Workshop in Ancona
Activities 2.5.1 - 2.5.2

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The workshop was held in Ancona on December 5th 2019.

The external Agency "Wilson srl" of Recanati (Italy) was commissioned to organize the event and a number of meetings took place to decide the Workshop location, people to invite, the agenda, possible invited speakers, etc.

A total of 100 invitations were sent using the EVENTBRITE platform. The target were Universities, Scientific Institutes, Scientific Cooperatives, Institutional Stakeholders.

53 participants attended the Workshop.

The workshop included three sessions:

Session one: Three lectures were included in this section: two lectures regarded the ecological and recreational roles of the natural and artificial reefs. A third lecture described the most recent hydrographic techniques to monitor the seabed.

Session two: this session was devoted to the ADRIREEF Project and concerned an introductive presentation of the project, a lecture on the technologies and monitoring tools and the presentations of the Italian and Croatian case studies.

Session three: Open space technology. The topics were:

1. Blue Economy and Stakeholders Engagement
2. Priorities for sustainable use of reef resources
3. Barriers and accelerators for the development of Blue Economy activities
4. Integrated management of reef resources

Invitation sent by e-mail

Ti invitiamo al seguente evento:

ADRIREEF - INNOVATIVE EXPLOITATION OF ADRIATIC REEFS

L'evento si terrà all'ora, data e località seguenti:

Giovedì 5 dicembre 2019 dalle 09:30 alle 16:00 (CET)

Accademia di Babele
2 Largo Fiera della Pesca
60125 Ancona
Italia
Visualizza Mappa

Sì No Forse

CNR IRBIM è lieto di invitarvi al **Workshop Scientifico - Innovative exploitation of Adriatic Reefs in order to strengthen blue economy**

CNR IRBIM is pleased to invite you to the **Scientific Workshop - Innovative exploitation of Adriatic Reefs in order to strengthen blue economy**

(english version below)

DESCRIZIONE EVENTO

The formal invitation and AGENDA

Italy - Croatia ADRIREEF EUROPEAN UNION

Adriatic Reefs in order to **strengthen** blue economy

CNR IRBIM

is pleased to invite you to the:

SCIENTIFIC WORKSHOP - INNOVATIVE EXPLOITATION OF ADRIATIC REEFS IN ORDER TO STRENGTHEN BLUE ECONOMY

WHEN

5th December 2019 - from 9.30 a.m. to 4 p.m.

WHERE

Accademia di Babele - Largo Fiera della Pesca, 2, 60125 Ancona (AN)

EVENT OVERVIEW

The objective of the ADRIREEF project, with almost 3 million euros funded under the European Interreg programme Italy-Croatia 2014-2020, is to provide guidelines for developing sustainable business activities through the exploitation of services and goods the natural rocky habitats and artificial reefs occurring in the Adriatic Sea can offer. In order to do that the project includes a review of existing laws at international, national and local level which regulate the use of natural and artificial rocky habitats, a mapping of the Adriatic natural and artificial reefs, and their classification basing on geophysical and ecological features as well as of current and possible future usages from different stakeholders. The potential of the different reef typologies for the development of sustainable economic activities will be investigated through innovative monitoring technologies with low environmental impact, which will be tested in several Case Studies.
The project also foresees the involvement of all categories of stakeholders who can be interested in the management, monitoring, and use of those areas. In this context, the Workshop is aimed to connect scientists and representatives from the public sectors involved in the management of marine areas in order to discuss and identify the optimal ways for sustainable management of Adriatic reefs to increase the local tourism offer as well as to implement other activities (e.g., small scale fisheries, aquaculture).

European Regional Development Fund

Interreg Italy - Croatia ADRIREEF EUROPEAN UNION

ADRIREEF

Innovative exploitation of Adriatic Reefs in order to **strengthen** blue economy

9.30 – 10.00	Registration
10.00 – 10.10	Opening session (G. Fabi – CNR IRBIM)
10.10 – 10.35	Ecological role of natural and artificial reefs and the goods and services they can provide (M. Ponti - University of Ravenna, Ravenna Campus)
10.35 – 11.00	Artificial reefs and recreational fishing (F. Grati – CNR IRBIM)
11.00 – 11.25	The relevance of hydrographic surveys for the seabed monitoring (N. Langellotto – Istituto Idrografico della Marina)
11.25 – 11.40	Coffee break
11.40 – 12.05	ADRIREEF Project presentation (G. Cillani - Municipality of Ravenna)
12.05 – 12.30	Technology, methodology and monitoring protocols for Adriatic reefs (P. Penna & A.N. Tassetti - CNR IRBIM)
12.30 – 12.40	Presentation of the Case Study Paguro wreck (S. Pigozzi & M. Palma - ARPAE)
12.40 – 12.50	Presentation of the Case Study Plić Seget (I. Benzon - RERA)
12.50 – 13.00	Questions and discussion
13.00 – 14.00	Brunch
14.00 – 14.10	Presentation of the Case Study P.to Recanati – P.to Potenza Picena (A. Spagnolo - CNR IRBIM)
14.10 – 14.20	Presentation of the Case Study Torre Guaceto MPA (E. Barbone - ARPA Puglia)
14.20 – 14.30	Presentation of the Case Study Plić Lagnići (I. Vuksa – University of Zara)
14.30 – 14.40	Presentation of the Case Study Trezza San Pietro (D. Borme - INOGS)
14.40 – 14.50	Presentation of the Case Study Plićina Konjsko (I. Orlic Kapovic – University of Rjieka)
14.50 – 15.00	Questions and discussion
15.00 – 15.40	Open Space Technology
15.40 – 16.00	Plenary Session and Workshop closure

Participants

Universities, Technology Transfer & Research Institutions: 32

Local Regional, National Public Authorities: 17

Regional Local Development Agencies: 3

SMEs: 1

GIANNA FABI

CNR – IRBIM, Ancona (Italy)

CHAIRMAN

Gianna Fabi opened the workshop thanking the participants and introducing the Agenda. She presented all the speakers and moderate the debate.

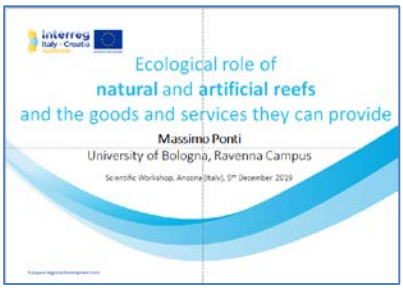
Session 1 - LECTURES

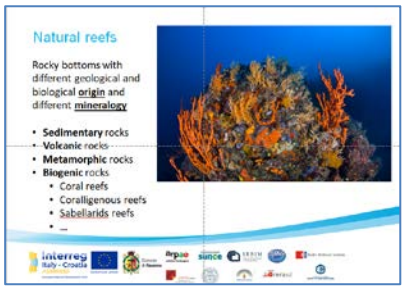
MASSIMO PONTI

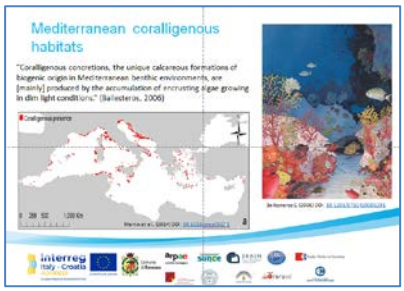
UNIVERSITY OF BOLOGNA - RAVENNA CAMPUS, Bologna (Italy)

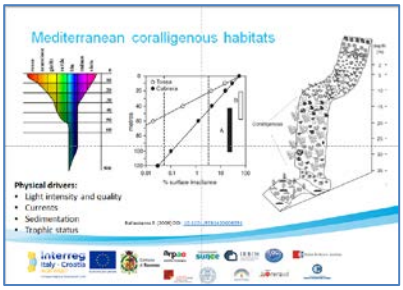
INVITED SPEAKER

Massimo Ponti described the different typologies of natural and artificial reefs in the Mediterranean Sea with special attention to the Adriatic basin. Purposes of artificial reefs were explained from both ecological and economic point of view. The lecture concluded with a series of suggestion on the responsibilities in the management of artificial reefs.



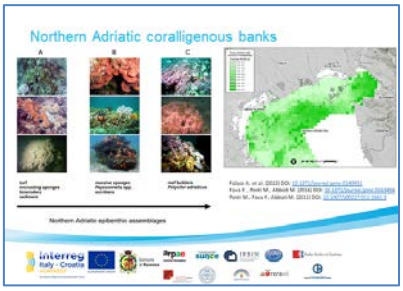







Northern Adriatic coralligenous banks


Northern Adriatic coralligenous banks
Reef builders
Bio-erosion


Northern Adriatic coralligenous banks


Natural reefs: goods & services
high biodiversity
complex ecological processes
benthic-pelagic coupling
food webs
carbon sinks


Artificial reefs
Artificial reefs (ARs) are manmade structures deployed on sea bottoms with the primary purpose of protecting coastal habitats and/or increasing biotic resources by aggregating marse species and preventing trawling (Baine, 2001).
What are ARs?


Artificial reefs materials


Concrete artificial reefs


Artificial reefs in Europe

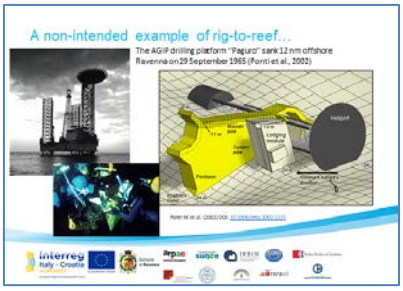

Artificial reefs purposes

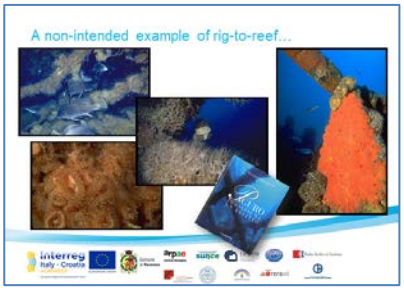

Artificial reefs purposes


Artificial reefs purposes
To support recreational activities...
Fishing (at the expense of local resources)
Diving (as an alternative to natural reefs)


Artificial reefs as underwater SCUBA parks


Artificial reefs purposes
Non intended artificial reefs...


A non-intended example of rig-to-reef...
The AGIP drilling platform "Paguro" sank 12 nm offshore Ravenna on 29 September 1965 (Foriti et al., 2002)


A non-intended example of rig-to-reef...

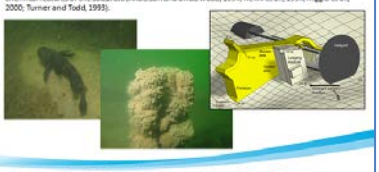
Can artificial reefs mimic natural reef communities?

Even after a century an AR will mimic its adjacent NR communities only if it possesses **structural features** similar to those of the **natural surroundings**.

However, if the two differ structurally, their communities will remain distinct.

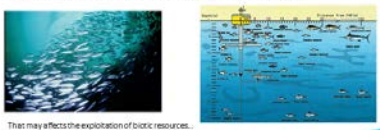
Artificial reefs benthic communities

Vagile and sessile species colonise ARs according to complex ecological processes affected by seasonal larval supply, water circulation, turbidity and nutrients, depths, orientation and physical-chemical features of the substrata (Anderson and Underwood, 1994; Relini et al., 1996; Riggio et al., 2000; Turner and Todd, 1993).



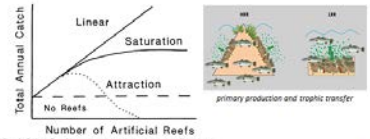
ARs as Fish Aggregating Devices (FADs)

Fish aggregating effects of artificial reefs are well known and the effectiveness of different structure typologies in this respect are well documented (Santos et al., 1997).



That may affects the exploitation of biotic resources...

The attraction versus production debate



primary production and trophic transfer

Artificial reef ecology

- support sessile filter feeders
- provide nourishment and refuges for motile species
- attract benthic-nectonic fishes
- affect trophic webs

Artificial reefs: Do they achieve the goals?

Although they do not replace natural reefs, artificial reefs can **mimic some ecological functions** and thus provide some **useful goods and services** to humans, especially where natural reefs are absent, e.g.:

- Seabed protection from trawling
- Increasing fishing yield
- Adding recreational values
- Help restoring damaged natural reefs

Artificial reefs: Major ecological concerns

- changes in local species composition
- changes in local species interactions and food webs
- interaction between organism and substrata (e.g. encrusting, bioerosion)
- overexploitation of biotic resources
- alteration of population connectivity and genetic diversity
- facilitation of the spread of non-indigenous species
  - by creating suitable habitats
  - reduced competition with native species (low biotic resistance)
  - migrating corridors

Management responsibility

- environmental compatibility
- environmental monitoring
- safety responsibilities
- maintenance
- regulated access

Contacts:

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Benthic ecologist at the University of Bologna

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+39 0544 937400
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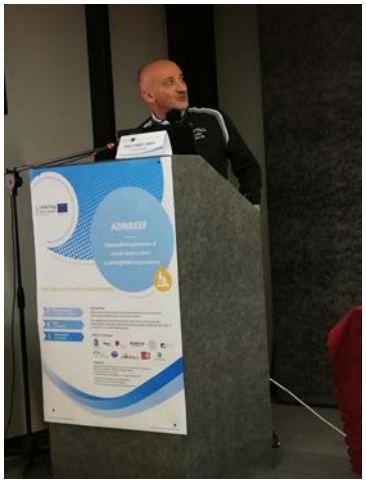
www.isprs.info
www.reefcheckmed.org

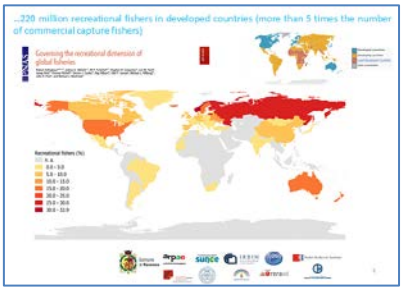
FABIO GRATI

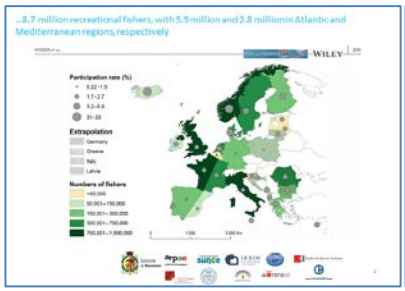
CNR – IRBIM, Ancona (Italy)

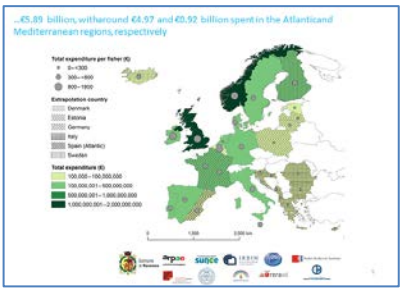
INVITED SPEAKER



Recreational fishery has a great socio-economic importance worldwide involving more than 220 million of recreational fishers. Artificial reefs can improve this activity increasing habitat for target species having a limited habitat, mitigating stressed or destroyed habitats, and enhancing life stage survival. A series of potential uses of artificial reefs for recreational fishery management was illustrated. Finally, some examples of recreational fishing reef around the world were described.




