EMRA'14
Workshop on EU-funded
Marine Robotics and Applications

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The "Breaking the Surface" Workshop
A Path of Collaboration and Mutual Understanding

breaking the surface

CNR, Rome, Italy – June 9-10, 2014

The project ***Developing the Croatian Underwater Robotics Research Potential*** aimed at reinforcing the Croatian S&T potential in underwater robotics (underwater systems and technologies) through a coherent set of measures that are focused toward:

- Supporting and mobilization of human and material resources;
- Developing strategic partnerships with well known research centers in EU;
- Dissemination of scientific information and research results;
- Facilitating communication between UNIZG-FER's Laboratory for Underwater Systems and Technologies (LabUST) and research entities with similar scientific interests in the EU, as well as other stakeholders in the region;
- Improve LABUST's responses to socio-economic needs of the country and region, especially with respect to the Adriatic Sea.


Murter
Office of Naval Research
GLOBAL
Science & Technology
ONR Global

Town of Murter on the homonymous island

Breaking the Surface; International Interdisciplinary Field Training in Marine Robotics and Applications

BtS is a meeting place of experts and students of marine control engineering and signal processing and the marine robotics application areas in various types of ocean science.

BtS is a successful, multi-year field training program that combines academic topics in marine robotics and robotics application areas and hands-on working experience in the sea, doing remote sensing and sampling for various ocean sciences.

MAROB	MARBIO	MARCH	MARSEC
Marine Robotics	Marine Biology	Maritime Archaeology	Maritime Security

Breaking the Surface; International Interdisciplinary Field Training of Marine Robotics and Applications

BtS is a meeting place of experts and students of marine control engineering and signal processing and the marine robotics application areas in various types of ocean science.

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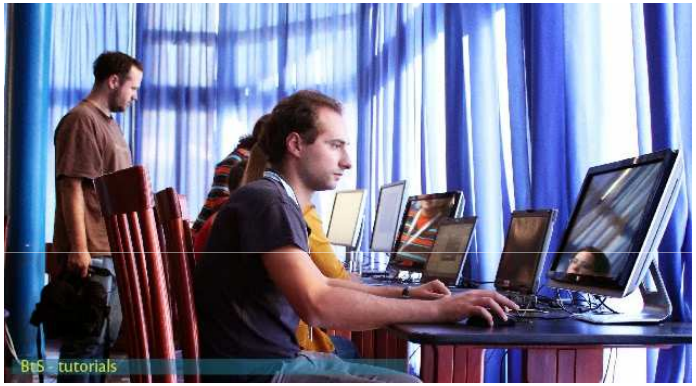
MAROB	MARBIO	MARCH	MARSEC	MARGEO	OCEAN	GRAPH
Marine Robotics	Marine Biology	Maritime Archaeology	Maritime Security	Marine Geology	Oceano-logy	Oceano-graphy

Plenary talks

Hands-on tutorials

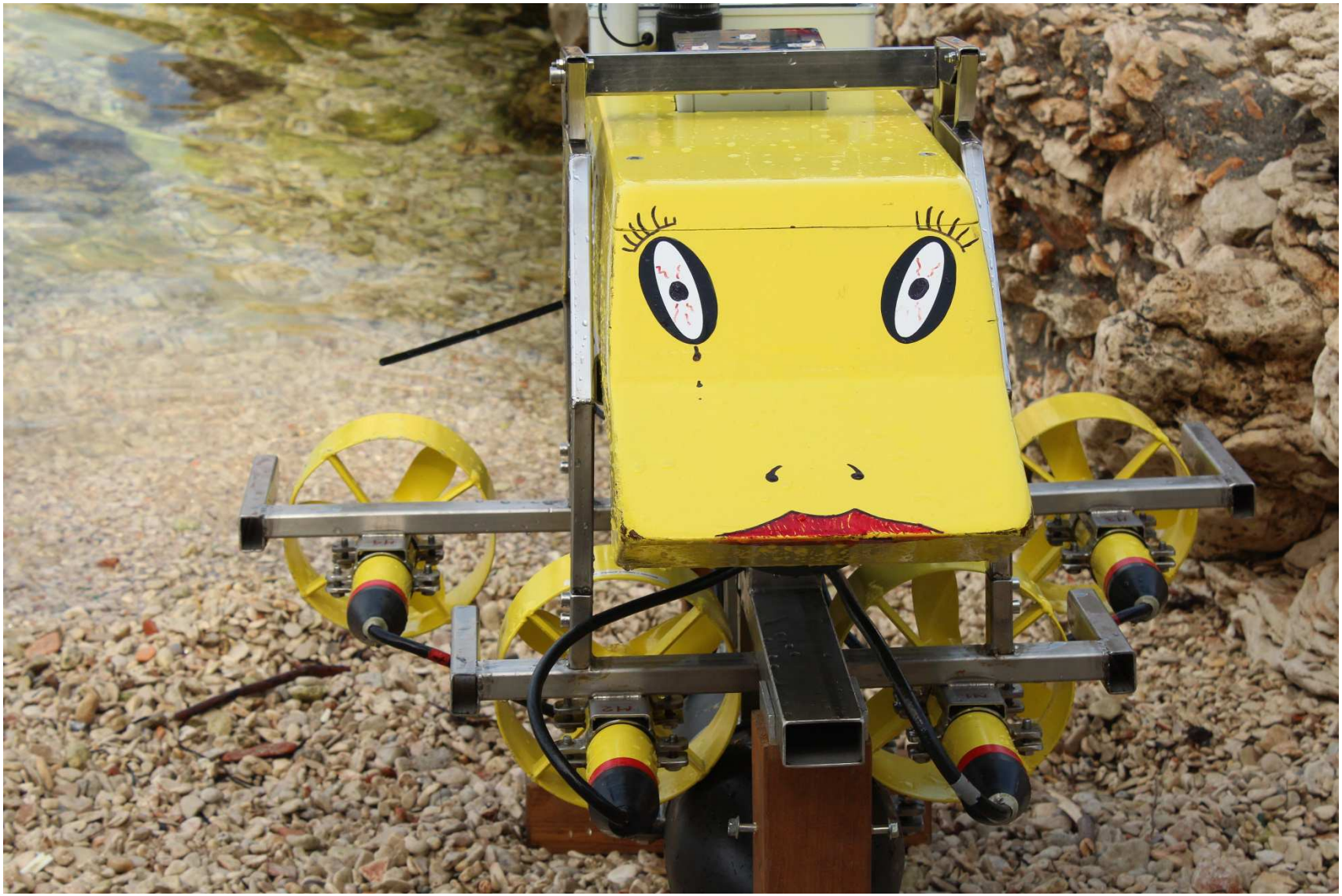


Demonstrations of marine technologies

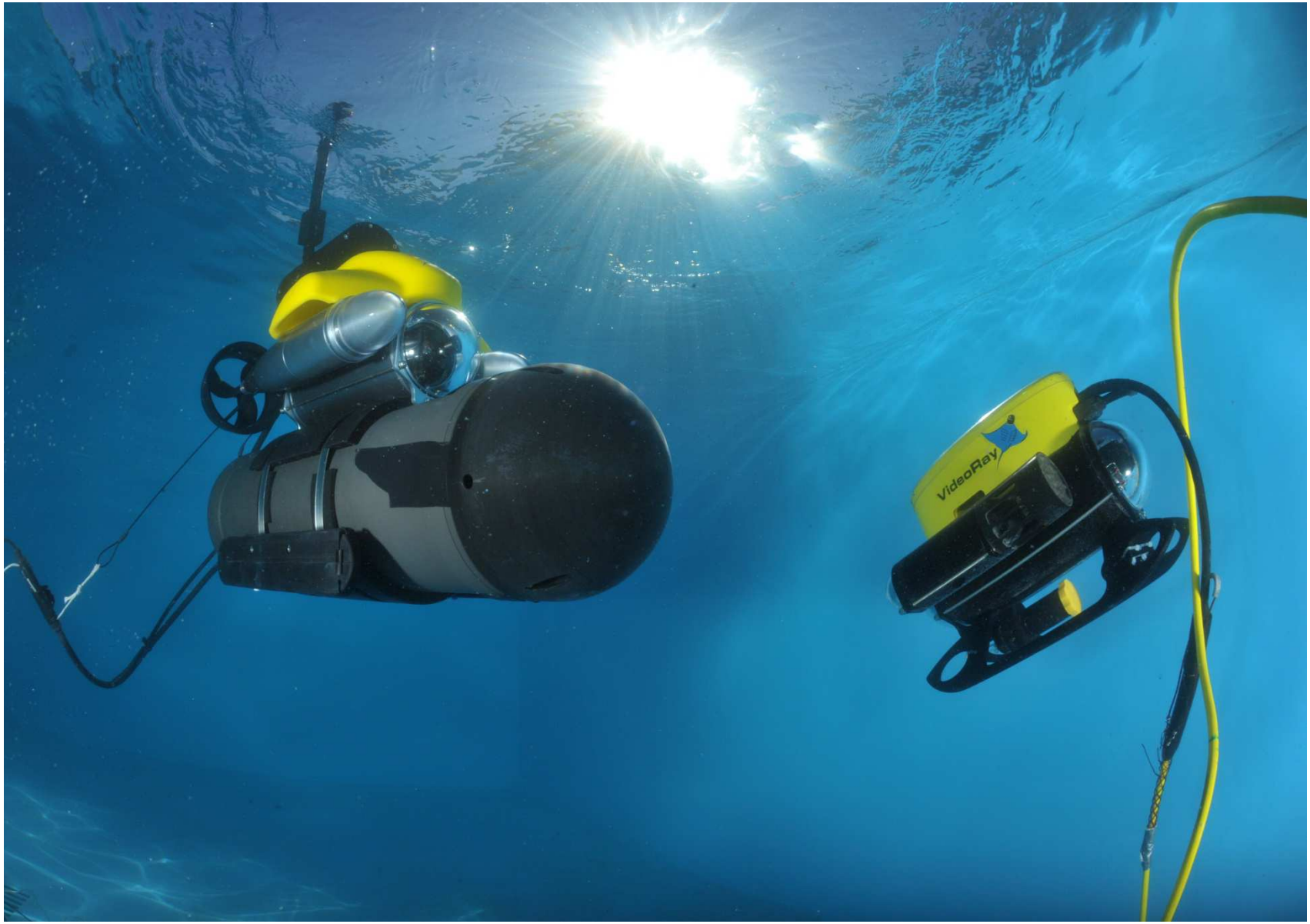

Look Into Feature
Desired Features of Future ROVs:
Improved User Interface:
Higher Level of Automation:
Advanced Control Modes:
High-Accuracy DP in Deep Water:
Built-in Thruster Fault Tolerance :
Improved ROV - Ship Bridge Link:
Universal Architecture:
Ultimate Objective:
Saving ship time,
Making ROV operations easier & safer.


Biology: Zebra mussel detection
Competition Sponsor
AUVSI

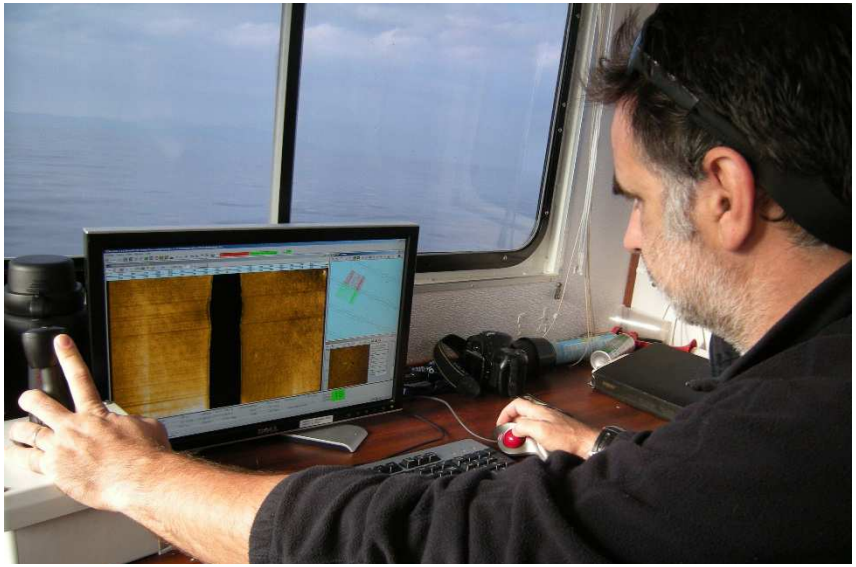

OVLAŠTENI CENTAR
DIVER



During the breaks . . .

