



Project n. 037110

## NEAREST

“Integrated observations from NEAR shore sourCES of Tsunamis:  
towards an early warning system”

Instrument: STREP

Thematic priority: 1.1.6.3 GOCE (GIObal Change and Ecosystems)

### D24b: CRUISE REPORT

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Dissemination level		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including Commission Services)	
<b>RE</b>	Restricted to a gruop specified by the Consortium (including Commission Services)	
<b>CO</b>	Confidential, only for members of the Consortium (including Commission Services)	

**Swath Bathymetric survey,  
on the western Continental Shelf of Algarve,  
down to the 100 meters depth contour**

Work for:

**Fundação da Faculdade de Ciências de Lisboa**

Carried out under the  
**NEAREST Project**



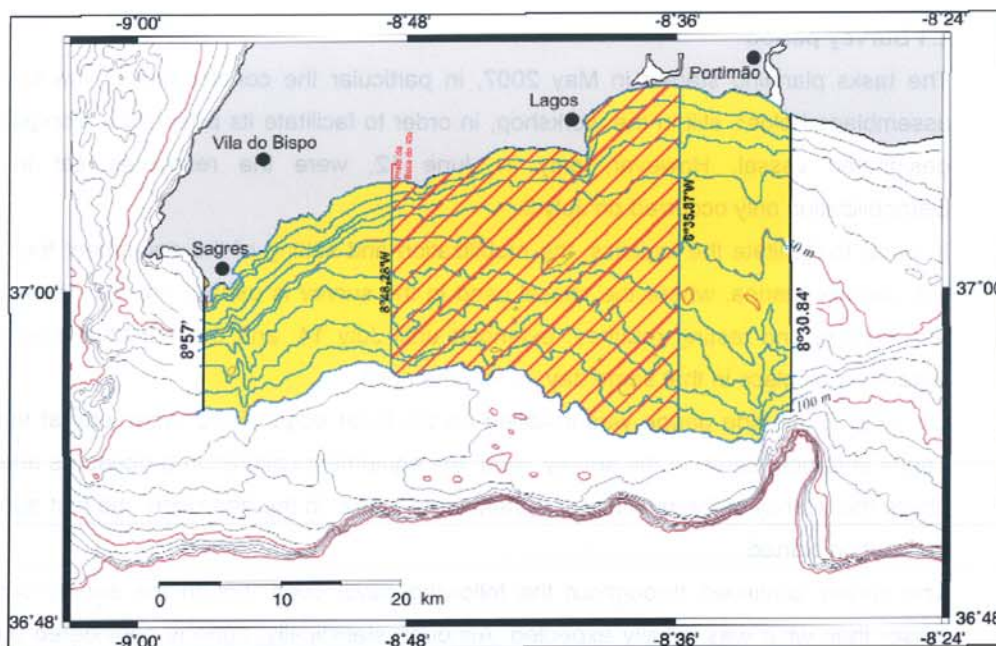
Final Technical Report – RTF 007HID/07  
October 2007

## Swath Bathymetric survey, on the western Continental Shelf of Algarve, down to the 100 meters depth contour

Work carried out under the  
European Project NEAREST, for the  
Fundação da Faculdade de Ciências de Lisboa.

### Summary

The present report describes the swath bathymetric survey carried out on June and July 2007, on the western Algarve Continental shelf, over a 32.560 ha area, which northern and southern limits are the shore line and the 100 meters contour, respectively, and the eastern and western limits are the  $008^{\circ} 35,87' W$  and  $008^{\circ} 48,28' W$  meridians.



Pict. 1 – Survey area: initially projected area in yellow, and effectively surveyed area in dashed red.

### 1. Introduction

Under the scope of the European Project NEAREST, the Fundação da Faculdade de Ciências de Lisboa, adjudicated to GEOSUB Lda, the accomplishment of a survey using a multibeam echosounder, to cover an area of 32 560 ha. The survey area corresponds to the western Algarve Continental Shelf, limited in the North and South, by the shoreline and the 100 meters depth contour, respectively, and to the East and West, by the  $008^{\circ} 35,87' W$  and  $008^{\circ} 48,28' W$  meridians. Red dashed lines in Picture 1 represent this area.

On July 4, there was the need to move all the equipment to another similar vessel, since there were previous compromises that had to be satisfied, and which made impossible to continue the survey with the first vessel. Thus, July 4 and 5 were spent reinstalling all the equipment and repeating the tests and calibration procedures.

