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# WORKSHOP ON THE HARMONIZATION OF FISHERIES INFORMATION SYSTEMS IN THE SWIO REGION

## Flic en Flac, Mauritius

2–4 July 2012

Funded by European Union

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*GCP/RAF/466/EC SmartFish Project*
*P072202 SWIOFP/FEM fund*
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Report of workshop on the harmonization of fisheries information systems in the South West Indian Ocean region

Flic en Flac, Mauritius, 2–4 July 2012

Report/Rapport: SF-FAO/2012/03, August/août 2012.

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## Acronyms and abbreviations

| | |
|---|---|
| CPUE | Catch per unit effort |
| CTA | Chief Technical Advisor |
| DSD | Data Structure Definition |
| FAO/FI | FAO department of fisheries and aquaculture |
| FIMES | Fisheries Metadata Element Set |
| FIRMS | Fisheries Resource Management System |
| FS | Fleet Segment |
| IRD | Institut de Recherche pour le Développement |
| KMFRI | Kenya Marine Fisheries Research Institute |
| ORI | Oceanographic Research Institute |
| OU | Operational Unit |
| REC | Regional Economics Commission |
| RFB | Regional Fisheries Bodies |
| RIS | Regional Information System |
| SDMX | Statistics Data and Metadata Exchange |
| STF | Status and Trend Fisheries |
| REST | Representational State Transfer |
| SWIOFC | South West Indian Ocean Fisheries Commission |
| SWIOFP | South West Indian Ocean Fisheries Project |
| WIOFish | Western Indian Ocean Fisheries database |
| WP | SWIOFC Working Party |

# Executive summary

The SmartFish harmonization workshop has been conceived as a response to the SWIOFC 4th Scientific Committee (SC) meeting (December 2010) which recommended the development of an action plan towards the creation of a Regional Information System for the South West Indian Ocean region. The workshop was held at Pearle Beach Hotel, Flic en Flac, Mauritius from the 2nd to 5th July 2012. As agreed, this workshop brought together experts from three relevant existing information systems in the region (StatBase, WIOFish and FIRMS) and the FishCode-STF approach to data collection. Each system/approach was represented by two experts. Thanks to good preparatory work during the preceding month, including two web-conferences and three working documents, and very lively contributions of all participants, the workshop achieved its objectives: a technical option agreed upon for the development of the prototype of a harmonized information system, a working methodology, and a road map towards the presentation of the prototype together with sustainability assessment considerations to regional decision-makers during the course of the second quarter of 2013.

The option retained for the prototype includes the following components:

- A regional portal which could either build on the SWIOFP created capacity at KMFRI (Kenya) or the FAO SWIOFC website. This portal will organize access to the data and information available in the relevant systems, focusing on target user expectations (e.g. resource status, fishery management, sector policy making).
- A web-based fishery ontology organizing all concepts and reference data across the concerned systems and their mapping. This ontology will be stored in FAO/FI's FLOD knowledge base, and will be maintained through the FAO/FI Code List Manager/Mapper built under iMarine.
- Web-based search services (building on tools developed in iMarine), which will be exploited by the portal to enable relevant linking and navigation across the concerned systems.

This option is the less intrusive with regards to the existing systems and essentially builds on an agreement on how to link concepts and reference data utilized under each constituent system. The sustainability and regional ownership concerns will require focus on StatBase, check the most appropriate solution for the maintenance of the Portal, and confirm the role of FAO/FI in maintaining Code lists manager/mapper and FLOD services.

# Résumé exécutif

L'atelier d'harmonisation de SmartFish a été conçu suite à la réunion du 4ème Comité Scientifique du SWIOFC tenu en décembre 2012 qui recommanda l'élaboration d'un plan d'actions pour la création d'un système d'information régional pour la région Sud-Ouest de l'océan Indien. L'atelier s'est tenu à l'hôtel Pearle Beach à Flic en Flac (île Maurice) du 2 au 5 juillet 2012. Comme convenu, cet atelier a rassemblé des experts de trois systèmes d'information pertinents dans la région (StatBase, WIOFish et FIRMS) et de l'approche FishCode-STF pour la collecte de données. Chaque système/approche était représenté par deux experts. Grâce à une bonne préparation le mois précédent, qui comprenait deux vidéo conférences et trois documents de travail, et de très vives contributions de tous les participants, l'atelier a pu atteindre ses objectifs: une option technique a été convenue pour l'élaboration du prototype d'un système d'information harmonisé, une méthodologie de travail, et une feuille de route pour la présentation du prototype, y compris l'évaluation de la pérennité, aux décideurs régionaux durant le second trimestre de 2012.

L'option retenue pour le prototype comprend les composantes suivantes:

- Un portail régional qui pourrait être élaboré soit sur les capacités créées par SWIOFP au sein de KMFRI (Kenya) ou sur le site internet de la FAO SWIOFC. Ce portail gérera l'accès aux données et aux informations disponibles sur les systèmes concernés, se concentrant sur les attentes spécifiques de l'utilisateur (par ex. l'état d'une ressource, la gestion d'une pêcherie, l'élaboration des politiques d'un secteur).
- Une ontologie des pêches disponible en ligne, organisant les concepts et les données de référence entre les systèmes concernés et leur cartographie. Cette ontologie sera stockée dans la base de connaissances FLOD du département des pêches de la FAO et sera maintenue à travers le gestionnaire des *Code Lists* et de leurs liens développés par le département des pêches de la FAO sous iMarine.
- Des services de recherches sur le web (basés sur les outils élaborés dans iMarine) qui seront exploités par le portail afin de permettre des liens pertinents et une navigation dans les systèmes concernés.

Cette option est la moins intrusive s'agissant de l'interaction avec les systèmes existants et est basée essentiellement sur un accord sur la façon de relier les concepts et les données de référence utilisés dans chaque système dont il est constitué. La pérennité et l'appropriation régionale nécessiteront de porter une attention particulière à StatBase, aux solutions les plus appropriées pour la maintenance du portail et de confirmer le rôle du département des pêches de la FAO dans la maintenance du gestionnaire des *code lists* et de leurs liens ainsi que des services FLOD.

# 1. Introduction and agenda

The workshop was held at Pearle Beach Hotel, Flic en Flac, Mauritius from the 2nd to 5th July 2012.

The FAO team and SmartFish Chief Technical Advisor welcomed the participants on behalf of FAO (see list of participants in Appendix 1).

The agenda was then presented and adopted (see Appendix 2).

As an introduction to the workshop, background elements were given and the objectives of SmartFish project were presented. The need to focus on harmonization was detailed.

Main workshop activities could then start.

Note 1: Mr. Xavier Vincent from the World Bank paid a courtesy visit to the workshop on the second day. He emphasized the interest of the World Bank in the improvement of statistical data collection, and its support in the development of the existing information systems. These activities could soon be necessary to trigger funds payments to countries; it should play the role of an incentive to improve fisheries statistical data collection, processing and dissemination.

Note 2: All the documents referenced in this report have been provided to the participants and are listed in Appendix 4 of this report. This appendix describes where a given file can be found in the CD or USB pen drive folders.

Note 3: as three systems and one approach were presented and discussed, the report will refer to these four entities as four "systems/approach".

# 2. Workshop activities

During the discussions after each presentation, common issues were raised each time. These are summarized in Section 2.4.

## 2.1 An introduction to harmonization

(See attached working document: *2012-06-Methodology_harmonization_semantics_validated.docx*)

Yann Laurent presented the possible options for concept and reference data harmonization.

Harmonization can be seen from two viewpoints: either by identifying regional common concepts and reference data and enforcing them within the national systems so that data are collected using same reference data; or by identifying concepts which structure the different systems and by identifying relationships (mapping) between the concepts to navigate from one system to another. Experience showed that the first option can only be very partially applied.

The methodology for harmonization starts with an analysis of the existing systems and building of a formal representation of the concepts underlying the system. The comparison of the formal representation leads to identification of similarities/dissimilarities among concepts. Matching concepts allow finding easy gateways between the systems; dissimilarities will require an additional step of mapping concepts.

Examples of relationships in reference data were presented: one to one, one to many, one to many with weighting, complex one to many concepts.

Discussion: The following points were raised during the discussion which followed this presentation.

Species names: WIOFish uses scientific names supported with the local names used in countries. Scientific names change regularly, and WIOFish has a field "previous scientific name", and a procedure for updating names.

The need for harmonization is strong for artisanal fisheries, especially for vessels.

It is important to see harmonization as linkage between national levels and regional/international levels. National level standards and codification should be kept as they are. Harmonization is mapping concepts and code lists between national and regional/international systems.

There are overlaps in concepts between systems; there is a need to identify best practices and then find synergies between systems–approach.

The issue of double counting of statistics when using gear-based models was raised. A way to address this issue should be found (FishCode-STF with its vessel entry point to statistics is one solution).

## 2.2 Systems and approach presentations

### *2.2.1 FishCode-STF*

(See attached presentation: *FishCode-STF presentation Regional Info systems SWIOFC workshop.pptx*)

Gertjan de Graaf presented the FishCode-STF approach.

Fisheries management has to be based on accurate and relevant information and knowledge of fisheries and fishery resources. Based on recommendations by the Advisory Committee on Fisheries Research (ACFR), a proposal was developed to improve the way fishery status and trends information is assembled and disseminated. The proposal was discussed in a FAO Technical Consultation in 2002 and the "Strategy for Improving Information on Status and Trends of Capture Fisheries" (FAO Strategy-STF) was adopted by the 25$^{th}$ Session of the FAO Committee on Fisheries (COFI) and endorsed by the United Nations General Assembly (UNGA) in 2003.

The FAO Strategy-STF is a voluntary instrument that applies to all states and entities. Its overall objective is to provide a framework for the improvement of knowledge and understanding of fishery status and trends as a basis for fisheries policy-making and sustainable management. The FAO Strategy-STF will be implemented through agreements between states, directly or through Regional Fishery Bodies (RFBs) and arrangements, and FAO.

