

FIRMS Steering Committee Meeting

Eleventh Session

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The Global Record of Stocks and Fisheries (GRSF)

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Revision History		
Date	Author	Summary
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24 April 2019	FIRMS Secretariat	<ul style="list-style-type: none"> • Second version, edited according to feedback provided by Mr M. Melnychuk (UW) • Updated figures of the pilot release (Par.5.2)

1. Why GRSF?

The Global Record of Stocks and Fisheries (GRSF) is a global repository of uniquely identified stocks and fisheries resulting from collation and merging of records across multiple data sources:

- Fisheries and Resource Monitoring System (FIRMS)
- RAM Legacy Stock Assessment Database
- FishSource (program of Sustainable Fisheries Partnership)

The GRSF is a collaborative instrument to collectively support the global monitoring of fish stocks and fisheries status. It can be tailored for use by countries / regional organizations / fishery-related institutions etc. to enable/facilitate the dissemination and monitoring of their information.

In a growing data-dependent world, with communities seeking for the best available scientific evidence to apply the most effective management measures, the GRSF is the digital answer offering key services in support of: 1) stakeholders involved in global/regional/national state of stocks indicators – particularly for SDG 14.4.1 “Proportion of fish stocks within biologically sustainable levels” (2030 UN Agenda for Sustainable Development A/RES/71/313), and 2) public and private actors involved in seafood traceability and certification including catch documentation schemes, ecolabelling schemes, food safety, sustainable fisheries.

Today’s technologies allow a finer grain resolution on data and information in any sector. The GRSF has been developed with advanced IT solutions by renowned research institutes and it is proposing a global repository of uniquely identified stocks and fisheries with standard codifications, thus enabling the formalization, collation, standardization, and sharing of marine resource and fisheries information.

The standard stocks and fishery identifiers are the pillars of such an initiative, which is aiming to boost connected knowledge on stocks and fisheries.

To date, the GRSF initiative is probably the biggest collation of stocks and fisheries data in the world from national, regional or global sources. We welcome new partners to share or explore fisheries information in the GRSF.

2. Background

The Global Record of Stocks and Fisheries (GRSF) stems from a FAO initiative which received support from FIRMS partners¹ and funded by the European Union Horizon 2020 BlueBRIDGE² project (2016-2018). It has been developed in collaboration with the Food and Agriculture Organization (FAO) and the FIRMS Partnership (Fisheries and Resource Monitoring System), the University of Washington (UW, RAM Legacy Stock Assessment Database) and FishSource, a program of the Sustainable Fisheries Partnership (SFP). The technical development is carried out by the Italian Consiglio Nazionale delle Ricerche (CNR-ISTI) and the Greek Foundation for Research and Technology - Hellas (FORTH), both partners in the BlueBRIDGE project. During the BlueBRIDGE project, the formulation of the requirements and the development of the GRSF was discussed in 7 Technical Committee meetings, 3 Technical Working Group meetings, 2 Advisory Board meetings and more than 60 conference calls. The GRSF takes advantage of the iMarine³ e-infrastructure and its software, both open-source (e.g. CKan data catalogue) and proprietary (e.g. MatWare for semantic warehouse).

The GRSF is currently disseminated through the GRSF catalogue in iMarine.

3. The GRSF data model, the standards, the unique identifiers, the time dependent data

The fields of the GRSF records are currently populated by information harvested from the three sources, of which the information constitutes the GRSF knowledge base. Not all FishSource/FIRMS/RAM information is imported, but only selected subsets of data are processed to produce the new GRSF records. The original data remains unaltered.

The GRSF database collects information on two domains, generically identified as “stocks” and “fisheries”. Each domain includes different types.

Types for stock: 1) "Assessment unit"; 2) "Marine Resource", when the record is generically describing a resource of value to fisheries.

Types for fishery: 1) "Fishing unit", a record bound to the fishing operation aspects; 2) "Other fishery", includes the identification of other fisheries described under different approaches (e.g. jurisdiction, management unit, fishery resource, production system). The different types were conceived following the overall strategy to be as inclusive as possible in the importing process from the source databases.

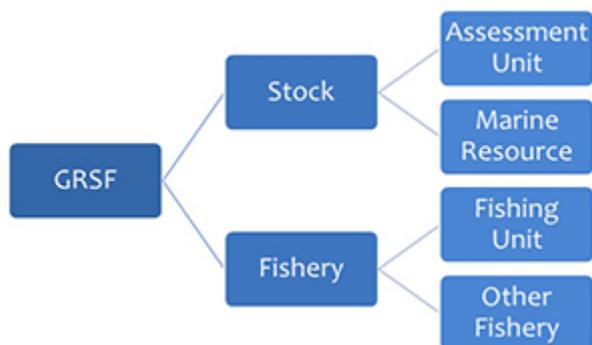


Figure 1 - GRSF information domain model

¹ See report of the Ninth Session of the FIRMS Steering Committee Meeting, Swakopmund, Namibia, 23–24 and 27 February 2015 http://www.fao.org/fishery/docs/DOCUMENT/FIGIS_FIRMS/2015/FSC9_Report.pdf

² BlueBRIDGE <http://www.bluebridge-vres.eu/>

³iMarine - Data e-Infrastructure Initiative for Fisheries Management and Conservation of Marine Living Resources <http://www.imarine.eu/>

Definitions

- **Assessment Unit⁴:** A group of individuals of one (or more) species that is the object of a stock assessment and/or any other analysis aiming to investigate stock status. The assessment unit can coincide with the biological stock (ideally) or not. In some cases the biological stock boundaries are not known and assessment units are established on the basis of practical/political convenience. Being the focus of an assessment, assessment units implicitly inform on the very likely existence of at least some management measures.
- **Marine Resource:** any other marine resource not identified as an assessment unit
- **Fishing Unit:** A fishing unit is a fishery targeting a single species (or group of species) conducted by a single flag state using a single fishing gear operating in a water area, which is possibly managed by a single empowered management authority or treaty under a unique set of management measures.
Note: in the latest case, the “water area” associated to the fishing unit equates the management unit area, which ideally can be connected with one single assessment unit.
- **Other Fishery:** Any other fishery that does not fall within the “fishing activity” definition.

