

# Workshop in Ancona Activities 2.5.1 - 2.5.2

The workshop was held in Ancona on December 5<sup>th</sup> 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 introductory 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](#)

**Si**  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



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).












**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 - ARPAAE)
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 Lagniči (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 Plićna Konjsko (I. Orlic Kapovic – University of Rijeka)
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.

#### Natural reefs

Rocky bottoms with different geological and biological origin and different mineralogy

- Sedimentary rocks
- Volcanic rocks
- Metamorphic rocks
- Biogenic rocks
  - Coral reefs
  - Coralligenous reefs
  - Sabellarids reefs

#### Mediterranean coralligenous habitats

"Coralligenous concretions, the unique calcareous formations of bryozoan sponges in Mediterranean benthic environments, are [bank] produced by the accumulation of encrusting sponges growing in dim light conditions." (Ballesteros, 2008)

#### Mediterranean coralligenous habitats

Physical drivers:

- Light intensity and quality
- Currents
- Sedimentation
- Trophic status

#### Mediterranean coralligenous habitats

Rims develop in the outer part of marine caves and on vertical cliffs, usually in shallower waters than banks. The thickness of rims is also variable and ranges from 20-25 cm to >2 m; thickness increases from shallow to deep waters.

Banks are flat frameworks with a variable thickness that ranges from 0.5 to several (3-4) m. They are mainly built over more or less horizontal substrata and have a very caespitose structure that often leads to a very typical morphology.

#### Northern Adriatic coralligenous banks

### Northern Adriatic coralligenous banks



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Northern Adriatic coralligenous banks


**Reef builders**



**Bio-erosion**

Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Northern Adriatic coralligenous banks



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Natural reefs: goods & services

- High biodiversity
- Complex ecological processes
- Ecotone-ecotop coupling
- Food webs
- Carbon sinks



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### 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 marine species and preventing trawling (Baine, 2001).



**What are ARs?**

Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Artificial reefs materials

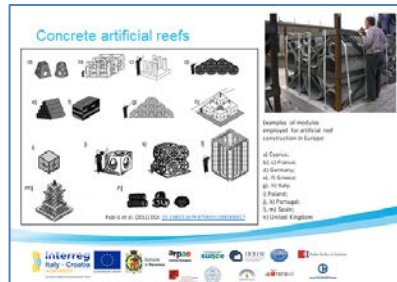
The materials used in their construction include natural rocks, concrete blocks and several discarded supplies (like tires, pipes, shells, barges, bundled solid waste, coal ash, vehicles, etc.) (Fawcett et al., 2011).



Concrete is the most common material, because it is cheap, versatile, allowing the realization of structures with different shapes and sizes, and may ensure long life, being resistant to the chemical and physical marine actions (Fawcett et al., 2011).

Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Concrete artificial reefs



Examples of structures proposed for artificial reef construction in Europe:

- Italy: 10
- France: 10
- Spain: 10
- Portugal: 10
- Malta: 10
- Germany: 10
- Poland: 10
- Denmark: 10
- Sweden: 10
- Finland: 10
- Belgium: 10
- Netherlands: 10
- United Kingdom: 10

Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Artificial reefs in Europe



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Artificial reefs purposes

Traditionally, in the **euphotic waters** (e.g. western Mediterranean Sea), the goals of ARs were to protect *Posidonia oceanica* meadows from illegal trawling, and to increase habitat complexity and promote higher species diversity (Bainy et al., 1994; Riggioni et al., 2000; Conrath-Correa et al., 2005).



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Artificial reefs purposes

Conversely, in the **subtropical waters** (e.g., central and northern Adriatic Sea) the main purpose of ARs was to **increase fishery yields** (Bombacei et al., 1994; Ardiccione et al., 1996; Bombacei et al., 1997).



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Artificial reefs purposes

To support recreational activities:

- Fishing (at the expense of local resources)
- Scuba diving (as an alternative to natural reefs) (Dhanraj et al., 2012)



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Artificial reefs as underwater SCUBA parks



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

### Artificial reefs purposes

Non intended artificial reefs...



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

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

The AGIP drilling platform "Vagator" sank 12 nm offshore Ravenna on 29 September 1985 (Pantini et al., 2002)



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.

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



Interreg Italy - Croatia, ARPA, SISPAC, IREDA, etc.



### Can artificial reefs mimic natural reef communities?

Even after a century an AR will mimic its adjacent natural 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.

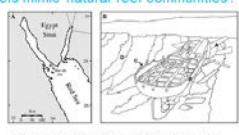



Fig. 1. Geographical location of the study site and (B) Schematic illustration of the Adriatic Sea and the location of the artificial reef (AR) and natural reef (NR). The location of the artificial reef and natural reef are marked: A. Plate, B. Right Tull, C. Left Tull, D. Base of the natural reef.

Project funded by the ADRIREEF (www.adrireef.com) and the ADRIREEF partners.



### 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, depth, orientation and physical-chemical features of the substrate (Underwood and Underwood, 1994; Reiris et al., 1994; Aligio et al., 2000; Turner and Todd, 1995).






Project funded by the ADRIREEF (www.adrireef.com) and the ADRIREEF partners.




### 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 (Gillis et al., 1993).

They may affect the exploitation of benthic resources.

Source: Gillis et al., 1993; Proceedings of the 1st ADRIREEF Conference.



### The attraction versus production debate

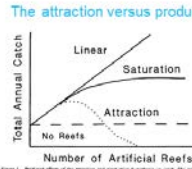
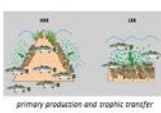

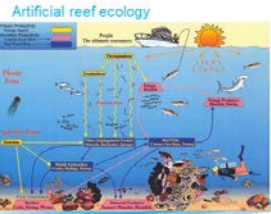



Figure 1. Production of the primary and secondary production on an artificial reef. The attraction towards the reef and the production of the reef are shown. The reef is shown as a structure that attracts fish and provides a habitat for them. The primary production and trophic transfer are shown as a process that occurs on the reef.


Source: Aligio et al., 2000; Biol. Mar. 15: 463-471.



### Artificial reef ecology



- support sessile filter feeders
- provide nourishment and refuge for mobile species
- attract benthic-nectonic fauna
- 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:



**Massimo Ponti**  
Benthic ecologist at the University of Bologna

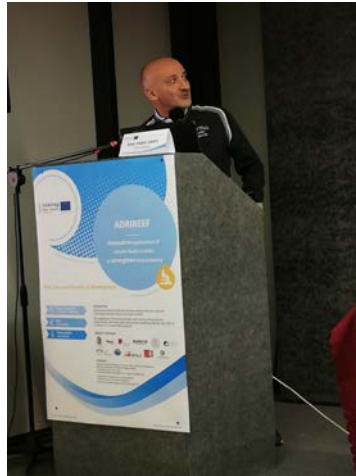
Laboratori di Scienze Ambientali,  
 Via S. Alberto 165, 48123 Ravenna (Italy)  
 massimo.ponti@unibo.it  
 +39 0544 937400  
 www.unibo.it  
 www.d.sas.unibo.it  
 www.reefchecked.org



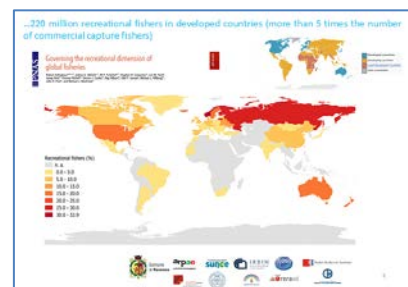
## FABIO GRATI

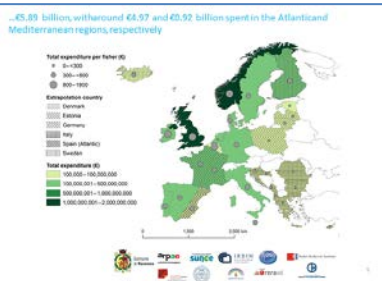
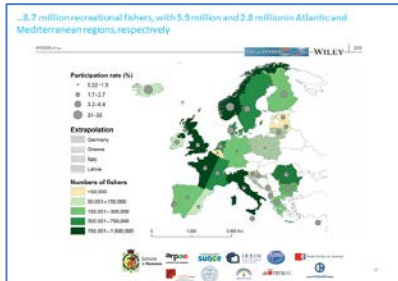
### CNR – IRBIM, Ancona (Italy)

### 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.





...How can ARs be used to improve RF?