In November 2004, the FAO FishCode-STF project started with the main objective being to support the implementation of "FAO Strategy-STF" worldwide with special focus on small-scale fisheries and capacity building.

Since 2007, FAO FishCode-STF supported a number of field activities in Africa: frame surveys in Liberia, Democratic Republic of Congo, Benin, Togo, Ivory Coast and Lake Tanganyika; design and implementation of catch assessment surveys in Lake Tanganyika, Guinea, Rwanda; and the development of Information Systems in Lake Tanganyika and Guinea.

A major lesson learned is that in small-scale fisheries, a canoe should be the entry point of data collection for small-scale fisheries. This aspect is important as in a number of countries, data collection and information systems are "Gear-based", while data collection systems should be canoe-based as:

- Total number of gears needed for raising daily catches to total catches is difficult to estimate and results on this in frame surveys are often reliable.
- A number of fisheries are multi gear, i.e. a number of different gears are used simultaneously, which makes it almost impossible to estimate the CPUE for the different gears.
- Data from a number of fisheries in Africa indicated that gear of the same type is almost always larger, and more units are used in motorized canoes.

**Table 1:** Classification of fleet segments

| Gear type (CWP classification) | Canoe motorized | Average length of gear | Average number of gears used | Average length of canoes | Average no. of crew |
|---|---|---|---|---|---|
| **Gillnets (non specified)** | Yes | 945 | 6 | 12 | 9 |
| **Gillnets (non specified)** | No | 589 | 3 | 6 | 2 |
| **Set gillnets (anchored)** | Yes | 650 | 16 | 11 | 5 |
| **Set gillnets (anchored)** | No | 234 | 8 | 7 | 3 |
| **Drift nets** | Yes | 809 | 15 | 13 | 6 |
| **Drift nets** | No | 600 | 2 | 7 | 2 |
| **Encircling gill nets** | Yes | 799 | 4 | 12 | 4 |
| **Encircling gill nets** | No | 402 | 8 | 6 | 2 |
| **Portable lift nets** | Yes | 360 | 4 | 15 | 13 |
| **Portable lift nets** | No | 181 | 3 | 7 | 4 |
| **Hand and pole lines** | Yes | 960 | | 13 | 6 |
| **Hand and pole lines** | No | 558 | | 6 | 1 |
| **Hand, pole and long lines** | Yes | 349 | 42 | 20 | 17 |
| **Hand, pole and long lines** | No | 224 | 26 | 8 | 2 |
| **Set long lines** | Yes | 1,558 | | 12 | 5 |
| **Set long lines** | No | 921 | | 6 | 2 |
| **Surrounding net (without purse line)** | Yes | 506 | 20 | 17 | 12 |
| **Surrounding net (without purse line)** | No | 125 | 5 | 9 | 3 |
| **Beach seines** | Yes | 706 | 2 | 12 | 19 |
| **Beach seines** | No | 300 | 1 | 8 | 7 |
| **Vessel seine nets** | Yes | 695 | 1 | 14 | 11 |
| **Vessel seine nets** | No | 300 | 1 | 7 | 8 |

Therefore, FAO FishCode STF uses the concept of "*fleet segments*" and "*operational units*".

A ***fleet segment*** is: "*a set of boats with more or less similar vessel and fisheries characteristics*". Fleet segments could be: industrial tuna purse seiners, industrial tuna long liners, coastal shrimp trawlers, artisanal motorized planked canoes using large gill nets, or artisanal dug out non-motorized canoes using hook and line, etc.

An ***operational unit*** is: "*a group of fishing vessels practising the same type of fishing operation, targeting the same species or group of species and having a similar economic structure*".

During the 2008 Working Party, identification of fleet segments and operational units started in the SWIOFC area with as major objective to develop a regional harmonized classification of small scale fisheries (SSF). The latter is important as presently, SSF vessels are internationally classified as "Others".

Carrying out an inventory using the fleet segment and operational unit concept is often done in two steps:

**Step 1: Classify the fleet segments (see Table 2).**

**Table 2:** Classification of fleet segments

| | | Major gear used | | | | |
|---|---|---|---|---|---|---|
| **Fleet segment** | **Vessel no.** | **Surrounding nets** | **Gill & entangling nets** | **Trawls** | **Hook & lines** | **Traps** |
| Dug-out non-motorized canoe, 4 m, multi gear | 300 | | **300** | | **300** | **300** |
| Planked non-motorized canoe, 8 m, multi gear | 500 | | **500** | | | **200** |
| Planked non-motorized canoe, 8 m, gillnets | 350 | | **350** | | | |
| Motorized canoes, 18 m, purse seines | 800 | **800** | | | | |
| Motorized canoes, 18 m, hook and line | 400 | | | | **400** | |
| Fibreglass boats, 12 m | 250 | | | | | **250** |
| Shrimp trawler < 12m | 25 | | | **25** | | |
| Tuna longliners | 17 | | | | **17** | |

In this example, we see the multiple gear use by the non-motorized dug-out canoes while in the rest of the fleet, only one gear type is used.

**Step 2: Define the operational units by specifying gears and target species (see Table 3)**

**Table 3:** Example of operational units

| | | Operational Unit | | | | | |
|---|---|---|---|---|---|---|---|
| **Fleet segment** | **Vessel no.** | **Purse seine – *Small Pelagics*** | **Hook and line – *Groupers*** | **Gillnet – *Demersals*** | **Trawls – *Shrimps*** | **Hook & lines – *Tuna*** | **Traps – *Spiny lobster*** |
| Dug-out non-motorized canoe, 4 m, multi gear | 300 | | **300** | **300** | | | **300** |
| Planked non-motorized canoe, 8 m, multi gear | 500 | | | **500** | | | **200** |
| Planked non-motorized canoe, 12 m, gillnets | 350 | | | **350** | | | |
| Motorized canoes, 18 m, purse seines | 800 | **800** | | | | | |
| Motorized canoes, 18 m, hook and line | 400 | | **350** | | | **300** | |
| Fibreglass boats, 12 m | 250 | | | | | | **250** |
| Shrimp trawler < 12m | 25 | | | | **25** | | |
| Tuna longliners | 17 | | | | | **17** | |

The fleet segments, operational units and classification will be discussed in the upcoming 3rd working party on data collection and statistics of SWIOFC (July 2012) and the results are highly relevant for a regional information system.

Key points of the presentation are:

FishCode-STF is not a system (compared to FIRMS, WIOFish and StatBase) but is an **approach**.

FishCode-STF approach is **focused** on routine **data collection** starting from the vessel; it promotes two high level "composite" or "complex" concepts: Fleet Segment and Operational units. These concepts will structure the national systems in context where data collection will comply with the FishCode-STF approach.

Discussion:

Linkage with CountrySTAT was discussed as CountrySTAT[1] is the recommended tool by FAO to centralize agriculture and food statistics at national level to then exchange it with FAOSTAT. Previous work in West Africa provided a list of the minimum fisheries indicators to be published in CountrySTAT, which could be used as reference indicators for the Regional Information System (see the list presented in Section 2.6.2). Breakdown in CountrySTAT for production is by Marine/Inland and Industrial/Artisanal, and for employment, it is by processing, marketing and boat building.

For sustainability reasons, FishCode-STF is working to establish links with Regional Economics Commission (REC) and Regional Fisheries Bodies (RFB), as RECs have available funds to secure data collection.

### *2.2.2 StatBase*

(See attached presentation: *2012-06-System_Presentation_StatBase.ppt*)

Julien Barde presented the StatBase system.

StatBase is a generic application that improves the management of statistical datasets by complying with generic data structures (set up by IRD) and reference code lists (it can be international standard or not, can be mapped or not with international classifications).

StatBase has been set up in the framework of two projects related to fisheries management. The first project (SIAP) started in 2000 and ended in 2004 with the datasets of the countries related to the Sub Regional Fishery Commission in West Africa. The second project started in 2008 and deals with datasets from eight countries related to SWIOFC FRB and SWIOFP project. StatBase first used Access as a storage system and Excel as the front end to Access for users to browse, extract or plot data shared by the different partners. In the framework of SWIOFP, StatBase has been entirely redeveloped to become available through a web portal on top of a PostgreSQL server; the application now uses a web-pages java server.

There are currently 50 datasets stored in StatBase for the SWIOFP project that are supposed to be updated annually.

The generic approach of the database model consists in mapping original datasets structures with the three main concepts (entities) of the conceptual (meta-) model: a dataset is always described as a combination of columns which are either "criteria" (i.e. "dimensions") or "statistics" (i.e. "quantities" (catch/incomes, efforts or others: registry, number of vessels). Criteria use code lists that are managed in a dedicated component which enables mapping between reference code lists and local code lists, allowing users to define their own nomenclatures.

Thirteen types of criteria are defined for now but this list is expandable and not mandatory: Temporal, Species-category, Boat, Power of motor, Boat tonnage, Overall length of boat, Fishing gear, Countries, Maritime zone, Terrestrial zone, Activities, Fisheries.

[1] For more information on CountrySTAT see the corporate CountrySTAT website http://www.fao.org/economic/ess/ess-capacity/countrystathome/en/ and http://www.countrystat.org for the National CountrySTAT website with statistics.

For now, there is no upgrade planned to add new functionalities to StatBase. Among possible functionalities are the following: management of different patterns for data providers to facilitate and standardize data upload, new kinds of dimensions and statistics to cover the needs of various data structures, SDMX export, REST Web Service.

Key points of the presentation are:

StatBase is **a statistical database**, based on a **generic and flexible tool**.

A StatBase dataset can be defined at any level of granularity. The indicators published in StatBase are defined by the users based on the **13 available dimensions**.

These dimensions correspond to code lists and can be considered as "building block" concepts.

Discussion:

Existing mappings were identified in StatBase: for species, vessel and gear, StatBase provides local classification mapped with international classifications (if established by local expert). Linkage with WIOFish would be easier.

StatBase datasets can be structured with different indicators per table.

Question of SDMX export was discussed: it could be done as it has already been done for other IRD databases within iMarine project context.

