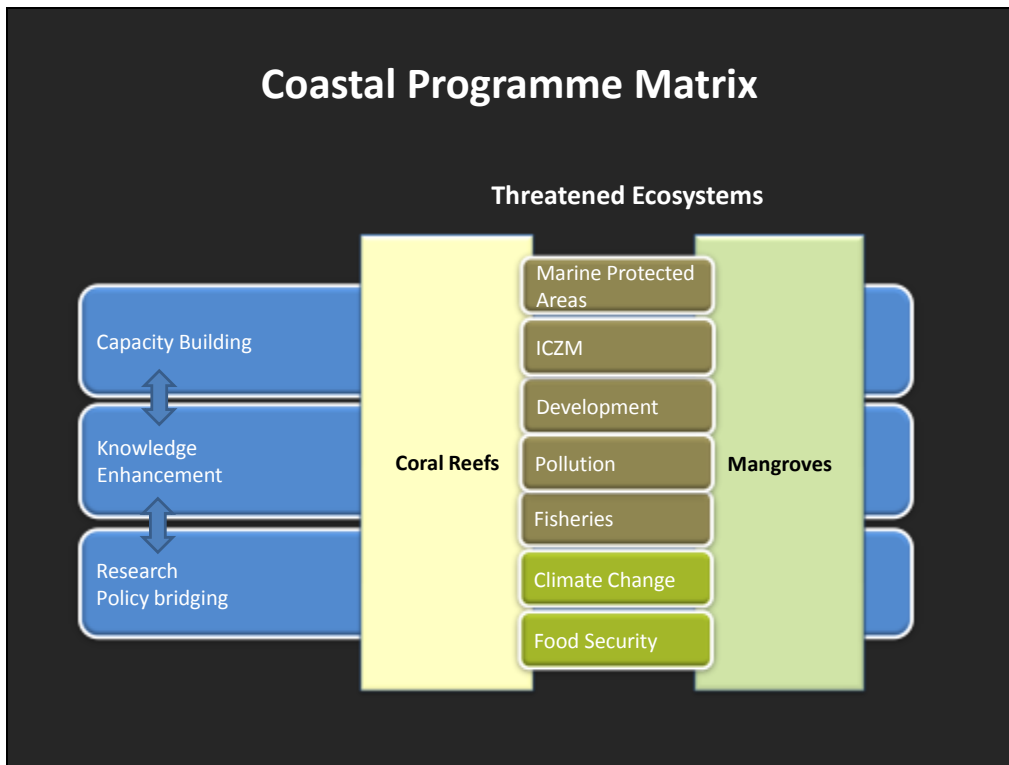


Slide 2

Lessons learned from around the world:

- 1) Engaging coastal community groups in collection of coastal (bio-physical) data
- 2) Lessons from similar issues in MPAs and coastal management
- 3) Communication and feedback
- 4) Building & maintaining networks

Slide 3



Slide 4



- A lot of data is scattered and inaccessible
- A lot of data is on paper on a dusty shelf
- Disconnect between different Divisions within government – no linking of data
- Data is not well fed into management
- Data is not shared with stakeholders
- Lack of trust and communication between government, NGOs and Communities impedes co-management
- Top-down approach to management
- You need many consultation meetings and not just one

Lessons from Project on reef connectivity for the design of MPAs (World Bank Project)

Belize, Guatemala, Mexico, Honduras


Meso-American Barrier Reef

- Collecting and Monitoring Physical and Biological Parameters in 4 countries at multiple reef sites
- Staff local NGOs and managers trained
- Database management and sharing problems



Caribbean Coastal Pollution Project

World Bank and Canada POPs Trust Fund



Belize

Dominican Republic

Guatemala


Honduras

Jamaica

Mexico

St Lucia

Trinidad & Tobago



Network established of individuals from 18 partner agencies

Technical Training








Slide 9

 <p>Inter-lab comparison exercise Mexico, Jamaica & 2 Canadian labs</p>	 <p>Upgrade (equipment) national and regional laboratories</p>	 <p>Build capacity to monitor & manage pollution</p>
 <p>Initiate baseline sampling & ongoing regional monitoring of coastal waters</p>	 <p>Local research (demonstration) projects</p>	 <p>Build network among stakeholders</p>

Slide 10

A clear plan

- What type of information do we need?
- What type of information can a community realistically collect?
(Standard species list, measure, weigh etc.)
- Which communities are we targeting?
- Do we already work with these communities?
- Is there a local community group or NGO?
- How will sites be selected and why?
- How often do we collect data?
- Who collects data?
- Who manages the data?
- Who analyses data?
- What will data be used for? Not mindless monitoring
- How will you monitor impacts of changes made?

Things to Consider

- General capacity coastal fishing communities in collecting (fisheries) information is weak
- Overall low level of awareness of fishery issues
- Level of engagement will depend on culture-location (country)
- First need to develop strong level of trust with coastal communities & building trust takes time
- Acceptance that fisheries staff are trying to help fishers improve their catch
- Build support for the need for regulations
- Build willingness to share catches with fishery officers
- What is their incentive or reward?
- Clearly explain in their language why you need them involved and what this is for. Nothing fluffy

Have a clear message



For example - all ecosystems are connected and so are the fish you are fishing
E.g. If you overfish in mangroves you take away babies and reduce your catches on reef

Things to Consider

- There are many “beliefs” or superstitions that are very hard to change
- No one wants to have anyone tell them what to do
- What will the data be used for and will there be regulatory measures that impact the communities?
- Will tenure and fishery rights be taken into account?
- Lack of communication and trust between different fishermen groups (trap, line and net)
- Staff turn over need to re-train
- Linking authority goals to goals & needs to community
- Communities also need to be involved in decisions

Use existing community org’s or coastal management agencies/NGOs

- Is there a local management unit that can be the link between authorities and community?
- Often management NGOs have already built up levels of trust and understanding and have good rapport with community members
- NGOs can be used as communicator for the collection of fishery data
- Use experiences and guidelines MPA community

Community consultations

- Regular community consultations that are informal frank and open and are not dominated by the authorities
- Preferably led by a local community member that everyone knows well
- Asses what coastal communities' priorities & management needs are
- Speak language that all understand, make it fun, not too heavy
- Clear reports of consultation meetings with key issues and suggestions noted
- Follow up on actions needed to be taken
- Reports shared with all stakeholders publically available
- No hiding of information

Provide regular feedback/stay connected to communities

- Too often we come in with a splash and then slowly disappear
- Provide feedback to the community on how their concerns and recommendations were addressed and used
- What is being done with the data?
- Follow up consultation meetings or visits communities, or use leaflets and even local media



You need “local champions”

- With a local champion you have won half the battle
- Crucial to get full community support and ownership
- Can serve as communicator and motivator to others
- Can take the lead in gathering information

Example of community based seasonal closure of a marine reserve in Madagascar

- A clear message on link mangroves and reefs and role mangroves as nurseries
- Local NGO led this effort with many years of community consultations and negotiations - this is raising awareness.
- Once local fishermen understood that mangroves are the nursery area for many of their fishery species they voluntarily closed the area down seasonally to let the stock grow again and for their fish catches to improve
- Now local fishermen educate others and lead initiative



E(ii). Enhancing Data Collaboration, Analysis and Management

Slide 1

ENHANCING DATA COLLABORATION ANALYSIS AND MANAGEMENT

CARIBBEAN ICT RESEARCH PROGRAM
11.02.2014



The illustration shows two children on the left, one holding a fishing rod and the other a red fish, standing next to a wooden table. On the right, a man in a white shirt and tie stands holding a tablet. A large black double-headed arrow connects the children to the man, symbolizing collaboration between traditional and modern data collection methods.