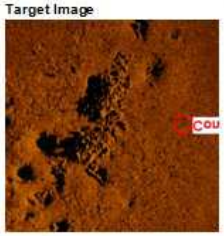

VideoRay

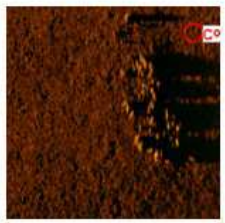

AURORA
Ocean Exploration & Education Trust
www.auroratrust.com

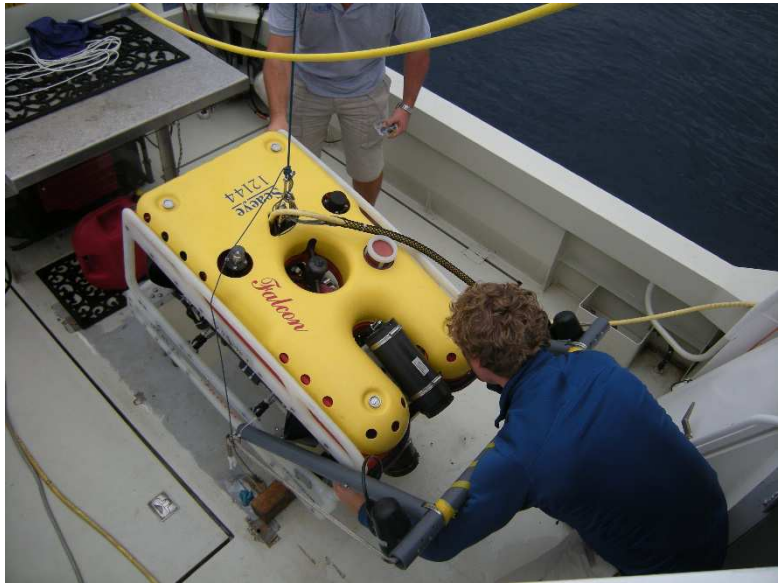


Report_Croatia 2010 ROV

Generated on: 13/10/2010 14:42:35 by SonarWiz.MAP TargetReportGen (V2.4.1)

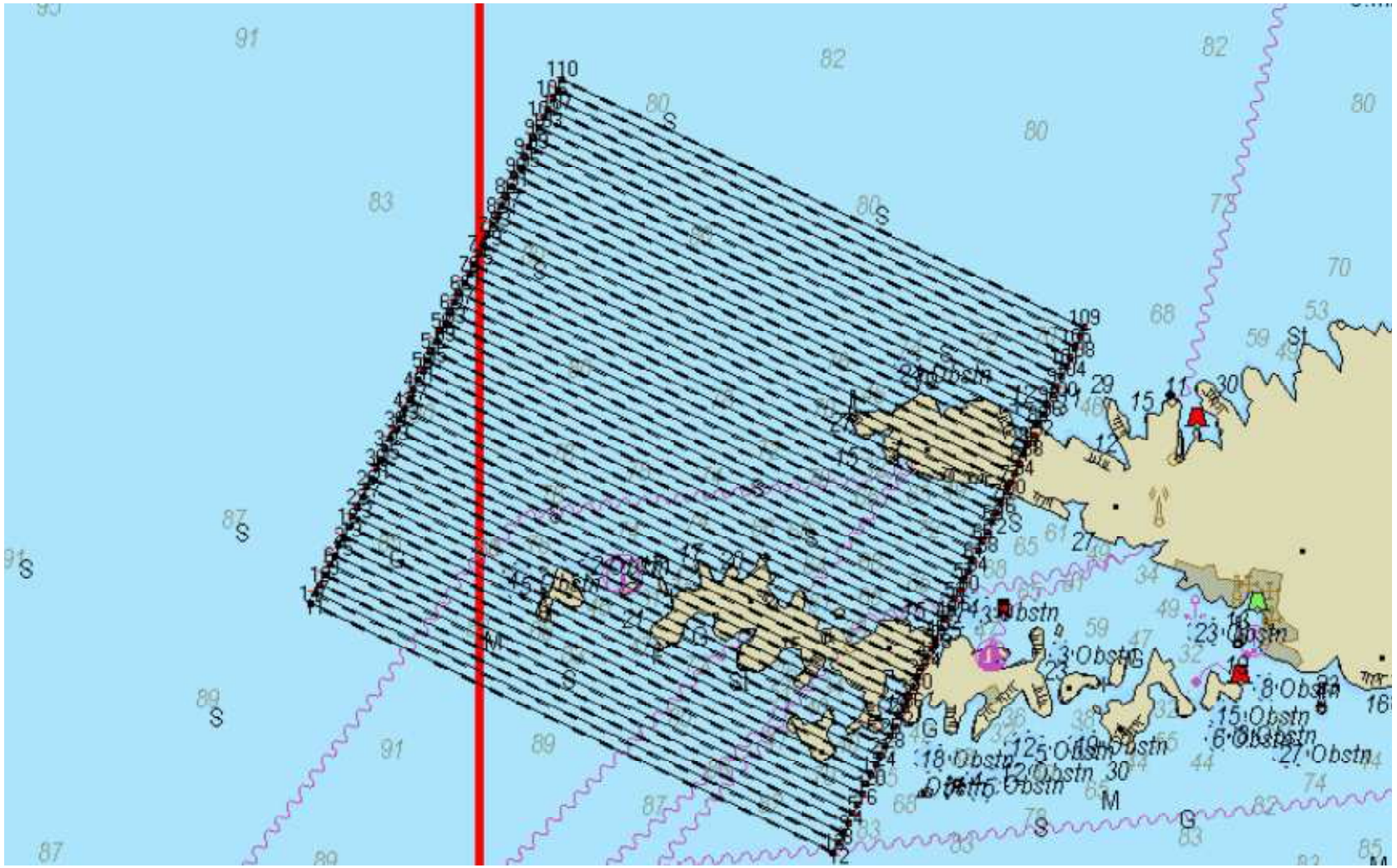
Target Image	Target Info	User Entered Info
	**Contact0000** • Sonar Time at Target: 10/11/2010 12:22:04 • Click Position (Lat/Lon Coordinates) 43° 11.09761' N 016° 21.08603' E (WGS84) • Click Position (Projected Coordinates) (X) 609,822.83 (Y) 4,782,241.11 • Map Proj: WGS 1984 UTM, Zone 33 North, Meter • Acoustic Source File: I:\11 10 2010 Croatia\sonar_data101011142200.xtf • Ping Number: 51965 • Range to Target: 9.10 Meters • Fish Height: 3.39 Meters • Heading: 337.79998779 • Event Number: 0 • Line Name: sonar_data101011142200	**Dimensions** Target Height >= 0.21 Meters Target Length: 7.04 Meters Target Shadow: 0.59 Meters Target Width: 2.15 Meters Mag Anomaly: Avoidance Area: Classification 1: Classification 2: Area: Block: Description: Target in channel
	**Contact0001** • Sonar Time at Target: 10/10/2010 09:21:52 • Click Position (Lat/Lon Coordinates) 43° 12.75962' N 016° 18.82839' E (WGS84) • Click Position (Projected Coordinates) (X) 606,716.76 (Y) 4,785,268.65 • Map Proj: WGS 1984 UTM, Zone 33 North, Meter • Acoustic Source File: G:\10 10 2010 Croatia\sonar_data101010112300.xtf • Ping Number: 80015 • Range to Target: 13.24 Meters • Fish Height: 3.04 Meters • Heading: 338.89999390 • Event Number: 0 • Line Name: sonar_data101010112300	**Dimensions** Target Height = 0.00 Meters Target Length: 0.00 Meters Target Shadow: 0.00 Meters Target Width: 0.00 Meters Mag Anomaly: Avoidance Area: Classification 1: Classification 2: Area: Block: Description: Debris?
	**Contact0002** • Sonar Time at Target: 10/08/2010 13:13:49 • Click Position (Lat/Lon Coordinates) 43° 14.04379' N 016° 19.91715' E (WGS84) • Click Position (Projected Coordinates) (X) 608,152.88 (Y) 4,787,668.84 • Map Proj: WGS 1984 UTM, Zone 33 North, Meter • Acoustic Source File: G:\8 10 2010 Croatia\sonar_data101008151400.xtf • Ping Number: 204310 • Range to Target: 15.19 Meters • Fish Height: 4.10 Meters • Heading: 335.70001221 • Event Number: 0 • Line Name: sonar_data101008151400	**Dimensions** Target Height = 0.00 Meters Target Length: 0.00 Meters Target Shadow: 0.00 Meters Target Width: 0.00 Meters Mag Anomaly: Avoidance Area: Classification 1: Classification 2: Area: Block: Description: Debris in trawl zone.

	**Contact0003** • Sonar Time at Target: 10/10/2010 09:45:50 • Click Position (Lat/Lon Coordinates) 43° 12.57205' N 016° 19.34242' E (WGS84) • Click Position (Projected Coordinates) (X) 607,418.14 (Y) 4,784,932.44 • Map Proj: WGS 1984 UTM, Zone 33 North, Meter • Acoustic Source File: G:\10 10 2010 Croatia\sonar_data101010114400.xtf • Ping Number: 109202 • Range to Target: 3.43 Meters • Fish Height: 3.28 Meters • Heading: 319.39999390 • Event Number: 0 • Line Name: sonar_data101010114400	**Dimensions** Target Height = 0.00 Meters Target Length: 0.00 Meters Target Shadow: 0.00 Meters Target Width: 0.00 Meters Mag Anomaly: Avoidance Area: Classification 1: Classification 2: Area: Block: Description: Rocks.
	**Contact0004** • Sonar Time at Target: 10/10/2010 09:32:25 • Click Position (Lat/Lon Coordinates) 43° 12.51609' N 016° 19.53290' E (WGS84) • Click Position (Projected Coordinates) (X) 607,677.61 (Y) 4,784,836.63 • Map Proj: WGS 1984 UTM, Zone 33 North, Meter • Acoustic Source File: G:\10 10 2010 Croatia\sonar_data101010112900.xtf • Ping Number: 94279 • Range to Target: 13.28 Meters • Fish Height: 4.81 Meters • Heading: 338.70001221 • Event Number: 0 • Line Name: sonar_data101010112900	**Dimensions** Target Height = 0.00 Meters Target Length: 0.00 Meters Target Shadow: 0.00 Meters Target Width: 0.00 Meters Mag Anomaly: Avoidance Area: Classification 1: Classification 2: Area: Block: Description: Rocks.
	**Contact0005** • Sonar Time at Target: 10/07/2010 11:45:30 • Click Position (Lat/Lon Coordinates) 43° 08.87207' N 016° 21.95722' E (WGS84) • Click Position (Projected Coordinates) (X) 611,069.98 (Y) 4,778,141.03 • Map Proj: WGS 1984 UTM, Zone 33 North, Meter • Acoustic Source File: I:\sonar_data101007114400.xtf • Ping Number: 107097 • Range to Target: 15.44 Meters • Fish Height: 1.97 Meters • Heading: 335.79998779 • Event Number: 0 • Line Name: sonar_data101007114400	**Dimensions** Target Height = 0.00 Meters Target Length: 7.28 Meters Target Shadow: 0.00 Meters Target Width: 0.00 Meters Mag Anomaly: Avoidance Area: Classification 1: Classification 2: Area: Block: Description: Target???
	**Contact0006** • Sonar Time at Target: 10/07/2010 11:45:06 • Click Position (Lat/Lon Coordinates) 43° 08.87826' N 016° 21.94018' E (WGS84) • Click Position (Projected Coordinates) (X) 611,045.70 (Y) 4,778,152.10 • Map Proj: WGS 1984 UTM, Zone 33 North, Meter • Acoustic Source File: I:\sonar_data101007114400.xtf • Ping Number: 106232 • Range to Target: 16.31 Meters • Fish Height: 2.33 Meters • Heading: 336.00000000 • Event Number: 0	**Dimensions** Target Height >= 0.30 Meters Target Length: 5.09 Meters Target Shadow: 2.71 Meters Target Width: 1.66 Meters Mag Anomaly: Avoidance Area: Classification 1: Classification 2: Area: Block: Description: Target II