Web services could be developed to serve some statistics stored in StatBase. It could benefit other IRD projects, like the MACROES ANR project and Ecoscope knowledge base.

Regarding StatBase content, no raw (confidential) data are stored in StatBase even though it could be done. StatBase only publishes official and public aggregated data. Furthermore, one should understand that the datasets loaded in StatBase are expected to match the objectives agreed upon by countries for the region.

The issue of StatBase sustainability was raised: question of system development and maintenance funding but also StatBase system use by countries: Mauritius has some human resource problems while Seychelles has technical problems with very low bandwidth. Harrison Onganda from Kenya is assisting the countries to upload data to address the problems of lack of data in the system for certain countries.

### *2.2.3 WIOFish*

(See attached presentation: *2012-06-System_Presentation_WIOFish.pptx*)

Bernadine Everett presented the WIOFish system.

The WIOFish Project began in 1999 as an IUCN initiative to assist countries of the Western Indian Ocean Region implement the Jakarta Mandate of the Convention on Biological Diversity. The rationale behind the project was that fisheries could not be managed in sustainable ways if there was no information available about them. At that time, most of the fisheries of the region had not been described or documented at all. WIOFish was designed to collect as much information as possible about every aspect of the fisheries. This collation of information provided an annotated fisheries inventory of all the fisheries of the region and it has been made freely available in the public domain. The primary goals of WIOFish are:

- to identify each unique fishery type found in the coastal zone and to describe the main features of each fishery;
- to maintain an up-to-date database of annotated fishery profiles for all fisheries of the region;
- to report annually on the "status" of the fisheries, including risk profiles and management needs;
- to establish a permanent regional partnership between national fishery nodes in the main WIO countries; and

- to supplement regional initiatives of the South West Indian Ocean Fisheries Commission (SWIOFC) by providing an information service to fishery resource managers, donors, researchers, including those with specific environmental concerns.

Currently, there are eight participating countries, each represented by a National Node and co-ordination of the project is carried out by a Regional Node, which is based in South Africa. There are 269 fishery profiles entered in WIOFish and represent every fishery sector.

A fishery in WIOFish is defined as a distinct unit that can be managed as a separate entity and a pragmatic choice was made to define these units on the basis of management units considered in each country. There are 353 registered users on the system from 48 countries around the world from a variety of backgrounds. This fits in well with the target audience including fisheries researchers and managers to general public who have an interest in the fisheries.

WIOFish is a centralized information system fed into by eight National Nodes. WIOFish is based on national expertise in fisheries: the National Nodes invite other relevant organizations who collect and utilize fisheries data to participate in the process of adding and validating the information stored in WIOFish.

Main Reference data used in the system are: Fishing area as country EEZ; Sector as locally defined fishing operations; Species using scientific name; Vessel which is mostly local vessel names and Gear which is also mostly local gear names. Species, vessel and gear were originally based on ASFIS, ISSCFV and ISSCFG respectively but were considered inadequate and thus, have been appended.

WIOFish is installed on a central server situated in New York, United States (www.wiofish.org). It uses MySQL for the database and PHP for the user interface. Negotiations are currently under way to source funds for the next three to five years of the project but ultimately, we would like to see it institutionalized to provide more security in its sustainability.

Key points of the presentation are:

WIOFish is **NOT a statistical database**; it reflects the structure and definition of national fisheries.

A Fishery is the high level “composite” concept structuring the system. A fishery can be flexibly defined from a gear, resource, vessel or management view point.

Discussion:

WIOFish gear list can be considered a regional list, since it matches the individual needs of each country. Specific gear descriptions are available at record level.

In WIOFish, the geographical representations can be made by hand for each fishery and submitted as shape files (this has been set up for South Africa). Those shape files have been provided to StatBase.

WIOFish has to pay a rental fee for the system hosting (based in the USA), but the content is own by WioFish. WIOFish information is public and can be freely utilized under a copyright policy of citing Oceanographic Research Institute (ORI) as WIOFish have been careful about copyright infringements.

The question of the exposition of the database to other systems was raised: an on-demand export can be done every year. The exposition of the database to automatic harvesting system based on web services has to be agreed by the WIOFish partners but it is not possible now. The system should be accessible to scanning tools (similar to the search engines robots).

Very important similarities between WIOFish reference data (code lists) and FishCode-STF SWIOFC’s reference data were identified. A common regional reference list could be elaborated from both WIOFish and FishCode-STF. WIOFish already has mapping of ASFIS species and local names. Synergies between the systems/approach can be already found.

WIOFish scope initially focused on small-scale fisheries, but has progressively evolved to cover also industrial fisheries and recreational fisheries.

### *2.2.4 FIRMS*

(See attached presentation: *2012-FIRMS_Presentation.pptx*)

Marc Taconet and Elena Balestri presented the FIRMS system.

The Fishery Resources Monitoring System (FIRMS) was presented according to the common template received.

It started with a brief description of the history of the partnership including the drivers to its creation: providing easier access to users worldwide to marine resource status reports, and helping to identify fisheries management performance and gaps.

The conceptual framework on which the FIRMS system has been structured was also briefly illustrated, including an exhaustive description of the multifaceted concept of fishery. Modules of information stored in the database (fisheries and marine resources) and the products which are disseminated as result of processing and structuring this information were described (fact sheets, state and trend summaries, thematic pages, web services, etc.).

The presentation also included basic notions on system architecture together with the description of the process of data verification, harmonization, validation, loading, enrichment and publication.

The training material and existing documentation accessible through the web was also briefly described. Conclusions referred to sustainability of the system, mostly relying on FAO's Regular Programme funding for the Secretariat and the maintenance and commitment by partners regarding data provision and meeting participation.

Key points of the presentation are:

FIRMS is a highly structured system based on two high level "composite" concepts: Marine resources (biological aspect) and Fisheries (human aspect).

FIRMS is based on agreed and validated definitions and classifications.

Discussion:

Linkage between FIRMS/Marine resources and WIOFish fisheries should be of high interest to WIOFish. Discussion should start on how to formalize such collaboration. Instituting a systematic workflow to feed FIRMS/fisheries from WIOFish would have to come from the countries concerned.

Question of the sensitiveness of representation of fishing area was raised. For example, EEZs are not utilized in the FIRMS Marine resources for representing location of marine resources. Harmonization must take these issues into consideration.

The mapping of fishery concept was discussed between systems/approach. It was agreed that fishery is a flexible concept. WIOFish fishery concepts are the ones defined by the countries. It might then be difficult to map concepts across countries.

A consensus was reached around mapping the different systems through the vessel/operational unit developed in FishCode-STF. The linkage to StatBase could be difficult.

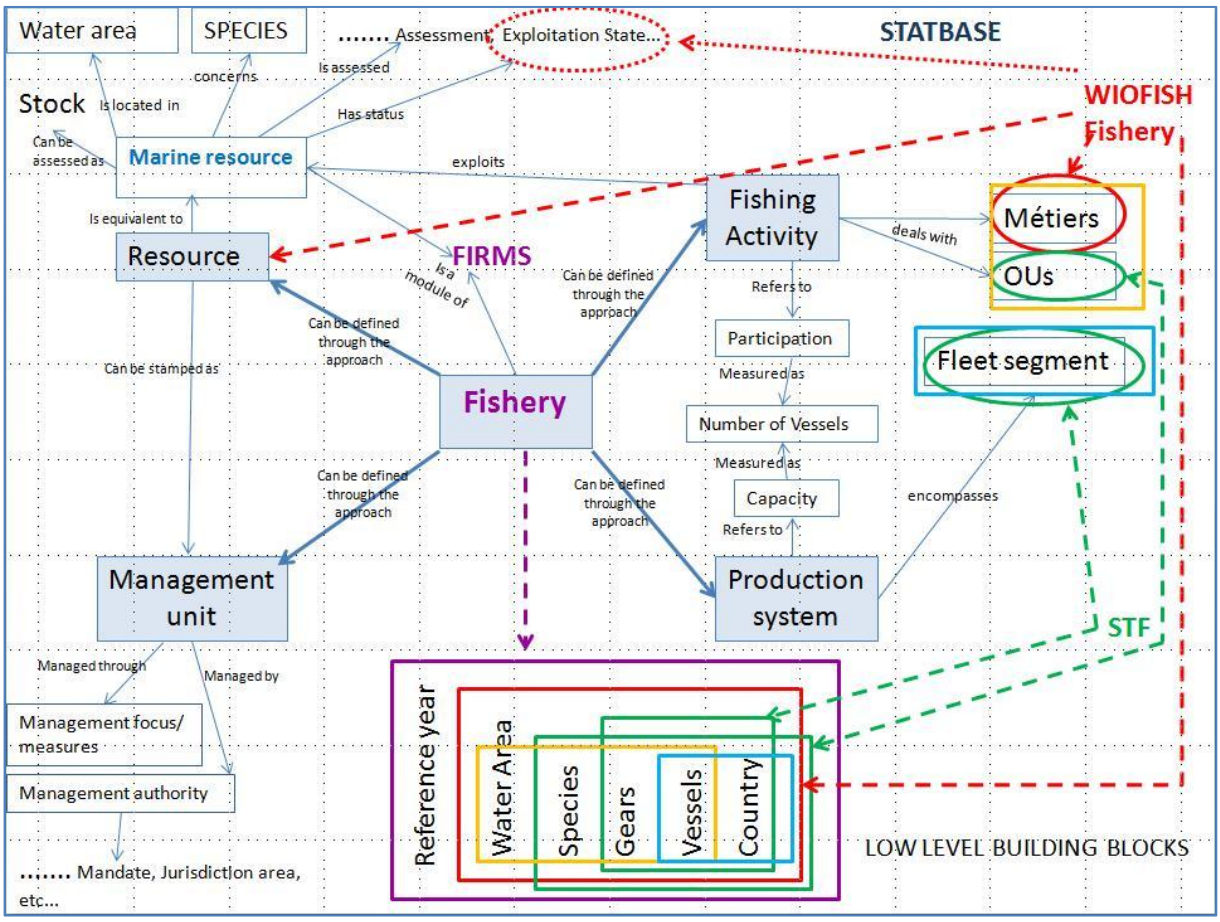
## 2.3 Identifying similar/dissimilar concepts

Elena Balestri presented an attempt to map FIRMS concepts and other systems and approaches.