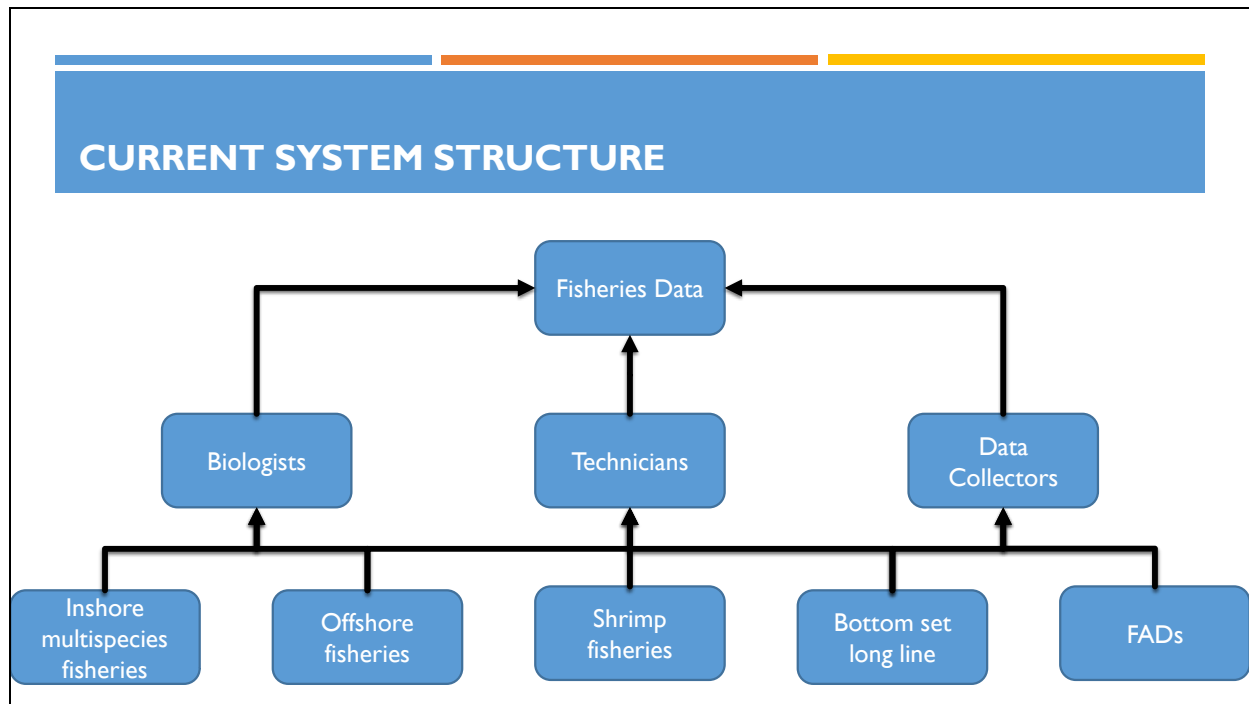
Slide 2

UNDERSTANDING THE CURRENT SYSTEM

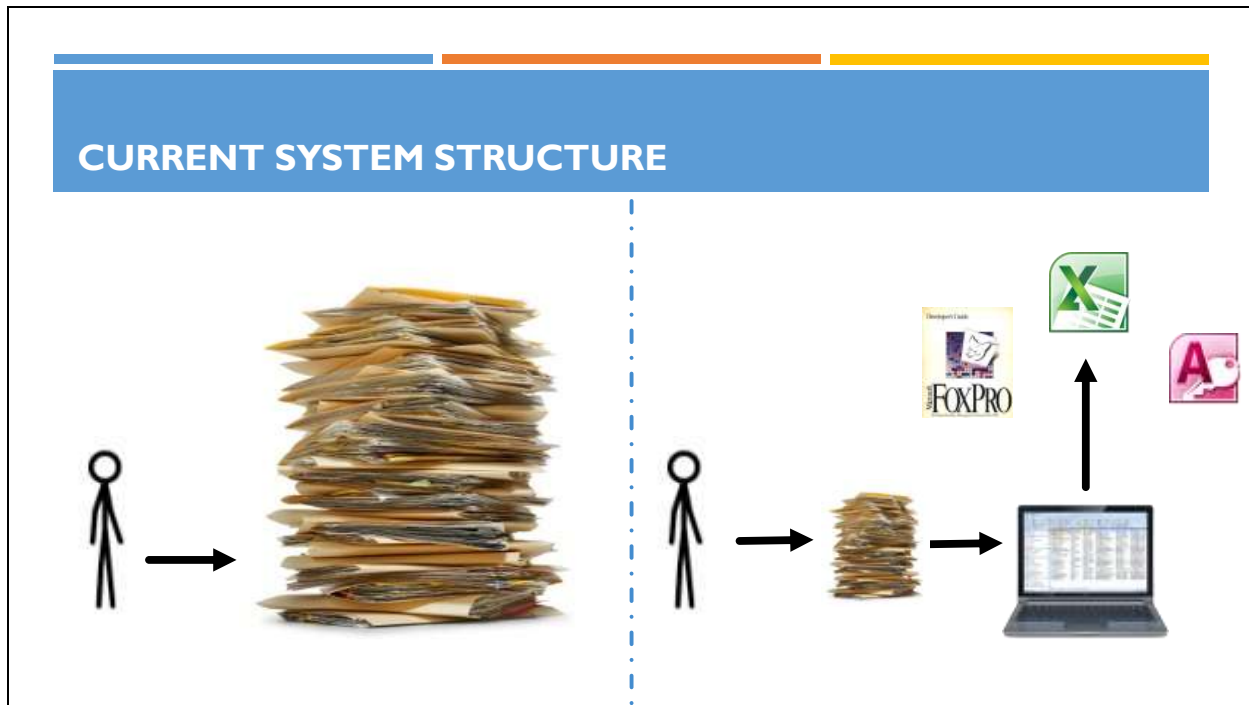
In order to introduce an ICT system that would enhance data collection, collaboration, analysis and management we must first analyze the current working system.

