EDELWEIS'14 Sea Trial

Test Plan

Version 7.0 - June 9, 2014

TITLE:	EDELWEIS'14
PERIOD COVERED:	4 - 10 August 2014
PORT OF ORIGIN:	Zakynthos (Greece)
SEA TRIAL RESPONSIBLE:	Alexandros Frantzis
SCIENTIST IN CHARGE:	Emmanuel Skarsoulis
ENGINEERING COORDINATOR:	Fred Zabel

SUBMITTED:

S.M. JESUS _____ date: _____

E. SKARSOULIS _____ date: _____

A. FRANTZIS _____ date: _____

TEST PLAN APPROVAL:

OC DIRECTOR _____ date: _____

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1 IDENTIFICATION

1 Project	EDELWEIS
2 Trial name	EDELWEIS'14
3. Sea trial responsible	A. Frantzis
3 Scientist in charge	E. Skarsoulis
4 Engineering Coordinator	F. Zabel
5 Dates	August 4 - 10, 2014
6 Areas	Western Greece (areas A, B, C see below)
7 Participating Vessel	R/V NEREIS
8 Other involved units	None
9 Departure Port	Zakynthos
10 Return Port	Zakynthos
11 Port Calls (possible)	Lixouri, Limni Keriou, Katakolo, Pilos
12 Notices of Intention	To be submitted by PCRI to port authorities.

2 OBJECTIVES AND RELEVANCE

The objectives of the EDELWEIS'14 sea trial fall under project EDELWEIS'13 "Experiment for Detection and Localization of Simulated Whale Sounds in Sagres" namely to conduct a controlled detection and localization experiment emulating sperm whale monitoring, originally to be carried out near Sagres, off the south-west coast of Portugal. This objective was extended to include actual sperm whales and therefore moved to a region off the west coast of Greece, known as the Hellenic Trench, where there is a relatively large sperm whale community.

This test plan fulfills the objectives of Task 2 - Experiment design, while the experiment itself falls under the objectives of Task4 - Experiment implementations, namely to :

- acquire acoustic data transmitted from a pinger deployed at a depth compatible with sperm whale diving, in various configurations and setups so as to allow pinger localization and validation;
- acquire concurrent environmental data such as temperature and/or sound speed profiles to allow sufficient environmental description for propagation model setup;
- if possible, obtain actual sperm whale vocalization acoustic recordings in configurations allowing for animal localization and tracking.

The relevance of this sea trial is to acquire experimental data for both emulation and if possible actual sperm whale data for testing localization and tracking algorithms in real conditions, namely to support task 5 of EDELWEIS'13 contract.

3 DESCRIPTION OF OPERATIONS

3.1 Principal resources required

The principal wet end resources required for this trial on board R/V NEREIS are:

handheld CTD
AOB21
AOB22
Online pinger + rope
Manual winch
500m pressure gauge
Overboard hydrophone
WiFi reception station
GPS

3.2 Sea Trial

The sea trial will take place in the Ionian Sea off west Peloponnese (Greece) in the area designated in Fig. 2 as area A, to the west/south of Zakynthos and Kefallonia islands, within a box bounded by:

37°	59'	47.75"	N	019°	40'	44.52"	E
38°	13'	29.91"	N	020°	06'	39.79"	E
36°	30'	34.89"	N	021°	10'	05.05"	E
36°	48'	05.69"	N	021°	37'	44.14"	E

The following particularities of the area are of central importance for the development of the EDELWEIS'14 sea trial:

- the activity area is easily accessible from the ports of Zachynthos, Lixouri or Pilos. The small port of Limni Keriou on Zakynthos island or Katakolo in the Peloponese also offer a close access to the working area.
- most importantly, and as shown in figure 2, area A covers a large portion of the Hellenic Trench, a deep region (see bathymetric chart in figure 3) where a Mediterranean sperm whale community comes for feeding during the summer and, therefore a perfect spot for whale observation and, in our case, vocalization recordings.

CTDs will be made whenever necessary. All deployed equipment will be recovered when sea conditions do not permit safe working operations. Operation of R/V Nereis will be conducted so as to always respect safe distances of operation from equipment and animals. An overview of the sea trial schedule is given below; a detailed daily schedule is issued in Appendix A and a complete list of the planned events is presented in Appendix B. Any changes to the daily schedules and planned events should be made by the scientist in charge and after consultations with the sea trial responsible and involved partners.

