PUNTA MANARA survey project

Project for the enhancement of the submerged natural heritage of Punta Manara. 3D reconstruction of gorgonian forests.

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UNIVERSITÀ POLITECNICA DELLE MARCHE

MEDITERRANEAN SEA

Interreg MARITTIMO-IT FR-MARITIME

NEPTUNE

2002 2022 PORTOFINO DIVERS 20 YEARS

Presentation of the project

Coralligenous habitats are among the most typical biogenic assemblages on the Mediterranean basin. Even though its distribution is constrained to low light environments from 20 to 200 m and relatively constant environmental conditions as temperature, salinity and low turbidity, these communities host the highest level of biodiversity on the Mediterranean (Ingrosso et al., 2018; Zapata et al., 2016). These bioconstructions are aggregations created by the addition of layers of different calcareous organisms at different levels with generally a very low growth rate, modifying not only physico-chemical characteristics of the benthos but also enhancing biological dynamics (Cerrano et al., 2000; Ponti et al., 2016; Valisano et al., 2019).

The Tigullian Gulf is recognised as a site of ecological interest due to the variety and richness of the benthic assemblages present and the different ecological factors taking place on its strategic position in the Ligurian Sea (Morri et al., 1986). Ecological peculiarity of Punta Manara has been outlined in the area since the fifties with the first record of Savaglia savaglia on Italian coasts (Rossi, 1958), continued in the nineties with its establishment as a Special Area of Conservation (SCI), in order to protect the Posidonia oceanica meadows. And finally, on 2005, SCI boundaries were modified to include coralligenous habitats down to 80 m depth.

NEPTUNE is a project co-financed by the Italy France Maritime 2014-2020 cross-border cooperation program, aimed at promoting the sustainable development of underwater activities, guaranteeing and developing the protection of marine and coastal habitats of high naturalistic and cultural value.
Increasing knowledge about the underwater heritage is an indispensable condition for its protection: the added value of the project is to encourage sustainable underwater use, also through the use of new technologies.
Punta Manara is a little known and even less valued dive site. Our intent during the three days of the project is to check the health of the coralligenous and to monitor its progress through the aid of some standardized protocols and photogrammetry. Among the various objectives there is also the possible reporting and recovery of abandoned fishing gear.
Due to its richness in biodiversity, the site represents a potential point of interest for photography and nature diving enthusiasts. Enhancing it and making it usable means creating an alternative destination by reducing the pressure of divers on the nearby marine protected area of Portofino.

Objectives

In this project our efforts will be focussed on the assessment of the integrity of the vertical growth layer, mainly represented by the gorgonian Paramuricea clavata which is present in two of its chromotypes, often associated with dense populations of gold coral (Savaglia savaglia) and porifera (Axinella polypoides). The reason for this is the sensitivity of these gorgonian forests to both natural and human activities, specially to thermal anomalies and mechanical impacts caused by climate change and fishing impact respectively. These stresses have shown evident consequences on gorgonian's and sponge's populations over the last decades, leading to mass mortality events in some areas (Cerrano et al., 2005; Ponti et al., 2014).

Method

A wide range of approaches have been applied to describe the status of gorgonian forests, from structural to morphological and biomass metrics; but only in recent years, the development of new technologies has supported researchers with more suitable in-situ methodologies (Palma et al., 2018). Structure from Motion (SfM) photogrammetry is proposed as a suitable cost-effective technology, steamed from scientific and field experience over the past 10 years. An image-based 3D scene reconstruction method, that has reached a nice balance wide study area/high resolution relationship thanks to the recent developments on the field of computer vision and image processing, demonstrating accuracy and resolutions comparable to more expensive and sophisticated technologies.

Goals

- Obtain a permanent 3D record of the sessile communities present, being able to compare these reconstructions over the time to highlight changes.
- Record actual distribution of the gorgonians, paying special attention on the impact assessment, as damaged tissues ID and fishing net presence.
- Location of fishing-nets, estimating time of the impact and if possible, cleaning up of nets on the coralligenous of Punta Manara SCI area.

