

Executive Summary of the iMarine "Ecosystem approach to marine and fishery data management" workshop

Co-located with ICRI2014 conference

Donatella Castelli, CNR-ISTI -- Pasquale Pagano, CNR-ISTI -- Stephanie Parker, Trust-IT



Executive Summary

Defining appropriate conservation and policy measures for the sustainable exploitation of natural resources in the marine environment requires **comprehensive, multi-domain and good quality knowledge** on the **status** of **biodiversity** and **ecosystems**, as well as on **marine resource exploitation and management**.

The ICRI workshop presented several existing solutions that exist today to address the challenges of **environmental, marine and fishery research**, with interactive discussions assessing challenges that still need addressing, charting possible pathways for future collaborative efforts.

Blue Growth¹ is the maritime contribution to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth. Specifically, it is the long term strategy to support sustainable growth in the marine and maritime sectors as a whole. Seas and oceans are drivers for the European economy, where the "blue" economy represents roughly 5.4 million jobs and generates a gross added value of almost €500 billion a year, and have great potential for innovation and growth.

The **Blue Growth strategy** presents new opportunities for collaborative research and calls for consensus building around the major challenges that require focused efforts involving stakeholders with different expertise. The workshop offered a platform to explore these challenges, define future collaboration priorities and start to identify strategies for user engagement.

¹ http://ec.europa.eu/maritimeaffairs/policy/blue_growth/.

Where we stand today – current approaches and solutions

Research infrastructure initiatives have different, but often complementary, approaches to the challenges of **environmental, marine and fishery research**. The exhibit below offers a snapshot of current approaches and solutions presented during the ICRI workshop.

Exhibit 1 - Current approaches and solutions

Focus Area	Approach to challenges
iMarine ² is an initiative for the management and conservation of marine living resources to support the ecosystem approach. Its focus is multidisciplinary and participatory.	The iMarine infrastructure has been built as a “system of systems” where the constituent parts include other infrastructures, services and information systems ³
SeaDataNet ⁴ is a pan-European infrastructure for ocean and marine data management, linking some 90 national oceanographic data centres and marine data centres	A major technical development is ensuring that the data centres interact as a virtual datacentre for the delivery of integrated data, metadata and products of controlled quality through a single portal.
LifeWatch ⁵ is the European e-Science infrastructure for biodiversity and ecosystem research aimed at providing advanced capabilities for research on the complex biodiversity system.	Tackle the big basic questions in biodiversity, as well to address the urgent societal challenges concerning biodiversity, ecosystems and other cross-cutting issues.
EarthServer ⁶ is an initiative establishing open access and ad hoc analysis on extreme-size earth science data.	Scalability of both storage and processing.
Agro-Know ⁷ is a company that captures, organises and adds value to the rich information available in agricultural and biodiversity sciences, in order to make it universally accessible, useful and meaningful.	Developing and putting into real practice solutions that transform data into meaningful knowledge and services. Untapped opportunities: Data products leveraging data from research infrastructures is still in a nascent stage.
MERMAID ⁸ is an initiative developing concepts for the next generation of	Collectively, these initiatives stress the importance of data integration for socio-

² www.i-marine.eu.

³ For the full list of iMarine data providers, see the iMarine Catalogue of Data Providers, <http://ow.ly/zwYyD>.

⁴ <http://www.seadatanet.org/>.

⁵ <http://www.lifewatch.eu/>.

⁶ <http://www.earthserver.eu/>.

⁷ <http://www.agroknow.gr/agroknow/>.

⁸ <http://www.mermaidproject.eu/>.

offshore platforms which can be used for multiple purposes (e.g. energy extraction, aquaculture and platform related transport).

H2OCEAN⁹ is an initiative aimed at developing an innovative design for an economically and environmentally sustainable multi-use open-sea platform.

TROPOS¹⁰ is an initiative developing a floating modular multi-use platform system for use in deep waters, with an initial geographic focus on the Mediterranean, Tropical and Sub-Tropical regions.

economic analysis in marine related projects.

Gap analysis

Future research efforts should seek to fill identified gaps by:

- Ensuring the wider exploitation of the data that is generated through research.
- Making the data available to a broader set of communities, such as policy-making and educational institutions.
- Focusing on efficient and rapid micro-service deployment along large data and service infrastructures.
- Dedicating effort on metadata quality. For example, intelligent and dynamic metadata and data transformation is crucial.

Standards and metadata

Standards are crucial to increase the understanding and re-usability of data. **Metadata information** is necessary to describe the functionality of a data tool/service, make it discoverable and verify its compatibility with research needs. While considerable effort is dedicated to metadata standards, **little effort** has been **devoted to** creating **metadata information** for **data tools** and **services**. Currently, we lack **metadata models** for describing the functionality, for example, of a data mining, a data visualisation or a data analysis service. The development of such metadata models is essential for making data tools and services discoverable and usable. This is a key requirement for open science, which means open access not only to data but also to scientific analyses, data tools and services.

Organisational practices

A robust global research data infrastructure should not only consist of a technical infrastructure but also provide a set of **organisational practices** and **social forms** that work together to support the full range of individual and collaborative scientific work across diverse geographic locations.

⁹ <http://www.h2ocean-project.eu/>.

¹⁰ <http://www.troposplatform.eu/>.

Applying big data from the field across multiple domains

Large amounts of data are generated in the fields of fisheries, marine and ocean sciences. Applying this data across **multiple domains** such as modelling, policy making and education is both interesting and challenging. This also applies to modelling data and metadata, as well as the quality measurement of data and metadata and its fitness for use.

Integrating data and models to support relevant communities

Integrating data and models is an important service for user communities. Firstly, modelling logistic processes in fishery and developing algorithms helps find solutions to optimise these processes. Secondly, it is possible to define different policies and their impact by trying to model ecosystems and evaluating scenarios. Thirdly, the development of forecasting models can include aspects like weather, pollution, fish populations and migrations. Lastly, we can apply data mining techniques to transform raw data into knowledge (irrespective of the size of the data).

Bringing socio-economic data into the picture

The wealth of data and metadata being collected for use and analysis by the natural sciences is not currently matched by socio-economic data, which could support decision-making for activities connected to the natural environment. This gap needs to be addressed through investments in developing and integrating data from the natural sciences (already existing or being collected) with relevant **socio-economic data**, also because economics is a **data hungry discipline**.