...8.7 million recreational fishers, with 5.9 million and 2.8 millionin Atlantic and Mediterranean regions, respectively


...€5.89 billion, witharound €4.97 and €0.92 billion spent in the Atlanticand Mediterranean regions, respectively


...how can ARs be used to improve RF?
Reef Vision


...potential uses of ARs for RF management
Increase habitat if species are habitat limited


...potential uses of ARs for RF management
Mitigation for stressed habitat


...potential uses of ARs for RF management
..mitigation for destroyed habitat

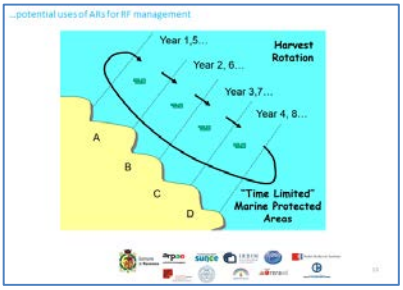

...potential uses of ARs for RF management
Enhance life stage survival for species at a specific life stage


Spawning substrate


...potential uses of ARs for RF management
Facilitate directional movement

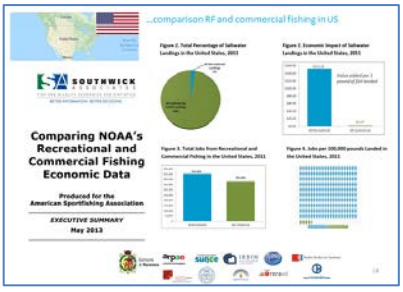

...potential uses of ARs for RF management
Enhance colonization from inshore habitat to offshore reefs by juveniles
"Stepping Stones"

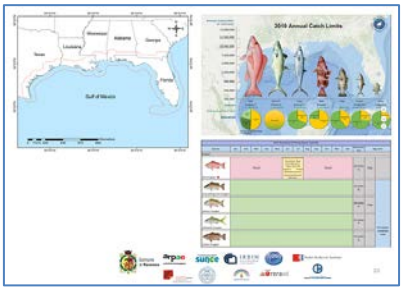

...potential uses of ARs for RF management
X km
3X km
Reduce fishing pressure on natural habitat


...potential uses of ARs for RF management
Year 1,5...
Year 2, 6...
Year 3,7...
Year 4, 8...
Harvest Rotation
A
B
C
D
"Time Limited" Marine Protected Areas


In the course of human history, there are
Perhaps we should be
In fisheries management, artificial reefs should be directed toward fish species that:
1. Disperse to find the reef
2. Will stay on the reef once there
3. Can benefit from the reef scenario through:
a) Enhanced fitness
b) Faster growth
c) Larger populations
4. Are pre-adapted to reef conditions


How can we evaluate artificial reefs in fisheries management.....if there are no artificial reefs used in fisheries management?
Bortone's Heretical Observation:
"Artificial Reefs play almost no role in the management of any fishery".
(November 2009)
IDENTIFYING HERESY
YEP, IT'S HERESY


...comparison RF and commercial fishing in US
SOUTHWICK
Comparing NOAA's Recreational and Commercial Fishing Economic Data
Produced for the American Sportfishing Association
EXECUTIVE SUMMARY
May 2013




Shallow Water Reefs
Quarry Rocks
Concrete Culverts
Reef Pyramids
Reef Balls
Bridges and Causeways


Ships-to-Reefs


Torquay Offshore Recreational Fishing Reef
Boat Based Reefs


Shore Based Reefs


Bibione Reef


Thanks for your attention


Artificial Reefs & Recreational Fishing
CNR-IRBIM
Fabio GRATI
Lgo Fiera della Pesca, 1, 60125, Ancona (Italy)
fabio.grati@cnr.it
+39 071 2078846
www.italy-croatia.eu/ADRIREEF

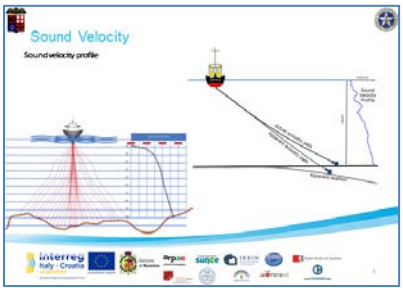
NUNZIANTE LANGELLOTTO

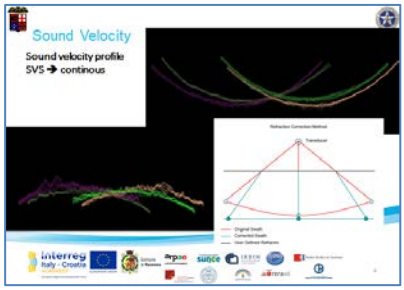
ITALIAN NAVY HYDROGRAPHIC INSTITUTE, Genova (Italy)

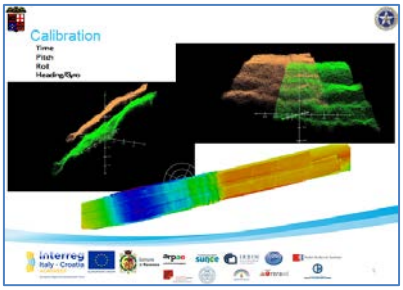
INVITED SPEAKER

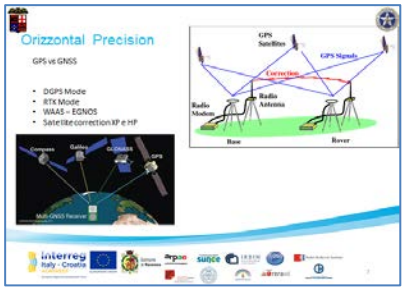
The knowledge of hard sea bottoms is very important not only from a geological, biological or ecological point of view, but also for a number of applications such as weather conditions, to understand and predict the coastal movements, etc.

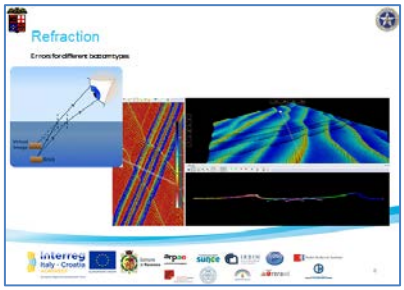
Multibeam echosounder is a very suitable instrument to map seabed because it allows to obtain a lot of information, but a series of measures are required for a correct use.

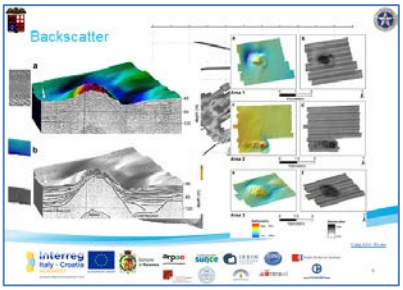


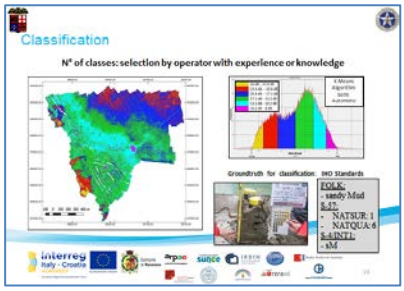


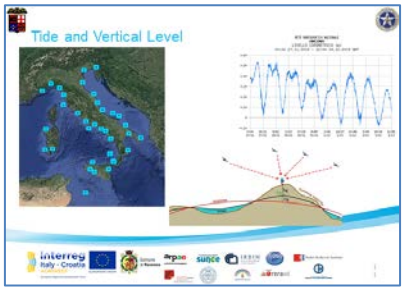


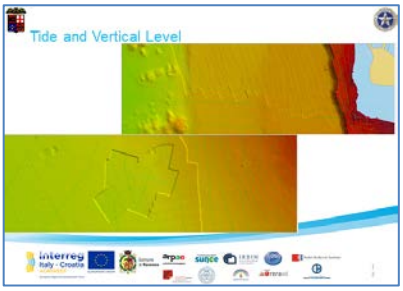

Orizzontal Precision
GPS ve GNSS
DGPS Mode
RTX Mode
WAAS – EGNOS
Satellite correction XP e HP
GPS Signals
Correction
Radio Antenna
Base
Rover

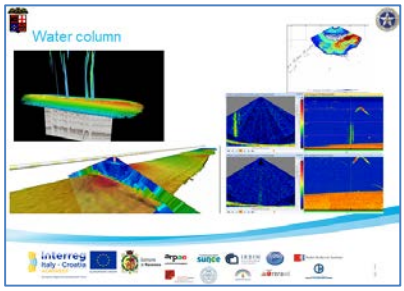

Refraction

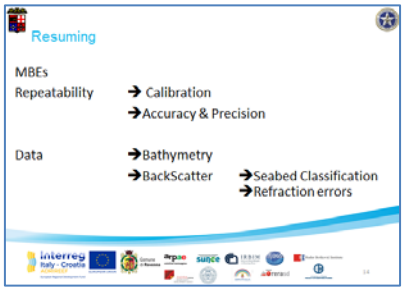

Backscatter

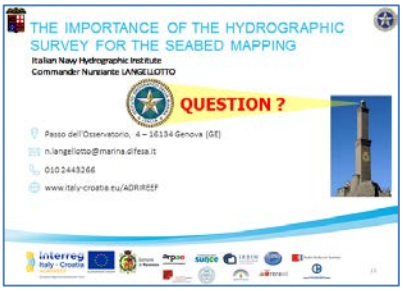

Classification
N° of classes: selection by operator with experience or knowledge
Groundtruth for classification: IHO Standards
FOLK:
- sandy Mud
S-57:
- NATSUR: 1
- NATQUA: 6
S-44INT1:
- sM


Tide and Vertical Level


Tide and Vertical Level


Water column


Resuming
MBEs
Repeatability
→ Calibration
→Accuracy & Precision
Data
→Bathymetry
→BackScatter
→Seabed Classification
→Refraction errors


THE IMPORTANCE OF THE HYDROGRAPHIC SURVEY FOR THE SEABED MAPPING
Italian Navy Hydrographic Institute
Commander Nunziante LANGELLOTTO
QUESTION ?
Passo dell'Osservatorio, 4 – 16134 Genova (GE)
n.langellotto@marina.difesa.it
010 2443266
www.italy-croatia.eu/ADRIREEF

Session 2

ADRIREEF PROJECT PRESENTATION

GIULIA CILLANI

MUNICIPALITY OF RAVENNA (Italy)

Giulia Cillani as LP described the project explaining objectives, the partnership, WPs, and the best practices. Finally, she introduced the ADRIREEF case studies.

WP2 - COMMUNICATION

- Objective communication plan to organize on-line and off line communication
- WP Leader CNR - IRBIM
- Activities

1. Communication activities
2. Scientific workshop -> next one in May 2020 in Zadar
3. Stakeholders survey
4. 2 Adrireef festival: Ravenna and Split

WP2 – COMMUNICATION Adrireef festival

ADRIREEF FESTIVAL
VIS
JULY 2020

We'll wait for you!

WP3 – MAPPING OF DEI REEFS ADRIATICI

- Objective collect, organize and capitalize all the information produced with independent project and researches, with the aim to obtain a map of the current situation of Adriatic reefs
- WP Leader CNR - IRBIM
- Activities

1. Reefs classification in the cooperation area
2. Legal framework analysis
3. Identification of relevant case studies
4. Identification of technologies for underwater monitoring
5. Stakeholders analysis

WP4 – MONITORING PHASE OF ADRIATIC REEFS

- Objective the project will allow the partnership to buy innovative equipment to monitor the selected case studies
- WP Leader ARPAE
- Activities

1. Monitoring of case studies in Italy
2. Monitoring of case studies in Croatia
3. Data analysis of monitoring results

WP5 – INNOVATIVE EXPLOITATION OF ADRIATIC REEFS

- Objective Drafting the main output documents of the project. The PPs will find out the relevant information to be trasnferred to stakeholders
- WP Leader ZADRA NOVA
- Activities

1. Scientific reporting of the in depth analysis on Adriatic reefs
2. Definition of common guidelines for reefs' user
3. Definition of recommendation for policy maker and funding agencies

USE OF THE REEFS IN THE VIEW OF BLUE ECONOMY

The project has the ambition to combine innovative actions with possible socio-economic impact in those sector

- TOURISM → DIVING AND SNORKELING
- FISHING → PROFESSIONAL OR RECREATIONAL
- AQUACOLTURE

BEST PRACTICES

- TOURISM → DIVING E SNORKELING

Sustainable tourism development at reefs' areas will only provide benefits if certain conditions are met (Hawkins, 1998):

- the natural attractions of the region must be competitive with those of other international destinations;
- management organisations capable of implementing conservation policies and managing tourism impacts must exist;
- long-term financing support for reef monitoring and management must be ensured.

GREEN FINS - https://www.greenfins.net/
International project to promote the elaboration and diffusion of guidelines for the sustainability within the diving and snorkeling industry

BEST PRACTICES

- TOURISM → DIVING E SNORKELING

"House of fishes"

Project funded by the Tuscany Region and implemented in the coasts in frotn of the Natural park of Maremma with the objective to create an area in which to promote a sustainable model of fruition:

- Installation of bollard for illegal fishing
- Creation of diving circuits with sculptures
- Creation of underwater art gardens

BEST PRACTICES

- FISHING → PROFESSIONAL OR RECREATIONAL
  - Necessary adoption of guidelines for sustainable implementation of these activities
  - reefs, natural or artificial, can serve as a nursery area for the conservation of fish stocks for fishing outside the barrier areas

Best practice fishing guidelines of the Australian great barrier reef (from: http://www.gbrmpa.gov.au/access-and-use/responsible-reef-practices/fishing)

Installation of artificial reefs for recreational fishing and for repopulation

- **Artificial Reef Development Program** in Lousiana, Florida, Mississipi, Texas and Alabama
- **"Rigs to Reef"** programme that use abandoned structures and reefs areas for the creation of new habitats for fish repopulation (https://www.boem.gov/what-we-do/environmental-focuses/rigs-to-reefs)

BEST PRACTICES

- AQUACOLTURE → REEF ARTIFICIALI

Mussel collection on offshore platforms in Ravenna

Installation of farming reefs in Portonovo (AN)

CASE STUDIES

Case study name	PP responsible	Type of reef	Reef category
Pagure wreck	ARPAE Emilia-Romagna – PP6	Artificial Reef	Sunken jackup drilling rig + additional structures
Pta Lagnillo	University of Siena – PP14	Natural reef with a ship wreck	Sand flat/rock with reef structures protruding from the sediment
Porto Recanati-Porto Potenza Picena	CNR-ISMAR Ancona – PP10	Artificial Reef	Specifically designed concrete modules geometrically assembled to form structure with concrete anchor
Torre Guaceto Marine Protected Area	ARPAP – PP16	Natural Reef	Low profile reef and Patch reef
Trieste San Pietro	ZRS – PP17	Natural Reef	Patch reef (hard bottom with small reef structures protruding from the sediment)
Vis	Institut Ruđer Bošković – PP18	Natural Reef	Patch reef (hard bottom with small reef structures protruding from the sediment)
Picena Konjsko	University of Split, Faculty of Maritime Studies – PP19	Natural Reef	Low profile reef (the reef protrudes less than 20 metres from the bottom sediment)

I CASI STUDIO

TREZZE SAN PIETRO – Friuli Venezia Giulia

Type of reef: REEF NATURALE
Area SIC IT3330009 "Trezze San Pietro e Bardelli"
Category: Patches

POSSIBLE BUSINES ACTIVITIES:
- ✓ Diving
- ✓ Sport fishing and tourism related to fishing
- ✓ Indirect increasing of tourism in the area

STAKEHOLDERS:
- ✓ Public authorities managing state-owned maritime properties and maritime safety
- ✓ Public authorities responsible for tourism policies and fishing policies
- ✓ ONG "Progetto-Trezze-Lignano-Sabbiadoro"
- ✓ Business activities related to diving
- ✓ Fishermen

I CASI STUDIO

PAGURO – Emilia Romagna

Type of reef: REEF ARTIFICIAL
Biological Protection Zone since 1922
Area SIC IT4070026 "Pagure" since 2012
Category: Sunken jackup drilling rig + additional structures

POSSIBLE BUSINES ACTIVITIES:
- ✓ recreational and educational diving
- ✓ scientific research

STAKEHOLDERS:
- ✓ public institutions, research institutes and associations responsible for the correct implementation of the site Management Plan
- ✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)

I CASI STUDIO

PORTO RECANATI – PORTO POTENZA PICENA – Marche

Type of reef: REEF ARTIFICIAL
Category: Specifically designed concrete modules

POSSIBLE BUSINES ACTIVITIES:
- ✓ recreational diving
- ✓ Recreational fishing
- ✓ local small-scale commercial fishing

