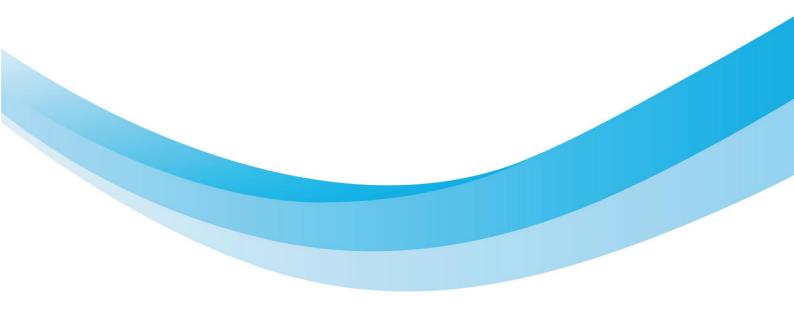


# D.2.4.2. REPORT ON 2<sup>nd</sup> BTS

# InnovaMare project

Blue technology - Developing innovative technologies for sustainability of Adriatic Sea

WP2 – Communication activities





## **Project References**

Call for proposal 2019 Strategic – InnovaMare Project number: 10248782 Work package: WP2 Communication activities Activity title: A4 Public events Deliverable title: D.2.4.2. Report on 2nd BTS Expected date: M17 Deliverable description: D.2.4.2. Report on international interdisciplinary field workshop of maritime robotics and applications where all the leading experts will be present to share and upgrade their knowledge in this specific field that shall contain all the gathered information and conclusion from this event Partner responsible for the deliverable: IRB Dissemination level: CO - Confidential Status: Final Version: V1

Date: 30<sup>th</sup> November 2021

European Regional Development Fund

IRB Contact person Neven Cukrov

Bijenička cesta 54, 10000 Zagreb



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The Breaking the Surface 2021 was held from 26th September until 3rd October in Biograd na Moru, Croatia and more than 130 people participated. It was the first, successful, post-pandemic edition of Breaking the Surface (Bts), the international interdisciplinary workshop on robotics and maritime innovations organized by the Faculty of Electrical and Computer Engineering (FER) of the University of Zagreb. The BtS scheduled events, held over 20 in depth lectures, 7 tutorials maritime innovations related (in marine robotics, maritime archeology, marine biology), 5 demos and one full day workshops on Analysis Of Data From Marine Observatories including talks and demos by partners and stakeholders to allow participants to get a first-hand knowledge on the latest in scientific results, on technological achievements, as well as hands-on experience in working with complex and modern underwater systems, such as in the case of the 6 vehicles demonstrated.

Dates: 26th September – 3rd October 2021 Location: Biograd na Moru, Croatia Website: <u>http://bts.fer.hr/</u>

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# **GENERAL INFORMATION OF THE EVENT**

Breaking the Surface - BtS International Interdisciplinary Field Workshop of Maritime Robotics and Applications has been organized by UNIZG FER LABUST for the last 12 years – first three years as a part of FP7-REGPOT CURE project, while in the following years with Office of Naval Research Global and EU funded projects. This year's BTS was financed and supported by Interreg Italy-Croatia InnovaMare project, H2020 EUMarine Robots – Marine Robotics Research Infrastructure Network and IEEE Oceanic Engineering Society. During the years, BtS served as a meeting place of experts and students of marine robotics and the marine robotics application areas such as marine biology, marine archaeology, marine security, oceanography, marine geology, and oceanology. This is the world's first successful, multi-year field training programme that combines academic topics in marine robotics and robotics application areas and hands-on working experience in the sea, doing remote sensing and sampling for various ocean sciences. The workshop took place from 26th September to 3rd October in Biograd na Moru, Croatia.

The programme is organised in the form of plenary talks, hands-on tutorials and demonstrations of marine technologies. Over the years, the programme has been growing and has been modified with novel elements.

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#### **BTS 2021 IN NUMBERS**



#### **ORGANIZERS**

Breaking the Surface is organized under the European Union's Horizon 2020 project EUMarineRobots -Marine Robotics Research Infrastructure Network (GA: 731103), Interreg Italy-Croatia InnovaMare project (ID: 10248782), and IEEE Oceanic Engineering Society. The main organizers are University of Zagreb Faculty of Electrical Engineering and Computing, Laboratory for Underwater Systems and Technologies and Centre for Underwater Systems and Technologies University of Zagreb Faculty of Electrical Engineering and Computing.