3.3 Contigency plan

Figure 2 also shows three other areas: B1, B2 and C. These areas are set as a contigency plan in case of bad weather. Areas B1 and B2 are protected from North - Northwest, normally strong, wind predominant in the area. Area C is in the gulf of Corinthos and is very protected both from wind and sea. In these areas there would be no possibility for sperm whale recordings and the focus will be on pinger deployment and recording. Area A will be the primary working area, weather permitting, while decisions for steming to areas B1, B2 or C would be taken on scene depending on local conditions and transit time. Bathymetric maps showing the limitations of areas B and C are given in figures 4 and 5, respectively.

3.4 Activity plan

The activities will encompass both whale emulation using an acoustic pinger and actual sperm whale listening if and when available in the area. At least one day will be devoted to sperm whale emulation using the acoustic pinger. Day allocation will depend on weather conditions and likelihood of presence of sperm whales in the area. AOBs will be deployed in a surface suspended free drifting configuration and recovered at the end of each day. Acoustic whale vocalization recordings will be made taking all the precautions maintaining safe distances from animals and equipment. CTD casts will be performed every day in the morning, in the evening and whenever necessary. Approximate positions of AOBs and geometries for engineering test, pinger and sperm whales activities are described in appendix B, while pinger transmitted signals and AOB characteristics are described in appendix C.

3.5 Ship movements

A detailed plan of ship movements is presented in Appendices A and B.

4 EQUIPMENT REQUIREMENTS

4.1 CINTAL

Portable CTD, AOB21, AOB22, WiFi boat reception unit.

4.2 FORTH

ONLINE acoustic pinger, 1000m cable, manual cable winch and pressure gauge (TDR).

4.3 PCRI

On board GPS and bathymetric map.

5 PERSONNEL REQUIREMENTS

5.1 PCRI

4 persons.

5.2 CINTAL

2 persons.

5.3 FORTH

2 persons.

5.4 OC

1 person.

6 DATA COLLECTION AND AT-SEA RESPONSIBILITIES

Data collection and at-sea responsibilities are set as follows:

6.1 Aboard R/V NEREIS

FORTH:

- operation of acoustic pinger, winch and pressure gauge
- monitoring acoustic signals and adjustment of pinger depth
- acoustic propagation calculations for decision support purposes
- CTD operation

CINTAL:

- AOBs deployment, recovery and setup
- acoustic data reception and monitoring
- acoustic data backup
- testing event detection
- WiFi communication operation

PCRI and OC:

- experiment coordination
- sperm whale location and observation
- GPS of ship movements

7 ANALYSIS AND REPORTING REQUIREMENTS

All data acquired during EDELWEIS'14 will be shared among the participating institutions. In order to organize data handling and reporting, responsibilities are set as follows:

1. TDR depth and temperature data will be collected, archived and reported by FORTH.

2. recorded acoustic data will be collected, archived and reported by CINTAL, along with a preliminary assessment of acoustic receptions by FORTH.

3. environmental and bathymetric data, ship movements and sperm whale visualizations will be reported by PCRI

A data sharing meeting will be organized by UNIBAS possibly during October 2014. Data reports will be issued by each institution until the October meeting.

8 ADMINISTRATIVE

- Pre-sail briefing (tentative): August 4, 2014 aboard R/V NEREIS
- Debriefing (tentative): 11 July 2014, aboard R/V NEREIS during transit from location.

9 TRANSPORTATION

Each institution will be responsible for the travel of its participants and equipment to Zakynthos (Greece) and back. A common transportation for personnel may be provided from Athens to Zakynthos I on August 3rd and then return from Zakynthos to Athens on August 12th.

10 SAFETY PROCEDURES

Procedures for a safe deployment and recovering of the CTD, AOBs, acoustic pinger and TDR will be issued by the respective responsible institutions (see section 4).

Appendix A

Daily schedule plan

This is an ideal schedule of events to be followed, weather and equipment permitting. Deviations from this schedule may be made by the scientist in charge in agreement with the participants involved.