STAKEHOLDERS:
- ✓ Public authorities managing state-owned maritime properties and maritime safety
- ✓ Public authorities responsible for tourism policies and fishing policies
- ✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)
- ✓ Local small-scale commercial fishermen

I CASI STUDIO

TORRE GUACETO - Puglia

Type of reef: NATURAL ARITIFICIAL
Wetland of International Importance (Ramsar Convention) "Torre Guaceto" 1981;
"Torre Guaceto" Marine Protected Area 1991;
"Torre Guaceto" State Natural 2000;
ZPS "Torre Guaceto" code IT9140008;
SIC "Torre Guaceto e Macchia S. Giovanni" IT9140005
Category: Low profile reef and Patchreef

POSSIBLE BUSINES ACTIVITIES:
- ✓ recreational and educational diving (Citizen science)
- ✓ scientific research

STAKEHOLDERS:
- ✓ public institutions responsible for the area protection and management
- ✓ research institutes
- ✓ Public authorities responsible for tourism
- ✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)


I CASI STUDIO
Plić Lagnjići - Isola Lunga
Type of reef: NATURAL ARITIFICIAL
Category: Low profile reef
POSSIBLE BUSINNES ACTIVITIES:
✓ recreational diving
✓ Recreational fishing
✓ Research
STAKEHOLDERS:
✓ Public authorities managing state-owned maritime properties and maritime safety
✓ Public authorities responsible for tourism policies
✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)


I CASI STUDIO
VIS
Type of reef: NATURAL ARITIFICIAL
Category: Patch reef
POSSIBLE BUSINNES ACTIVITIES:
✓ recreational diving
✓ Recreational fishing
STAKEHOLDERS:
✓ Public authorities managing state-owned maritime properties and maritime safety
✓ Public authorities responsible for tourism policies
✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)

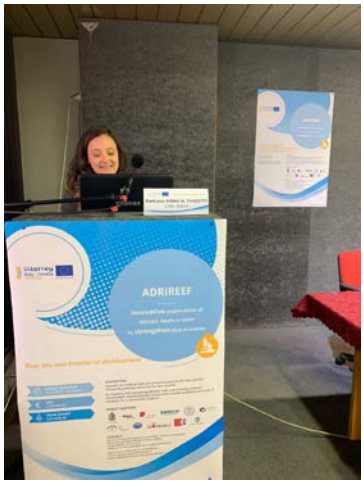

I CASI STUDIO
Plićina Konjsko - Krk island
Type of reef: NATURAL ARITIFICIAL
Category: Low profile reef
POSSIBLE BUSINNES ACTIVITIES:
✓ recreational diving
✓ Recreational fishing
✓ Research
STAKEHOLDERS:
✓ Public authorities managing state-owned maritime properties and maritime safety
✓ Public authorities responsible for tourism policies
✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)


GRAZIE
E
BUON LAVORO

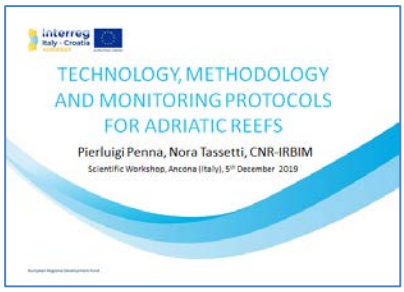
LECTURE

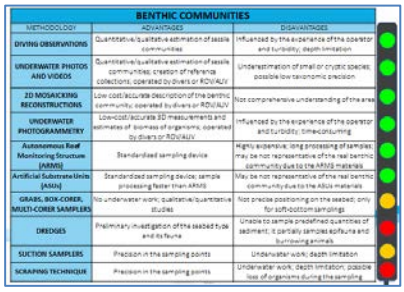
PIERLUIGI PENNA and ANNA NORA TASSETTI

CNR-IRBIM, Ancona (Italy)



Pierluigi Penna and Anna Nora Tassetti explained the most innovative technologies, methodologies and monitoring protocols for natural and artificial reefs.

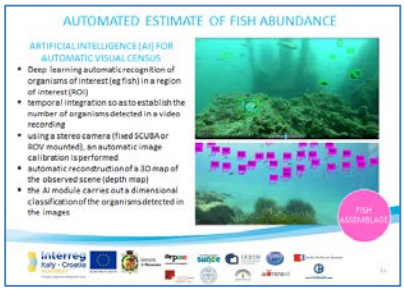


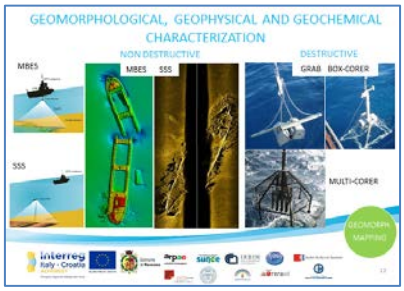



SENSORS, BOTTLE-SAMPLERS AND REMOTE SENSING
Moored buoy and realtime communication
Oceanographic sensors
Fixed CTD
Taking Water Samples with Profiling CTDs
WATER COLUMN

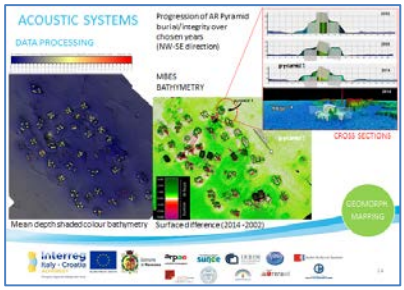

UNDERWATER PHOTOS and VIDEOS, DIVING OBSERVATIONS
Different classes of Remotely Operated Underwater Vehicles (ROVs)
Underwater visual census on a NR
Deployment of a Baited Remote Underwater Video (BRUV)
BENTHIC COMMUNITY
FISH ASSEMBLAGE

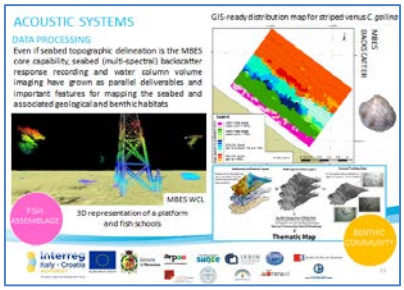

AUTOMATED ESTIMATE OF FISH ABUNDANCE
Research/inspection class ROV
Stereographic equipment: Stereo GoPro pair, fixed baseline and chessboard pattern for calibration
Experimental Stereographic prototype
FISH ASSEMBLAGE


AUTOMATED ESTIMATE OF FISH ABUNDANCE
ARTIFICIAL INTELLIGENCE (AI) FOR AUTOMATIC VISUAL CENSUS
Deep learning automatic recognition of organisms of interest (eg fish) in a region of interest (ROI)
temporal integration so as to establish the number of organisms detected in a video recording
using a stereo camera (fixed SCUBA or ROV mounted), an automatic image calibration is performed
automatic reconstruction of a 3D map of the observed scene (depth map)
the AI module carries out a dimensional classification of the organisms detected in the images
FISH ASSEMBLAGE

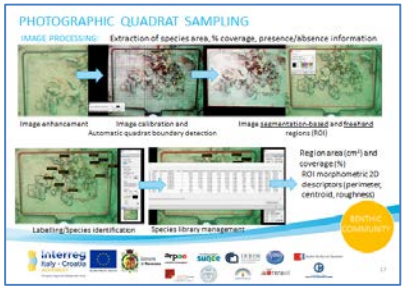

GEOMORPHOLOGICAL, GEOPHYSICAL AND GEOCHEMICAL CHARACTERIZATION
NON DESTRUCTIVE
DESTRUCTIVE
MBES
SSS
GRAB
BOX-CORER
MULTI-CORER
GEOMORPH. MAPPING

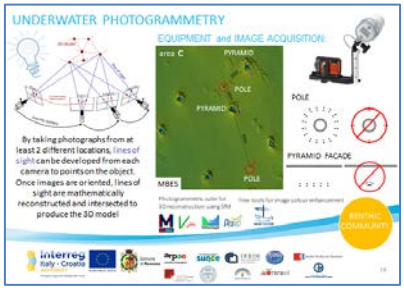

ACOUSTIC SYSTEMS
MATERIALS
EM2040DC transducers hull-mounted on R/V "Tecnopesca II"
SURVEY
Survey lines (in yellow) are planned so as to ensure 100% of the seafloor with at least ~20% of overlap and have a good resolution
MBES Multispectral backscatter
MBES
GEOMORPH. MAPPING

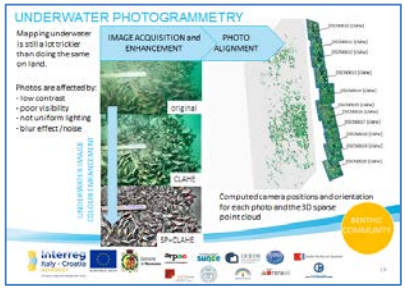

ACOUSTIC SYSTEMS
DATA PROCESSING
Progression of AR Pyramid burial/integrity over chosen years (NW-SE direction)
MBES BATHYMETRY
CROSS SECTIONS
Mean depth shaded colour bathymetry
Surface difference (2014 -2002)
GEOMORPH. MAPPING

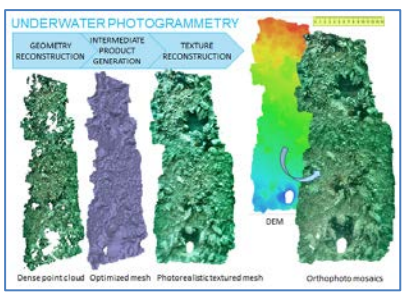

ACOUSTIC SYSTEMS
DATA PROCESSING
Even if seabed topographic delineation is the MBES core capability, seabed (multi-spectral) backscatter response recording and water column volume imaging have grown as parallel deliverables and important features for mapping the seabed and associated geological and benthic habitats
GIS-ready distribution map for striped venus C. gallina
MBES BACKSCATTER
MBES WCI
3D representation of a platform and fish schools
Thematic Map
FISH ASSEMBLAGE
BENTHIC COMMUNITY


UNDERWATER PHOTOS
MATERIALS
PHOTOGRAPHIC QUADRAT SAMPLINGS
Underwater camera, flash and frame
ImageJ
Free photo quadrant analysis software for advanced image processing
BENTHIC COMMUNITY


PHOTOGRAPHIC QUADRAT SAMPLING
IMAGE PROCESSING:
Extraction of species area, % coverage, presence/absence information
Image enhancement
Image calibration and Automatic quadrat boundary detection
Image segmentation-based and freehand regions (ROI)
Region area (cm²) and coverage (%)
ROI morphometric 2D descriptors (perimeter, centroid, roughness)
Labelling/Species identification
Species library management
BENTHIC COMMUNITY


UNDERWATER PHOTOGRAMMETRY
EQUIPMENT and IMAGE ACQUISITION:
area C
PYRAMID
POLE
PYRAMID FACADE
MBES
By taking photographs from at least 2 different locations, lines of sight can be developed from each camera to points on the object. Once images are oriented, lines of sight are mathematically reconstructed and intersected to produce the 3D model
BENTHIC COMMUNITY


UNDERWATER PHOTOGRAMMETRY
Mapping underwater is still a lot trickier than doing the same on land.
Photos are affected by:
- low contrast
- poor visibility
- not uniform lighting
- blur effect/noise
IMAGE ACQUISITION and ENHANCEMENT
PHOTO ALIGNMENT
original
CLAHE
EP+CLAHE
Computed camera positions and orientation for each photo and the 3D sparse point cloud
BENTHIC COMMUNITY


UNDERWATER PHOTOGRAMMETRY
GEOMETRY RECONSTRUCTION
INTERMEDIATE PRODUCT GENERATION
TEXTURE RECONSTRUCTION
DEM
Dense point cloud
Optimized mesh
Photorealistic textured mesh
Orthophoto mosaics


CONTACT
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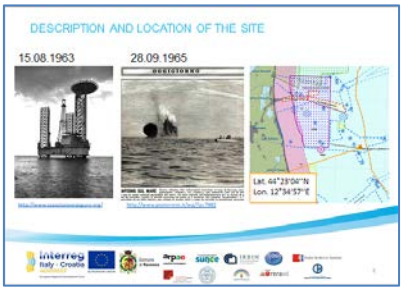
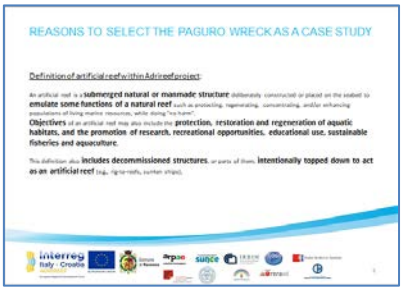
www.italy-croatia.eu/ADRIREEF

ADRIREEF CASE STUDIES

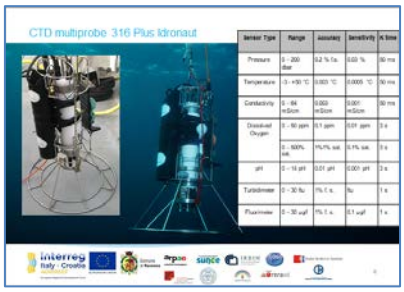
SILVIA PIGOZZI and MARCO PALMA

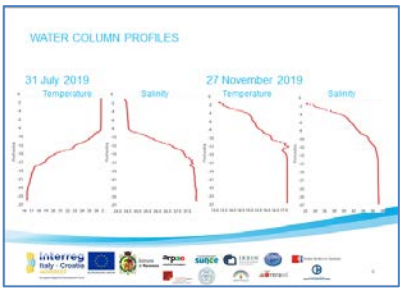
ARPAE EMILIA ROMAGNA, Cesenatico (Italy)

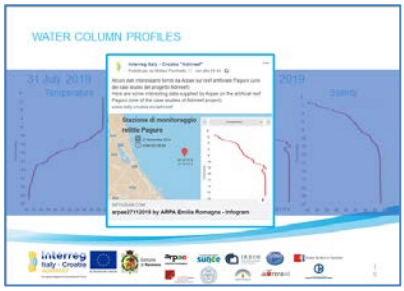


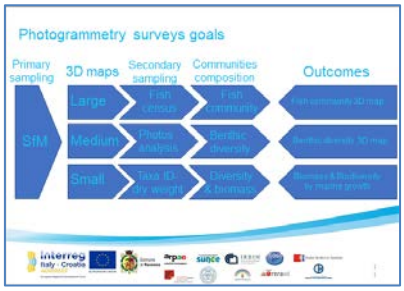



ADRIREEF MONITORING PROTOCOL - CS PAGURO WRECK


CTD multiprobe 316 Plus Idronaut


WATER COLUMN PROFILES
31 July 2019
Temperature
Salinity
27 November 2019
Temperature
Salinity

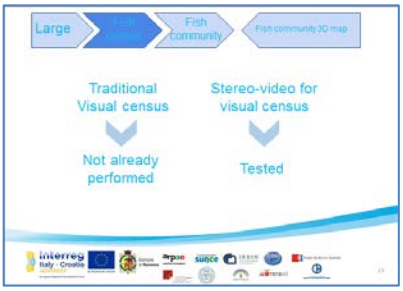

WATER COLUMN PROFILES


Photogrammetry surveys goals
Primary sampling
3D maps
Secondary sampling
Communities composition
Outcomes
SfM
Large
Medium
Small
Fish census
Photos analysis
Taxa ID - dry weight
Fish community
Benthic diversity
Diversity - % biomass
Fish community 3D map
Benthic diversity 3D map
Biomass & Biodiversity by marine growth


Primary sampling
SfM


Large
Fish census
Fish community
Fish community 3D map

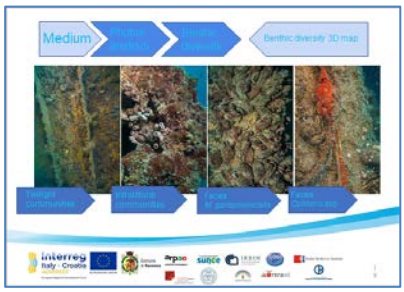

Large
Fish census
Fish community
Fish community 3D map
with decommissioned structures