University of Zagreb Faculty of **Electrical Engineering and** Computing



**IN PARTNERSHIP WITH** 

AMOS

AMOS – Centre for Autonomous Marine Operations and Systems





Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento







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# LABUST

Laboratory for Underwater Systems and Technologies



Centre for Underwater Systems and Technologies



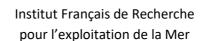
### Herriot Watt University



King's College London



NATO S&T Centre for Maritime Research and Experimentation





Marine Institute Foras na Mara



Natural Environment Research Council



The Association of Instituto Superior Técnico for Research and Development



Universidade de Lisboa (ULisboa)

Integrated Systems for Marine Enviroment



Norwegian University of Science and Technology (NTNU)



The Oceanic Platform of the Canary Islands



University of Girona (UdG)



University of Limerick (UL)



University of Porto

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# BREAKING THE SURFACE ORGANIZATION STRUCTURE

## **Committees Chairs**







Ana Golec

Orga





Igor Kvasić

# **Programme Committee**

Prof. João Sousa University of Porto	Roee Diamant University of Haifa	Massimo Caccia Italian National Research Council (CNR)
Portugal	Israel	Italy
Ralf Bachmayer	Prof. Bridget Buxton, PhD	Bill Kirkwood
University of Bremen	University of Rhode Island	Monterey Bay Aquarium Research
Germany	USA	Institute (MBARI) USA
		udmi
Fausto Ferreira	Irena Radić Rossi	
UNIZG FER	University of Zadar	
Croatia	Croatia	

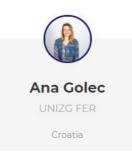
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# **Organizing Committee**



# **Technical Committee**



Anja Babić UNIZG FER Croatia



Igor Kvasić UNIZG FER Croatia Nadir Kapetanović

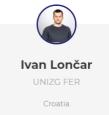
Croatia



Croatia



Croatia



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## Supporters / Financed by:





Financed in the scope of the

project EUMarineRobots -

Marine robotics research

infrastructure network (GA 731103) which has received funding from the European Union's Horizon 2020 research and innovation programme.



IEEE OES – Oceanic Engineering Society



Interreg Italy-Croatia Innovamare project financed by the European Regional Development Fund

# **REPORT ON THE OUTCOMES**

Given the global pandemic situation, the outcome of BtS 2021 edition can be considered a great success. Once again the BTS event is a confirmation of the recognizability of BTS as an event that encourage interaction and exchange of knowledge and experiences in the field of marine robotics and its applications, and is also one of the most important events and activities in the Innovamare project.

Over 130 participants took specifically part in the project activities in BtS, namely two talks, one demo, one side event with end-users, one press visit and one steering committee.

BTS also hosted several side events, such as IEEE OES UNIZG Student Branch Chapter presentation, Women in Blue, social events.

Great lectures, international panel discussions, robotics demos and tutorials took place over the workshop, which has been widely attended, by Croatians and Italians researchers, as well as experts from all over the world willing at combining exploratory work and innovative experiences to strengthen the fight against pollution in the sea.

On September 27 the InnovaMare stakeholder Croatian Statim Company held the demo "Plurato Sailfin – Electric Hydrofoil Surf Board" focused on development of electric hydrofoil board. It has been followed by a talk, on September 28, about "Multidisciplinary applications of robotic solutions in shallow coastal

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environments" held by CNR-ISMAR researchers Francesca De Pascalis and Fantina Madricardo, aiming at highlighting how todays' challenge to have clean seas can be encountered by robotic solutions.

On 30 September, a presentation of the InnovaMare innovative solutions in underwater robotics and sensors took place, a side event addressed to public institutions and other institutions, for whom those solutions and technologies enable growth, development, competitiveness and technological leadership in the field of blue economy and innovative blue technologies.

On October 1, the important demonstration session "Citizen Engagement: learning by imitation in marine robotics" took place focusing on how the newly implemented "SWAMP Robot" might learn from human beings. BTS participants have been concretely involved in a maritime experience and asked to "teach" Swamp, an autonomous light surface vehicle, to navigate autonomously by performing tasks at their place.

#### INNOVAMARE PRESENTATION OF INNOVATIVE SOLUTIONS IN UNDERWATER ROBOTICS AND SENSORS

The Bts 7-day initiative is a totally unique event that enables InnovaMare partners and stakeholders to internationally showcase their achievements while engaging in a productive, on the field, exchange of knowledge.