4 AUG 14

08:00	Collect equipment at transportation company and bring to port; check integrity and deploy on pier; make preliminary electrical tests.
15:00	Embark of equipment on board R/V NEREIS : AOB21, AOB22, WiFi reception equipment and backup equipment, acoustic pinger, rope and winch; antenna installation and testing.
16:00	sea trial briefing aboard R/V NEREIS

5 AUG 14
to
10 AUG 14

06:00	R/V NEREIS departs whatever port for the working area, approximately 1 to 3 hour of transit (depending on port).
11:00	Start Event I or II, depending on whale presence.
16:00	End Event I or II, depending on whale presence.
15:00	Recover pinger.
16:00	Recover AOBs.
17:00	Transit back to Zakynthos and R/V NEREIS secures for the night.

Appendix B

Description of events for EDELWEIS'14 Sea Trial

During EVENT I R/V NEREIS will transmit codes from acoustic pinger as specified in Appendix C.1. During EVENT II, sperm whale vocalizations will be used as source signals. A detailed description of Events follows.

EVENT I

Pinger localization

1. **Transmissions:** Online pinger coded signals (see Appendix C.1).
2. **Geometry and ship movements:** (see Fig.1) The experiment will take place in a deep water area (depths exceeding 1000 m) south of Zakynthos I., R/V NEREIS deploys AOB21 and AOB22 in free drifting mode, approximately 300 m apart, while R/V NEREIS sets to the START position and deploys the pinger at 500-800m depth while transmitting. Transmissions are received on AOB's and radio transmitted to onboard R/V NEREIS. When depth is reached R/V NEREIS stems at 3 knot along path perpendicular to the line of the two AOBs. R/V NEREIS will make stations of 15 min every mile performing the path in figure 1.
3. **Collected hydrological data:** R/V NEREIS will perform CTD casts when possible.

EVENT II

Localization of sperm whale vocalizations.

1. **Transmissions:** sperm whale vocalizations.
2. **Geometry and ship movements:** R/V NEREIS localizes sperm whale community and deploys AOBs at predetermined locations. Signals are recorded for as long as possible.
3. **Collected hydrological data:** R/V NEREIS will perform CTD casts when possible.

Appendix C.1

Online acoustic pinger characteristics

Acoustic output power	20 W ± 3 dB
Beampattern	omnidirectional
Center frequency	11 kHz
Pulse duration	5 ms
Ping repeat period	5 s
Weight in air	11.5 Kg
Pressure rating	300 bar (3000 m)

Appendix C.2

Acoustic Oceanographic Buoy version 2 (AOB2) characteristics

Receiving Array	
Name	AOB2
Model	001 (002)
Type	Acoustic VLA
Aperture	80 m (66 m)
No. sections	1 (1)
No. channels	8 (16)
Hydrophone depths (m)	
model 001	10,15,55,60,65,70,75,80
model 002	hyd 1 at 6 m, spacing 4m
Frequency band	0 - 16 kHz
Sampling frequency	60 kHz (GPS synchro)
AD conversion	16 bits
Bit rate	7.68 (15.36) Mb/s
No. thermistors	16 (16)
model 001	#1@5m, 5m spacing, Fs=1 Hz
model 002	@hyd depths, Fs=1 Hz
Battery	48 Ah/15 V
Autonomy	11 to 13 h
Data storage	80 (120) GB
Wirelesslan	802.11b
Wirelesslan amp.	1 W
Wirelesslan antenna	omni 7 dBi
Weight (air/water)	41.4 / 10 Kg
Height w/mast	300 cm
Width w/ float	40 cm
Ballast	10 Kg