The PowerPoint presentation is attached to the report (*RelationshipsAmongSystemsApproaches.pptx*) with animations to better visualize relationship.

The image below gives an idea of the concepts and their relationships:

There are high level "composite-complex" concepts and low level "building blocks" ones.




The presentation and the discussion held after highlighting the following points:

- Systems/approach natures are different; StatBase is a statistical system while FIRMS and WIOFish are expert systems focusing on fisheries identification and description. Mapping between systems must be carefully defined.
- Content type and granularity of each system highly depends upon the mandate assigned to each system by its supporting parties. For example, StatBase generally does not contain statistics at fine grained fishery level: statistical data currently available in StatBase are official statistics more aggregated than comparable data in WIOFish. Mapping systems could be difficult given this difference in data/information granularity among systems/approach.
- The concept of fishery was extensively discussed to find correspondence between the definition of this concept in each system and approach: a flexible definition of fishery was agreed upon (see Section 2.4.1). It was agreed that the fleet segment concept is commonly shared across systems/approach but not completely implemented as regards StatBase; regional classifications are necessary to draw better links between systems.

## 2.4 Discussion on harmonization, similar and dissimilar concepts

### *2.4.1 A fishery can be defined only with its approach*

From FIRMS definition, a fishery *can be defined through*:

- Resource
- Fishing activity
- Production system
- Management unit

It was accepted by the participants as a common fishery definition, flexible enough to cover all definitions for the systems/approach.

### *2.4.2 Several concepts can be matched across systems/approach*

From these fishery approaches, relationships can be defined between systems/approach:

- A *fishery/fishing activity* deals with *Métiers*[2] or *Operational units*.
- An *Operational unit* concept of FishCode-STF matches many fisheries defined in WIOFish.
- *Fleet segment*, core FishCode-STF concept, is encompassed by the *fishery/production system* concept.
- …

Concepts can be mapped from one system to another.

### *2.4.3 Low level "building block" concepts constitute simple gateway between systems and approach*

A fishery is a high level complex concept composed from lower level building blocks concepts; there are six building blocks in FIRMS:

- Reference year (defines each observation occurrence on a fishery)
- Water area
- Species
- Gear
- Vessel
- Country

The workshop agreed on the universality of these fishery building blocks across systems and approach. Reference data however can be different from one system to another.

The relationships between these building blocks among systems were analysed and discussed: where concepts were common to two systems/approach, these were compared.

The following tables describe the relationship between these building blocks among the systems/approach (additional mapping can be found in the Excel file: *Mapping-Concepts-RelationshipsWORKSHOPend2day.xslx*):

[2] Definition: The concept of Métier: "A métier is usually defined by the use of a given fishing gear in a given area, in order to target a single species or group of species, e.g. inshore shrimp trawling, offshore flatfish trammel netting … (Mesnil and Shepherd, 1990; Laurec et al., 1991)."

- **FIRMS to STATBASE**

| FIRMS concept | StatBase concept | Notes |
|---|---|---|
| ***can be inferred*** | | |
| Target species | Species | Target species in FIRMS can be inferred as Species in StatBase where catch is qualified as retained |
| Discarded species | Species | Discarded species in FIRMS can be inferred as Species in StatBase where catch is qualified as discarded |
| Associated species | Species | |
| Protected species | Species | |
| ***close match*** | | |
| Captured species | Species | |
| ***encompasses*** | | |
| Vessel description | Overall length of boat | |
| | Boat tonnage | |
| | Power of motor | |
| ***is equivalent*** | | |
| Gear type | Fishing gear | |
| Vessel type | Boat | |
| Geographic reference | Dataset country | |
| Flag state | Country | |
| Water area | Maritime zone | |

- **FIRMS to WIOFish**

| FIRMS concept | WIOFish concept | Notes |
|---|---|---|
| ***is equivalent*** | | |
| Target species | Species in catch/catch type: Target | Species in WIOFish are requested at species level, family level, and order level |
| Discarded species | Species in catch/catch type: Discard | |
| Gear type | Gear type | |
| Geographic reference | Reporting country | |

| FIRMS concept | WIOFish concept | Notes |
|---|---|---|
| Type of production system | Sector | |
| ***close match*** | | |
| Associated species | Species in catch/catch type: By-catch | |
| ***could be part of*** | | |
| Protected species | Threatened species | |
| ***can include*** | | |
| Captured species | Species in catch/catch type: Target | Species in WIOFish are requested at species level, family level, and order level |
| | Species in catch/catch type: Discard | |
| | Species in catch/catch type: By-catch | |
| ***encompasses*** | | |
| Vessel description | Vessel type | The vessel type in WIOFish is a local name |
| Vessel description | Vessel description | |
| Depth zone | Minimum depth affected by gear | |
| Depth zone | Maximum depth affected by gear | |
| ***includes*** | | |
| Characteristics of fishing ground | Area of operation | Some of the characteristics listed as control terms can be found in the textual description of WIOFish area of operation |
| ***is illustrated*** | | |
| Water area | Fishery shape file | WIOFish-FIRMS Fishery shape file locates the water area where the fishery takes place |

- **FIRMS to FishCode-STF**

| FIRMS concept | FishCode-STF concept | Notes |
|---|---|---|
| ***close match*** | | |
| Target species | Fleet segment/Principal Target group | STF: defined at major group level |
| Target species | Operational unit/Principal Target species | STF: defined at family level (only Scombridae further specified) |
| ***can include*** | | |
| Captured species | Principal Target species | |
| Discarded species | X | |
| Associated species | X | |
| Protected species | X | |
| ***is equivalent*** | | |
| Gear type | Gear type | |
| Vessel type | FS/vessel type | |
| Vessel type | OU/vessel type | |
| Vessel description | FS/local name | |
| Geographic reference | Country | |
| Flag state | Flag | |
| Type of production system | Sector | |
| ***is split into*** | | |
| Water area | Inshore/Offshore | By default for STF within the EEZ |

The concept of vessel type posed some problems when mapping reference data; it is especially true for WIOFish and FishCode-STF as the reference data is the local name of the vessel. In a regional context, mapping with the ISSCFV classification does not make much sense since small-scale fisheries vessels are all aggregated under "Others"; instead, mapping should first be achieved at an intermediate regional level, e.g. for comparing fisheries between countries of the same region, and from there to the international level. The need for a regional vessel type classification capturing the small scale (artisanal) fisheries vessel was raised. Both FishCode and WIOFish have already national vessel type for several countries; a first proposal for a regional list of vessel type should be elaborated from these existing lists for presentation at the SWIOFC Working Party in July 2012 (action to be done by Gertjan DeGraaf and Bernadine Everett.)

The above work has been done by taking a FIRMS standpoint and comparing its concept to those in the other systems. This work should be continued by similar bilateral comparisons among each systems/approach. In order to prepare for

this task, the previously mentioned Excel file (*Mapping-Concepts-RelationshipsWORKSHOPend2day.xlsx*) will be cleaned by the FAO HQ team and sent to the participants for their action (action to be taken by Elena Balestri).

### *2.4.4 There is a need to agree on common definition for the main concepts*

The definitions of the main building blocks have been already agreed upon.

The group examined the FIRMS definitions for the main fisheries concepts. As already stated, the definition of fishery has to be kept flexible enough to cover several different approaches to a fishery. It was noted that in WIOFish:

- The fisheries are mostly defined from a fishing activity viewpoint but some are from a vessel viewpoint (or production system), and some from a resource viewpoint (essentially subsistence fisheries). WIOFish could easily add a field and classify its records according to the main approaches recognized by FIRMS.
- The fisheries are defined pragmatically according to management units defined by countries. These units are the ones used to collect data or organize management measures. Therefore, the concept of management unit in WIOFish differs from that in FIRMS.
- FIRMS "Related fisheries" correspond to WIOFish "Sub-fisheries"
- The Management system concept in FIRMS enforces a much stronger idea of management framework (i.e. there should be an explicit Management plan) than it does in WIOFish.

Dates have to be carefully handled in an integrated system in order to ensure time alignment of data. The FIRMS Reference year and Reporting year concepts have been reviewed and agreed upon, with a light amendment brought to their definition (where "fishery" was replaced by "information"). It was agreed that the user interface will have to strongly stress on years and dates or periods for which the information is valid.

Other "non-core" concepts were reviewed:

- Habitat information in FIRMS and WIOFish can be mapped relatively easily.
- "Inshore" in StatBase (based on SWIOFP definitions) is a habitat concept meaning depth < 50 m; in FishCode-STF, inshore and offshore rather convey a "range of action" meaning linked to the fleet capacity.
- WIOFish/Management/Fishing-controls correspond to FIRMS/enforcement.
- WIOFish/Management/Access-controls correspond to FIRMS/management measures.

For the rest, the FIRMS definitions were adopted unchanged (see Appendix 3).

### *2.4.5 There are common fisheries indicators*

Indicators defined in the different systems/approach were discussed and summarized in a table:

| STF | STATBASE | WIOFish | FIRMS |
|---|---|---|---|
| **Fish production** | | | |
| Quantity | Catch quantity (retained) | Total catch | Production/landed volume |
| Values | | Calculated (possible) | Production/landed value |
| **Fishing capacity** | | | |
| Number of vessels | Other (Number of vessels) | Number of vessels | Number of vessels/fishing units |

| STF | STATBASE | WIOFish | FIRMS |
|---|---|---|---|
| | | Number of gears | |
| Number employed | | Number of fishers | Number of fishers |
| **Participation** | | | |
| Number of vessels | Other (Number of vessels) | Number of vessels | Number of vessels/fishing units |
| Number employed | | Number of fishers | Number of fishers |
| **Post-harvest and backyard** | | | |
| Number employed | | | Auxiliary employment (upstream and downstream employment) |
| **Trade by commodity** | | | |
| Quantities | | | |
| Values | | | |
| **Other** | | | |
| | Effort | | |
| | Any statistics may be included if available introduced by countries | Scoresheet | |
| | | | Stock status |

The group agreed that data harmonization efforts on the indicators will depend highly upon the final use of the Regional Information System (to support management plan, to support national policy making, regional policy making?). Insights of such RIS use should be gathered initially through the SWIOFC's 3rd Working Party on Fishery Statistics.

