iFADO Case Study:
The SURVEILLAMP Project

Identification, selection and demonstration of technical solutions for the monitoring of French Marine Protected Areas

An extended network of MPAs

22% of French marine waters are covered by more than 500 marine protected areas (MPAs). MPAs are defined spaces at sea where environmental protection and sustainable development activities can coexist under the joint governance of all stakeholders. In order to reconcile environmental goals and human activities, a close management of MPAs needs to be established. But MPAs are often faced with large areas to monitor with limited staff and resources. Therefore, technology and innovation are essential to help managing and monitoring MPAs.

The French Agency for Marine Protected Areas (AAMP[1]) provides scientific, administrative and technical support to MPAs' managers, to contribute to the fulfilment of France's international commitments in favour of marine and coastal biodiversity.

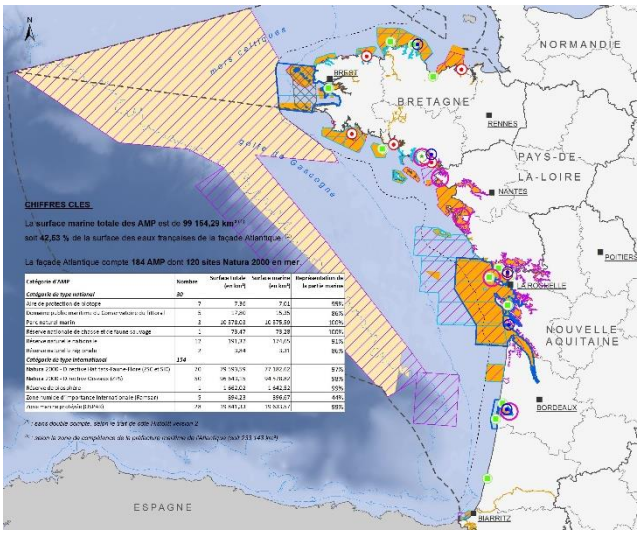

Figure 1: MPAs in the Atlantic

To help MPAs' managers to operate relevant equipment for observing and monitoring their areas, the AAMP decided in 2009 to organise demonstrations of high-priority systems, in partnership with 2 sea innovation clusters, Pôle Mer

[1] In January 2017, the AAMP became the French Biodiversity Agency. The French Biodiversity Agency (Agence Française pour la Biodiversité) is a public organization under the supervision of the Ministry of the Environment established for the purpose of supporting public policies implementation in order to improve the knowledge, to protect, to manage and to restore, terrestrial, aquatic and marine biodiversity.

Bretagne Atlantique (PMBA) and Pôle Mer Méditerranée (PMM). Under the supervision of the 2 Pôles Mer, the conduct of the project was granted to a consulting agency, in charge of collecting MPAs' needs, identifying possible solutions, selecting SMEs, preparing and organising demonstrations at sea.

Technology for the service of Environment

The first phase of the project started in 2010 and consisted in identifying and making an inventory of MPAs' needs to better manage their areas. MPAs expressed a need for a better knowledge of the seabed (depth, seabed status, habitats mapping, including fauna and flora), of the water column (water quality, hydrography, sea life) and of the water surface (marine and coastal environment, weather forecasting, monitoring and CCTV). They also stated a need for support equipment (boats, surface and sub-surface positioning systems, submarine communication systems) and for data collection and management systems.

The second phase aimed at identifying existing and under development solutions which could meet the MPAs' requirements. 173 small and medium-sized enterprises (SMEs) were selected among members of Pôle Mer Bretagne Atlantique and Pôle Mer Méditerranée and were invited to propose relevant equipment and services. Among the 173 SMEs approached, 47 responded and suggested more than 193 proposals, divided between off-the-shelf solutions, prototypes and projects. The various solutions were categorized by deployment location (seabed, water column, surface and sub-surface) and by technology (acoustics, underwater imaging, airborne monitoring, data management and transmission). Finally, they were ranked in each category according to their readiness level and adequacy to MPAs' needs.

