

EUROFLEETS RI – AN ALLIANCE OF ORGANIZATIONS AND RESEARCH VESSELS TO STRENGTHEN INTEGRATED AND SUSTAINED OBSERVATIONS IN THE OCEAN AND SUPPORT INNOVATIVE NEW TECHNOLOGY VALIDATION TO FURTHER ADVANCE OBSERVING COMPETENCIES AND CAPABILITIES

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Abstract

Built on the two previous FP7 grants Eurofleets (2009-2013) and Eurofleets 2 (2013-2017) and within the on-going H2020 Eurofleets+ project, the under-discussion Eurofleets RI aims at strengthening the role of the European Research Vessel Fleet in collecting marine data from global oceans, regional seas and coastal waters, deploy and service observing systems, so providing a vital platform for other European RIs. Eurofleets+ provides transnational access to a unique fleet of research vessels through a robust call management and evaluation process. Joint research activities in the project aims at advancing data management, improving interoperability of rigs for deployment of different equipment, facilitating installation of mobile equipment across different vessels and validating new innovations for intelligent exploration. Active dialog with stakeholders ensures that marine research vessels including associated equipment are coordinated, designed and operated optimally to meet scientific user's requirements in addition to providing training activities to support the next generation of marine scientists. Fostering innovation through the management of exploitable results is

supported through collaboration with industrial partners. A business plan and strategic roadmap are under development for Eurofleets RI, while extensive dissemination and communication activities to raise awareness of the essential role of the European Research Vessel Fleet are ongoing.

Keywords: pan-European research infrastructures, marine science, research vessels, transnational access, observing systemsinterdisciplinarity, deep seafloor and water column

1. Introduction

Ocean science has become 'big science', involving sophisticated and costly equipment, such as research vessels, fixed-point platforms (e.g. seabed observatories, buoys or moorings) and mobile units (e.g. ROVs, AUVs, USVs, gliders, Argo floats), remote sensing tools (e.g. high-frequency radars, satellites, aeroplanes or drones), land-based facilities (e.g. marine stations) and e-infrastructure (UNESCO, 2017). Research vessels are key Research Infrastructures (RIs) offering vital access to our Seas and global Oceans for conducting marine science and ocean observing (European Marine Board, 2013). Research vessels are essential in ocean observation as they are used to collect a wide variety of data and samples from the atmosphere, the ocean surface, the water column, the seabed, and the ground below it, as well as facilitating exploration of the vast expanses of relatively unexplored and unobserved ocean areas. Their work ranges from fisheries surveys to seafloor mapping, and from climate studies to deep-water/ocean observations. In addition, research vessels are critical for ocean observing stationary installations on the ocean floor, in the water column or on the surface as they deploy, recover and service them, as well as providing ground-truthing for satellites/AUV/gliders/etc. data.

Driven by the need to understand the inevitable impacts of climate and other global changes, based on 'the best available scientific knowledge' according to the Paris Agreement on Climate Change, the demand for sea and ocean data provided by research vessels is higher than ever. This demand for new data is not only for scientific needs, but also in response to current European Directives. For example, in support of the Marine Strategy Framework Directive (MSFD), the Water Framework Directive (WFD), the INSPIRE Directive and Data Collection Framework (DCF), Member States are required to conduct regular monitoring and observations in their own waters.

At a global level, the UN Sustainable Development Goals (SDG's), and especially SDG14 (Life below water) place added political pressure on countries to understand ocean health status within their national waters and to recognise the potential impacts of management decisions.

These collected data and metadata contribute not only to the research purposes of the scientific cruises, but also add significantly to the presence and availability of ocean

observations, as well as increasing the rigour of the observational network through calibration. Consequently, research vessels function as important ocean observatories in their own right.