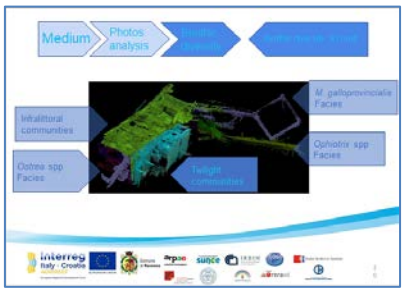

Large
Fish community
Fish community 3D map
Traditional Visual census
Not already performed
Stereo-video for visual census
Tested


Large
Fish community 3D map
Stereo-video for visual census
Tested


Large
Fish census


Large
Fish census


Medium
Benthic diversity 3D map


Medium
Photos analysis
Infralittoral communities
Ophiothrix spp Facies
Osthrea spp Facies
Twilight communities


CONTACT INFORMATION
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Regional Agency for Prevention, Environment and Energy of Emilia-Romagna
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IVO BENZON

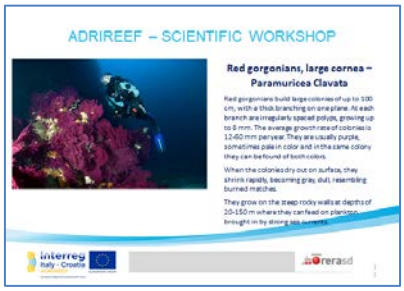
RERA, Split (Croatia)


ADRIREEF – SCIENTIFIC WORKSHOP
Where?
Sika od Stupilća, close to the island Vis (0.1 NM from coast of island Vis and 2.3 NM from City of Komiža); 7.6 m depth, area exposed to W-NW winds and waves
What is?
natural reef
Current uses/activities?
no significant uses – fishery/diving
Main economic activities?
Fishery (in a wider area)
Why?
there are no activities connected with the reef, the reef so far has not been exposed to significant environmental load; however it is quite attractive and with significant potentials;
Activities to be implemented?
monitoring of the reef with very limited recreational load and relatively close to the important tourist centre (City of Komiža)
Which data could be collected?
estimation of baseline environmental load (water column, sediment features, geomorphological maps, in cooperation with IPZI), potential development activities and projection of future environmental loads
Are there available data?
Basic data
Monitoring programs in place?
no
Do fixed stations exist for monitoring?
no, it is possible to install
Innovative monitoring system?
visual inspection of the site using ROV; measuring of chemical and physical data
Testing under low environmental impact?
yes


ADRIREEF – SCIENTIFIC WORKSHOP
Sika od Stupilća, close to the island Vis (0.1 NM from coast of island Vis and 2.3 NM from City of Komiža); 3-6 m depth, area exposed to W-NW winds and waves


ADRIREEF – SCIENTIFIC WORKSHOP
Nutornja Sika (Inner Reef)
43 00 33 N 16 04 06 E
Depth: 3m → 50m
Type: Pinnacle Reef
One of the tamest reefs on Vis island, it's located close to the shore and an excellent position for beginners and advanced divers alike.
Notable: Due to it's proximity to the shore and Komiža bays outer point it's often visited by large fish species such as Bonito, Grouper and Amberjack.
Zvonska Sika (Outer Reef)
43 00 26 N 16 03 54 E
Depth: 6m → 60m
Type: Pinnacle Reef
Beautiful reef located near the town of Komiža in the open water. Available to all certified divers.
Notable: It's position and specific orientation leave it open to powerful currents that bring about a abundance of life. One of the biggest red gorgonian scolonies on Vis can be found on it's outer slopes with large snappers and scorpion fish being common.


ADRIREEF – SCIENTIFIC WORKSHOP
Where?


ADRIREEF – SCIENTIFIC WORKSHOP
Red gorgonians, large cornea – Paramuricea Clavata
Red gorgonians build large colonies of up to 100 cm, with a thick branching on one plane. At each branch are irregularly spaced polyps, growing up to 8 mm. The average growth rate of colonies is 12-60 mm per year. They are usually purple, sometimes pale in color and in the same colony they can be found of both colors.
When the colonies dry out on surface, they shrink rapidly, becoming gray, dull, resembling burned matches.
They grow on the steep rocky walls at depths of 20-150 m where they can feed on plankton brought in by strong sea currents.


ADRIREEF – SCIENTIFIC WORKSHOP
Sea tree, Yellow cornea – (Eunicella Cavolinii)
Yellow cornea is a species of corals with calcified skeleton. The polyps of this coral build colonies in the form of yellow branched tree.
It is mainly located on the rocky walls in areas of strong currents, at depth of 10 to 100 meters where it feeds on plankton brought in by the current.


ADRIREEF – SCIENTIFIC WORKSHOP
Paramuricea clavata
Paramuricea is a genus of gorgonian – type octocorals in the plexauridae.
The bright orange fan can may very well exceed a diameter of 1 meter.
The fan is usually spread out transverse to the dominating current direction. This way it can maximize the volume of water flowing through. It is often hosting Gorgon's heads which exploit the excellent current conditions provided by the sea fans.


ADRIREEF – SCIENTIFIC WORKSHOP
Sufurous sponge – Aplysina Cavernicola
Sufurous sponge often builds large settlements. In rocky, shaded, semi caved areas, usually on greater depts.
It is yellow in the sea and when is brought to surface it gets oxidized and become black.


ADRIREEF – SCIENTIFIC WORKSHOP
Red coral - Corallium rubrum
Red corals grow on rocky seabottom with low sedimentation, typically in dark environments – either in the depths or in dark caverns or crevices.
It grows at depths from 10 to 300 meters below sea level, although the shallower of these habitats have been largely depleted by harvesting.
Colour: often dark red, sometimes and rarely pink or even white.
Highly commercially exploited and priced red coral (Corallium rubrum) at lesser depths than ordinarily, and the existence of black coral (Antipathes sp.), otherwise rare in the Adriatic, at greater depths.


ADRIREEF – SCIENTIFIC WORKSHOP
Noble pen shell - Pinna nobilis
The noble pen shell lives on sandy bottom of shallow coastal front.
It is endemic species, wide spread throughout the Adriatic.
This is the largest species of shellfish in the Mediterranean and Adriatic sea and is highly prized and sought after as a souvenir anonument.
Due to the overfishing in many tourist areas its population are completely destroyed.
Therefore, the pen shell is since 1994 protected by law and collecting, harvesting and trading with this bird is strictly prohibited.


ADRIREEF – SCIENTIFIC WORKSHOP
Mediterranean slipper lobster
John Dory
Mediterranean moray
Red scorpionfish
Lobster (Palinurus elephas)
Common dentex (Dentex dentex)


ADRIREEF – SCIENTIFIC WORKSHOP
Vassilios Wreck
At the southern part of the Gulf of Komiža, around Cape Stupilće, at a depth of 22 to 55 meters is the ship "Vassilios". The ship was transporting coal to Venice, and due to a rudder failure, it was stranded and sank shortly afterwards on March 19, 1939.
The boat is 105 meters long and 15 meters wide and lies on the sandy bottom on the left flank.
Due to the impressive dimensions of the ship, and the crystal clear sea it is relatively easy accessible, this is an extremely interesting location, though caution is needed because of the depth.
Numerous inhabitants of the wreck - various sponges and fish, make diving even more attractive, and the position for attractive photographs extremely


ADRIREEF – SCIENTIFIC WORKSHOP
Position: 43 00 18 N 16 03 56 E
Depth: 22m → 63m
Entry: boat
Descent Line: Yes
Type: Cargo Steamship
Size: 105m x 15m x 6m
Sank: 19. March 1939
Vassilios is one of the largest shipwrecks in the Adriatic, everything about this 105m boat is supersized including it's fishy inhabitants.
Notable: The ship is home to many large Scorpion fish (Scorpaena scrofa)


ADRIREEF – SCIENTIFIC WORKSHOP
Threts – invasive species
Caulerpa racemosa belongs to a genus of green algae from the Caulerpaceae family, which are common in tropical and moderately warm seas. This invasive algae in the Adriatic was discovered by the Institute of Oceanography and Fisheries in Split, in the fall of the year 2000 in the underwater world of the Palagruža islands. Caulerpa in the Adriatic does not have predators, and because of this spreads quickly and uncontrollably, and occupies large areas of rocky sea bottom.
Sphyraena sphyraena, also known as the European barracuda or Mediterranean barracuda, is a ray-finned predatory fish of the Mediterranean basin and the warmer waters of the Atlantic Ocean.
Fisherman consider it a great pest that seriously threatens the precious Adriatic fish species, taming them in large numbers.
Because, except that the fish eats a third of its weight every day, when it bites among sea bass, grey mullet, goldfin (salpa) and other fish that are easy prey, it attacks and kills even when it is not hungry, so they call it sea piranha.


ADRIREEF – SCIENTIFIC WORKSHOP
„No take" zone
the Community Initiative for the Protection of the Sea by So-called "No take" zone.
No-take zones are marine protected areas that do not allow any fishing, mining, drilling, or other extractive activities. As a result, fish in no-take zones can age and grow to large, healthy sizes
Shell collecting and archaeological digging are also extractive.
Recreational activities such as boating, snorkeling, and diving are allowed. However, fishing and coral collecting are entirely prohibited
No-take zones within multiple-use MPAs usually protect the spawning grounds of many aquatic species. No take zone are very effective in restoring and preserving biodiversity, and in enhancing ecosystem resilience


ADRIREEF – SCIENTIFIC WORKSHOP
„No take" zone (2)
protect habitats and ecosystems from destructive fishing practices and other harmful - human activities, and allow already damaged areas and ecosystems to recover.
Although marine reserves were conceived to protect ecosystems within their boundaries, they have also been shown to enhance local fisheries and create jobs and new incomes through ecotourism.
They may also serve as outdoor laboratories that allow scientists to compare the undisturbed areas of a no-take area to those impacted by human activities. Through these experiments, scientists are better able to understand how human activities affect the marine environment.
This would make diving tourism more attractive with benefits of it, from diving schools to fishermen and local communities.


ADRIREEF – SCIENTIFIC WORKSHOP
Fish watching
increasing interest in fish watching and reefs eco-tourism ignited by local scuba diving centres
now some families of fishermen are currently focusing on doing these ecotours so that people can interact with fish and other species in their natural habitat.
underwater photography – fish foto safari


ADRIREEF – SCIENTIFIC WORKSHOP
Catch and release - Semi protected zone (B)
For discusing???
Catch and release fishing improves native fish populations by allowing more fish to remain and reproduce in the ecosystem. This practice provides an opportunity for increasing numbers of anglers to enjoy fishing and to successfully catch fish.
In catch and release fishing anglers immediately release native fish - unharmed - back to the water where they are caught. When done correctly, catch and release methods result in high survival rates.
Catch and release is a practice within recreational fishing intended as a technique of conservation. After capture, the fish are unhooked and returned to the water.
A number of scientific studies have now found shallow water fish caught-and-released on fly and lure have extremely high survival rates (95–97%) and moderately high survival rates on bait (70–90%, depending on species, bait, hook size, etc.), emerging research suggests catch and release does not work very well with fish caught when deep sea fishing.


ADRIREEF – SCIENTIFIC WORKSHOP
Instalation of camera – supervision
Instalation underwater sets if IC cameras - monitoring


ADRIREEF – SCIENTIFIC WORKSHOP
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ALESSANDRA SPAGNOLO

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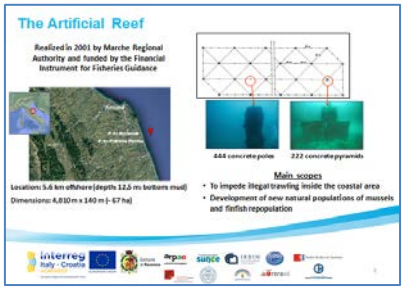


Potential activities
If appropriately monitored and managed, the AR could have a great potential for several activities in line with the Blue Economy
PROFESSIONAL FISHING ACTIVITIES
allowing the small-scale fishermen to operate within the AR under specific management measures would mean to shift part of the fishing effort from the usually exploited resources of the natural soft seabed to alternative species and/or mussel harvesting
NH
AR
Aims of the Monitoring within ADRIREEF Project
VERIFY THE REEF SUITABILITY FOR THE IMPLEMENTATION AND/OR DEVELOPMENT OF THESE POTENTIAL ECONOMIC ACTIVITIES
to create a data set useful to promote the AR usages
to monitor the biological status of the reef
to develop and test low impact, automated sampling methodologies
stakeholders linked to the use of state-owned maritime properties and to maritime safety
Port Authority of the Central Adriatic Sea
local Coastguard offices
Marche Region office "Servizio Tutela, Assetto e Gestione del Territorio"
stakeholders linked to tourism
Marche Region - Tourism dep.
Municipalities – Tourism Office
Tourism Associations
Diving Centers
stakeholders linked to professional fishing activities
Marche Region - Fishery dep.
COSP-FLAG Marche
Fisherman associations
How?
Geomorphological mapping
Description of morphological features of the reef
Production of maps useful for planning the other investigations
Water column parameters (continuous sampling and real-time data transmission)
Solar Panels
Rechargeable Battery
Router 4G+Antenna for real time data
Wind speed and direction, temperature
Physical and chemical parameters near the surface (T°, conductivity, dissolved oxigen, turbidity)
Currents' tracking along the water column
Give stakeholders (divers) real-time information on oceanographic status
How?
Benthic community settled on the AR
Describe the status of the community in terms of species assemblages and coverage
Provide information for divers
To make the ecological features of the AR known
PYRAMID
PhotoQuad Software
How?
Benthic community settled on the AR
Describe the status of the community in terms of species assemblages and coverage
Provide information for divers
To make the ecological features of the AR known
POLE
PhotoQuad Software
How?
Fish assemblage
Describe the fish population in terms of species composition and abundance to provide stakeholders (e.g. diving, recreational and professional fisheries) with updated information on the fish assemblage
Visual census by the use of a remotely operated vehicle (ROV) equipped with digital video cameras mounted in a stereo configuration and automatic reconstruction of a 3D map
The effectiveness of the ROV to describe the fish community will be evaluated through UVC with scuba divers
ROV
6 thrusters
6 subsea Light
Rechargeable Battery
300m tether cable
Spool tether storage
Spare kit
Altimeter Sonar
Scanning image sonar 360
Underwater GPS
3D camera for photogrammetric purpose
Artificial intelligence software
Deep learning automatic recognition of the organisms in a region of interest
temporal integration so as to establish the number of organisms detected in a video recording
automatic image calibration
automatic reconstruction of a 3D map of the observed scene
dimensional classification of the organisms detected in the images
How?
Mussels
Patterns of biomass and density distribution → Underwater photogrammetry and scraping samplings for photogrammetry validation
Evaluating of the suitability for human
THANK YOU FOR YOUR ATTENTION !
and thanks to my colleagues!
CNR - IRBIM
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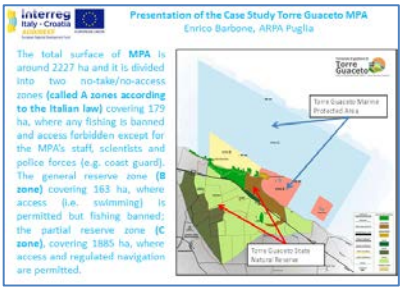
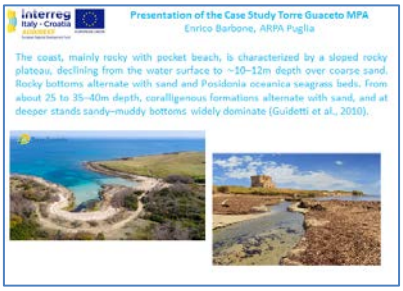
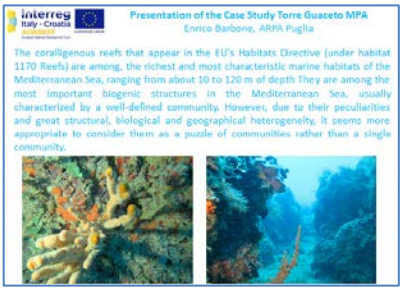
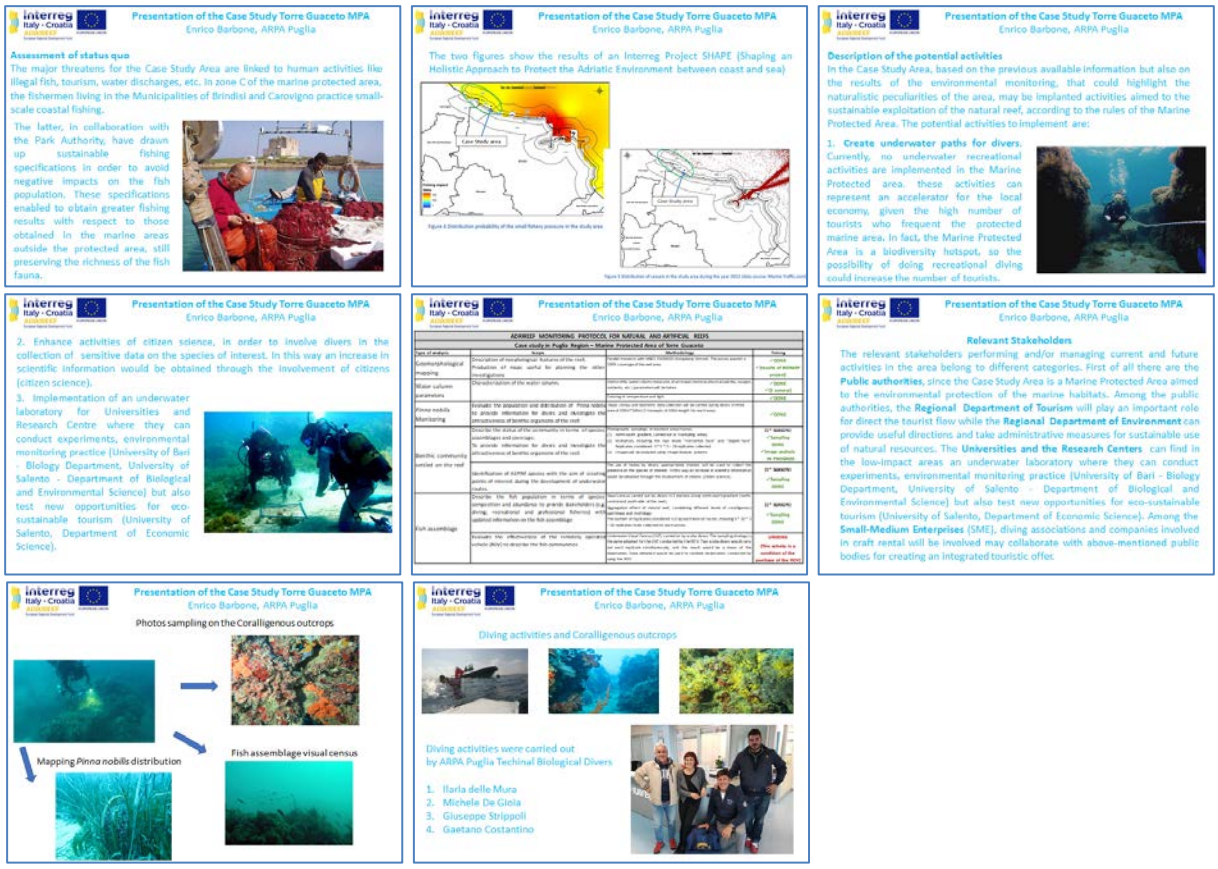
ENRICO BARBONE

