

## FAIRSEA (ID 10046951)

“Fisheries in the Adriatic Region - a Shared Ecosystem Approach”

# D 3.3.2 – Second advanced school on quantitative methods for EAF application

<b>Work Package:</b>	WP 3 – Mapping, benchmarking, sharing and enhancing EAF capabilities  Activity 3.3: Enhancing technical capabilities on EAF
<b>Type of Document</b>	Report of the organization, development and evaluation of the Second Advanced School on quantitative methods for EAF application.
<b>Use</b>	Public
<b>Responsible PP</b>	PP10-UNIST
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<b>Version and date</b>	Version 01, July 2021

## Deliverable 3.3.2

# Second advanced school on quantitative methods for EAF application

### **FAIRSEA – Fisheries in the Adriatic Region – a shared Ecosystem Approach**

FAIRSEA is financed by Interreg V-A IT-HR CBC Programme (Priority Axis 1 – Blue innovation)

*Start date: 01 January 2019*

*End date: 31 August 2021*

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## Acronyms used

<b>AMAREMED</b>	Advanced school on Multispecies modelling Approaches for ecosystem-based marine Resource Management in the MEDiterranean Sea
<b>CFP</b>	Common Fisheries Policy
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation
<b>EAF</b>	Ecosystem Approach to Fisheries
<b>EPO</b>	European Patent Office
<b>FAIRSEA</b>	Fisheries in the Adriatic Region – a Shared Ecosystem Approach
<b>MICE</b>	Models of Intermediate Complexity
<b>OGS</b>	Istituto Nazionale di Oceanografia e di Geofisica Sperimentale - OGS
<b>UNIST</b>	University of Split
<b>UW</b>	University of Washington
<b>UM</b>	University of the Southern Mississippi
<b>LP</b>	Lead partner
<b>PP</b>	Project Partner
<b>WP</b>	Work package

## Executive Summary

The FAIRSEA (Fisheries in the Adriatic Sea a Shared Ecosystem Approach) project aims at enhancing transnational capacity and cooperation in the field of an ecosystem approach to fisheries in the Adriatic region by exchanging knowledge and sharing good practices among project partners and external stakeholders.

In this perspective the Second advanced school on quantitative methods for EAF application aims at increasing technical skills and capacities in the region also through demonstrative applications. The second Advanced School entitled AMARE-MED 2021 (Advanced school on Multispecies modelling Approaches for ecosystem-based marine Resource Management in the MEDiterranean Sea, 2021) contributed to the FAIRSEA specific objective to enhance transboundary integrated competence in the field of ecosystem approach to fisheries. The FAIRSEA Second advanced school was held at the hotel Ora in Split (Croatia) from 21<sup>st</sup> to 26<sup>th</sup> June 2021. The AMARE-MED 2021 program included in-depth investigation of (I) Modeling in Ecospace using EwE (Ecopath with Ecosim), (II) Spatial population dynamics modeling and (III) Spatial multispecies model from data to management scenarios: exercises with available data from the Adriatic Sea. The course was highly technical, with practical hands-on computer activities, assignments and programming. It was organized in hybrid mode: in person for 10 students and online for 19 students. Key lecturers were André Punt (University of Washington), Kim de Mutsert (University of Southern Mississippi), Simone Libralato (OGS) and Natalia Serpetti (OGS). In total the AMARE-MED 2021 involved **40** people including students, teachers, assistants and organizers.

The evaluation of the Second advanced school done by students after lectures was very positive and highlighted the success of the school and high quality of lectures and overall organisation of the event.

## INTRODUCTION

**The FAIRSEA project aims at enhancing transnational capacity and cooperation in the field of an ecosystem approach to fisheries in the Adriatic region by exchanging knowledge and sharing good practices among partners.** The complementary expertise of the partners is shared, interlinked and integrated, considering also challenges and opportunities identified by stakeholders. The best way to reach sustainability, in fact, is to ensure stakeholders' participation in the process that requires time, trust, transparency and efficient steering.

The efforts are embedded in a spatially explicit management platform that will allow to share expertise, create a common pool of knowledge, boost the operational application of the ecosystem approach to fisheries, enhance the competence in complex system dynamics, and foster a consensus on the state of the environment and fisheries in the region. The platform will result in a spatially explicit dynamic tool, integrating cornerstone elements for an ecosystem approach to fisheries that are: water masses circulation and connectivity (module HYDRO), biogeochemical planktonic processes (BGC), distribution of resources (BSTAT), catch and fleet statistics (FSTAT), effort distribution (EFFORT), bioeconomic responses (BIOECO) and food web dynamics (FWM).

**The attention to the spatial components in the distribution of the resources, the variability of the oceanographic condition, the management policies and the socio-economic impact is a particularly innovative and extremely valuable aspect.** The shared integrated platform will be used as a planning tool to implement demonstrative testing of applicable fisheries policies both at local (subareas) and whole Adriatic scales. Especially, it will provide a scientific basis to formulate and evaluate shared management advice in the local and international participatory processes, answering to the need of reference points knowledge for the optimisation between ecological and socio-economical sustainability. The process developed in FAIRSEA will provide an opportunity to describe best practices and define guidelines for a sustainable fishery management.



**Figure 1.** Scheme of the different objectives and expected contributions of the FAIRSEA integrated platform, from support to management to participatory approaches, from pooling knowledge **to increase competences and capacities on the EAF.**

## Contribution of Advanced schools to the project objectives

The project moves beyond single species assessment to reduce environmental vulnerabilities and safeguard optimal exploitation thus it promotes the most efficient exploitation of fisheries resources. Furthermore, there is a „**need to secure the availability of high-skilled human resources in key sectors to strengthen development patterns in the area**” as well as the “need to support „brain circulation” among research institutes/academies and companies as a condition for developing cooperation in the field of blue technologies”. **FAIRSEA set an innovative mechanism that results in a participated, integrated, shared and quantitative ecosystem approach to fisheries that connects and enhances territorial skills and capabilities.** Furthermore, enhancement of high-level skills in the region is guaranteed by capacity building and networking activities foreseen by the project. FAIRSEA central focus, in fact, is not only the development of the integrated tool, but the collective participation of institutional, scientific, technical, policy makers and stakeholder partners in the conceptualization, application and analysis as a way to cross-contaminate across disciplines, across boundaries and across technical, institutional and stakeholder levels to foster innovation.

### Contribution of Advanced schools to specific FAIRSEA objectives

**Enhancing the competencies of project partners and target groups on concepts and analytical methods useful for the implementation of EAF** will facilitate further innovations in the sector in forms of new technical management tools, new services in the form of fisheries technical measures and devices. Possibly such innovations, on the long run, can bring new submissions to European Patent Office (EPO).

#### **Project specific objective 1: Enhance transboundary integrated competence in the field of ecosystem approach to fisheries**

The Capacity building envisaged in FAIRSEA is carried out through advanced schools set on the yearly basis for spreading concepts and methods of EAF. These schools will represent the beginning of a series continuing after the project and respond to the Project specific objective 1 (as from the FAIRSEA Application Form, AF): **Enhance the transnational competencies and skills in the field of EAF** in all network’s members, by crossing and pooling resources and complementary expertise, exchanging and integrating knowledge and sharing the results. The goal is to develop a territorially integrated conceptualization of the EAF beyond existing differences and boundaries, and to strengthen and structure a network for future transnational



plans, **useful in the framework of the Common Fisheries Policy (CFP)**. This will result in reinforcing cohesion and encourage identification and adoption of economic optimal strategies.