3.1 Standards

GRSF records are populated with source data mapped to the following standard concepts.

- **Species Scientific Name** - Any other classification mapped to ASFIS (FAO 3Alpha code) or WoRMS (AphiaID, if ASFIS code is missing). Any other scientific name can be entered in the GRSF but this will be treated only as a text string and not qualified.
- **Assessment/Distribution Area** - Any other classification mapped as appropriate to EEZ (from Marine Regions - MRGID) or RFBs geographic system (ICCAT management unit, GFCM geographical sub-areas, IATTC Pacific tuna reporting area) or FAO Area (and its subdivisions).
- **Fishing Area/Management Area** - Any other classification mapped as appropriate to EEZ (from Marine Regions - MRGID) or RFBs geographic system (ICCAT management unit, GFCM geographical sub-areas, IATTC Pacific tuna reporting area) or FAO Area (and its subdivisions).
- **Jurisdiction Area** - Any other classification mapped as appropriate to EEZ (from Marine Regions - MRGID) or RFBs areas of competence.
- **Management Authority** - Any authority with name and acronym (if available) and the indication if national or international management. In case of national authority, the underlying iso3 country code or the EEZ is also added. Prefixes: "authority:NAT:", "authority:INT:"; other prefixes: "High seas", "SpecialAgreement".
- **Fishing Gear** - Any other classification mapped to ISSCFG classification or “SFP fishing gear classification”.
- **Flag State** - Any other classification mapped to ISO3 country code (plus custom solutions to manage exceptions).

The main technical challenge in the GRSF is the harmonization of the different existing standards (international, regional and national) from different data sources.

⁴ The definition of Assessment Unit is in progress within FIRMS TWG members, TWG6.2 gave mandate to the FIRMS Secretariat to formulate an additional proposal. See also meeting doc. FSC11/2019/3.

3.2 Unique identifiers

Two kinds of identifiers were conceived within the GRSF: **Universally Unique Identifier (UUID)**⁵ and a **Semantic Identifier**.

GRSF UUID: this is unique and does not change once assigned. UUIDs are machine readable codes and aimed to respond to any global IT standard. With the UUID the GRSF overcomes the problem to provide access to data that is described using different classification schemes.

Example: <http://data.d4science.org/ctlg/GRSF/58e5d057-8f8c-30e2-9622-541261992531>

GRSF Semantic Identifier: aimed to be unique but subject to standards availability and can change across time. The semantic identifier is human readable for records identification and validation, and codified according to a specific convention⁶ based on the GRSF standards.

Example:

- **asfis:PAR+fao:34.3.4** (stock - *Pagellus bellottii* Western Gulf of Guinea)
- **asfis:COD + fao:21.3.M + grsf-org:INT:NAFO + isscfg:OTB + iso3:LTU**
(fishery - *Gadus morhua* - Atlantic, Northwest/21.3.M - Northwest Atlantic Fisheries Organization (NAFO) - Bottom otter trawls – Lithuania)

The GRSF identifiers are complemented with the GRSF stock/fishery title. Two types of names are envisaged:

- the **GRSF Title** (label of the Semantic ID), is the concatenation of the decoded values of the Semantic ID codes; (e.g. *Pagellus bellottii* Western Gulf of Guinea);
- A **Short Title**, user friendly and manually entered according to specific naming conventions (e.g. Red Pandora - Côte d'Ivoire, Ghana, Togo and Benin).



STANDARD CODING SYSTEM FOR:

- ▶ Stocks <Species> + <Assessment Area(s)>
- ▶ Fisheries <Species> + <Fishing area(s)/Management area(s)> + <Management Authority(ies)> + <Geartype> + <Flag State>

EXAMPLE OF SEMANTIC IDENTIFIER, AND OF ITS FULL LABEL

asfis:COD + fao:21.3.M + authority:INT:NAFO + isscfg:03.12 + iso3:LTU
Gadus morhua - Atlantic, Northwest/21.3.M - Northwest Atlantic Fisheries Organization (NAFO) - NAFO area of competence - Single boat bottom otter trawls - Lithuania

Species: *Gadus morhua*
 Species code: COD
 Fishing Area: FAO 21.3.M
 Management Authority: Northwest Atlantic Fisheries Organization (NAFO)
 Jurisdiction: NAFO area of competence
 Fishing Gear: Single boat bottom otter trawls
 Fishing Gear code: 03.12
 Flag State: Lithuania
 Flag State Code: LTU
 ID: asfis:COD + fao:21.3.M + authority:INT:NAFO + isscfg:03.12 + iso3:LTU
 UUID: <http://.../b99fd03e-709e-3139-9f5d-133df0b103fd>

Source FAO, SOFIA, 2018

Figure 2 - Example of a Semantic Identifier (ID) and a Universally Unique Identifier (UUID) for stocks and fisheries

⁵ Universally Unique Identifiers (UUIDs) <https://www.iso.org/standard/62795.html>

⁶ Convention for the GRSF Semantic Identifier: Stock “<Species> + <Assessment Area(s)>” ; Fishery “<Species> + <Fishing Area(s)> + <Management Authority(ies)> + <Geartype> + <Flag State>”