Fig. 1: *Geometry of EVENT I during EDELWEIS'14 Sea Trial*

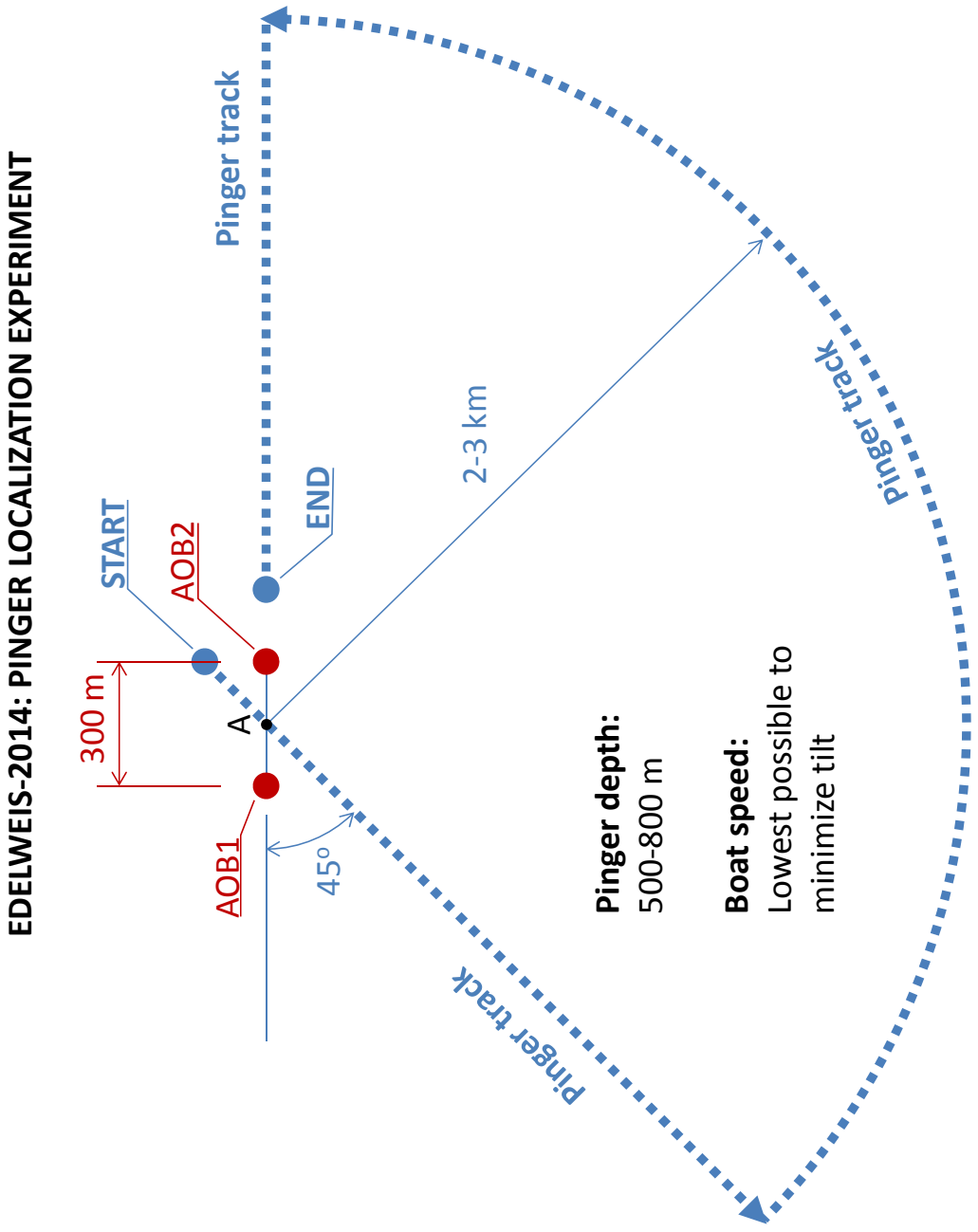

Fig. 2: *Localization of the