On day 6, the survey lines restarted and the data acquisition was concluded late in the morning of July 8.

## 2.2 Coverage area

The survey was planned to guarantee the entire coverage of the area of interest, i.e., assuring the overlap of the information paths obtained from every two parallel and consecutive survey lines. According to the multibeam system that was being used, the horizontal spacing between each survey line was five times greater than the water column height.

Each time a small hiatus occurred in the seafloor coverage, due to casual deviations from the survey line, in the course of the vessel, a second passage was made over the same area in order to fill up the hiatus.

## 2.3 Statistics

Bathymetric data was acquired along 188 survey lines, E-W oriented, corresponding to a total of 1.312 miles (~2.430 km). The daily survey average output was of approximately 60 miles, much less than would had been possible under better wind conditions.

During the acquisition, the average vessel speed was 6,6 knots.

The survey had a total duration of 27 days, of which, 22 were of effective data acquisition.

## 2.4 Tide

During the entire multibeam survey, the water height measurements, for later reduction of the tide effect on the hydrographic survey, were made with an AANDERAA WTR9 tide gauge, immersed in the inner edge of the West jetty at the Port of Lagos entrance. Measurements were made at a 10 minutes interval and were stored in a *data-logger*.

## 2.5 Hydrographic drawings

Appendix A of the present report represents an example of a hydrographic drawing on a scale 1:30.000, with the implementation of a synthesis of the acquired bathymetric data.

Given the quantity and density of the acquired survey data, the results will be delivered in ASCII format, to facilitate the processing of data, according to the criteria of the responsible for the Project in which this work is being done.



multibeam system. This unit is based on fibre optic gyroscope technology, coupled with a DSP (Digital Signal Processor) and works in connection with data coming from a positioning system, in this case, the DGPS. The corrected signal of the instantaneous attitude values of the vessel (pitch and roll) was sent to the QINSY navigation and multibeam data acquisition system.



Every time the differential signal was lost, or even the GPS signal, the PHINS navigation system is able to keep a good position in pure inertial mode, thanks to its internal accelerometers. Further detailed information about this equipment is presented in the Appendix B.

- 3.2.6 The ship "Astinufa", mod. *Astinor 1275*, with 12,75 meters overall length, 11 DWT and with comfortable inhabitability and necessary security conditions, was used during the largest part of the survey.

However, on July 4, contrary to what had been the initial estimates, the survey hadn't been concluded, and therefore, there was the need to change vessel, since the "Astinufa" had previously assumed compromises and had to leave in that date.

As a result, the last 3 days of survey were carried out on board the "Pescamar" ship, similar to the previous one, but slightly smaller - *Astinor 1000 Fishing* with 10 meters overall length. In the Appendix B of this report, the prospectuses with the ships characteristics are presented.

- 3.2.7 The power supply to the multibeam system was guaranteed through a 2,2 kVa Honda generator.

- 3.2.8 Two vehicles used for the carriage of the material and passengers, one of which, a luggage van.

- 3.2.9 Two PC's and a workstation were used, as well as navigation, acquisition and processing of bathymetric data software, *QINSY* from QPS.

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**APPENDIX A**

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**APPENDIX B**



## SeaBat 8101

Multibeam Echosounder



### SeaBat 8101

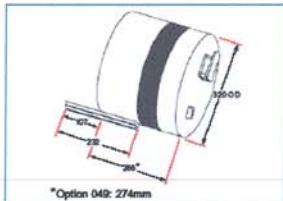
- Phase and amplitude bottom detection
- 150° swath coverage (upgradeable to 210°)
- 240kHz frequency
- Up to 600m swath width (with Option 040)
- Meets IHO & USACE Class 1 standards

The SeaBat 8101 Multibeam Echosounder measures discrete depths, enabling complex underwater features to be mapped with precision. Dense coverage is achieved utilizing up to 4,000 soundings per second for a swath up to 600 meters in width, even as the survey vessel travels at speeds in excess of 12 knots.

With high accuracy and a measurement rate of up to 40 profiles per second, the SeaBat 8101 enables surveys to be completed faster and in greater detail than previously realized.