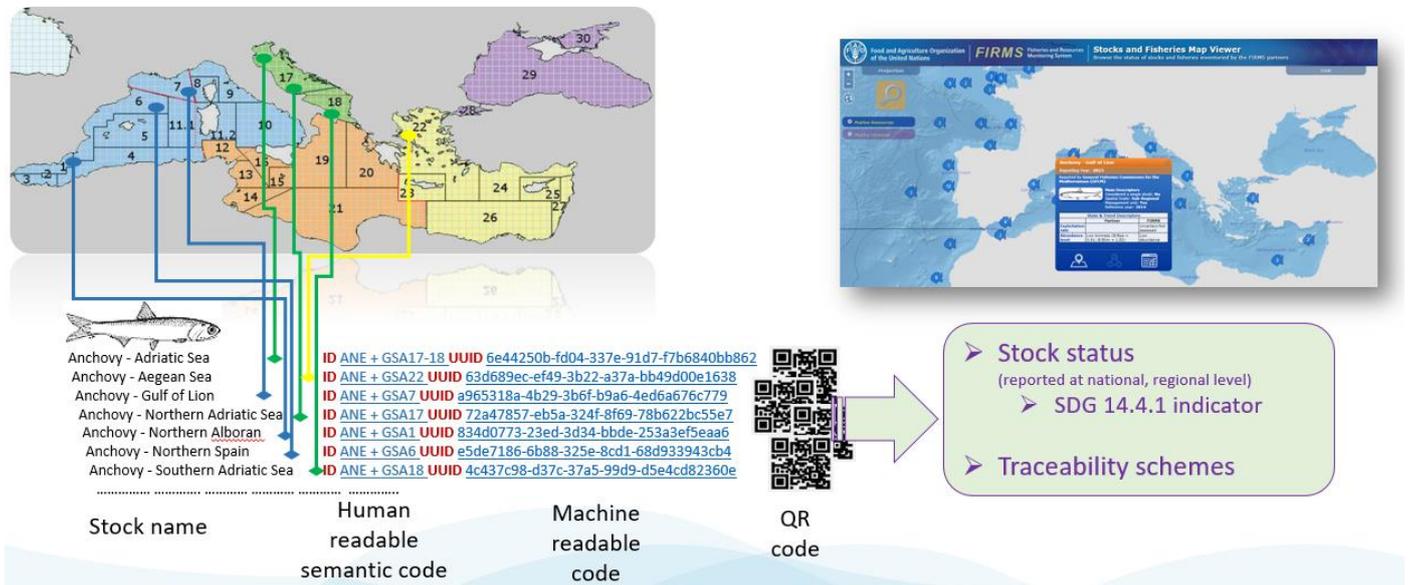


Figure 3 - Example of assessment units and unique identifiers

3.3 Time dependent data

In addition to unique identifiers associated to GRSF record (a time independent data), the GRSF collates time dependent data from the database sources which are associated to the GRSF records in the form of time series or narrative content. Each datum is referenced regarding the database source and has its own reporting year.

Here follows the list of data harvested (when available) and retrieved in GRSF records:

- Abundance Level (FIRMS Standard) (qualitative descriptor)
- Abundance Level (quantitative/qualitative descriptor)
- Fishing Pressure (FIRMS Standard) (qualitative descriptor)
- Fishing Pressure (quantitative/qualitative descriptor)
- FAO Stock Status Categories (qualitative descriptor)
- Biomass (time series)
- Catches (time series)
- Landings (time series)
- Scientific advice (narrative)
- State and Trend (narrative)

4. FIRMS involvement

FIRMS Partners were involved in the GRSF development from the beginning of this adventure. Specifically, the following meetings⁷ had dedicated sections on GRSF:

- FSC9 - FIRMS Steering Committee Meeting - 9th Session (Namibia, Swakopmund, 23 - 27 February 2015)
- TWG5 - FIRMS Technical Working Group Meeting (FIRMS-TWG5) Fifth session - BlueBRIDGE Technical Working Group Meeting (BB-TWG1) First session - BlueBRIDGE Advisory Board Meeting (Italy, Rome, 29 February - 4 March 2016)
- BlueBRIDGE External Advisory Board Meeting (EAB) - Technical Working Group Meeting on Global Record of Stocks and Fisheries - Second Session / BlueBRIDGE - Regional Database VRE workshop (Italy, Rome, 28 February - 3 March 2017)
- FSC10 - FIRMS Steering Committee Meeting - 10th Session (Denmark, Copenhagen, 21 - 24 June 2017)
- TWG6 - BlueBRIDGE Technical Working Group (TWG3) joint meeting with FIRMS TWG6 on the Global Record of Stocks and Fisheries (GRSF) (Italy, Rome, 7 - 9 February 2018)

By circulating the reports of the above meetings, all FIRMS partners were informed about the progress made on the GRSF during the BlueBRIDGE project.

5. GRSF today

The development of the GRSF application has continued after the end of the BlueBRIDGE project (Feb. 2018) thanks to the effort of CNR, FAO, FORTH, SFP and UW colleagues. The RAM and FishSource colleagues are currently working in collaboration with the FIRMS Secretariat to test the application, report issues in the GRSF tickets system, and validate the records.

5.1 Data sources

The GRSF is populated with content harvested in the FIRMS, FishSource and RAM databases. According to the GRSF data model, FIRMS and FishSource contribute data on stocks and fisheries while RAM provides data for stocks only. All of the three databases feed the GRSF with public data compiled from multiple data sources at different reporting levels including FAO, RFBs, countries and research institutes.

FIRMS, FishSource and RAM databases aim to be global in scope but none of them are actually having a real world full coverage. The collation of all of these data produce an increase of the global coverage as well as a step ahead in supporting the need of global standards for the monitoring of stocks and fisheries status and trends. Please visit the source databases website for details on their coverage.

