

# Periodic Newsletters

Activity 2.2 – Media Relations and Publications  
WP2 - Communication activities  
SUSHI DROP project (ID 10046731)

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## Abstract

SUSHI DROP SUstainable fiSHeries wIth DROnes data Processing is a project financed by European Union through the Interreg Italy-Croatia Programme. The project aims at enhancing knowledge on accurate and non-invasive methods for mapping the marine ecosystems of Adriatic Sea, in order to assess environmental status of habitats and fish stocks population as reliable and up-to-date information about the state of marine resources are essential to support sound management decisions.

The most important goal of SUSHI DROP is to better understand the sensitivity of the habitats to fishing pressures and to design and implement more effective marine management plans. SUSHI DROP evaluates the adoption of drones (UUVs - unmanned underwater vehicles) equipped with sensors to monitor physical, chemical and biological features. In particular, acoustical and optical technologies will be employed as a non-invasive mean to assess fish stocks population.

The findings of the opto-acoustic surveys will be compared with classical procedures based on fish sampling and to assess the accuracy in deriving single-species abundance indices (in numbers or weight) for direct input into stock assessments. The data gathered during the project will be collected in a Geographical Information System known as GIS.

It will serve as an open database for collecting, maintaining and sharing the scientific data acquired by the UUVs and as a useful resource in further research and preservation of the biodiversity of the Adriatic.

The partnership of the project has been able to pool all skills and competences of relevant institutions in order to achieve the set of project results, having the capacity to create strong links to target groups addressed by the project.

This document is the deliverable **D.2.2.5 Periodic newsletters (two per year)** published on the website and printable, a means for reaching a wide audience with summary information, keeping stakeholders as well as the wider public up to date with the latest development of the project.

## The SUSHIDROP Project Newsletters

**PP2 - Marche Region, Fisheries Economy Department** was in charge for the realization and the dissemination of the project newsletters while all the Partners were invited to contribute to the content development according to their competences and to the tasks implemented within the project.

The project partners should promote the action and the results by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner. It is important to go beyond the project's own community for reaching out to society, showing how the innovation realized and tested could contribute to improve marine ecosystem and biodiversity thus having an impact on citizens' life as well.


Project Newsletter has been conceived to:

- raise awareness about the project;
- inform target groups about the progress of the project;
- invite target groups and interested public to all project events;
- facilitate all partners of the project to foster new partnerships and capitalize the project achievements.


### #First SUSHIDROP Project Newsletter

The first newsletter has been sent out on the 15<sup>th</sup> of December 2020 and provided for detailed information on:

- Italy and Croatia Partners in the SUSHIDROP project
- The Sushidrop drone overview
- Aim of the SUSHIDROP collected data
- The Open database that could be set up
- Information about the first survey at sea
- Information about next project events




[SITO WEB](#)



**SUSHI DROP**

Sustainable fISHeries with  
DROnes data Processing


NEWSLETTER #1



**ITALY AND CROATIA PARTNERS IN THE SUSHIDROP PROJECT**

An Italian-Croatian team is working at the realization of an underwater Drone to the final aim of protecting the environment using innovative underwater technologies

[read more](#)



**THE SUSHIDROP DRONE OVERVIEW**

Thanks to the **UUVs (Unmanned Underwater Vehicles)** equipped with specific sensor, the challenge is to improve our knowledge of the seabed and the benthonic communities in order to correctly assess and manage the pressure and the impact of human activity on these key environmental elements of the marine ecosystem

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### A RELEVANT IMPROVEMENT IN CONSERVATION AND FISHING MEASURES

All information collected by the SUSHIDROP Drone will enable an implementation of targeted conservation measures, such as the possible establishment of new protected areas or Nature 2000 sites also taking into consideration the numerous human activity concentrated in specific areas, such as fishing, aquaculture and tourism.

[read more](#)

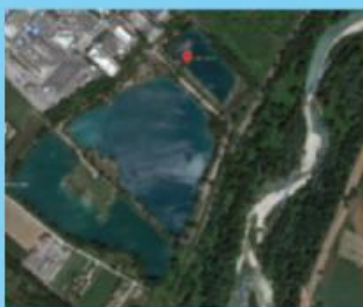


### AN OPEN DATABASE AVAILABLE ON LINE

The data collected during the sampling



campaigns carried out using the drone, and the related estimates associated with the abundance indices for the population of species will be inserted in an open database, to be made available online at disposal of researchers, NGOs, blue economy operators and policy makers.



### THE FIRST DRONE TEST COMING SOON!

The first drone test will occur in Marche Region during the next months. In detail, the testing will take place in an area near the city of Fano, where there is the presence of ex artificial gravel mining lakes.

[read more](#)

## NEXT EVENT



### ON LINE MEETING

16th december 2020

ore 15:00 - 18:00

Innovation Projects in Marche Region for the development of a more sustainable and competitive Fisheries and Aquaculture

THE EVENT WILL BE HELD IN ITALIAN LANGUAGE



Progetti di innovazione nella Regione Marche per lo sviluppo di una filiera della pesca e dell'acquacoltura più competitiva e sostenibile

EVENTO IN LINGUA ITALIANA

[Programme](#)

[Registration](#)



## SUSHI DROP TEAM

The work of SUSHIDROP team is the results of a coordinated collaboration among researchers from different disciplines to better understand and address the complex project challenges aimed to set up a customized unmanned underwater vehicle equipped with acoustical and optical technologies in order to implement a non-invasive method to assess environmental status of habitats, fish stocks population and, in general, to monitor the biodiversity of marine ecosystems.

**The University of Bologna** coordinated the project with the participation and contribution of researchers from different department:

- Laboratory of Marine Biology and Fishery located in Fano
- Department of Electrical, Electronic, and Information Engineering
- Department of Civil, Chemical, Environmental and Materials Engineering

Furthermore, the activities are implemented jointly with the researches of **the Institute of Oceanography and Fisheries**, located in Split.



LABORATORY OF MARINE BIOLOGY AND FISHERY  
University of Bologna



INSTITUTE OF OCEANOGRAPHY AND FISHERIES  
Split, Croatia

### LEAD PARTNER CONTACT

Alma Mater Studiorum - University of Bologna  
Contact person: Luca De Marchi  
Email: l.demarchi@unibo.it

## THE UNIVERSITY OF BOLOGNA

Here below the presentation of the interdisciplinary team working on the SUSHIDROP activities:

Luca De Marchi



project coordinator

Luca De Marchi is Associate Professor in Electronics at Alma Mater Studiorum – Università di Bologna. He received the Dr.Eng. and Ph.D. Degrees in Electronic Engineering respectively in 2002 and 2006 from the same University. He prepared his Master Thesis in Digital Signal Processing and ASICs Design at the Technical University of Berlin (TUB). At the end of 2011, he joined the Department of Electrical and Information Engineering (DEI) at the University of Bologna where he is leading the Intelligent Sensor Systems research group. Since 2002, he is also with the Advanced Research Center for Electronic Systems

(ARCES). His research interests are in embedded systems for vibration, acoustic and ultrasonic inspections, with particular emphasis on structural health monitoring applications. In this field, he has published more than 150 papers in international journals or in proceedings of international conferences, and holds two patents.

He is the Principal Investigator of SUSHIDROP and specifically involved in the development of the drone technologies.

Luca Vittuari



Luca Vittuari is full professor of Geomatics at the Alma Mater Studiorum – Università di Bologna, concerning offshore environment, he is lecturer in two courses (Applied geomatics for offshore engineering, and Monitoring and positioning in offshore engineering) within the master's Course of the University of Bologna in Offshore Engineering. Before starting his work at University, Luca worked offshore on the laying of pipelines, platforms and for geophysical prospecting campaigns. He has more than 20 years' experience in the application of high precision geodetic techniques for the measurements of movements and deformations of the soil, kinematic precise positioning and 3D surfaces

reconstruction using photogrammetry, laser scanning and high-resolution images acquired by RPAS, aircrafts or satellite. He participated in ten scientific expeditions in Antarctica and one in Arctic and was responsible for the implementation of the GPS geodetic control network for the EPICA and TALDICE drilling sites. He participated within the International Trans-Antarctic Scientific Expedition (ITASE) activities and he is responsible for the GNSS permanent station installed at Station Concordia.

He is involved in SUSHIDROP project for the geomatics aspects such as precise positioning, photogrammetry and mapping.

#### Paolo Castaldi



Assistant Professor Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi" Academic discipline: Systems and Control Engineering . He took his PhD in System Engineering at University of Bologna where currently is Assistant Professor. He teaches the courses of "Automatic Flight Control" (second level degree) and "Automatic Control" (first level degree) He has been member and Ph.D. student's supervisor for the Ph.D. board of the European Doctorate course in Information Technology and of the doctorate course in biomedical, electrical and system engineering He is vice chair for education of the Technical Committee on Aerospace of IFAC. He is member of ARCES (Advanced Research Center on Electronic Systems for Information and Communication Technologies). He is member of the National Institute for Nuclear Physics.

He has been national coordinator of the project "Development of a CUAV (Civil Unmanned Aerial Vehicle) for testing new guidance and FTC algorithm for mission and patrolling in hostile environment" and coordinator of the project T-

RECS (Traffic Report with Enhanced Control of (Airport) Surface), with the industrial partner VITROCISET s.p.a.

He was a member of the board of the European Project SHERPA and now is a member of the H2020 project SWAMP and SUSHI.

Paolo Castaldi is author of more than 140 articles published on International Journals and on the proceedings of International Congresses and author of a research book. He has been also, plenary speaker, program chair and co-organizer of international congresses, organizer and chair of several invited sessions.

He is Associated editor of Control Engineering Practice (Elsevier) and designated editor of Adaptive Control and Signal Processing ( Wiley) and of Applied Mathematics and Computer Science . He is outstanding reviewer of several journals including Control Engineering Practice; Transactions CST, TAC, IE; Automatica.

Finally, he has the licence as Private Pilot (PPL) and is the coordinator of several permit to fly procedure with the national authority for civil aviation.