In the third phase, 4 types of demonstrations were decided, according to MPAs' priorities:

- seabed mapping;
- noise recording;
- sea life monitoring;
- surface monitoring.

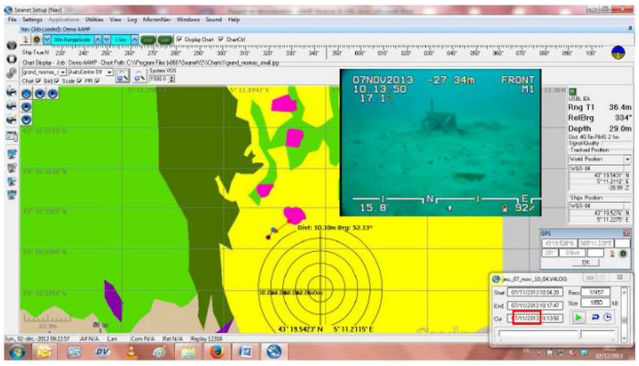

Figure 2: ROV picture and navigation interface

In 2013 and 2014, the fourth and final phase consisted in selecting one SME for each of the 4 types of demonstration,

amongst the 22 which applied in total, and in organising the demonstrations at sea. The 4 demonstrations were carried out in 4 different MPAs, in the presence of various stakeholders:

- Seabed mapping: "HABI_ROV+POSIT" is a submarine observation system, composed of a wired remotely operated vehicle (ROV) equipped with a camera and a positioning system to observe, inspect and map the seabed, particularly artificial reef habitats (Fig.2);
- Noise recording: "MAMM_ACOUS" offers a solution for broadband recording, real-time transmission and analysis of underwater acoustic signals, particularly sounds of biological (e.g. marine mammals) and anthropic origins (e.g. recreational and fishing boats) (Fig.3);
- Sea life monitoring: "HALIEUT_SONDEUR" provides a solution for monitoring, assessing and characterising pelagic fish biomass, benthic habitat cover (e.g. macroalgae) or bathymetric survey via echo sounding (Fig.4);
- Surface surveillance: "SURV_DRONE" is an airborne surveillance and photographic survey system for monitoring wild life. Its relevance was tested on seabirds' distribution and habitats (Fig.5).

Figure 3: Acoustic buoy for noise recording

Stakeholders and beneficiaries

Various stakeholders were involved in the project:

- National and local public services: French Agency for Marine Protected Areas (AAMP), Marine Protected Areas (MPAs), local Maritime Affairs authorities, the French Hydrographic and Oceanographic Service (SHOM);
- Local elected representatives;
- Professionals from the maritime sector and users of the sea;
- Industry, Research and sea innovation clusters (Pôle Mer Bretagne Atlantique and Pôle Mer Méditerranée);
- The marine scientific community
- Environmental non-governmental organisations (NGOs).

AAMP, MPAs and SMEs were direct beneficiaries of the project. The project was also indirectly beneficial to many stakeholders since better monitoring results in a better shared use of the areas, taking into account the requirements and constraints of each sea user.

Results and evidence of success

The SURVEILLAMP project showed that the tested technologies mostly met the MPAs' requirements and had some short-term and long-term positive results.

In the short term, it created business for some SMEs involved in the project: A ROV and a positioning system were purchased by the AAMP for immediate use and further experimentation with new options. The AGOA Sanctuary for marine Mammals in the French Caribbean Islands ordered a bigger version of the acoustic buoy tested for noise recording. The SME which demonstrated the echo sounding solution won a contract with an MPA in a French overseas territory in the Indian Ocean for seabed mapping.