The SeaBat 8101 transducer is available for operating depths of 120, 300, 1500, and 3,000 meters. Small and lightweight, it can be mounted on underwater vehicles (ROV or towed) and transported to locations where accurate measurements are required.





#### SYSTEM PERFORMANCE

Operating Frequency:	240kHz
Swath Coverage:	150° (upgradeable to 210°)
Max Range:	300m
	450m max range available with ER option
Number of Beams:	101, beamspacing 1.5°
Along-Track Beamwidth:	1.5°
Across-Track Beamwidth:	1.5°
Max. Update Rate:	40
Operational Speed:	Up to 18 knots

#### PROCESSOR SPECIFICATIONS

Power Required:	100/240VAC, 47/63Hz, 100W maximum
Data Uplink:	High-speed digital coax with fiber-optic option
Computer Interface:	10MB Ethernet and RS232C
Data Downlink:	Serial, 19.2k baud
Display Video Out:	SVGA: 800 x 600;
	Refresh Rate: ~72Hz
Graphics Colors:	Sonar Image: 256 Colors
	Other Graphics: 8-bit RGB
Input Device:	3-Button Trackball
Dimensions (HWD):	177 x 483 x 417mm
Mounting:	19in. rack mountable
Temperature:	Operating: 0° to +40°C
	Storage: -30° to +55°C
Weight:	20kg (44 lbs.)

#### DISPLAY SPECIFICATIONS

Screen Size:	14" diagonal
Display:	SVGA High-Resolution, Color Monitor
Power Consumption:	80W
Weight:	11.2kg (24.6lbs.)

#### SONARHEAD SPECIFICATIONS

Power Requirements:	24VDC, 2 amps max. (Power available from Processor.)
Operating Depth:	120m (300,1500, and 3000m available)
Dimensions:	266 x 320mm (W / D) excluding projector
Temperature:	Operating: -5° to +40°C
	Storage: -30° to +55°C
Weight (aluminum):	Dry: 26.8kg (59lbs.)
	Wet: 4.8kg (10.6lbs.)
Weight (titanium):	Dry: 40kg (88lbs.)
	Wet: 18kg (39.6lbs.)

#### OPTIONS

Sidescan upgrade	Mounting plate assembly
Fairings	Spares kit
Titanium housing	210° swath
Extended-Range (ER) projector	Coax to fiber optic interface unit
Increase sonar head depth rating	

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Version: B007 051103 / AA



## PHINS INERTIAL NAVIGATION SYSTEM

PHINS, Photonic Inertial Navigation System outputs position, heading, roll, pitch, depth, velocity, and heave. Its high accuracy inertial measurement unit is based on IXSEA's FOG technology coupled with an embedded digital signal processor that runs an advanced Kalman filter.

### FEATURES

- All-in-one high-accuracy 3D positioning with heading, roll and pitch
- Fiber Optic Gyroscope (FOG), unique strap-down technology
- Multiple interfaces (DVL, EM log, GPS and depth sensor)
- Compact, lean and reliable

### BENEFITS

- Complete navigation unit
- No spinning element hence maintenance free
- Versatile
- Appropriate for all underwater vehicles



APPLICATIONS • Surface navigation for frigates, MCMV and fast patrol boats • AUV • ROV • HOV • SDV

# PHINS

## TECHNICAL SPECIFICATIONS

### PERFORMANCE

<b>Position accuracy <sup>(1)</sup></b>	
With stand-alone GPS aiding	5 to 15 m
With differential GPS aiding	0.5 to 3 m
With RTK differential GPS aiding	2 to 5 cm
With DVL aiding	0.1% of traveled distance (3 m/hr at 2 knots)
No aiding for 2 minutes	3 m
No aiding for 5 minutes	20 m
Pure inertial mode	0.6 NM/hr
<b>Heading accuracy <sup>(2)</sup></b>	
With GPS aiding	0.01 deg secant latitude <sup>(3)</sup>
With DVL aiding only	0.02 deg secant latitude <sup>(3)</sup>
No aiding	0.05 deg secant latitude <sup>(3)</sup>
Roll and Pitch accuracy <sup>(2)</sup>	0.01 deg
Heave accuracy	5 cm or 5% (whichever is highest) Setup free: SAFE HEAVE™

### OPERATING RANGE / ENVIRONMENT

Temperature operating / Storage	-10 to 50 °C / -40 to 80 °C
Calibration interval	None required
MTBF	30,000 hours
Angular dynamic range	> 500 deg/s
Acceleration dynamic range	+/- 5 g
Attitude range	No limitation