**Reef Vision**

- Artificial reefs
- Natural reefs
- Hybrid reefs

...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

...potential uses of ARs for RF management

...opening substrates

Artificial spawning substrates and participatory research to foster cutthroat stock recovery. A pilot study in the Atlantic Sea

...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

Reduce fishing pressure on natural habitat

...potential uses of ARs for RF management

Harvest Rotation

"Time Limited" Marine Protected Areas

In the course of human history, there are only 4 species about which we know they can be cultured. Perhaps we should be using them to help manage wild fish species?

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?

**Identifying Heresy**

Borroni's Heretical Observation: "Artificial Reefs play almost 0% role in the management of any fishery". (November 2009)

**YEP, IT'S HERESY**

...comparison RF and commercial fishing in US

**Comparing NOAA's Recreational and Commercial Fishing Economic Data**



Produced for the American Sportfishing Association

**EXECUTIVE SUMMARY**

May 2013



2021	2020	2019	2018	2017
France	1,200	1,200	1,200	1,200
Italy	1,200	1,200	1,200	1,200
Montenegro	16	16	16	16
Luxembourg	100	100	100	100
Spain	100	100	100	100

### Shallow Water Reefs



### Ships-to-Reefs



### Torquay Offshore Recreational Fishing Reef

...the reef was built to provide an additional recreational fishing site for the local community...

### Boat Based Reefs

...the reef was built to provide an additional recreational fishing site for the local community...

### Shore Based Reefs

...the reef was built to provide an additional recreational fishing site for the local community...



### Bibione Reef



### Thanks for your attention



### Artificial Reefs & Recreational Fishing

CNR-IRBIM  
Fabio GRATI

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## NUNZIANTE LANGELOTTO ITALIAN NAVY HYDROGRAPHIC INSTITUTE, Genova (Italy) INVITED SPEAKER



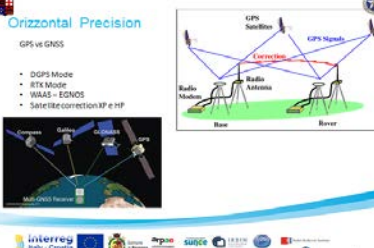
The knowledge of hard sea bottoms is very important not only from a geological, biological or ecological point of view, but also for a number of applications such as weather conditions, to understand and predict the coastal movements, etc.

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

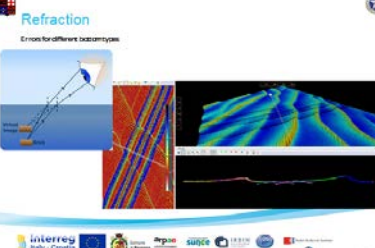
GPS vs GNSS

- DGPS Mode
- RTK Mode
- WAAS - EGNOS
- Satellite correction (RTK e RTF)

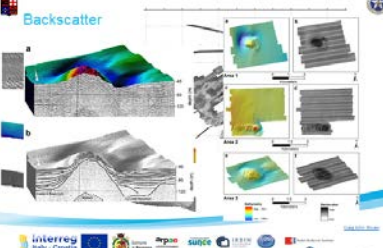


### Refraction

Errors for different bathymetry

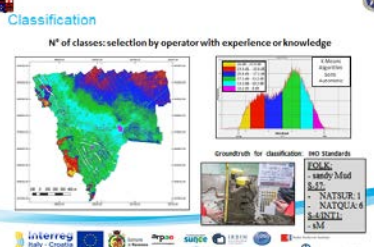


### Backscatter



### Classification

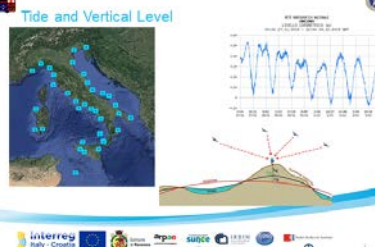
N° of classes: selection by operator with experience or knowledge



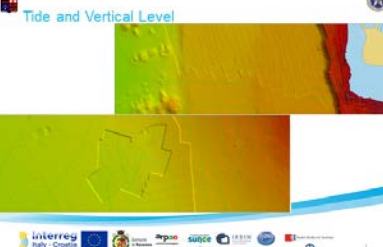
Groundtruth for classification: IHO Standards

- MUD
- SANDY MUD
- NATURAL SAND
- SAND
- MUD

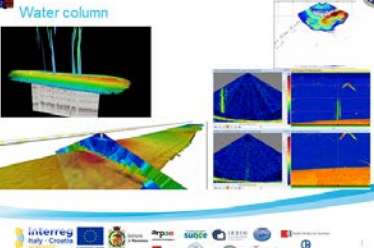
### Tide and Vertical Level



### 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 Nunsarica LANGUCCIO

**QUESTION ?**

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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.