- ❑ Current System Structure
- ❑ Issues Faced by Current System

Slide 3



Slide 4

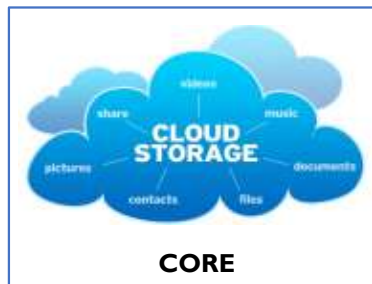


ISSUES FACED

<ul style="list-style-type: none"> ❑ Paper Based Database / Local Database ❑ Data not readily available, or accessible ❑ Data loss is lost or corrupted ❑ Incompatible platforms 	DATABASE
<ul style="list-style-type: none"> ❑ Practice / Forms varies from area to area 	FLEXIBILITY
<ul style="list-style-type: none"> ❑ Manual aggregation of data ❑ Forms and collected information changes over time ❑ Time delays obtaining sampled information ❑ Sampling issues (no biological data, etc.) ❑ Data quality issues 	SAMPLING

ADDRESSING THE ISSUES: DATABASE

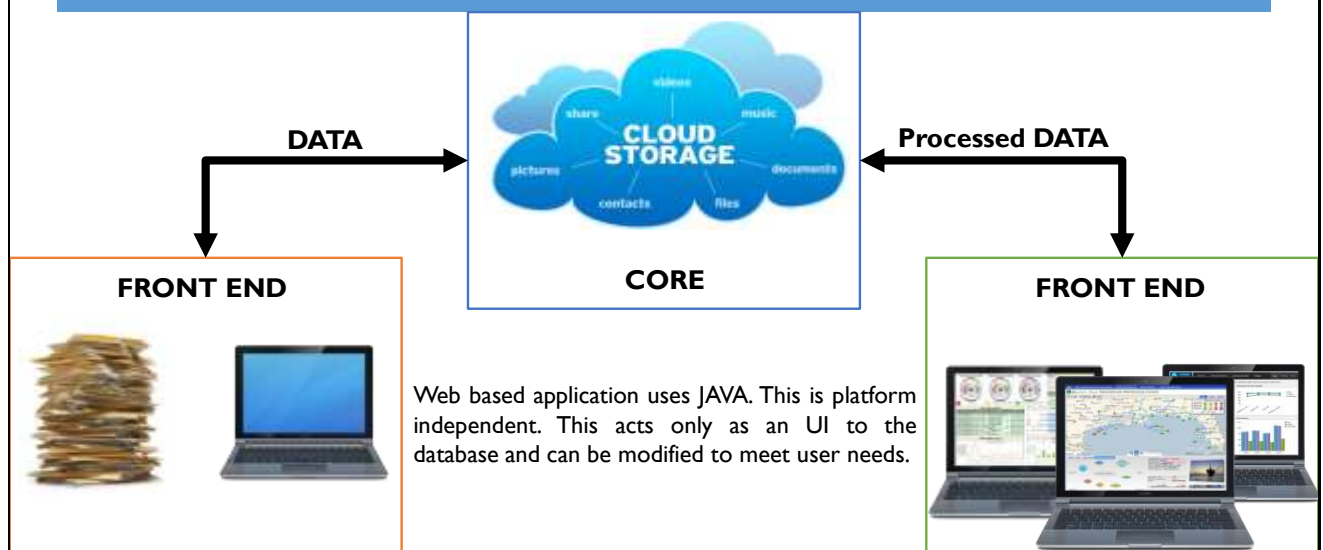
With an ICT tool a centralized data store can be implemented where all information is automatically collected and aggregated. Removes the need for manual aggregation and summaries. Further more this information can be easily accessed.



ADDRESSING THE ISSUES: DATABASE (CLOUD ADV)

- ❑ Online hosted database
 - ❑ Servers are used to store information. Server itself has no GUI and remote access can be used.
- ❑ Open source (Free)
 - ❑ Free server and SQL database are available: LAMP (Linux Apache MySQL Php)
- ❑ Worldwide support
 - ❑ Most common type of database system used.. Great support with technical difficulties.
- ❑ Flexible
 - ❑ SQL queries makes it very flexible. SQL queries can be made to return any amount of information, in any type, form, style etc.
- ❑ Scalable
 - ❑ Can handle increasing amounts of load, information stored.
- ❑ Data Redundancy
 - ❑ Cloud data is stored among several database servers. Reduces the chances of lost data.
- ❑ Data security
 - ❑ Security certificates (SSL) can be used to protect private information stored in database. Can meet national and international standards
 - ❑ Cloud security provides extra security (New)
- ❑ Supports web based applications

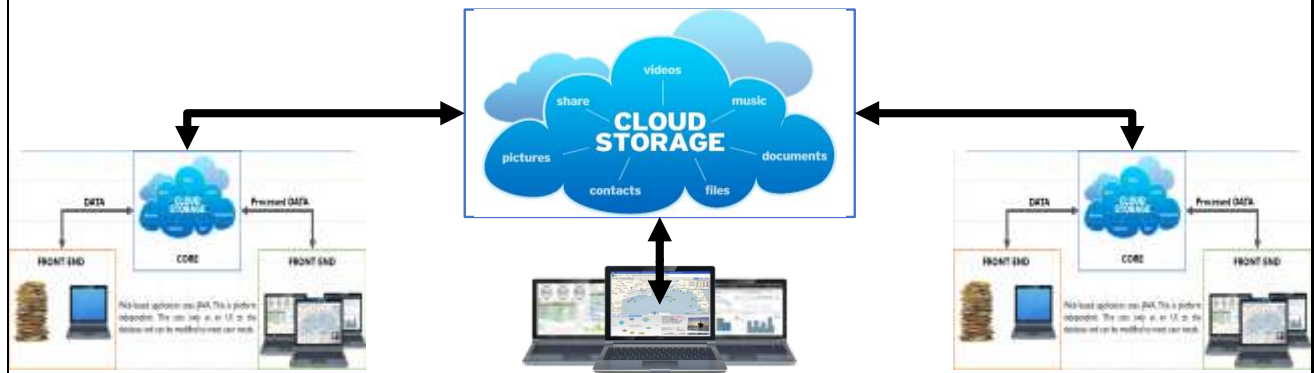
ADDRESSING THE ISSUES: DATABASE



ADDRESSING THE ISSUES: DATABASE

Interoperability

- This system allows standardized sharing of information amongst different bodies. Allows for communication for processed information, rather than raw data, however raw data can still be shared if required.