#### Alessandro Lambertini



Since his master's degree in civil engineering at the University of Bologna, Alessandro became interested in geomatics, the discipline that studies the survey, analysis, integration, processing and management of geographic information. He later obtained a PhD title at the Department of Civil, Chemical, Environmental and Materials Engineering (DICAM) discussing his thesis "Innovative use and integration of remote sensed geospatial data for 3D city modeling and GIS urban applications" in 2017.

In recent years he has continued his activities as a research fellow focusing on geomatics research and the treatment of geographic data applied in the context of various competitive European projects thanks to his skills in Geographic Information Systems (GIS) and interests in drone technology (UAV: Unmanned Aerial Vehicle). He is now a GIS teacher, a

licensed UAV pilot and an outdoor enthusiast. Author of dozens of scientific publications in international journals and national and international conference proceedings.

He is involved in SUSHIDROP project with aim at developing methodologies of analysis and modeling of acoustic and optical georeferenced survey. He will use geomatics techniques such as photogrammetry and Structure from Motion to process the heterogeneous and multi-sensor 3D data surveyed by the project Unmanned Underwater Vehicle.

His goal is to transform the raw multi-sensor data into significant geographic information as fundamental elements that constitute a geodatabase in a GIS environment for the characterization of the marine ecosystem at different resolution.

#### Emanuele Mandanici



Emanuele Mandanici has a PhD in Geomatics and Transportation Engineering from the University of Bologna (Italy). Now, he is assistant professor at the Dept. of Civil, Chemical, Environmental and Materials Engineering (DICAM) of the University of Bologna. His research activity, which pertains to the disciplines of Geomatics and Remote Sensing, concerns the development of methods for the acquisition and processing of geospatial information, to address problems of environmental monitoring and sustainability, energy efficiency in urban environments, study and preservation of cultural heritage sites.

Emanuele is author of more than 40 scientific publications and has been involved in different European and National research projects.

He participates to the SUSHIDROP project for the Geomatics aspects related to image processing and georeferencing, photogrammetry and mapping.

#### Margherita Norbiato



Margherita Norbiato is a biologist and currently the financial manager of SUSHIDROP project. She works in the INTERREG and LIFE projects office of Alma Mater Studiorum - University of Bologna, where she also deals with the financial management of other INTERREG projects. Margherita has experience in designing LIFE projects and has worked as a researcher in various LIFE "Nature and Biodiversity" projects in the field of conservation of animal species included in the Habitat Directive and European Red Lists.

As a researcher, she has carried out various wildlife and floristic researches in some Italian protected areas. She has been collaborating for many years with the Natural History Museum of

the University of Florence (Italy), where she mainly deals with entomological research, and she is author of several scientific papers in international and national journals in the field of entomology and conservation biology. She has the qualification of "Expert Technician in programming faunistic-environmental interventions" for the Emilia-Romagna Region (Italy). Margherita has a strong interest in everything related to the natural environment and she held public seminars to raise awareness of environmental issues, such as the protection of endangered species, the importance of safeguarding biodiversity and mitigating climate change.

### Jacopo Cimini



Jacopo Cimini is a marine scientist at the Marine Biology and Fishery Laboratory of Fano - Bigea Department.

He obtained a BSc in Natural Sciences at the University of Bologna, and then graduated in MSc in Marine Sciences at the University of Genova.

His current field of research is the analysis of fishery resources with the MEDITS survey programme (International bottom trawl survey in the Mediterranean) for GSA17 (high and medium Adriatic) and is a research fellow for the Sushi-drop project.

He participates to the SUSHIDROP project for the Biological and Ecological aspects. The main aim is to assess the accuracy and efficiency at the fishery level of the optoacoustic surveys carried out by UUVs in deriving single-species abundance indices (in numbers or weight) for direct input into fishery stock assessment and management. Furthermore, evaluate the benefits brought by these new technologies (e.g. UUVs) with regard to the classical procedures of fishes sampling.

### Massimiliano Menghini



Massimiliano Menghini has a master's degree in Aerospace Engineering from the University of Bologna (Italy). His Master's thesis is titled: "Unknown Input Observer based Quadrotor Fault Detection and Isolation using Kinematic Model". Before the achievement of the master's degree, he started working as a collaborator in H2020 European Project called SWAMP (Smart Water Management Platform) in the field of precision farming. In particular, he was involved in the acquisition and analysis of multispectral images through autonomous aerial vehicle. Nowadays, he is research fellow of SUSHIDROP project. His research activity is mainly based on Automatic Control of autonomous vehicles, concerning the research

and development in multivariable control and fault detection algorithms of actuators and sensors to address the problem of efficiency, sustainability, and reliability in autonomous vehicles.

**INSTITUTE OF OCEANOGRAPHY AND FISHERIES, SPLIT, CROATIA**  
 Laboratory of Fisheries Science and Management of Pelagic and Demersal Resources

Here below the presentation of the interdisciplinary team working on the SUSHIDROP activities

**Nedo Vrgoč**



Director of the Institute of Oceanography and Fisheries

Project manager

Nedo Vrgoč is project manager in SUSHIDROP and expert in fisheries science with special attention to demersal and deep sea communities. Besides being the project manager, he is also Head of Laboratory of Fisheries Science and Management of Pelagic and Demersal Resources, scientific advisor, director of the IOF and professor at the University of Split. Nedo has advanced knowledge in population dynamics,

assessments and biology of fishes, cephalopods and crustaceans and he also is a STECF adviser, Croatian representative in Scientific Advisory Committee of GFCM, etc. classical procedures of fishes sampling.

**Igor Isajlović**



Scientific associate in Laboratory of Fisheries Science and Management of Pelagic and Demersal Resources

Communication manager

Igor Isajlović is communication manager in SUSHIDROP and expert in fisheries science with special attention to demersal and deep sea communities. Advanced knowledge in population dynamics, assessments and biology of fishes, cephalopods and crustaceans. Associate researcher in numerous scientific

and monitoring studies dealing with demersal resources. Expert in bottom trawl and towed underwater television (UWTV) sampling techniques and processing of UWTV data.

#### Petra Lukić



Associate in Laboratory of Fisheries Science and Management of Pelagic and Demersal Resources

Financial manager

Petra Lukić is a marine biologist and financial manager for IOF in SUSHIDROP project. She works in in Laboratory of Fisheries Science and Management of Pelagic and Demersal Resources where she also deals with the financial and communication management of other INTERREG projects. Petra has experience in DCF (Data Collection Framework) project - European Community framework for the

collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy (CFP) and MEDITS scientific survey (Mediterranean International Bottom Trawl Survey).

#### Danijela Bogner



Senior scientific associate in Laboratory of Chemical Oceanography and Sedimentology of the Sea

Staff

Employment: from 1993 as marine geologist in Laboratory of chemical oceanography and sedimentology of the sea, Institute of Oceanography and Fisheries, Split, Croatia. Research interests is sediments as well as the

use of echo sounder data to interpret seabed sediments. She is involved in SUSHIDROP project for mapping and data evaluation for strategies to improve ecosystems and biodiversity conservation.

#### Ivan Cvitković



Scientific associate in Laboratory for Benthos Staff

Dr. sc. Ivan Cvitković works in Laboratory of benthos, Institute of Oceanography and Fisheries in Split, Croatia, as a senior research scientist. His main research interest is zoobenthos, with special focus on ecology of benthic communities, biodiversity, distribution and abundance of benthic invertebrates and alien species. He is also involved in several EU fishery projects like SoleMon (Evaluation of stock of *Solea vulgaris* in the central and northern Adriatic Sea and impact of the

different fishing activities) and MEDITS (Mediterranean International Bottom Trawl Surveys) where he is analysing discard and state of epifauna on trawling grounds. He also participated in development of the MSFD in Croatian waters (Initial assessment, GES and Monitoring Programme in Croatian waters under descriptors D1 and D6) and in many other EU and national projects. His interest is also diving and underwater photography.anean International Bottom Trawl Survey).

#### Marija Despalatović



Scientific associate in Laboratory for Benthos Staff

Marija Despalatović is senior research scientist, with PhD in Biology, at the Institute of Oceanography and Fisheries in Split, Croatia. She works on marine zoobenthos, with special focus on benthic communities, biodiversity, distribution and abundance of benthic invertebrates and alien species; changes in benthic communities in coastal and open waters in the Adriatic Sea under anthropogenic influence and climate changes impact. She is involved in several national and EU projects.

The cartography of the two studied sub-areas will be compared with the maps drawn of the benthic community. In cooperation with the administrative institutions (Region and County) and the NGO and GAC, that already have experience in marine areas management, proposal of integrated management to protect biological community of the Adriatic will be draw up in order to improve ecosystems and biodiversity conservation.





## THE SUSHIDROP DRONE OVERVIEW

### SUSHI DROP PROJECT

Thanks to the **UUVs (Unmanned Underwater Vehicles)** equipped with specific sensors, the challenge is to improve our knowledge of the seabed and the benthonic communities in order to correctly assess and manage the pressure and the impact of human activity on these key environmental elements of the marine ecosystem

«**This equipment** – says Luca De Marchi, Electronic Engineer from the University of Bologna and coordinator of the Sushi Drop project – **will allow us to monitor the ecosystems characteristic of the upper-middle part of the Adriatic Sea, which are the most interesting for us because of their highest biodiversity so as to be considered as a real „nursery“ for many species**»

#### LEAD PARTNER CONTACT

Alma Mater Studiorum - University of Bologna  
Contact person: Luca De Marchi  
Email: [L.demarchi@unibo.it](mailto:L.demarchi@unibo.it)

European Regional Development Fund

<https://www.italy-croatia.eu/sushidrop>

## Description

SUSHIDROP project is focused on the adoption of **Unmanned Underwater Vehicles (UUVs)** equipped with sensors to monitor physical, chemical and biological parameters of the Adriatic Sea. The system will allow us to monitor its environmental status and estimate in particular fish abundance indices in marine areas characterized by rocky reefs and deep waters, where the most common sampling techniques used to monitor fish assemblages are inefficient or inapplicable.