<h3>WP2 - COMMUNICATION</h3> <ul style="list-style-type: none"> <li>Objective: communication plan to organize on-line and off line communication</li> <li>WP Leader: CNR - IRBIM</li> <li>Activities</li> </ul> <ol style="list-style-type: none"> <li>Communication activities</li> <li>Scientific workshop -&gt; next one in May 2020 in Zadar</li> <li>Stakeholders survey</li> <li>2 Adriref festival: Ravenna and Split</li> </ol>	<h3>WP2 - COMMUNICATION Adriref festival</h3>  <p>ADRIREF FESTIVAL JULY 2020</p> <p>We'll wait for you!</p>	<h3>WP3 - MAPPING OF DEI REEFS ADRIATICI</h3> <ul style="list-style-type: none"> <li>Objective: collect, organize and capitalize all the information produced with independent project and researchers, with the aim to obtain a map of the current situation of Adriatic reefs</li> <li>WP Leader: CNR - IRBIM</li> <li>Activities</li> </ul> <ol style="list-style-type: none"> <li>Reefs classification in the cooperation area</li> <li>Legal framework analysis</li> <li>Identification of relevant case studies</li> <li>Identification of technologies for underwater monitoring</li> <li>Stakeholders analysis</li> </ol>																																																							
<h3>WP4 - MONITORING PHASE OF ADRIATIC REEFS</h3> <ul style="list-style-type: none"> <li>Objective: the project will allow the partnership to buy innovative equipment to monitor the selected case studies</li> <li>WP Leader: ADRIE</li> <li>Activities</li> </ul> <ol style="list-style-type: none"> <li>Monitoring of case studies in Italy</li> <li>Monitoring of case studies in Croatia</li> <li>Data analysis of monitoring results</li> </ol>	<h3>WP5 - INNOVATIVE EXPLOITATION OF ADRIATIC REEFS</h3> <ul style="list-style-type: none"> <li>Objective: Drafting the main output documents of the project. The PPs will find out the relevant information to be transferred to stakeholders</li> <li>WP Leader: ZADRA NOVA</li> <li>Activities</li> </ul> <ol style="list-style-type: none"> <li>Scientific reporting of the in depth analysis on Adriatic reefs</li> <li>Definition of common guidelines for reefs' user</li> <li>Definition of recommendation for policy maker and funding agencies</li> </ol>	<h3>USE OF THE REEFS IN THE VIEW OF BLUE ECONOMY</h3> <p>The project has the ambition to combine innovative actions with possible socio-economic impact in those sector</p> <ul style="list-style-type: none"> <li>TOURISM -&gt; DIVING AND SNORKELING</li> <li>FISHING -&gt; PROFESSIONAL OR RECREATIONAL</li> <li>AQUACULTURE</li> </ul>																																																							
<h3>BEST PRACTICES</h3> <ul style="list-style-type: none"> <li>TOURISM -&gt; DIVING &amp; SNORKELING</li> </ul> <p>Sustainable tourism development at reefs' areas will only provide benefits if certain conditions are met (Kawkins, 1988):</p> <ul style="list-style-type: none"> <li>the natural attractions of the region must be competitive with those of other international destinations;</li> <li>management organisations capable of implementing conservation policies and managing tourism impacts must exist;</li> <li>long-term financing support for reef monitoring and management must be ensured.</li> </ul> <p><b>GREEN FINS</b> - <a href="https://www.greenfins.com/">https://www.greenfins.com/</a> International project to promote the elaboration and diffusion of guidelines for the sustainability within the diving and snorkeling industry</p>	<h3>BEST PRACTICES</h3> <ul style="list-style-type: none"> <li>TOURISM -&gt; DIVING &amp; SNORKELING</li> </ul> <p>"House of fishes"</p> <p>Project funded by the Tuscany Region and implemented in the coasts in front of the Natural park of Maremma with the objective to create an area in which to promote a sustainable model of fruition:</p> <ul style="list-style-type: none"> <li>Installation of buoys for illegal fishing</li> <li>Creation of diving circuits with buoys</li> <li>Creation of underwater gardens</li> </ul>	<h3>BEST PRACTICES</h3> <ul style="list-style-type: none"> <li>FISHING -&gt; PROFESSIONAL OR RECREATIONAL</li> </ul> <ul style="list-style-type: none"> <li>Necessary adoption of guidelines for sustainable implementation of these activities</li> <li>reefs, natural or artificial, can serve as a nursery area for the conservation of fish stocks for fishing outside the reserves</li> </ul> <p>Best practice: fishing guidelines of the Australian great barrier reef (from: <a href="http://www.barrm.gov.au/access-and-use/responsible-reef-practices/fish.pdf">http://www.barrm.gov.au/access-and-use/responsible-reef-practices/fish.pdf</a>)</p> <p>Installation of artificial reefs for recreational fishing and for repopulation</p> <ul style="list-style-type: none"> <li>Artificial Reef Development Program in Louisiana, Florida, Mississippi, Texas and Alabama</li> <li>"Rigs to Reefs" programme that use abandoned structures and reefs to create the creation of new habitats for fish repopulation</li> </ul>																																																							
<h3>BEST PRACTICES</h3> <ul style="list-style-type: none"> <li>AQUACULTURE -&gt; REEF ARTIFICIAL</li> </ul> <p>Mussel collection on offshore platforms in Ravenna</p>  <p>Installation of farming reefs in Portonovo (AN)</p> 	<h3>CASE STUDIES</h3>  <table border="1"> <thead> <tr> <th>Case Study Name</th> <th>WP 4/5/6/7/8/9/10</th> <th>WP 1/2/3/4/5/6/7/8/9/10</th> <th>WP 1/2/3/4/5/6/7/8/9/10</th> <th>WP 1/2/3/4/5/6/7/8/9/10</th> </tr> </thead> <tbody> <tr> <td>Porto Recanati</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Potenza Picena</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>Porto Tino</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> </tbody> </table>	Case Study Name	WP 4/5/6/7/8/9/10	WP 1/2/3/4/5/6/7/8/9/10	WP 1/2/3/4/5/6/7/8/9/10	WP 1/2/3/4/5/6/7/8/9/10	Porto Recanati	10	10	10	10	Porto Potenza Picena	10	10	10	10	Porto Tino	10	10	10	10	Porto Tino	10	10	10	10	Porto Tino	10	10	10	10	Porto Tino	10	10	10	10	Porto Tino	10	10	10	10	Porto Tino	10	10	10	10	Porto Tino	10	10	10	10	Porto Tino	10	10	10	10	<h3>I CASI STUDIO</h3> <p>TRZEE SAN PIETRO - Friuli Venezia Giulia</p>  <p>Type of reef: REEF NATURALE Area SIC IT2330029 "Trzee San Pietro e Barbell" Category: Pastoral</p> <p><b>POSSIBLE BUSINESSES ACTIVITIES:</b></p> <ul style="list-style-type: none"> <li>✓ Diving</li> <li>✓ Sport fishing and tourism related to fishing</li> <li>✓ Indirect increasing of tourism in the area</li> </ul> <p><b>STAKEHOLDERS:</b></p> <ul style="list-style-type: none"> <li>✓ Public authorities managing state-owned maritime properties and maritime safety</li> <li>✓ Public authorities responsible for tourism policies and fishing policies</li> <li>✓ ONG "Progetto-Trzee Lignano-Rabadoro"</li> <li>✓ Business activities related to fishing</li> <li>✓ Fishermen</li> </ul>
Case Study Name	WP 4/5/6/7/8/9/10	WP 1/2/3/4/5/6/7/8/9/10	WP 1/2/3/4/5/6/7/8/9/10	WP 1/2/3/4/5/6/7/8/9/10																																																					
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<h3>I CASI STUDIO</h3> <p>PIGGIORD - Emilia Romagna</p>  <p>Type of reef: REEF ARTIFICIAL Biological Protection Zone since 1922 Area SIC IT2470026 "Piggiorio" since 2012 Category: Sunken jacked drilling rig + additional structures</p> <p><b>POSSIBLE BUSINESSES ACTIVITIES:</b></p> <ul style="list-style-type: none"> <li>✓ recreational and educational diving</li> <li>✓ scientific research</li> </ul> <p><b>STAKEHOLDERS:</b></p> <ul style="list-style-type: none"> <li>✓ public institutions, research institutes and associations responsible for the correct implementation of the site Management Plan</li> <li>✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)</li> </ul>	<h3>I CASI STUDIO</h3> <p>PORTO RECANATI - PORTO POTENZA PICENA - Marche</p>  <p>Type of reef: REEF ARTIFICIAL Category: Specifically designed concrete modules</p> <p><b>POSSIBLE BUSINESSES ACTIVITIES:</b></p> <ul style="list-style-type: none"> <li>✓ recreational diving</li> <li>✓ Recreational fishing</li> <li>✓ local small-scale commercial fishing</li> </ul> <p><b>STAKEHOLDERS:</b></p> <ul style="list-style-type: none"> <li>✓ Public authorities managing state-owned maritime properties and maritime safety</li> <li>✓ Public authorities responsible for tourism policies and fishing policies</li> <li>✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)</li> <li>✓ Local small-scale commercial fishermen</li> </ul>	<h3>I CASI STUDIO</h3> <p>TORRE GUACETO - Puglia</p>  <p>Type of reef: REEF NATURAL/ARTIFICIAL Wetland of international importance (Ramsar Convention) "Torre Guaceto" 1982; "Torre Guaceto" Marine Protected Area 1991; "Torre Guaceto" State Natural 2000; EPS "Torre Guaceto" code IT940005; SIC "Torre Guaceto e Maccu S. Giovanni" IT940005 Category: Low profile reef and Patch reef</p> <p><b>POSSIBLE BUSINESSES ACTIVITIES:</b></p> <ul style="list-style-type: none"> <li>✓ recreational and educational diving (Citizen science)</li> <li>✓ scientific research</li> </ul> <p><b>STAKEHOLDERS:</b></p> <ul style="list-style-type: none"> <li>✓ public institutions responsible for the area protection and management</li> <li>✓ research institutes</li> <li>✓ Public authorities responsible for tourism</li> <li>✓ scuba diving associations/clubs and SMEs (boat rentals, scuba diving equipment stores, dive centers)</li> </ul>																																																							



**I CASI STUDIO**  
**PIR Laganj - Iola Lupa**



Type of reef: NATURAL/ARTIFICIAL  
 Category: Low profile reef

**POSSIBLE BUSINESS 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**  
**VIŠ**



Type of reef: NATURAL/ARTIFICIAL  
 Category: Patch reef

**POSSIBLE BUSINESS 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**  
**PIRina Korčula - Kok Island**



Type of reef: NATURAL/ARTIFICIAL  
 Category: Low profile reef

**POSSIBLE BUSINESS 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)

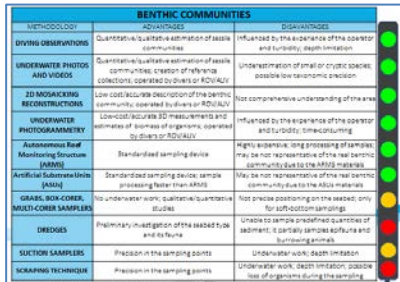



Pierluigi Penna and Anna Nora Tassetti explained the most innovative technologies, methodologies and monitoring protocols for natural and artificial reefs.