### Contribution of Advanced schools FAIRSEA communication objectives

**The activity 3.3 of the project FAIRSEA has the objective to enhance the scientific and technical capabilities through the establishment of annual advanced teaching events on practical applications and operative quantitative analyses for EAF.** The annual advanced schools will provide an in-depth understanding of analytical approaches from single species tools (e.g. SS3 and/or data-poor approaches) to multispecies and holistic approaches (e.g. MICE, GADGET, Ecopath with Ecosim, Atlantis, Osmose, Bemtool, Smart, and others). The summer schools are targeted to experts involved in fisheries management from technical and scientific institutions of the partnership and beyond. The activity 3.3 is expected to result in at least 25-30 people each year (from universities and research institutions, from management agencies, from technical and operative institutions, from advisory agencies participating to summer schools) to be acquainted with quantitative integrated approaches.

The EAF moves fisheries management from the single-species models used in stock assessments, to more complex models that include species interactions, environmental drivers and human consequences. Different models and tools have been developed to tackle this complexity. However, difficulties in understanding the models and related uncertainties by those who make the decisions result in hesitation to use EAF approaches. The advanced schools are going to contribute to communication objective 1 of the project.

### **Communication objective 1: Informing about possible tools to tackle ecosystem complexity**

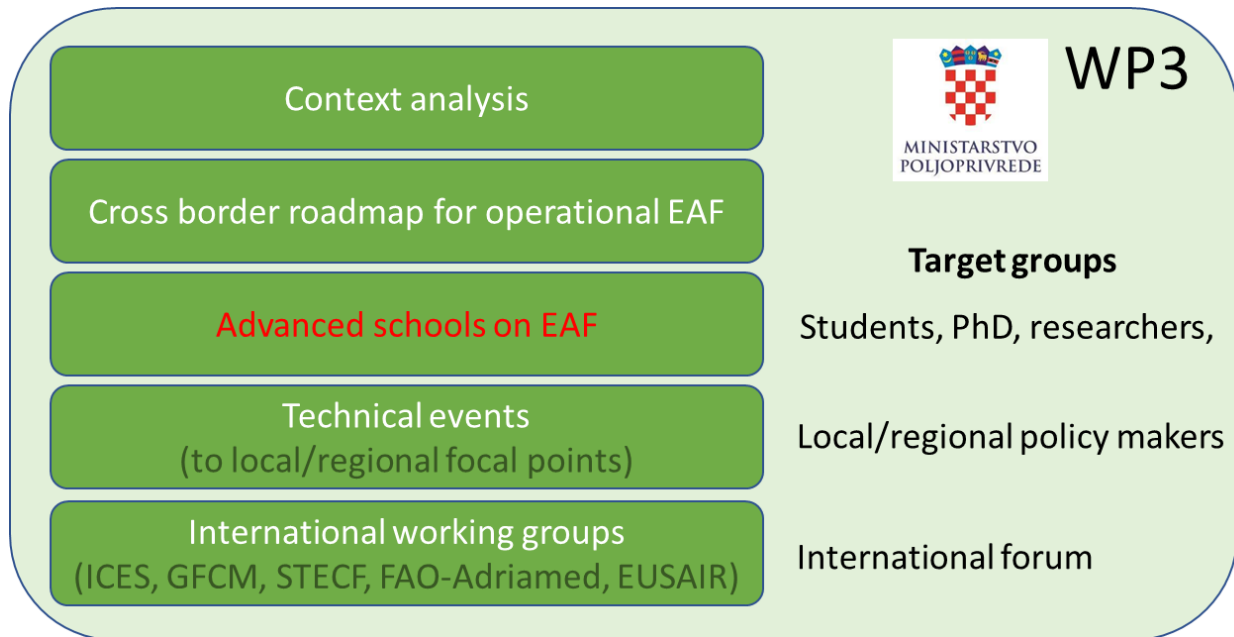
Explaining how EAF tools work is essential to predicting the effects of fisheries and other drivers. Complexity makes communicating new research about these ecosystems a challenge. Too much complexity can confuse the audience, even one that is scientifically literate. The role of communication is to translate such complexity in a language understandable to non-technical audience and policy-makers involved in fisheries management. This requires the development of tools to effectively disseminate knowledge and inform management in a simple and effective way.

**Target groups:** Local, regional and national authorities; universities and research institutions; NGOs; education and training organisations.

**Tactics/approach:** Increasing the literacy of Adriatic community on EAF quantitative tools through summer schools on advanced methods for an EAF will allow for a deep understanding of principles and scientific capabilities to tackle ecosystem complexity, thus enhancing technical skills of students, researchers and policymakers.

### Expected contribution of Advanced schools to the project outputs

Two summer schools were organised (WP3) for increasing skills and capacities. At each school students were jointly trained on high-level technical tools useful for EAF in the region.



**Figure 2.** Scheme of the WP3 where the Activity 3.3.2 is embedded.

## Second FAIRSEA advanced school on quantitative methods for ecosystem approach to fisheries application

### Organization

The FAIRSEA Second advanced school on quantitative methods for EAF application was organized by the University Department of Marine Studies, University of Split (UNIST) and the National Institute of Oceanography and Applied Geophysics (OGS), with contributions from the National Research Council, Institute for Biological Resources and Marine Biotechnology (CNR-IRBIM), SUNCE and Institute of Oceanography and Fisheries of Split (IOF).

The School was held from 21<sup>st</sup> to 26<sup>th</sup> June 2021 at a four stars hotel Ora located near the city center of Split (Croatia). Initially, it was planned to be held in 2020 at the UNIST campus but due to the situation with COVID pandemic the school had to be postponed for 2021 with hope that it would be possible to organize it fully in person. As the situation with pandemic didn't improve, the decision was made by the Organisation committee in April 2021 to organize lectures in the mixed model for health safety reasons, with a possibility for partner institution participants to attend the School in person and all other students online. Three lecturers (de Mutsert, Libralato and Serpetti) were present in person while prof Punt was unable to join the School in person due to the constraints related to the COVID19 pandemic, and he therefore held his lectures fully online.



**Figure 3.** Hotel Ora, venue of the Second advanced school AMARE-MED 2021.

Full description of organization structure is reported in the following text.

## **AMARE-MED 2021**

### **Advanced school on Multispecies modelling Approaches for ecosystem-based marine Resource Management in the MEDiterranean Sea**

21<sup>st</sup> – 26<sup>th</sup> June 2021  
Hotel ORA, Split (Croatia)

**Website:** <http://echo.inogs.it/amare-med/>  
**Secretariat e-mail:** echo@ogs.trieste.it

#### **LECTURERS**

André Punt (UW, USA), Kim de Mutsert (USM, USA), Simone Libralato (OGS),  
Natalia Serpetti (OGS)

#### **ORGANIZING COMMITTEE**

Simone Libralato (OGS), Svjetlana Krstulović Šifner (UNIST), Jure Brčić (UNIST),  
Mirela Petrić (UNIST)

#### **SCIENTIFIC COMMITTEE**

Simone Libralato (OGS), Angelo Bonanno (CNR), Roberto Carlucci (CONISMA), Piera Carpi (CEFAS), Francesco Colloca (SZN), Fabio Fiorentino (CNR), Tomaso Fortibuoni (ISPRA), Saša Raicevich (ISPRA), Giuseppe Scarcella (CNR), Svjetlana Krstulović Šifner (UNIST), Cosimo Solidoro (OGS), Maria Teresa Spedicato (COISPA), Nedo Vrgoč (IOF)

**Website:** Valentina Mosetti (OGS)

**Communication activities:** Mirela Petrić (UNIST)

**Supporting team:** Daniel Bartulović (UNIST), Nikola Bejo (UNIST), Vedrana Nerlović (UNIST), Željka Trumbić (UNIST), Josip Gugić (UNIST), Tea Kuzmičić (SUNCE), Tina Disopra (SUNCE)

### **Specific contribution to the second advanced school organization**

Other than contribution explicitly indicated above, some additional details of the school organization are in the following.