2. European Research Fleet

The European Marine Board's Position Paper 25 'Next Generation European Research Vessels – Current Status and Foreseeable Evolution' (Nieuwejaar *et al.*, 2019) provides an overview of the current European Research Fleet and its capabilities, and the report recommends ways in which the Fleet should evolve to meet future science needs. In 2019, the European Research Fleet consisted of 99 research vessels (31 Local & Coastal Class, 36 Regional Class, 14 Ocean Class and 18 Global Class), run by 62 different research vessel operators, public and private, in 23 countries, with an uneven distribution of vessels in Europe (Figure 1).

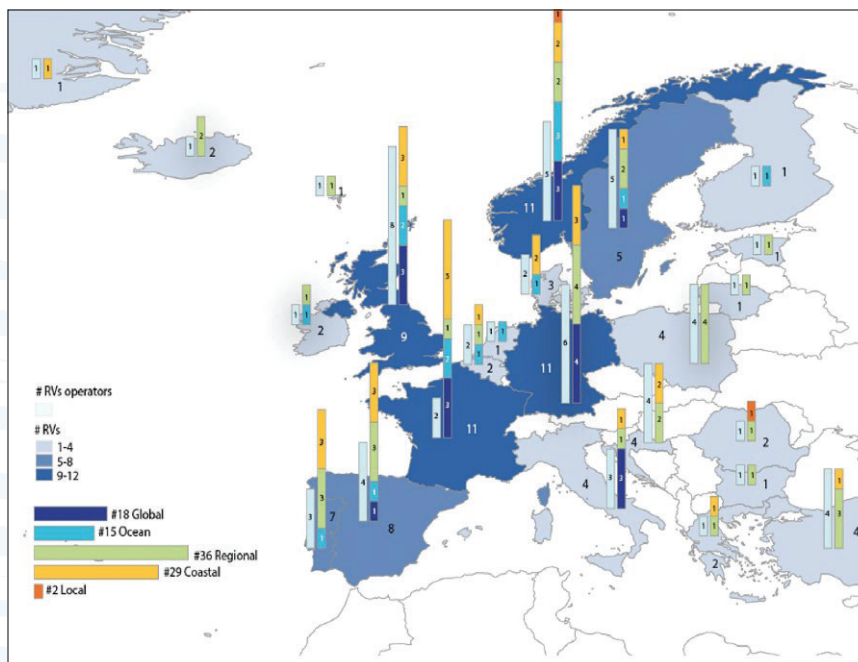


Fig. 1. Geographical overview of the numbers and classes of European research vessels per country (Source: EMB's Position Paper 25, 2019).

The current European research vessel fleet is highly capable to support all kinds of marine science, is able to provide excellent support to European marine science and wider scientific research and can take the lead on the world stage. However, with a typical functional life expectancy of a research vessel of 30 years, the fleet is ageing and urgently requires further investment and reinvestment to continue to be as efficient and capable as the scientific community expects and requires. The capabilities of the fleet have increased considerably since 2007 (Binot *et al.*, 2007), and vessels have kept up with fast-paced technological developments. The demand for complex and highly capable vessels will continue, and research vessel designs and outfitting, and the European research vessel fleet as a whole will need to keep pace in order to remain fit-for-purpose and continue to be a key player globally. There is huge diversity in vessel types and designs in terms of capabilities and equipment, management structures and processes, and training possibilities. While it would not be possible or appropriate to highlight any one approach as the only one to use, a growing trend in collaboration through community groups, agreements, legal entities and funded projects now enables more strategic thinking in the development of these vital infrastructures. However, some issues remain in enabling equal access to research vessel time for all researchers across Europe regardless of country, and regardless of whether or not that country owns a suitable research vessel for their scientific needs.

3. Eurofleets+ Project

Over the years, the European Commission (EC) has strongly supported the opening-up of existing national research infrastructures at a European level. Within research projects granted under EU funding programmes (e.g. FP7 and H2020), Transnational Access (TA) to key infrastructures is viewed as a key enabler of research and innovation to address global environmental, social and economic challenges. In addition, long-term sustainability of research infrastructures has been repeatedly highlighted as one of the main challenges for the overall research and innovation system in Europe. Long-term sustainability of research infrastructures has been recognized as mandatory to remain at the forefront of science and technology, and to stay competitive in the global knowledge-based economy.