Falcon


Falcon


FRAGILE
Falcon


110
109
3 Obstn
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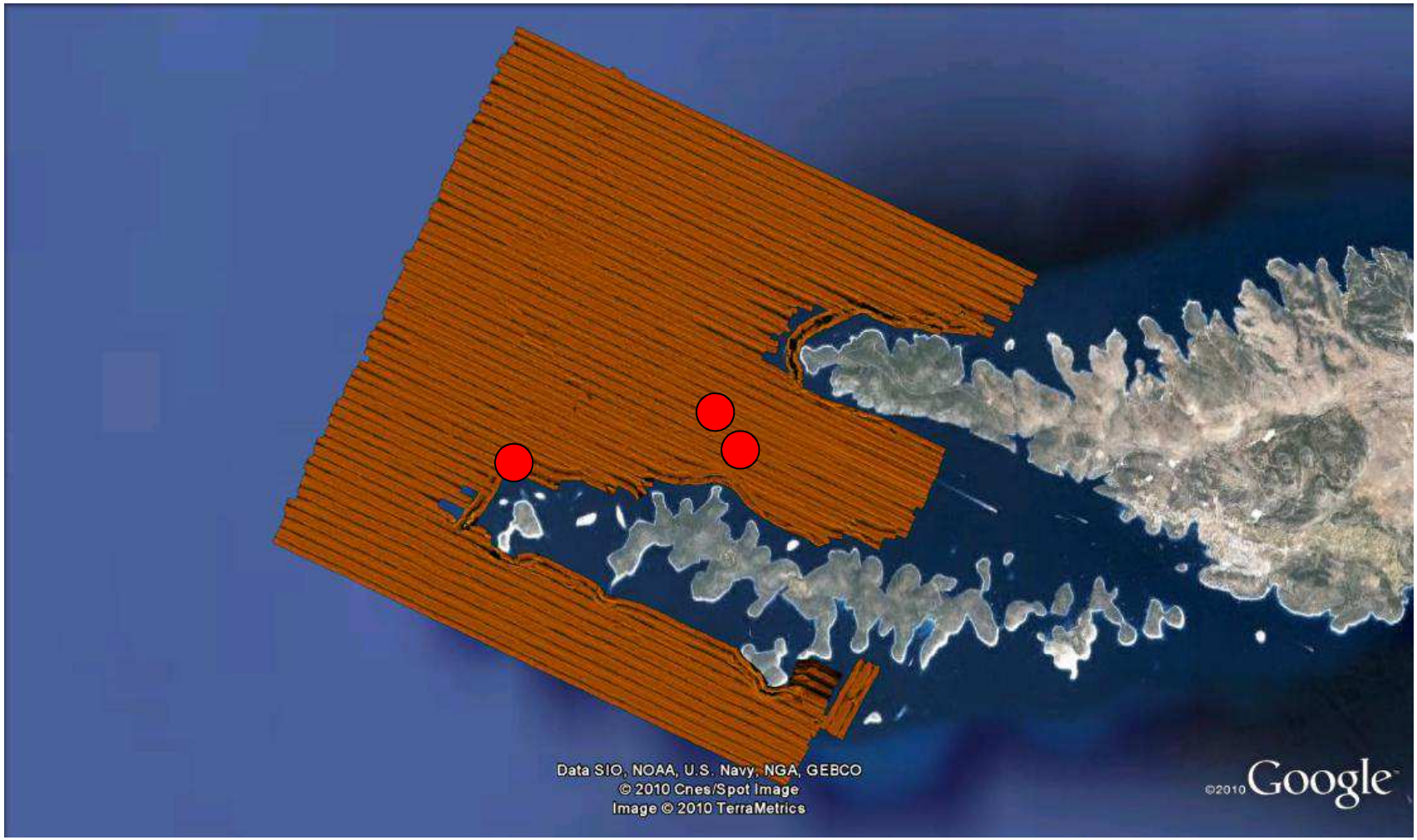
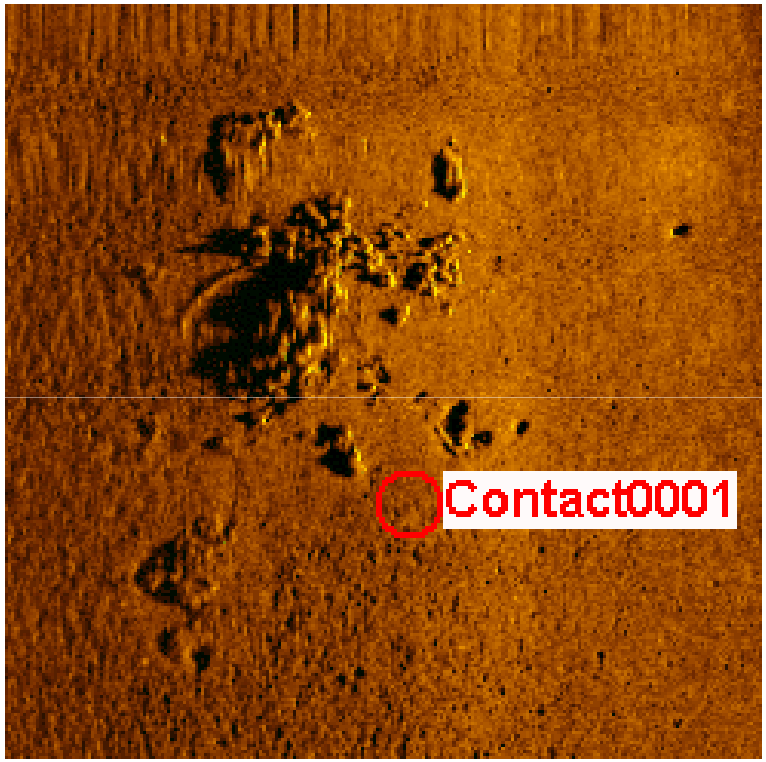
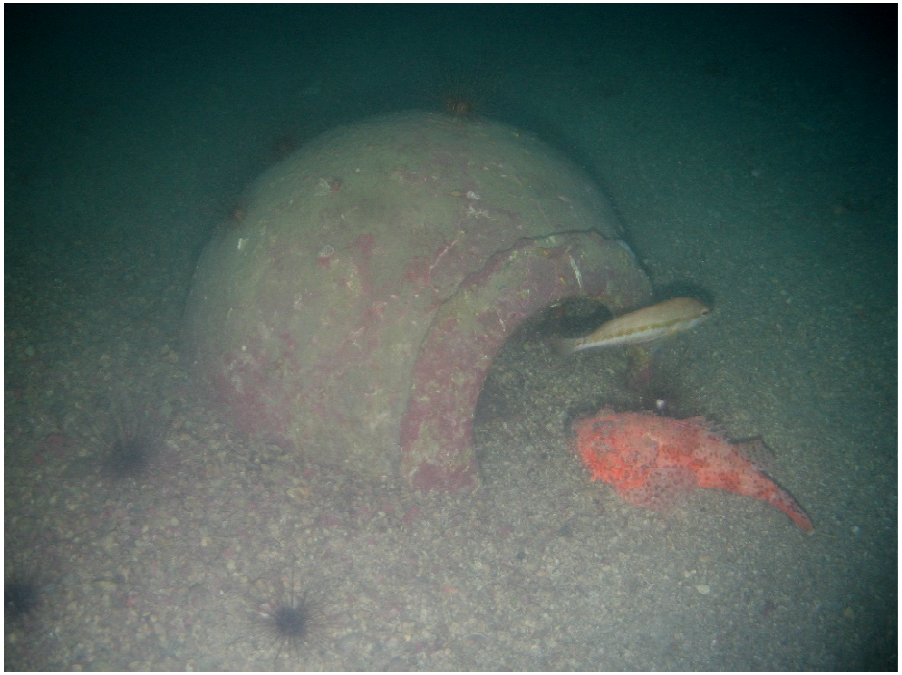
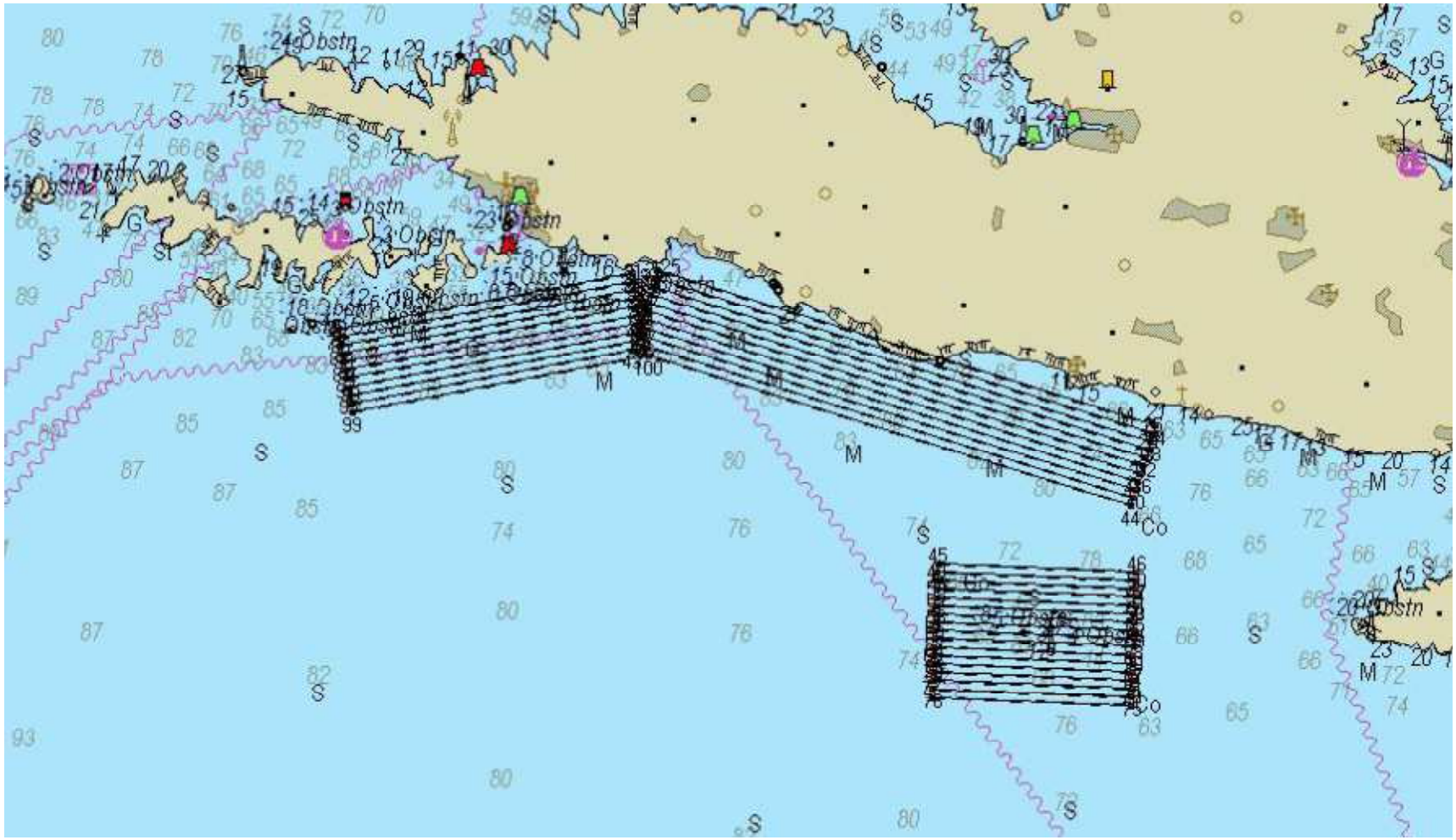

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 Cnes/Spot Image
Image © 2010 TerraMetrics
©2010 Google


Contact0001


Contact0031






Hvar, Croatia
11.4 km
Pointer 43°08'55.65" N 16°33'41.10" E
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image NASA
© 2011 Cnes/Spot Image
© 2011 Tele Atlas
Streaming 100%
©2007 Google™
Eye alt 39.44 km


2
22
23
3
4
26
21
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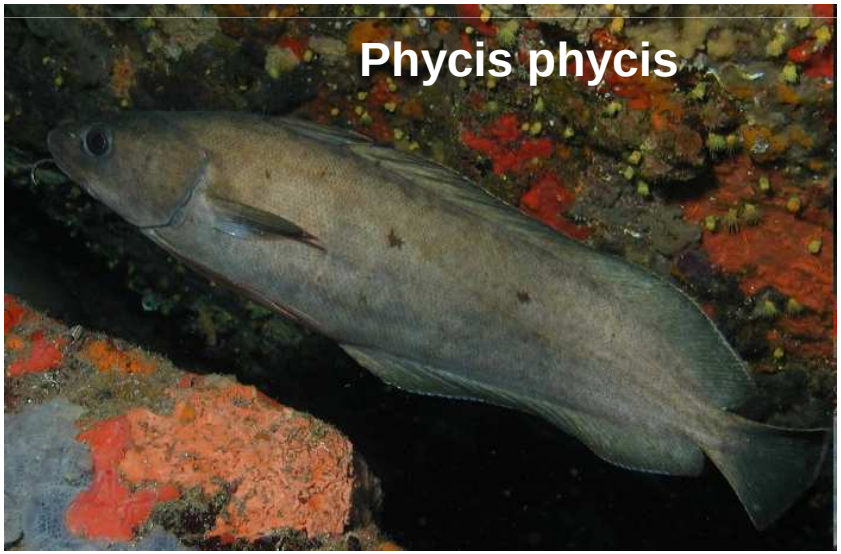
14
24
28
Hvar
5