The **Scientific Committee** was involved in the planning the event and its contents, in the different parts of its organization and logistics. In particular:

- all members of the Scientific Committee and all FAIRSEA project partners contributed to disseminate the event, to invite students to participate and to discuss the contents of the school;
- Simone Libralato (OGS), Francesco Colloca (SZN), Giuseppe Scarcella (CNR), Sjetlana Krstulović Šifner (UNIST) and Nedo Vrgoč (IOF) constituted the committee for selecting the participants among the applicants;

The **Organizing Committee** took care of the logistics and detailed organization of the event.

## Contents

The second school was expected to cover the following aspects: i) spatial modelling considering species movements and environmental drivers to set targets for management and evaluate trade-offs; ii) multidisciplinary dimension of fishery management; iii) addressing socioeconomic and environmental issues in fisheries management.

The Second FAIRSEA summer school included in-depth investigation of the modeling in Ecospace using EwE (Ecopath with Ecosim), (II) Spatial population dynamics modeling and (III) Spatial multispecies model from data to management scenarios: exercises with available data from the Adriatic Sea. The course was highly technical, with practical hands-on computer activities, assignments and programming.

## Invited lecturers

High profile lecturers were invited to prepare lectures, assignments and exercises. The lecturers of the AMAREMED 2021 were:



**André Punt (School of Aquatic and Fishery Sciences, University of Washington – USA)**

André Punt is a professor in the School of Aquatic and Fishery Sciences at the University Washington, Seattle, USA and the currently the Director of the School. He received his B.Sc., M.Sc. and Ph.D. in Applied Mathematics at the University of Cape Town, South Africa. Before joining the University of Washington, he was a Principal Research Scientist with the CSIRO Division of Marine and Atmospheric Research in Australia. Prof. Punt has been involved in stock assessment and fisheries management for over 30 years and has been recognized for his contributions in this area with awards from CSIRO, the University of Washington, the Australian Society for Fish Biology, and the American Fisheries Society. The research undertaken by prof. Punt and the MPAM (Marine Population and Management) group at the University of Washington relates broadly to the development and application of fisheries stock assessment techniques, bioeconomic modelling, and the evaluation of the performance of stock assessment methods and harvest control rules using the Management Strategy Evaluation approach. Currently, projects that he is undertaking

with his research group include ecosystem modelling, assessment and management methods for data-poor methods, and understanding the impact of climate change and environmental variation on the performance of assessment and management methods. Prof. Punt has conducted stock assessments for a wide range of species, ranging from anchovies and sardines, to groundfish, tunas, and cetaceans. He has over 350 publications in the peer-reviewed journals, along with over 400 technical reports. He was a member of a National Research Council panel on evaluating the effectiveness of fish stock rebuilding in the United States. Prof. Punt is currently a member of the Scientific and Statistical Committee of the Pacific Fishery Management Council, the Advisory Committee for Center for the Advancement of Population Assessment Methodology, the Crab Plan Team of the North Pacific Fishery Management Council, and the Scientific Committee of the International Whaling Commission.



**Kim de Mutsert (School of Ocean Science and Engineering, University of Southern Mississippi, USA)**

Kim de Mutsert is an assistant professor in the Division of Coastal Sciences, School of Ocean Science and Engineering at the University of Southern Mississippi, and an Associate Director of the Potomac Environmental Research and Education Center (PEREC). She received her M.Sc. in Biology at the University of Amsterdam, the Netherlands, and her Ph.D. in Oceanography and Coastal Sciences at Louisiana State University, USA. She has 20 years of experience in fish ecology in marine, estuarine and freshwater environments. Asst. prof. de Mutsert is especially interested in studying effects of environmental and anthropogenic stressors on nekton community structure and food web dynamics in coastal ecosystems. In current projects she develops Ecospace models to evaluate effects of hypoxia and large-scale restoration projects on fish and fisheries, advance ecosystem-based fisheries management, and support environmental impact assessments. She is an early-career research fellow with the National Academies of Sciences, Engineering and Medicine. She is a member of the Virginia Alosa Task Force, the River Herring Technical Expert Working Group, the Executive Board of the Ecopath Research and Development Consortium, the Executive Committee of Community Surface Dynamics Modeling System, the Executive Committee of the Atlantic Estuarine Research Society, and the Steering Committee of the Chesapeake Community Modeling Program. She has served as a Subject Editor of Ecological

Modelling, and is currently an Associate Editor of the North American Journal of Fisheries Management. As Associate Director of PEREC she focuses on Potomac River restoration and local sustainability practices, and leads a monitoring program used to evaluate effects of wastewater treatment plants on the fish community in the freshwater tidal environment and the spawning populations of anadromous fishes. She teaches several courses at university focused on aquatic sciences and fish ecology.



**Simone Libralato (National Institute of Oceanography and Applied Geophysics – OGS, Italy)**

Simone Libralato is a research scientist at OGS, in Trieste (Italy). He received his MSc (1998) and PhD (2004) in Environmental Sciences at University Ca' Foscari of Venice, Italy. He has a background in ecological modelling and quantitative analyses with special emphasis on individual based models, trophic web models and ecotoxicological models. Programming and development of bioenergetic models for representing the growth of fish and shellfish; models of populations structured in age classes. Advanced user of Ecopath with Ecosim for the building of food web models of coastal and open sea ecosystems and integration with hydrodynamic/biogeochemical models. He applies these methods for studying the effects of different stressors including fishing, aquaculture, pollution, climate change and nutrient input. He is the coordinator of Italy-Croatia Interreg project FAIRSEA on ecosystem approach to fisheries in Adriatic, and PI in projects PRIZEFISH (Piloting of eco-innovative fishery supply-chains to market added-value Adriatic fish products), VENEZIA2021 (Research program for the Venice Lagoon ecosystem), and Noci di Mare (regional project on the invasion of *Mnemiopsis leydi* in the Adriatic Sea). In the past he was the coordinator of activities in the regional project for sustainable aquaculture, (SOSTEMITS), coordinator of Task in the RITMARE Italian flagship project, PI on end-to-end modelling in EU projects PERSEUS and OPEC. The research activity is documented in more than 70 peer-reviewed publications.





**Natalia Serpetti (National Institute of Oceanography and Applied Geophysics – OGS, Italy)**

Natalia Serpetti is a Senior PDRA in Ecosystem Modelling and benthic ecologist, using multi-disciplinary approaches to understand spatial-temporal changes of observed ecosystem functioning. She received a “Specialization abroad diploma” (equivalent to a M.Sc.) in Marine Biology, and her Ph.D. in marine sediment biogeochemistry, both at the University of Aberdeen, UK. She has >10 years of experience that cover a wide range of the ecosystem levels from fish ecology and fisheries to nutrient cycling and deep-sea benthic ecology. Currently she is using Ecopath with Ecosim and Ecospace (EwE) modelling approach testing new software tools to support fisheries and marine-spatial planning advice. She worked on several ecosystems in the North East Atlantic- UK domain (West coast of Scotland, Irish Sea and Celtic Sea) and currently she is focusing on building a new EwE of the Adriatic and Ionian Seas focusing on assessing anthropogenic impacts on marine ecosystems such as impact of fisheries and climate change under the Interreg Italy-Croatia, FAIRSEA project. She has published >20 papers in the peer-reviewed literature, along with 18 technical reports; she is teaching Ecopath with Ecosim and Ecospace as part of the Ecopath consortium since 2017.

