

# WP4

## The innovation approach of the FAIRSEA platform

### FAIRSEA Project

II International stakeholder Meeting | 23-24.02.2021


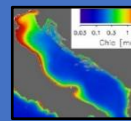
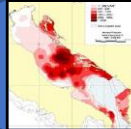
CNR-IRBIM | Francesco Masnadi & Giuseppe Scarcella

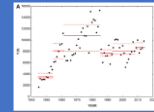
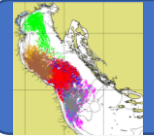
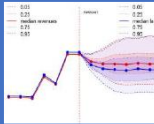
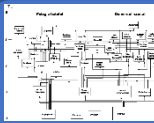


# WP4 - The innovation approach of the FAIRSEA platform

*WP AIMS:* This WP is dedicated to the development of an **integrated platform (IP)** for a quantitative ecosystem approach to fisheries that goes across territorial boundaries and across several disciplines. The platform will integrate datasets from physics to bioeconomy of fisheries as a state of the art and decision support tool.

The IP cornerstone elements are:

-  **HYDRO**  
Water circulation & connectivity
-  **BGC**  
Biogeochemical & plankton processes
-  **BSTAT**  
Distribution of resources

-  **FSTAT**  
Catches and fleets statistics
-  **EFFORT**  
Spatial distribution and dynamics
-  **BIOECO**  
Bio-economic responses
-  **FWM**  
Food web dynamics

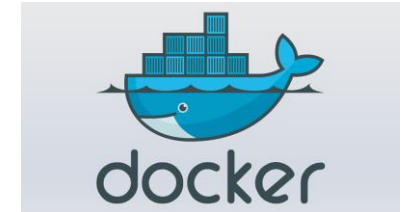
Implementation of local management actions in the IP will result in **applicative pilot actions** demonstrative of operative use and potential insights that can be gained from the shared integrated approach (WP5).

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## IP structure and development

<https://www.docker.com/>

FAIRSEA IP is a **web-GIS application** based on open source software, all services are deployed by *Docker* containers, main services are:



- Backend: REST API developed in [Python](#) with [Django](#), [Django Rest Framework](#) and [GeoDjango](#) ;
- Frontend: a Single Page Application based on [AngularJS](#) with [Angular Material](#) framework ;
- Database: [PostgreSQL](#) with [PostGIS](#) ;
- Gis software: [Geoserver](#) ;
- Charts and dashboards: [Plotly](#) and [Grafana](#) ;



Other used libraries and services: [GDAL](#), [scipy](#), [Shapely](#), [netCDF4](#), [Pandas](#), [MapProxy](#), [Pillow](#).

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## HYDRO – Hydrodynamic circulation and connectivity