ADDRESSING THE ISSUES: USABILITY

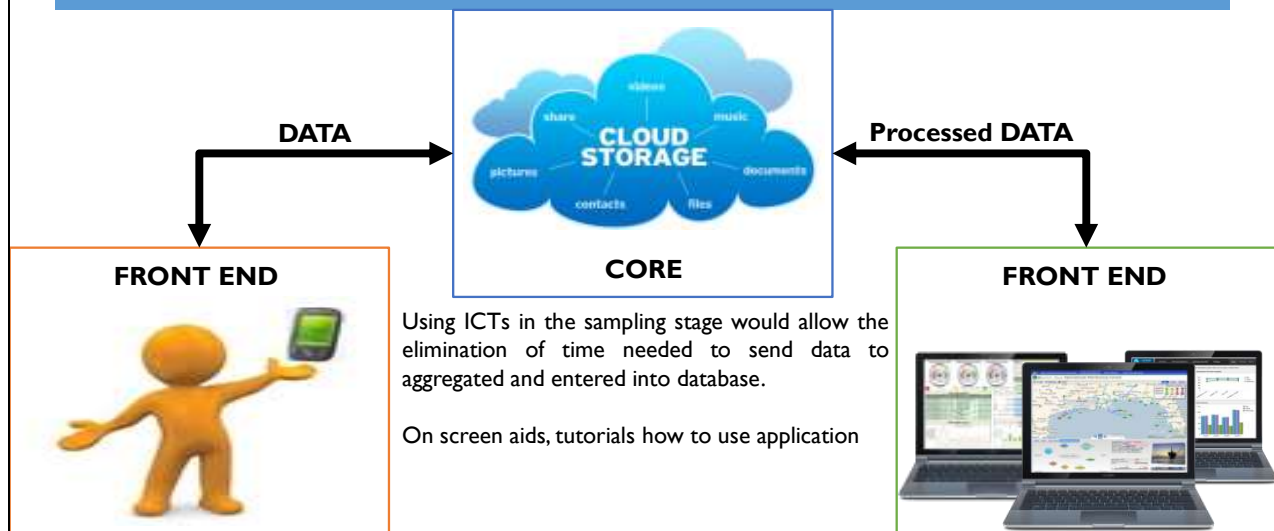
- Both front ends can be edited to have maximum usability, user friendliness. On screen aid, prompts etc. can be used to guide users.



ADDRESSING THE ISSUES: SAMPLING

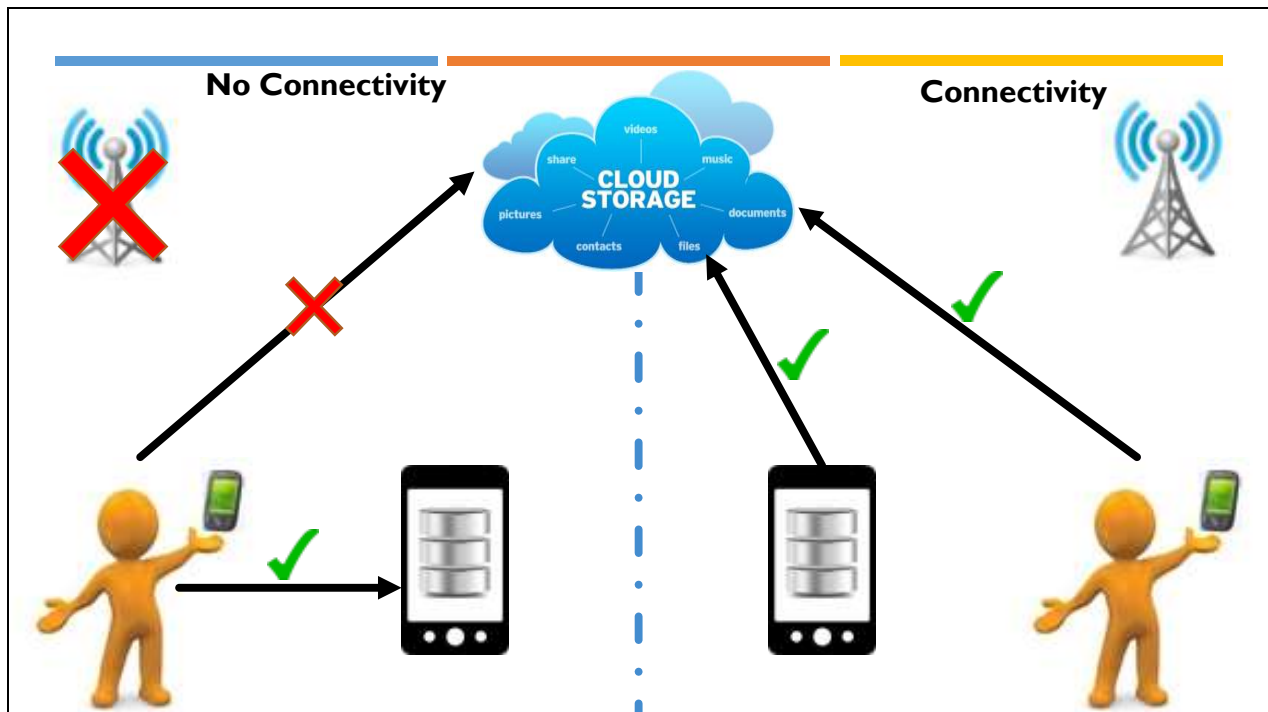
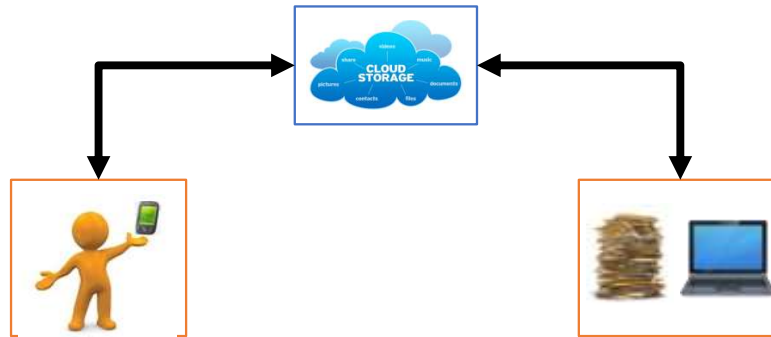
- ❑ In order to successfully collect data we must improve all areas of the system.
- ❑ Must satisfy all users of the system.

ADDRESSING THE ISSUES: SAMPLING



ADDRESSING THE ISSUES: SAMPLING

- ❑ Any changes made to forms or sampling practices are communicated immediately.
- ❑ Offline capacity where data is collected and stored on the device, then once in connectivity is acquired it upload to the central repository system.



ADDRESSING THE ISSUES: SAMPLING

- Mobile screen sizes now large enough to display as much information as paper based methods.



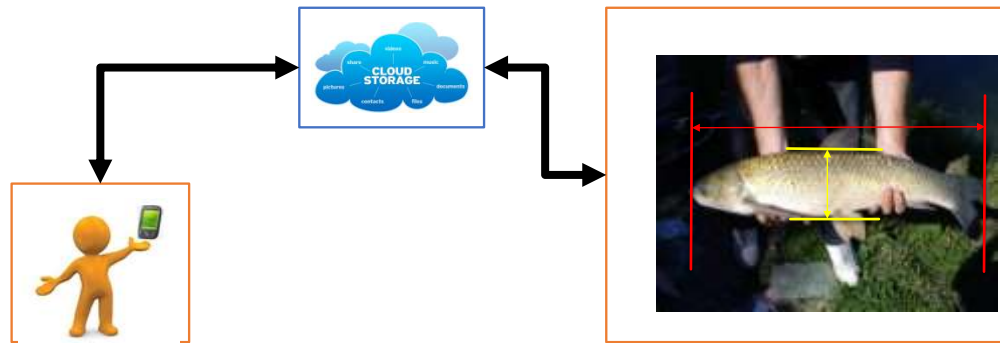
ADDRESSING THE ISSUES: SAMPLING

- ICT can also provide automated, assisted and passive data capture.