## Dissemination, flyer and website

A flyer was created to present briefly the Second advanced school in early 2020, aiming at having the school on July 2020 in accordance with the FAIRSEA workplan. The flyer was used in e-mails and also printed and exposed in different premises of FAIRSEA partners. After selection of the applicants, the COVID-19 pandemic situation forced to postpone the activity to July 2021.



**AMARE-MED 2020**

Second advanced school on quantitative methods for ecosystem approach to fisheries application

*Multidisciplinary ecosystem management approaches using spatial modelling with addressing socio-economic and environmental issues*

**WHEN**  
20-25 July 2020

**WHERE**  
Split (Croatia)

**INFO & REGISTRATION**  
<http://echo.inogs.it/amare-med>

**APPLICATION DEADLINE**  
15 March 2020

**CONTACTS**  
UNIST Group  
E-mail: [fairsea.summer.school@unist.hr](mailto:fairsea.summer.school@unist.hr)

**DESCRIPTION**  
The 2nd FAIRSEA advanced school on quantitative methods for EAF application will include i) in-depth investigation of single and multispecies spatial models using GADGET and SeaPopDym with focus on the technical interactions and overview of the management strategy evaluation; ii) use of ECOSPACE of the Ecopath with Ecosim suite to address multidisciplinary dimension of ecosystem management including both socio-economic and environmental issues. The course is highly technical, with practical hands-on computer activities, assignments and programming. Candidates must apply online and maximum 25 students will be selected based on their expertise in fisheries and related fields, programming and quantitative skills and interests. Selection process will be conducted under the principles of non-discrimination, equal opportunities and equality for men and women. Links with the CBC Italy-Croatia programme area will be considered in the selection. Fellowships are available for a few selected applicants that will be supported by the Project.

**KEYNOTE SPEAKERS**  
**André PUNT** (School of Aquatic and Fishery Sciences, Seattle, USA)  
**Kim de Mutsert** (Department of Environmental Science and Policy, George Mason University, USA)

**VENUE:** University of Split, University Campus Visoka (Z3F building)

**ORGANIZING COMMITTEE**  
Simone Libralato, Sveltana Krstulović Šifner, Jure Brčić, Mirela Petrić

**SCIENTIFIC COMMITTEE**  
Simone Libralato (OGS), Angelo Bonanno (CNR), Roberto Carlucci (CONISMA), Piera Carpi  
Francesco Colloca (SZN), Fabio Fiorentino (CNR), Tomaso Fortibuoni (ISPRA),  
Saša Raičević (ISPRA), Giuseppe Scarcella (CNR),  
Sveltana Krstulović Šifner (UNIST), Cosimo Sotgiro (OGS)  
Maria Teresa Spedicato (COISPA)  
Nedo Vrgoč (IOF)

Logos: OGS, UNIST, sunce

**Figure 4.** The flyer developed and distributed for the Second advanced school

The Second advanced school on EAF was widely disseminated through dedicated e-mails to over 600 selected addresses of the stakeholder mapping including relevant scientific/academic institutions, networks and individual e-mail addresses of scientists, professors and experts in marine ecology.

Moreover, a website (<http://echo.inogs.it/amare-med/>) completely dedicated to the AMARE-MED schools was created and used for online applications.



**Figure 5.** The web page of the Second Advanced schools on EAF, AMARE-MED 2021.

## Applicants and selection process

From the beginning of March 2019 to the end of April 2020 a total of 123 applications from all over the world were received through the online application system on the school website.

There was a broad interest for the Second advanced school organized by FAIRSEA, with a total of 29 countries being represented by applicants: Albania, Algeria, Argentina, Australia, Belgium, Brazil, Bulgaria, Croatia, Ecuador, Egypt, France, India, Indonesia, Iran, Italy, Kenya, Malta, Mauritania, Morocco, Nigeria, Palestine, Peru, Portugal, Serbia, Spain, Tanzania, Tunisia, Turkey, Ukraine.

As it was not possible for all 123 candidates to attend the lectures, a selection process was implemented.

A selection process was carried out considering skills, expertise, programming capabilities related to the aims of the school and motivation.

**The participants to the second Advanced School were selected fully considering the inclusive and non-discriminatory principles, giving priority to expertise and skills, but also balancing representativeness (i.e., considering the target areas of the program: CBC program area and EU Strategy for the Adriatic and Ionian Region).**

**The members of the Selection committee were: Simone Libralato (OGS), Francesco Colloca (SZN), Giuseppe Scarcella (CNR), Svjetlana Krstulović Šifner (UNIST) and Nedo Vrgoč (IOF).**

Several details were collected in the application form online that facilitated the selection and the selection committee defined scores for each relevant information for the purposes to select the best candidates considering the principles above. Criteria considered were:

1. Highest degree obtained (score 0-3: None = 0; Bachelor's degree = 1; Master's degree = 2; Doctoral degree = 3);
2. List of selected publications (score = 0-3);
3. Motivation/interest for the school (score = 0-3);
4. Knowledge of programming (score = 0-3: None = 0; Basic = 1; Good = 2; Expert user = 3);
5. Knowledge on basic population dynamics (score = 0-3: None = 0; Basic = 1; Good = 2; Expert user = 3);

6. Knowledge on predation models (score = 0-3: None = 0; Basic = 1; Good= 2; Expert user = 3);
7. Geographical area: CBC programme area (score = 3), Mediterranean (score = 1)

The selection committee had possibility to access to application form details including the curriculum vitae submitted by each participant. Skills and motivational/interest to the EAF concepts and tools were evaluated with particular care by the committee.

During the Skype meeting held on 15<sup>th</sup> May 2020, the Selection committee defined criteria for ranking the candidates, discussed individually appointed scores and defined the final ranking order of applicants based on the sum of the scores obtained in criteria.

It was considered an opportunity to have applicants from outside the CBC program area because:

- These applicants allow to bring the transnational and shared EAF approaches and concepts developed in FAIRSEA beyond the CBC program area (in particular the EUSAIR region and the Mediterranean and Black Sea areas);
- Applicants from other EU countries or other parts of the world can bring the highly qualified expertise and experiences of those countries with benefits for the school.

