In a seashell; lessons learnt

D4 and D5; Fisheries and Aquaculture

Anton Ellenbroek, Marc Taconet, Aureliano Gentile, Emmanuel Blondel, Alexandre Bennici (FAO of the UN)
Yannis Tzitzikas, Yannis Marketakis (FORTH)
Julien Barde, Bastien Grasset (IRD)
Emeric Lavergne, Sylvie Giraud, Jeremy Augot (CLS)
And many in-kind contributors across the FIRMS network, Univ Washington, SFP, Planet.com

Blue-Cloud Open Conference

Brussels, 8 December 2022

Blue-Cloud has received funding from the European Union's Horizon Programme call BG-07-2019-2020, topic: [A] 2019 - Blue Cloud services, grant Agreement number 862409.

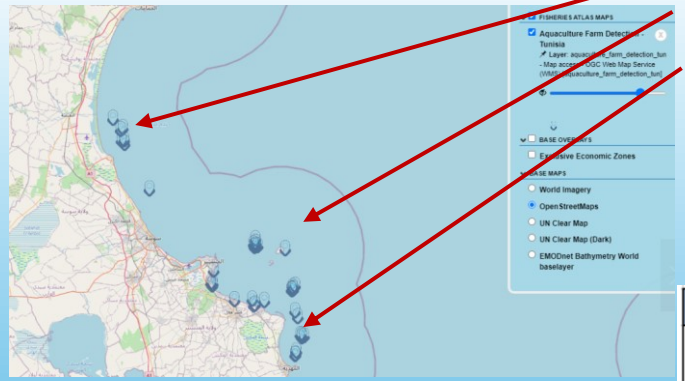
D5: Aquaculture monitoring: Introduction

- Satellite monitoring of aquaculture locations
  - Technical Feasibility relies on the satellite data
    - Synthetic Aperture Radar : night and day, all weather -> **Everywhere**
    - Medium to Very High Resolution Optical imagery **-> Weather-sensitive**
  - Affordability relies on the use of open satellite data from the European Union Copernicus Programme – Sentinel constellation
    - Images from commercial satellites are expensive !
  - Effectiveness relies on the use of Blue Cloud Infrastructure & services and advanced tech for processing open satellite data
  - Objectives:
    - Detect cages with S1 radar
    - Detct coastal aquaculture with S2 optical

Offshore Aquaculture: Results

- Succesfull S1 detection of aquaculture clusters
- Published in Blue-Cloud VRE

Figure: Results in Puerto Montt (Chile)



Location	Precision (%)	Recall (%)
Puerto Montt (Chile)	76	66
Monastir (Tunisia)	91	91

Table: Precision and Recall for Aquaculture Cage Detection

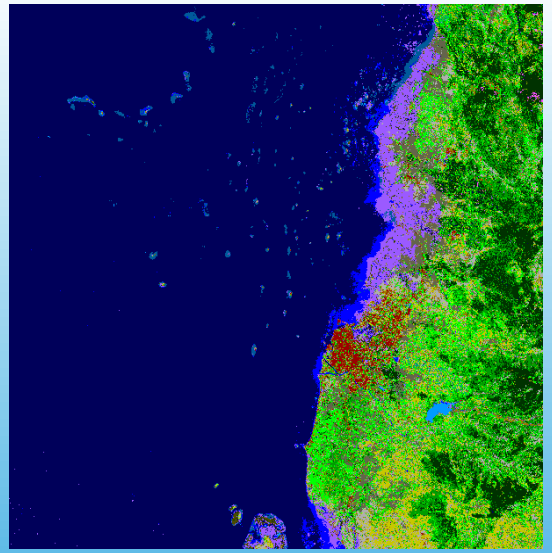
Inland Aquaculture

- Objective: Use AI to assign land-types; aquaculture ponds and other crops.

Figure: Google Satellite image in Sulawesi, Indonesia

Inland Aquaculture; Results

- Ground based validation with Indonesian partner INRIA
- Overall Accuracy: 71.6%



