PLASMAR

Bases para la planificación sostenible de áreas marinas en la Macaronesia

Habitat characterization protocol, using acoustic tools: Side Scan Sonar

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1.1 INTRODUCTION

The use of sonar for marine mapping is on the rise. The Side-Scan Sonar (SSS) provides digital images of the composition and morphology, differences in materials and texture types of the seafloor (Eilers and Griffin; Mulhearn 2001). Its application is a useful tool for nautical (ex. finding pipelines, shipwrecks or even drowning), archaeology and ecological disciplines, particularly for the identification of habitats and mapping of their backgrounds (e.g. seagrass and seaweeds monitoring, Fig. 1).

Fig 1. Image of a wreck as an artificial reef, within the Habitat categorization study

1.2 TECHNICAL CONCEPT

The side-scan sonar, usually called as “Towfish”, has the form of a military torpedo (Fig. 2), with hydrodynamic shape and fins (to facilitate its stability, movement, and dispersion of the acoustic signal), emitting pulses or acoustic beams (ping) perpendicular to the survey line that propagates through the water column throughout the surrounding area. The pulse frequencies can vary from low (e.g. 100 kHz) to high frequencies (e.g. 1600 kHz) depending on the study goals and the SSS used (Eilers and Griffin; Mulhearn 2001; Ehrhold 2004).

Fig 2. Picture of the Side Scan Sonar used in campaigns

The lower frequencies provide broad swath coverage instead increasing frequencies imply greater image resolutions, diminishing the data coverage. The ping of the sonar bounces against the objects, materials or morphologies transmitting energy sonar incidental and returning it to the sonar (backscattering). This final sound back is shown as an echo from the seafloor and recorded in a series of cross-track portions able to show an image of the sea bottom within the area covered by the device beam (Fig. 3; Ehrhold 2004; Leriche et al. 2004).

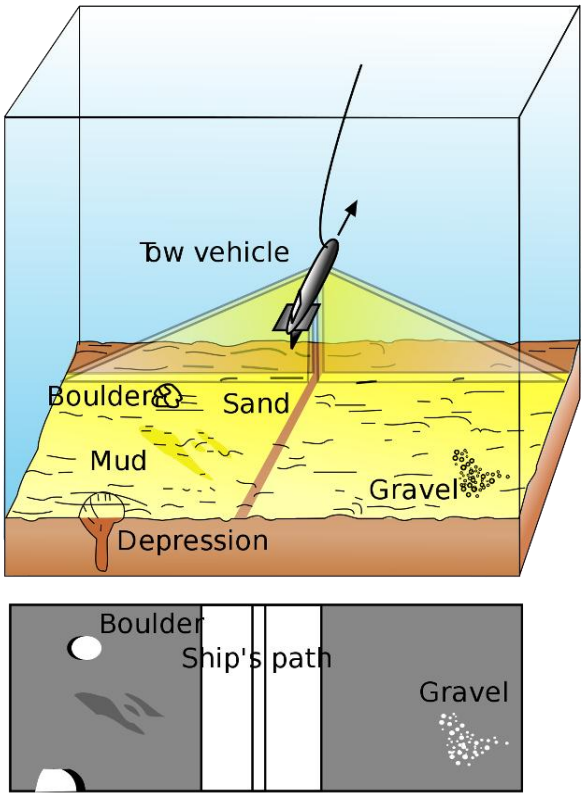

Fig 3. Side Scan Sonar performance scheme (USGS & Mysid)

1.3 MONITORING METHOD

To acquire the data, the sonar may be towed from a surface boat or directly gripped to the ship's hull, depending on the final image resolution or the deepness of the water. The SSS employed was a digital CM2 Tow-fish (C-Max, UK), operating in two different frequencies (325 and 780 kHz), being 780 kHz the best for mapping habitats. It is necessary for obtaining processable data at this frequency that the SSS remains less than 5 m from the bottom and not exceed a bandwidth width greater than 40 m on each side of the Tow-Fish. Also, due to the amount of cable required, the SSS can not exceed 50 m depth (Eilers and Griffin; Ehrhold 2003; Geosoluciones 2014). All devices could be installed in a recreational fishing boat, including an electric winch joined to the towing davit with the count cable pulley able to calculate the amount of tow Kevlar cable deployed and make estimates of the horizontal distances of towfish behind the boat. Also, a differential GPS (Hemisphere GPS A325 GNSS Smart Antenna, USA) is needed for navigation and SSS positioning in the software mentioned above (Fig. 4).