A strong accent is kept on the characterization of the ecology of larval and juvenile stages and stock recruitment relationship of small pelagic and demersal fish relevant for fisheries. An open platform will also be developed which will make the habitat mapping data available.

## SUSHIDROP Introduction

Reliable and up-to date information about the state of marine resources is essential to support sound management decisions for the protection of ecologically important areas. Conventional fish capture procedures are extremely onerous in terms of human resources, besides being extremely invasive for the ecosystem they are meant to monitor: the capture of many non-targeted organisms can be high and unacceptable. For this reason, the use of capture methods such as trawls are prohibited in Marine Protected Areas.

Thus, there is an urgent need to develop accurate and non-invasive methods for mapping the marine ecosystems to establish their condition, extent and geographical location. The urgency of such need is highlighted in the EUSAIR Action Plan and also in the Strategic Research and Innovative Agenda of the BLUEMED Initiative. In this context the SUSHIDROP proposal will evaluate the adoption of drones i.e. unmanned underwater vehicles (UUVs) equipped with sensors to monitor physical, chemical and biological features. The UUV technology has evolved over the last few years, from simple demonstrators developed by research institutes to commercial products.

Nowadays applications in environmental researches and ecosystems monitoring are emerging, thanks to the capabilities offered by UUV of carrying out researches without interfering with the seabed and at reduced costs, if compared to the use of oceanographic vessels.

Within SUSHIDROP, a customized UUV will be developed and equipped with acoustical and optical technologies in order to implement a non-invasive mean to assess environmental status of habitats, fish stocks population and, in general, to monitor the biodiversity of marine ecosystem. We are planning to assess the accuracy of the opto-acoustic surveys in deriving single-species abundance indices (in numbers or weight) for direct input into stock assessments, and to evaluate the benefits brought by these new technologies with respect to the classical procedures based on fish sampling.

Moreover, a dedicated open-access database system will be created to collect, maintain and share the scientific data acquired by the UUVs.

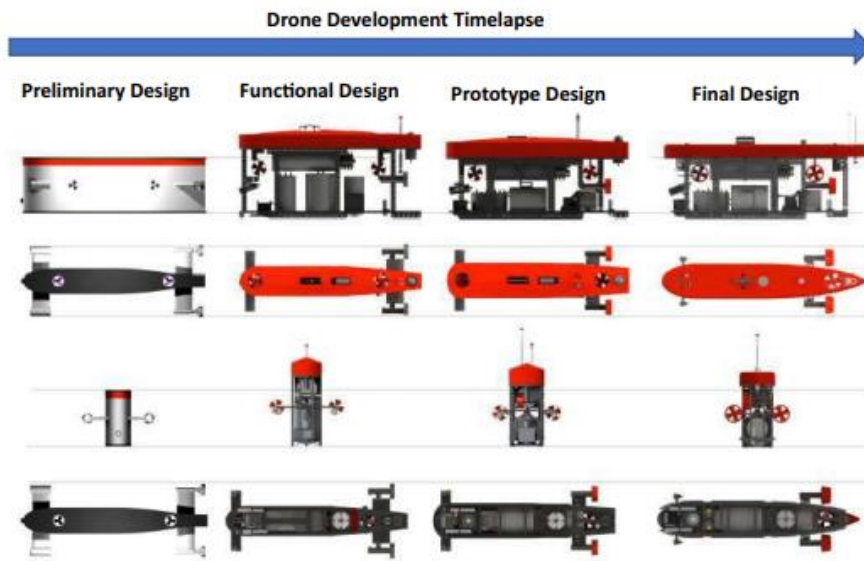
The final aim is to combine the georeferenced information gathered by the UUVs and the one related to the spatial extent and patchiness of fishing pressures to better understand the sensitivity of the habitats to those pressures and to design and implement more effective marine management plans. The development of such sensitivity analyses is becoming a priority for the preservation of the biodiversity in the Adriatic Sea



### SUSHIDROP Drone's Overview

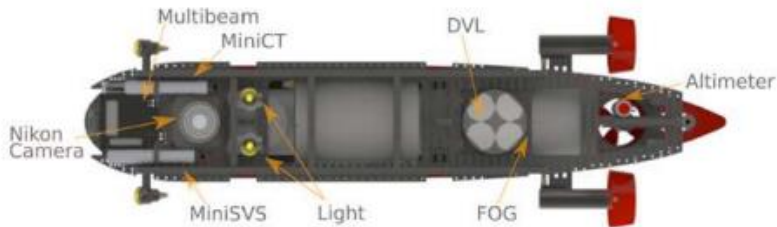
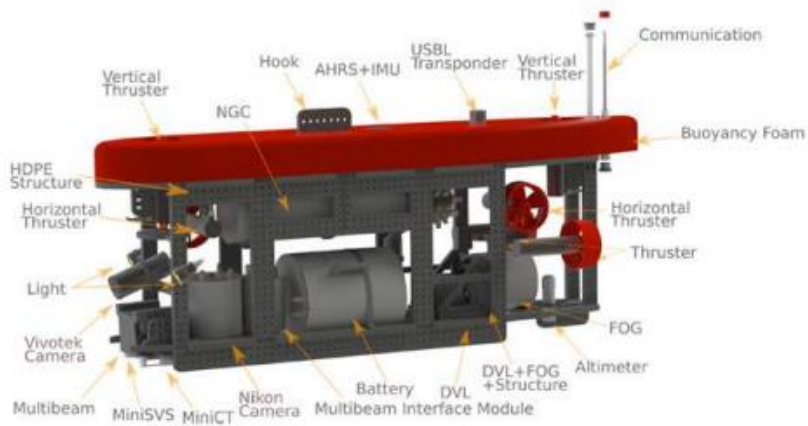
The project overall objective is the implementation of an UUV-based sensing system capable to characterize benthic habitats in deep waters with acoustic and optical instruments. Such system will allow to monitor the environmental status and estimate fish abundance indices in Marine Areas characterized by rocky reefs and deep waters, in which the classical fish sampling procedures are ineffective or inapplicable.

Operative Depth:	150m (300m max)
Weight:	205 Kg
Operative Mission Time:	8 hours
Number of Thrusters:	<ul style="list-style-type: none"> <li>• 4 Horizontal (2longitudinal, 2 Lateral)</li> <li>• 2 Vertical</li> </ul>
Navigation Mode:	<ul style="list-style-type: none"> <li>• Remotely operated (ROV)</li> <li>• Autonomous (AUV)</li> </ul>
Scientific Data:	<ul style="list-style-type: none"> <li>• Bathymetry</li> <li>• Water Columns</li> <li>• Bottom Photos</li> <li>• Front Videos and Photos</li> <li>• Salinity</li> <li>• Temperature</li> <li>• Pressure</li> <li>• Sound Velocity</li> </ul>



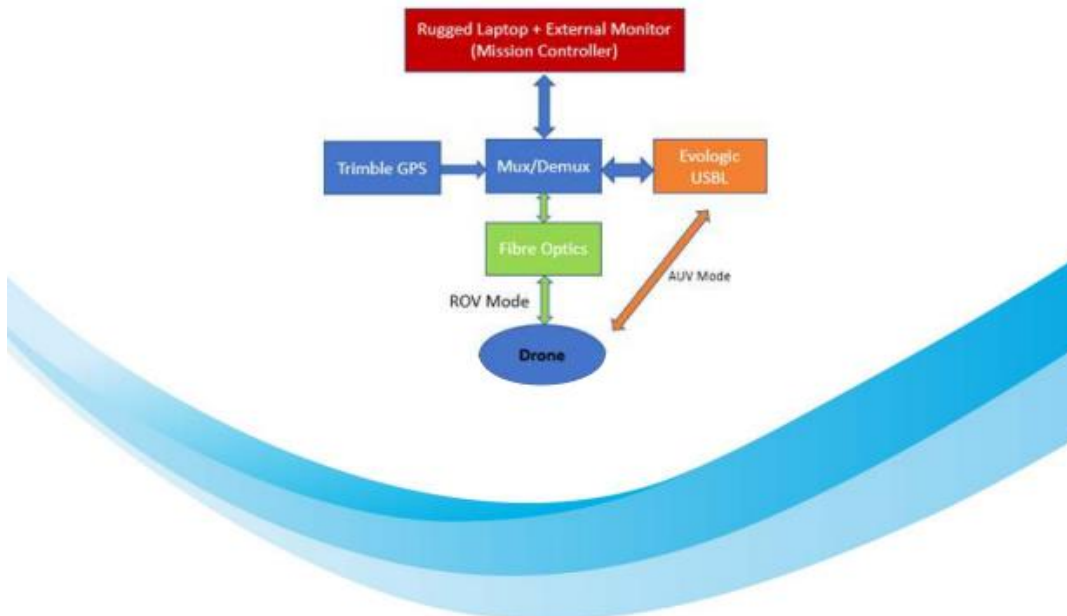
### SUSHIDROP Drone Main Subsystems

The drone is a smart system consisting of a multitude of components and subsystems to handle specific activities, as you can see in figures below.