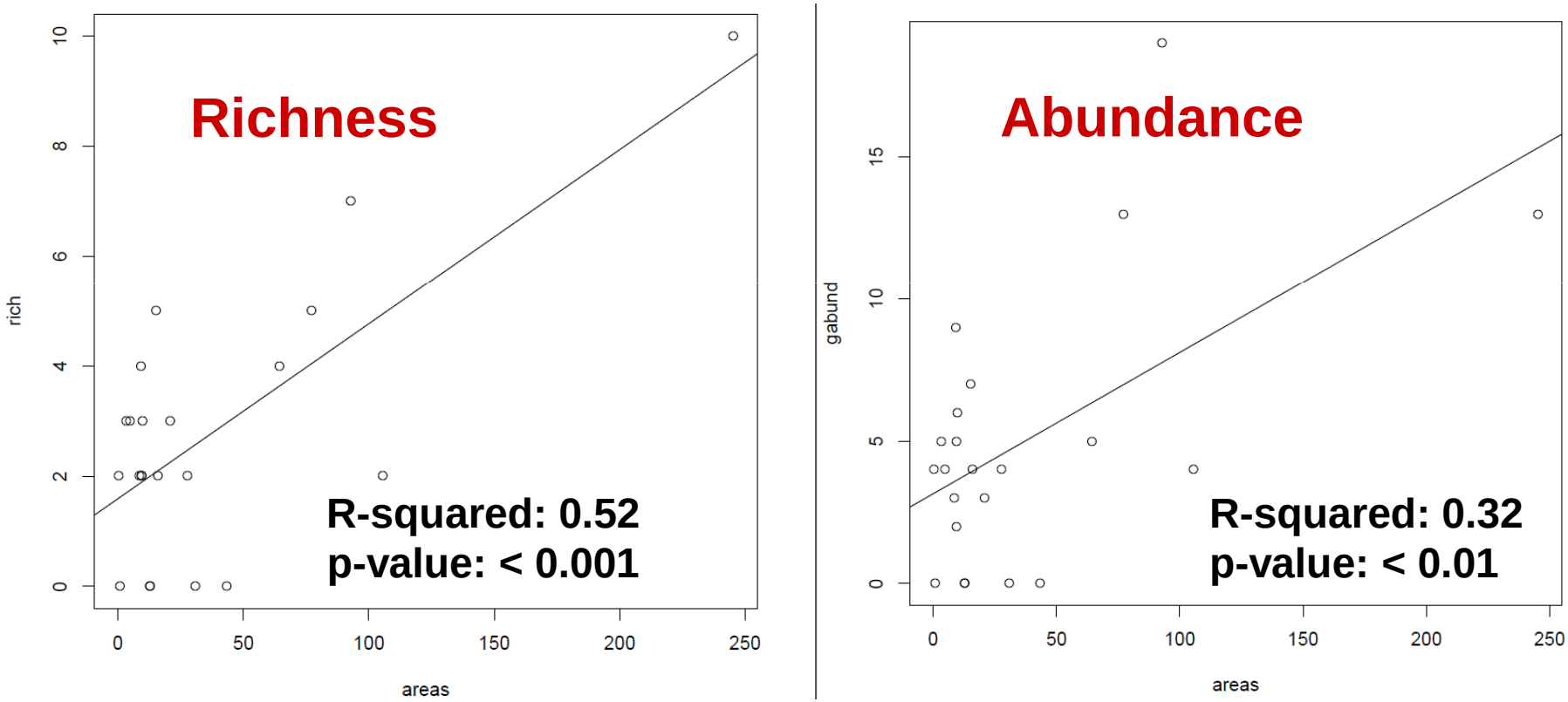

Scorpaena scrofa

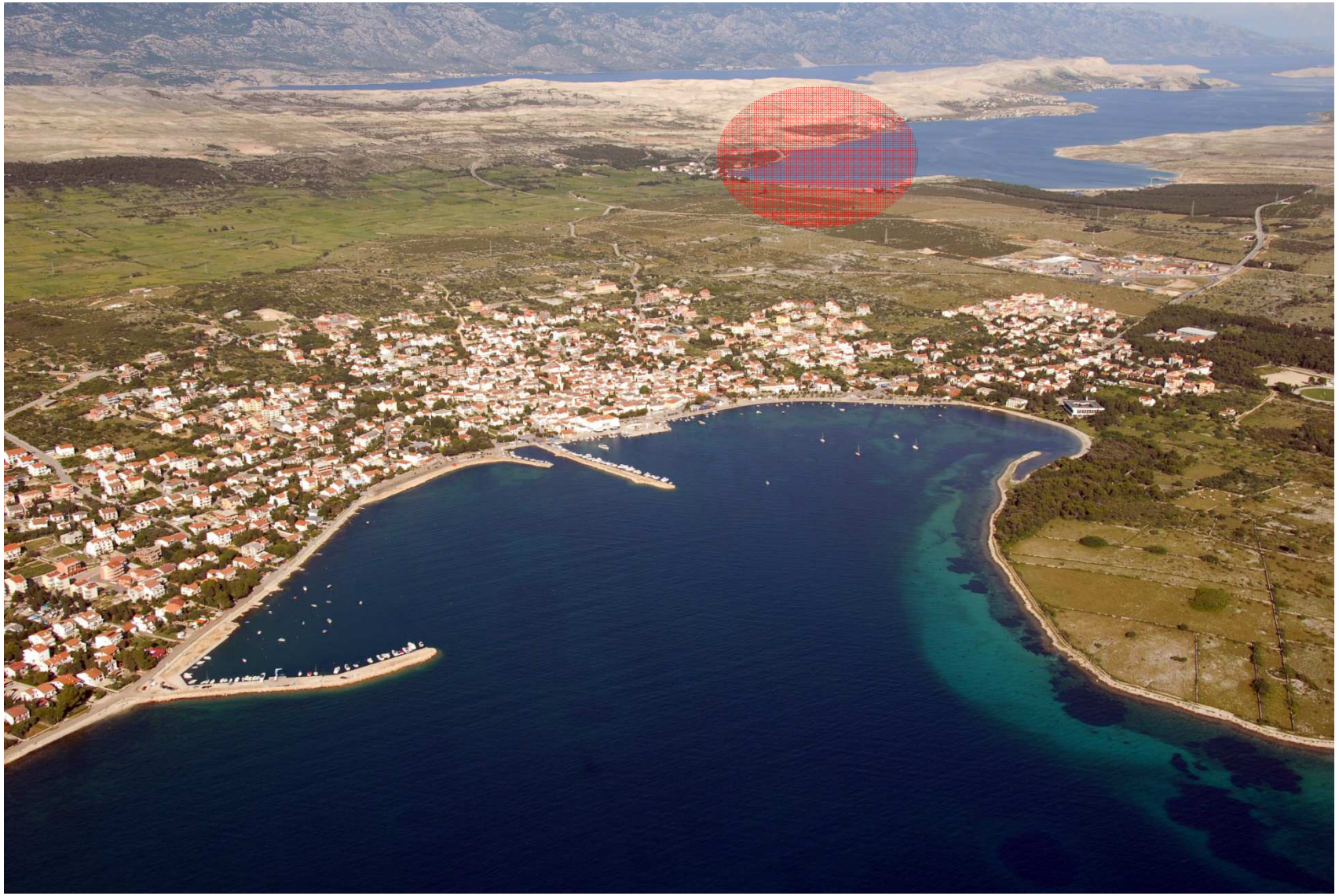

Serranus cabrilla
© William Desmartin

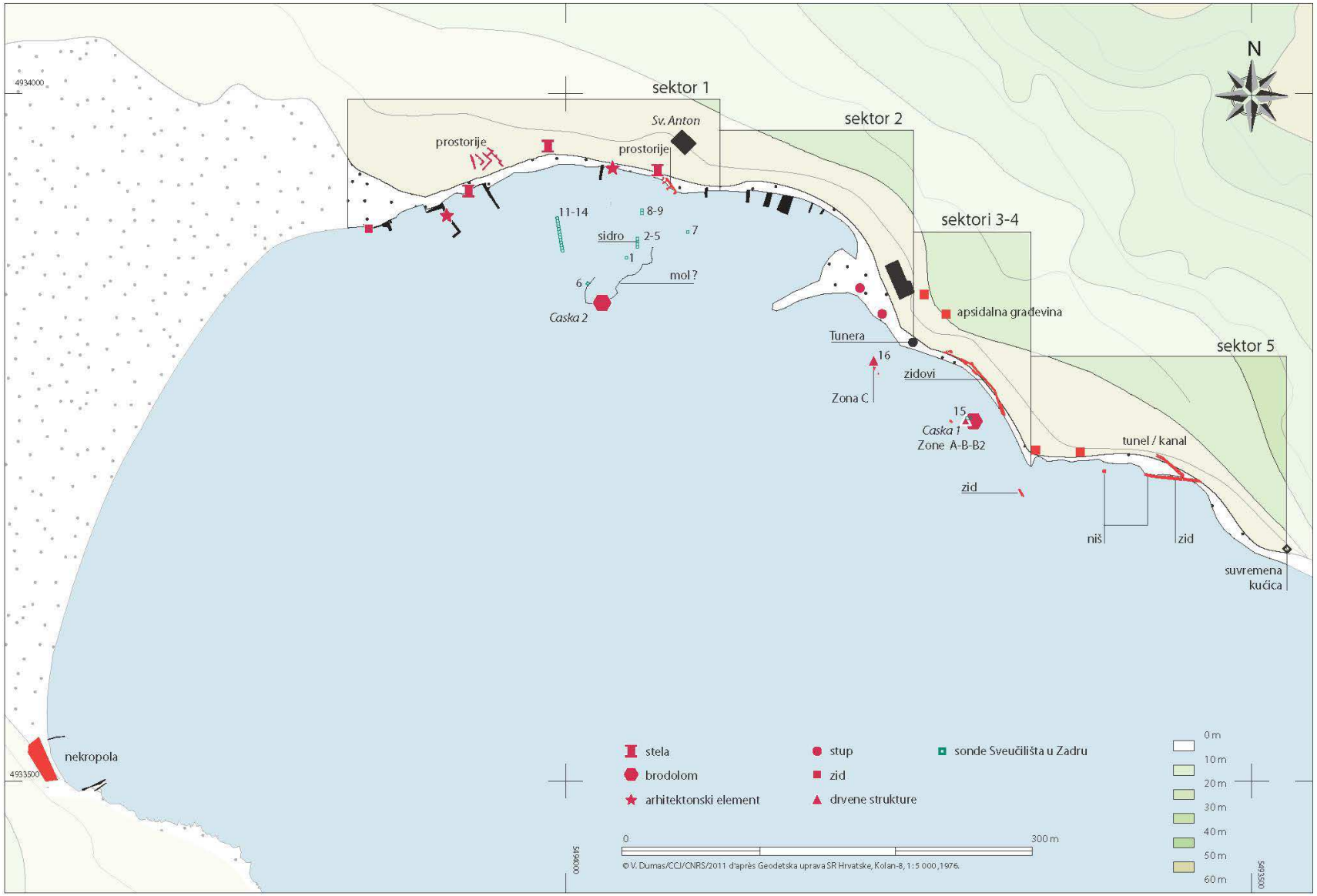

Phycis phycis


Conger conger

Richness and abundance depend on area with three dimensional structure



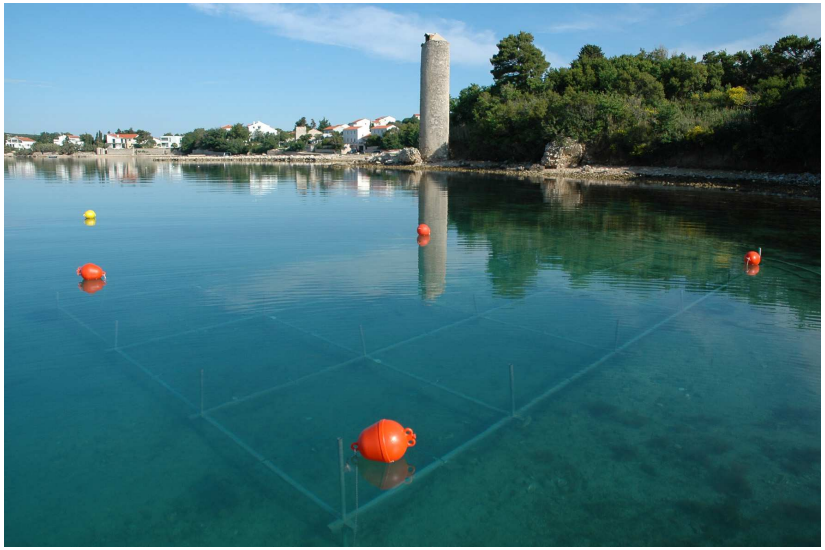


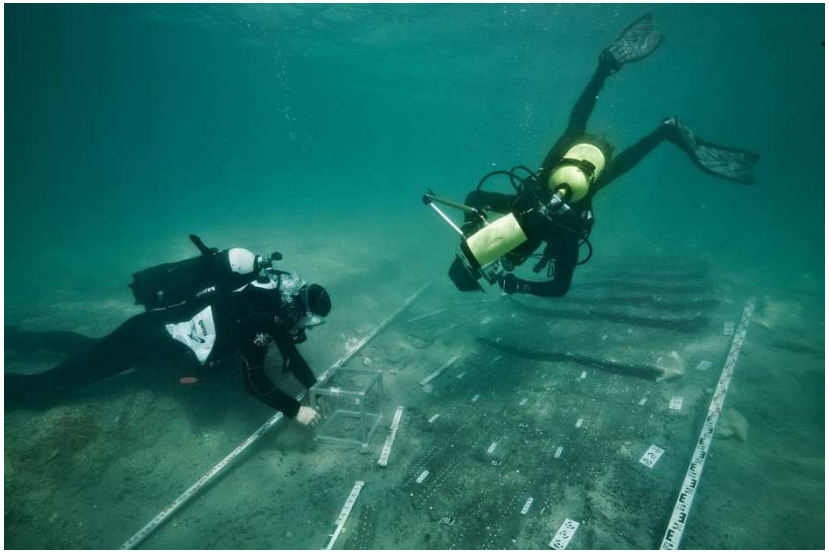


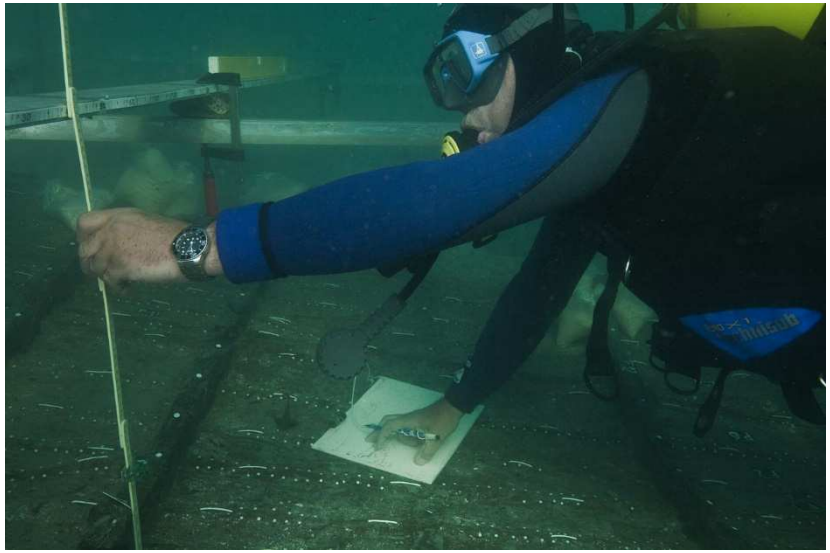
EMRA'14

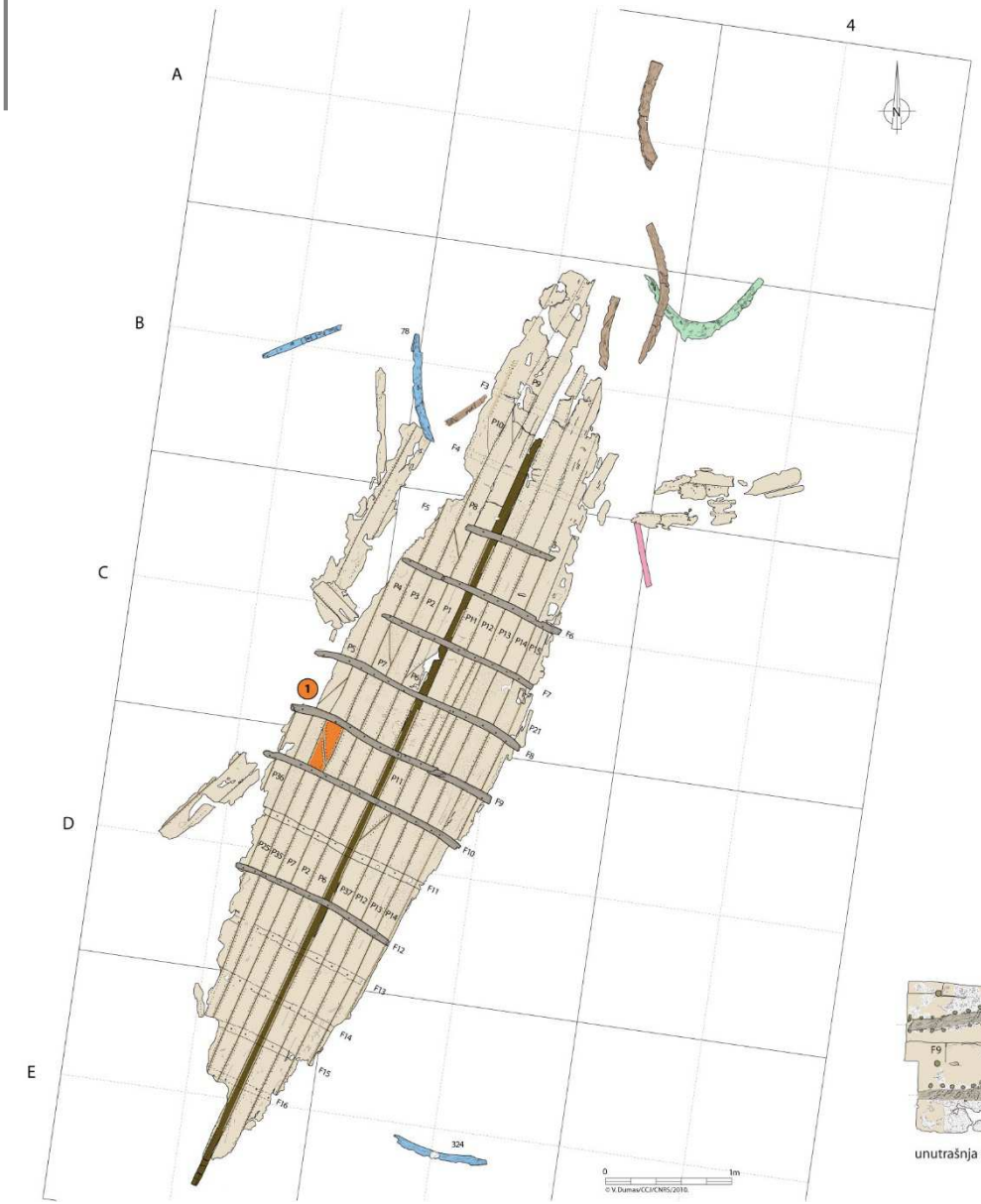
CissAntiqua Project – Reconstructing the palaeolandscape of the island of Pag

breaking the surface



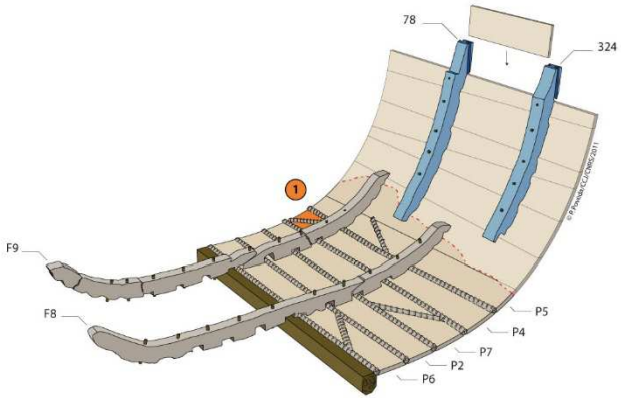


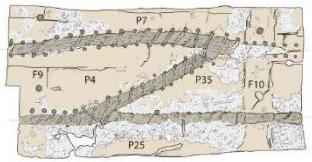