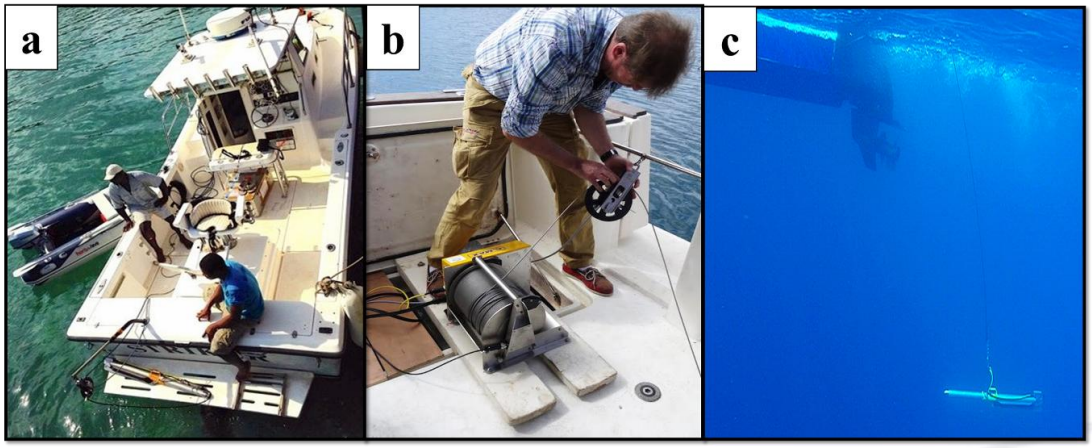

Fig 4. Side Scan Sonar Operating methodology. A: Boat with a cockpit. B: Electric winch attached to the towing davit with the count cable pulley. C: Image of the SSS being towed to acquire data.

1.4 DATA PROCESSING

Data acquisition is done through the CM2 transceiver (STR) and processed with the SonarWiz 6 software (Chesapeake Technology Inc, USA). This raw data can be improved through software programs that can create mosaics in real time through acoustic maps (for example, SonarWiz). These programs allow the processing of the visualization of the seabed for a subsequent characterization and geo-positioning that involves programs of the Geographic Information System (for example, ArcGIS or QGis) (Fig. 5).

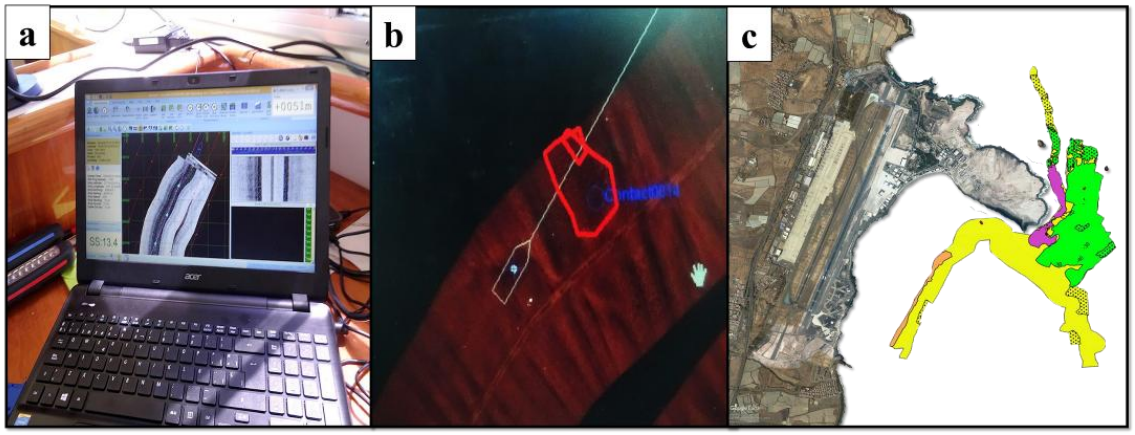

Fig 5. Side Scan Sonar Data acquisition methodology. A: SonarWiz 6 program fixed in a competitive computer. B: SSS lines with GPS position and raw data attained. C: Postprocessed data in QGis, showing the habitats composition.

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