The InnovaMare project is designed to develop and establish a model of innovation ecosystem in the field of underwater robotics and sensors for the control and monitoring of pollution in the Adriatic Sea. The project is co-financed by the EU Regional Development Fund under the Italy-Croatia cross-border cooperation program 2014-2020. One of the main challenges of the InnovaMare project is to increase the efficiency of innovation activities in relevant areas of the blue economy - by increasing knowledge transfer within cooperation.

This event is intended for public institutions and other institutions to which new innovative solutions and technologies enable growth, development, competitiveness and technological leadership in the field of blue economy and innovative blue technologies.

After the presentation of the strategic InnovaMare Project, on September 29, made by the project coordinator, Mateo Ivanac, from the Croatian Chamber of the Economy, the leading project partner, a general overview of the project results in terms of underwater robots innovations and high-tech sensors has been given by CNR (Italian National Research Council) researcher Angelo Odetti and Massimo Caccia and Nikola Mišković and Fausto Ferreira from the Faculty of Electrical Engineering and Computing, University of Zagreb.

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On the same day, in the afternoon the Croatian Chamber of Economy organized a press visit aimed at promoting and showcasing to enlarged public some of the most promising technological solutions to detect, monitor and counter maritime pollution.

# **EVENT MATERIALS**

Complete information regarding the agenda, talks, participants and communication materials follows below.

## Agenda and speakers

The complete schedule is summarized in the following table and is available on the website together with abstracts and biographies of all speakers.

The daily programme follows can be found on the link <u>https://bts.fer.hr/schedule-2021/</u>

DAY 1			
16:30 - 18:00	REGISTRATION		

DAY 2			
09:00 - 09:15	OPENING SESSION		
09:15 - 10:00	ROBOTS FOR KARSTIC EXPLORATION		
10:00 - 10:45	LEVERAGING OCEAN DATA HARVESTING BY		
	HETEROGENOUS ROBOTIC ORGANIZATIONS AND		
	AUTONOMOUS VEHICLES AS SENSOR CARRYING		
	PLATFORMS		
11:00 - 11:45	LOW COST DOES NOT COME CHEAP: WORKING TOWARDS		
	A LOW COST DEEP-SEA AUTONOMOUS OBSERVATION		
	SYSTEM		
11:45 - 12:30	TITANIC REVISITED		
12:30 - 13:15	PRESENT STATUS AND ACHIEVEMENTS AT THE SWEDISH		
	MARITIME ROBOTICS CENTRE SMARC – AN INVITATION TO		
	COLLABORATE		
14:30 - 15:00	H20ROBOTICS PRODUCTS		

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15:00 - 15:30	TUTORIAL 1 INTRO – KTH: USING PHYSICS-INFORMED			
	LEARNING FOR NONLINEAR SYSTEM IDENTIFICATION OF			
	UNDERWATER ROBOTS			
15:30 - 18:30	DEMO: H2OROBOTICS PRODUCTS			
15:30 - 18:30	TUTORIAL 1 HANDS-ON: KTH			
15:30 - 18:30	DEMO: PLURATO SAILFIN – ELECTRIC HYDROFOIL SURF			
	BOARD			

DAY 3			
09:00 - 09:45	WHALING IN THE EUROPEAN ARCTIC 1600-1900 -		
	TECHNOLOGICAL INNOVATION AND ADAPTATION		
09:45 - 10:30	MAKING SENSE OF MARINE AND MARITIME PROCESSES		
	THROUGH INTELLIGENT INFORMATION ACQUISITION AND		
	SHARING		
10:45 - 11:30	MULTIDISCIPLINARY APPLICATIONS OF ROBOTIC		
	SOLUTIONS IN SHALLOW COASTAL ENVIRONMENTS		
11:30 - 12:15	FORMAL AND RISK-BASED METHODS FOR DESIGNING,		
	TESTING AND VERIFYING AUTONOMOUS MARINE		
	CONTROL SYSTEMS		
12:15 - 13:00	UNDERWATER ARCHAEOLOGY AT BTS: A DECADE OF		
	INNOVATION		
14:30 - 15:00	TUTORIAL 2 INTRO – AI ZEROCALIBER: EDGE COMPUTING		
	FOR MARITIME IOT		
15:00 - 15:30	TUTORIAL 3 INTRO: MARINE UNITY SIMULATOR		
15:30 - 18:30	DEMO: PROJECT HEKTOR – KORKYRA		
15:30 - 18:30	TUTORIAL 2 HANDS-ON: ZEROCALIBER		
15:30 - 18:30	TUTORIAL 3 HANDS-ON: MARINE UNITY SIMULATOR		