### *2.4.6 From concepts mapping to reference data mapping*

The last step of concepts and relationships analysis concerns the reference data mapping.

The exercise of analysing the underlying reference data was achieved with two concepts: geographic referencing (initially focusing on geographic reference and then more broadly extended to geographic referencing) and vessel type.

- Reference data use in the different systems/approach for geographic referencing

| FIRMS | STATBASE | WIOFish | STF |
|---|---|---|---|
| FAO statistical area | FAO statistical area | | |
| FAO statistical sub area | FAO statistical sub area | | |
| FAO statistical division | FAO statistical division | | |
| EEZ | | | |
| LME | | | |
| Rfb_comp | | | |
| | iotc_maritime_zone | | |
| | Local fishing zones | | |
| | Ifremer referencing squares | | |
| GAUL (FAO) | | Country (FAO*) | GAUL (FAO) |

**: WIOFish will soon adopt the FAO official countries list*

- Reference data use in the different systems/approach for vessel concepts

| FIRMS | STATBASE | WIOFish | STF |
|---|---|---|---|
| **Vessel type** | | | |
| ISSCFV | ISSCFV | | ISSCFV |
| | Local name (partial) | Local name | Local name |
| **Vessel length** | | | |
| | Length range | Average length | Average length |
| **Materials** | | | |
| | | Yes | Yes |
| **Propulsion method** | | | |
| | | Yes | Yes |
| **Preservation** | | | |
| | Yes | Yes | Yes |

With reference to the fact that presently, SSF vessels are all internationally classified as “Others” (see Section 2.4.3); the table above illustrates the lack of regional classification and the opportunity to elaborate one from the different local lists already available.

### *2.4.7 The issue of sustainability*

This issue was raised several times during the workshop. It is particularly acute with StatBase as the current SWIOFP supporting the development and implementation of the system in Western Indian Ocean countries is reaching its end in December 2012. The plan is now to deploy StatBase in KMFRI for hosting and maintenance. No additional plan exists within IRD to further extend the software; it could also be done in the context of other projects (Regional database project from large pelagic with FishFrame data format). Sustainability is not limited to maintenance and evolution of software. It's also a matter of regular data update. An empty shell without data is of little interest to the decision-makers. The question of enforcing regular updates from countries in the region was raised. One proposed solution was a formal agreement with the national parties for a regular data feed in StatBase as part of a broader arrangement aiming at streamlining countries' mandatory statistical data contributions to FAO. In this regard, the regional to global statistical framework harmonization process followed by SEAFDEC was referred to.

It was noted that both WIOFish and FIRMS/Marine resources have sustainability arrangements with regards to system maintenance and data contributions from the region.

This sustainability issue was also extended to the Regional Information System to be developed through the SmartFish project. The questions of hosting, maintenance and evolution of the system were raised. Will the RIS require high IT skills in the institution maintaining the system? Would the RIS need high level of administration and maintenance? These various issues will have to be addressed while designing and implementing the prototype of this Regional Information System.

### *2.4.8 Conclusion*

The previous activities lead to identifying the main shared concepts across systems and approach in a common ontology.

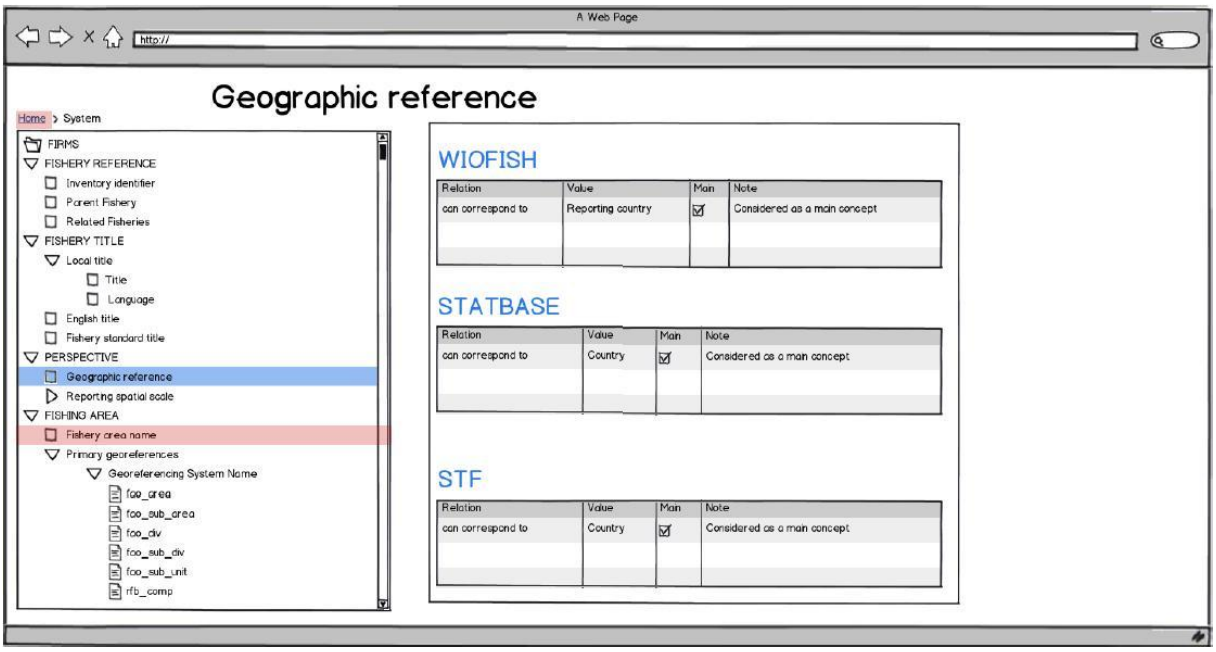
The first conclusion is for strong complementarities between systems with existing gateways between them: the low level building blocks are shared between all, and main concepts such as Fleet Segment, or Operational units have equivalences among systems/approach. Gateways can be found between WIOFish, FIRMS and FishCode-STF.

StatBase being a generic statistical database might need more formalism in the definition of its published indicators to fully be mapped with the other systems/approach. Nevertheless, common concepts and indicators have been identified and conceptually easy mapping can be drawn between WIOFish and FIRMS fisheries to the available statistics in StatBase (by species, gear, vessel and/or geographical reference).

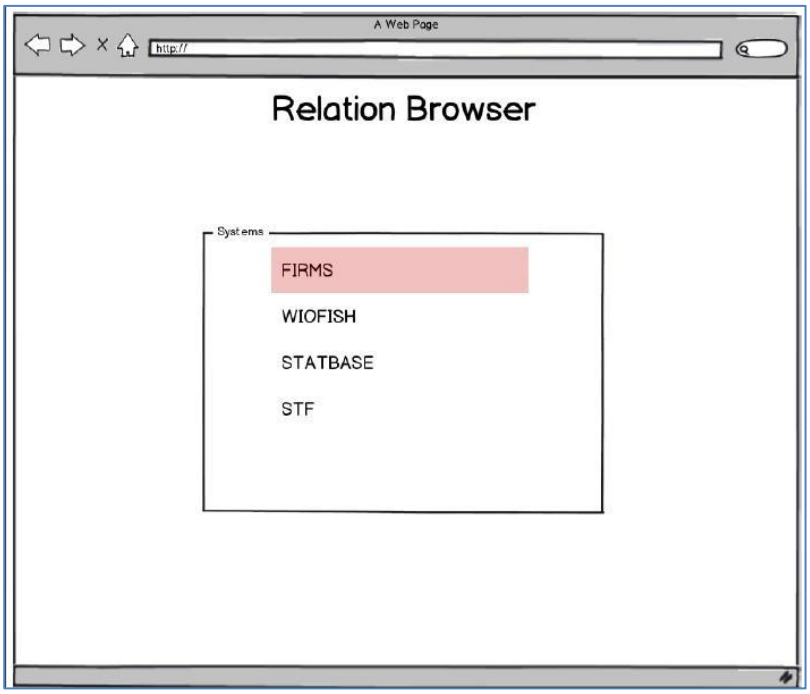
The question of the sustainability, especially for StatBase, should be addressed.

## 2.5 From concept analysis to formal representation of concepts and relationship/mapping

Once the analysis of the concepts/relationships from the different systems/approach is done, the result can be stored in a more systematic way. This work should start by creating in an Excel file with the different identified concepts/ relationships between systems. The resulting file will then be analysed by the FAO FI HQ ontology specialist, Claudio Baldassarre, to formalize better the relationship. The ontology can then be loaded into a tool designed to manage and display the current ontology in a more friendly way. A mock-up was developed and presented to the group (see *Mockup-ontology.pdf* document):




The presented tool allows the definition of concepts and mapping between the defined concepts from several systems.




## 2.6 The regional information system

### *2.6.1 Interoperability among systems/approach*

A preliminary presentation was delivered by Yann Laurent on technical solutions to make systems interoperable.

Interoperability is the ability of two or more systems to interact together.

- One system can (dynamically) link with the other one

*For instance: FIRMS fishery description could be linked with the WIOFish description if name of country, gear, species are known*

- One system can query the other one.

  *For instance: WIOFish could get StatBase statistics as graph if name of country, gear and species are known.*

- One system can exchange data with the other one.

  *For instance: WIOFish could send missing indicators values to FIRMS for import in its database.*

In the field of [fishery] statistical time series, the data exchange can use SDMX standard and tools.

The SDMX registry offers the possibility to send Data Structure Definition (DSD) to any system requesting it. The concepts and code lists for a given structured set of data can therefore be easily shared and exchanged.