### PHYSICAL CHARACTERISTICS

Dimensions (L x W x H)	180 x 180 x 160 mm
Weight in air	4.5 kg
Material	Aluminium

### INTERFACES

Data output rate	0.1 Hz to 100 Hz
RS 232/ RS 422	6 inputs, 6 outputs
Output format	Based on industry standards (NMEA0183, ASCII, hexa or binary)
Power consumption	< 12 W
Power supply	24 V nominal (from 20 to 30 V)

(1) CEP: Circular Error Probability 50 %

(2) Heading, Roll, Pitch figures are RMS values

(3) Secant latitude = 1 / cosine latitude

Specifications subject to change without notice

IXSEA : • EMEA : +33 (0)1 30 08 98 88 • AMERICAS : +1 (781) 937 8800 • ASIA : +65 6747 4912 • www.ixsea.com



## Astinor 1275



Les presentamos el modelo más alto de la gama de nuestro astillero: "ASTINOR 1275", el barco que colmará las exigencias del más experimentado aficionado a la pesca de altura dadas sus características (amplia bañera, pasillos walk-around, fly-bridge con cómodo acceso) en perfecta combinación y con todas las prestaciones de un gran crucero, dotado de amplios solariums en proa y flybridge, un confortable camarote de armador con aseo independiente, dos camarotes para invitados con aseo común y un acogedor salón que armoniza elegancia, sobriedad y funcionalidad.

Todo ello, con el toque final de unos acabados en los que predominan el lajo de las maderas de teka birmana.



### CARACTERÍSTICAS TÉCNICAS

ESLORA TOTAL	12,75 m.
ESLORA DE CASCO	11,98 m.
MANGA	4,25 m.
PUNTAL	2,19 m.
CALADO APROX.	1,00 m.
DESPLAZAMIENTO APROX.	11,00 Tn.
ARQUEO	22,0 T.R.B.
MOTORIZACIÓN MÁXIMA	2x500 Hp. Diesel con ejes
VELOCIDAD MÁXIMA APROX.	35 nudos
AUTONOMÍA ESTIMADA	400 millas
CAPACIDAD DE COMBUSTIBLE	1.500 L. (completos)
CAPACIDAD DE AGUA	400 L.
CONSTRUCTOR	Embarcaciones Astinor, S.L.

"Astinufa" - Astinor 1275 (12,75 m)

### TECHNICAL CHARACTERISTICS

Length between perpendiculars	12,75 m
Length on waterline	11,98 m
Breadth	4,25 m
Draft	1,00 m
Displacement	11,00 Tn
Ship measurement	22,0 T.R.B.
Engine power	2x500 CV
Maximum Speed	35 knots
Autonomy	400 Nautical Miles
Fuel Capacity	1.500 L.
Watering	400 L.
Manufacturer	Embarcaciones Astinor, S.L.

"Pescamar" - Astinor 1000 (10 m)

#### TECHNICAL CHARACTERISTICS

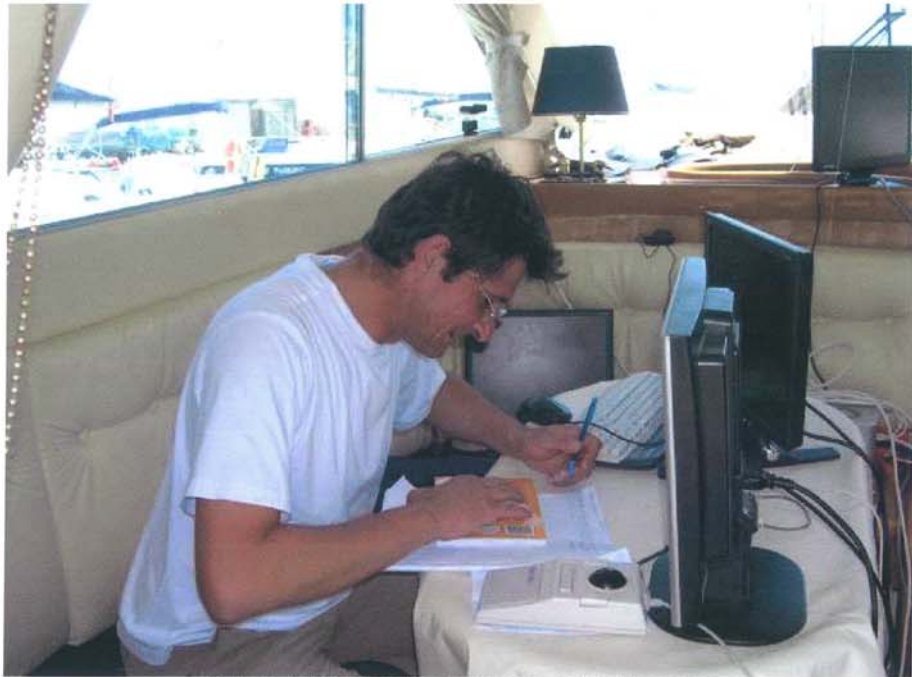
Length between perpendiculars	10 m
Length on waterline	9 m
Breadth	3,35 m
Draft	0,70 m
Displacement	5,25 Tn
Ship measurement	11,5 T.R.B.
Engine power	2x290 CV
Maximum Speed	32 knots
Autonomy	200 Nautical Miles
Fuel Capacity	600 L.
Watering	200 L.
Manufacturer	Embarcaciones Astinor, S.L.