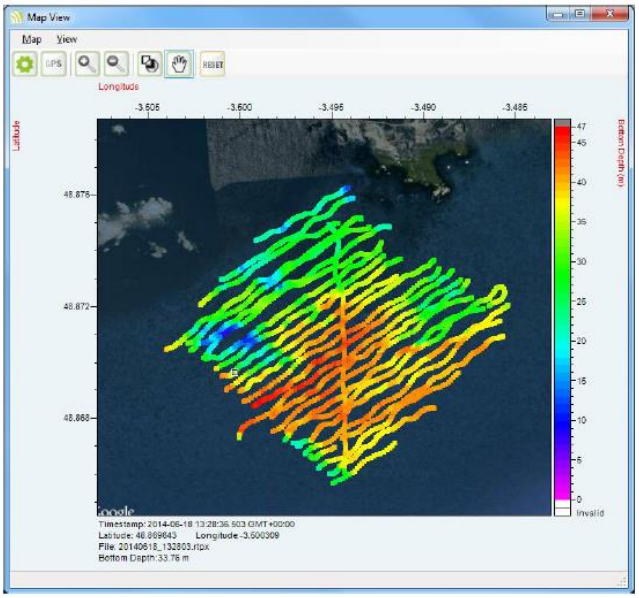

Figure 4 : Bathymetric mapping for biomass monitoring

In the longer term, the whole process boosted innovation. The large mobilisation of SMEs for proposing demonstrations covering the needs of MPAs and adapting/developing equipment to reach MPAs objectives is an evidence of success. It encouraged the AAMP to maintain a technological watch on emerging solutions and innovations in marine ecosystems monitoring. The project triggered the emergence of research and development activities in specific fields with great potential in favour of marine monitoring: data gathering, automatic image processing, airborne drones. It was widely publicised and was presented to MPAs science and technology days and annual seminars.

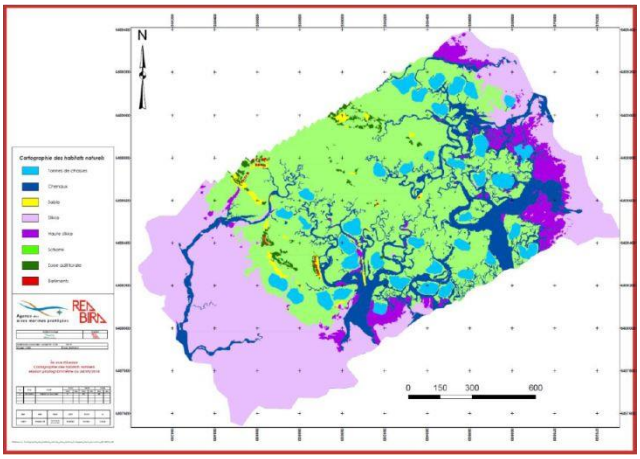

Figure 5: Habitat mapping using UAVs

Lessons learnt and keys to success

- MPAs are the first beneficiaries of technological solutions proposed by SMEs: they need to be involved at the very beginning of the project in order to take ownership of it, to contribute and follow its development and to build perspectives according to preliminary tests or results. Faced with limited staff and financial resources,

they need to set priorities and work on expressing more precise requirement specifications.

- Introducing new technologies in MPAs is a real challenge. The AAMP will need to allocate a dedicated team of experts and technicians to:
  - implement the solutions identified during demonstrations into real life operations and assess reliability in the long term;
  - provide guidance to MPAs managers and staff to become familiar with and manage technology.
  - maintain equipment which includes regular cleaning of sensors, calibration and comparisons with collected data and analyses via conventional methods.
- The project allowed to validate the process of identifying and selecting technical solutions for MPAs. To go further and help in selecting the most relevant technologies, demonstrations need to be organised to compare similar solutions in a single test site.
- Expertise of sea innovation clusters such as PMBA and PMM are paramount to supervise such projects, to identify SMEs and provide technical advice on MPAs' management tools.
- Communication is important, internally towards MPAs and externally towards SMEs, to bring together as many stakeholders as possible and publicise the project and its future orientations.

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