### SENSORS, BOTTLE-SAMPLERS AND REMOTE SENSING

Moored buoy and realtime communication

Fixed CTD Taking Water Samples with Profiling CTDs

Oceanographic sensors

WATER COLUMN



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### UNDERWATER PHOTOS AND VIDEOS, DIVING OBSERVATIONS

Underwater visual census on a NR

Different classes of Remotely Operated Underwater Vehicles (ROVs)

Deployment of a Baited Remote Underwater Video (BRUV)

FISH ASSEMBLAGE



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### AUTOMATED ESTIMATE OF FISH ABUNDANCE

Research/inspection class ROV

Experimental Stereographic prototype

Stereographic equipment: Stereo GoPro pair, Fixed baseline and chessboard pattern for calibration

FISH ASSEMBLAGE



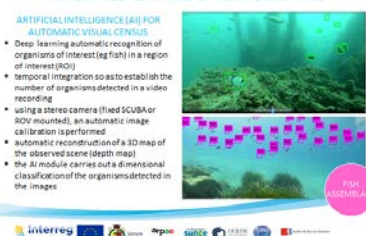
Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### 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 (eg last 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



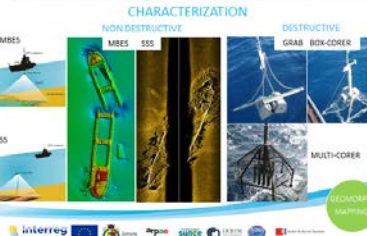
Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### GEOMORPHOLOGICAL, GEOPHYSICAL AND GEOCHEMICAL CHARACTERIZATION

NON DESTRUCTIVE: MBES, SSS

DESTRUCTIVE: GRAB, BOX-CORER, MULTI-CORER

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### ACOUSTIC SYSTEMS

Materials

EM2400C transducers

Survey lines (in yellow) are planned so as to sensibly 100% of the seafloor with at least 20% of overlap and have a good resolution

Part of the MBES	Hardware or Software
SWATH	MBES/MSX
Chirp Receiver	SVP's with CHIRP (SVP/CHIRP)
SWATH	SWATH
Heading	Sony Compass SCA-200 2D
Compass	Compass Type 100-200 (A001)
Speed	Sierra 504P
Speed/Sound Profiles and a transducer head	Sierra Information System (SIS)
Data acquisition software	Caris Edge and Star 11.0
Data processing software/libraries	MBES Multiplatform
MBES	MBES Multiplatform

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### ACOUSTIC SYSTEMS

#### DATA PROCESSING

Progression of Air Pyramid burial/Integrity over chosen years (NW-SE direction)

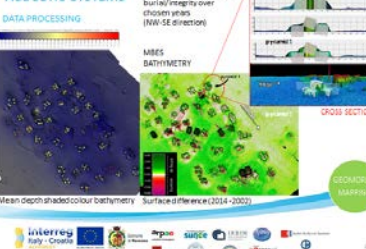
MBES BATHYMETRY

CROSS SECTIONS

Mean depth shaded colour bathymetry

Surface difference (2014-2007)

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### ACOUSTIC SYSTEMS

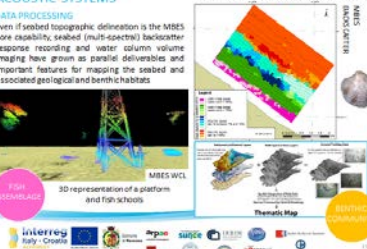
#### DATA PROCESSING

Even if swathed topographic delineation is the MBES core capability, evolved (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

3D representation of a platform and fish schools

Thematic Map

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### UNDERWATER PHOTOS

Underwater cameras, flash and frame

ImageJ

Free photo quadrat analysis software for advanced image processing

PHOTOGRAPHIC QUADRAT SAMPLING

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### PHOTOGRAPHIC QUADRAT SAMPLING

#### IMAGE PROCESSING

Extraction of species area, % coverage, presence/absence information

Image enhancement

Image calibration and Automatic quadrat boundary detection

Image segmentation and feature extraction


Region area (cm<sup>2</sup>) and coverage (%)

3D morphometric 3D descriptors (perimeter, centroid, roughness)

Labeling/species identification

Species library management

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### UNDERWATER PHOTOGRAMMETRY

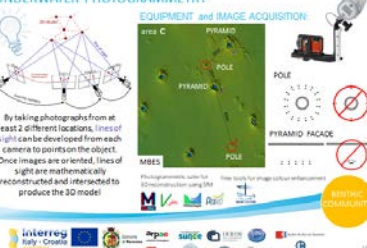
#### EQUIPMENT AND IMAGE ACQUISITION

By taking photographs from at least 2 different locations, lines of sight can be developed from each camera to position the object. Once images are oriented, lines of sight are mathematically reconstructed and intersected to produce the 3D model

Photogrammetry suite for 3D reconstruction using SfM

Free tools for image colour management

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### 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

Computed camera positions and orientation for each photo and the 3D sparse point cloud

ECOLOGICAL MAPPING



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### UNDERWATER PHOTOGRAMMETRY

GEOMETRY RECONSTRUCTION

INTERMEDIATE PRODUCT GENERATION

TEXTURE RECONSTRUCTION

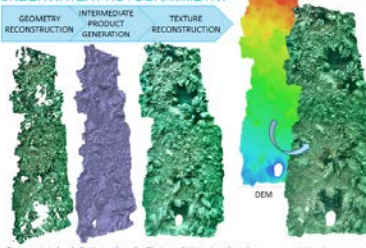
Dense point cloud

Optimized mesh

Photorealistic textured mesh

Orthophoto mosaics

DEM



Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

### CONTACT

CNR-IRBIM

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Largo Fiera della Pesca 2

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+3607 1307881

www.italy-croatia.eu/ADRIREEF

Logos: Interreg Italy-Croatia, Apipa, SUGCE, etc.

# ADRIREEF CASE STUDIES

## SILVIA PIGOZZI and MARCO PALMA

### ARPAE EMILIA ROMAGNA, Cesenatico (Italy)



**CASE STUDY "PAGURO WRECK"**

Silvia Pigozzi, Marco Palma  
ARPAE Emilia-Romagna  
Scientific Workshop, Ancona (Italy), 5<sup>th</sup> December 2019




**DESCRIPTION AND LOCATION OF THE SITE**

15.08.1963      28.09.1965




**REASONS TO SELECT THE PAGURO WRECK AS A CASE STUDY**

Definition of artificial reef within ADRIREEF project:  
An artificial reef is a **submerged natural or manmade structure** intentionally constructed or placed on the seabed to **emulate some functions of a natural reef** such as protection, aggradation, sedimentation, and/or enhancing persistence of long marine resources, while doing "no harm".  
**Objectives** of an artificial reef may also include the **protection, restoration and regeneration of aquatic habitats, and the promotion of research, recreational opportunities, educational use, sustainable fisheries and aquaculture.**  
This definition also includes decommissioned structures, or parts of them, **intentionally topped down to act as an artificial reef** (e.g., rig-wrecks, carrier wrecks).



**ACTIVITIES IN PLACE AND THAT MAY BE IMPLEMENTED FURTHER**

DM 21.07.1999 Ecological Protection Zone      Commission Dec. 2012/14/UE Site of Community Importance (SCI code IT4070020)      DM 03.04.2019 Special Area of Conservation



SICOPIS HABITATS Retezza della piattaforma Paguro Piano di Gestione



**ACTIVITIES IN PLACE AND THAT MAY BE IMPLEMENTED FURTHER**

Un'indagine di qualità sulla distribuzione di alcuni macroalghe di "Paguro" nella dorsale della "Paguro".  
Ricerca di nuove specie di "Paguro".  
Ricerca di nuove specie di "Paguro".  
Ricerca di nuove specie di "Paguro".