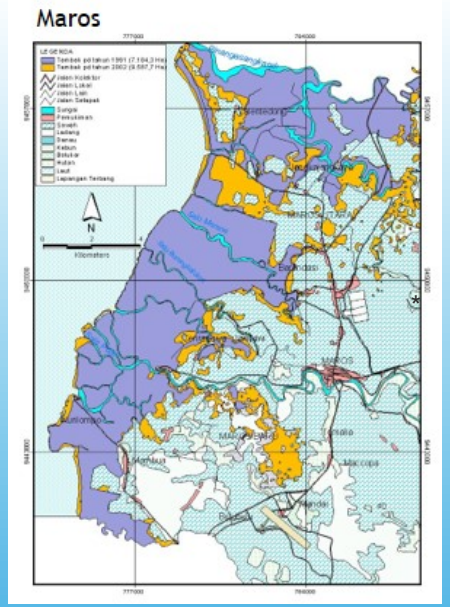
Natural Forest	
Secondary Forest	
Tree plantation	
Bushland	
Grassland	
Fallow / Reed	
Meadow	
Paddy Rice (lowland)	
Rain Fed (Upland) Rice	
Rivers I Channels	
Lakes	
Fishponds (chanos chanos, ...)	
Swamps	
Mangrove	
Settlements / Built aera	
Bare soil (coastal)	
Deep Sea	
Shallow sea	

$$^{*}Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

TP: True Positive TN: True Negative

FP: False Positive FN: False Negative

Validation with existing maps+ In-situ experience



D4: Fisheries Atlas

- A collabortion between FAO, IRD, FORTH
  - With engagement of academia; University of Washinton
  - With uptake by industry; Sustainable Fisheries Partnership
- Results
  - Global Tuna Atlas
  - Global record of Stocks and Fisheries

The Global Record of Stocks and Fisheries (GRSF)

A Blue-Cloud action in the Fisheries Atlas

A. Gentile, A. Ellenbroek, Y.Tzitzikas, Y.Marketakis

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Global Record of Stocks and Fisheries - GRSF

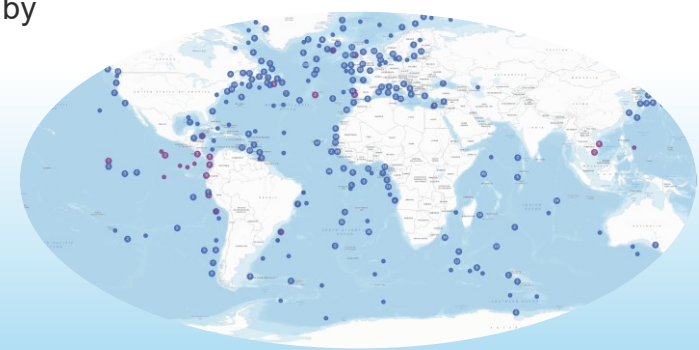
Result: A comprehensive repository of stocks and fisheries

Four major sources brought to GRSF under FIRMS governance:

- **Fisheries and Resources Monitoring System** (FIRMS): http://firms.fao.org
- **RAM Legacy Stock Assessment Database**: http://ramlegacy.org, owned by University of Washington
- **FishSource**: http://www.fishsource.com, owned by Sustainable Fisheries Partnership
- **FAO SDG14.4.1 Questionnaire** for which FAO is custodian agency

+2026 approved records

Status of Stock



Browse the:

Catalogue https://i-marine.d4science.org/web/grsf/data-catalogue

Map Viewer https://i-marine.d4science.org/web/grsf/map-viewer

Web services and **competency queries**

Traceability along value chain

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The Global Tuna Atlas

J.Barde, B.Grasset (IRD France)
E.Blondel, F.Fiorellato, A.Bennici (FAO)

FIRMS
FISHERIES AND RESOURCES MONITORING SYSTEM

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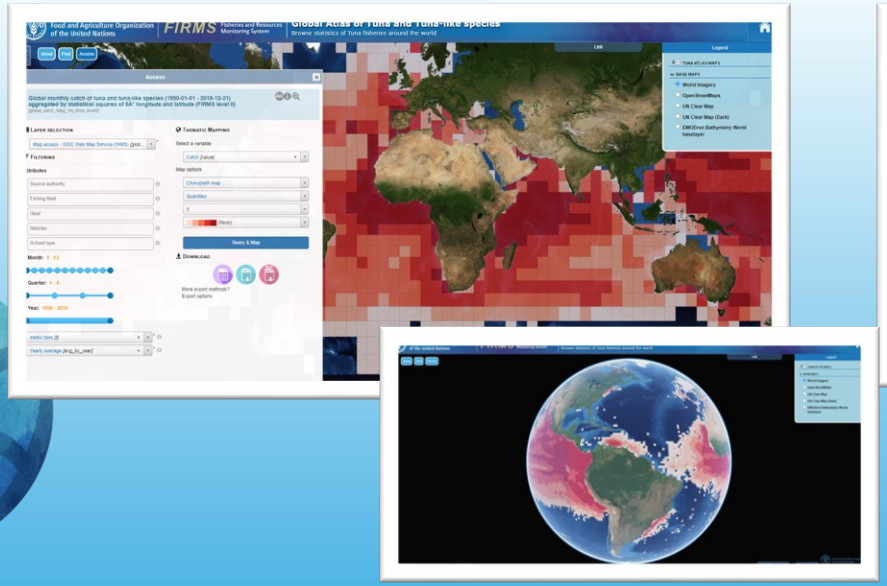
FIRMS Global Tuna Atlas (GTA)