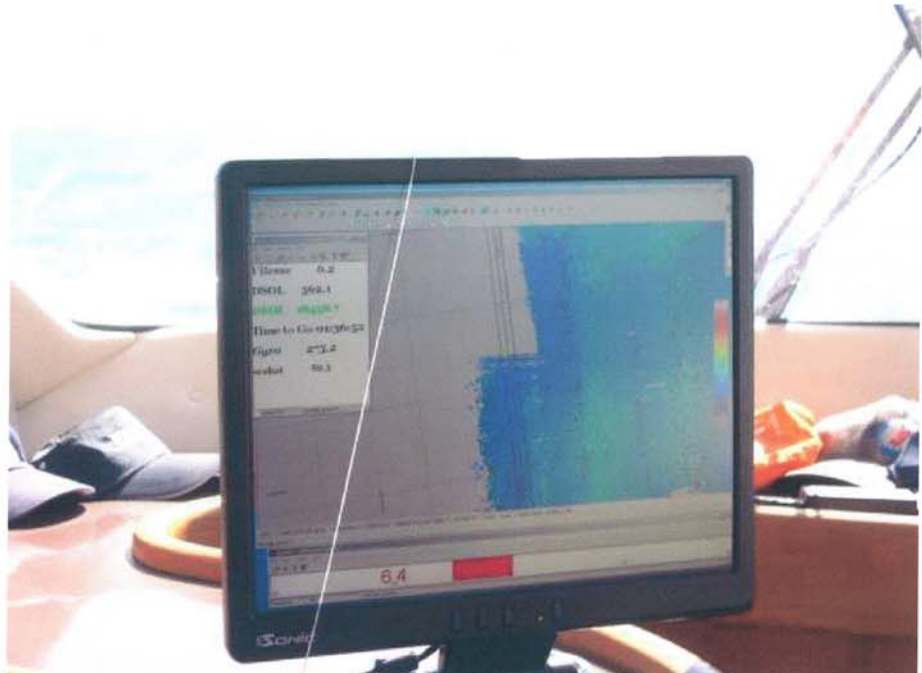


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**APPENDIX C**



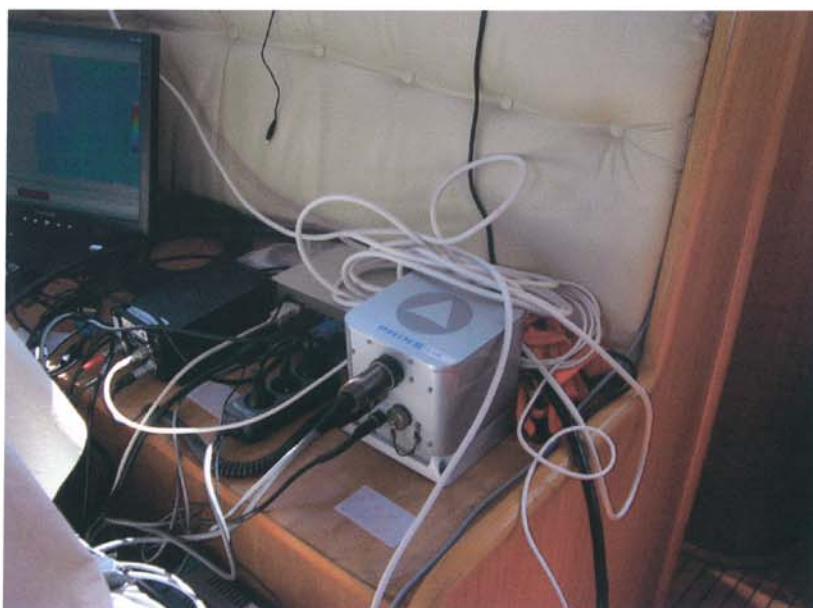
Picture 1 – Multibeam system control screens on board the vessel.