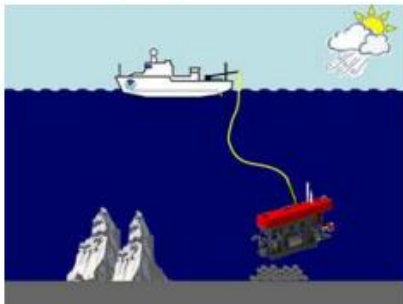
The Drone can be classified into the following main subsystems:

- Navigation, Guidance and Control Subsystem (NGC): this subsystem is the beating heart of the drone, indeed it manages all the subsystems on board the vehicle. In particular the NGC Subsystem manages the sensors for inertial navigation (Doppler Velocity Log (DVL), Fiber Optic Gyroscopes (FOG), Inertial Measurements Unit (IMU), Ultra Short BaseLine (USBL)), the sensors for communications with the Ground Station (fiber optic, USBL, Comms sensors), the controllers of the thrusters and all the scientific payloads on board the vehicle.
- Scientific Payloads: this subsystem includes all the components designed for the geophysical, biological and bio-marine characterization of the Adriatic Sea. The following components are considered part of this subsystem:
  - Multibeam
  - Nikon Camera (bottom looking)
  - Vivotek Camera (Forward Looking)
  - Mini Sound Velocity Sensor
  - Mini Conductivity Temperature Sensor
  - Altimeter
- Ground Station subsystem: this subsystem allows communication, supervision and guidance of the drone during the missions. It allows to monitor the mission phases and the health status of the drone. Via the ground station is possible to command the drone using two modes of guidance: Remotely operated (ROV Mode) and Autonomous operated (AUV Mode). In the following is reported the Architecture scheme of the Ground Station:



## SUSHIDROP Drone Navigation Mode

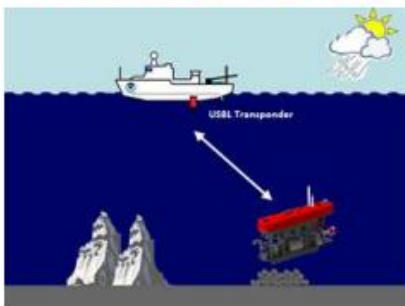
### Remotely Operated Vehicle



In ROV Navigation mode, the drone is connected to the ship via fiber optics and is directly controlled by the User. This type of navigation is required for close-range inspections and where maximum accuracy is required:

- Fish nests inspection
- Underwater Structure Inspections
- Visual inspections of marine flora (corals)
- Close seabed inspections

### Autonomous Underwater Vehicle Mode (AUV Mode)



In Autonomous Navigation mode, the drone is freely to navigate using the on-board instrumentations (Dead reckoning navigation) and it can follow trajectories uploaded by the user before the mission. The Drone communicates with the ship with the acoustic communication system (USBL Transponder). Autonomous navigation is required during the Multibeam and bottom Camera Data Surveys.

## Scientific Payload -Multibeam



The drone is equipped with a R2Sonic 2020 Multibeam EcoSounder which allows the acquisitions of bathymetric data of a very large areas. The data outputs are:

- Bathymetry
- WaterColumn

The bathymetry data allows to have an idea of the seabed morphology by means of 3D reconstruction of the multibeam acoustic data.

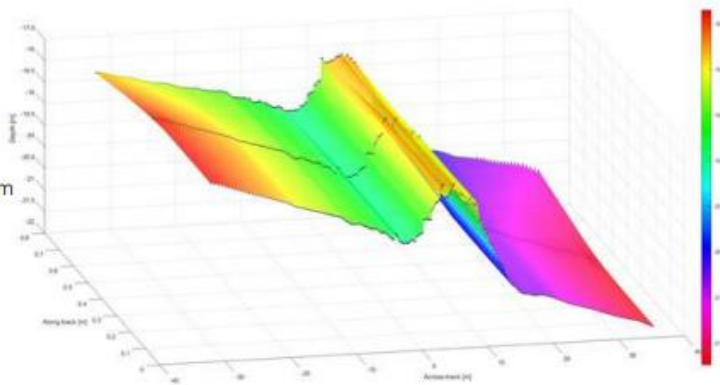


Figure 1 Bathymetry

The water column allow to display what is lying between the seabed and the transducer. These include features such as fish and gas bubbles

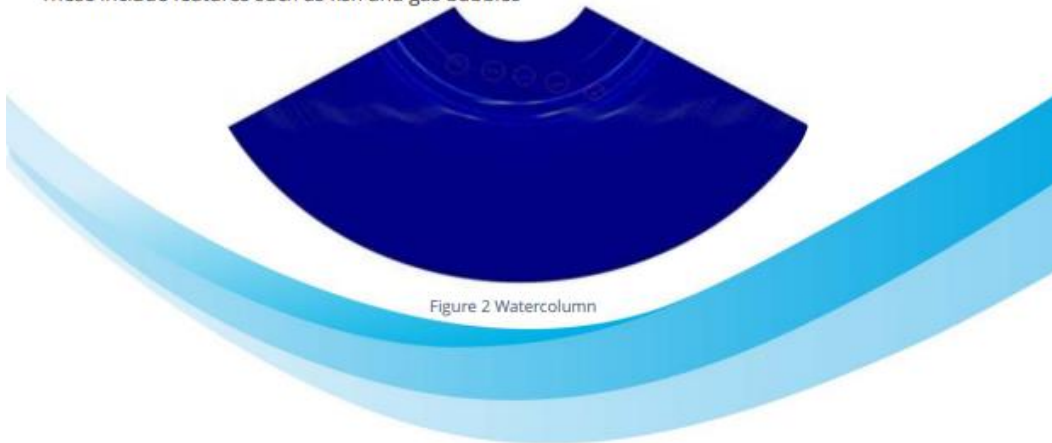


Figure 2 Watercolumn



## Scientific Payload - Cameras

The drone is equipped with two High-Resolution Cameras:

- **Bottom Camera:** used to texturize 3D bathymetric reconstruction with High Resolution RGB Images
- **Pilot Camera:** used for pilot and acquire photos and videos of the surrounding environment both during Autonomous and ROV missions



## Scientific Payload – Underwater Environment characterization

The drone is also equipped with devices capable of characterize the physical quantities of the underwater environment:

- **Mini CT:** it measures the conductivity and the temperature of the medium
- **MiniSVS:** it measures the Sound Velocity and the Pressure of the medium

Through these data it is possible to model the underwater environment of the whole water column



### Photos components/structure



Figure 3 Canisters



Figure 4 iXblue FOG (Fyber Optic Gyroscopes)



Figure 5 Fyber optic cable + winch



Figure 6 R2Sonic 2020 Multibeam



Figure 7 Spot Led



Figure 8 Main Computer Navigation Guidance Control (NGC)



Figure 9 Nortek Doppler Velocity Log (DVL)

# SUSHI DROP

SUstainable fiSHeries with  
DROnes data Processing



## A RELEVANT IMPROVEMENT IN CONSERVATION AND FISHING MEASURES

### DESCRIPTION

All information collected by the SUSHIDROP Drone will enable an implementation of targeted conservation measures, such as the possible establishment of new protected areas or Nature 2000 sites also taking into consideration the numerous human activity concentrated in specific areas, such as fishing, aquaculture, tourism, and the extraction of hydrocarbons, pollutants, and the risks caused by global warming.

SUSHIDROP project is focused on the adoption of **Unmanned Underwater Vehicles (UUVs)** equipped with sensors to monitor physical, chemical and biological parameters of the Adriatic Sea. The system will allow us to monitor its environmental status and estimate in particular fish abundance indices in marine areas characterized by rocky reefs and deep waters, where the most common sampling techniques used to monitor fish assemblages are inefficient or inapplicable.

A strong accent is kept on the characterization of the ecology of larval and juvenile stages and stock recruitment relationship of small pelagic and demersal fish relevant for fisheries. An open platform will also be developed which will make the habitat mapping data available.



## Scientific Payload -Multibeam



The drone is equipped with a R2Sonic 2020 Multibeam EcoSounder which allows the acquisitions of bathymetric data of a very large areas. The data outputs are:

- Bathymetry
- WaterColumn

The bathymetry data allows to have an idea of the seabed morphology by means of 3D reconstruction of the multibeam acoustic data.

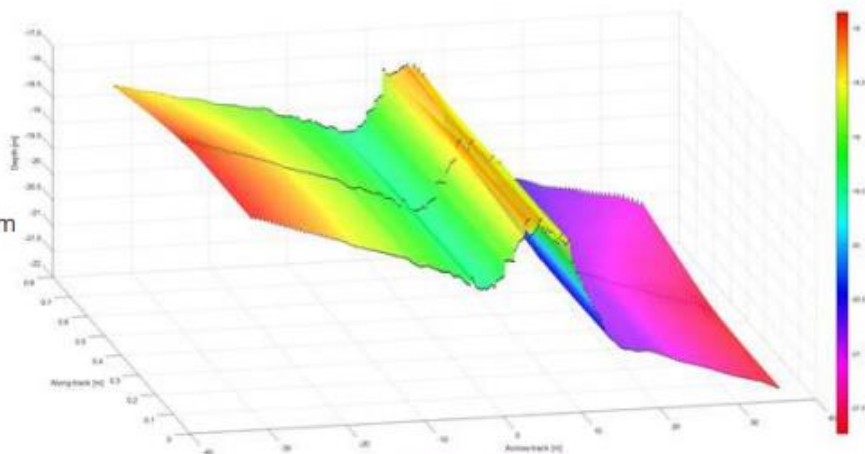
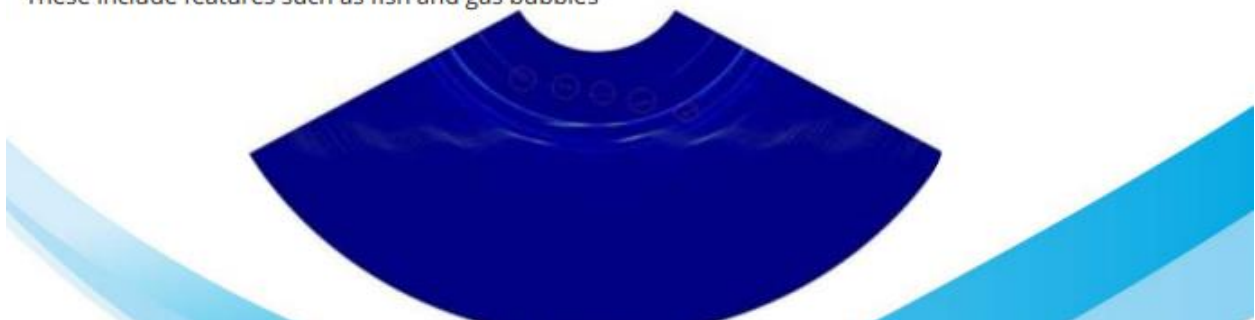


Figure 1 Bathymetry

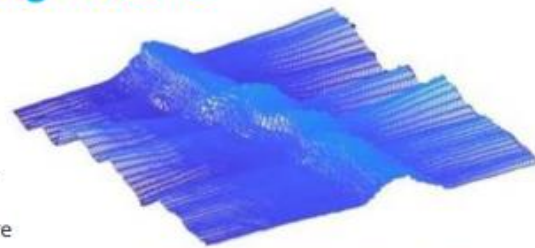
The water column allow to display what is lying between the seabed and the transducer. These include features such as fish and gas bubbles



## SUSHIDROP Multibeam Post-Processing Software

The aim of the SUSHIDROP project is to develop an AUV (Autonomous Underwater Vehicle) equipped with MultiBeam EcoSounder (MBES) and other additional sensors for the geophysical, biological and biomarine characterization of the underwater environment.