Experimental Site*

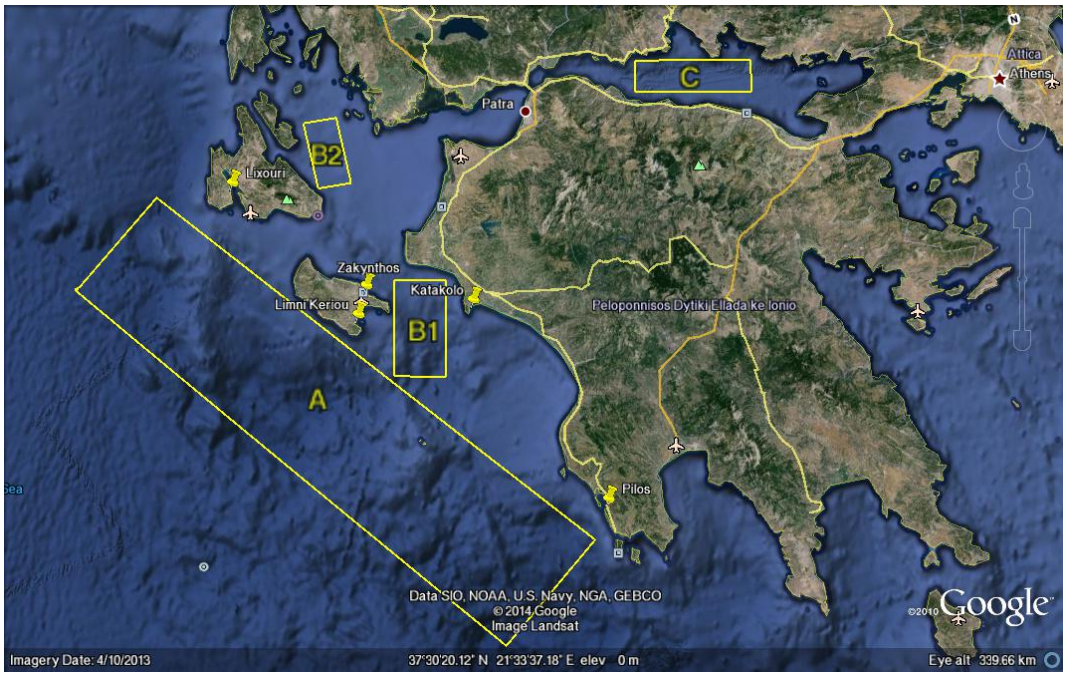

Fig. 3: *Bathymetric maps: area A*

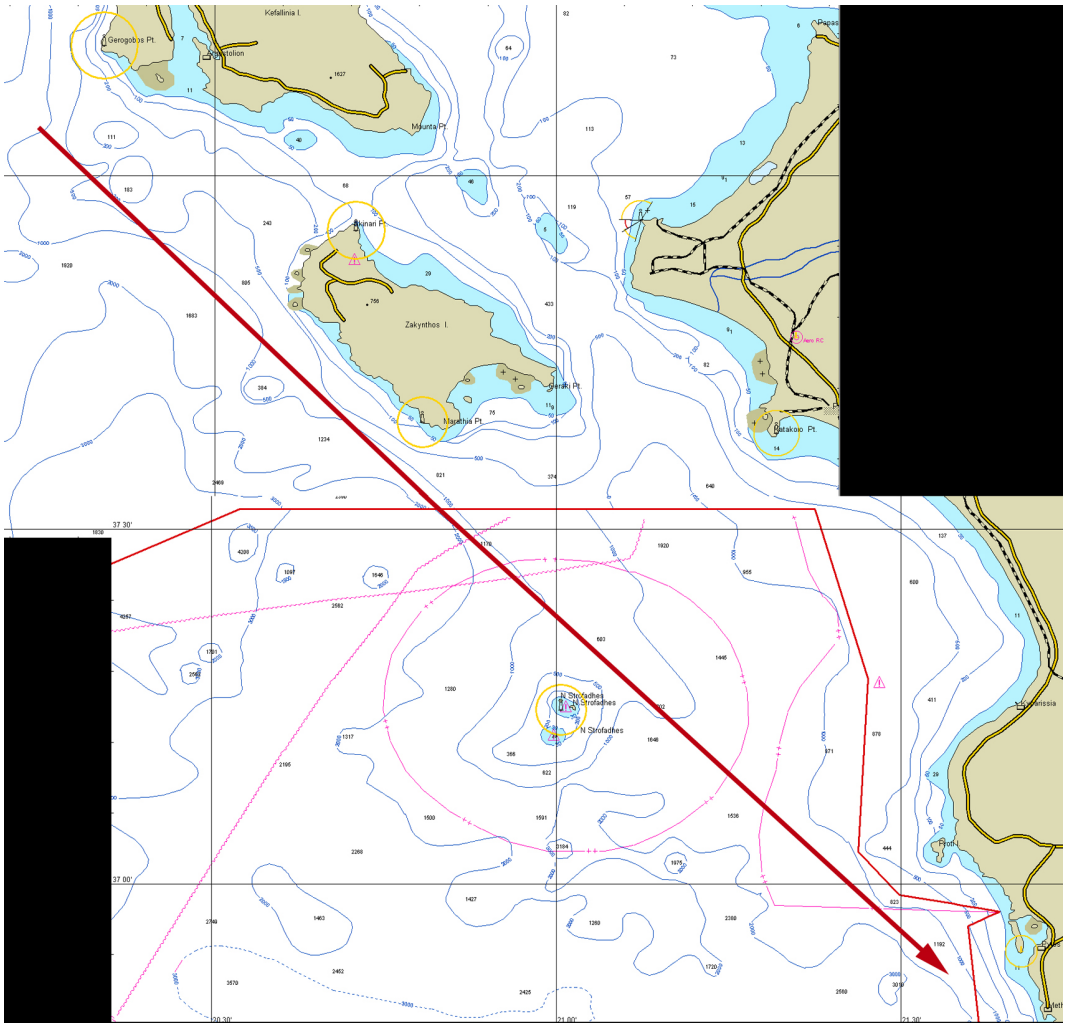