The H2020 funded project Eurofleets+ (An alliance of European marine research infrastructure to meet the evolving needs of the research and industrial communities) is an Advanced Community with a high degree of coordination and networking, attained through Integrating Activities awarded in two previous FP7 grants, Eurofleets and Eurofleets 2. The Eurofleets+ project provides TA to a unique fleet of state-of-the-art, modern research vessels and arrange that these are optimally used for excellent science, leading to high level scientific publications and exploitation by European and international researchers through a robust call management and evaluation process. The Eurofleets+ Joint Research Activities (JRA) are aimed at advancing data management, improving and advancing the interoperability of rigs to be able to deploy different equipment, enabling installation of mobile equipment when needed,

facilitating sharing and installation of equipment across different vessels and validating new innovations for intelligent exploration, mapping and control using cooperative navigation. Active dialog with stakeholders and user communities ensures that the relevant marine research infrastructures are coordinated, designed and operated optimally for user's challenging requirements while training and education activities to support early stage researcher's careers and train the next generation of marine scientists and activities to promote ocean literacy to all. Fostering innovation through the capture and management of exploitable results, in particular those with a strong scientific, economical and/or environmental protection potential will be supported through collaboration with key industrial partners. A strategic roadmap, business case and business plans are under development for the coordination and integration of the European research vessel fleet, and practical guidelines produced to ensure sustainability beyond the project lifetime, while all of this activity is widely disseminated and communicated to raise awareness of the role of the European Research Vessel Fleet in advancing our knowledge of marine processes and resources and thereby our management of the ocean.

4. Peculiarities of research vessel operators models

Management of research vessels is usually not centralized per country, but rather by institutions, universities or government bodies focusing on environmental monitoring and/or marine research. The most striking and recent example of centralized fleet management is in France, where the French Oceanographic Fleet has been managed by one single operator, IFREMER, since 2018. In Spain, an agreement for the creation of a joint management unit called FLOTPOL65 was signed between CSIC and IEO in 2013 in order to strengthen collaboration and optimize the operation of the research vessels and equipment owned and operated by these two institutions. In other countries where several research vessels are operated, three and even up to eight operators can be identified, such as three different operators managing five (Italy) or seven (Portugal) research vessels. In Norway, the Institute of Marine Research (IMR) operates seven research vessels that are owned and co-owned by five different public institutions belonging to four different ministries.

Funds to operate research vessels mainly come from the national governments although the funding schemes differ between countries. Some countries have a fully funded RI, where all costs associated with the vessel(s) and the science conducted on board are covered. In other countries, part or all of the costs other than the vessel's fixed operating costs, such as transportation of equipment to be used on the cruise, travel for the science party to/from the vessel etc. have to be covered by the scientific users.

Other significant characteristics with regards to research vessels are the high investment cost in the order of 10 – 15 M€ for a coastal research vessel, 20 – 40 M€ for a regional research vessel and 50 – 150 M€ for an ocean class or global class research vessel,

and the high annual running cost which can be in the order of 0,5 – 1 M€ for a coastal vessel, 3 – 4 M€ for a regional vessel and 5 – 10 M€ for a ocean/global vessel. Given a lifetime of 30 – 40 years, the decision to invest in a research vessel is substantial, requires a long-term financial commitment from the owner(s) and must be based on a solid user need analysis and a sustainable scientific strategy.

Co-ownership at an international level is not a common management model for European research vessels. This is mainly due to issues that arise concerning the legal status of the vessel. A vessel can only fly one unique national flag, generally the national flag of the owner, hence if it is jointly owned by several countries, it is not obvious which flag it should fly. The national flag also makes research vessels highly visible at a national level and hence they are considered as national assets.