DAY 4			
09:00 - 09:45	INNOVAMARE PROJECT		
09:45 - 10:30	ADRIATIC		
10:45 - 11:30	UNDERWATER HUMAN ROBOT INTERACTION (U-HRI): AN		
	OVERVIEW OF THE HISTORY, CHALLENGES, AND METHODS		

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44.00 40.45	
11:30 - 12:15	INFORMATIVE SPATIAL SAMPLING WITH AUTONOMOUS
	UNDERWATER VEHICLES
12:15 - 13:00	EXPLORATIONS IN AI FOR MARINE ROBOTICS
14:30 - 15:00	TUTORIAL 4 INTRO – LSTS TOOLCHAIN: OVERVIEW AND E-
	INFRASTRUCTURE ACCESS
15:00 - 15:30	HYDROMEA – THE LUMA FAMILY OF COMPACT, FAST
	OPTICAL UNDERWATER MODEMS
15:30 - 18:30	DEMO: HYDROMEA
15:30 - 18:30	TUTORIAL 4 HANDS-ON: LSTS

DAY 5			
09:00 - 09:15	WORKSHOP: INTRODUCTION TO THE WORKSHOP – THE		
	CHALLENGE OF DATA PROCESSING FROM MARINE		
	OBSERVATORIES		
09:15 - 09:30	WORKSHOP: INTRODUCTION TO THE WORKSHOP – THE		
	NEED FOR STANDARDIZATION IN MARINE OBSERVATORIES		
09:30 - 10:15	WORKSHOP: MANAGEMENT AND PROCESSING OF		
	GEOPHYSICAL DATA FROM CONTINUOUS MONITORING		
	ONBOARD THE SHIP NRP SAGRES		
10:15 - 10:30	WORKSHOP: OPEN DISCUSSION ON DISSEMINATION OF		
	DATA		
11:00 - 11:45	WORKSHOP: QUALITY ASSURANCE FOR DATA FROM THE		
	THEMO MARINE OBSERVATORY		
11:45 - 12:30	WORKSHOP: USING AUVS FOR IN-SITU CALIBRATION OF		
	SENSORS ONBOARD MARINE OBSERVATORIES		
12:30 - 13:00	WORKSHOP: OPEN DISCUSSION ON STANDARDIZATION OF		
	DATA FROM OBSERVATORIES		
14:30 - 15:00	WORKSHOP: ODYSSEA – OPERATING A NETWORK OF		
	INTEGRATED OBSERVATORY SYSTEMS IN THE		
	MEDITERRANEAN SEA		
15:00 - 15:30	WORKSHOP: NEW FINDINGS FROM THE DEEPLEV		
	DEEPWATER MARINE OBSERVATORY		
15:30 - 16:00	WORKSHOP: THEMO – SCIENCE DISCOVERIES FROM THE		
	FIRST THREE YEARS OF OBSERVATIONS		

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16:00 - 16:15	WORKSHOP: PANEL DISCUSSION ON CHALLENGES OF
	COLLABORATION BETWEEN MARINE OBSERVATORIES

DAY 6			
09:00 - 09:45	UNDERWATER HYPERSPECTRAL IMAGING AS A TOOL FOR		
	BENTHIC HABITAT MAPPING		
09:45 - 10:30	DATA DRIVEN METHODS FOR DERIVING BATHYMETRIC		
	MAPS FROM SIDE-SCAN SONARS		
10:45 - 11:30	AN ROV REVOLUTION? USING THE NEW GENERATION OF		
	LOW-COST BATTERY POWERED ROVS FOR SUBSEA		
	ARCHAEOLOGICAL WORK		
11:30 - 12:15	ROBOTIC SYSTEMS IN MARICULTURE		
12:15 - 13:00	ACCURATE QLBL ACOUSTIC POSITIONING OF MULTIPLE,		
	FAST MOVING UNDERWATER TARGETS IN CONFINED		
	WATERS		
14:30 - 15:00	TUTORIAL 5 INTRO: CNR-INM – CITIZEN ENGAGEMENT:		
	LEARNING BY IMITATION IN MARINE ROBOTICS		
15:00 - 15:30	TUTORIAL 6 INTRO – CYPRUS SUBSEA: EFFICIENT AND		
	SCALABLE SENSOR-PLATFORM INTEGRATION		
15:30 - 18:30	DEMO: EVOLOGICS		
15:30 - 18:30	TUTORIAL 5 HANDS-ON: CNR-INM		
15:30 - 18:30	TUTORIAL 6 HANDS-ON: CYPRUS SUBSEA		
	CLOSING CEREMONY		