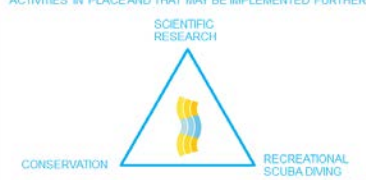


Con il Fondo di Cultura




**ACTIVITIES IN PLACE AND THAT MAY BE IMPLEMENTED FURTHER**

SCIENTIFIC RESEARCH



CONSERVATION      RECREATIONAL SCUBA DIVING



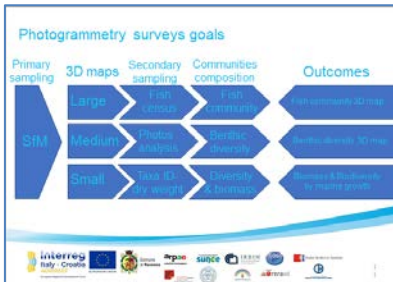
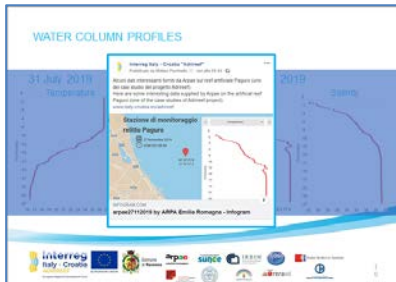
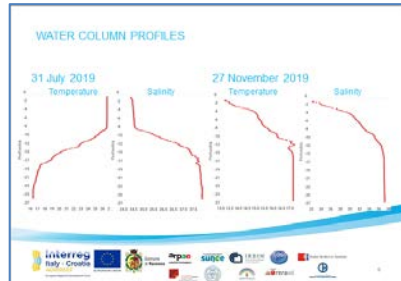
### ADRIREEF MONITORING PROTOCOL - CS PAGURO WRECK

Type of survey	Scope	Methodology	Timing/frequency
Geomorphological mapping	Description of morphological features of the wreck	Multi-Beam echosounder mapping	1 survey
Water column parameters	Characterization of water column parameters (clarity, depth, temperature, salinity, conductivity, pH, Chlorophyll 'a', Turbidity)	CTD probe with sensors for: • Temperature • Conductivity • Salinity • Depth • pH • Chlorophyll 'a' • Turbidity	1 sampling trip with increased frequency during summer period
Benthic community within the site	Describe the status of the community in terms of species composition and coverage to provide information for the monitoring	ADCP Photogrammetric mapping	State updated annually 1 survey season
Fish assemblage	Describe the fish population in terms of species composition and abundance to provide information (e.g. change with updated information on the fish assemblage)	Visual census performed by scuba divers • Stereo video analysis and automatic fish classification	1 survey season

### CTD multiprobe 316 Plus Iridonaut



Sensor Type	Range	Accuracy	Sensitivity	Unit
Pressure	0 - 200 bar	±2 % / 1 m	0.05 %	10 m
Temperature	0 - +50 °C	±0.03 °C	0.003 °C	10 m
Conductivity	0 - 84 mS/cm	±0.02 mS/cm	0.001 mS/cm	10 m
Dissolved Oxygen	0 - 30 ppm	±1 ppm	0.01 ppm	1 m
pH	0 - 14 ppm	±0.1 pH	0.1 %	1 m
Turbidity	0 - 30 %	±1 %	1 %	1 m
Fluorescence	0 - 35 µg/l	±1 %	1 %	1 m



### Primary sampling



- Full frame sensor 42.4 Mpixel
- Optic 23 mm
- FishEye Dome port 230mm
- Video illumination system 16000 lumens 2 x 8000 lumens 2
- Sensor 16 Mpixel
- Optic 10 mm
- FishEye Dome port 150mm
- Strobe light
- Video illumination system 2300 lumens 2

### Large

Fish census → Fish community → Fish community 3D map



### Large

Fish census → Fish community → Fish community 3D map

with decommissioned structures



### Large

Fish census → Fish community → Fish community 3D map

Traditional Visual census → Not already performed

Stereo-video for visual census → Tested

### Large

Fish census → Fish community → Fish community 3D map

Stereo-video for visual census → Tested



### Large

Fish census → Fish community → Fish community 3D map



### Large

Fish census → Fish community → Fish community 3D map



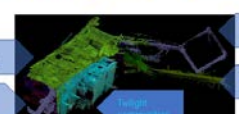
### Medium

Photos analysis → Benthic diversity → Benthic diversity 3D map



### Medium

Photos analysis → Benthic diversity → Benthic diversity 3D map



Infaunal communities

Ophiura spp Facies

Caprellid spp Facies

### CONTACT INFORMATION

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# IVO BENZON

## RERA, Split (Croatia)





### ADRIREEF – SCIENTIFIC WORKSHOP

ADRIREEF | JU RERA S.D | Ivo Benzon

Scientific workshop | Ancona | 05 December 2019

Case study – Sika o Štupičića  
Island Vis



### ADRIREEF – SCIENTIFIC WORKSHOP





### ADRIREEF – SCIENTIFIC WORKSHOP



The island of Vis is the foremost island on the Adriatic, an island in the central Dalmatian archipelago, a part among Croatian Adriatic islands, left untouched by the development of tourism for so many years. Due to its strategic location on the open sea, it served as a military zone for many years. Since the independence of Croatia, the island began opening slowly to the outside world, offering its unique traditions, history, cultural heritage, and natural beauty to the outside world, and it is slowly becoming one of the most popular tourist destinations in Croatia.

Vis has always been an island of fishermen and vinegrowers. The vast coastline, with sandy bottom, is situated on the western coast of the island, comes on the island of Vis to create the cradle of fishing in the Adriatic.



### ADRIREEF – SCIENTIFIC WORKSHOP

#### Seget Reef

Depth: 12m → 300m  
Entry: boat  
Type: Pinnacle Reef

Seget Reef is an incredible series of interconnected reefs that move from very shallow waters to more than 300 meters deep. Covered in pretty much any kind of corals you can find in the Adriatic, and often visited by all fish species it's a marvel to behold.

Notable: The position is extremely challenging to dive due to strong currents, constant boat traffic and quickly changing weather conditions. Only for well-trained and prepared dive teams.



### ADRIREEF – SCIENTIFIC WORKSHOP

#### GEORNIK VIS ARCHIPELAGO

The Vis Archipelago is a central Adriatic equidistant which belongs to the island of Vis, with a number of nearby uninhabited islands: Bračak, Badičeva, Veli Perak, Mali Perak, Orleteri, Hrv, Veli Brgaj and Mali Brgaj and the coasts islands among which the most famous are the islands of Palagruža (10 nautical miles southwards), inhabited only by lighthouse keepers, and the island of Jabuka which rises like a black pyramid from volcanic diatase above the sea, some 30 miles at sea west of Vis.

Within this marine range, with surface area amounting to nearly 8000 km<sup>2</sup>, there are also the islands of Brač, Anđulica, Bračak and the only populated island among them, the island of Brač.

As far as geology, this is the most attractive area of the Adriatic, formed from the oldest and the youngest formations of rock. Parts of the Vis archipelago are built from volcanic rock. Such rocks are unique in the Adriatic area and are easily distinguished from other Adriatic islands which are predominantly sedimentary rocks.

Seget is an area with an important geological heritage and a strategy for a sustainable economic development, and the promotion of its development to the benefit of the local community. The Geopark Vis Archipelago is a part of the European and Global UNESCO Geoparks Network, whose main goals are protection, education and a sustainable development.



### ADRIREEF – SCIENTIFIC WORKSHOP

#### Natura 2000

Natura 2000 is the ecological network of the European Union which includes important bird habitats and preserved habitats significant for other wild species of interest to the European Union.

For the sake of preservation of targeted animal and plant species, and land habitats, the entire land area of the Vis Archipelago is included in the Natura 2000 ecological network, with the total of 7 protected zones.

With the total of 9 zones, the submarine area of Vis and a lot of its islands, islets, reefs and cliffs is part of the Natura 2000 ecological network, the aim of which is to preserve marine habitats and the highly protected species of the bottlenose dolphin (*Tursiops truncatus*).