Sample Information	Date of Sampling Enumerator	
Vessel Information	Vessel Registration Gear Details	Assisted form inputs: preloaded select boxes
Effort and Activity	Days Away from port, days fishing, additional effort data	Assisted form inputs: preloaded select boxes, sliders etc.
Spatial Information	Fishing grounds Landing Place	Automated form inputs: GPS, sensors satellites, remote sensing
Information on total landings	Weight by Commercial Price per Kg commercial	Passive form inputs: Aggregated information on number of landings
Discard information	Percent discarded	Assisted form inputs: select boxes, number pickers
Within commercial group	Sample species composition	Passive form inputs: automatically record create a list of sample species
Within species, length frequencies samples	Sample for length frequencies	Assisted form inputs

ADDRESSING THE ISSUES: SAMPLING

- Other input technologies: Biological information



ADDRESSING THE ISSUES: SAMPLING

- Other Input Technologies: Digital Pen
 - Mobile ICT can facilitate digital pen technology for collection of qualitative information.
 - Digital Pen can also facilitate easier inputs to data collection forms



ADDRESSING THE ISSUES: SAMPLING

- ❑ ICTs can improve and even solve of some the issues faced by the present system. However what are the other capabilities of ICTs in data collection?
- ❑ Data Validation: Form inputs can be automatically validated for correctness before being submitted. This reduces the errors at the source.
 - ❑ Limits can be set, from predefined knowledge to reduce errors in inputs.
 - ❑ Ensure no unwanted blank fields.



ADDRESSING THE ISSUES: SAMPLING

- ❑ Language: ICT application can easily be translated to many other different languages. Information shared can also be automatically translated, facilitating collaboration amongst different languages.
- ❑ Units handling: doesn't matter of the units entered as ICT applications can convert before storing or presenting information.

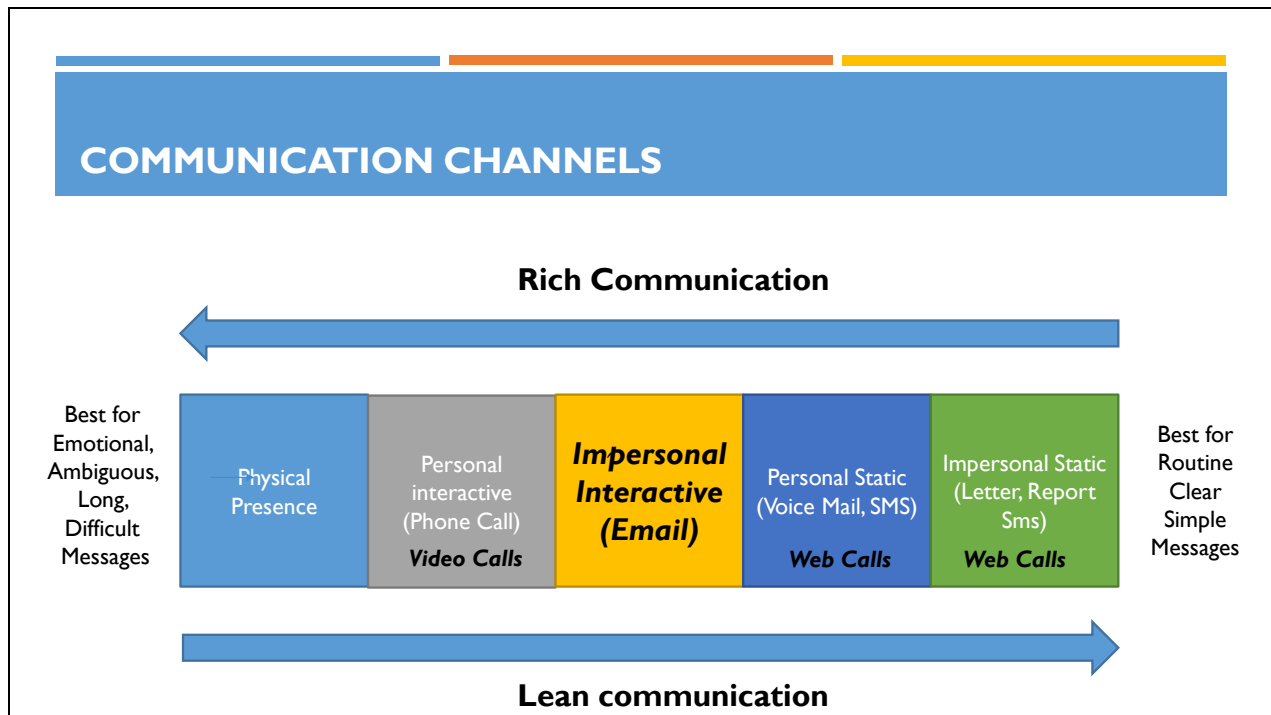
ADDRESSING THE ISSUES: SAMPLING

- ❑ Data Dashboard: ICTs can provide an interactive environment where information can be visualized both graphically, and spatial. This can be useful to data analysts to examine real time changes to trends as the information presented can contain information collected from a day to day basis.



ADDRESSING THE ISSUES: SAMPLING

- ❑ Crowd Sourcing: ICTs can empower any stakeholders to add their views and input/report on issues. This data can be used to establish upcoming trends, help predict future problems.
- ❑ Qualitative to quantitative conversions. Interviews can be processed to obtain statistics



INTRODUCTION TO SDLC

- Where ICTs are involved, a software development life cycle must be employed.
 - Would ensure that the functional and performance requirements are first identified
 - Would ensure that correct system components are used that would meet the requirements of the system stakeholders and performance requirements.
 - Ensure a proper design that can perform under load etc.
 - Testing and implementation
 - User training.

The slide features a blue header bar with the title 'INTRODUCTION TO SDLC'. Below the header, there is a bulleted list. The first bullet point is 'Where ICTs are involved, a software development life cycle must be employed.' followed by a sub-list of five items: 'Would ensure that the functional and performance requirements are first identified', 'Would ensure that correct system components are used that would meet the requirements of the system stakeholders and performance requirements.', 'Ensure a proper design that can perform under load etc.', 'Testing and implementation', and 'User training.'

THANK YOU



APPENDIX 4: PROPOSED INTERVENTION POINTS AND ACTIONS FOR STRATEGY FOR CAPACITY BUILDING TO STRENGTHEN FISHERIES DATA AND INFORMATION MANAGEMENT IN THE CRFM

Introduction and Background

The Caribbean Regional Fisheries Mechanism (CRFM) has established a long-term relationship with the University of the United Nations – Fisheries Training Programme (UNU–FTP), Iceland, for the purpose of building national and regional capacities for fisheries development and management in the region. Recently, the UNU provided further support to the CRFM by the conduct of a training needs assessment. The assessment pointed to the management of statistics, data and information as an area still requiring concerted effort by Member States. It was recognized, however, that given all the work done previously in these regards it became necessary to prioritise training needs with regard to these areas; devise new strategies and approaches to address this problem; and, to agree on modalities through which UNU can facilitate the provision of training in support of these strategies and approaches. This is particularly important in light of the Caribbean Community Common Fisheries Policy, in which this topic is an important issue.