In this framework, in order to analyze the large amount of data that will be gathered during the Sea Missions throughout the Multibeam R2Sonic 2020, it was necessary to develop a software for the acquisition and processing of these data.

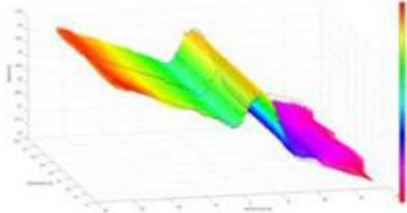


Bathymetry 3D reconstruction of real data

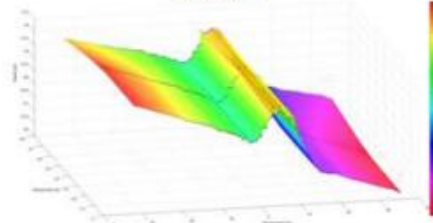
### Bathymetry and Water Column Post Processing

#### Implementation of Interpolation Algorithms

#### Inverse Distance Weight (IDW)



#### KRIGING



Interpolated  
Bathymetry  
(IDW and Kriging)

#### Improvement in Resolution and Details of the Bathymetric Data

These data must be read, corrected and analyzed in order to obtain relevant information about seabed of the Adriatic Sea and its morphology through bathymetric acquisitions. In addition, it will be possible to obtain information about what is situated inside the water column between the multibeam and the seabed. This acquisitions will highlight the presence of fishes' banks or gas bubbles.

The multibeam post-processing software is able to apply ray tracing correction algorithms based on Snell's law. These correction algorithms are necessary because the Sound Speed Profile varied along the water column. In addition, spatial interpolation algorithms such as Inverse Distance Weight (IDW) and Kriging algorithms have also been implemented in the software, which allow to obtain less noise and an high resolution in the Digital Terrain Model (DTM). Thus, thanks to these algorithms it will be possible to recognize the presence of object or animals lying on the seabed.





# SUSHI DROP

Sustainable fiSHeries with  
DROnes data Processing



## THE FIRST DRONE TEST COMING SOON!

The first drone test will occur in Marche Region during the next months. In detail, the testing will take place in an area near the city of Fano, where there is the presence of ex artificial gravel mining lakes.



**LEAD PARTNER CONTACT**  
 Alma Mater Studiorum - University of Bologna  
 Contact person: Luca De Marchi  
 Email: l.demarchi@unibo.it

## Pilots: Vicini Lake and Missione Lake



The first drone test will take place in The Regione Marche, specifically in the Town of Fano where there are three artificial lakes which have been used for gravel extraction on the past.

For these first vehicle tests there have been selected: "Vicini Lake and Solazzi Lake" (which are open to the public) and a privately-owned one "Missione Lake". The three lakes are very close to each other and located in the immediate suburbs of Fano on the left side of Metauro River.

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Vicini Lake has an extension of 3.5 hectares and has been acquired by the "Fondazione Cassa di Risparmio di Fano" (Italian bank) for educational and scientific purposes. Later on, the "Fondazione Cassa di Risparmio di Fano" entrusted the "Argonauta Naturalistic Association" to maintain and manage the lake ([www.argonautafano.org](http://www.argonautafano.org)). The overall redevelopment project of this area aims at increasing its biodiversity, at realising a visit centre and at promoting the scientific dissemination.

After the gravel extraction processes, the average depth of "Lago Vicini" resulted to be 6 meters with maximum peaks of 8 meters. The lake rapidly became a perfect natural habitat for various plants typical of wetlands, and attracted many species of wild fauna; Herons, Seagulls, Ducks, Coots together with different fish species like Carps and Largemouth Bass (For further information please visit: <https://www.lavalledelmetauro.it/contenuti/beni-ambientali/scheda/11631.html>)

Vicini Lake



The "Missione Lake" has got characteristics similar to the close "Vicini Lake" in spite of its larger dimensions (about 15 metres) and depth (with peaks of 20-25 metres). The shores of this lake are easy to be approached and this makes the operations of release and recovery of the drone quite easy.

Missione Lake



### Solazzi Lake

"Solazzi Lake" is an artificial lake. Like the others with a similar origin: it has been gravel extraction area filled by flooding . The lake is currently managed by a sport fishing association (<http://www.polisportivaclubhouse.it>) which immediately showed to be interested in allowing the use of the lake for the tests. Currently, this lake is exclusively dedicated to sportfishing mainly for the presence of Carps and Sturgeons, and for Carassio and Largemouth Basses.



Owing to the large use of fishing baits, the water of this lake appears to be less clear. Although the turbidity could compromise the result of Video and photos, the Solazzi Lake is an excellent solution to carry out the first drone tests, thanks to its high depth and easily accessible shores.





## Progetti di innovazione nella Regione Marche per lo sviluppo di una filiera della pesca e dell'acquacoltura più competitiva e sostenibile

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### Un confronto tra il settore, la ricerca e le istituzioni

Mercoledì 16 dicembre 2020

ore: 15.00 - 18.00



### PROGRAMMA

**Moderatore:** [Giorgio Scavino](#) - European projecting advisor

**15.00 - 15.15**  
**Saluti Istituzionali**  
[Mirco Carloni](#) - Vicepresidente Regione Marche con delega alla pesca marittima  
[Francesco Regoli](#) - Direttore Dipartimento di Scienze della Vita e dell'Ambiente, Università Politecnica delle Marche

**15.15 - 15.30**  
**Introduzione ai lavori**  
[Raffaele Pasquali](#) - Dirigente P.F. Economia Ittica, Regione Marche

**15.30 - 15.45**  
**I risultati delle Programmazione FEAMP 2014/2020: prospettive per l'innovazione e la cooperazione tra ricerca e settore produttivo**  
[Eleonora Iacovoni](#) - Dirigente Ufficio PEMAC IV - D.G. della pesca marittima e dell'acquacoltura - Ministero delle politiche agricole alimentari e forestali

**15.45 - 16.00**  
**La cooperazione territoriale europea per la blue economy**  
[Natalino Barbizzi](#) - Servizio Attività Produttive lavoro e Istruzione- Regione Marche

**16.00 - 16.15**  
**L'utilizzo di tecnologie innovative per il monitoraggio e la protezione della biodiversità: il drone sottomarino del progetto SUSHIDROP**  
[Luca De Marchi](#) - Professore associato Dipartimento di Ingegneria dell'Energia Elettrica e dell'Informazione "Guglielmo Marconi" presso l'Università di Bologna  
[Corrado Piccinetti](#) - Responsabile scientifico settore pesca, Laboratorio di Biologia Marina e Pesca di Fano

**16.15 - 16.30**  
**Azioni pilota di sperimentazione di misure gestionali per la valorizzazione della sostenibilità della piccola pesca in Adriatico, Progetto ADRISMARTFISH**  
[Francesca Perretta](#) - ASSAM, Agenzia Servizi Settore Agroalimentare della Regione Marche  
[Fabio Grati](#) - membro dell'Advisory Board del Progetto - CNR, Istituto per le Risorse Biologiche e le Biotecnologie Marine (IRBIM)

**16.30 - 16.45**  
**Azioni sperimentali per il ripopolamento attivo della Seppia (Sepia officinalis)**  
[Giorgia Gioacchini](#) - Dipartimento di Scienze della Vita e dell'Ambiente - Università Politecnica delle Marche

**16.45 - 17.00**  
**Prospettive di crescita ed innovazione per l'acquacoltura nelle Marche**  
[Giuseppe Prioli](#) - Direttore Cooperativa Mare, Presidente AMA (Associazione Mediterranea Acquaoltori)

**17.00 - 17.10**  
**Le azioni previste dal Progetto ARGOS per un'acquacoltura più sostenibile e competitiva**  
[Laura Gagliardini Anibaldi](#) - PF Economia Ittica - Regione Marche

**17.10 - 17.30**  
**Dibattito e Conclusioni**

**17.30 - 18.00**  
**Sessione di verifica riservata agli studenti ed ai dottorandi del Corso di Laurea Magistrale in Biologia Marina (UNIVPM)**



MEETING ON LINE  
in diretta su piattaforma ZOOM

CLICCA QUI per  
iscrizione on line

**INFORMAZIONI**

<https://www.regione.marche.it/Regione-Ufficio/Informazioni-Sviluppo-Rurale-e-Pesca/Pesca-Marittima-e-Acquacoltura>  
 email: [itribim@assam.marche.it](mailto:itribim@assam.marche.it)





European Regional Development Fund [www.italy-croatia.eu/sushidrop](http://www.italy-croatia.eu/sushidrop)

The first newsletter has been sent to 692 emails and uploaded on the SUSHIDROP project website on the news section. The newsletter is available on the following link:

<https://www.italy-croatia.eu/web/sushidrop/-/2020-12-16-sushidrop-newsletter1>

## #Second SUSHIDROP Project Newsletter

The second newsletter has been sent out on the 6<sup>th</sup> of July 2021 and provided for detailed information on:

- ✓ the first mission at sea of the SUSHIDROP underwater drone that called “Blucy” carried out in Croatia;
- ✓ the participation of the SUSHIDROP project to a round table organized in the framework of the EU Green week 2021 and focused on “Innovation and Open data: dialogues and synergies between European projects for sustainability in the maritime sector”.



