

## Development of a citizen monitoring program for the Barcelona coastal waters: the Scientific Patí Vela (PATI CIENTIFICO)

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**Abstract** – The first results of the PATI CIENTIFICO project are presented. This is a collaborative project funded by a Barcelona Institute of Culture's grant for research and innovation under the 2019 Barcelona Science Plan. The main objective of this project is to develop a monitoring program for the coastal waters of Barcelona through a small-sailboat fleet of the traditional and sustainable *Patí de Vela* (sailing skate). This pleasure boat is to become a scientific sailing skate. This fleet will acquire the essential oceanographic variables along the Catalan coast, which will be incorporated and accessible in a web platform. We present the initial adaptations done to the *Patí de Vela* to have an onboard platform holding the scientific instruments (sensors and devices) for sampling the Barcelona coastal waters. These adaptations allow the systematic measurements of the essential physical and biogeochemical variables. These data, which will allow detecting variations along the coast, hence identifying potential sources of contamination and also providing the necessary knowledge of natural and anthropogenic seasonality, and will be freely available on a web platform. The PATI CIENTIFICO project will increase our knowledge of the coastal waters of the Barcelona coast, encouraging participation in sea monitoring activities and increasing social awareness on the need to love and protect our oceans.

**Keywords** – Coastal research platform, Barcelona coast, recreational sailing, sustainable platform, citizen initiative, ocean awareness, ocean monitoring.

### I. INTRODUCTION

Our knowledge of the ocean has improved drastically during the last decades, particularly thanks to remote sensing from satellites and a fleet of underwater instruments (Argo floats, <http://www.argo.net/> and EMSO ERIC, <http://www.emso.eu>) present in all the oceans far from the coast. Paradoxically, the available amount of data for the coastal ocean has experienced a very slow increase. However, accurate observations of the coastal oceans are required to understand how these regions evolve due to natural, and very particularly, anthropogenic effects.

Barcelona's climate is conditioned by the Mediterranean Sea, which acts as a natural regulator to prevent extreme weather conditions. Further, the surrounding sea provides natural resources for local fisheries and a gathering space for local people and visitors, for recreational and social activities. Despite its relevance, the Barcelona marine environment remains very poorly sampled. Apart from the water quality control carried out in summer [1]-[2], only a systematic year-long offshore sampling along one line normal to the Somorrostro Beach has been regularly maintained since 2002 [3]-[4]. These data, which are available on the ICM's webpage [5], have been used to produce a substantial number of publications [6]-[8].

In order to address this lack of observations, here we propose to take advantage of a traditional and fully sustainable recreational boat widely used on Barcelona's coast and nearby: the sailing skate (*Patí de Vela*). It is a wooden sailing boat that was born on the beaches of Badalona and Barcelona in the 1920's because of the need for swimmers to pass over the polluted near-shore waters. It is a lightweight one-person catamaran with a single Marconi sail and no boom. This boat has the peculiarity of not having a rudder nor a centreboard. The steering is only controlled using the bodyweight of the crew member and the tension in the sail.

### II. OBJECTIVES

Our main objective is to create the first prototype of the scientific *Patí de Vela* to sample the Barcelona coastal waters using relatively cheap sensors to help answer scientific questions such as: *How healthy is the Barcelona coastal ocean? How intense rainy events modify the offshore water quality? How are the temperature and salinity evolving?* The second objective is to create a small fleet of sailing skates that can routinely monitor the coastal waters, encouraging citizens to produce

reliable scientific knowledge and effectively incorporating the oceans into Barcelona's collective imaginary.

Throughout the process, outreach and communication activities will be held, especially among university students and schools and civil associations from the coastal neighbourhoods, as well as together with other citizen sailing initiatives.

### III. RESULTS

We present the adaptation of the first prototype of the Scientific *Patí de Vela* (Fig. 1, Left) such that it can hold all the scientific instruments onboard and tow a net to remove floating debris. Some essential ocean variables (e.g. temperature and salinity) are sampled in the surface and sub-surface layers (max: 30 m depth). The data is acquired from a designed and tested prototype of a low-cost instrumented oceanographic platform.

We will show the first observations taken with the scientific *Patí de Vela* from a coastal zone between Hotel Vela and Forum, which is about 4-5 km long and between 0.4 and 2.4 km wide (Fig. 1, Right).

All data will be freely available thanks to the development of an open-access interactive web where data will be incorporated and retrieved.

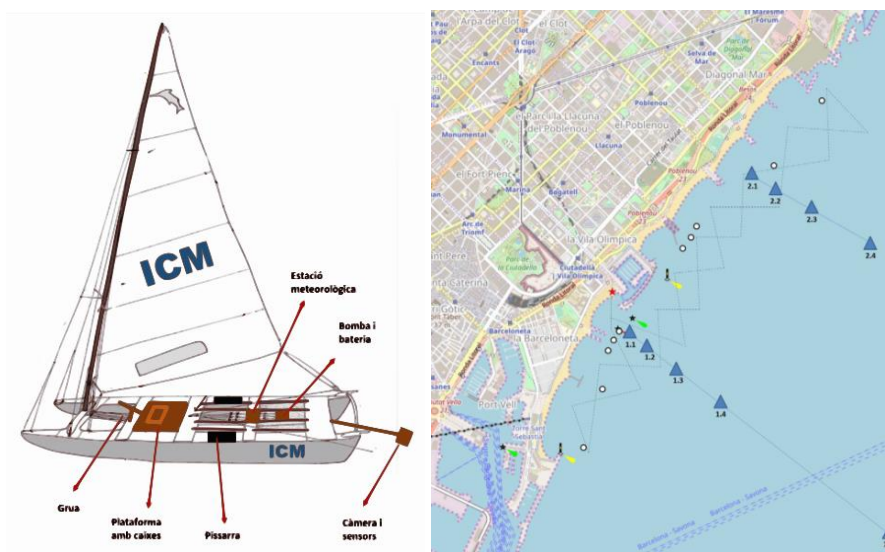


Fig. 1. *Left*: Preliminary sketch illustrating some modifications that will be done to the scientific *Patí de Vela*, including the incorporation of several sensors and sampling devices. *Right*: Schematics of the area of study. The triangles indicate the hydrographic stations monthly sampled by the Institut de Ciències del Mar (only stations 1.1, 1.2, 1.3, 1.4 and 1.5 are currently maintained). The dotted line illustrates a possible track for one single *Patí de Vela*. The white circles point at potential reference locations along the coast. The red star indicates the location of the boat yard, in the Club Patí Vela Barcelona premises.

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