⁷ BlueBRIDGE Technical Working Group (TWG3) joint meeting with FIRMS TWG6 on the Global Record of Stocks and Fisheries (GRSF), Rome, Italy, 7–9 February 2018 <http://www.fao.org/3/CA1566EN/ca1566en.pdf>

Report of the tenth Session of the FIRMS Steering Committee Meeting, Copenhagen, Denmark 21-24 June 2017 http://www.fao.org/fi/static-media/MeetingDocuments/FIRMS/FIRMS_FSC10/FIRMS_FSC10_Report.pdf

BlueBRIDGE External Advisory Board Meeting (EAB) - Technical Working Group Meeting on Global Record of Stocks and Fisheries - Second Session, Rome, Italy, 28 February, 1 and 2 March 2017 http://www.fao.org/fi/static-media/MeetingDocuments/BlueBRIDGE/EAB-TWG2-GRSF/EAB-TWG2-GRSF_REPORT.pdf

FIRMS Technical Working Group Meeting (FIRMS-TWG5) Fifth session - BlueBRIDGE Technical Working Group Meeting (BB-TWG1) First session - BlueBRIDGE Advisory Board Meeting, Rome, Italy, 29 February – 1 March 2016 http://www.fao.org/fishery/docs/DOCUMENT/FIGIS_FIRMS/TWG5/FIRMS-TWG5-Report.pdf

Report of the ninth session of the FIRMS Steering Committee Meeting, Namibia, Swakopmund, 23 - 27 February 2015 http://www.fao.org/fishery/docs/DOCUMENT/FIGIS_FIRMS/2015/FSC9_Report.pdf

In summary, beyond cases of overlapping: i) RAM is mostly covering officially published assessments of shared and national stocks in North and South America, Europe, Japan, New Zealand, Australia, South Africa, Northwest Africa, and tuna Regional Fisheries Management Organizations; ii) FIRMS is covering stocks and fisheries according to the area of competence of its partners and underlying member countries all over the world with a smaller coverage in the Pacific and in South America while more information is available for Africa and increasingly for the Caribbean in comparison to the other two databases; and iii) the primary focus of FishSource is to provide major seafood buyers with up-to-date information on fisheries and the connected stocks status, when available. The FishSource data coverage currently reflects the fisheries from which their partners and their suppliers source from (i.e. American Continents, Europe, Australia and New Zealand, South East Asia).

5.2 Pilot release

The GRSF is part of the iMarine Data Catalogue and can be accessed through two VREs (Virtual Research Environment):

- the “GRSF” VRE for public users with approved records;
- the “GRSF Admin” VRE for authorized users to manage and validate the GRSF records.

The GRSF VRE contains a pilot release with approved records screened by the FIRMS Secretariat in collaboration with RAM and FishSource colleagues (GRSF Team). The approval process is in progress and the number of records is steadily growing.

The GRSF VRE is however still under restricted access until a decision is made by FIRMS for its public release.

The total amount of collated GRSF stocks and fisheries records can be accessed through the GRSF Admin:

Record types	Total number	Uniquely sourced from			Jointly sourced from			
		FIRMS	FishSource	RAM	FIRMS FishSource RAM	FIRMS RAM	FishSource RAM	FIRMS FishSource
Stocks from source systems	3179	732	1156	1291				
Assessment unit	2322	484	518	1156	37	73	25	29
Marine resource	606	76	528	-	-	-	-	2
Fisheries from source systems	3367	256	3111	-				
Fishing unit	6596	3526	3070	-	-	-	-	-
Other fishery	242	239	3	-	-	-	-	-

The approval process consists of screening the GRSF records to detect any duplication, overlapping or inconsistency beyond what the algorithm of the GRSF knowledge base has done by systematically applying the GRSF standards and principles. As expected, based mostly on the fifteen years of experience of FIRMS in building global inventories of stocks and fisheries, a variety of cases have emerged in terms of definition of assessment and fishing units. For example, partial overlapping due to different assessment or fishing areas, assessment units no longer monitored, taxonomic groups broken down in lower items (e.g. from genus to species), closed fisheries, uncertainties on flag states operating with specific gears targeting selected species, changes of legal frameworks, etc.

The process does not foresee altering the content of the information harvested from the three source databases (if not for the short title).

In addition, GRSF records can be flagged as eligible for SDG and/or for traceability purposes.

For traceability purposes, assessment units and fishing units can be also connected. This specific task is mainly carried out by the FishSource team assisted by the FIRMS Secretariat.

At the time of the circulation of this meeting document (24 April 2019), the Pilot release contains:

- 956 Approved stocks
- 95 Approved fisheries
- 36 Archived stocks

The main issues are related to the detection of overlapping stocks or fisheries due to different standards, particularly for the area codes. The "monitoring evolution" of stocks is also contributing to the complexity where assessment units are no longer updated. For example, the RAM database contains 36 "Outdated RAM stocks", FIRMS also contains tens of "No longer monitored stocks" which anyway would need to be checked, approved and then archived. Another frequent example of monitoring evolution is the merge or split of assessment units. For example:

- 1) One resource becomes two assessment units
Angler fish - Bay of Biscay and Iberian Basin was reported until 2009, then the assessment unit *Lophius* spp. has been broken down in two different assessment units
 - *L. budegassa* (Angler - Bay of Biscay South and Portuguese Waters East)
 - *L. piscatorius* (Blackbellied angler - Bay of Biscay South and Portuguese Waters East)
- 2) Same species broken down in two smaller areas
Flounder Sound and Belt Sea becomes
 - Flounder - Baltic West of Bornhol and Southern Central Baltic West
 - Flounder - West of Gotland, Archipelago Sea, Bothnian Sea, Bothnian Bay and Gulf of Finland

The validation process takes a considerable amount of time, at least in this first iteration. The GRSF Team, while testing the application and approving records, also had the opportunity to spot issues on their source data and amend or annotate accordingly. GRSF team colleagues, in charge of validating records, spend their time cross checking GRSF records, verifying legacy records (the sources) and providing criteria for bulk approvals of specific sub-sets of records. For example, the approval of all stocks records pertaining to a given species with no similar assessment areas with other records. In this example the issue consists of detecting those stocks and fisheries described with unknown area codes.