[SITO WEB](#)





**FIRST FIELD MISSION WITH THE DRONE BLUCY**

In ancient times, the Adriatic Sea was called the Blue Sea; that's why our drone is called Blucy.

The Adriatic Sea includes more than 1,300 islands. Most of these islands are located near the Croatian coast. The first SUSHI DROP project operational mission of our Blucy drone took place successfully in Croatian waters.



Its main purpose is noninvasive sampling and monitoring of marine habitats thanks to its multitude of scientific sensors on board.

The first mission campaign was conducted for 5 days in May at different locations and depth in the waters near Split and Solta.

Researchers from IOF – Institute of Oceanography and Fisheries and University of Bologna participated to the mission campaign with the support of marine robotics researchers of CNR-ISSIA.





In particular, several mission tests have been carried out to confirm the capabilities and performances of the vehicle even in adverse meteomarine conditions. During these tests we have collected biophysical data, videos and high-resolution images of the underwater environment of the Croatian coast.

In these first missions, Blucy has been piloted in ROV (Remotely Operated Vehicle) mode connected to the main ship through the 500m long fiber optic cable. This mode of navigation allows to explore the seabed with high precision ensuring a flow of data and video in real time, this allows to approach specific hotspots that can be reached during the survey activities.



After the Multibeam EcoSounder sensor is tuned, Blucy will be disconnected from the fiber optic cable and can be configured in AUV (Autonomous Underwater Vehicle) mode, communicating with the mothership through hydroacoustic sensors, to tackle new mapping missions at different scales.

Thanks to Blucy, comprehensive data will finally be available on the current state of health of the underwater habitat in areas difficult to explore with traditional methods. All data collected and subsequently processed will be published in open data format and will be available in Geo Database on GIS (Geographic Information System) platform to all scientists, researchers, NGOs and all entities involved in the blue economy.



## SECOND FIELD MISSION IN PREPARATION PHASE

The second field mission with the drone Blucy will be conducted on the Italian side of the Adriatic Sea at the end of July.

The study area identified is an area located in International Water, around 30 NM off the coast of the Marche Region. This area is well known by fishermen who call it "Scogli di Pedaso".

The study area in question has always attracted the attention of many, since

ancient times. Some local fishermen call this area 'Isola' (Island) because legend saw there is a sunken city.

This name is because at a depth of around 80m there are rocky barriers, which prevent fishing using traditional techniques as the nets could be compromised.

Even though the history of an underwater city is a legend, this region is an area rich in terms of biodiversity.

Indeed, this area is characterized by the presence of a variety of reefs and rock formations as well as sandy ravines that represents an ideal habitat for European hake (*Merluccius merluccius*) and many other benthonic organisms.

Thanks to the advanced technologies of our vehicles, as multibeam and high-resolution cameras, it will be possible to obtain a complete description of the area of our interest, both from a morphological and a fauna point of view, highlighting benthic communities, fish and rock formations.

Furthermore, fairly detailed cartography of the bottom does not exist for this area, so it will be a meaningful test for the navigation and mapping capabilities of these new UUV technologies, in poorly-known environments, far from the coast.

## JOINT EVENTS WITH OTHER PROJECTS

On Wednesday, **the 9th of June 2021 (11.00 a.m. to 1.00 p.m.)**, Sushidrop representatives joined a round table organized in the framework of the EU Green Week.

The round table focused on "Innovation and Open data: dialogues and synergies between European projects for sustainability in the maritime sector". The event was conceived as an interactive and networking session to foster dialogue and synergies among projects supporting the European Marine Strategy and the Blue Growth. The following European projects have joined the round table:

- **DYDAS - DYnamic Data Analytics Services co-financed by the Connecting Europe Facility of the European Union.** The DYDAS project aims at developing a collaborative platform for offering data, algorithms, processing and analysis services to a large number of users from different public and private user communities.

[read more](#)

- **BLUE DEAL - Blue Energy Deployment Alliance** The project, funded in the framework of the Interreg MED 2014-2020 Cooperation Programme, aims to increase transnational activity of innovative clusters and networks of the BLUE ENERGY sector, develop links and synergies between SME`s, public authorities, knowledge institutions and civil society and establish transnational and regional Blue Deal Alliances.

[read more](#)

- **ARGOS - Shared Governance of Sustainable Fisheries and Aquaculture Activities as Leverage to Protect Marine Resources in the Adriatic Sea.** The project, funded in

the framework of the Interreg Italy-Croatia Programme 2014-2020, is aimed to promote and apply a common integrated approach in the protection of marine resources and in the preservation of good environmental status of Adriatic sea, built upon both institutional and operative actions oriented to reduce directly and indirectly the human pressure by fisheries and aquaculture activities on marine habitats and species.

[read more](#)

- **SUSHI DROP - Sustainable fiSHeries with DROnes data Processing** which is also funded by the Interreg Italy-Croatia Programme 2014-2020.

The round table was aimed to promote multidisciplinary approach, share common challenges and opportunities, also taking into account new perspectives and synergies for the development of future common projects and initiatives. The presentation of the round table could be downloaded from here:

[Download](#)

## NEXT EVENTS



Further, Sushidrop representatives will join the FAIRSEA project final conference on the 8th of July 2021 from 16:00 to 17:30 p.m. during the **working Session 5: Interacting with other projects for finding next steps for an EAF (Ecosystem Approach to Fisheries) implemented Round table with representatives of related projects of Axis 1.**

Joinly with other projects dealing with Blue Innovation in the Adriatic area e.g Prizefish, AdrismartFish and Itaca they will discuss on weaknesses, linkages, opportunities and how the projects together can see the next future. Due to Covid situation the final conference will be hybrid, with participants both in person and online.

You are invited to register at the following link:

[Registration](#)

The second newsletter has been sent to 661 emails and uploaded on the SUSHIDROP project website on the news section. The newsletter is available on the following link:

<https://www.italy-croatia.eu/web/sushidrop/-/2021-07-06-sushidrop-newsletter2>

## #Third SUSHIDROP Project Newsletter

The third newsletter has been sent out on the 2<sup>nd</sup> of November 2021 and provided for detailed information on:

- ✓ the first results of the second field mission which has been carried out on the Italian Side of the Adriatic sea in two different Regions (Marche and Abruzzo) during the month of July 2021;
- ✓ the Reef population observed;
- ✓ the setting up of the database in Geo Database format on a GIS (Geographic Information System) platform
- ✓ Launch the participation of the SUSHIDROP project to SEALOGY® , the first trade fair entirely dedicated to the sea and its resources, the European Exhibition on Blue Economy held in Ferrara from the 18th to the 20th of November 202.



## FIRST RESULTS OF THE FIELD MISSION ON THE ITALIAN SIDE OF THE ADRIATIC SEA

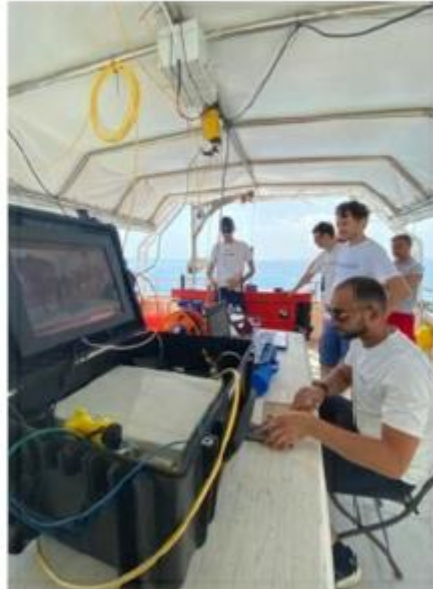


The second field mission of the drone Blucy has been conducted in July in two different Italian Regions: Marche and Abruzzo. The study area identified in Marche Region is located in international water (30 NM off the coast), well known by the fishermen with the name "Scogli di Pedaso".

During these surveys, additional navigation tools were fine-tuned, including the underwater acoustic positioning system (USBL), which allows real-time georeferencing of the drone and of the data collected. This aspect is of a paramount importance for the setting up of the open access databases.

The second study area has been selected in the coastal zone of the Abruzzo Region named “Costa dei Trabocchi” between the cities of Ortona and Vasto. During these surveys, many biological data regarding the biodiversity of the area have been acquired.

Furthermore, the first survey of a traditional mussel farming was carried out to evaluate the potential use of Blucy within a hostile environment characterized by the presence of socks, peaks and floats. The non-invasive monitoring of the drone Blucy allowed carrying out the survey in complete safety without causing damage to either the marine fauna or the mussels farm itself.



## WHAT HAS BEEN OBSERVED BY THE DRONE “BLUCY”?

The reefs population: bryozoans, gorgonians, sponges and corals

### *Leptogorgia sarmentosa*



**Leptogorgia sarmentosa**, is a arborescent-like gorgonia, whose colour can vary from white to red. The “Leptogorgia sarmentosa” lives in murky water, rich in nutrients and exposed to currents. It prefers muddy or rocky seabeds between 6 and 300 m of depth. The photo was taken during the survey in the north pier of the Ortona port, at a depth of 8 meters.

### *Schizoporella errata*



**Schizoporella errata**, bryozoan that forms massive colonies of different shapes, depending on the interactions with other organisms and by hydrodynamic conditions. The color is typically brick-red with orange growth margins. During the sampling in the area of the south pier of the port of Ortona, at a depth of 7 meters, various species of sessile organisms were identified, including this specimen of *Schizoporella errata*.



### *Aplysina aerophoba*



**Aplysina aerophoba**, is a sponge that forms pads with a typical yellow color. It has a cosmopolitan distribution and is quite common in the Mediterranean Sea. It typically grows on sandy seabed or, as in the case of this photo, rocky seabed at a depth ranging between 5 and 30 meters. In particular, this specimen was photographed in the area next to the Ortona lighthouse.