Activities

Study site: Punta Manara it is a wide promontory 15 km eastern from Portofino MPA. The rocky bottom is mainly built by big boulders coming from the upper cliff. The coralligenous starts on the rocky shoals at 24 m depth and developpes down to 85 m (Valisano et al., 2019).

Material:

- Underwater camera, e.g. sport cameras as GoPro.
- Ground control points (GCPs) and metric references.
- Underwater scooter is recommended to reduce sampling time and effort.
- Artificial light could be necessary in case of low light conditions.

Photogrammetric protocol: to produce accurate 3D models of the seascape and the associated communities on it, avoiding spatial biases, two kind of references will be used: Ground Control Points (GCPs) by GPS positioning to geo-referenciate the reconstructions and metric-scales will be deployed to scale the model. It is suggested to use bright contrasted colours, as white and black, to better recognise scale subdivisions. Once references are placed, it will be possible to start the survey approximately 1 meter above the substrate. Use of underwater scooter is recommended to cover wider areas during the sampling. Regarding camera settings, fix focal length and interval timer shooting are advised to enhance respectively standardisation and quality of the imaging. In terms of imagery collection, path will adapt to the sea bottom complexity following a zig-zag pattern, approximately having a 60 to 80% of overlapping between images and covering all possible perspectives of the benthic structure paying special attention where impacts or gorgonian forests are present. In behalf of diver's security, it is preferable to avoid high season on summer and always start sampling on the deepest part the scheduled transect (Fig.1) to be imaged.

About the processing of the images, different steps can be identified: a) image quality control b) colour correction, c) photogrammetric 3D reconstruction, d) scaling, e) georeferentiation and finally f) segmentation of the 3D reconstruction based on the present facies/impacts. Being developed in detail during the training course.

Expected results

- The first step would be the development of a training course by marine biologists from Reef Check Italy in order to familiarize volunteer divers with the main organisms of ecological interest on the area. During this course all necessary elements to conduct a standard SfM-based sampling would be addressed. Once the course is finished, the second step would be to carry out the fieldwork as described on the previous section.
- Distribution of the different facies present along Punta Manara benthos will be defined along with the identification of the impacted areas after obtaining the 3D output.
- A subsequent step would be to locate all fishing nets laying on the seabed and organise a clean-up operation where possible.
- Further steps on the future would be the construction of a restoration plan to define the best way of action in order to recover the integrity of the affected communities and the establishment of SfM-method as a regular monitoring tool on this area.
- Being the final aim of this project to propose Punta Manara as a Marine Protected Area (MPA) in the best interest of the proper management and protection of this vulnerable and relevant location.

TEAM

Participation is open to a maximum of 6 volunteers. There will be two teams in action, each consisting of a minimum of 2, a maximum of 3 divers each. The presence of at least one underwater video-photo operator and one diving instructor in active status is required in each team.

Calendario attività

Martedì 3 Maggio 2022

08.30 – 09.15 Presentazione delle facies e comunità target del protocollo.

9.15 – 10.00 Introduzione alla fotogrammetria e presentazione del protocollo standard di campionamento.

10.15 – 10.30 Formazione delle squadre di campionamento.

10.30 – 12.00 Check up di attrezzatura e strumentazione per il campionamento, e simulazione a secco del protocollo di campionamento.

14.30 1° immersione: Team 1 - familiarizzazione con il sito di immersione e predisposizione di transetti e Ground Control Points; Team 2 - familiarizzazione con il sito di immersione, localizzazione colonie di *Savaglia savaglia* e attrezzi da pesca abbandonati.

Mercoledì 4 Maggio 2022

8:00 - 9:00 Preparazione e pianificazione immersione

10:30 2° immersione: Team 1 - campionamento sui transetti posizionati il giorno precedente, rilievi di dettaglio di aree predefinite (ES: 2 aggregazioni *Savalia savaglia* vs 2 aggregazioni *Paramuricea* vs 2 aree senza colonie arborescenti vs 2 aree con *Axinella polypoides*) ; Team 2 - rilevamenti sui siti maggiormente impattati da reti e lenze da pesca abbandonate.