	DAY 7	
FIELD TRIP		

## Information on participants

Over 130 participants amongst experts, public administrations and private investors gathered in Biograd na Moru (Croatia) - from September 26th to Oct 3rd - for a first, successful, post-pandemic edition of Breaking the Surface (Bts), the international interdisciplinary workshop on robotics and maritime innovations organized by the Faculty of Electrical and Computer Engineering (FER) of the University of Zagreb.

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# Pictures and videos



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Pictures of the opening session, tutorials and demos



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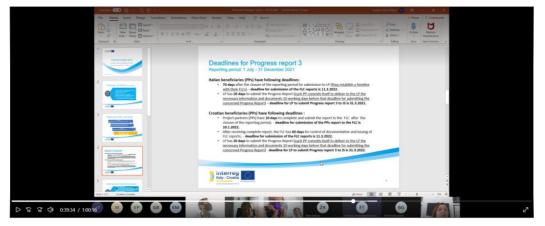
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D	eliverables 01.07.20	)2130.9.2021			
World	Peckage List of Deliverables /Outputs achieved	Partner in charge	Month		
	VP1 D1.3.1.Activities progress reports 2 D1.3.2.Monitoring report 4 D1.4.2. Financial Reports (FR) & Payment Claims (FC) 2	CCE CCE CCE	July		
	VP2 D2.2.3. Social Media Marketing reports 4	ARTI	July		
	VP3 D3.1.2. Map of excellence at cross- border level (update)	UNITS	September		
	DS.1.2. Report on Training in Bari of PP on LL DS.2.1. Preliminary conceptual design of multifunctional robotic and sensor solutions	CCE FER, CNR ISMAR	Agust July		
	Interreg Italy - Croata Into addamenter			4	





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#### **INNOVAMARE PROJECT**

#### Wednesday 29<sup>th</sup> September

09:00 - 09:45 Presentation of the InnovaMare project

15:00 - 16:00 Press visit

#### Thursday 30<sup>th</sup> September

10:00 - 12:00 Side event

Agenda:

60 min FER + CNR presenting WP530 min open discussion with end-users30 min defining new challenges for the WP5 prototypes for future projects

On September 29, Croatian Chamber of Economy organized a press visit aimed at promoting and displaying to enlarged public some of the most promising technological solutions to detect, monitor and counter maritime pollution where the Croatian national radio and television reported about the project activities and results.

InnovaMare project was presented during the BTS 2021 at the Side event with a discussion on deliverable 2.5.1 with end users. Side event was held on September 30th. At the event, project partners CNR, FER and CCE have presented solutions and possible applications of the robotic and sensoric solution that will be developed within project. The possible end users have discussed the prices and advantages of use of the solutions.

End users have expressed their interest in owning this kind of solution but also to participate with their need in further development. The participants were invited via email and all the data were available on the project official site www.italy-croatia.eu/innovamare

We have invited them to join us and participate in the presentation of innovative solutions in underwater robotics and sensors organized by the Faculty of Electrical Engineering and Computing, University of Zagreb and the Croatian Chamber of Economy within the strategic project InnovaMare. The presentation was held

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on September 30, 2021 from 10.00 to 12.00 as part of the conference / workshop Breaking the Surface (BtS) in Biograd na Moru (Hotel Ilirija).

Participation was free, and the application link is: <u>https://hgk.hr/prezentacija-inovativnih-rjesenja-u-podvodnoj-robotici-i-senzorici-najava</u>. Applications were opened until September 22, 2021.

This event was intended for public institutions and other institutions to which new innovative solutions and technologies enable growth, development, competitiveness and technological leadership in the field of blue economy and innovative blue technologies.

The presentation was a two-hour event for Italian and Croatian project and business partners and stakeholders.

