

Inndaga: An environmental data acquisition innovation platform

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Abstract – INNDAGA is a multipurpose platform for conducting oceanographic surveys in coastal areas developed on an 8.5 m long inflatable boat. This concept allows the vessel to operate safely and with great manoeuvring flexibility in areas where larger research vessels cannot access (rocky areas, port ...) at low operational cost. Is fully integrated in an information management system to providing efficiency and effectiveness of strategic decision making

Keywords – INNDAGA, ENVIRONMENTAL MAGNAGEMENT TOOLS, ITCZ, COASTAL RESEARCH VESSEL

I. INTRODUCTION

Half the world's population lives within 200 km of the coast. This densely populated strip represents 15% of the Earth's surface, and concentrates many rich and productive, but also vulnerable, areas. The concentration of human activities on the coast dedicated to the legitimate enterprise of increasing the level of life of its inhabitants, cause important environmental problems.

In this way, the convergence of social, economic and environmental interests in this small strip of the Earth have cause such an immense anthropic pressure through the centuries to the point of threatening their own existence and becoming the source of human health issues.

Therefore, in recent decades it has been identified the need for careful planning coastal protection, that allows of a rational development of the ever increasing needs for subsistence of the population.

Integrated coastal zone management (ICZM) has become one of the biggest environmental challenges for mankind today, being the target of numerous international programs. ICZM requires an understanding of the major interactions in coastal ecosystems. Understanding the interactions between all the elements that compose these systems at the short, middle and long term is a very fundamental objective for scientists and managers, if the sustainability of these areas are to be guaranteed. Informed decision-making requires understanding both the environmental and socioeconomic aspects of the coastal areas, something that can be best achieved by the use and further development of advance tools based on the most advanced scanning and data acquisition techniques.

II. INNDAGA

In this context, Inndaga (acronym for environmental data acquisition innovation platform) was initially developed under the INNODRAVAL Project (IPT-310000-2010-17) of the National Plan for Scientific

Research, Development and Technological Innovation. Our main aim was to pursue innovation in the environmental restoration operations of coastal areas by developing an integrated platform for characterization of the marine environment including, geophysical surveying, and water and sediment sampling. The main goal was to develop an integrated tool that implemented the best available techniques of characterization and monitoring of the environmental condition in port areas; and that at the same time time met the necessary responsive and operationally inexpensiveness to work in such a environment.

Originally conceived to serve the operations of dredging, treatment and recovery of sludge and sediments with organic and inorganic contaminants in port areas, its range of use has now been widely extended to any applied and research activity in coastal areas

III. WHAT IS INNDAGA

INNDAGA is a multipurpose platform for conducting oceanographic surveys in coastal areas developed on an 8.5 m long inflatable boat. The boat hull combines a shallow draft rigid submerged structure with a high strength pneumatic float. This concept allows the vessel to operate safely and with great manoeuvring flexibility in areas where larger research vessels cannot access (rocky areas, harbours, etc.).

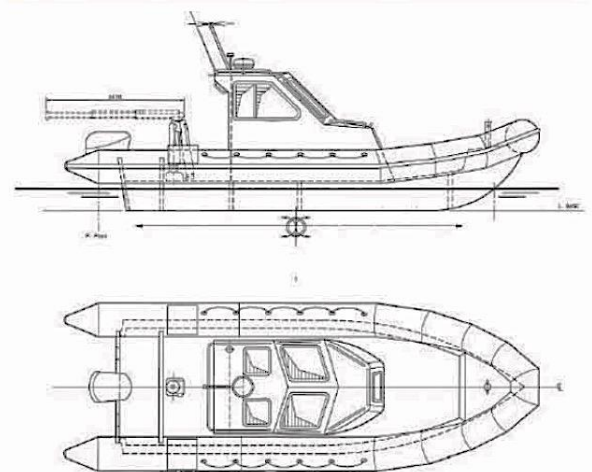


Fig 1. Inndaga blueprints

The vessel includes a closed cabin that houses the scientific instrumentation consoles, allowing for normal

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operation of the more sensitive equipment even in adverse environmental conditions. The implementation of a Honda 3KVA generator grants electric autonomy (220/12V) to the entire platform. INNDAGA also integrates a small crane with a capacity load of up to 200 kg, which facilitates the operation of small scientific instrument.



Fig 2. General view of the vessel showing the cabin and the crane.

IV. SCIENTIFIC EQUIPMENT

INNDAGA is equipped with scientific instrumentation of the highest performance in the market such as advanced DGPS and RTK Positioning; Systems (Trimble SPS), geophysical and hydrographic survey systems such as Side Scan Sonar (Klein 3900), Multibeam Sonar (Kongsberg GS +) and Parametric Sounder (Innomar 2000Compact Sounder); and sampling and parameter acquisition tools such as a 120 cm long Piston corer (UWITEC), a 500 ml grabber (Van Veen, Niskin bottles, CTDs (XRX- 620 and SBE 37-SMP MicroCAT), Portable Multiparameter probe (YSI) and current meters (Aandera RCM9/Seaguard). All the equipments can operate between 1 – 60 m of depth.



Fig. 3. Detail of the installation of the operating unit within the cabin under the folding table and the top right are seen the GPS in yellow. The solution adopted is also shown for output cables to the transceiver unit in the two photographs bottom of the figure.



Fig. 4. Blue print and view of the structure in full swing pole, installed in the INNDAGA boat to anchor the multibeam system plus GeoSwath of Geoacustics and GPS antennas on line.