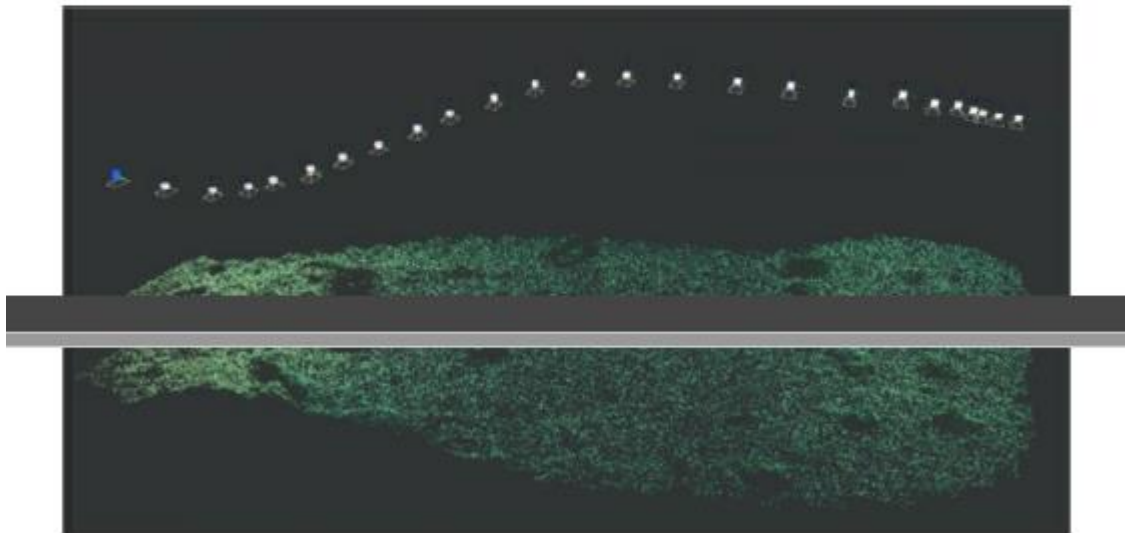
### *The health condition of a mussel's farm*



During the week of the mission in Abruzzo Region, one day was dedicated to the monitoring of a traditional mussels breeding farm located in front of the coast of the city of Vasto. In particular, during the survey, some of the mussels' rows were inspected using optical instruments. The farmed mussel was the *Mytilus galloprovincialis*, the classic Mediterranean mussel. The mussel farming facilities attract several pelagic fishes in its surroundings. In particular, sea bream and sea bass were observed during the inspections.

## THE DATA COLLECTION

All the data collected and later analysed, will be published in an open access platform and will be available in Geo Database format on a GIS (Geographic Information System) platform, for the scientists, researchers, NGOs and all bodies and institutions dealing with the Blue Economy issues. These data will allow a deeper level of knowledge of the seabed both from the morphological and marine biodiversity point of view, supporting the improvement of the related policies aimed at preserving the marine environment.



*This photo shows a 3D reconstruction of the seabed derived from a sequence of photos taken each 2 seconds using the drone's high-resolution camera.*

## NEXT PROJECT EVENTS

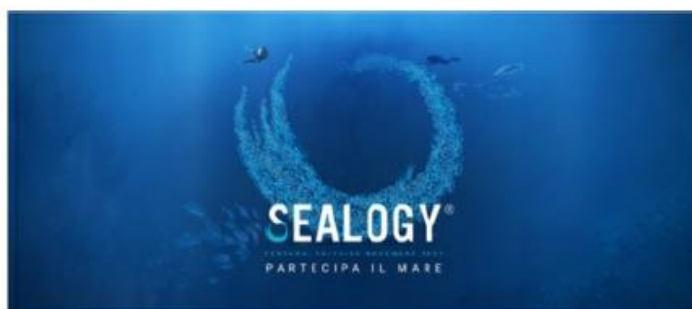


### SUSHIDROP Project

will be present with a stand in the **SEALOGY®** fair

**18th – 20th of November 2021**

SEALOGY® is the first trade fair entirely dedicated to the sea and its resources, it is the European Exhibition on Blue Economy and aims to become an international reference event for the Blue Economy sectors



The fair will be held in Ferrara from the **18th to the 20th of November**.

Further, in the framework of the fair, the results of the **SUSHIDROP** project will be presented in a live talk session that will be held on

**Friday 19th of November from 11:00 to 12:00.**

Details of the event will follow soon, in the meanwhile please save the date and visit our Sushidrop stand in the exhibition.

Website of the exhibition  
[CLICK HERE](#)

[www.italy-croatia.eu/sushidrop](http://www.italy-croatia.eu/sushidrop)

The third newsletter has been sent to 871 emails and uploaded on the SUSHIDROP project website on the news section. The newsletter is available on the following link:

<https://www.italy-croatia.eu/web/sushidrop/-/2021-11-17-sushidrop-newsletter3>

## #Fourth SUSHIDROP Project Newsletter

The fourth newsletter has been sent out on the 15<sup>th</sup> of December 2021 and provided for detailed information on:

- ✓ A further mission, just offshore of Fano, implemented by the SUSHIDROP researchers' team to continue the fine-tuning of the navigation tools and sensors with particular reference to the Multibeam Echosounder;
- ✓ The first version of the "Open Access Platform" released;
- ✓ Two articles regarding SUSHIDROP results and achievements been published on EU relevant newsrooms (DG Mare and DG Regio).



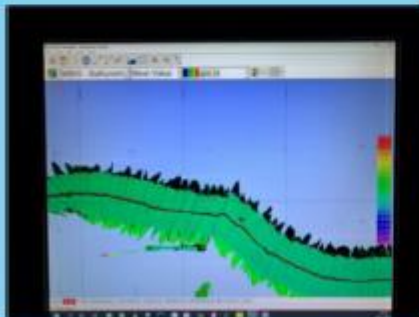
## The field mission of “Blucy” in Fano



A further mission, just offshore of Fano, has been implemented by the SUSHIDROP researchers' team at the beginning of December to continue the fine-tuning of the navigation tools and sensors with particular reference to the Multibeam Echosounder capable to map the seafloor by a fan of narrow acoustic beams and thus providing 100% detailed coverage of the bottom.



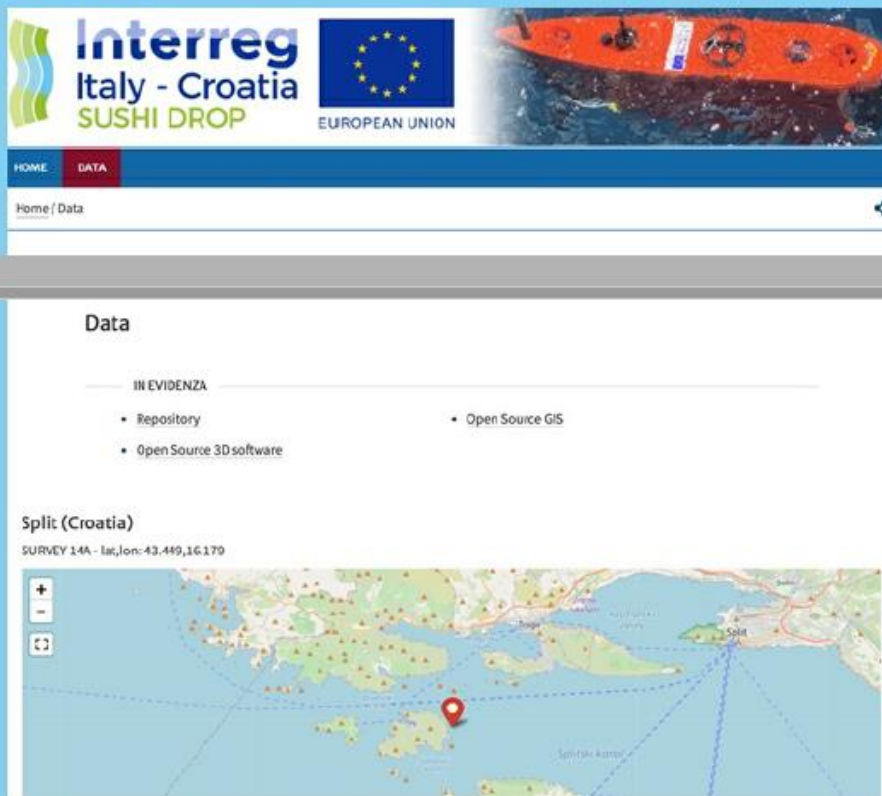
Despite the bad weather conditions, the researchers were able to acquire the first data with the multibeam. During the week, they have mainly used the instrument testing it at different depths and with different types of seabed



The lessons learned in these missions will pave the way for the deployment of a fleet of UUVs that will provide the scalability needed to cope with the observation of critical habitats in larger area

## The SUSHIDROP Open Access Platform

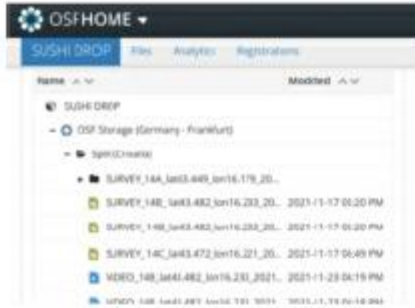
The first version of the "Open Access Platform" has been released! The researchers and technicians from the University of Bologna are uploading the data collected during the filed missions with the drone "Blucy" in the Open Access Platform.



The platform has the following features:

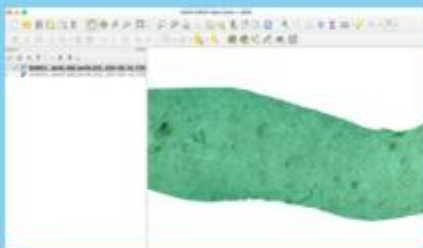
- 1) Organized in Database and served with a Geographic Information System (GIS)
- 2) WebGIS map with open-source JavaScript library Leaflet and OpenStreetMap basemap open data
- 3) Open Access Database: on-line repository at Open Science Framework

The open database website: <https://site.unibo.it/sushidrop>



### Open access repository

The Open Access repository is currently implemented on Open Science Framework: an open and free platform aimed to support research and cooperation among scientists. Is it possible to visualize available data and download them freely without the need to register .