Considering the large number of applicants an effort was made to have the largest number possible to grant also quality lectures. **Therefore, from the list of applicants ranked by the sum of scores (obtained in criteria 1-7) the first 31 applicants were selected.**

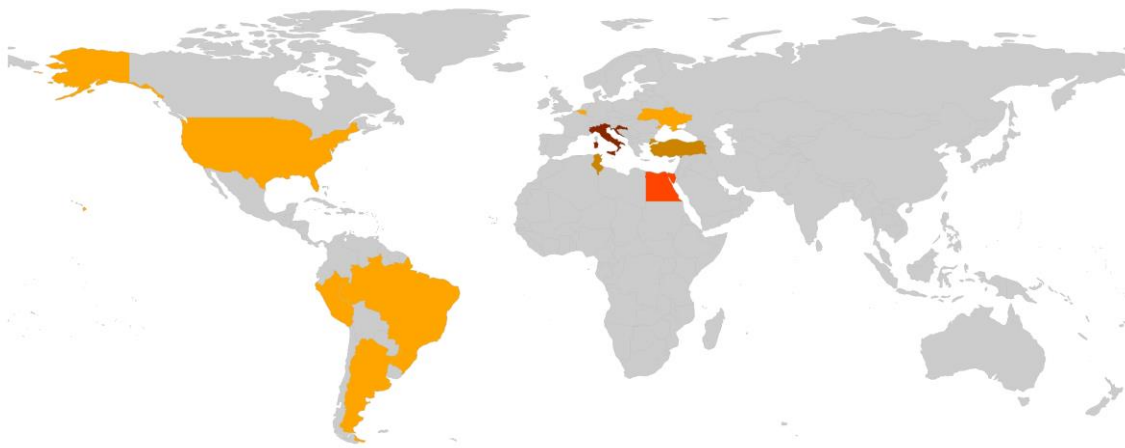
The list of selected students is reported in the following table.

**Table 1.** Applicants selected by the Committee for participating to AMARE-MED 2021.

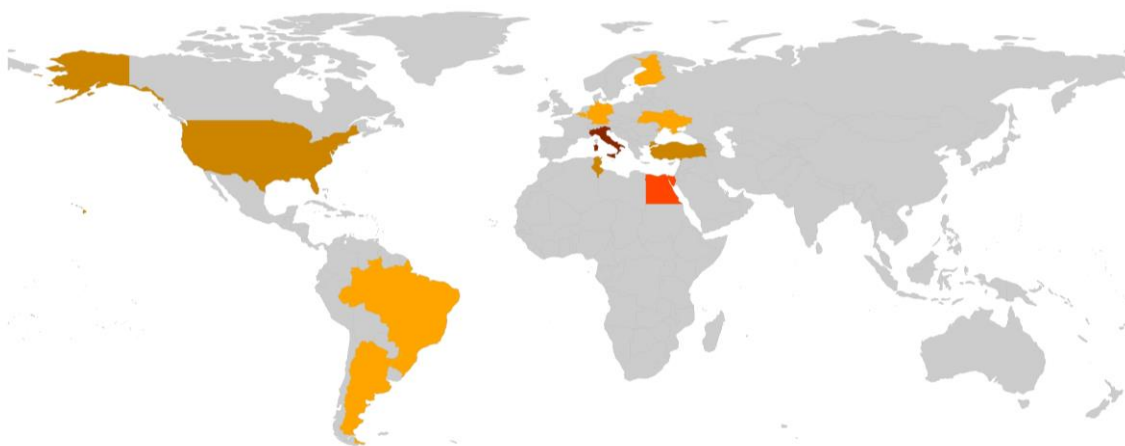
<b>Name</b>	<b>Institution</b>
Igor Celić	National Institute of Oceanography and Applied Geophysics, ITA
Isabella Bitetto	COISPA Tecnologia & Ricerca, ITA
Giovanni Romagnoni	Leibniz Centre for Tropical Marine Research (ZMT), DEU
Giacomo Milisenda	Stazione Zoologica Anton Dohrn, ITA
Enrico Nicola Armelloni	National Research Council, Institute for Biological Resources and Marine Biotechnology (CNR-IRBIM), ITA
Francesco Masnadi	1) University of Bologna (UNIBO); 2) National Research Council, Institute for Biological Resources and Marine Biotechnologies (CNR-IRBIM), ITA
Pasquale Ricci	Università degli Studi di Bari Aldo Moro, ITA
Diego Panzeri	National Institute of Oceanography of Trieste, ITA
Martina Scanu	National Research Council, Institute of Biological Resources and Marine Biotechnology of the (CNR-IRBIM), ITA
Ricardo Oliveros-Ramos	Inter-American Tropical Tuna Commission, USA
Tevfik Ceyhan	Ege University, Graduate School of Natural and Applied Sciences, TUR
Reda Fahim	College of Fisheries and Aquaculture Technology, Arab Academy for Science, Technology and Maritime Transport, EGY
Juan Gil Herrera	Spanish Institute of Oceanography (IEO), SPA
Natalija Dunić	Institute of Oceanography and Fisheries, CRO
Tomislav Džoić	Institute of Oceanography and Fisheries, CRO
Mourad Cherif	National Institute of Marine Sciences and Technology (INSTM), TUN
Maurizio Ingrosso	Università degli Studi Aldo Moro - Bari / CONISMA, ITA
Giulia Cipriano	Department of Biology University of Bari - LRU CoNISMa, ITA
Steven Pint	Flanders Marine Institute (VLIZ), BEL
Margaret Clark Siple	University of Washington, USA
David Edgardo Galvan	Center for the Study of Marine Systems (CESIMAR), National Scientific and Technical Research Council (CONICET), ARG
Ayman Salama Ali Ahmed	National Institute of Oceanography and Fisheries (NIOF), EGY
Ismet Saygu	Cukurova University, Fisheries Faculty, TUR
Daria Ezgeta Balić	Institute of Oceanography and Fisheries, CRO
Dunja Jusufovski	Faculty of Biological and Environmental Sciences, Organismal and Evolutionary Biology Research Programme, FIN
Amanda Ricci Rodrigues	Institute of Oceanography, Fisheries Ecosystems Laboratory, BRA
Yevhen Leonchuk	Odessa Center of Southern Research Institute of Marine Fisheries and Oceanography (Odessa Center YugNIRO), UKR
Walid Mohamed Taher Elsayy Aly	National Institute of Oceanography and Fisheries (NIOF), Egypt, EGY
Olfa Ben Abdallah-Ben Hadj Hamida	Institut National des Sciences et Technologies de la Mer, TUN
Gorana Jelić Mrčelić	Faculty of Maritime Studies, CRO
Nika Ugrin	University of Split, Department of Marine studies, CRO

## Participants

Of the 31 selected students, 10 participated the school in-person and 19 online. Two selected applicants canceled their participation due to an unforeseen parallel activity. The 29 students that effectively participated to AMARE-MED 2019 had nationality and affiliation country that demonstrated a very broad international participation to this FAIRSEA activity (see Figure 6 and 7).



**Figure 6.** Participants by nationality (light orange=1; brown =2; red =3; dark red >=4).



**Figure 7.** Participants by affiliation (orange=1; brown =2; red =3; dark red >=4).

From the Italy-Croatia CBC programme area there were 14 students: 10 from Italy and 4 from Croatia. One Italian participant was not from the CBC program area. Other participants were from Peru (1), USA (1), Brazil (1), Egypt (4), Tunisia (2), Turkey (2), Argentina (1), Spain (1), Belgium (1), Ukraine (1) and Finland (1).

There were **29 selected participants** and the **4 teachers** (K. de Mutsert, A. Punt, S. Libralato, N. Serpetti), **1 IT technician** D. Bartulović (UNIST), **3 members of the organizing committee** (J. Brčić, S. Krstulović Šifner and M. Petrić), **3 members of the FAIRSEA team** from UNIST (N. Bejo, V. Nerlović, and Ž. Trumbić) **for a total of 40 participants to the AMAREMED 2021 activity.**



**Figure 8.** Group photo of the Second Advanced school on EAF, AMARE-MED 2021.



## Support

No fee was requested to selected students for attending the AMAREMED 2021. All AMAREMED 2021 participants were provided with:

- Free access to conference rooms and facilities at the Ora hotel;
- Course materials;
- Gadgets;
- Lunches;
- Coffee breaks;
- Participation to excursion;
- Social dinner.