It is not easy to make an estimate on the remaining effort to screen all the records and approve/reject/merge them. In any case, the FIRMS experience testifies that - for a monitoring system - this is a never ending activity where updates take place every year, steadily growing as long as the capacity of the Partners and underlying Member countries are growing.

The fishery GRSF domain may be evaluated differently where the GRSF system is basically offering a specific standard with examples of fisheries (fishing unit). Regardless of today's amount of potential fisheries vs. real ones, the number of records and their connections with assessment units will gradually grow with the buy-in of interested users. Regional and national experts could also be consulted to further review the work done to confirm or reject the approvals and suggested merges or new records.

Further development of the GRSF application, with more advanced web services/competency queries and improved performances can also speed up the process (e.g. the response time of the GRSF catalogue at the moment is quite slow).

FIRMS Partners are encouraged to request access and browse the pilot release at <https://i-marine.d4science.org/group/grsf> (GRSF) and <https://i-marine.d4science.org/group/imarine-gateway> (GRSF Admin).

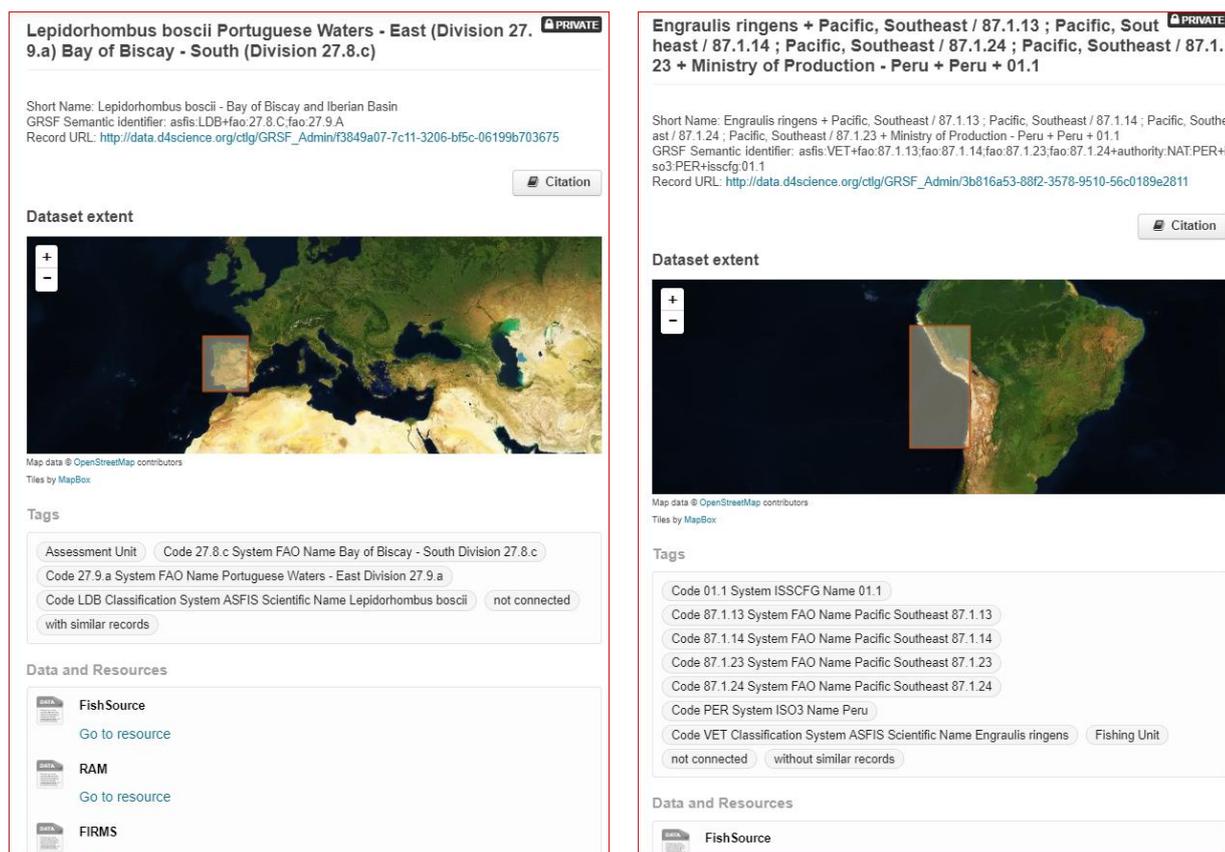


Figure 4 – Example of GRSF stock and fishery record pages

5.3 Potential users, benefits of GRSF, how it can be used

The availability of GRSF unique identifiers sets the potential for a global, structured and distributed network of accurately connected resources of information on single stocks and fisheries. By the multifaceted nature of stocks and fisheries identifiers, this capacity expands to connecting related information resources of other sciences such as environmental sciences or food security and safety.

Users

The GRSF can target different types of users:

- RFBs and their member states
- National agencies of governments responsible for stocks and fisheries reporting
- Researchers and officers working on global analyses on state of fishery resources
- NGOs promoting sustainable fisheries
- Seafood industry
- Seafood certifiers
- General public

Benefits

Benefits would include:

- A global standard to identify stocks and fisheries based on a Universally Unique Identifier (UUID) and a Semantic Identifier
- Support to monitoring, reporting and dissemination of Sustainable Development Goal Indicator SDG 14.4.1 “Proportion of fish stocks within biologically sustainable levels”
- Support to seafood traceability and catch documentation, ecolabelling schemes, food safety, sustainable fisheries
- Boost connected knowledge on stocks and fisheries.