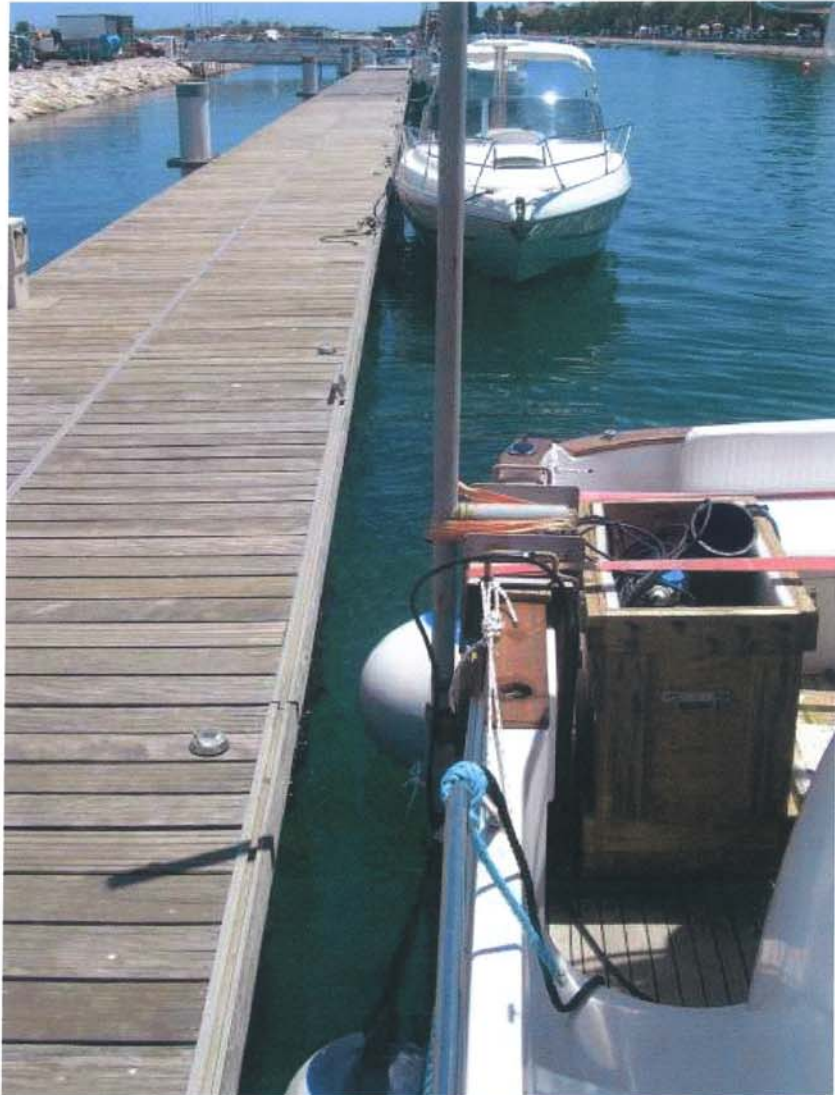
Picture 2 – Software QINSY information displayed on screen, allowing to follow the planned survey lines and giving an insight to the seafloor coverage during data acquisition.



Picture 3 – Aspect of the navigation console, departing the Port of Lagos, on the way to one more day of survey.



Picture 4 – Inertial Navigation System PHINS, attached to the cabin's interior during the overall survey, allowed to monitor and correct all the movements of the vessel.



Picture 5 - Aspect of the transducers holder, mounted on the starboard side of the vessel.



Picture 6 – Aspect of the westernmost coastal sector of the surveyed area.