To this end, UNU–FTP supported the hosting of a workshop to develop a Strategy for strengthening capacity in CRFM States in the area of fisheries statistics and information. The overall objective of the workshop was to agree on new strategies and approaches for the management of fisheries statistics, data and information in the context of the Caribbean Community Common Fisheries Policy; and, to determine preferred modalities for capacity building in support of these strategies and approaches

Training Needs Assessment in fisheries divisions of the CRFM member states

A Training Needs Assessment was made in October 2014 in the Fisheries Divisions of the CRFM Member States. Respondents were asked to indicate their views regarding competencies existing in their departments. The findings indicated that respondents perceived strong competency in various fisheries administration activities, fisheries management, awareness building, and communication with stakeholders. Low competency was believed to exist in Environmental Monitoring, Quality Assurance, and Aquaculture. Training options in fisheries at university level are little, and fisheries staff relies on short courses and “on-the-job” training to improve their professional skills. The training activities vary greatly among FDs. Few of the fisheries officers have academic training and the staff of the FDs has mainly received training in various Fisheries Management issues which reflects their competency in fisheries management. The FDs identified, as a priority, training in Data Collection and Management, Fisheries Management, and Project formulation and planning, but put little emphasis on Fishing gear technology, Quality assurance and Aquaculture despite that fact that these are areas of low competency and have been identified as priority areas in the CRFM strategic plan. The study identified need for training in the area of data management, quality assurance, and aquaculture, and recommends regional scholarship programme for fisheries studies, establishment of a research fund to promote research and education in fisheries in regional universities, and that a capacity building strategy is made both nationally and regionally.

Performance of CRFM Annual Scientific Meetings (format and outputs) and associated Dgroups

The CRFM Annual Scientific Meeting (ASM) serves as a forum for the meetings of five resource working groups for major commercial species (conch and lobster; shrimp and groundfish; reef and slope fish; large pelagic fish, and small coastal pelagic fish) as well as the Data, Methods and Training Working Group (DMTWG). Through the DMTWG participants have also received training in use of various assessment methodologies, statistical and stock-assessment related software. There is also opportunity for collaboration with international consultants (contracted for the meeting) as well as regional technical

officers towards improving the quality of data and information used for fisheries management decision-making.

Use of “limited” data for economic analysis and fisheries management purposes

Given the limited human and financial resources, it is necessary to bear in mind the costs and benefits of data collection. The data collection costs can include: organization and management, collection, and storage. The benefits of data collection can include more accurate models and improved decision making. The net benefits of data collection reach a maximum at the optimal complexity point. This point can change throughout time as the costs and benefits can change. More complex modeling is therefore not always better. Risk and uncertainty should be incorporated into the model choice as the net benefits of a simple model can be greater when risk is low compared to a complex model. Similarly, the net benefits of a complex model can be greater when uncertainty is low compared to a simple model.

Data management and realistic analysis of fisheries data for stock assessment

Fisheries science is a quantitative field that covers diverse fields. Achieving an assessment based on some analytical model should be considered as only one element within this field and not as a goal in itself. Good understanding of the development, status and driving forces within fisheries are a prerequisite when inference is made with respect to likely development and status of the biological stocks.

Increasing competence and skills in fisheries analysis could be achieved by using a step-wise approach. Deliverables along such a route need to be carefully defined (to make them achievable) taking into consideration the current knowledge and technical level. The first deliverable could be a detailed analysis of the development, status and importance of the fisheries as a whole. This analysis could include an evaluation of the current sampling design. Important part of the objectives could be increasing the competence and skills in statistical data analysis, making inferences (connecting the dots), reporting and presentation.

National fisheries information systems

Despite the differences in the magnitude of catches of different countries in the region and limitations as regards data quality, as well as resource limitations, there appear to be sufficient data which can be used to populate a regional database and which can be analyzed to provide information for management. However, issues regarding insufficient human capacity for future expansion of data collection programmes remain. Consequently there is need to rethink the existing sampling strategies and to redeploy existing resources in a more effective way. There still remains a need to standardize data format across countries, particularly for shared resources.

The apparent lack of confidence in data quality results in hesitance to analyze existing data and apprehension to provide information on the fishery based on the data. There is need to gain greater confidence in basic data analysis and a commitment to improving the current situation to improve on data quality. However, collecting more data would not solve this situation. Existing data should be analyzed and the respective caveats stated upfront in the outputs of such analyses. There is need to develop the understanding of the fishery and associated resources so as to inform the sampling strategy. In addition, standard reports for management of the respective data collection, data entry and management systems should be produced to reach a wide audience; and, stakeholder feedback on the data collected is critical to achieving buy-in, motivation etc.

Current and future data requirements

Determination of present and emerging fisheries information demands requires consideration of not only the required skills; but, these must be predicated on standards or methodologies previously accepted by States in the context of regional fisheries data and information management. As the demands for management advice expand to address the ecosystem-based approach and risk management, the main

capacity needs, in the regional context, are: improvement in data management skills, specific statistical skills; conducting general fishery and specific stock assessment analyses; if CARIFIS is installed/updated, training in SQL; development appropriate fisheries management plans; and, information management. The landing of catches in foreign countries, due to more lucrative economic prospects, creates a challenge for data collection. A number of capacity needs exist in terms of meeting international requirements for data; however, these needs would be met by addressing the abovementioned regional needs. The most common data that FAO ask for annually from the Caribbean were indicated. The specific annual reports required for ICCAT contain specific, separate sections on fisheries, research, management and inspection activities and may optionally include appendices containing additional information pertinent to those sections. Information presented in Annual Reports is to be divided into: Information on Fisheries, Research and Statistics and Management implementation. The relevant forms are available on the ICCAT website. While some of the data required by ICCAT may address types of monitoring that we do not routinely do, they are beginning to feature more with ICCAT such as observer programme data and trade data. These developing areas are worthy of consideration at some point.

Networking and using ICT to enhance collaboration in data collection, analysis and management

An impediment to attaining effective region wide fisheries management in the Wider Caribbean Region (WCR) is incomplete capture of artisanal catches taking place at numerous often remote sites and not always entering a clear commercial market. One way to improve data collection at these sites is by engaging local fishing communities and/or small fisherfolk organizations. Decentralized and more community-based approaches to coastal management have proved to be effective in other areas around the world. There are lessons contained in UNU INWEHs experiences on engaging coastal community groups in the collection of coastal bio-physical data and on building a network for data collection, analysis and management. A key element in achieving community participation in fisheries data collection and management is the creation of a sense of ownership. Current awareness of local fishing communities on fishery issues and their capacity in collecting fisheries information is overall low. Awareness and capacity must be built on the need for collection of catch and effort data, the value of management and the fact that fisheries staff are trying to help fishers improve their catch.