GRSF today's **services** include:

- Web-based data catalogue (GRSF VRE)
- Download of time series (.csv files per record)
- Competency queries returning results in tabular format (e.g. Retrieve all species and related stock records; List all stocks records from GRSF with associated catch series; Retrieve all flag states and related records)
- Web services (APIs in JSON format)

Scenarios

There is a wide spectrum of possible scenarios for utilizing the GRSF. Detailed requirements for specific utilizations have not been defined yet. However, while interacting with colleagues in different contexts the following scenarios have been envisaged in support of:

- **SDG 14.4.1 and SOFIA stock status indicator**
 - Digital Inventories of national stocks/assessment units under global standards
 - Categorization in shared, straddling or national stocks
 - Consistency checks across the global inventory of stocks
 - Detection of duplication, overlapping assessment units among reporting countries
 - Assignment of unique identifiers for “approved” records
 - Handling of unique identifiers as structured and connected hierarchy of national, regional and global stock units to support the reporting of stock status (e.g. SOFIA)
 - Web services to consume GRSF data (e.g. download time series applying customizable filters)
 - Advanced competency queries including the ability to download some data types for all stocks/fisheries or sub-sets at once (e.g. clusters of assessment units)
 - Connection/link (and potential mining/harvesting) to national or regional web-resources disseminating stock status (upon inclusion of UUIDs in such resources by data owners)
- **Fishing activities monitoring**
 - Digital inventories of national fishing units under global standards
 - Connection/link with national or regional catch and effort statistics databases
 - Contextualization of AIS fishing footprint estimates (upon inclusion of UUIDs in AIS algorithms)

- **Seafood traceability solutions**
 - A standardized and globally-accepted identifier system for digital Inventories of fisheries/fishing units usable by the fishery industry sector
 - Assignment of machine-readable unique identifiers for individual fisheries that other systems can pull from (e.g. via API)
 - Starting point for ad-hoc services to add new fishery records and get unique identifiers in return
 - Use of unique identifiers for traceability purposes in the seafood supply chain
 - Combine GRSF technology and unique identifiers with other technologies (e.g. blockchain) for enriched certification schemes
 - Development of a standardized list of fishery management units
 - FAO elaboration towards setting up a list of minimum requirements for seafood traceability

- **Food security and nutrition**
 - Connection of unique identifiers for the:
 - food security
 - food safety
 - nutritional values
 - Environmental indicators
 - Food Cloud (EU H2020)

6. GRSF business model, proposed governance, status of the agreements

6.1 Business model

At FIRMS FSC10 and FIRMS TWG6 the Public / [not-for-profit Private] partnership business model was selected under the form of a FIRMS-GRSF expanded Partnership, as FIRMS and GRSF share one goal, to gather and disseminate data on stocks and fisheries, and use the same data sources primarily originating from countries. It was preferred over a Public-only partnership because of the involvement of organizations already connected to the seafood industry and potential opportunities to develop data products and services for the sector.

6.2 Governance

The choice of the governance model was guided by the FIRMS Partnership Agreement which remains unaltered as well as the roles of the Partners. It is viewed as an expansion of the FIRMS partnership controlled by FAO/FIRMS rules. FIRMS will be the owner of the GRSF VRE. The data standardization and content activities and the daily administration will be completely integrated into the FIRMS organization; SFP and UW will become FIRMS members/collaborative institutions (with no voting rights) as defined by a specific Collaborative Arrangement (see meeting doc. FIRMS FSC10/2017/4 "FIRMS Collaborative Arrangement") and by any amendment of the Rules of Procedures as needed; FORTH as IT technology provider and expert in knowledge management will, similarly to SFP and UW, become FIRMS members/collaborative institution to contribute to the GRSF knowledge base and to participate to FIRMS technical committees thus providing their expertise in knowledge management. CNR as technology providers will operate under Memorandum of Understanding (MoU) and a specific Service Level Agreement (SLA) with FAO/FIRMS Secretariat. This organizational scheme remains open to the development of data products and services, including any generation of income by third parties that might also cover the GRSF sustainability aspects. However consistently with the principles underlying FAO as an UN Organization, these types of activities are outside the FIRMS scope, and will be further evaluated and kept under FAO review. By adding specific collaborative arrangements and by amending/integrating the current documentation on FIRMS governance, new types of membership can be created for non-RFB non-country partners such as NGOs, universities, research institutes, etc. The GRSF can be

managed under the current FIRMS Partnership Agreement that is unlikely to be amended thanks to the flexibility already offered by the existing FIRMS governance mechanism.

The figure 5 depicts how the “expanded partnership” would work in addition to the actual governance mechanism made of the FIRMS Steering Committee (FSC), the Technical Working Group (TWG) and the Secretariat. The decision making role remains in the hands of the [inter]-Governmental partners, while the Collaborative Arrangement will enable other institutions and possible champions of countries to join FIRMS and its TWG. The collaborative institutions can also take part in specific sessions of the TWG with ad hoc groups for handling the FIRMS/GRSF knowledge base with focus on content and standards for SDG and traceability needs. Technical suppliers for the FIRMS/GRSF operating under specific MoUs/SLAs are coordinated by the FIRMS Secretariat. They can also provide services to third-party companies, for example the seafood industry involved in eco-labelling and traceability (not in the scope of this arrangement).