ARPA PUGLIA, Bari (Italy)



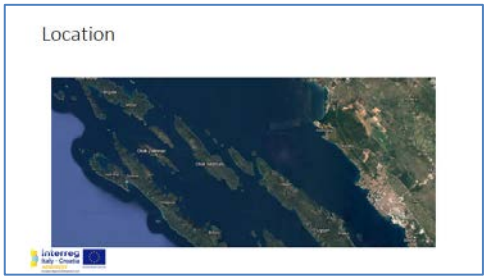


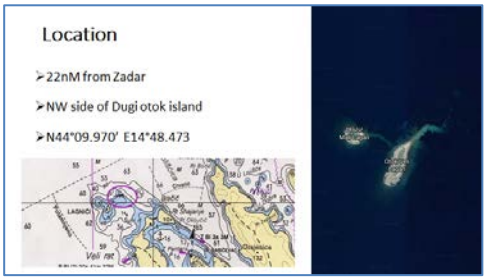


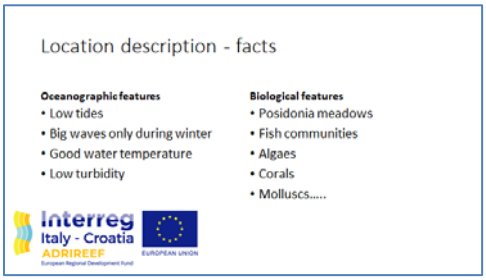

Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
Assessment of status quo
The major threatens for the Case Study Area are linked to human activities like illegal fish, tourism, water discharges, etc. In zone C of the marine protected area, the fishermen living in the Municipalities of Brindisi and Carovigno practice small-scale coastal fishing.
The latter, in collaboration with the Park Authority, have drawn up sustainable fishing specifications in order to avoid negative impacts on the fish population. These specifications enabled to obtain greater fishing results with respect to those obtained in the marine areas outside the protected area, still preserving the richness of the fish fauna.
Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
The two figures show the results of an Interreg Project SHAPE (Shaping an Holistic Approach to Protect the Adriatic Environment between coast and sea)
Case Study area
Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
Description of the potential activities
In the Case Study Area, based on the previous available information but also on the results of the environmental monitoring, that could highlight the naturalistic peculiarities of the area, may be implanted activities aimed to the sustainable exploitation of the natural reef, according to the rules of the Marine Protected Area. The potential activities to implement are:
1. Create underwater paths for divers.
Currently, no underwater recreational activities are implemented in the Marine Protected area. these activities can represent an accelerator for the local economy, given the high number of tourists who frequent the protected marine area. In fact, the Marine Protected Area is a biodiversity hotspot, so the possibility of doing recreational diving could increase the number of tourists.
Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
2. Enhance activities of citizen science, in order to involve divers in the collection of sensitive data on the species of interest. In this way an increase in scientific information would be obtained through the involvement of citizens (citizen science).
3. Implementation of an underwater laboratory for Universities and Research Centre where they can conduct experiments, environmental monitoring practice (University of Bari - Biology Department, University of Salento - Department of Biological and Environmental Science) but also test new opportunities for eco-sustainable tourism (University of Salento, Department of Economic Science).
Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
ADRIREEF MONITORING PROTOCOL FOR NATURAL AND ARTIFICIAL REEFS
Case study in Puglia Region – Marine Protected Area of Torre Guaceto
Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
Relevant Stakeholders
The relevant stakeholders performing and/or managing current and future activities in the area belong to different categories. First of all there are the Public authorities, since the Case Study Area is a Marine Protected Area aimed to the environmental protection of the marine habitats. Among the public authorities, the Regional Department of Tourism will play an important role for direct the tourist flow while the Regional Department of Environment can provide useful directions and take administrative measures for sustainable use of natural resources. The Universities and the Research Centers can find in the low-impact areas an underwater laboratory where they can conduct experiments, environmental monitoring practice (University of Bari - Biology Department, University of Salento - Department of Biological and Environmental Science) but also test new opportunities for eco-sustainable tourism (University of Salento, Department of Economic Science). Among the Small-Medium Enterprises (SME), diving associations and companies involved in craft rental will be involved may collaborate with above-mentioned public bodies for creating an integrated touristic offer.
Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
Photos sampling on the Coralligenous outcrops
Mapping Pinna nobilis distribution
Fish assemblage visual census
Presentation of the Case Study Torre Guaceto MPA
Enrico Barbone, ARPA Puglia
Diving activities and Coralligenous outcrops
Diving activities were carried out
by ARPA Puglia Technal Biological Divers
1. Ilaria delle Mura
2. Michele De Gioia
3. Giuseppe Strippoli
4. Gaetano Costantino

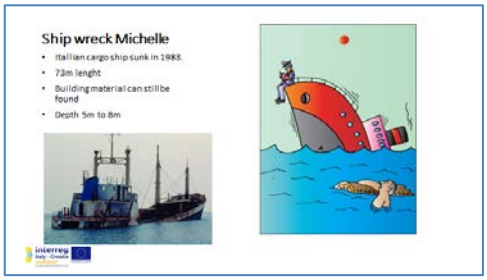
IVANA VUSKA

UNIVERSITY OF ZARA, Zara (Croatia)










Ship wreck Michelle
Interreg
Italy - Croatia
ADRIREEF
EUROPEAN UNION


Activities
Tourism
Sport
Recreation
Education
FINALLY VACATION
AAAND I'M BORE


Tourism


Sport
Interreg
Italy - Croatia
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Recreation
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Education
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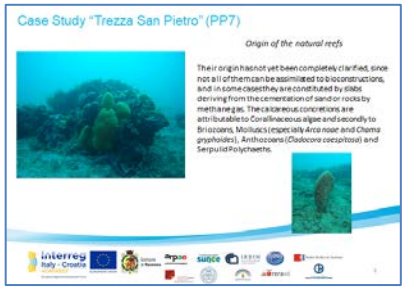
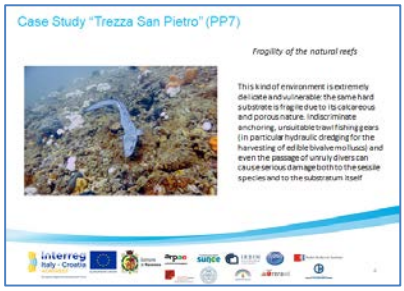
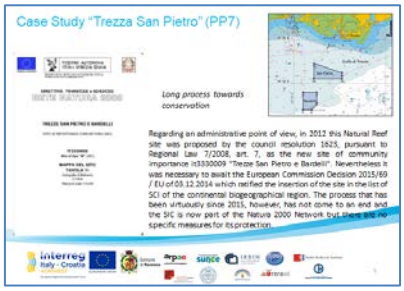
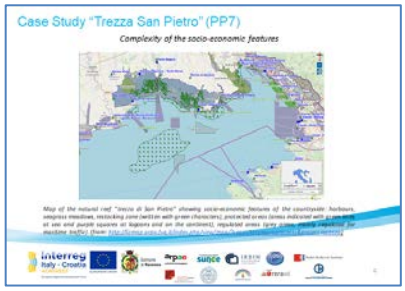
DIEGO BORME

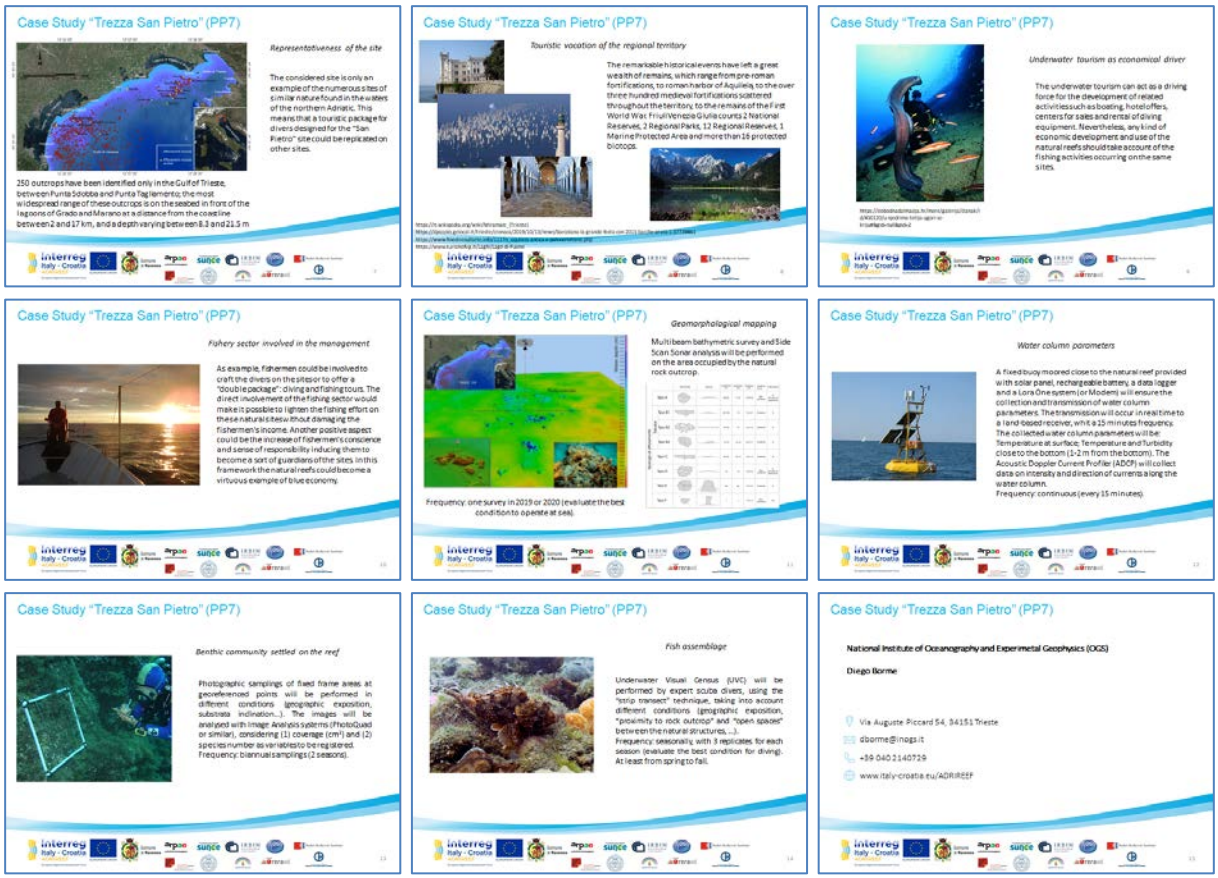
INOGS, Sgonico (Italy)