SDMX offers common ISO formats for data exchanges. The container of the data and metadata is formally defined and tools are available to trigger and easily exchange statistics using this common container. Data are exchanged using a SDMX-ML file (an XML file formatted with SDMX standards).

Yet a specific interface has to be developed to import SDMX-ML files for a given DSD into a system using a different DSD.

Discussion

The need to go further with SDMX was expressed: SDMX is proposing a standard container for data and metadata exchanges. The standardization of fisheries statistics should be encouraged in order to avoid the need to develop specific SDMX-ML reader for a given system to import data from another system. In this regard, FAO reported its experience with Eurostat as part of the SEIF (SDMX for Eurostat, ICES and FAO) project in which a standard DSD has been achieved for aquaculture and capture time series.

When standard DSD cannot be shared, the alternative would be the development by the SDMX community of a SDMX-ML reader using mappings defined between two DSD (the one of the SDMX-ML and the one of the system importing the SDMX-ML). The mapping being defined between the two systems, this reader should be able to automatically convert the import SDMX-ML into the system based on that mapping. There will be no more need to write a specific reader for a given DSD. This is the kind of service which the iMarine data infrastructure could implement.

### *2.6.2 Options for a Regional Information System*

Four options for a regional information system were presented (see attached working document *2012-06-Options_ regional_IS_validated.docx*). It has been acknowledged that the ontology preparatory work initiated during this workshop to identify concepts and define relationships is the prerequisite to the building of the Regional Information System.

The content of the RIS must be driven by the user's needs. Parts of these needs have already been identified during the previous SWIOFC Working Parties (WP). The following indicators list has been validated by the WP:

- ***Annual capture production in live-weight equivalent and value***
  - *Total annual fish production*
  - *Total annual marine fish production and value*
  - *Total annual inland fish production and value*
  - *Total annual marine industrial fish production*
  - *Total annual marine artisanal fish production*

- *In the above, include only catches by national vessels; catches of non-national vessels operating in your waters are allocated to the flagship country!*

- ***Number of boats in use during year and employment***
  - *Total annual number of marine industrial vessels in operation*
  - *Total annual fishers as full-time employed in marine industrial fishing*
  - *Total annual fishers as part-time employed in marine industrial fishing*
  - *Total annual marine artisanal crafts in operation*
  - *Total annual fishers as full time in marine artisanal fishing*
  - *Total annual fishers as part time in marine artisanal fishing*
  - *Total annual crafts in operation for inland water fishing*
  - *Total annual fishers as full-time employed in inland water fishing*
  - *Total annual fishers as part-time employed in inland water fishing*
- ***Secondary sector***
  - *Total annual full-time employment in the secondary fisheries sector (e.g. Processing, marketing, boat building)*
- ***Import/Export***
  - *Total annual import and export fish products (product weight and value)*
- ***Aquaculture***
  - *Total inland aquaculture production and value*
  - *Total surface area of inland aquaculture*
  - *Total marine/brackish water aquaculture production and value*
  - *Total surface area of marine/brackish water aquaculture*

**1. A simple portal to the existing Information System**

This portal will be a unique entry point to the existing systems, a collection of links organized according to user's needs. This entry point could also be the above list of indicators to the systems hosting such statistics.

- Pros:
  - simple to develop
  - easy to update
- Cons:
  - time consuming for a regular maintenance (maintenance is highly manual)

**2. A fully integrated Regional Information System**

The system is based on the concept of high centralization of data flow coming from different systems, automating data exchange from data providers to the Regional Information System. This is the option chosen by each of the three considered systems (StatBase, Wiofish, FIRMS).

Data (can cover all kind of indicators, time series of artisanal to industrial fisheries) are stored in a central database. Data exchange between the central database and the national data providers is based on defined and agreed data/information structure. Formal agreements are signed between partners to ensure a regular update of data using the agreed harmonized format and reference data.

Such a cross-domains centralized database could build on the iMarine data infrastructure developed by a consortium under an EU funded project, consortium in which FAO has a user community leadership role. iMarine also provides web services for data/information dissemination (such as graph, maps).

- Pros:
  - Metadata and data flows are rationalized through signed agreement between partners: the indicators centralized in the RIS MUST be defined and agreed upon.
  - No more risk linked to low bandwidth when querying system (data is centralized, no need to access data from other systems).
  - Data and information organization and publication are easy and controlled by the data providers (data are centralized in an organized data base).
  - Constitutes a solution to backup national data.
  - If the centralized solution is the globally available iMarine data infrastructure, the use of such infrastructure could alleviate the need to regionally maintain StatBase.
- Cons:
  - Requires developments of current applications in order to enable data exchange through agreed formats and protocols. This would be necessary for StatBase (enabling it with an SDMX capacity) and WIOFish (enabling it with export services following the FIMES standard).
  - If the centralized solution consists of a regional platform, the question is that of the sustainability of this integrative platform at regional level.
  - If the centralized solution consists of the iMarine platform, there is a risk of poor feeling of ownership by national parties. In addition, there is a need for guaranteeing sustained services from iMarine.

**3. A system based on concept mapping, harmonizing data flow from national and/or regional information system**

It is a system fully relying on the ontology and its web services. This ontology will be stored and organized in a tool such as FLOD developed by FAO to store and disseminate as linked open data concepts and relationships in a formalized way. These concepts and relationships will constitute the backbone of the system, providing the user with a tool to navigate through it. Yet a visualization tool is needed to give a friendly access to the user to these concepts organized in a complex network of relationships. A RIS portal presenting entry points similar to those evoked for option 1 could organize these web services, and reuse additional iMarine components such as graphs and maps.

Tools exist to scan the data hosted by existing systems, and compare and map the scanned data to this ontology, something similar to the common search engine bots browsing the web. Xsearch is one of these tools currently being integrated on the iMarine platform. The results are concepts and associated resources in the different systems "cleverly" clustered together and available as links.

iMarine is developing a web-based Code lists Manager and Mapper application which will handle the workflow enabling the data managers of the existing systems to update the ontology as required.

- Pros:
  - It is the less intrusive option as the existing systems remain by and large unchanged: the existing systems are periodically and passively scanned.
  - This option therefore enforces the ownership on the existing systems.
  - Maintenance is easy as it requires only the update of ontology when changes are brought to the main concepts (a rare event) and to the code lists (an infrequent event). Tools exist like the iMarine code list manager/Mapper to maintain this ontology.

- Cons:
  - The main risk is represented by erroneous mapping between concepts and terms from different systems (mapping is done automatically with no human action). The importance of such risk will have to be assessed at prototyping stage.
  - Sustainability risk: the long term maintenance of the ontology is not straight forward as concepts developed and stored in the system convey some level of abstraction. The ontology maintenance knowledge will have to be part of the skills of the data managers in charge of each system.

**4. A fourth solution: a web of information threads shared across systems**

This option builds on the ontology services (including code list and mapping) presented for the third option. These services are available to the existing systems and can be exploited by each to create a real integrated information network.

Each system is thus aware of the mapping existing with each other. The communication protocols among systems are implemented on a bilateral basis. Protocols for relevant/accurate linking among systems, or data feeds from one system to another, can be envisaged under this logic. As a result, the user would be able to navigate (starting from any entry point – i.e. from the RIS portal, or from any page of its constituent systems) following a thread of relationships and/or data feeds established among the systems.

Same pros and cons as for option 3, plus:

- Pros:
  - All systems are fully interconnected, thus users can consistently navigate (following a thread) across all records of the various systems constituting the RIS.
  - This solution can be implemented at any moment and individually by any of the existing system, following a step-wise approach.
- Cons
  - There are more developments and maintenance impediments, with time and budget impacts.

Discussion:

In all cases, the need for a portal, i.e. an entry point for the user to access data, was identified. This portal would be more or less sophisticated depending on the selected option.

The conceptual ontology work which this workshop tackled is also necessary to all solutions. The design of the portal will build on this work, whether just conceptually (option 1, 2) or by using tools exploiting the formalized ontology (options 3, 4).

It was then agreed that the benefits of the tools building on a formalization of the ontology should be explored to see how much can be done with it. It is understood that this option is based on innovative concepts and technically requires adequate skills from the systems administrators, but most of the complexity will be managed by FAO headquarters through the FIGIS and iMarine infrastructures and it is expected that this option would be viable in a collaborative deal. At regional level, simple tools such as Excel sheets (for maintenance) and URL syntaxes (for calling the services) will be made available to the regional administrators.

The participants recommended developing two prototypes, one for the portal and one ontology based.

### *2.6.3 Short-term planning for the development of a prototype*

#### *2.6.3.1 Proposal for prototype*

The workshop recommended developing two prototypes in parallel in order to test the ontology based option, as follows:

- Prototype 1: corresponds to option 1 of the RIS proposal (Links) – the portal's target use should cover fishery management (first goal under SmartFish) and sector policy making (a medium term goal). The list of indicators produced by the Working Party should be used as a starting point (see Section 2.6.2) (can be included in the SWIOFC web site, yet to be developed).
- Prototype 2: corresponds to option 3 of the RIS proposal (Ontology based) – Prototype 1 will provide the entry point to access data/information through web-based ontology services. The scope of the prototype will be limited to the main concepts (fisheries, resources, species, gear, vessel, geographic referencing) – Starting point: fisheries and resources - indicators with data/information in the data provider systems.

#### *2.6.3.2 Development planning*

- Milestone 1: SWIOFC Working Party July 2012: from WP indicators, select 2–3 to show relationship – PowerPoint presentation to initiate discussion on needed indicators, information/data to be extracted, needs, etc… Agree on the principle of a network and its participants who will be involved in providing inputs and commenting the main feedback phases of prototype development. The network should initially consist of the WP participants, and could expand upon request. The decision to expand this network lies with the SWIOFC Secretary, after consultation with SmartFish project management.
- Milestone 2: first prototype for review by workshop participants by end of December 2012.
- Milestone 3: a SmartFish project event (still to identify with SmartFish project management) to demonstrate the prototype (March-April 2013) and provide elements on cost and sustainability.

