M7 POLITOLANA, A NEW LOW COST TOWED VEHICLE DESIGNED FOR THE CHARACTERIZATION OF THE DEEP-SEA FLOOR

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The Politolana sled, designed by the Santander IEO in collaboration with the Marine Robotics Company, is a robust submarine towed vehicle to study the deep-sea floor (Figure 1). The vehicle operates hung of a simple coaxial cable, available on every oceanographic ships with hydrographic purposes, because of that are not necessary expensive operations of installation for special winches (with fiber optics cables, etc.) and deployment devices (LARS, frames, etc). The bidirectional telemetry to control the different submerged instruments is carried out using a cable modem NEXUS MKE from MacArtney that connect the Politolana sled to an industrial microcontroller that carries out the following functions:

RS232 serial ports Multiplexing data from the different scientific instruments connected (altimeter, CTD probe, compass, video and still cameras control, rs232, etc.) and sends the data to surface correctly synchronized in real time. Also receives the surface orders to switch ON/OFF all the different peripherals connected to it (focuses, laser pointers, video camera and pictures, etc.). Besides, it integrate the necessary power supplies to feed the different instruments connected to it, and allows to carry out a real time supervision of tensions, current consumptions, state of fuses, alarms, etc.

In the surface unit, the cable modem is connected to a 19" rack format computer, that executes an application which display all the telemetry data received from the bottom unit to a sled operator screen (Figure 2). The software save in a text file all the received data from the vehicle instruments for later study it in the laboratory, and finally send orders on real time to the submerged vehicle.

This vehicle allows us to obtain simultaneously still pictures and video, georeferenced and synchronized with environmental variables. For this purpose, it uses a FullHD video camera, installed with an angle of 45° with respect to the bottom, and two LED last generation light (12600 lumens / 5800° Kelvin). This camera records in solid-state memory and MTS video format all the visual transect and incorporates 2 pointers of green laser (532 nm wave length) to facilitate the scaling of images. The signal provided by the video camera is visible in real time in the control unit located in surface (Figure 2), which facilitates the control of transect flight in structurally complex areas, such as the cold-water coral reefs. It also has a system of photogrammetry based on a Nikon D90 camera and 4 laser pointers located in zenithal position. It includes a powerful electronic Subtronic strobe with iTTL system, a Seabird 37 CTD probe to characterize each image according to the oceanographic features (pressure, temperature and salinity) and a sensor of vehicle heading, pitch and roll. The location of the vehicle on the bottom is obtained through a USBL (Ultra Short Base Line) transponder based on HiPAP 500 Kongsberg system. The vehicle can be operated up to a maximum of 2000 m depth and the transects were carried out with the vehicle navigating to 1 knot of speed at a altitude between 2 and 4 m over the sea floor. As the vehicle is powered from the surface using the coaxial cable, the visual transects duration is not limited by the batteries depletion.

This system generates direct visual information in structurally complex deep-sea areas, not accessible to the classic samplers (dredges, trawls, etc.), that are characterized by the presence of vulnerable biological communities. The high resolution of digital pictures allows us a better classification of the species that the video. Besides, the scaling of the image is more accurate, allowing to estimate the abundance and the percentage of coating of the different marine habitats.

In addition it provides information about the complexity of habitats, the impact of fishing gear and complete listings of faunal species not accessible to the extractive sampling systems. One of the major utilities of this vehicle is to obtain high-resolution maps which are necessary in the management plans of Marine Protected Areas. Their operating costs and the needs of qualified technical personnel are much lower than those of the ROVs. On the other hand, allow us to access in a relatively safe way to environmental conditions, that are very difficult (rocky highs, strong currents, etc.) and dangerous (lost fishing gears, shipwreck, etc.) and then inaccessible to AUVs.

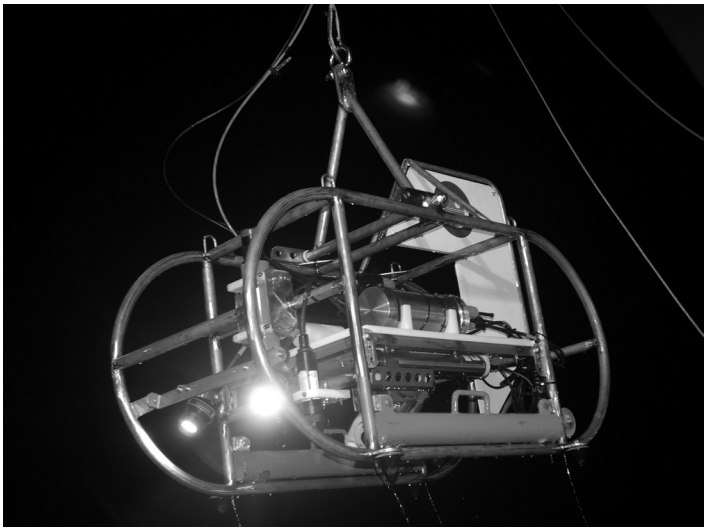
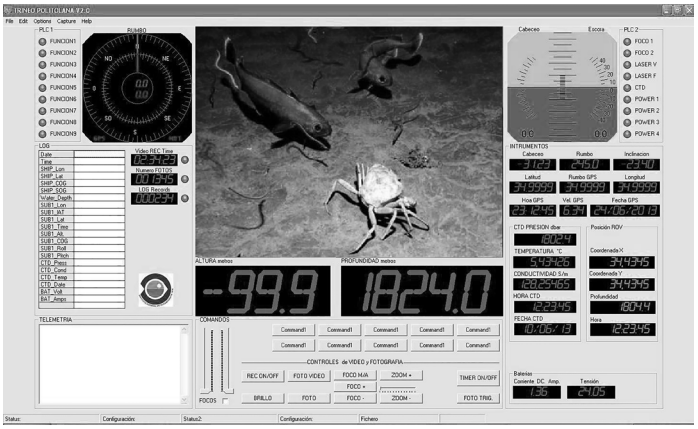


Figure 1. Politolana towed sled deployment during the INDEMARES 0412 survey on board of the RV Ramón Margalef

Keywords: towed sled, video transect, sea floor characterization, multiplexer, marine habitat mapping.



◀ Figure 2. Interface showed on the control software installed on the surface unit.

REFERENCES

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