Case Study "Trezza San Pietro" (PP7)
Representativeness of the site
The considered site is only an example of the numerous sites of similar nature found in the waters of the northern Adriatic. This means that a touristic package for divers designed for the "San Pietro" site could be replicated on other sites.
250 outcrops have been identified only in the Gulf of Trieste, between Punta Sdobba and Punta Tagliamento; the most widespread range of these outcrops is on the seabed in front of the lagoons of Grado and Marano at a distance from the coastline between 2 and 17 km, and a depth varying between 8.3 and 21.5 m
Case Study "Trezza San Pietro" (PP7)
Touristic vocation of the regional territory
The remarkable historical events have left a great wealth of remains, which range from pre-roman fortifications, to roman harbor of Aquileia, to the over three hundred medieval fortifications scattered throughout the territory, to the remains of the First World War. Friuli Venezia Giulia counts 2 National Reserves, 2 Regional Parks, 12 Regional Reserves, 1 Marine Protected Area and more than 16 protected biotops.
Case Study "Trezza San Pietro" (PP7)
Underwater tourism as economical driver
The underwater tourism can act as a driving force for the development of related activities such as boating, hotel offers, centers for sales and rental of diving equipment. Nevertheless, any kind of economic development and use of the natural reefs should take account of the fishing activities occurring on the same sites.
Case Study "Trezza San Pietro" (PP7)
Fishery sector involved in the management
As example, fishermen could be involved to craft the divers on the pitstop to offer a "double package": diving and fishing tours. The direct involvement of the fishing sector would make it possible to lighten the fishing effort on these natural riches without damaging the fishermen's income. Another positive aspect could be the increase of fishermen's conscience and sense of responsibility inducing them to become a sort of guardians of the sites. In this framework the natural reefs could become a virtuous example of blue economy.
Case Study "Trezza San Pietro" (PP7)
Geomorphological mapping
Multibeam bathymetric survey and Side Scan Sonar analysis will be performed on the area occupied by the natural rock outcrop.
Frequency: one survey in 2019 or 2020 (evaluate the best condition to operate at sea).
Case Study "Trezza San Pietro" (PP7)
Water column parameters
A fixed buoy moored close to the natural reef provided with solar panel, rechargeable battery, a data logger and a Lora One system (or Modem) will ensure the collection and transmission of water column parameters. The transmission will occur in real time to a land-based receiver, with a 15 minutes frequency. The collected water column parameters will be: Temperature at surface, Temperature and Turbidity close to the bottom (1-2 m from the bottom). The Acoustic Doppler Current Profiler (ADCP) will collect data on intensity and direction of currents along the water column.
Frequency: continuous (every 15 minutes).
Case Study "Trezza San Pietro" (PP7)
Benthic community settled on the reef
Photographic samplings of fixed frame areas at georeferenced points will be performed in different conditions (geographic exposition, substrate inclination,..). The images will be analysed with Image Analysis systems (PhotoQuad or similar), considering (1) coverage (cm²) and (2) species number as variables to be registered.
Frequency: biannual samplings (2 seasons).
Case Study "Trezza San Pietro" (PP7)
Fish assemblage
Underwater Visual Census (UVC) will be performed by expert scuba divers, using the "strip transect" technique, taking into account different conditions (geographic exposition, "proximity to rock outcrop" and "open spaces" between the natural structures, ..).
Frequency: seasonally, with 3 replicates for each season (evaluate the best condition for diving). At least from spring to fall.
Case Study "Trezza San Pietro" (PP7)
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IVANA ORLIC KAPOVIC

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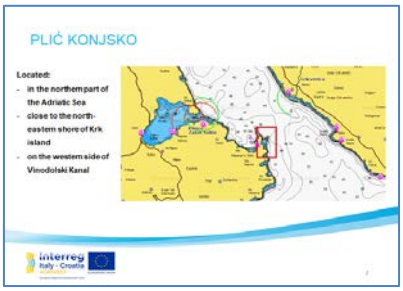
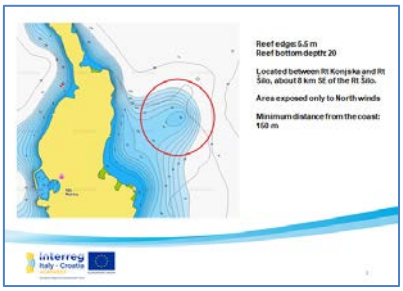
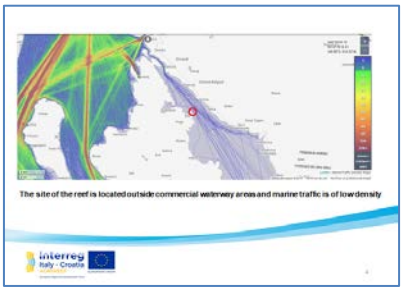
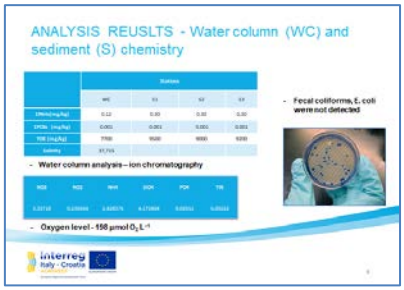


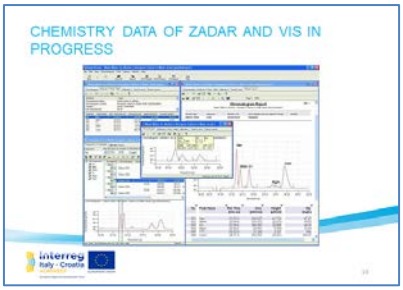





MONITORING ACTIVITIES


ANALYSIS REUSLTS
- Evaluation of human loads and tourist pressure – beach in the vicinity
- Physical garbage quantities – not observed any garbage
- Maritime traffic – recreational boats
- Water Column parameters – Institut Ruđer Bošković
- Benthic community settled on the reef and sediments – University of Zadar


ANALYSIS REUSLTS - Water column (WC) and sediment (S) chemistry
- Fecal coliforms, E. coli were not detected
- Water column analysis – ion chromatography
- Oxygen level - 158 μmol O_2 L^{-1}


CHEMISTRY DATA OF ZADAR AND VIS IN PROGRESS


FUTURE MONITORING ACTIVITIES
EQUIPMENT PURCHASED
1. Site Sonar - HUMMINBIRD SOLIX 12 +,GPS,G2
2. UNDERWATER DRONE - BLUEYE PIONEER PACK
3. SCUBA diving equipment (tender will be published in the


TESTING


Organisation name: University of Rijeka, Faculty of Maritime Studies
Contact person: Vlado Francic
Address: Studentska 2, 51000 Rijeka, Croatia
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Telephone number: +385 91 511 4835
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Session 3 - OPEN SPACE TECHNOLOGY

The Open Space Technology involved all the participants who rotated among the four groups providing ideas and suggestions to the different topics.

Focus 1: Blue Economy and Stakeholders Engagement

Facilitator: GIULIA CILLANI (MUNICIPALITY OF RAVENNA)

Advising activities in terms of education on natural and artificial reefs represents the main priority. A limited technical support from Institutions has been highlighted.

Focus 2: Priorities for sustainable use of reef resources

Facilitator: Gianna fabi (CNR - IRBIM)

Priorities for Natural reefs:

- Map of ecosystem;
- Biocoenoses survey;
- Torre Guaceto: recreational fishing and diving are prohibited. SSF is allowed and regulated;
- Conflicts between RF and SSF;
- Reconversion of traditional fishing to recreational fishing (need to search for regional funds to support the transition);
- General absence of management plans of the reefs (linked to the absence of funds). Need to establish them.

Priorities for Artificial reefs:

- Temporal Monitoring;
- Strong Association Between Ar And Aquaculture (Mussels): Use Of Ar To Lighten The Exploitation Of Reefs Within Protected Areas);
- Marine Spatial Planning;
- Establish Model Of Management Of Ar Lead By Association (Establish Rules, Controls And Exploitation).

Focus 3: Barriers and accelerators for the development of Blue Economy activities

Facilitator: Massimiliano Pinat (CNR - IRBIM)

Barriers	Accelerators
- normative restrictions - accessibility restrictions	-divulgation to the non-scientific community (e.g. citizen science); - specific and targeted funding opportunities
HR: absence of scientific studies, that lead to absence of data and management plans	Engagement of stakeholders in the management plan
Will of changes	On tourism: invest on marketing for the creation of a reef network
	Best practices exchange
	Innovative strategies on communication and awareness raising

Focus 4: Integrated management of reef resources

Facilitator: Fabio Grati (CNR - IRBIM)

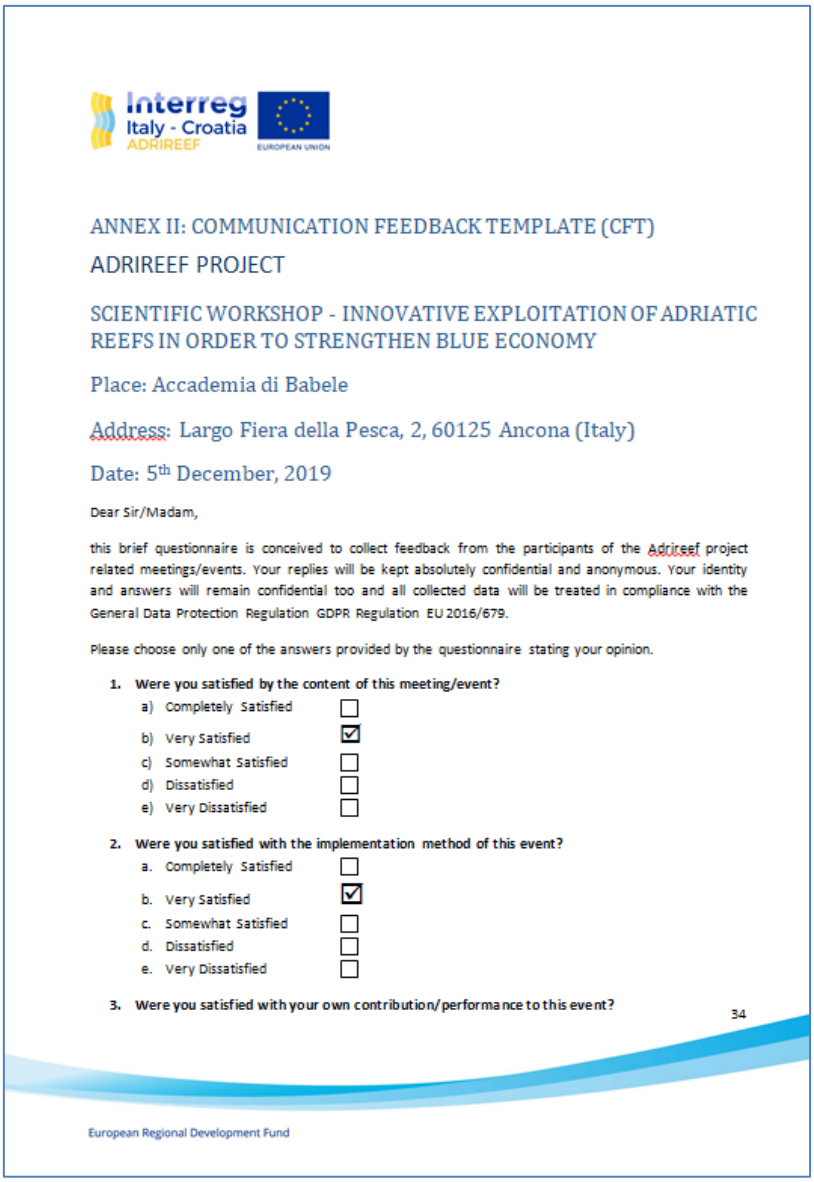
The main suggestion was the time rotation of different activities along to monitoring ones. People expressed the need to involve schools or other educational activities.
Very important is the spatial allocation providing distinct concessions to empower the possible users of the reef.
Criterions for a sustainable use of a reef are: to reduce and regulate activities and to control samples extracted from the reefs.

SCIENTIFIC WORKSHOP FEEDBACK

A few days after the workshop a feedback template was sent to the participants.

Six feedbacks have been received as reported below.

Feedback from UNIVPM



ANNEX II: COMMUNICATION FEEDBACK TEMPLATE (CFT)

ADRIREEF PROJECT

SCIENTIFIC WORKSHOP - INNOVATIVE EXPLOITATION OF ADRIATIC REEFS IN ORDER TO STRENGTHEN BLUE ECONOMY

Place: Accademia di Babele

Address: Largo Fiera della Pesca, 2, 60125 Ancona (Italy)

Date: 5th December, 2019

Dear Sir/Madam,

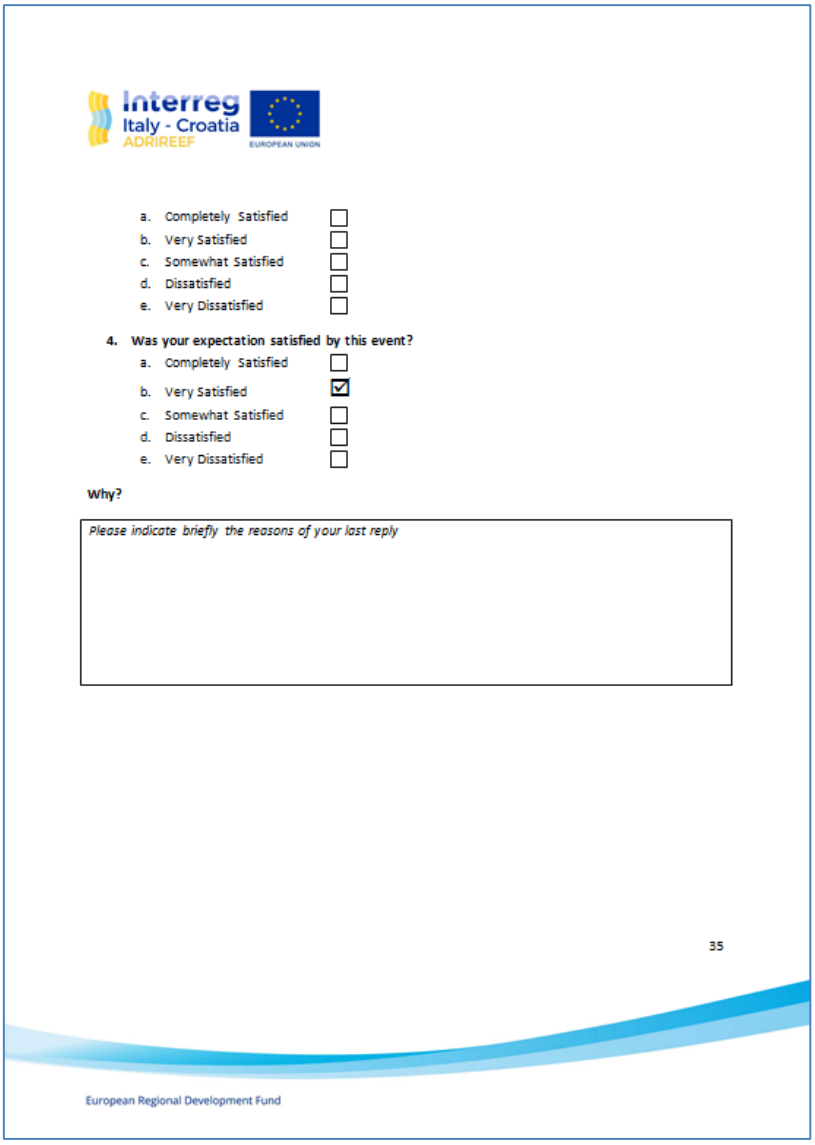
this brief questionnaire is conceived to collect feedback from the participants of the Adrireef project related meetings/events. Your replies will be kept absolutely confidential and anonymous. Your identity and answers will remain confidential too and all collected data will be treated in compliance with the General Data Protection Regulation GDPR Regulation EU 2016/679.

Please choose only one of the answers provided by the questionnaire stating your opinion.