With the growing demand for data and a system to support proper collection and sharing, information communication technologies (ICTs) can be viable tools for data collection in fisheries management. Its support of real time communication allows it to automate many operations providing faster collection of datasets and communication from field agents to governing organizations and other stakeholders. It offers data quality, security and can flexibly provide functions across dispersed geographic locations and countries that exhibit different preferences and user demands, while still harmonizing the data sets collected into a regional dataset. Furthermore ICTs can help evaluate results that can in the future support evidence based decisions, policy modification and effective resource management.

Strategic actions

The main points of the discussions are captured in the report of the workshop; however, based on the discussions, a number of actions were identified. These actions are in the main related to Strategic objective A: *Information on status and trends in the fisheries and aquaculture sector* of the provisional Strategic Plan for the CRFM. The organizational results for this strategic objective are:

- A1 A regional database on fisheries and aquaculture statistics and information from the CRFM members is established and maintained at CRFM headquarters.
- A2 Appropriate standards for data and information sharing are adopted by the Countries, supported by a protocol for data and information sharing.
- A3 Countries have strengthened capacities to collect, analyze and use data and information for decision making, planning, policy formulation and implementation
- A4 A CRFM Statistics and Information report is published bi-annually

To varying extents, the proposed actions also relate to the other strategic objectives of the CRFM; in particular, as they are relevant to the reporting function:

Strategic Objective B: Research & Development

Strategic Objective C: Sustainable management and use of fisheries resources

Strategic objective D: Sustainable development of aquaculture

Strategic Objective E: Adaptation to climate change and disaster risk management in fisheries

Strategic Objective F: Capacity building and institutional strengthening

Strategic Objective G: Effective collaboration with member states and stakeholders

Strategic Objective H: Efficient and Effective administration

The proposed strategic actions are indicated below:

Intervention point	Proposed action	Timeframe	Responsible entity
Field Sampling and Data Collection	Identify the most important information and establish minimum level of data to be collected for fisheries analysis by all Member States	immediate ²	Fisheries Divisions; CRFM Secretariat
	Agree on and implement a common /standard format for the collection and presentation of fisheries data.	soon	Fisheries Divisions; CRFM Secretariat
	Agree on the list of ten most commercially important species to be assessed/monitored regionally.	immediate	Fisheries Divisions; CRFM Secretariat
	Create awareness of the important role data collectors play in the whole data management process.	ongoing	Fisheries Divisions
	Provide training/coaching and mentoring of data collectors on a periodic basis	ongoing	Fisheries Divisions
	Routinely update national sampling plans as required	immediate and ongoing	Fisheries Divisions
	Develop and implement a data quality control mechanism	soon	Fisheries Divisions; CRFM Secretariat
	National reporting on best practices (which should be updated yearly). • Develop and provide guidelines to countries in documenting the best practices they implement, lessons learned etc.	Annually, with periodic updates of guidelines as necessary	Fisheries Divisions • CRFM Secretariat
	Build awareness among stakeholders of their role in providing information for fisheries management ³	Soon and ongoing	Fisheries Divisions; CRFM Secretariat • Fisheries Divisions

² “immediate refers to an activity that should begin immediately and should be completed in the next 4-6 months; “soon” refers to an activity that would begin within the next 2-4 months but should be completed within no more than a 12 month period

³ Issues regarding training of fishers and development of trust so as to facilitate their contribution to fisheries data collection were discussed, including issues related to buy-in and support for the management measures. Given the limited financial resources it was recommended that consideration be given to non-financial incentives to fishers to collect data.

Intervention point	Proposed action	Timeframe	Responsible entity
	<ul style="list-style-type: none"> Identify “Champions” in the field is critical 		
	Make most effective use of existing regional capacity to take lead roles at the scientific meetings	ongoing	CRFM Secretariat
	Further develop regional capacity in the areas of deficiency.	ongoing	Fisheries Divisions; CRFM Secretariat
	Consider creation and or establishment of web based database	soon	CRFM Secretariat
	Explore procedures regarding data collection and data quality that are used by other regional fisheries bodies	immediate	CRFM Secretariat; Fisheries Divisions
	Evaluate use of ICT at the level of data collection	soon	Fisheries Divisions; CRFM Secretariat
	Develop legal instrument for commitment on the part of resource users to provide data	Soon; especially in context of CCCFP	Fisheries Divisions with some assistance from CRFM Secretariat as requested
Database Management and Manipulation	Develop partnerships for database management and to facilitate continued database maintenance	ongoing	CRFM Secretariat
	Determine preferred/required information (regional? national?) <ul style="list-style-type: none"> Consider querying/ reporting/sharing requirements that determine minimum requirements for national, regional and international uses <ul style="list-style-type: none"> Evaluate existing national and regional fisheries databases⁴ Determine need for more data fields for inclusion in (the existing electronic) database(s) taking account the role of CRFM as a data provider Identify types of and variations in required information 	immediate ⁵	Fisheries Divisions; Forum <ul style="list-style-type: none"> CRFM Secretariat <ul style="list-style-type: none"> Fisheries Divisions; CRFM Secretariat Fisheries Divisions; CRFM Secretariat CRFM Secretariat
	Evaluate utility and cost options of online technologies as “backend” for database ⁶ <ul style="list-style-type: none"> engender collaboration between CRFM Secretariat and ICT research 	immediate ⁵	Fisheries Divisions; CRFM Secretariat <ul style="list-style-type: none"> CRFM Secretariat

⁴ The use of online database systems can be approached on a phased basis. It is noted that apprehension concerning use of a new system by Data Entry personnel can be averted by having the front end developed in line with what such persons are already accustomed to using. The use of online database systems is supported on the basis that the software is open-source and technical assistance is widely available. In addition, there are ample security measures in place and access to data in various forms can be controlled. Consequently a number of problems in management are easily solved.