Building on Open Source tools we delivered www.fao.org/fishery/geoserver/tunaatlas/

Based on data provided by the five tuna RFMO's (CCSBT, ICCAT, IATTC, IOTC, WCPFC/SPC)

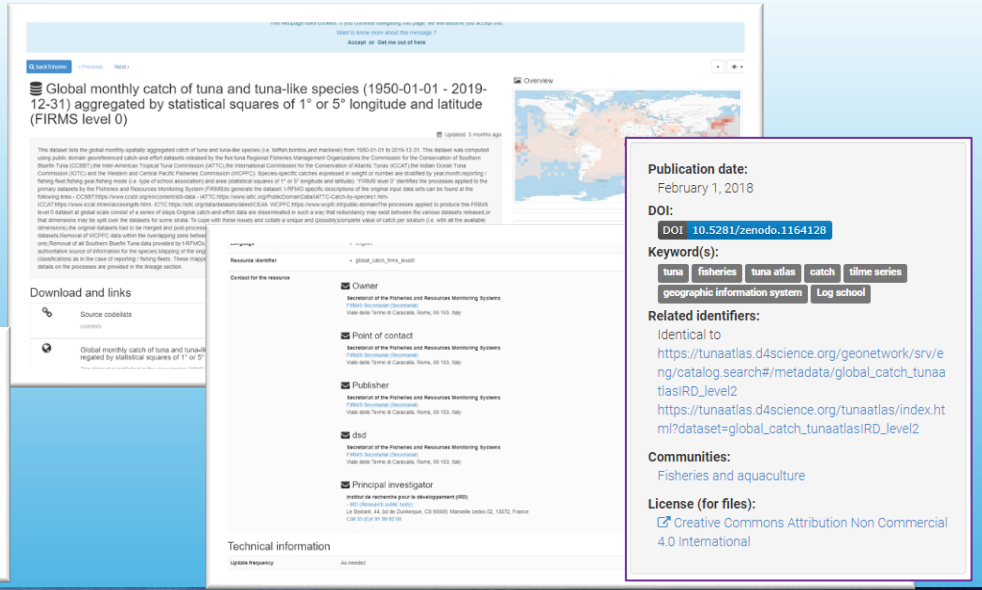
1. An interactive **map viewer**

- Automatically built from metadata, implementing the FAIR principle



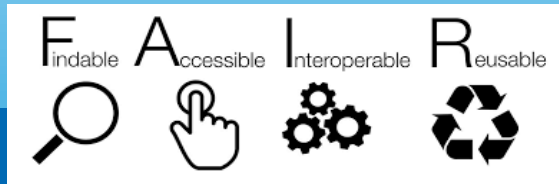
2. A **metadata catalogue**

- Increase datasets outreach and enable cross-referencing through **DOIs**



GTA's FAIRy tale

- compliance with standards to foster ***Interoperability***
- **discovery metadata**: easy to ***Find and Acces***
  - Dublin Core & Datacite
- **usage metadata**: ease and trust to ***Reuse***
  - data provenance (Lineage / process steps) with OGC / ISO 19115
  - data structure with OGC / ISO 19110
  - DOI's to facilitate citation and clarify licences
- **domain specific metadata** (ad hoc)
  - describing the main characteristics of data (spatial, temporal, taxonomic coverage, fishing gears...)
  - these metadata are displayed in automated / dynamic reports (Rmarkdown) or Shiny apps



Workflow executed in a Virtual Research Environment

The **runtime environment** is provided by a **VRE** of the H2020 Blue-Cloud project:

- Hosted by **D4Science** in the general context of EOSC
- VRE made of widely used software:
  - R within RStudio server, Shiny apps, Jupyter notebooks
  - SDI components: PostGis, GeoNetwork, GeoServer
- Docker images (for RStudio / Shiny servers..) used behind the scene

2022

Unlocking Open Science in support of the EU Green Deal

Blue-Cloud

Website: www.blue-cloud.org
E-mail: info@blue-cloud.org
Twitter: @BlueCloudEU
LinkedIn: Blue-Cloud Org

Final Conference