Legenda / Légende :

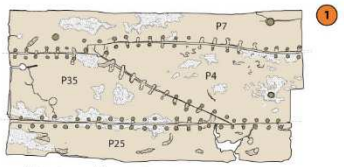
- kobilica / quille
- oplata / bordé
- rebrenica / varangue
- vijenac / fourcat
- rebreni nastavak / allonge
- neidentificirano rebro / membrure non identifiée
- podebljani voj / préceinte
- smola / poix





unutrašnja strana / face interne

Uzorak oplate / Prélèvement de bordé



vanjska strana / face externe

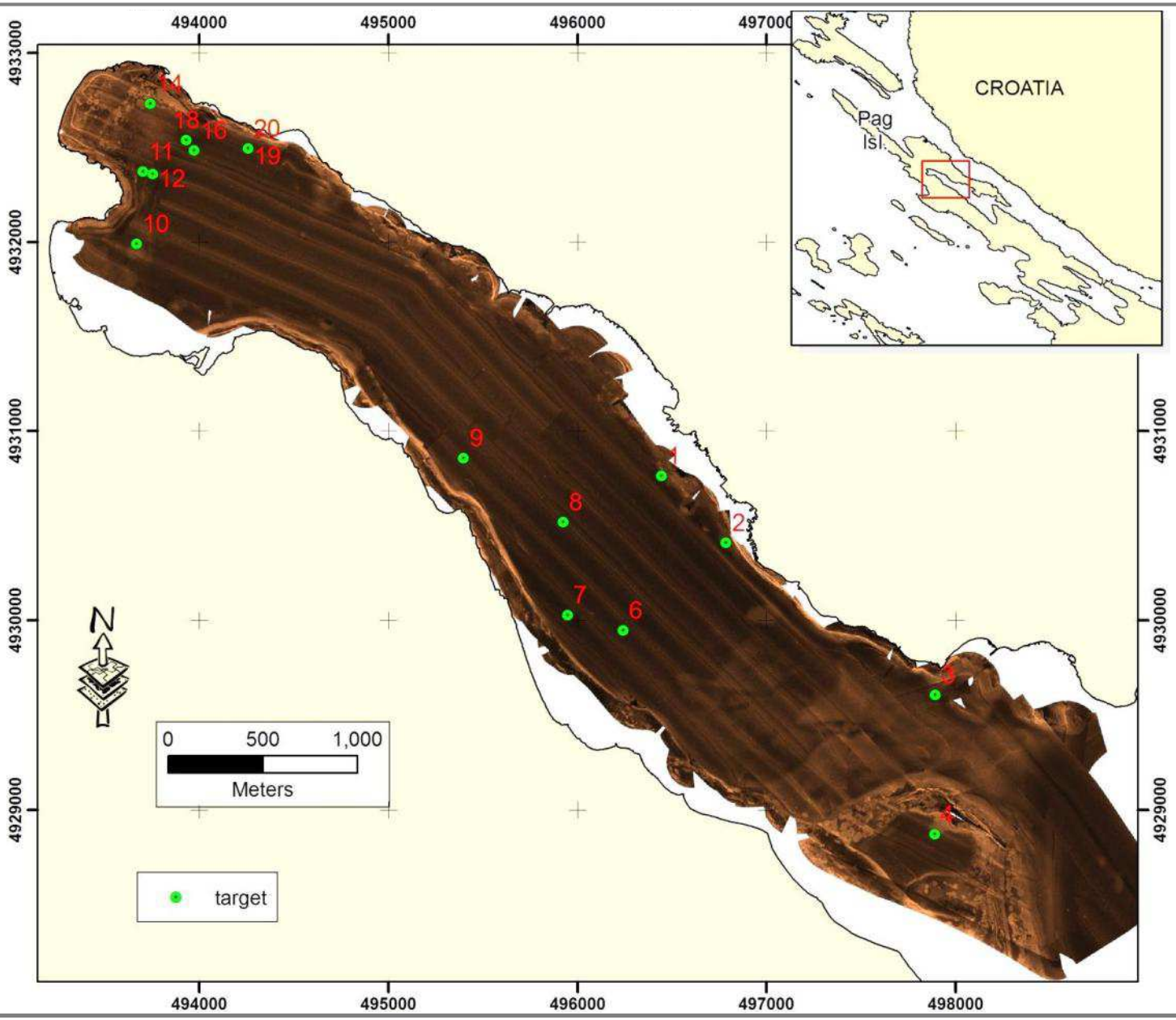
EMRA'14

CissAntiqua Project – Reconstructing the palaeolandscape of the island of Pag

breaking the surface


quille
bordé
membrure
vaigrage
épontille/support
chevilles
goupille
clou
bois déplacés/tiges
bloc
mortier
tuile