V. APPLICATIONS

- Sea bed quality determination
- Shallow water high resolution bathymetry
- Determination of sediment units thickness
- Subtidal area characterization of oceanographic conditions in subtidal areas.
- Monitoring and quality control in dredging operations.
- Assessment of maritime construction works.
- Location and positioning of underwater structures and salvage operations.

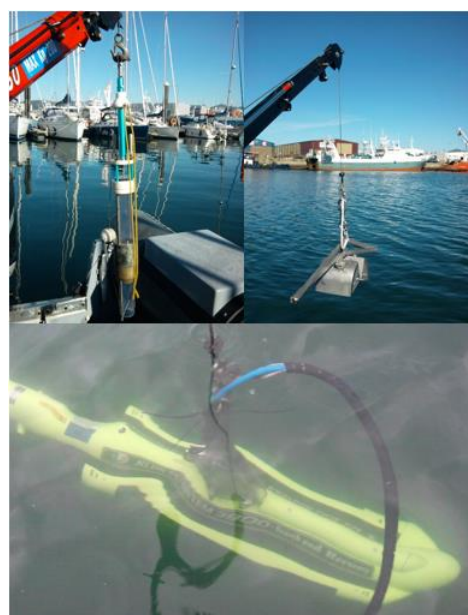


Fig 5. Piston corer and van Veen grabber being deployed.

VI. INNDAGA AND ICZM

Inndaga is very flexible and has a very wide range of applications. In ports, it becomes an ideal platform to develop site-specific technologies and methodologies for accurate inspection and monitoring of port elements and piers, hydrographical conditions, and to improve their maintenance and operation in compliance of current EU directives (ie DMEM) and UN descriptors.

This concept allows for acquisition of high-resolution data necessary to improve hydrodynamic models, important to predict the possible effects of dredging, to analyse the behaviour of a structure, or to design strategies to combat and management potential spills.

A fully developed postsurvey scheme allows for quick data processing and water and sediment sample analysis. These results are integrated in a Georeferenced Information System (GIS) allowing the display of all the relevant for the environmental management of coastal areas information, providing efficiency and effectiveness of strategic decision-making. This allow to develop practices that integrate morphodynamic numerical models habitat mapping techniques, including geological observations, bathymetric, Biological and Physical Properties acquired able to predict, monitor and mitigate the impacts of human activity in coastal areas where larger research vessels cannot access (rocky areas, beaches, small estuaries, ports, etc.).

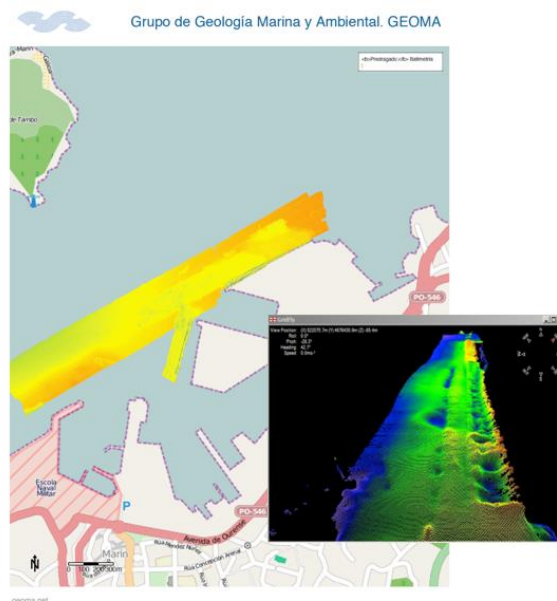


Fig 5. Typical Inndaga automated quick report output produced from the integrated WebGis at <http://geoma.net/geomapas.html>.

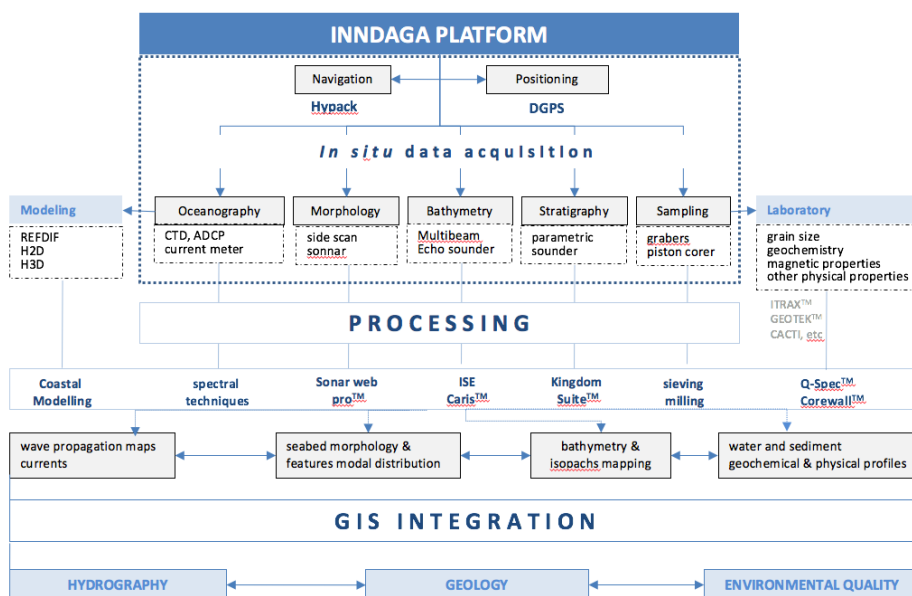


Fig 6. Flow diagram showing Inndaga capacities and work-flow to aid informed decision making in common coastal management situations.