Everyone participating at the event have agreed that is needed to address as many institutions as possible to inform the participants about existing and future solutions and how they can use them. In this way, possible users will be more involved and there where many opportunities for cooperation and some new projects.

## Promotional materials developed for the event

Promotional materials used for the event were the brochures, pens, writing blocks, USB sticks and roll up of the project InnovaMare. The dissemination of information for the (virtual) attendees regarding regular update on the development of the situation prior to the event was done via newsletters: Save the Date, Important Notice, Preliminary Programme, and Final Programme.

## News and posts on social media

Posts on BtS official FB page were published along the year and especially during the event. In particular, several posts with info and pictures of previous years were published in the first half of the year for marketing purposes. The preliminary programme talks were presented throughout August (before updating the programme). In September, the final programme and schedule was announced. Daily posts during the event included photo albums for the lectures, tutorials, and demos.

## Press office activities

The communication focused more on social media (Facebook posts) and newsletters sent by e-mail to the subscribed audience, to ensure quick updates on the development of the situation. The press was also included in the dissemination activities as well.

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# CONCLUSIONS

Over 130 participants amongst experts, public administrations and private investors gathered in Biograd na Moru (Croatia) - from September 26th to Oct 3rd - for a first, successful, post-pandemic edition of Breaking the Surface (Bts), the international interdisciplinary workshop on robotics and maritime innovations organized by the Faculty of Electrical and Computer Engineering (FER) of the University of Zagreb, where also the Interreg Italy-Croatia strategic project InnovaMare Project took part with its activities.

The Bts 7-day initiative is a totally unique event that enables InnovaMare partners and stakeholders to internationally showcase their achievements while engaging in a productive, on the field, exchange of knowledge.

Great lectures, international panel discussions, robotics demos and tutorials took place over the workshop which has been widely attended by Croatians and Italians researchers, as well as experts from all over the world willing at combining exploratory work and innovative experiences to strengthen the fight against pollution in the Adriatic Sea.

After the presentation of the strategic InnovaMare Project, on September 29, made by the project coordinator, Mateo Ivanac, from the Croatian Chamber of the Economy, the leading project partner, a general overview of the project results in terms of underwater robots innovations and high-tech sensors has been given by CNR (Italian National Research Council) researcher Angelo Odetti and Massimo Caccia and Nikola Mišković and Fausto Ferreira from the Faculty of Electrical Engineering and Computing, University of Zagreb.

On the same day, in the afternoon the Croatian Chamber of Economy organized a press visit aimed at promoting and showcasing to enlarged public some of the most promising technological solutions to detect, monitor and counter maritime pollution.

Amongst the BtS scheduled events, over 20 in depth lectures, 7 tutorials maritime innovations related (in marine robotics, maritime archeology, marine biology), 5 demos and 1 workshop on Analysis Of Data From Marine Observatories including talks and demos by partners and stakeholders to allow participants to get a first-hand knowledge on the latest in scientific results, on technological achievements, as well as hands-on experience in working with complex and modern underwater systems, such as in the case of the 6 vehicles demonstrated.

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In particular, on September 27 Croatian Statim Company held the demo "Plurato Sailfin – Electric Hydrofoil Surf Board" focused on development of electric hydrofoil board. It has been followed by a talk, on September 28, about "Multidisciplinary applications of robotic solutions in shallow coastal environments" held by CNR-ISMAR researchers Francesca De Pascalis and Fantina Madricardo, aiming at highlighting how todays' challenge to have clean seas can be encountered by robotic solutions.

On 30 September, a presentation of innovative solutions in underwater robotics and sensors took place, a side event addressed to public institutions and other institutions, for whom those solutions and technologies enable growth, development, competitiveness and technological leadership in the field of blue economy and innovative blue technologies.

On October 1, the important demonstration session "Citizen engagement: learning by imitation in marine robotics" took place focusing on how the newly implemented "SWAMP Robot" might learn from human beings. BTS participants have been concretely involved in a maritime experience and asked to "teach" Swamp, an autonomous light surface vehicle, to navigate autonomously by performing tasks at their place.

Over 70 participants took specifically part in the project activities in Bts, namely two talks, one demo, one side event with end-users, one press visit and one steering committee.

BTS also hosted several side events, such as IEEE OES UNIZG Student Branch Chapter presentation, Women in Blue, social events.

More information available on the BTS website https://bts.fer.hr/ and at the project website at https://www.italy-croatia.eu/web/innovamare.

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