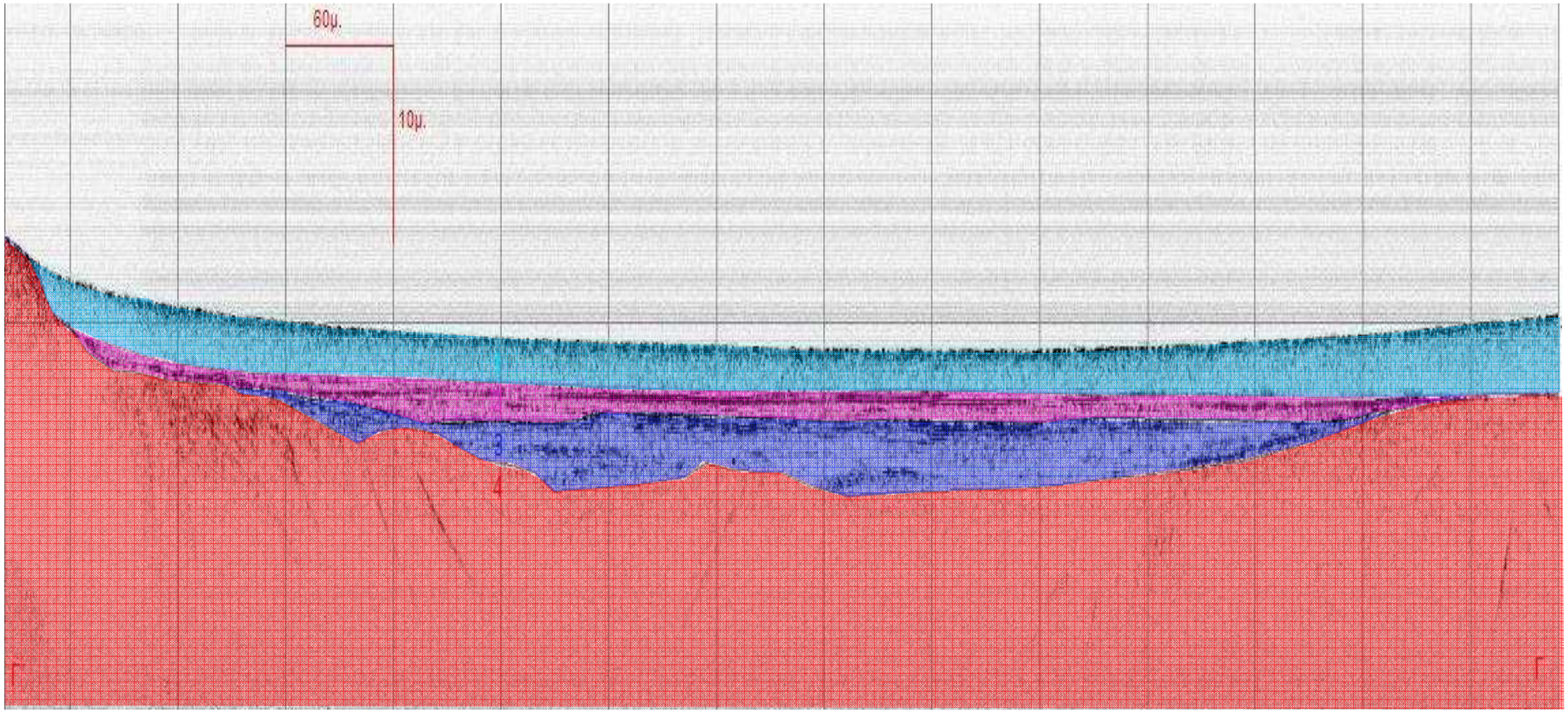
Ship Caska 2

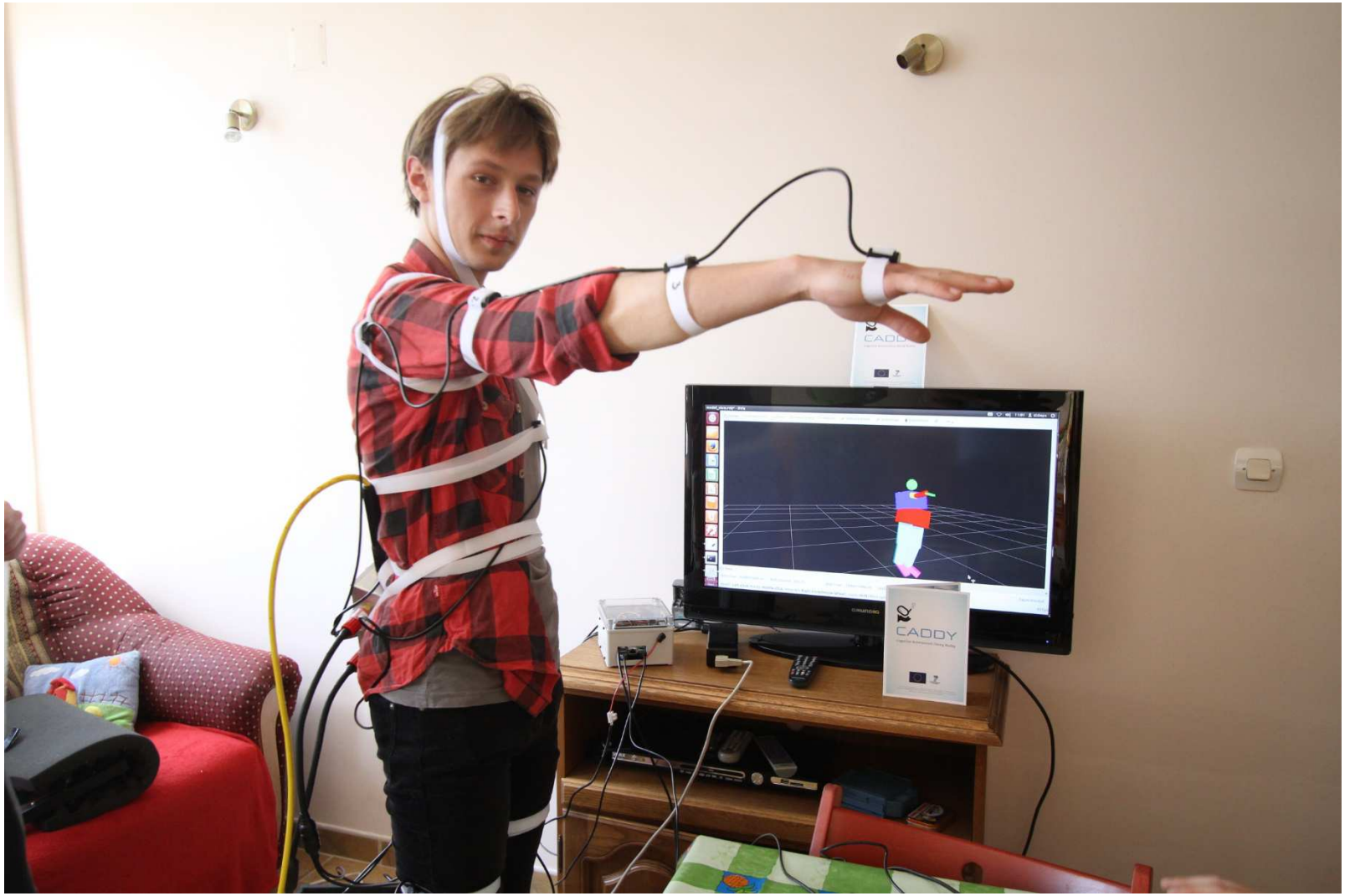


EMRA'14

CissAntiqua Project – Reconstructing the palaeolandscape of the island of Pag

breaking the surface

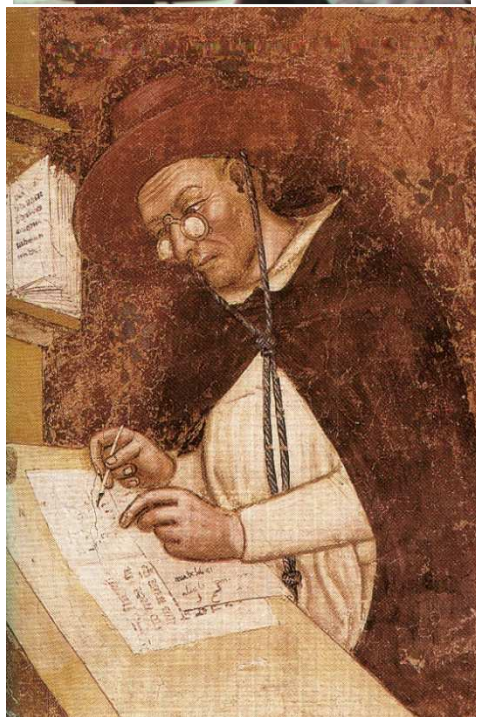

60μ.
10μ.


CADDY

EMRA'14

The Shipwreck of Gnalić –
Mirror of Renaissance World

breaking the surface



EMRA'14

The Shipwreck of Gnalić –
Mirror of Renaissance World

breaking the surface

Sveučilište u Zadru / University of Zadar

CMAC – Texas A&M University

Grad Biograd na moru / City of Biograd na moru

Fakultet elektrotehnike i računarstva Sveučilišta u Zagrebu
University of Zagreb, Faculty of electrical engineering and computing

United Nations Educational, Scientific and Cultural Organization

Organisation des Nations Unies pour l' éducation, la science et la culture

Hrvatsko povjerenstvo za UNESCO
Croatian Commission for UNESCO
Commission croate pour l'UNESCO

UNESCO
Participation programme 2010-2011

ARS NAUTICA – Obrazovni program u području arheologije i povijesti pomorstva; šesnaesto i sedamnaesto stoljeće

BRODOLOM KOD GNALIĆA

Povijest istraživanja, problematika konzerviranja arheoloških nalaza, primjena podvodne informacijsko-komunikacijske tehnologije i planovi za budućnost