⁵ This would require the post of Programme Manager, Statistics and Information at the CRFM Secretariat to be filled

⁶ Including centralized management and maintenance of database; this will also address issues of availability/ accessibility/ utility of existing data and also support mainstreaming

Intervention point	Proposed action	Timeframe	Responsible entity
	institutions to facilitate utilization of on line (including “cloud”) technologies		
	Design and develop preferred “front-ends” for database(s)	soon	CRFM Secretariat; ICT research institution
	Facilitate migration of existing data as required	Dependent on acceptance of preferred options	Fisheries Divisions assisted/facilitated by CRFM Secretariat
	Performance and functional test of the revised database platform (including development of prototype) ⁷	Prototype - In time for next Forum meeting	Fisheries Divisions; ICT research institution; CRFM Secretariat
	Deploy/launch revised database platform ⁸	soon	ICT research institution; Fisheries Divisions; CRFM Secretariat
Data Analysis and Meaningful Reporting ⁹	Facilitate more holistic analyses during scientific meetings. <ul style="list-style-type: none"> Scientific Meeting Working Groups to develop work plans with time schedules. These work plans should consider the need for <ul style="list-style-type: none"> Valuation of the fishery sector and related activities. A detailed analysis of the development, status and importance of the fisheries as a whole. Keep under review sampling designs (Documentation and evaluation of the current sampling design). 	ongoing	CRFM Secretariat
	Carry out needs assessment to inform and keep under review a suitable training strategy.	Periodically - every 5 years	CRFM Secretariat; collaborating agencies
	Pursue and access training opportunities that would accommodate training of officers with the experience with experience that would be considered equivalent to required pre-requisite qualifications for higher level training. ¹⁰	ongoing	CRFM Secretariat; Fisheries Divisions; Government Training Departments
	Utilise current technologies for distance	ongoing	CRFM Secretariat;

⁷ If addressed regionally the use of ICT tools to facilitate data entry on site can be cost-cutting by reducing the need for data entry staff at office, notwithstanding the initial investment in and maintenance of hardware. There is a concern, however, in respect of data quality control, notwithstanding that there can be built-in quality control checks to the system.

⁸ also a consideration when determining partnerships

⁹ more holistic analyses and increase in competence and skills in statistical data analysis were prioritized, among the actions list under this heading, for attention at the 2014 scientific meeting

¹⁰ Persons responsible for data analysis jobs should be supported to be able to access an agreed minimum level of training.

Intervention point	Proposed action	Timeframe	Responsible entity
	learning; as well as relevant training centres, for upgrading skills; and build partnerships in support of this strategy		Fisheries Divisions; Government Training Departments
	Facilitate increase in competence and skills in statistical data analysis: <ul style="list-style-type: none"> • Use of CRFM regional pool of relevant resources and expertise to assist countries to review national situations and assist with completion of national analyses • Ensure that inter-sessional collaboration is maintained, and ICT Tools should be used to facilitate inter-sessional collaboration. • Facilitate field missions, as needed. 	ongoing	Fisheries Divisions; Government Training Departments; CRFM Secretariat
	Facilitate multiple reporting needs of multiple stakeholders. <ul style="list-style-type: none"> • Maintain technical reporting level to ensure basic information is produced at internationally accepted standard. • Identify stakeholders, build stakeholder profiles (characteristics – nature and activities) to inform suitable media and communication and reporting formats. • Give consideration to options for repackaging of scientific information / advice into various communication/ reporting formats to suit stakeholder needs, and should include use of online tools, e.g. blogs, automated reports. • Give consideration to specific communication expertise required. • Facilitate training of technical staff appropriate delivery of communication products (interactions with Professional PR persons may help?). 	ongoing	Fisheries Divisions; CRFM Secretariat <ul style="list-style-type: none"> • Fisheries Divisions • Fisheries Divisions assisted by CRFM Secretariat • CRFM Secretariat; ICT research institutions • Fisheries Divisions; ICT research institutions; CRFM Secretariat • Fisheries Divisions; Government Training Departments; CRFM Secretariat
Monitoring and performance evaluation	Build capacity to recognize deficiencies in data <ul style="list-style-type: none"> • Carry out internal evaluation for performance the national level • Develop/review/reiterate standards for CRFM parties 	immediate	Fisheries Divisions; CRFM Secretariat <ul style="list-style-type: none"> • Fisheries Divisions • CRFM Secretariat

Intervention point	Proposed action	Timeframe	Responsible entity
	Facilitate earlier screening of data for analyses at scientific meeting ¹¹ <ul style="list-style-type: none"> • Ensure implementation of consequences for non-compliance: if data not up to quality, MS not eligible to participate in scientific meeting • Facilitate more intercessional activity by Working group on data and methods, especially with regard to screening¹² • Strengthen links with local (teaching or “number crunching”) institution in support of data improvement • Revise role of external/extra-regional consultants in light of the need to develop regional institutional memory 	commencement immediate	Fisheries Divisions; CRFM Secretariat <ul style="list-style-type: none"> • CRFM Secretariat • CRFM Secretariat; Fisheries Divisions • CRFM Secretariat
	Determine length of time and/or frequency that a given species should continue to be assessed, thus covering more species in any given species group ¹³ .	soon	Fisheries Divisions; CRFM Secretariat
	Facilitate timely feedback on any evaluation of data performance; utilising different methods than what are currently being used	soon	CRFM Secretariat; Fisheries Division
	Develop mechanism for evaluating performance and use of data. <ul style="list-style-type: none"> • Determine whether commitments made at Forum are carried out, especially with regard to use of data • Facilitate staff time to allow them to carry out inter-sessional activities including their role in performance evaluation • Evaluate whether data are reaching other related sectors (e.g. coastal resource users, tourism, etc) • Facilitate capacity building for newer roles and changing international 	Commencement immediate	CRFM Secretariat; Fisheries Divisions <ul style="list-style-type: none"> • Fisheries Divisions; CRFM Secretariat • Fisheries Divisions • Fisheries Divisions; CRFM Secretariat • Fisheries Divisions; Government Training Departments; CRFM Secretariat <ul style="list-style-type: none"> ○ Government Training Departments;

¹¹ It was agreed that if the standard of data for scientific meeting improves, this should generally improve what is produced for other end-users; so this has been used as basis for discussion on the assumption that what is done for this use would benefit others

¹² Consider that group for screening data should be made up of different persons to those who are responsible for providing the data, i.e. participants at scientific meeting (self-auditing is not efficient). This smaller group could include persons from academia; it would be a core group working within the methods working group.

¹³ This would also provide more time for collection of time series of data on the given species until the next time it is up for assessment; consideration should also be given to the consequential data needs

Intervention point	Proposed action	Timeframe	Responsible entity
	requirements for fisheries data (such as Climate change, EAF and the like) <ul style="list-style-type: none"> ○ Utilize regional agencies to develop this capacity ○ Facilitate in-country partnerships and linkages in support of improved data collection, management and utilisation ○ Facilitate recognition of importance and, consequently, place more resources for data collection staff¹⁴. 		CRFM Secretariat <ul style="list-style-type: none"> ○ Fisheries Divisions ○ Fisheries Divisions
Cross-cutting actions	Build awareness of importance of data base management <ul style="list-style-type: none"> • Develop advocacy in stakeholders to engender support for data and database management 	immediate	Fisheries Divisions; CRFM Secretariat
	Engender agreement and commitment to further development of database	immediate	Fisheries Divisions; CRFM Secretariat
	Establish data and information policy that includes data standardization and sharing commitments, will take into account also issues pertaining to data access and ownership.	soon	Fisheries Divisions; CRFM Secretariat
	Improve communication in-country to ensure that decisions at regional level get “translated” into action at the national level ¹⁵	immediate	

¹⁴ This will contribute to making data collection more attractive against the backdrop of the turnover of data collection staff.

¹⁵ For example, ensure that staff meetings include discussion of outputs/decisions/recommendations of regional and other non-national meetings; these need to be incorporated into the work programmes of department/divisions