Thanks to FAIRSEA project all participants that attended School in person (10) were supported for travel and accommodation.



**Figure 9.** Gadgets provided to participants of the Second advanced school on EAF.

## Second Advanced school implementation

The school was held from Monday 21<sup>st</sup> June 2021 to Saturday 26<sup>th</sup> June 2021. It was organized in the mixed mode: in person and on-line using MS Teams. A week before the lectures all participants received video with directions on how to use MS Teams in case they were not familiar with use of the platform. On Monday and Tuesday (21<sup>st</sup> and 22<sup>nd</sup> June) lectures were given by K. de Mutsert. On Wednesday morning (23<sup>rd</sup> June) students went on a guided of the Diocletian Palace. The afternoon of Wednesday was reserved for a lecture provided on-line by A. Punt. On Thursday (24<sup>th</sup> June) and on Friday (25<sup>th</sup> June) S. Libralato and N. Serpetti held lectures and working group exercises. On Friday evening social dinner was organised. On Saturday (26<sup>th</sup> June), a full day cruising tour with a boat was organised with visits to island Hvar and Pakleni islands archipelago. Detailed agenda is presented in the following.

### Definitive agenda

#### **Day 1 – Monday, 21<sup>st</sup> June 2021**

**9:00 - 9:30 Welcome – Opening:** Prof. Leandra Vranješ Markić (vice rector for science and innovation at UNIST), Ass. prof. Maja Krželj (head of the Department of Marine Studies), Dr. Simone Libralato (coordinator of FAIRSEA project/organizer of School, OGS), Prof. Svjetlana Krstulović Šifner (organizer of School, UNIST)

Introduction to the Second Advanced School

#### **9:30 - 13:00 Modeling in Ecospace using EwE (lecturer K. de Mutsert)**

[0] Overview and introduction - explore student needs Lecture A: Introduction to Ecopath, Ecosim, and Ecospace

**10.30 - 11:00** Coffee break

Lecture B: Introduction to Ecospace Lecture C: Ecospace Teaser

Download EwE release version

**13:00 - 14:00** Lunch

#### **14:00 - 17:00 (continue) Modeling in Ecospace using EwE (lecturer K. de Mutsert)**

[1] Exercise: Creating an Ecospace model

**15:30–16:00** Coffee break

Seminar: Using Ecosystem Modeling to Evaluate Trade-offs in Coastal management: Effects of large-scale river diversions on fish and fisheries.

Look under the hood: The model behind the seminar

**Day 2 – Tuesday, 22<sup>nd</sup> June 2021**

**9:00 - 13:00 (continue) Modeling in Ecospace using EwE (lecturer K. de Mutsert)**

Lecture D: Ecospace Primer

Lecture E: The Spatial-Temporal Framework

**10.30 - 11:00** Coffee break

Download time-limited EwE Pro version

[2] Exercise: Climate change in a coastal bay

**13:00 - 14:00** Lunch

**14:00 - 17:00 (continue) Modeling in Ecospace using EwE (lecturer K. de Mutsert)**

[3] Exercise: Evaluating a Marine Protected Area for shrimp

**15:30 - 16:00** Coffee break

Seminar: Using coupled ecosystem modelling to evaluate effects of nutrient and hypoxia reductions on living marine resources

Look under the hood: The model behind the seminar

**Day 3 – Wednesday, 23<sup>rd</sup> June 2021**

Morning: visit Split - guided tour of the Diocletian Palace

**13:30 - 14:30** Lunch

**14:30 - 15:00** Preparing for the class with A. Punt

**15:00 - 17:00 Spatial population dynamics modeling (lecturer A. Punt)**

[0] Introduction and presentation

Lecture D (part 1): Estimation methods

[1] Including space in assessment models

Lecture D (part 2): Brief history of spatial models

[2] Including space in assessment models Lecture D (part 3): Assessment and structure with examples

**Day 4 – Thursday, 24<sup>th</sup> June 2021**

**9:00 - 13:00 Spatial multispecies model from data to management scenarios (lecturers S. Libralato, N. Serpetti and OGS group)**

[0] Introduction and presentation

Lecture 1: Introduction of the multispecies spatial model of the Adriatic Sea

**10.30 - 11:00** Coffee break

Lecture 2: Fitting and validating a complex ecosystem model

[0] Sharing in 5 groups (NGOs, Fishermen, Policy makers, Scientists, Socio-economic)

[1] Exercise 1: Running and exploring the model; Running the model for the Adriatic: analyzing ecological effects of management choices

Lecture 3: Fisheries Management in the Adriatic Sea

**13:00 - 14:00** Lunch

**14:00 - 17:00** (continue) **Spatial multispecies model from data to management scenarios**  
**(lecturers S. Libralato, N. Serpetti and OGS group)**

Lecture 4: Planning a management action: Working group exercise

[2] Exercise 2 by Working groups: define objectives and run scenario(s) of Group's policy.

**15:30 - 16:00** Coffee break

[3] Reporting results by WGs

**Day 5 – Friday 25<sup>th</sup> June 2021**

**09:00 - 13:00** (continue) **Spatial multispecies model from data to management scenarios**  
**(lecturers S. Libralato, N. Serpetti and OGS group)**

Lecture 5: Synthesis of multiple simulations by the groups, highlighting differences

[4] Exercise 3 in groups: Reconsidering management choices

**10:30 - 11:00** Coffee break

[5] Reporting results by WGs

Lecture 6: Considering adaptation of fisheries and multiple additive policies

**13:00 - 14:00** Lunch

**14:00 - 17:00** (continue) **Spatial multispecies model from data to management scenarios**  
**(lecturers S. Libralato, N. Serpetti and OGS group)**

[6] Exercise 4 in groups: Evaluate management choices and adaptive strategies of fishermen

**15:30 - 16:00** Coffee break

[7] Reporting results by WGs

Discussion, closure

**20:00** Social dinner (restaurant Zora bila)

**Day 6 – Saturday, 26<sup>th</sup> June 2021**

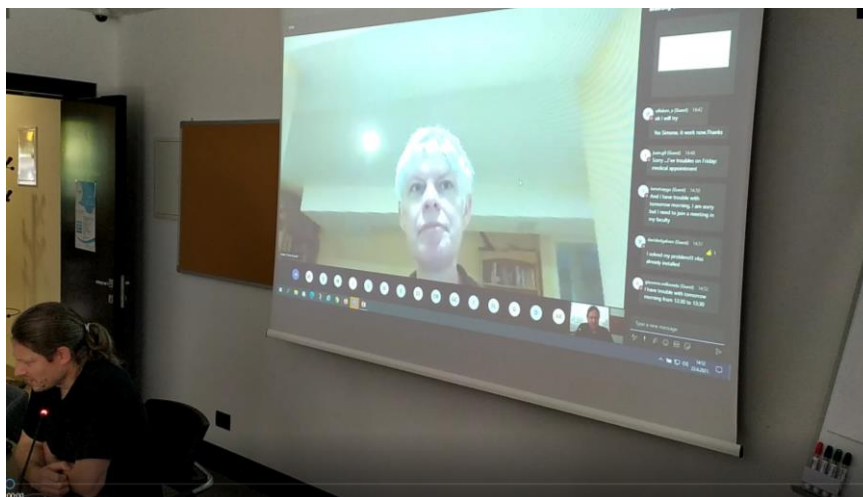
Day trip on a boat/sailing vessel; cruising and visits to Hvar and Pakleni islands.