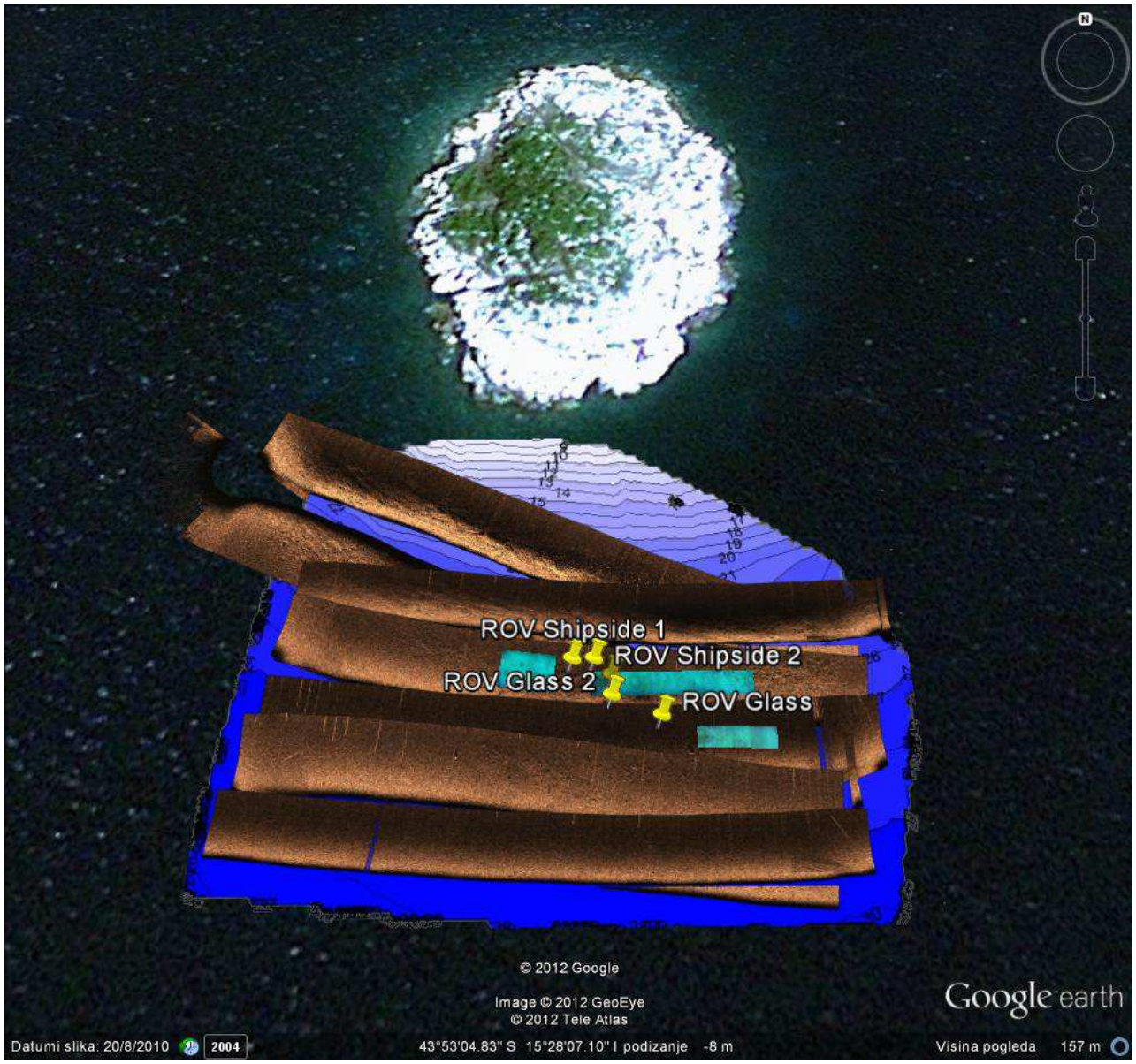
ARS NAUTICA - Educational programme in archaeology and history of navigation; sixteenth and seventeenth centuries

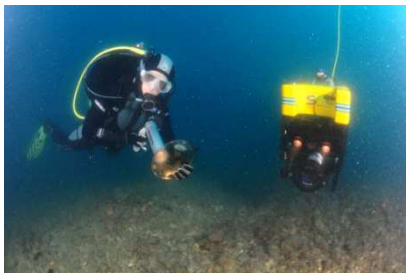
SHIPWRECK AT GNALIĆ

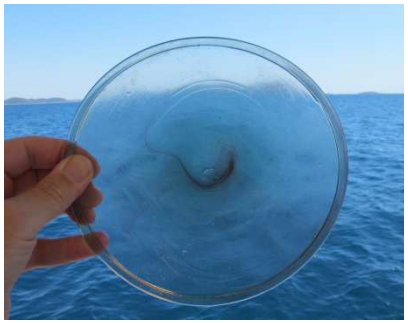
History of research, conservation of underwater archaeological finds, application of underwater information and communication technologies and plans for future

Grad Biograd na moru, Gradska vijećnica, Trg kralja Tomislava 5,
Biograd na moru, 5. srpnja 2011.

Municipality of Biograd na moru, Town hall, Trg kralja Tomislava 5,
Biograd na moru, 5th June 2011