5. From EUROFLEETS+ Project to EUROFLEETS RI

The European research vessel operators' community is less well developed in comparison with European marine science communities that have evolved towards pan-European initiatives for the coordination of Research Infrastructures, such as ERICs EMSO, EPOS, EURO-ARGO, ICOS, LifeWatch, EMBRC and AISBLs EUFAR, EuroGOOS, IAGOS, SeaDataNet and EOSC. Regular networking activities amongst the European research vessel operators exist mainly through the European Research Vessel Operators (ERVO) Group, which, however, has an informal nature, with no legal status or financial support.

The establishment of a long-term sustainable coordination system (Eurofleets RI) constitutes a fundamental strategic achievement for the Eurofleets+ project, consolidating a strategic and coherent vision of the European Research Vessel Fleet outlining the future research infrastructure developments of an alliance of coordinated organizations and research vessels, unique in the EU-Research Infrastructure landscape. Eurofleets RI will have the ability to handle TA to research vessels and Large EXchangeable Instruments (LEXIs) in Europe, together with strengthening the sharing of knowledge, experience, best practices and collaboration among research vessels and/or LEXI operators and various stakeholders across Europe (Figure 2).

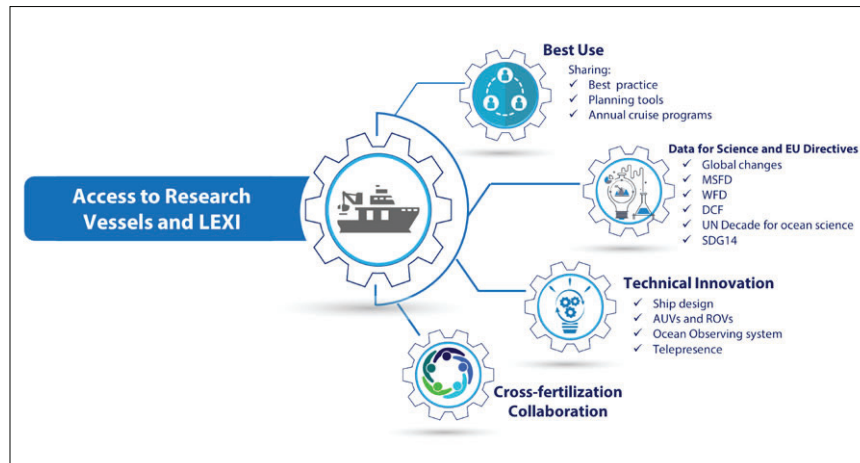


Fig. 2. Concept of the EUROFLEETS RI objectives.

Eurofleets RI will have the primary task to manage the TA calls, including the publication of the calls, recruitment of members for scientific and logistical panels, organising network meetings, money transfer from the EC to the Principal Investigators and the research vessels operators, collection and publication of results, etc. Eurofleets RI will also accommodate and nurture the following:

- I) Long-term coordination activities in liaison with the ERVO Group (with potential role as its permanent secretariat), the OFEG (Ocean Facilities Exchange Group), the IRSO (International Research Ship Operators) Group and the UNOLS (University-National Oceanographic Laboratory System);
- II) Coordination of fleets for JPI-style initiatives, EU projects and pan-European distributed RIs such as ERICs EMSO, Euro-Argo, ICOS Marine, LifeWatch and EMBRC;
- III) Technical groups for the exchange of best practices and shared developments, such as the operation of vessels and scientific instruments and equipment, software, acquisition standard coordination in liaison with SeaDataNet, EuroGOOS, etc.;
- IV) Maintaining and validating the European vessel and equipment database, e.g. the Research Infrastructure Database (RID) currently managed by EurOcean, and establishing a coordinated renewal plan for European Research Fleets by consolidating and optimising national renewal plans as much as possible.
- V) Temporary working groups on topics such as long coring, icebreakers, training for RV managers and instrument technicians, updates of EMB Position Paper 25, etc.

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