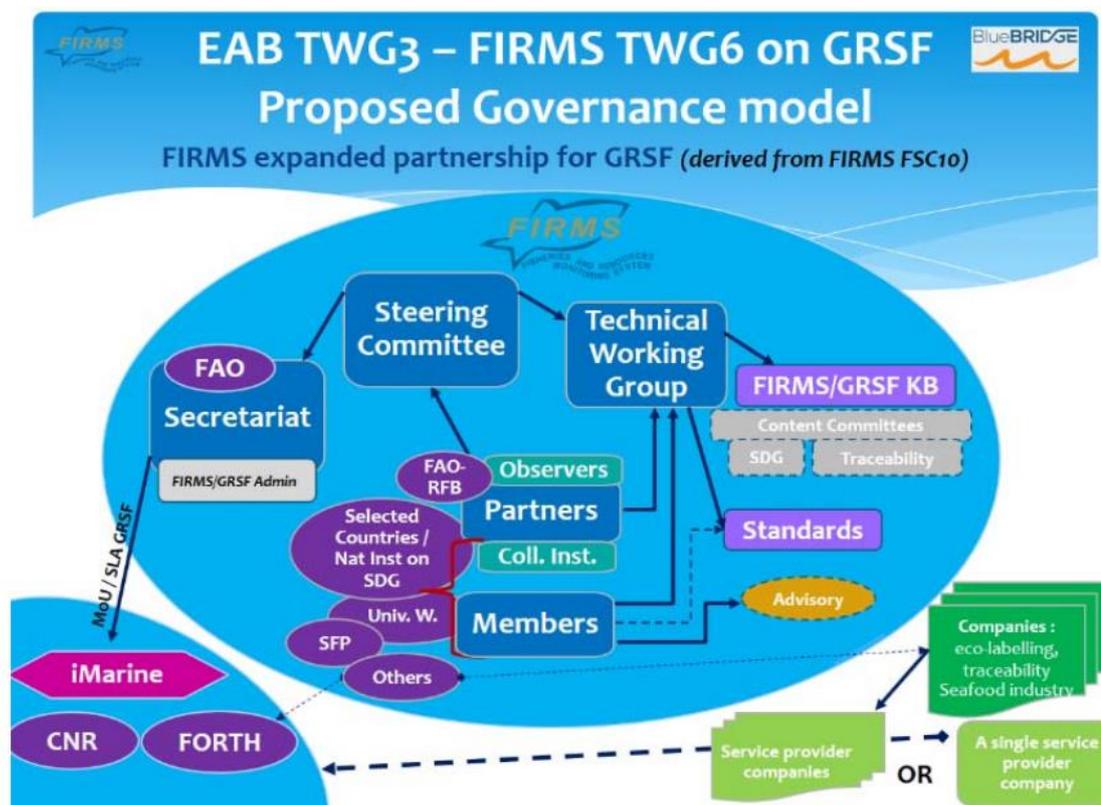


Figure 5 - Business / Governance model under the FIRMS expanded Partnership adapted with the conclusions of the TWG3

6.3 Status of the agreements with data providers and technical suppliers

FAO/FIRMS Secretariat developed different types of agreements according to the governance model (see fig. 5): Memorandum of Understanding (MoU), Service Level Agreement (SLA), Collaborative Arrangement, and other expressions of intent (as temporary agreements). The MoU provides the overall collaboration agreement, while the specific activities and related efforts of the IT suppliers under this MoU and beyond are covered in various agreements (SLAs) for handling the GRSF application. The collaborative arrangements (as described in the above par. 6.2) are content oriented and made for the collaborations with the data providers (UW, FishSource, FORTH). These documents are at a different level of finalization, specifically:

- **FAO-UW Collaborative Arrangement:** under consideration, an expression of intent has been provided (“Expression of Intent for Continued Collaboration between The Food and Agriculture Organization of the United Nations (“FAO”) and Hilborn Lab, School of Aquatic and Fisheries Sciences, University of Washington”). This document is to express the intent to continue informal collaborations surrounding the Global Record of Stocks and Fisheries (GRSF), as part of the FIRMS framework, and related studies. (Meeting doc. FSC11/2019/7)
- **FIRMS-SFP Collaborative Arrangement,** under review by FAO. This document is drafted upon the proposed standard FIRMS Collaborative Arrangement including the Annex 2 with details on and conditions of SFP’s FishSource data. The objective of the collaboration is to contribute FishSource records to GRSF and collaboratively play a role in their validation and publishing, and to act as strategic mediator between the seafood industry user base and FIRMS/GRSF (Meeting doc. FSC11/2019/8)
- **FIRMS-FORTH Collaborative Arrangement:** finalized ready for circulation to FAO corporate offices. This document, drafted upon the proposed standard FIRMS Collaborative Arrangement including the Annex 2, describes the provision of advisory services for knowledge management with emphasis on conceptual and ontological modelling, and data aggregation/ integration facilities. (Meeting doc. FSC11/2019/9)
- **FAO-CNR MoU:** the final draft is progressing in the FAO clearance process pipeline; final clearance is expected to be available by the FSC11, with the MoU possibly signed by FAO and CNR-ISTI. The purpose of this MoU is to provide a framework for strategic collaboration between the Parties aimed at (i) securing the current exploitation level of the iMarine platform, powered by the D4Science infrastructure; (ii) integrating and coordinating efforts to increase the exploitation of the iMarine platform; (iii) fostering the development of and coordination with relevant initiatives; and (iv) considering possible options to ensure the continuity of the iMarine initiative. (Meeting doc. FSC11/2019/11)
- **FAO-FORTH SLA on GRSF:** jointly agreed first draft ready for circulation to FAO corporate offices; This document describes the provision of services for the maintenance of the GRSF knowledge base, GRSF Competency queries, GRSF APIs and GRSF Services (GRSF-Services-Core, GRSF-Services-Merger, GRSF-Services-Updater). (Meeting doc. FSC11/2019/12)
- **FAO-CNR SLA on GRSF:** jointly agreed that the first draft is to be ready for circulation to the FAO corporate offices. This document describes the provision of the deployment and operation of two dedicated Virtual Research Environments (“GRSF” and “GRSF Admin”) for the content management and dissemination of the GRSF records. (Meeting doc. FSC11/2019/13)

Upon FSC11 approval, the SLAs are envisaged to enter into force on 1 March 2020. The above agreements will enable concerned institutions to assign efforts to the maintenance and further development of the GRSF under specific arrangements, both in-kind and upon future possible funding opportunities from projects or regular program activities.