**Figure 10.** The participants of the AMARE-MED 2021



**Figure 11.** Kim de Mutsert starting the lecture



**Figure 12.** André Punt giving online lecture



**Figure 13.** Simone Libralato lecturing



**Figure 14.** Natalia Serpetti lecturing



**Figure 15.** Social dinner in a local restaurant in Split



**Figure 16.** Day trip with a touristic boat visiting Hvar and Pakleni islands



## Course material

The course material included lectures, exercises, literature, software and photos all made available to participants through MS Teams. Each lecturer uploaded the materials in three subfolders “1\_Lectures”, “2\_Exercises” and “3\_Literature”.

### Kim de Mutsert

#### 1\_Lectures:

- 1 Intro\_Ecopath\_Ecosim\_Ecospace.pdf
- 2 Introduction to Ecospace.pdf
- 3 Ecospace teaser.pdf
- 4 Spatial temporal framework.pdf
- De Mutsert diversion seminar Croatia 2021.pdf
- De Mutsert hypoxia seminar Croatia 2021.pdf

#### Exercises:

##### - Subfolder: **EwE time-limited pro-version**

- EwE6.6.6-17404-pro-32bit
- EwE6.6.6-17404-pro-64bit
- EwEPro\_demo\_2021-09
- READ ME.docx

##### - Subfolder: **MPA spatial temporal data**

- mpa\_notrawlers\_2005-05
- mpa\_notrawlers\_2005-05
- mpa\_notrawlers\_2012-09
- mpa\_notrawlers\_2012-09

##### - Subfolder: **Temperature**

- Containing 260 \*.asc files

- Anchovy Bay depth.asc
- Anchovy Bay Ecospace.exemdb
- Exercise- evaluating an MPA.pdf
- Exercise-temperature effects in a coastal bay.pdf

#### Literature:

12 pdf files (scientific papers and one manual)

#### André Punt

##### 1\_Lectures:

- AMAREMED-21.ppt

##### 2\_Exercises:

- Subfolder: **SS**
  - Containing Stock synthesis files
  - Ex0.R
  - Ex1.R
  - Ex2.csv
  - Ex2.R
  - Ex3.R
  - r4ss Runs.R
  - r4ss Runs\_old.R

##### 3\_Literature:

- 12 pdf files (scientific papers)

## OGS Team (Natalia Serpetti and Simone Libralato)

### 1\_Lectures:

- AMAREMED2020\_OGSteam\_Lecture\_0.pptx
- AMAREMED2020\_OGSteam\_Lecture\_A.pptx
- AMAREMED2020\_OGSteam\_Lecture\_B.pptx
- AMAREMED2020\_OGSteam\_Lecture\_C.pptx
- AMAREMED2020\_OGSteam\_Lecture\_D.pptx
- AMAREMED2020\_OGSteam\_Lecture\_E.pptx
- AMAREMED2020\_OGSteam\_Lecture\_E\_addendum\_SAC\_SRC\_AS\_2021.pptx
- AMAREMED2020\_OGSteam\_Lecture\_E\_addendum\_SAC\_SRC\_AS\_2021\_v2.pptx
- AMAREMED2020\_OGSteam\_WG\_0.pptx

### 2\_Exercises:

#### - Subfolder: **Coupling PPN**

- containing 15 \*.asc files

#### - Subfolder: **spatial mgn**

- containing 15 \*.asc files
- AMAREMED2020\_OGSteam\_WG\_exercises.pptx
- AMAREMED2020\_OGSteam\_Working groups.pptx
- FAIRSEA Adriatic GSA 1718 Ecospace 20210623\_b\_STF.exeaccdb

### 3\_Literature:

- 5 pdf files (scientific papers)

All materials are available upon request.

## Evaluation of the course by participants

After the end of the AMAREMED 2021, all participants that successfully finished the course (21 students: 10 in person and 11 on-line) were provided a link to the MS Forms questionnaire (Figure 17) so that they can evaluate the school.



\* Required

1. How did you participate in the course \*

In-person

Online

2. **Information:**  
How well were you informed about the objectives of this course?

**Figure 17.** Screenshot of the questionnaire for the students made using the MS Forms (The pdf of the questionnaire can be found in appendix)

The completion of the questionnaire was anonymous and voluntary. In total 12 results were received (7 from In-person participants and 5 from online participants). In the first question the students were asked to choose whether they participated the course online or in-person. This allowed us to group the results separately for each group. The next 14 questions were given and asked to provide an evaluation from 1 (very low) to 5 (very high). End of the questionnaire included a question on specific suggestions (question 16) and a space for notes and comments (question 17).

### Scored questions

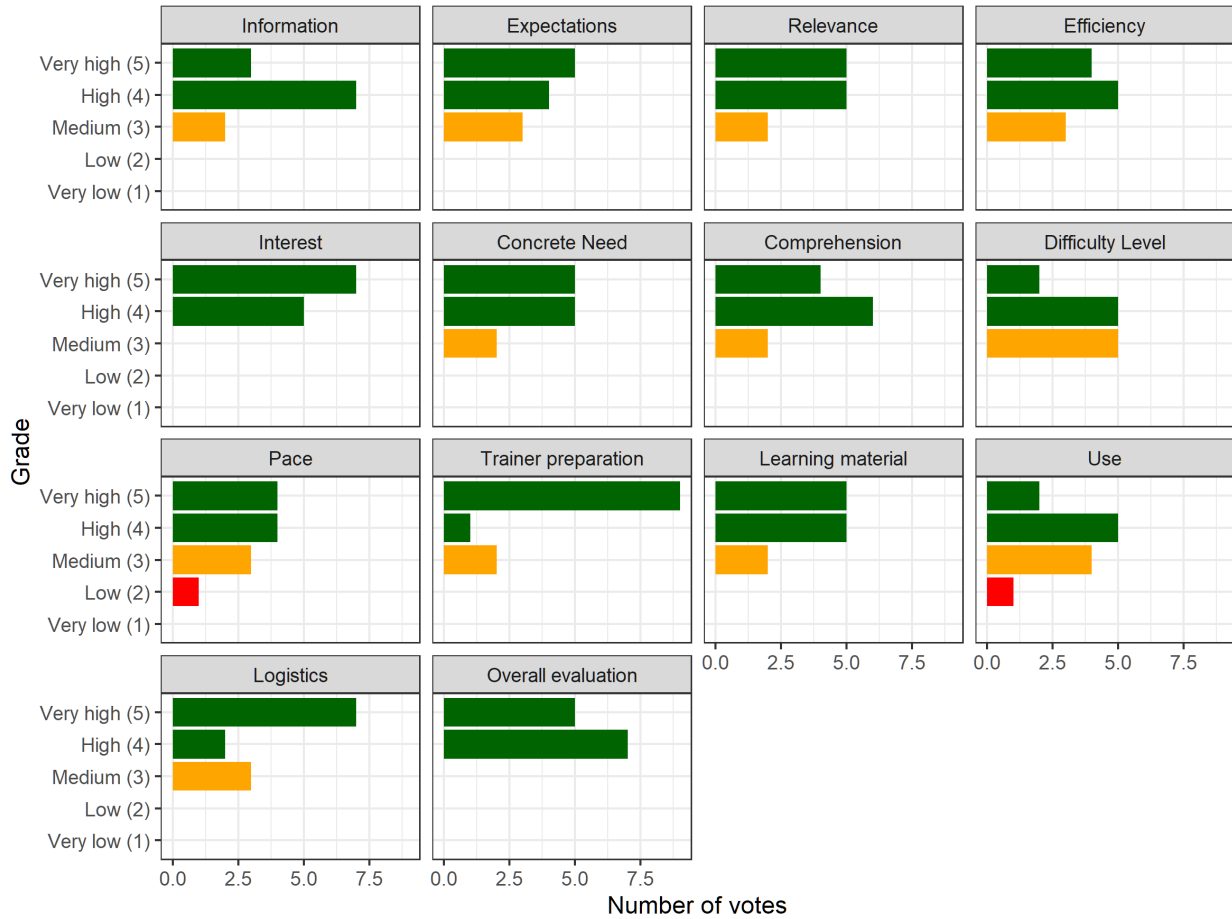
The questionnaire was composed of following 14 questions with evaluation score:

**1. Information:** *How well were you informed about the objectives of this course?*

- 2. Expectations:** *To what extent do you consider that this training course met your expectations?*
- 3. Relevance/Work:** *How relevant to your work do you consider the content of this training course?*
- 4. Efficiency:** *How do you consider the ratio between the number of subjects lectured within the course and the time allocated for each topic?*
- 5. Interest:** *How interesting did you consider this course to be?*
- 6. Concrete Need:** *To what extent did you consider the training was oriented to concrete needs and problems?*
- 7. Comprehension:** *To what extent do you consider that you have understood the content of the course?*
- 8. Difficulty Level:** *How appropriate do you consider the difficulty level of this training course?*
- 9. Pace:** *How appropriate do you consider the pace of this training course?*
- 10. Trainer preparation:** *How do you consider the preparation of the trainers?*
- 11. Learning material:** *Were the learning aids and materials of a good standard?*
- 12. Use:** *To what extent will you be able to use what you have learned in this course?*
- 13. Logistics:** *What do you think about the logistic and general organization of the course?*
- 14. Overall evaluation:** *What is your overall evaluation for this course?*

**Table 2:** Average grades of 14 scored questions of the from first (AMAREMED 2019) and the second (AMAREMED 2021) school. For the second school average grades are calculated based on the 12 responses (7 in person and 5 online).

Question	First school	Second school		
		Pooled (In-person + Online)	In-person	Online
1. Information	4.2	4.1	4.3	3.8
2. Expectations	4.2	4.2	4.4	3.8
3. Relevance	4.3	4.2	4	4.6
4. Efficiency	3.7	4.1	4.3	3.8
5. Interest	4.7	4.6	4.6	4.6
6. Concrete Need	4.1	4.2	4.3	4.2
7. Comprehension	3.8	4.2	4.3	4
8. Difficulty Level	3.9	3.8	4	3.4
9. Pace	4	3.9	4	3.8
10. Trainer preparation	4.8	4.6	4.6	4.6
11. Learning material	4.5	4.2	4.4	4
12. Use	3.7	3.7	3.7	3.6
13. Logistics	4.5	4.3	4.7	3.8
14. Overall evaluation	4.5	4.4	4.6	4.2



**Figure 18.** Grades received for the 14 scored questions in the questionnaire by the students who participated the Second advanced school.

### Open question

**15. Suggestions? Do you think is better to have one single method or more methods in one course? What would you change? What would you keep?**

(list of answers received)

- *Very interesting the aggregation of students in groups of stakeholders to work on the models. I think that is very useful to adopt in next AMARE MED editions*

- *hybrid teaching was not so easy. perhaps next time you could allocate more people to help online students, e.g. having one or two helping those online, and similar number helping those in presence. I had the feeling in a few cases that the online participants struggled to get help, but maybe it was just my perception.*
- *In case the future workshops need to be online, I would strongly recommend to record the lectures and sessions. They can have a limited availability, but it would help greatly. Personally, I would prefer to have some of the exercise materials available well in advance and also, it would be good to really stress and point out materials and/or programs that need to be downloaded beforehand for the exercise. I think it would have saved us a lot of time.*



## Comments

### *Any other comment you want to share:*

(list of answers received)

- Even online attending was great!! congratulations for such a good organization. Hope we'll can meet soon :-)
- the online participation was not so easy. This is nobody's fault. I am more familiar with Zoom as a platform, perhaps that would have made my experience better. Anyway, given the limitations, the course was a great experience, and the technical help, logistic as well as lecturer all went smoothly despite occasional challenges. Overall, good job!
- I appreciate the effort and time put into the organisation of the workshop, particularly the online one. I know that this was the last option and that many things were done for the first time without prior experience or the time to test it. All in all, it was a fun and wonderful workshop! Looking forward to the next one!

### Final comments on the course





Overall, the course was very positively evaluated. The lowest average score has been obtained for the questions about the pace and the use (Questions 9 and 12). Interest (Question 5) and trainers' preparation (Question 10) received the highest score (4.6). The overall evaluation (Question 14) was very positive (4.4). Compared to the first school, the second school received slightly lower grades. The reason for this could be the "hybrid mode" of teaching (In-person and Online). However, if we compare grades from the first school with the grades from In-person participants of the second school only, we can see the second school received on average higher grades. This potentially shows that students prefer in-person over online lectures. Since lecturers are in general much more experienced in in-person lecturing, this is not a surprise.

## ANNEXES

### 1-Amaremed 2021 flyer



### 2 - List of participants signed every day and attendance lists downloaded from MS Teams

- List of In-person participants signed every day  List of participants signed every day.pdf
- MS Teams attendance list 21/06/2021  meetingAttendance Report.csv
- MS Teams attendance list 22/06/2021  meetingAttendance Report.csv
- MS Teams attendance list 23/06/2021  meetingAttendance Report.csv
- MS Teams attendance list 24/06/2021  meetingAttendance Report.csv
- MS Teams attendance list 25/06/2021  meetingAttendance Report(General).csv

### 3 – Introductory lecture by S. Libralato



AMAREMED2020\_O  
pening\_July2021\_Lit

### 4- Lectures Kim de Mutsert



1  
Intro\_Ecopath\_Ecosi



2 Introduction to  
Ecospace.pdf



3 Ecospace  
teaser.pdf



4 Spatial temporal  
framework.pdf



De Mutsert  
diversion seminar



De Mutsert hypoxia  
Ciseminar Croatia 202

### 5 – Lecture André Punt



AMAREMED-21.pdf

### 6- Lectures OGS Team (Natalia Serpetti & Simone Libralato )



AMAREMED2020\_O  
GSteam\_Lecture\_0.p



AMAREMED2020\_O  
GSteam\_Lecture\_A.p



AMAREMED2020\_O  
GSteam\_Lecture\_B.p



AMAREMED2020\_O  
GSteam\_Lecture\_C.p



AMAREMED2020\_O  
GSteam\_Lecture\_D.p



AMAREMED2020\_O  
GSteam\_Lecture\_E.p



AMAREMED2020\_O  
GSteam\_Lecture\_E\_a



AMAREMED2020\_O  
GSteam\_Lecture\_E\_a



AMAREMED2020\_O  
GSteam\_WG\_0.pdf

## 7 – evaluation form and individual student responses



AMARE-MED 2021  
evaluation form (Pre



AMARE-MED 2021  
evaluation form(1-12