14:30 - 17:30 Debrienfing e preparazione equipaggiamenti per il giorno seguente.

Giovedi 5 Maggio 2022

8:00 - 9:00 Preparazione e pianificazione immersione

10:30 3° Immersione: Team 1 e Team 2 - come immersione del giorno precendete, scambio di ruoli.

14.30 - 17:30 Analisi e interpretazione di immagini e ricostruzioni ottenute durante i rilievi effettuati.

Participations costs *

€ 350 per diver (* based on a team of 6 volunteers), including:

- diving logistic and support
- training in the photogrammetric protocol and scientific coordination

Minimum participation requirements

- Normoxic trimix diving certificartion (50 meters) in open circuit and / or rebreather.
- 150 logged dives, at least 30 carried out in the range of 40-50 meters with 30 minutes of decompression and beyond.
- The presence of at least one active diving instructor is required for each team.
- Priority will be given to divers who are familiar with standardized submerged coastal environment monitoring protocols.

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Annesso

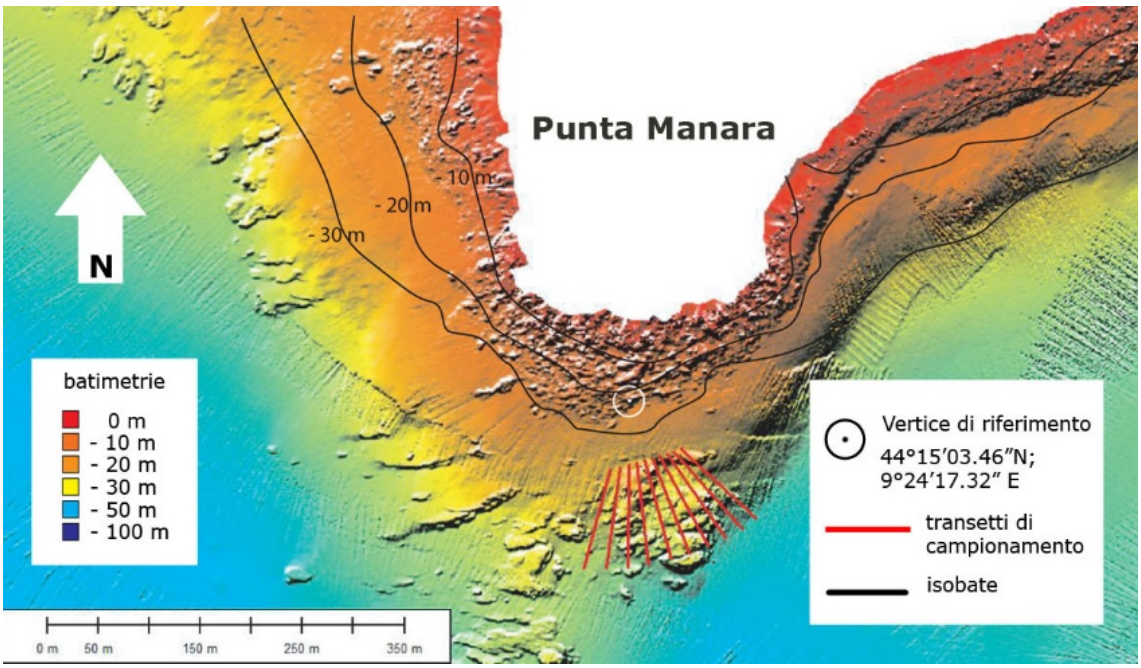

Fig.1: Mappa del sito di studio (La mappa è stata creata da S. Coppo e G. Diviacco (Regione Liguria) con L. Tunesi (ISPRA) tramite rilievi multibeam, nell'ambito di la caratterizzazione dei fondali della Liguria).