1. **Were you satisfied by the content of this meeting/event?**
   - a) Completely Satisfied ☐
   - b) Very Satisfied ☑
   - c) Somewhat Satisfied ☐
   - d) Dissatisfied ☐
   - e) Very Dissatisfied ☐
2. **Were you satisfied with the implementation method of this event?**
   - a. Completely Satisfied ☐
   - b. Very Satisfied ☑
   - c. Somewhat Satisfied ☐
   - d. Dissatisfied ☐
   - e. Very Dissatisfied ☐
3. **Were you satisfied with your own contribution/performance to this event?**

34

European Regional Development Fund



a. Completely Satisfied ☐
b. Very Satisfied ☐
c. Somewhat Satisfied ☐
d. Dissatisfied ☐
e. Very Dissatisfied ☐

4. Was your expectation satisfied by this event?

a. Completely Satisfied ☐
b. Very Satisfied ☑
c. Somewhat Satisfied ☐
d. Dissatisfied ☐
e. Very Dissatisfied ☐

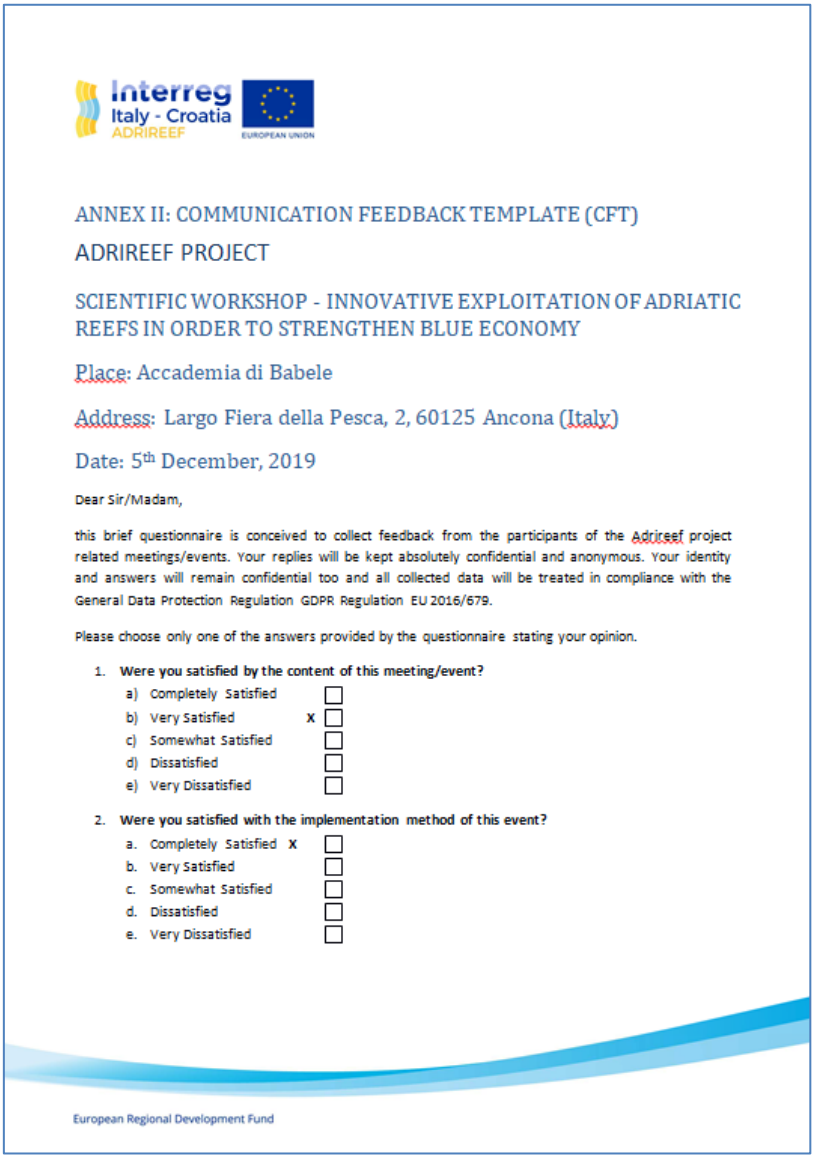
Why?

Please indicate briefly the reasons of your last reply

35

European Regional Development Fund

Feedback from CIVIL PROTECTION



ANNEX II: COMMUNICATION FEEDBACK TEMPLATE (CFT)

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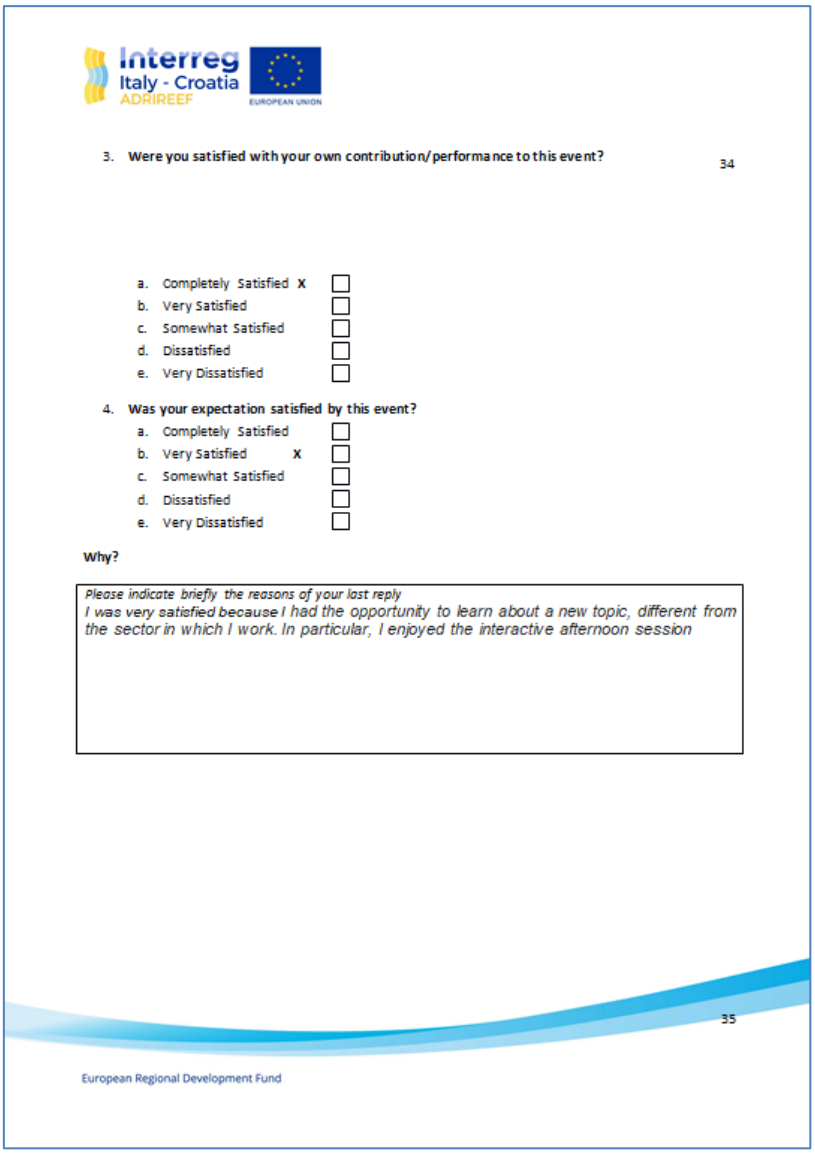
   a) Completely Satisfied ☐
   b) Very Satisfied X ☐
   c) Somewhat Satisfied ☐
   d) Dissatisfied ☐
   e) Very Dissatisfied ☐

2. **Were you satisfied with the implementation method of this event?**
   a. Completely Satisfied X ☐
   b. Very Satisfied ☐
   c. Somewhat Satisfied ☐
   d. Dissatisfied ☐
   e. Very Dissatisfied ☐

European Regional Development Fund



3. **Were you satisfied with your own contribution/performance to this event?**

34

a. Completely Satisfied **X** ☐
b. Very Satisfied ☐
c. Somewhat Satisfied ☐
d. Dissatisfied ☐
e. Very Dissatisfied ☐

4. **Was your expectation satisfied by this event?**

a. Completely Satisfied ☐
b. Very Satisfied **X** ☐
c. Somewhat Satisfied ☐
d. Dissatisfied ☐
e. Very Dissatisfied ☐

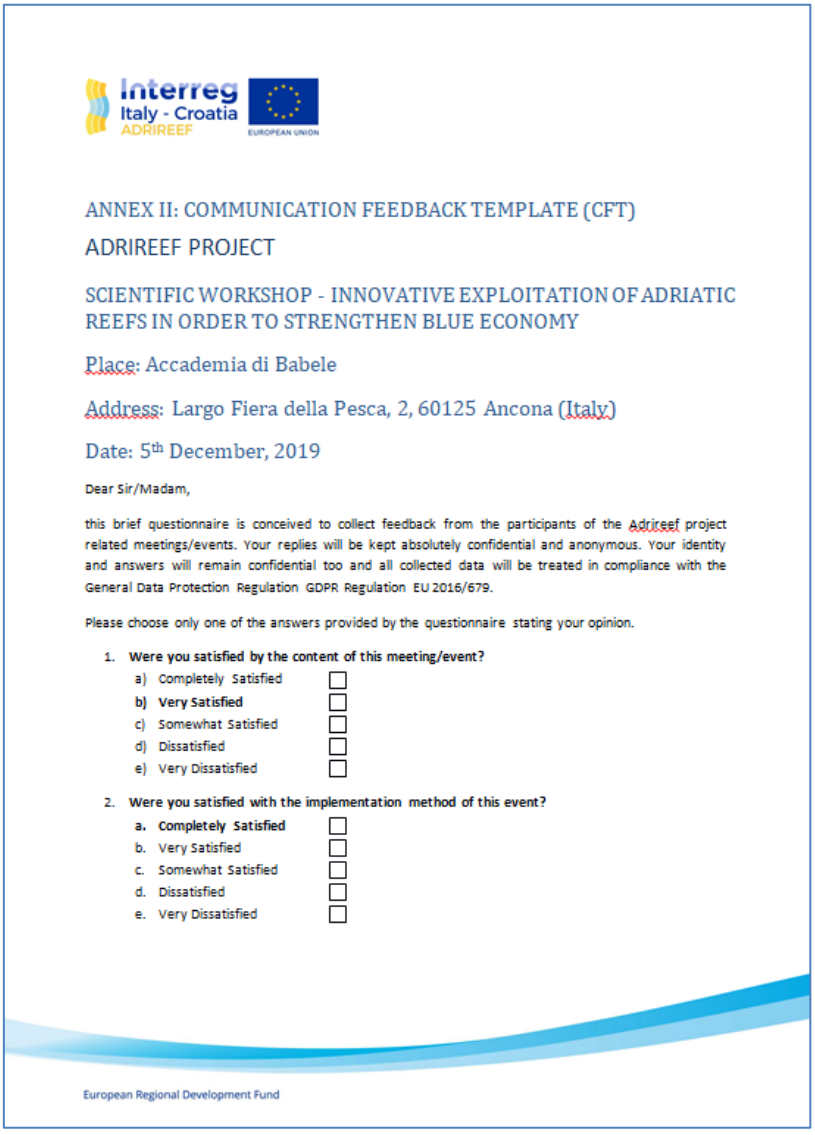
Why?

Please indicate briefly the reasons of your last reply
I was very satisfied because I had the opportunity to learn about a new topic, different from the sector in which I work. In particular, I enjoyed the interactive afternoon session

35

European Regional Development Fund

Feedback from ASSONAUTICA



ANNEX II: COMMUNICATION FEEDBACK TEMPLATE (CFT)

ADRIREEF PROJECT

SCIENTIFIC WORKSHOP - INNOVATIVE EXPLOITATION OF ADRIATIC REEFS IN ORDER TO STRENGTHEN BLUE ECONOMY

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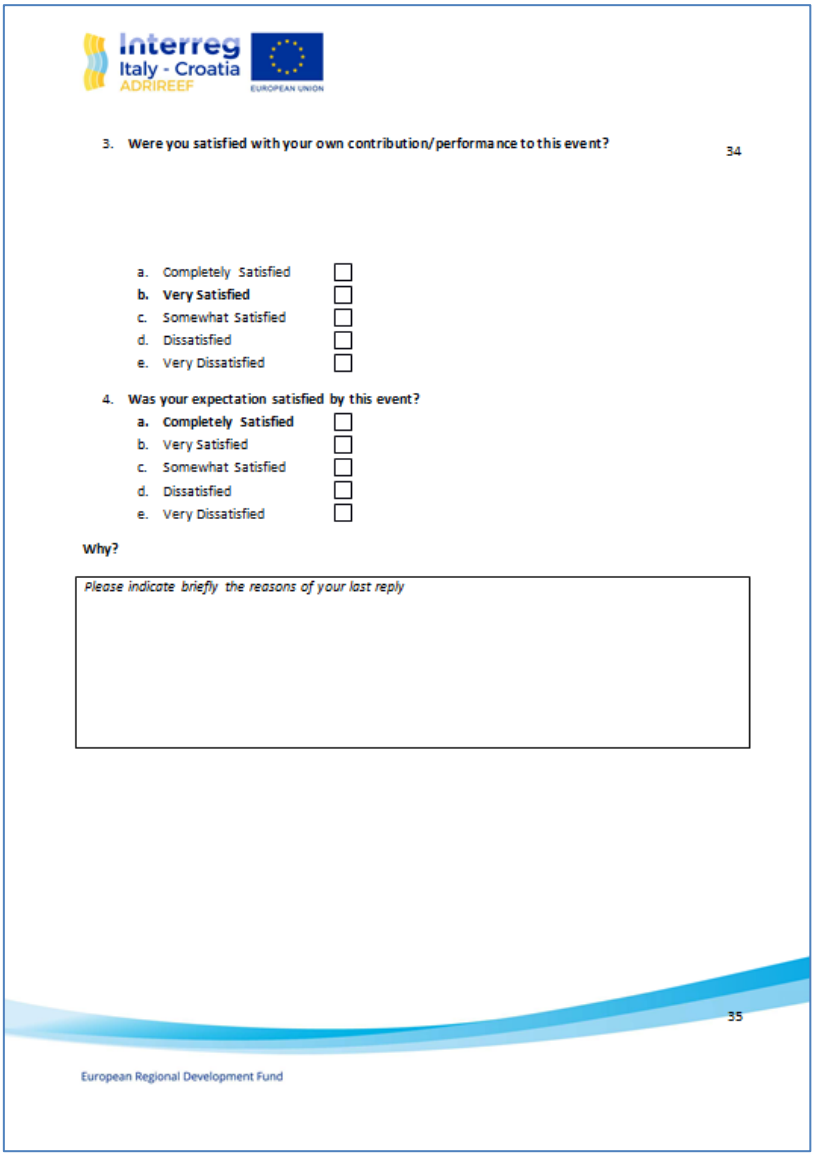
   - a) Completely Satisfied ☐
   - **b) Very Satisfied** ☐
   - c) Somewhat Satisfied ☐
   - d) Dissatisfied ☐
   - e) Very Dissatisfied ☐

2. **Were you satisfied with the implementation method of this event?**
   - **a. Completely Satisfied** ☐
   - b. Very Satisfied ☐
   - c. Somewhat Satisfied ☐
   - d. Dissatisfied ☐
   - e. Very Dissatisfied ☐

European Regional Development Fund



3. Were you satisfied with your own contribution/performance to this event? 34

a. Completely Satisfied ☐
b. Very Satisfied ☐
c. Somewhat Satisfied ☐
d. Dissatisfied ☐
e. Very Dissatisfied ☐

4. Was your expectation satisfied by this event?

a. Completely Satisfied ☐
b. Very Satisfied ☐
c. Somewhat Satisfied ☐
d. Dissatisfied ☐
e. Very Dissatisfied ☐

Why?

Please indicate briefly the reasons of your last reply

35

European Regional Development Fund

Feedback from ITALIAN NAVY HYDROGRAPHIC INSTITUTE

ITALIAN TRANSLATION

ALLEGATO II: MODULO DI FEEDBACK DI COMUNICAZIONE (CFT)

PROGETTO ADRIREEF

SCIENTIFIC WORKSHOP - INNOVATIVE EXPLOITATION OF ADRIATIC REEFS IN ORDER TO STRENGTHEN BLUE ECONOMY

Luogo: Accademia di Babele

Indirizzo: Largo Fiera della Pesca, 2, 60125 Ancona

Data: 5 Dicembre 2019

Gent. Le Signore/Signora,

questo breve questionario è stato concepito per raccogliere opinioni e commenti dei partecipanti agli incontri / eventi collegati al progetto Adrireef. Le informazioni contenute, così come la Sua identità e le risposte, saranno mantenute riservate e utilizzate in forma anonima. Tutti i dati raccolti saranno trattati in ottemperanza al Regolamento Generale sulla Protezione dei Dati GDPR Regulation EU 2016/679.