### ADRIREEF – SCIENTIFIC WORKSHOP

**Where?** Sika ad Šuplika, close to the island Vis (1.1 NM from coast of island Vis and 2.3 NM from City of Korčula), 7.6 m depth, area exposed to W-NW winds and waves

**What is it?** natural reef

**Current uses/activities?** fishery (in a water area)

**Main economic activities?** none

**Why?** reef are no activity connected with the reef, the reef so far has not been exposed to significant environmental load, however it is quite attractive and with significant potential

**Activities to be implemented?** monitoring of the reef with very limited recreational load and relatively close to the important tourist centre (City of Korčula)

**Which data could be collected?** estimation of baseline environmental load (water column, sediment features, geomorphological, etc.) in order to assess potential development activities and protection 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 water law environmental impact?** yes



### ADRIREEF – SCIENTIFIC WORKSHOP

**Sika ad Šuplika**, close to the island Vis (1.1 NM from coast of island Vis and 2.3 NM from City of Korčula), 7.6 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

**Zvonika Sika (Outer Reef)**  
43 00 26 N 16 03 54 E

**Depth:** 3m - 50m

**Type:** Pinnacle Reef

One of the tallest reefs on Vis Island, it's located close to the shore and an excellent position for beginners and advanced divers alike.

**Notable:** Due to its proximity to the shore and Korčula bays outer palm it's often visited by larger fish species such as Bonito, Groupers and Amberjacks.

Excellent light position and specific orientation leave it open powerful currents that bring about a abundance of life. One of the biggest red gorgonian colonies in Vis can be found on it's outer slopes with large emperors and scorpion fish being common.



### ADRIREEF – SCIENTIFIC WORKSHOP

**Where?**




### ADRIREEF – SCIENTIFIC WORKSHOP

**Red gorgonians, large cornea – Paramuricea Clavata**

Red gorgonians build grove colonies of up to 100 cm, with a thick branching on one plane. At each branch are irregularly spaced joints, growing up to 10 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 turn black, becoming grey, dull, resembling burnt matches.

They grow on the steep rocky walls at depths of 20-150 m where they continue on electricity brought in by strong sea currents.




### ADRIREEF – SCIENTIFIC WORKSHOP

**Sea tree, Yellow cornea – (Funicella Cavolinii)**

Yellow sea tree is a variety of corals with soft skeleton. The growth of the coral looks like the form of yellow funnel-like.

It is mainly located on the rocky walls in areas of strong currents, where it feeds on plankton brought by the current.




### ADRIREEF – SCIENTIFIC WORKSHOP

**Paramuricea clavata**

- Paramuricea is a genus of gorgonian – type octocorals in the phylum Cnidaria.
- 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 Gorgonian heads which exploit the excellent current conditions provided by the sea fans.




### ADRIREEF – SCIENTIFIC WORKSHOP

**Sulfurous sponge – Aplysina Cavemicola**

Sulfurous sponges often builds large settlements in rocky, shaded, semi-protected areas, usually on greater depths.

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 overhangs or caves.
- It grows at depths from 10 to 100 meters below sea level, although the prevalence 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 ordinary, and the existence of black coral (Acanthopora), otherwise rare in the Adriatic, at greater depths.




### ADRIREEF – SCIENTIFIC WORKSHOP

**Noble pen shell – Perna nobilis**

The noble pen shell has an sandy bottom of shallow coastal flats.

It is endemic species, widely spread throughout the Adriatic.

This is the largest species of shellfish in the Mediterranean and Adriaic sea and is highly prized and sought after in restaurant kitchens.

Due to the overfishing in many coastal areas this population are completely decimated.

Therefore, diver shall collect them protected by law and responsibly, harvesting and selling with this kind is strictly prohibited.




### ADRIREEF – SCIENTIFIC WORKSHOP

**Mediterranean slipper lobster**      **John Dory**      **Mediterranean moray**

**Red scorpionfish**      **Lobster (Palinurus elephas)**      **Common octopus (Sepia sepioides)**




### ADRIREEF – SCIENTIFIC WORKSHOP

**Vassilios Wreck**

At the southern part of the Gulf of Korčula, around Cape Šuplika, at a depth of 22 to 33 meters is the ship "Vassilios". The ship is in an excellent state of preservation, and due to a rusted hull, it was abandoned and sank shortly afterwards on March 18, 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 easily accessible. This is an extremely interesting location, though caution is needed because of the depth.

Numerous inhabitants of the wreck – various lobsters and fish, make diving over there attractive, and the position for attractive photographs is excellent.




### ADRIREEF – SCIENTIFIC WORKSHOP

**Position:** 42 00 18 N 16 03 54 E

**Depth:** 23m - 9 53m

**Origin:** local

**Decompose Date:**

**Type:** Cargo steamer

**Size:** 105m x 15m x 5m

**Sank:** 19. March 1939

Vassilios is one of the largest shipwrecks in the Adriatic, everything about this 105m-long steamer is still a mystery including its cargo.

**Notable:** The ship is home to many large European fish (European sea bream)




### ADRIREEF – SCIENTIFIC WORKSHOP

**Threats – invasive species**

- Caulea 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 2005 in the underwater world of the Rab island. Caulea in the Adriatic does not have predators, and because of this spreads rapidly and uncontrollably, and occupies large areas of rocky seabottom.
- Aplysina alypsina, also known as the European sea sponge or Mediterranean sea sponge, is a colonial predatory fish of the Mediterranean basin and the warmer waters of the Atlantic Ocean.
- Fishermen consider it a great pest that seriously threatens the sensitive Adriatic fish stocks, taking them in large numbers.
- Because, except that the fish was a third of its weight every day, when it takes emerging seabirds, grey mullet, gulf anchovy and other fish that are easy prey, it eats and kills even when it is not hungry, so they call it a parasite.




### ADRIREEF – SCIENTIFIC WORKSHOP

**„No take“ zone**

- The Community Initiative for the Protection of the Sea by 50-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 not active.
- Recreational activities such as boating, snorkeling, and diving are allowed. However, fishing and coral collecting are entirely prohibited.
- No take zones within multiple-use MPA usually protect the spawning grounds of many aquatic species. No take zone are very effective in restoring and preserving biodiversity and in such a way, ecosystem science.




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**„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 ecotourism 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 photo safaris





ADRIREEF – SCIENTIFIC WORKSHOP

**Catch and release - Semi protected zone (B)**

For discussing???

- 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

- Installation of camera - supervision
- Installation underwater sets of IC cameras - monitoring





ADRIREEF – SCIENTIFIC WORKSHOP

JU RERA SD  
Ivo Benzon

Thank you!

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## ALESSANDRA SPAGNOLO CNR – IRBIM, Ancona (Italy)



**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




**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 Adriaticas
- Local Coastguard office
- Marine Region Office "Servizio Tutela, Assetto e Gestione del Territorio"

**stakeholders linked to tourism**

- Marine Region - Tourism Dept
- Municipalities - Tourism Office
- Tourism Associations
- Cloning Centre

**stakeholders linked to professional fishing activities**

- Marine Region - Fishery Dept
- CSF-PLAZ Marche
- Fisherman association

**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-GS-Antenna for real-time data
- Wind speed and direction, temperature
- Physical and chemical parameters near the surface (pH, conductivity, dissolved oxygen, turbidity)
- Currents tracking along the water column

Give stakeholders (fishers) real-time information on oceanographic status




**How?**

**Benthic community**

- 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**



**PROFESSIONAL FISHING**



**How?**


**Benthic community**

- 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**



**PROFESSIONAL FISHING**



**How?**

**Fish assemblage**

- Describe the fish population in terms of species composition and abundance to provide stakeholders (e.g. diving recreational and professional operators) 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**

- Submersible
- Submersible light
- Rechargeable battery
- 300m cable
- Spot torch storage
- Sensor
- Autonomous Sonar
- Docking image on a 300m underwater GPS
- 3D camera for photogrammetric purpose

**Artificial intelligence software**

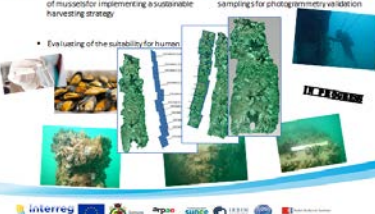
- Deep learning automatic recognition of the organisms in a region of interest
- temporal integration to assist establish the number of organisms assessed in a video recording
- automatic image calibration
- automatic reconstruction of a 3D map of the assemblage
- dimensional classification of the organisms detected in the image




**How?**

**Mussels**

- Patterns of biomass and density distribution → Underwater photogrammetry and scraping of mussel for implementing a sustainable harvesting strategy
- Evaluating the suitability for human
- Underwater photogrammetry and scraping of samplings for photogrammetry validation



**PROFESSIONAL FISHING**



**THANK YOU FOR YOUR ATTENTION !**

and thanks to my colleagues!