#### *2.6.3.3 Road map*

- For Milestone 1
  - WIOFish/StatBase/FIRMS study to define fisheries and indicators suitable for the WP presentation (data already existing for a management plan for Kenya?)
  - Interact with systems administrators to have access to the systems data (web service, URLs syntax with parameters).
  - A regional vessel type list is provided.
  - A regional species list with local names is provided.
  - Investigate the option of a host for the RIS's portal.
  - Define proposals for sustainability options for discussion by the WP – systems presentation should cover this section.

- For Milestone 2/Prototype 1
  - Define with KMFRI possible collaboration on development of Prototype 1.
  - Selection of the portal technology/Content Management System.
  - Development of mock-ups for feedback by SWIOFC network.
  - Development of Prototype 1.

- For Milestone 2/Prototype 2
  - An updated and cleaned concept/relationship (ontology) in Excel format is shared among participants for update.
  - Being able to access StatBase through web services (check with IRD for availability).
  - Implement some easy harmonization structural changes in WIOFish, such as “approach” or addition of regional or global classifications fields.
  - A vessel type regional classification for artisanal fisheries (=”Others” in the ISSCFV classification) – September.
  - Continue vessel characteristics (length, tonnage, etc.) harmonization – will depend on the result of the WP.
  - Provide GIS layers from StatBase (through MapServer/openlayers) and produce intersection tables. Load them.
  - Analysis of sustainability related issues (including StatBase, local capacities, FAO commitment and data governance issues).
  - Review of the completeness of the ontology Excel file.
  - Guidelines for delivering code list and its mapping.
  - Review code lists and the mapping provided (or not).
  - Import ontology into FLOD.
  - Review the ontology browser.
  - Assess technical capacities needed for implementing Prototype 2 – design user interface to ease the work of the administrators.
  - Portal development (Prototype 1) and related requirements according to WP comments and recommendations.
  - Development of ontology based search engine (assuming that systems can be scanned – to be assessed)
  - Integration of technologies in Prototype 2.
  - Delivery of the first results of Prototype 2.

- For Milestone 3
  - Review of ontology based searches and improvement of search engine.
  - Presentation of prototype and sustainability options to potential users.

# 3. Conclusion

The harmonization workshop fulfilled its goal of achieving a common understanding of existing systems. Participants have a better view on the complementarities of these systems.

The regional information system options were discussed and the choice to test 2 complementary options (a portal with links to the systems and an ontology based system) was made. A road map with milestones was discussed and adopted.

# 4. Actions to be taken / Recommendations

## 4.1 Actions to be taken

### *4.1.1 A regional vessel type list*

Gertjan de Graaf and Bernadine Everett worked together to build a regional vessel type list from the WIOFish and the current FishCode-STF list (July before the WP).

### *4.1.2 A regional species list with local name*

Bernadine Everett (involving Pierre Chavance) will send the WIOFish species list with the ASFIS unique ID (3 letters) when relevant. The list will be forwarded to Luca Garibaldi for assignment of ASFIS unique ID to the species missing one.

### *4.1.3 An updated and cleaned concept/relationships Excel file is shared among participants for update*

The Excel file (*Mapping-Concepts-RelationshipsWORKSHOPend2day.xlsx*) will be completed and cleaned by the FAO HQ team and sent back to the participants for them to define mappings from the perspective of their system. Proposed timeline for this action is the following: end of September 2012 for the FAO-HQ team to clean the Excel file and end of October 2012 for participants' inputs delivering.

### *4.1.4 An artisanal fisheries regional vessel type classification (="Others" in the ISSCFV classification)*

In September 2012 after the WP meeting led by Gertjan de Graaf.

## 4.2 Recommendations

**Recommendation 1**

Develop two prototypes to test two options for the Regional Information System: a portal based on links between systems, and an ontology based system. Set up a regional network of participants for the contribution to/validation of the prototype during the 3rd SWIOFC WP.

**Recommendation 2**

Explore sustainability issues for StatBase.

**Recommendation 3**

Explore hosting of the RIS portal by an institution within the region (KMFRI could be a candidate having hosted the SWIOFP website).

# 5. Appendix

## 5.1 Appendix 1: List of participants

| Expert name | Organization / information system | Expert email | Function |
|---|---|---|---|
| Mr. Julien Barde | IRD / StatBase | julien.barde@ird.fr | Information System expert |
| Mr. Norbert Billet | IRD / StatBase | norbert.billet@ird.fr | StatBase developer |
| Mr. Harrison Onganda | KMFRI / StatBase | honganda@kmfri.co.ke | KMFRI - SWIOFP data/info coordinator |
| Ms. Bernadine Everett | ORI / WIOFish | bernadine@ori.org.za | WIOFish Regional Coordinator |
| Mr. Satish Khadun | AFRC / WIOFish | skhadun@mail.gov.mu | Albion Fisheries Research Centre |
| Mr. Marc Taconet | FAO / FIRMS | Marc.Taconet@fao.org | FIRMS Secretary |
| Ms. Elena Balestri | FAO / FIRMS | Elena.Balestri@fao.org | FIRMS data manager |
| Mr. Gertjan de Graaf | FAO / SMARTFISH | Gertjan.DeGraaf@fao.org | SMARTFISH consultant |
| Mr. Yann Laurent | FAO / SMARTFISH | Yann.Laurent@fao.org | SMARTFISH Consultant |
| Mr. Xavier Vincent | World Bank | xvincent@worldbank.org | Senior Fisheries Specialist |

## 5.2 Appendix 2: Agenda

| Day 1: Morning | |
|---|---|
| 9.00 – 9.15 | Introduction |
| 9.15 – 9.30 | Participants presentation |
| 9.30 – 10.30 | What do we understand by "Harmonization"? (*working paper #1 will be provided)* |
| 10.30 – 10.45 | *Break* |
| 10.45 – 11.30 | FishCode-STF (45 min presentation, 15 min discussion) |
| 11.30 – 12.30 | StatBase (45 min presentation, 15 min discussion) |
| **Day 1: Afternoon** | |
| 14.00 – 15.00 | WIOFish (45 min presentation, 15 min discussion) |
| 15.00 – 16.00 | FIRMS (45 min presentation, 15 min discussion) |
| 16.00 – 16.30 | *Break* |
| 16.30 – 17.30 | Summary of previous presentation / discussion to initiate a first discussion on harmonization: discussion of a common concept for "Fishery" |
| | |
| **Day 2: Morning** | |
| 9.00 – 10.30 | Identify and discuss similarities among concepts / standards (*working paper #2 will be provided*) |
| 10.30 – 10.45 | *Break* |
| 10.45 – 12.30 | Identify and discuss dissimilarities among concepts / standards (*working paper #3 will be provided*) including the definition of the "Fisheries" |
| **Day 2: Afternoon** | |
| 14.00 – 14.30 | SDMX presentation |
| 14.30 – 16.00 | Mapping reference data and concepts: define harmonization driven priorities / define unique ID |
| 16.00 – 16.30 | *Break* |
| 16.15 – 17.30 | Mapping reference data and concepts: define harmonization driven priorities / define unique ID |
| | |
| **Day 3: Morning** | |
| 9.00 – 12.30 | Options for a regional information system (*working paper #4 will be provided*)<br>- conceptual considerations (Including need for big numbers section)<br>- sustainability considerations<br>- technological considerations |
| **Day 3: Afternoon** | |
| 14.00 – 15.00 | Short-term planning for the development of a prototype |
| 15.00 – 16.00 | Road map towards full-fledged development of a regional information system |
| 16.00 – 16.30 | *Break* |
| 16.15 – 16.45 | Recommendations |
| 16.45 – 17.00 | Conclusion |

## 5.3 Appendix 3: Agreed definition from FIRMS

**Aquatic Resource**: Biotic element of the aquatic ecosystem, including genetic resources, organisms or parts thereof, populations, etc. with actual or potential use or value (*sensu lato*) for humanity. Fishery resources are those aquatic resources of value to fisheries. FAO Fisheries Glossary.

**Fishery Resource**: In general, refers to elements of a natural aquatic resource (e.g. strains, species, populations, stocks, assemblages) which can be legally caught by fishing. It may sometimes be taken as including also the habitat of such resources.

**Stock**: A group of individuals in a species occupying a well-defined spatial range independent of other stocks of the same species. It can be affected by random dispersal movements and directed migrations due to seasonal or reproductive activity.

According to the above definitions, what cannot be identified as "Stock" is considered as a "Fishery resource". This term is sometimes interchanged with the more commonly used terms "Marine resource" or "Resource".

**Fishery**: A Fishery is an activity leading to the harvesting of fish, within the boundaries of a defined area. The fishery concept fundamentally gathers indication of human fishing activity, including from economic, management, biological/ environmental and technological viewpoints.