*Open Data loaded in Open Source GIS*

### Orthophoto

Information resulting from the processing of the data acquired during the first project surveys have been exported in a format ready for consultation in an Open Source GIS environment such as QGIS. Among the available data, we have some orthophotomosaics obtained by combining different acquisitions with a photogrammetric camera.



*Open Data loaded in Open Source GIS*

### Digital surface model

At the same time as Photogrammetric rendering, it was possible to realize a map of the seabed morphology and of all the species found on the seabed, setting up what is called a high-resolution Digital Surface model (DSM). This information is also available for consultation in GIS environment, raster format





#### Open Data in 3D: point cloud and mesh

Further, the elaborations carried out allowed to obtain also three-dimensional data such as high-density point clouds and by means of subsequent steps the creation of meshes and models with textures derived from the acquisitions of high-resolution optical images..

## Check out the SUSHIDROP articles published

Two articles regarding SUSHIDROP results and achievements have been published!

#### DG MARE news section

[https://ec.europa.eu/oceans-and-fisheries/news/not-raw-fish-sushi-drop-project-helps-sustainable-fisheries-eu-support-2021-10-29\\_en](https://ec.europa.eu/oceans-and-fisheries/news/not-raw-fish-sushi-drop-project-helps-sustainable-fisheries-eu-support-2021-10-29_en)

#### DG REGIO Panorama newsroom (Stories from Regional and Urban Policies)

[https://ec.europa.eu/regional\\_policy/en/newsroom/panorama/2021/10/29-10-2021-uncovering-the-mysteries-of-the-deep](https://ec.europa.eu/regional_policy/en/newsroom/panorama/2021/10/29-10-2021-uncovering-the-mysteries-of-the-deep)

Enjoy your reading!

[www.italy-croatia.eu/sushidrop](http://www.italy-croatia.eu/sushidrop)

The fourth newsletter has been sent to 871 emails and uploaded on the SUSHIDROP project website on the news section. The newsletter is available on the following link:

<https://www.italy-croatia.eu/web/sushidrop/-/2021-12-15-sushidrop-newsletter4>

## #Fifth SUSHIDROP Project Newsletter

The fifth and last newsletter has been sent out on the 30<sup>th</sup> of December 2021 to share with the stakeholders a detailed article published on the Eurofish magazine on the Project SUSHIDROP and on the results reached.



Check our latest article in the Eurofish Magazine!

Latest news about the Sushidrop project achievements and the scientific mission of the underwater drone Blucy has been published on the Eurofish Magazine Issue number 6 2021 (November / December).

<https://www.eurofishmagazine.com/magazine-issues/current-issue>

[ PROJECTS ]

**SUSHI DROP**—an interreg project with Italy and Croatia to map marine ecosystems in the Adriatic

## A non-invasive way of collecting data

The memorably named SUSHI DROP (Sustainable fISHeries with DRONES data Processing) project has developed an unmanned underwater vehicle to study marine ecosystems in the Adriatic for the benefit of scientific organisations, NGOs, policymakers and others with an interest in the blue economy.

The Adriatic Sea is characterised by high productivity and biodiversity. It plays host to habitats that require ad-hoc conservation and management measures that take into consideration the numerous human activities concentrated there. Reliable and up-to-date information about the state of marine resources is essential to make sound management decisions for the protection of ecologically important areas. Fishing activities can be extremely invasive for the ecosystem in which they take place: the capture of non-targeted organisms can be too high to be acceptable. Thus, as highlighted in the EUSAIR Action Plan and in the Strategic Research and Innovation Agenda of the BLUEMED Initiative, there is an urgent need to develop accurate and non-invasive methods of mapping marine ecosystems to establish their condition, extent, and location.

### The capabilities of underwater drones have increased rapidly in recent years

Using unmanned underwater vehicles (UUVs) equipped with sensors to monitor physical, chemical, and biological features may offer a way to gather information from areas where data are lacking. UUV technology has evolved over the last few years from simple demonstration models developed by research institutes to commercial



Missions both in Croatian and Italian waters have confirmed the vehicle's capabilities even under adverse conditions.

products. Applications in ecosystem monitoring are emerging thanks to the capabilities offered by UUVs of carrying out surveys without interfering with the seabed and at reduced costs compared with the use of oceanographic vessels.

Within the Interreg project SUSHI DROP, a customized UUV (named "Blucy") was developed and equipped with advanced instrumentation to assess, non-invasively, the environmental status of habitats, fish populations, and to monitor biodiversity. The challenge was to improve knowledge of the

seabed and of benthic communities to correctly evaluate and manage the pressure and impact of human activities on these key environmental components of marine ecosystem. The information collected enables the implementation of the most suitable conservation measures also considering the transboundary implications.

### Multidisciplinary team executes the project

The SUSHI DROP team comprises researchers with different specialisations to better understand and address the challenges raised by this complex project. The University of Bologna coordinates the project with the participation of researchers from different



[ PROJECTS ]



The drone is a smart system consisting of a multitude of components and subsystems to handle specific activities.

departments (Department of Civil, Chemical, Environmental and Materials Engineering, Laboratory of Marine Biology and Fishery located in Fano, Department of Electrical, Electronic, and Information Engineering). The scientific activities are implemented jointly with the Institute of Oceanography and Fisheries (IOF) in Split. Other partners are: Marche Region (Fisheries Economy Unit), Split and Dalmatia county, Fisheries Local Action Group Costa dei Trabocchi and the Association for Nature, Environment and Sustainable Development Sance.

The project objectives include:

- Development of an underwater unmanned vehicle (UUV) for biodiversity monitoring. The first step was the development of an unmanned underwater vehicle customised and equipped with acoustic and optical sensors to assess the environmental status of the habitat, the population of the different stocks, and to monitor the biodiversity of marine ecosystems.
- Monitoring the biodiversity of the relevant ecosystems. Testing the potential of the UUV to characterise the

biodiversity of ecosystems through large-scale scientific surveys. Upon completion of the project, the information collected provided a foundation for articulating protection measures for the ecosystems. Implementation of a data-rich and open access geographic information system (GIS). Creation of an open access database that provides researchers, NGOs, the institutions involved in the blue economy sector, and policy makers with the data collected during the UUV monitoring programmes and the fish stock abundance indices.

**The vehicle is highly versatile in its capabilities**

With a weight of 205 kg and an operational depth of 150 m (max. 300 m) the UUV can conduct an 8-hour long mission. It is equipped with instruments to measure salinity, temperature, pressure, and sound velocity and has cameras to take videos and stills. The craft is steered with four horizontal and two vertical thrusters and can be controlled remotely or operate autonomously. Two missions have been conducted in Italian and Croatian waters to

confirm the capabilities and performance of the vehicle even in adverse conditions. During these tests, the

researchers accumulated biophysical data, videos, and high-resolution images captured by the equipment mounted on the vehicle. The sophisticated components the drone is equipped with, such as the multi-beam and high-resolution camera, provide a complete description of the area of interest both from a morphological and a fauna point of view by highlighting benthic communities, fish, and rock formations.

During the scientific mission, the navigation tools were fine-tuned, including the underwater acoustic positioning system (USBL), which allows real-time georeferencing of the drone and of the data collected. These data are of paramount importance for establishing the open access databases to maintain and share the scientific data acquired by Blacy. So far, the drone has observed populations of bryozoans, gorgonians, sponges, and corals and has also monitored farmed mussels growing in the water. Among the species spotted was *Leptogorgia sarmentosa*, an arborescent gorgonia, whose colour can vary from white to red. It thrives in murky water, rich in nutrients, and exposed to currents. It prefers muddy or rocky seabeds between 6 and 300 m in depth. Another organism seen was *Schizoporella errata*, a bryozoan that forms massive colonies of different shapes, depending on the interactions with

other organisms and on hydrodynamic conditions. The colour is typically brick-red with orange growth margins. During the sampling in the area of the south pier of the port of Ortona, at a depth of 7 meters, various species of sessile organisms were identified. In the Abruzzo region, one day was dedicated to monitoring a mussel breeding farm located near the coast of the city of Vasto. During the survey rows of mussel were inspected using optical instruments. The farmed mussels, *Mytilus galloprovincialis*, attract several pelagic fishes such as seabass and seabream to their surroundings.

**Data collected by the drone will be available to all**

All the data collected and analysed will be published in the geodatabase format on a GIS (geographic information system) platform and will be freely available to scientists, researchers, NGOs, and other organisations and institutions dealing with the blue economy. These data will allow a deeper level of knowledge of the seabed both from the morphological and marine biodiversity point of view and will contribute to improving related policies aimed at preserving the marine environment.

**Project: SUSHI DROP**

**Full name:** Sustainable FISeries with DRONes data Processing  
**Framework:** Italy Croatia cross-border cooperation programme  
**Value:** EUR1.71m (EUR1.46m European Regional Development Fund + EUR0.26m national cofinancing)  
**Start:** 1 January 2019  
**End:** 31 December 2021  
**Coordinator:** Luca De Marchi, Department of Electrical, Electronic,

and Information Engineering, University of Bologna  
**Other partners:** Institute of Oceanography and Fisheries, Croatia; Fisheries Economy Department, Marche Region, Italy; Fisheries Local Action Group Costa dei Trabocchi, Italy; Association for Nature, Environment and Sustainable Development Sance, Croatia; County of Split-Dalmatia, Croatia



The fifth newsletter has been sent to 870 emails and uploaded on the SUSHIDROP project website on the news section. The newsletter is available on the following link:

<https://www.italy-croatia.eu/web/sushidrop/-/2021-12-30-sushidrop-newsletter5>