CNR - ISSM  
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## ENRICO BARBONE

### ARPA PUGLIA, Bari (Italy)





**SCIENTIFIC WORKSHOP**  
 ANZORA, 30th December 2019  
 Accademia di Scienze, Lettere e Arti di Lecce, Anzora

2014 - 2020 Interreg V-A Italy - Croatia CBC Programme  
**ADRIREEF Project**  
 "INNOVATIVE EXPLOITATION OF ADRIATIC REEFS IN ORDER TO STRENGTHEN BLUE ECONOMY"

**Presentation of the Case Study Torre Guaceto MPA**  
 Enrico Barbone, ARPA Puglia





**Presentation of the Case Study Torre Guaceto MPA**  
 Enrico Barbone, ARPA Puglia


**Torre Guaceto Marine Protected Area**

The Case Study selected from the Regional Agency for the Environmental Prevention and Protection of Puglia (ARPA Puglia) is the Marine Protected Area (MPA) of Torre Guaceto (SE Italy, southern, Puglia Region, province of Brindisi). The Torre Guaceto MPA was formally established in 1991, but entered into force in 2001.





**Presentation of the Case Study Torre Guaceto MPA**  
 Enrico Barbone, ARPA Puglia

The total surface of MPA is around 2227 ha and it is divided into two no-take/no-access zones (called **A zones** according to the Italian law) covering 179 ha, where any fishing is banned and access forbidden except for the MPAs staff, scientists and police forces (e.g. coast guard). The general reserve zone (**B zone**) covering 163 ha, where access (i.e. swimming) is permitted but fishing banned; the partial reserve zone (**C zone**), covering 1885 ha, where access and regulated navigation are permitted.





**Presentation of the Case Study Torre Guaceto MPA**  
 Enrico Barbone, ARPA Puglia

The Marine Protected Area (MPA) of Torre Guaceto has particularly distinguished itself in recent years for the management actions that have also earned it awards.

**In evidenza**

25  
2017

27  
2017

11  
2017



Torre Guaceto vince il Blue Park Award: premiata sei Riserve nel mondo.



Photo: Immagine coordinata s.p.a.




**Presentation of the Case Study Torre Guaceto MPA**  
 Enrico Barbone, ARPA Puglia

The coast, mainly rocky with pocket beach, is characterized by a sloped rocky plateau, declining from the water surface to ~10-12m depth over coarse sand. Rocky bottoms alternate with sand and *Posidonia oceanica* meadows beds. From about 25 to 35-40m depth, coralligenous formations alternate with sand, and at deeper stands sandy-muddy bottoms widely dominate (Guidetti et al., 2016).





**Presentation of the Case Study Torre Guaceto MPA**  
 Enrico Barbone, ARPA Puglia

The coralligenous reefs that appear in the EU's Habitats Directive (under habitat 1170 Reef(s)) are among the richest and most characteristic marine habitats of the Mediterranean Sea, ranging from about 10 to 120 m of depth. They are among the most important biogenic structures in the Mediterranean Sea, usually characterized by a well-defined community. However, due to their peculiarities and great structural, biological and geographical heterogeneity, it seems more appropriate to consider them as a puzzle of communities rather than a single community.



**Interreg Italy-Croatia** Presentation of the Case Study Torre Guaceto MPA Enrico Barbone, ARPA Puglia

**Assessment of status quo**  
The major threats 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.



**Interreg Italy-Croatia** 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)

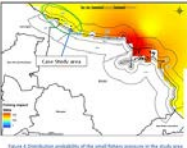
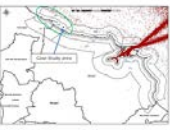




Figure 4 Distribution probability of the sea fishery resource in the study area  
Figure 5 Distribution of zones in the study area during the year 2022 (Data source: Marine Traffic)

**Interreg Italy-Croatia** 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, as the possibility of doing recreational diving could increase the number of tourists.



**Interreg Italy-Croatia** 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).



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**Case Study: Puglia Region - Marine Protected Area of Torre Guaceto**

ACTIVITY	DESCRIPTION OF THE ACTIVITY	PROTOCOLS FOR MONITORING AND APPLICABLE RISKS	STATUS
Ecological monitoring	Monitoring of the ecological state of the reef	Standardized protocols for data collection and analysis	Active
Water quality monitoring	Monitoring of water quality parameters	Standardized protocols for data collection and analysis	Active
Marine mammals monitoring	Monitoring of marine mammals presence	Standardized protocols for data collection and analysis	Active
Monitoring	Monitoring of the status of the reef and the presence of invasive species	Standardized protocols for data collection and analysis	Active
Scientific community	Implementation of an underwater laboratory for research and monitoring	Standardized protocols for data collection and analysis	Active
Fish assemblage	Monitoring of fish assemblage composition and structure	Standardized protocols for data collection and analysis	Active

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**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.

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**Photosampling on the Coralligenous outcrops**




Mapping Pinna nobilis distribution  
Fish assemblage visual census

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**Diving activities and Coralligenous outcrops**



Diving activities were carried out by ARPA Puglia Technical Biological Divers

1. Ilaria delle Mura
2. Michele De Giola
3. Giuseppe Strippoli
4. Gaetano Costantino



## IVANA VUSKA

### UNIVERSITY OF ZARA, Zara (Croatia)





### Case study - Plić Lagnići


Adrireef | University of Zadar | PP4  
Workshop | Ancona | 05. December 2022.




**Why?**






### Location





### Location

- > 22nM from Zadar
- > NW side of Dugi otok island
- > N44°09.970' E14°48.473



### Location description - facts


<p><b>Oceanographic features</b></p> <ul style="list-style-type: none"> <li>• Low tides</li> <li>• Big waves only during winter</li> <li>• Good water temperature</li> <li>• Low turbidity</li> </ul>	<p><b>Biological features</b></p> <ul style="list-style-type: none"> <li>• Posidonia meadows</li> <li>• Fish communities</li> <li>• Algae</li> <li>• Corals</li> <li>• Molluscs.....</li> </ul>
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### Ship wreck Michelle

- Italian cargo ship sunk in 1988.
- 73m length
- Building material can still be found
- Depth 5m to 8m



Shipwreck Michelle







Activities

- Tourism
- Sport
- Recreation
- Education





Sport







Recreation






Education








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## DIEGO BORME INOGS, Sgonico (Italy)



**Case Study "Trezza San Pietro" (PP7)**  
 Diego Borme,  
 National Institute of Oceanography and Experimental Geophysics - OGS  
 Scientific Workshop, Ancona (Italy), 3<sup>rd</sup> December 2013

**Case Study "Trezza San Pietro" (PP7)**


**Geographical location**



The Case Study is located 8.7 Km from the coast, offshore Grado harbor, close to an outgoing reef tract, it covers an area of about 3850 m<sup>2</sup>, comprising small reef structures protruding from the sediment (patch reef). Other similar natural reefs are located at a bottom depth between 15 and 16 m, with a reef edge of 2-0.9 m.