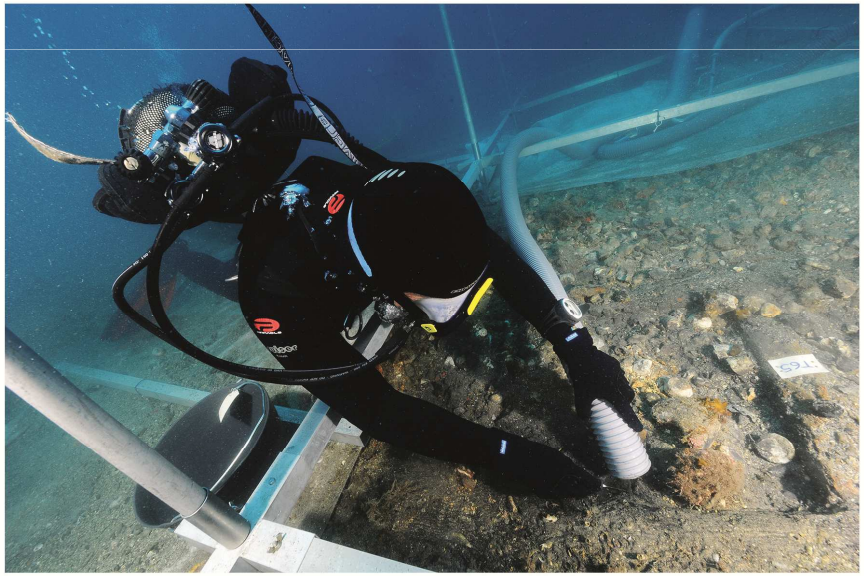




EMRA'14

The Shipwreck of Gnalić – Mirror of Renaissance World

breaking the surface

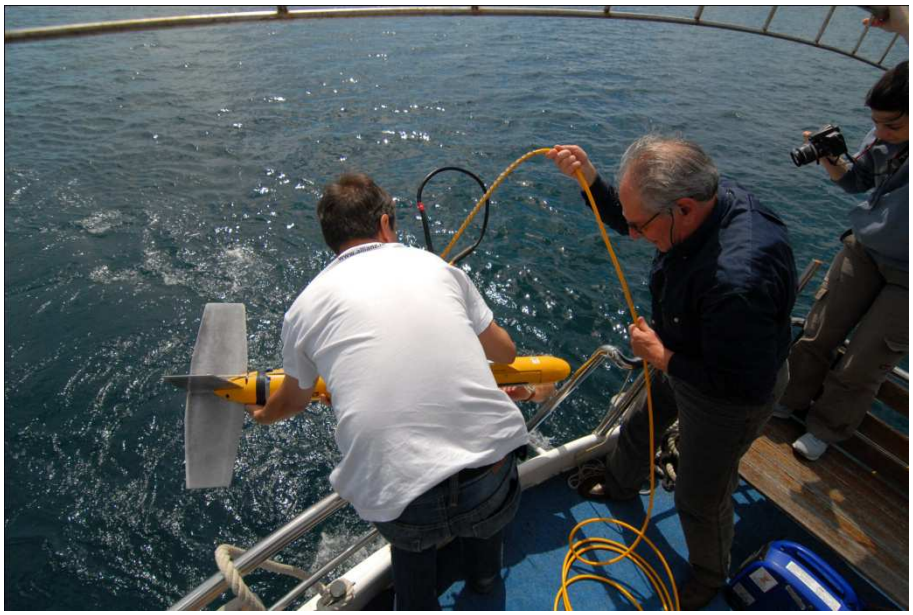


Gnalić 1967

Gnalić 2012

EMRA'14

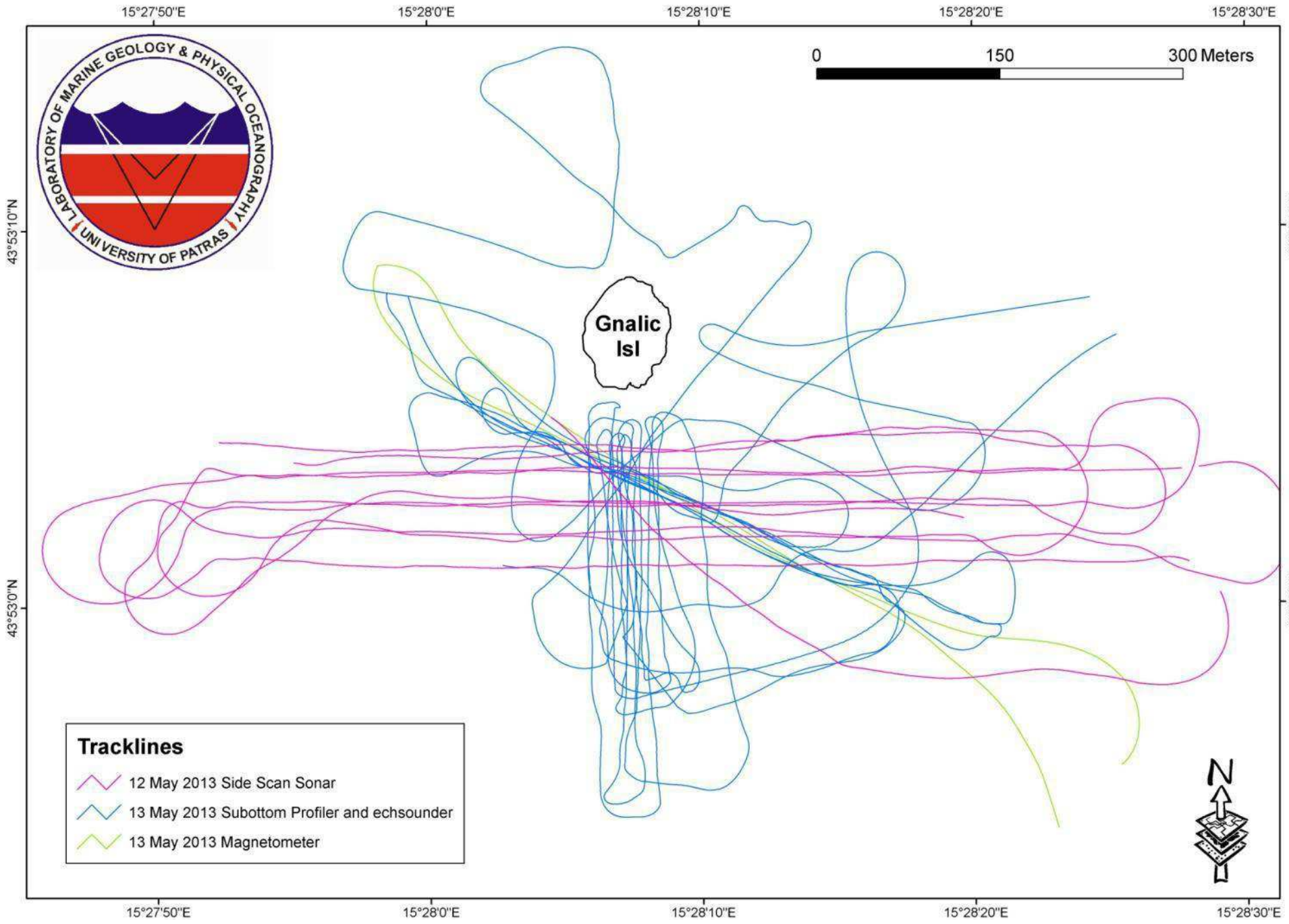
breaking the surface

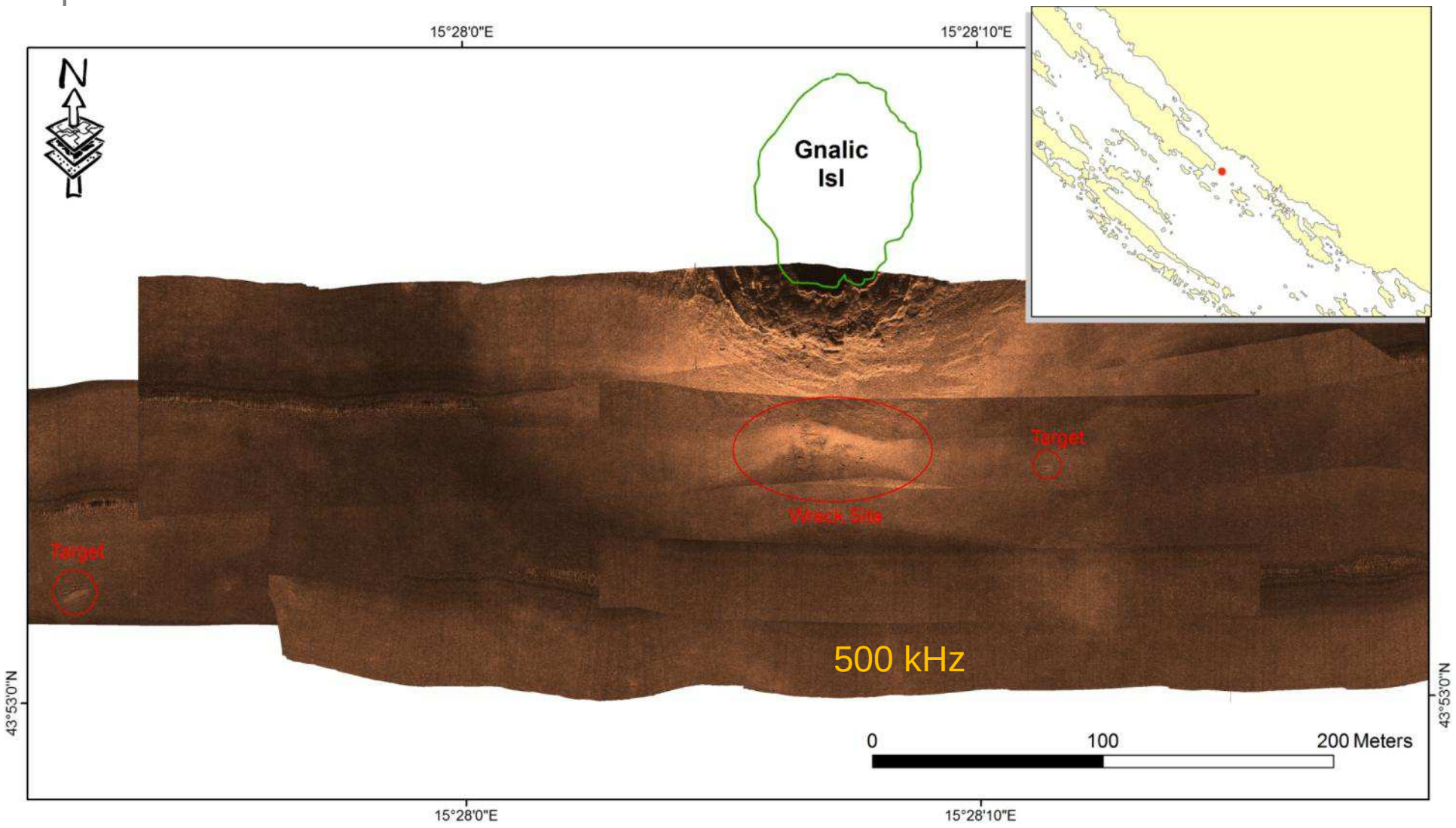


EMRA'14

The Shipwreck of Gnalić –
Mirror of Renaissance World

breaking the surface

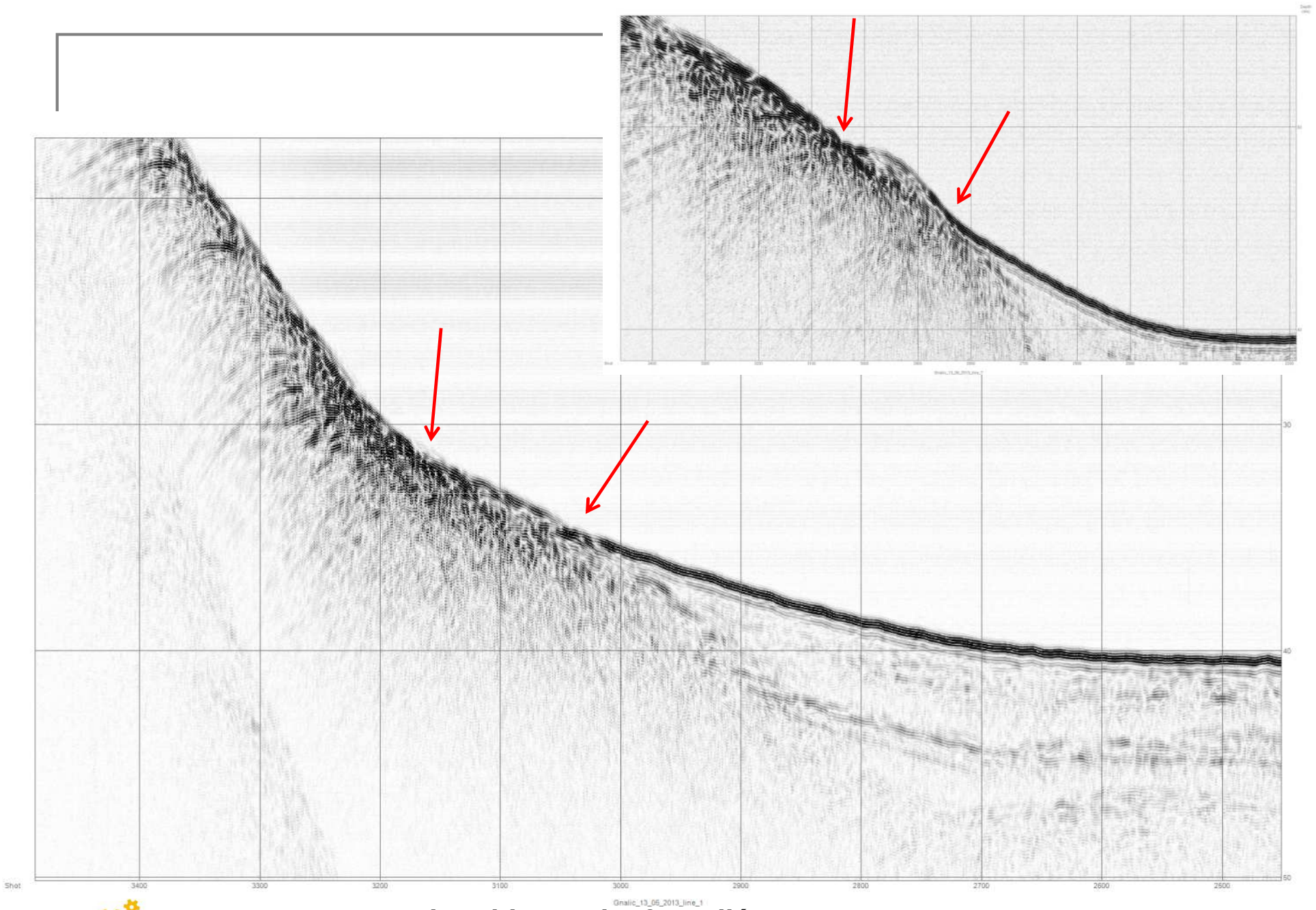

LABORATORY OF MARINE GEOLOGY & PHYSICAL OCEANOGRAPHY
UNIVERSITY OF PATRAS
15°27'50"E
15°28'0"E
15°28'10"E
15°28'20"E
15°28'30"E
43°53'10"N
43°53'0"N
0
150
300 Meters
Gnalic Isl
Tracklines
12 May 2013 Side Scan Sonar
13 May 2013 Subottom Profiler and echsounder
13 May 2013 Magnetometer
N



EMRA'14

The Shipwreck of Gnalić –
Mirror of Renaissance World

breaking the surface



EMRA'14

The Shipwreck of Gnalić –
Mirror of Renaissance World

breaking the surface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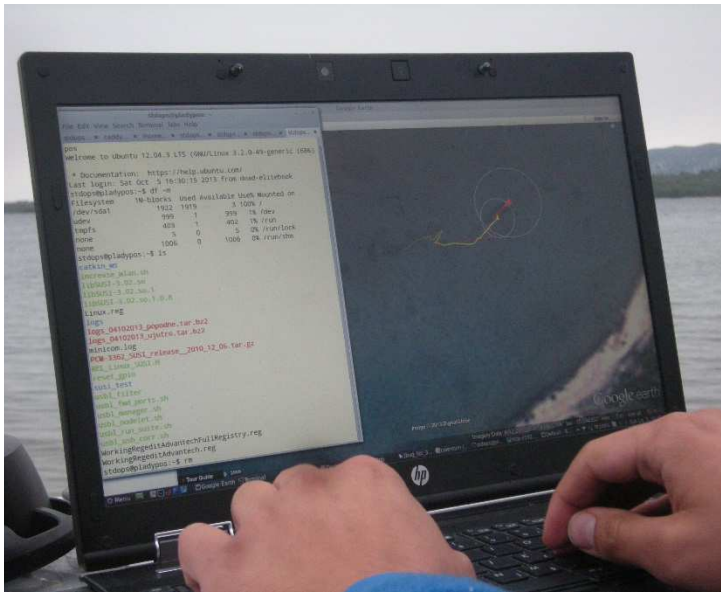
EMRA'14

The Shipwreck of Gnalić –
Mirror of Renaissance World

breaking the surface

Roman *Colentum*



PlaDyPos platform - Mapping the Roman coastal settlement of *Colentum*, island of Murter

EMRA'14

breaking the surface

breaking the surface 2014

BIOGRAD NA MORU, CROATIA 5th Oct. - 12th Oct.

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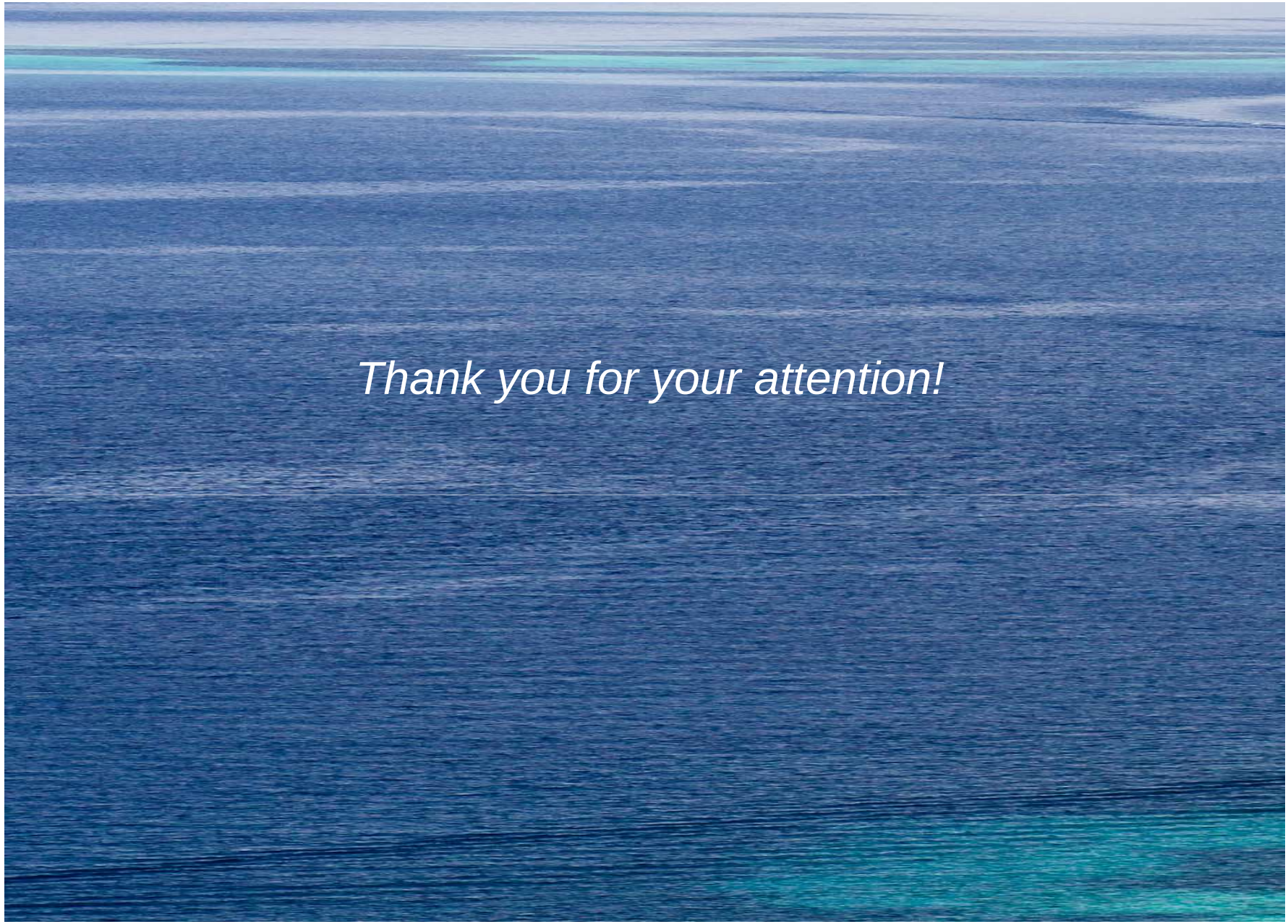
Thank you for your attention!