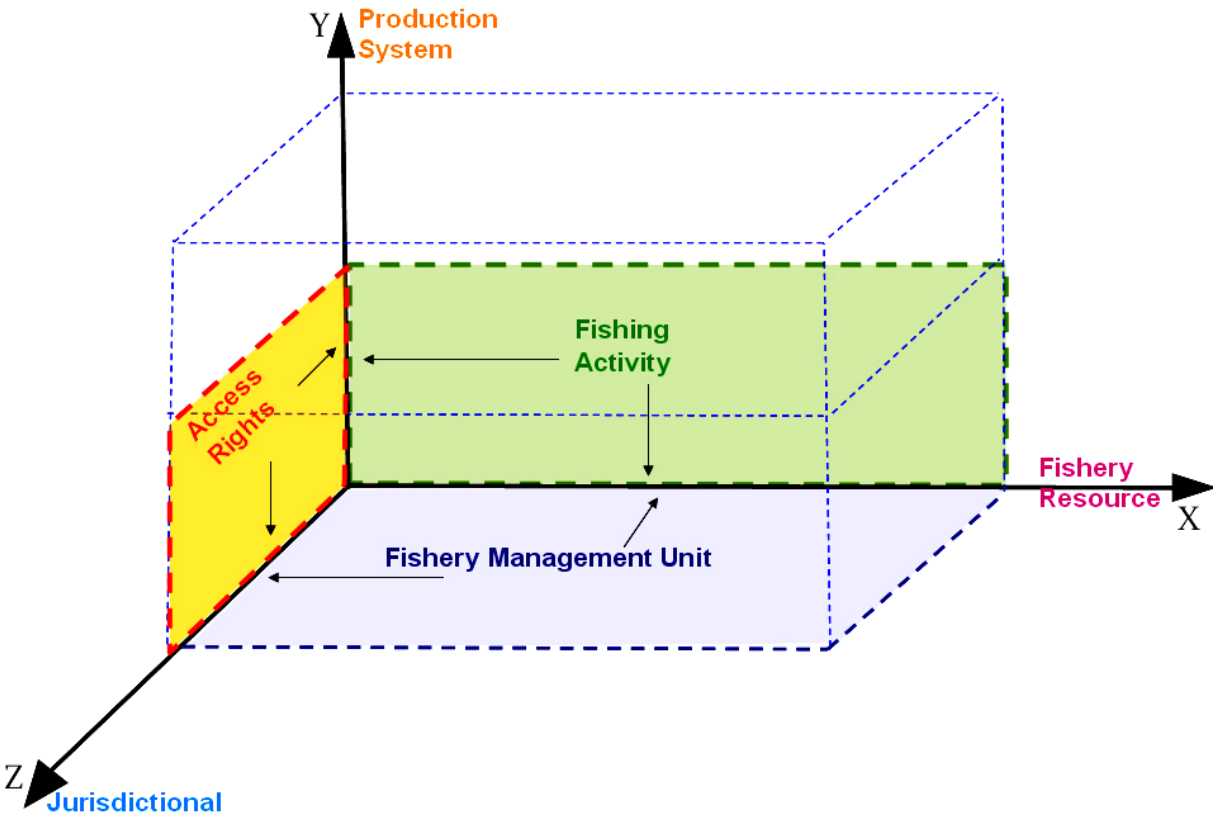
**Water area**: A water area refers to any location or geo-referencing regarding areas of the world covered by sea, brackish or freshwater. Geo-referencing system referred to can be statistical, environmental, jurisdictional, ...

**Thematic Approach**: "The thematic approach highlights the disciplinary viewpoint prevailing in the identification of fishery units (FIRMS 2008)". ➔ link to the cube.

Species or harvested resources, sea beds, fishing practices (or "métiers"), vessels, people or households are the elements which are perceived as fisheries.

The three dimensional diagram represented in Figure 1 helps to visualize these various perspectives/perceptions: three fundamental approaches, represented on the main axes of the diagram, are proposed as the Fishery resource (biological view), the Jurisdictional approach (legal view), and the Production system approach (socio-economic view); other perspectives at the cross-road of these main ones are represented on the plans of the diagram: a Management unit approach, a Fishing activity (métier) approach, an Access rights approach. FIRMS partners believe that most existing definitions of fisheries can be mapped to this standard framework, without pre-empting the possibility to extend the standard framework if required.

**Figure 1:** Conceptual model of the multifaceted approach to fisheries




The thematic approach plays a key role in the definition of a fishery, and accordingly in setting the key descriptors required for its identification.

With reference to the diagram represented in Figure 1, three fundamental thematic approaches are represented on the main axes:

| | |
|---|---|
| X axis | A **Fishery Resource approach** refers to elements of natural aquatic resources (biotic element) which can be legally caught by fishing;<br><br>Example: "Deep-sea shrimp fishery", where reference is made to the resources of shrimps in deep-sea waters off Angola.<br><br>Example: "Shrimp and groundfish fishery – Gulf of Paria", where reference is made to the resources of shrimps and groundfish in Gulf of Paria, in Trinidad and Tobago waters.<br><br>Note: the fishery resource approach would correspond to the Marine resource concept already released as part of FIRMS. |
| Y axis | A **Jurisdictional approach** emphasizes geopolitical and institutional boundaries which provide legitimacy for development of management systems; as such, it describes the set of governing rules agreed within a recognized legal framework for the management of a fishery or group of fisheries.<br><br>Example: "Commonwealth fisheries" (Australia), where reference is made to Australian fisheries operated within Australian Commonwealth waters and managed at federal level (as opposed to those occurring within state territorial waters and managed at state level).<br><br>Example: "Alaska fisheries", where reference is made to the USA Alaskan fisheries operated within the NPFMC management system. |

| | |
|---|---|
| | Example: "Municipal fishery – Philippines", where reference is made to the Philippines fisheries occurring within a jurisdiction area of 15 km coastal waters strip, and managed by local municipal and city government under municipal management systems. |
| Z axis | A **Production System** approach identifies homogeneous segments of means of production (e.g. vessel type, fleet segments, or fishers communities) including through consideration of their enterprise or livelihood strategies, and focuses on the description of their socio-economic aspects.<br><br>Example: "Coastal trawlers - Italian Adriatic coast", where reference is made to the fleet of coastal trawlers based in the various ports of the Italian Adriatic coast and operating according to same enterprise strategies.<br><br>Example: "Family-scale fishing and rice field fisheries", where reference is made to household communities in Cambodia basing their subsistence strategies on mixed fishing and rice culture activities. |

In addition of the fundamental approaches represented along the axes, other main approaches can be derived by combining these fundamental ones on the plans of the cube.

| | |
|---|---|
| X-Y plan | A **Fishery Management Unit** approach highlights those harvested fishery resources under management considerations; a Fishery Management unit evolves from a Resource focus, while taking into account the jurisdiction within which this Resource is managed; this concept is closely related to the formal settlement of a Fishery Management Plan.<br><br>Example: "Toothfish – South Georgia Maritime Zone", where reference is made to the harvested toothfish resources under CCAMLR-South Africa joint management responsibilities. |
| X-Z plan | A **Fishing activity** approach stresses the fishing activity component and identifies classes of fishing activity implemented by a fishing fleet or fishermen community; this approach is positioned at the crossroad of the production system approach and the Resource.<br><br>Example: "Offshore flatfish trammel netting", where reference is made to the fishing practice making use of trammel net for catching flatfish in offshore waters of French continental shelf.<br><br>Note: The concept of Métier: "A métier is usually defined by the use of a given fishing gear in a given area, in order to target a single species or group of species; e.g. inshore shrimp trawling, offshore flatfish trammel netting,… (Mesnil and Shepherd, 1990; Laurec et al., 1991). |
| Y-Z plan | An **Access rights** approach identifies Means of production authorized to operate within a jurisdiction.<br><br>Example: "European industrial fisheries", where reference is made to the European fishing fleet authorized to operate in Senegalese waters under Senegal-EU fisheries agreement. |

**Geographic reference**: "The geographic frame [work] from which fisheries are considered for inclusion in the inventory (modified from FIRMS, 2008)".

**Management unit**: It is a Fishery unit considered by an Authority for a purpose of management, usually within a jurisdiction and/or with established legal rights. Jurisdiction is interpreted here as the limits or territory within which some authority may be exercised.

**Management**: The art of taking measures affecting a resource and its exploitation with a view to achieving certain objectives, such as the maximization of the production of that resource. Management includes, for example, fishery regulations such as catch quotas or closed seasons. Managers are those who practise management.

**Management authority**: The legal entity which has been assigned by a State or States with a mandate to perform certain specified management functions in relation to a fishery, or an area (e.g. a coastal zone). Generally used to refer to a state authority, the term may also refer to an international management organization. Example of a Management authority is a regional body, a state, provincial government, or local fishing community.

**Management System**: Functional system governed by an authority having a mandate to perform specified management functions focusing on a territory, a production system or a fishery. This functional system is usually formalized through a legal framework. Examples of production systems as understood here are: Marine Capture fisheries, Inland Capture fisheries, Coastal fisheries, Culture based fisheries, Aquaculture. The degree of formalization of a Management system may vary from thoroughly established systems driven by a Regional Fishery Commission, to a recognized traditional rights based system at fishermen community level.

**Reference year**: The Reference year is defined as the year for which the status of the information has been evaluated/assessed.

**Reporting year:** The Reporting year is defined as the year in which the scientific meeting (or equivalent scientific validation process) reviewed the status of the information inventoried. It can correspond or not to the **Publication year.**

## 5.4 Appendix 4: Meeting documents provided to the participants on CD or USB pen drives

| Path | File name | Description |
|---|---|---|
| /agenda/ | 2012-06-Tentative-agenda for the harmonization workshop.docx | Workshop tentative agenda |
| /participants/ | 2012-07-List of Participants_final.docx | List of workshop participants |
| /reference-documents/background-documents | 2012-06-Methodology_harmonization_semantics_validated.docx | Illustrated methodologies for harmonization |
| /reference-documents/background-documents | 2012-06-Options_ regional_IS_validated.docx | 4 options for a regional information system |
| /reference-documents/background-documents | 2012-06-Similarities-dissimilarities_concepts_stand.docx | List of similarities and dissimilarities |
| /reference-documents/background-documents | 2012-07-Workshop prospectus.docx | Workshop prospectus |
| /reference-documents/background-documents | Mockup-ontology.pdf | Ontology browser mock-up |
| /reference-documents/presentations | 2012-06-SDMX-Interop.pptx | System interoperability |
| /reference-documents/presentations | 2012-06-System_Presentation_StatBase.ppt | StatBase presentation |
| /reference-documents/presentations | 2012-06-System_Presentation_WIOFish.pptx | WIOFish presentation |
| /reference-documents/presentations | 2012-FIRMS_Presentation.pptx | FIRMS presentation |
| /reference-documents/presentations | FishCode STF presentation Regional Info systems SWIOFC workshop.pptx | FishCode-STF presentation |
| /reference-documents/presentations | Mapping-Concepts-RelationshipsWORKSHOPend2day.xlsx | Result of mapping concepts activities during the workshop |
| /reference-documents/presentations | RelationshipsAmongSystemsApproaches.pptx | Proposed mapping of FIRMS and other systems/approach |