**Case Study "Trezza San Pietro" (PP7)**


**Origin of the natural reefs**



Their origin has not yet been completely clarified, since not all of them can be assimilated to biocostructions, and in some cases they are constituted by slabs deriving from the cementation of sand or rocky materials. The calcareous concretions are attributable to Corallinaceae algae and secondarily to Bryozoa, Mollusca (especially Anomia) and Chamaephyllodes, Anthozoans (Dobsonia coccinifera) and Serpula Polythete.

**Case Study "Trezza San Pietro" (PP7)**

**Fragility of the natural reefs**



This kind of environment is extremely delicate and vulnerable: the same hard substrate is fragile due to its calcareous and porous nature, indiscriminate anchoring, unauthorised overfishing (in particular hydraulic dredging for the harvesting of edible bivalve molluscs) and even the passage of unskilled divers can cause serious damage both to the sessile species and to the substratum itself.

**Case Study "Trezza San Pietro" (PP7)**

**Long process towards conservation**



Regarding an administrative point of view, in 2012 this Natural Reef site was proposed by the council resolution 1833, pursuant to Regional Law 7/2008, art. 7, as the new site of community importance n°1030009 "Treza San Pietro e Bassoli". Nevertheless it was necessary to await the European Commission Decision 2015/69 / EU of 05.12.2014 which ratified the insertion of the site in the list of SCI of the continental biogeographical region. The process that has been underway since 2011, however, has not come to an end and the SIC is now part of the Natura 2000 Network but there are no specific measures for its protection.

**Case Study "Trezza San Pietro" (PP7)**

**Complexity of the socio-economic features**



Map of the natural reef "Treza San Pietro" showing socio-economic features of the surrounding territory: agricultural activities, residential areas, green spaces, industrial areas, and the presence of sea and water sports or leisure and the potential impact on the environment.

**Case Study "Trezza San Pietro" (PP7)**

**Representativeness of the site**



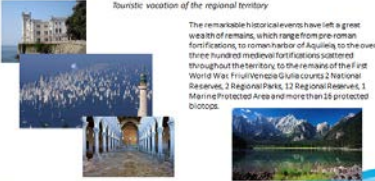
The considered site is only an example of the numerous sites of similar nature found in the widest part of the northern Adriatic. This means that a touristic package for divers designed for the "San Pietro" site could be replicated on other sites.

250 outcrops have been identified only in the Gulf of Trieste, between Punta Scutola and Punta Tagliamento; the most widespread range of these outcrops is on the seabed in front of the lagoons of Grado and Mirano 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)**

**Raurotic vocation of the regional territory**



The remarkable historical remains have left a great wealth of remains, which range from pre-Roman fortifications, to Roman history 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 15 protected biotopes.



**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**

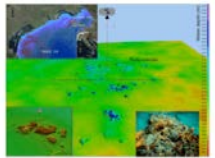


As an example, fishermen could be involved to draft the dives on the interior to offer a "double packaging": diving and fishing tours. The direct involvement of the fishing sector would make it possible to lighten the impact on these natural sites without damaging the fishermen's income. Another positive 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 Coda Octopus (Modem) will ensure the collection and transmission of water column parameters. The transmissions will occur in real time to a land-based receiver, with a 20-minutes frequency. The collected water column parameters will be: Temperature at surface, Temperature and salinity 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 analyzed with Image Analysis systems (PhotoQuad or similar), considering (1) coverage (cm<sup>2</sup>) 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: seasonal, with 3 replicates for each season (evaluate the best condition for diving. At least from spring to fall).




**Case Study "Trezza San Pietro" (PP7)**

**National Institute of Oceanography and Experimental Geophysics (OGG)**

**Diego Borne**

- Via Auguste Piccard 54, 34151 Trieste
- ogg@ogg.it
- +39 040 2140720
- www.italy-croatia.eu/ADRIREEF





## IVANA ORLIC KAPOVIC

### UNIVERSITY OF RJEKA, Rjeka (Croatia)





### CASE STUDY PLIĆ KONJSKO

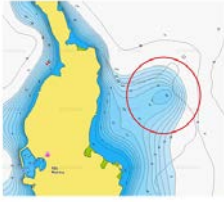
ADRIREEF

University of Rijeka, Faculty of Maritime Studies  
Scientific Workshop, Ancona, 8th December 2019

### PLIĆ KONJSKO

Location:

- in the northern part of the Adriatic Sea
- close to the north-eastern shore of Kik island
- on the western side of Vinodolski Kanal





Reef edge: 5.5 m  
Reef bottom depth: 20

Located between Rt Konjska and Rt Šilo, about 8 km SE of the Rt Šilo.

Area exposed only to North winds

Minimum distance from the coast: 150 m



The site of the reef is located outside commercial waterway areas and marine traffic is of low density

### COMMERCIAL ACTIVITIES

Because of the attractiveness of the reef and the small depth of the shallow reef, it is actively used as a dive site.

The major potential activities:

- diving activities,
- recreational fishing,
- boat excursion
- exposure underwater photo exhibitions,
- competitions and other activities allowing to diversify the local tourist offer



### MONITORING ACTIVITIES

Preliminary survey carried out:

- diving
- taking photos and video recording of the site - using of underwater camera
- collecting sediments and taking water sample



### MONITORING ACTIVITIES






### ANALYSIS RESULTS

Evaluation of human loads and tourist pressure – beach in the vicinity.  
Physical parameters – not observed any garbage  
Maritime traffic – recreational boats

Water Column parameters – limited  
Radar buoys

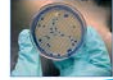
Benthic community settled on the reef and sediments – University of Zadar

### ANALYSIS RESULTS - Water column (WC) and sediment (S) chemistry

	Sediment			
	W1	S1	S2	S3
Phosphate (µg/g)	0.02	0.03	0.02	0.02
Ammonia (µg/g)	0.002	0.003	0.003	0.003
NO <sub>3</sub> (µg/g)	1000	9000	8000	1000
NO <sub>2</sub>	31.714			


- Fecal coliforms, E. coli were not detected





	W1	W2	W3	S1	S2	S3	W4
NO <sub>3</sub>	0.0016	0.0008	1.0001	0.0008	0.0014	0.0012	0.0012

- Water column analysis – ion chromatography

- Oxygen level - 158 µmol O<sub>2</sub> L<sup>-1</sup>



### 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 (order will be published in the week of November)





### TESTING




Organisation name: University of Rijeka, Faculty of Maritime Studies  
Contact persons: Vlado Francić



Address: Studenička 2, 51000 Rijeka, Croatia  
 Email: [vfrancic@fmr.hr](mailto:vfrancic@fmr.hr)  
 Telephone number: +385 91 511 4835  
 Website: [www.italy-croatia.eu/ADRIREEF](http://www.italy-croatia.eu/ADRIREEF)



## 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	-divulagation 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.

Criteria 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: 5<sup>th</sup> December, 2019

Dear Sir/Madam,

this brief questionnaire is conceived to collect feedback from the participants of the Adriareef 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?

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- 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*



## Feedback from CIVIL PROTECTION

### ANNEX II: COMMUNICATION FEEDBACK TEMPLATE (CFT)

#### ADRIREEF PROJECT

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  - e) Very Dissatisfied
  
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  - b. Very Satisfied
  - c. Somewhat Satisfied
  - d. Dissatisfied
  - e. Very Dissatisfied

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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*  
*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*

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## Feedback from ASSONAUTICA



ANNEX II: COMMUNICATION FEEDBACK TEMPLATE (CFT)  
ADRIREEF PROJECT

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- d. Dissatisfied
- e. Very Dissatisfied

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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*

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## 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

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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.*

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## Feedback from PORT AUTHORITY



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  
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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

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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 la tematica ambientale <sup>affiancato</sup> in questione in chiave di sviluppo economico e risorse da valorizzare per molteplici aspetti ancora da conoscere.

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## Feedback from COOPERATIVA MARE RICERCA



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  X

b) Very Satisfied

c) Somewhat Satisfied

d) Dissatisfied

e) Very Dissatisfied

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c. Somewhat Satisfied

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

a. Completely Satisfied  X

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e. Very Dissatisfied

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

a. Completely Satisfied  X

b. Very Satisfied

c. Somewhat Satisfied

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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

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## ANNEX 1 – Print Review