7. Envisaged resources to support GRSF

The GRSF will be supported through the combination of the following contributions:

- In-kind (contributions under the FIRMS partnership and collaborative arrangements)
- FAO core budget to support operations maintenance through SLAs, for initial configuration, depending on evolution and specific demands for use by Partners, other sources of partner budgets would be sought
- Specific projects such as EU H2020 BlueCloud for supporting performance enhancements and new features.

8. Ownership of the GRSF records

The matter was discussed at FIRMS TWG6⁸. The GRSF, as a whole as well as at single record level, needs to be properly acknowledged through source and ownership metadata, citations and credits. The following proposals were derived from existing arrangements in use by the FAO Terms and Conditions on web content, FIRMS, and D4Science (iMarine).

Citation template for GRSF records

© [Copyright holder]. [Title] ([Year]). In: Global Record of Stocks and Fisheries (GRSF). [Publisher]. Version: [Version]. Updated [Update date]. [Date accessed and/or downloaded [Access date]]. [GRSF Record URL].

Database sources: [Database sources].

Sources citations: [Citations to the database sources]

Citation template for FIRMS source records

[© FAO] [Date created]. [Title of content]. [Series title]. [Contributors]. In: Fisheries and Resources Monitoring System (FIRMS) [online]. Updated [Update date]. Accessed [Date accessed and/or downloaded]. [URL]

Citation template for RAM database

RAM Legacy Stock Assessment Database. ([Date created]). Version: 4.35. Updated [Update date]. Accessed [Date accessed and/or downloaded]. Retrieved from <https://www.ramlegacy.org>

Citation template for FishSource source records

© SFP. [Date created]. [Title of content]. [Series title]. [Contributors]. In: FishSource [online]. Updated [Update date]. Accessed [Date accessed and/or downloaded]. [URL]

In addition, a disclaimer may need to be added in relation to the GRSF content, once publicly available.

⁸ GRSF/2018/5 Data access and sharing policies for the Global Record of Stocks and Fisheries. <http://www.fao.org/fi/static-media/MeetingDocuments/FIRMS/TWG6/5e.pdf>

9. Workplan

The remaining work on GRSF mainly consists of finalizing the following tasks:

1. Governance documentations – completions of the agreements with the GRSF stakeholders
2. Pilot completion and public release
 - GRSF application – completion of the development/bug fixes
 - GRSF content – a new data harvest to get latest updates from FIRMS, RAM and FishSource databases thus inheriting all the bug fixes/improvements implemented so far
 - GRSF approval – completion of the on-going validation activity by GRSF stakeholders and nominated experts
 - GRSF public release – accompanied with a communication plan
3. An activity plan is expected to be discussed with FIRMS Partners in relation with the broader perspective of use which stems from the opportunity offered by the GRSF:
 - Promote the use of Identifier and receive feedback
 - Tailor the application to support the SDG14.4.1 and SOFIA indicators, i.e. enable the addition of an SDG14.4.1 source of records and their connection with regional and global record levels, and respond to voluntary involvement of RFBs in review of GRSF records under a SDG14.4.1 workflow
 - Need for further development of the GRSF standard, as regards the local area units
 - Invitation to any other partner views on use and what activities would have to be envisaged

10. FSC 11, actions requested from the Committee, and move forward

FSC11 is kindly requested to feedback on the matters elaborated in this document and to deliberate on the proposed workplan. More specifically:

- Confirmation of commitments
- Endorsement of proposed arrangements and Governance
- Comment envisaged resources
- Identify arrangements for the public release of GRSF
- Provide views on the promotion and potential use of GRSF and what activities would have to be envisaged

11. Outreach and references

The GRSF has been promoted in several meetings and through publications. Here follows a list of relevant references.

Regional Fishery Body Secretariats' Network (RSN) Magazine No. 18 Licence: CC BY-NC-SA 3.0 IGO. <http://www.fao.org/3/ca3925en/ca3925en.pdf>

FAO. 2018. The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals. Rome. Licence: CC BY-NC-SA 3.0 IGO. <http://www.fao.org/3/i9540en/I9540EN.pdf>

FAO. 2018. Fish Forum Book of abstracts. Rome. 338 pp. Licence: CC BY-NC-SA 3.0 IGO. <http://www.fao.org/3/CA2619EN/ca2619en.pdf>

Tzitzikas, Y., Marketakis, Y., Minadakis, N., Mountantonakis, M., Candela, L., Mangiacrapa, F., Pagano, P., Perciante, C., Castelli, D., Taconet, M., Gentile, A. & Gorelli, G. 2017. Towards a Global Record of Stocks and Fisheries. In M. Salampassis, A. Theodoridis & T. Bournaris, (eds). Proceedings of the 8th International Conference on Information and Communication Technologies in Agriculture, Food and Environment (HAICTA 2017), pp. 328–340. Chania, Greece, 21–24 September 2017 (available at http://ceur-ws.org/Vol-2030/HAICTA_2017_paper39.pdf).

GRSF Webinar, 25 January 2018, 3pm CET <https://www.bluebridge-vres.eu/news/webinar-global-record-stocks-and-fisheries-25-january-2018-3pm-cet>