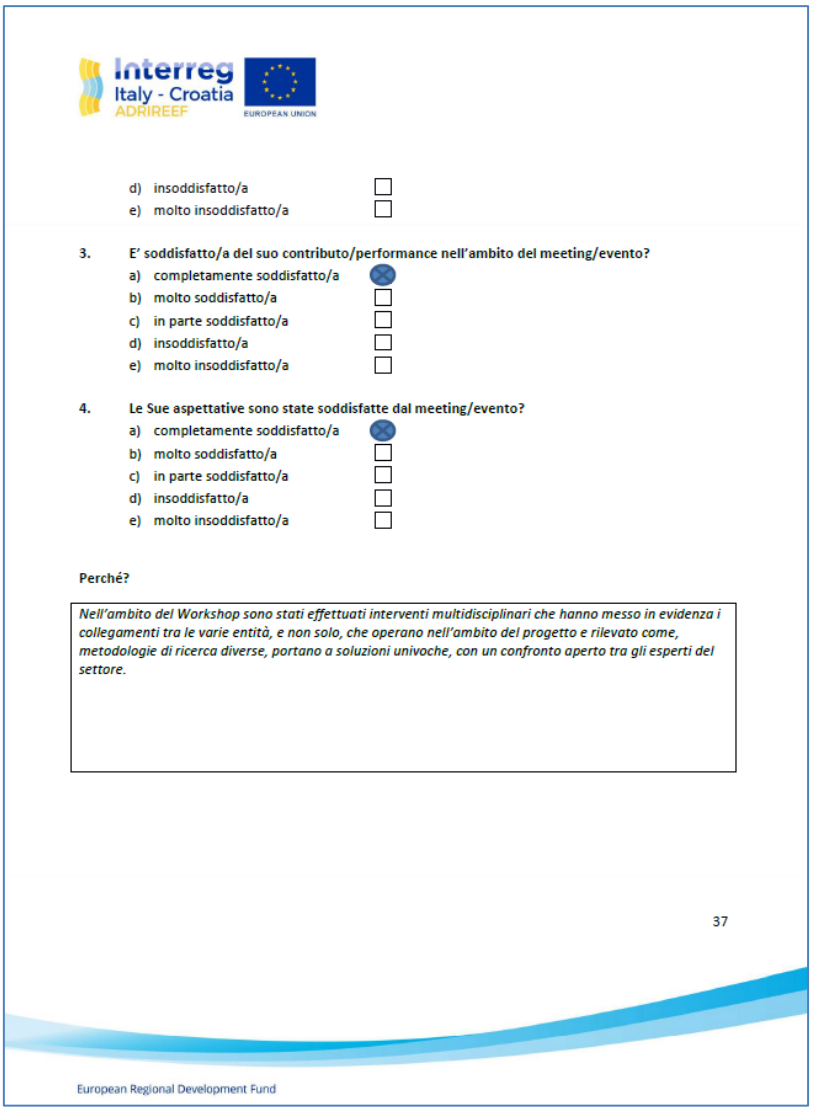
Per ogni domanda, si prega di scegliere solo una delle risposte fornite dal questionario, quella che più rappresenta la Sua opinione.

1. **E' soddisfatto/a del contenuto di questo meeting/evento?**
   - a) completamente soddisfatto/a ☒
   - b) molto soddisfatto/a ☐
   - c) in parte soddisfatto/a ☐
   - d) insoddisfatto/a ☐
   - e) molto insoddisfatto/a ☐

2. **E' soddisfatto/a del metodo di realizzazione di questo meeting/evento?**
   - a) completamente soddisfatto/a ☒
   - b) molto soddisfatto/a ☐
   - c) in parte soddisfatto/a ☐

36

European Regional Development Fund



d) insoddisfatto/a ☐
e) molto insoddisfatto/a ☐

3. **E' soddisfatto/a del suo contributo/performance nell'ambito del meeting/evento?**
a) completamente soddisfatto/a ☒
b) molto soddisfatto/a ☐
c) in parte soddisfatto/a ☐
d) insoddisfatto/a ☐
e) molto insoddisfatto/a ☐

4. **Le Sue aspettative sono state soddisfatte dal meeting/evento?**
a) completamente soddisfatto/a ☒
b) molto soddisfatto/a ☐
c) in parte soddisfatto/a ☐
d) insoddisfatto/a ☐
e) molto insoddisfatto/a ☐

Perché?

Nell'ambito del Workshop sono stati effettuati interventi multidisciplinari che hanno messo in evidenza i collegamenti tra le varie entità, e non solo, che operano nell'ambito del progetto e rilevato come, metodologie di ricerca diverse, portano a soluzioni univoche, con un confronto aperto tra gli esperti del settore.

37

European Regional Development Fund

Feedback from PORT AUTHORITY

ITALIAN TRANSLATION

ALLEGATO II: MODULO DI FEEDBACK DI COMUNICAZIONE (CFT)

PROGETTO ADRIREEF

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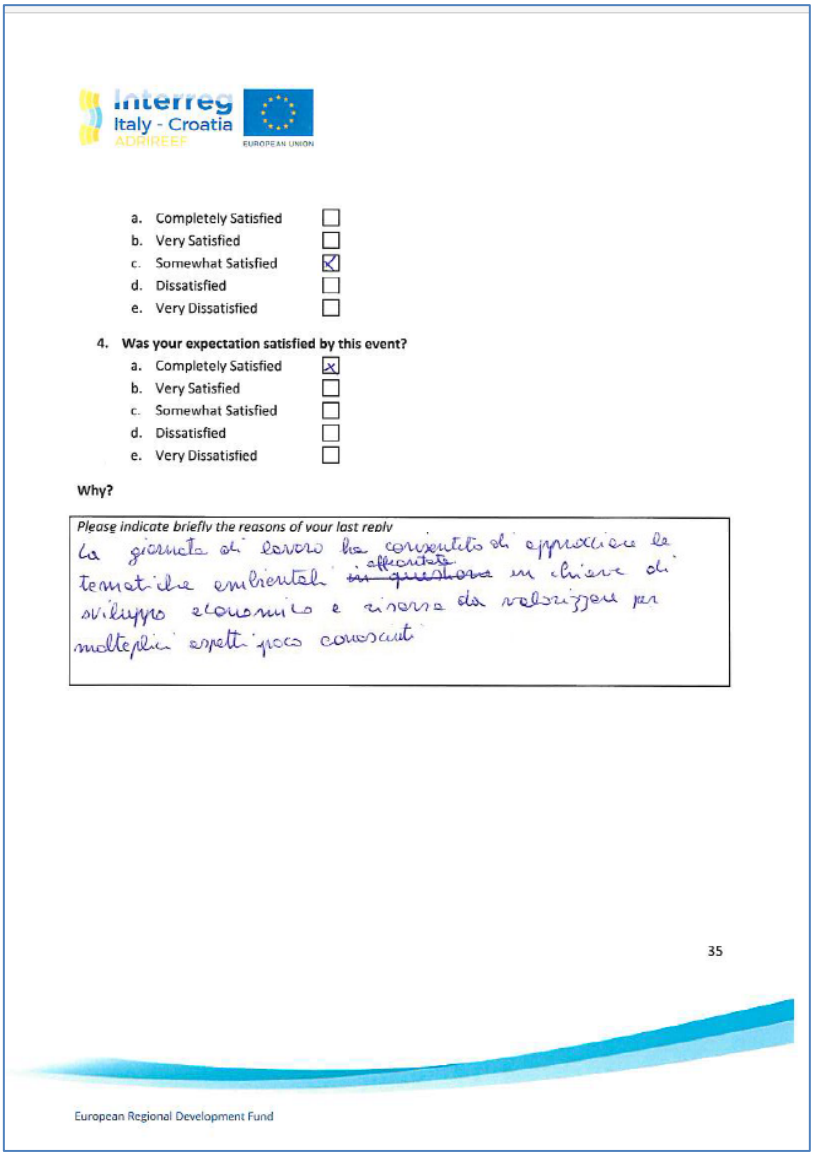
1. **E' soddisfatto/a del contenuto di questo meeting/evento?**
   - a) completamente soddisfastto/a ☐
   - b) molto soddisfatto/a ☒
   - c) in parte soddisfatto/a ☐
   - d) insoddisfatto/a ☐
   - e) molto insoddisfatto/a ☐

2. **E' soddisfatto/a del metodo di realizzazione di questo meeting/evento?**
   - a) completamente soddisfastto/a ☐
   - b) molto soddisfatto/a ☒
   - c) in parte soddisfatto/a ☐

36

European Regional Development Fund



a. Completely Satisfied ☐
b. Very Satisfied ☐
c. Somewhat Satisfied ☒
d. Dissatisfied ☐
e. Very Dissatisfied ☐

4. **Was your expectation satisfied by this event?**
a. Completely Satisfied ☒
b. Very Satisfied ☐
c. Somewhat Satisfied ☐
d. Dissatisfied ☐
e. Very Dissatisfied ☐

Why?

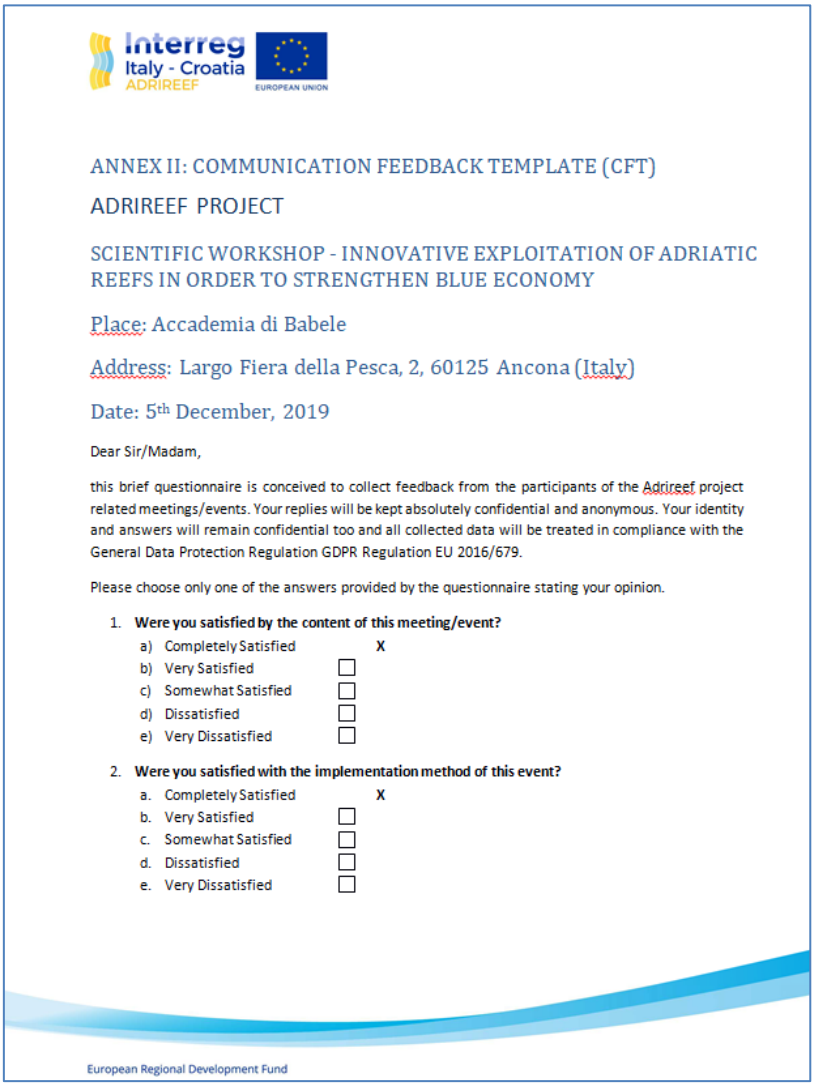
Please indicate briefly the reasons of your last reply

La giornata di lavoro ha consentito di approfondire le tematiche ambientali ~~in questione~~ affrontate in chiave di sviluppo economico e risorsa da valorizzare per molteplici aspetti poco conosciuti

35

European Regional Development Fund

Feedback from COOPERATIVA MARE RICERCA



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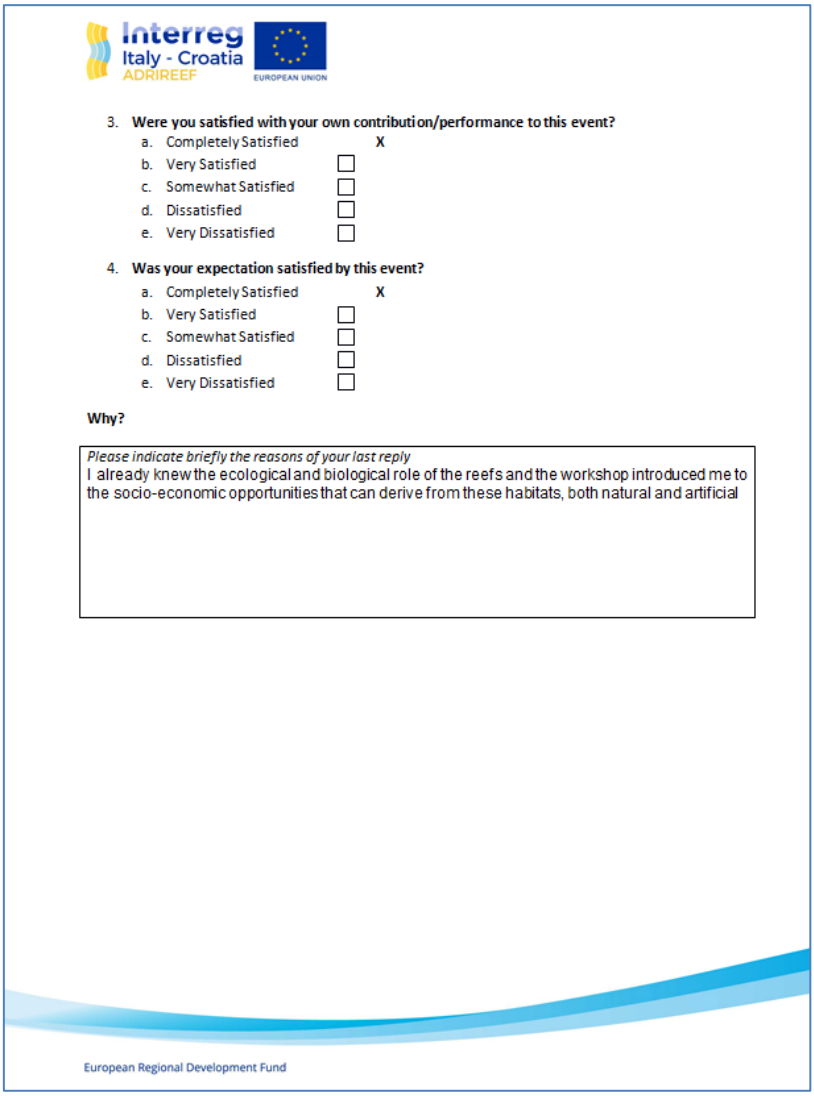
   b) Very Satisfied ☐
   c) Somewhat Satisfied ☐
   d) Dissatisfied ☐
   e) Very Dissatisfied ☐

2. **Were you satisfied with the implementation method of this event?**
   a. Completely Satisfied **X**
   b. Very Satisfied ☐
   c. Somewhat Satisfied ☐
   d. Dissatisfied ☐
   e. Very Dissatisfied ☐

European Regional Development Fund



3. **Were you satisfied with your own contribution/performance to this event?**
   a. Completely Satisfied **X**
   b. Very Satisfied ☐
   c. Somewhat Satisfied ☐
   d. Dissatisfied ☐
   e. Very Dissatisfied ☐

4. **Was your expectation satisfied by this event?**
   a. Completely Satisfied **X**
   b. Very Satisfied ☐
   c. Somewhat Satisfied ☐
   d. Dissatisfied ☐
   e. Very Dissatisfied ☐

Why?

Please indicate briefly the reasons of your last reply
I already knew the ecological and biological role of the reefs and the workshop introduced me to the socio-economic opportunities that can derive from these habitats, both natural and artificial

European Regional Development Fund

ANNEX 1 – Print Review