Fig. 4: *Bathymetric maps: areas B1 and B2*

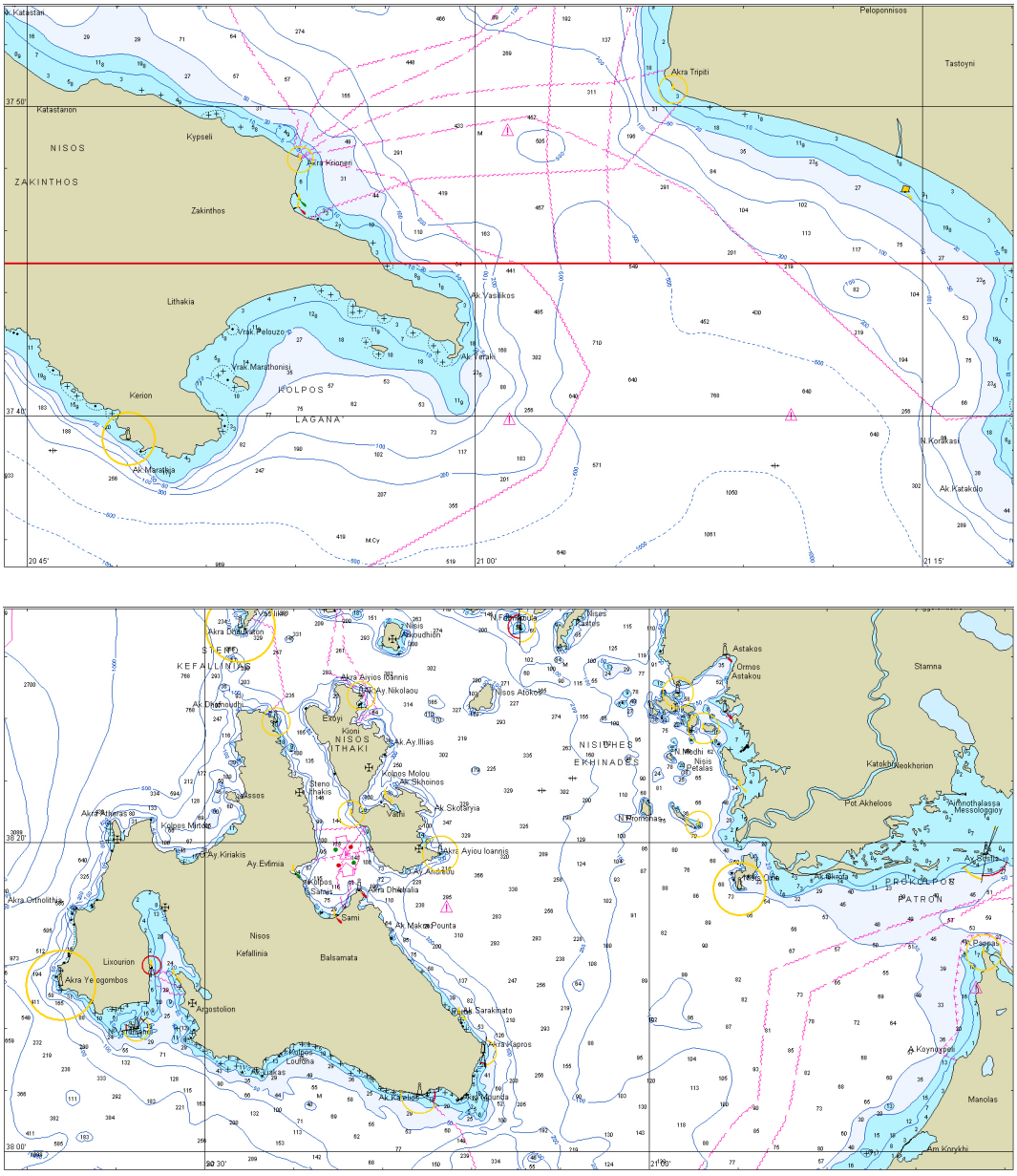

Fig. 5: *Bathymetric maps: area C*