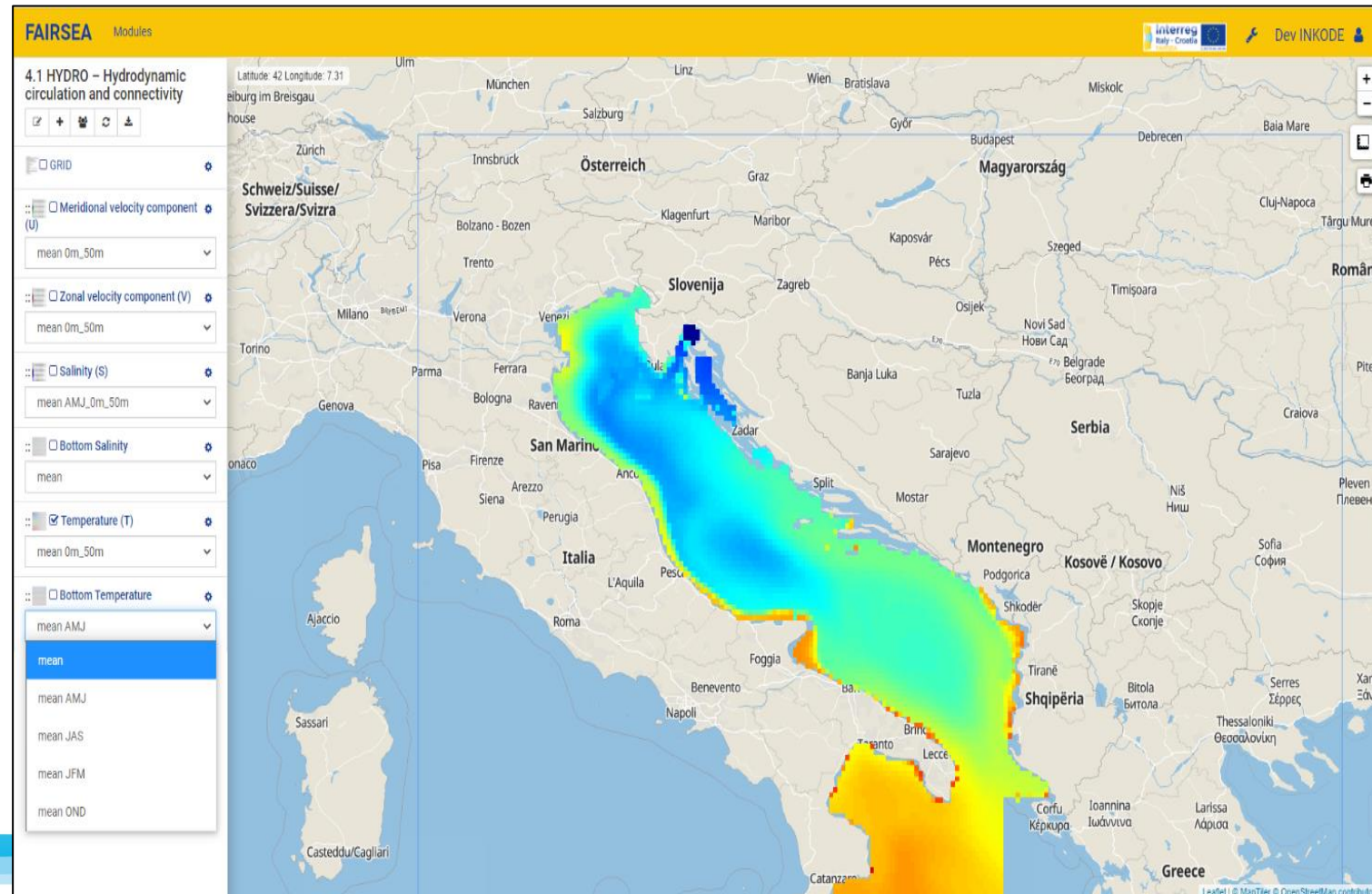


This module contains the description of the physical properties of the Adriatic and Ionian basins provided by a multidecadal reanalysis of the Mediterranean Sea for the past 20 years.

(CMEMS data, <http://marine.copernicus.eu/>).

The variables selected for the period 1999-2018 are:

- **Temperature**
- **Bottom Temperature**
- **Salinity**
- **Currents** (meridional and zonal component used as a proxy of the connectivity)



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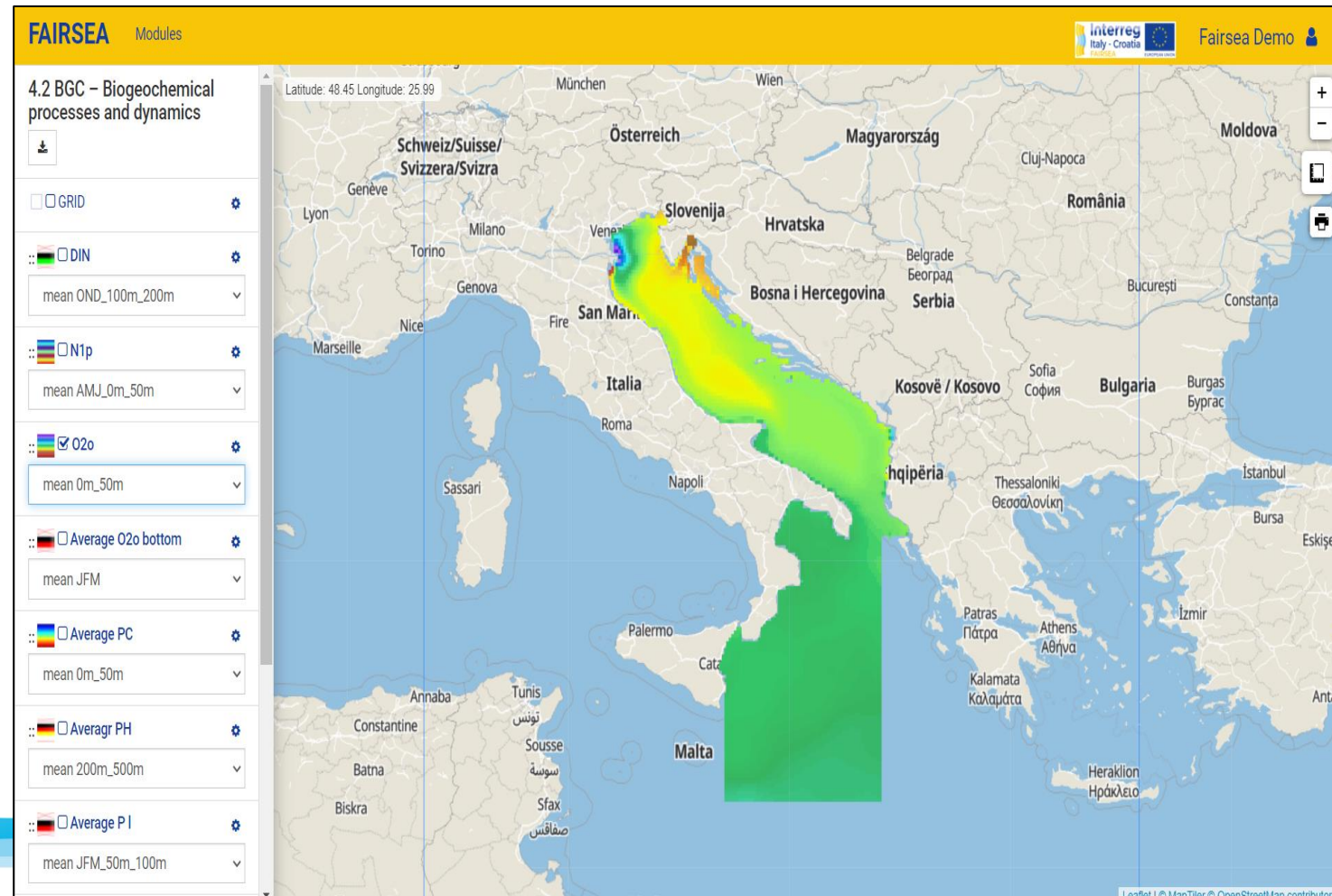
## BGC – Biogeochemical processes and dynamics



This module contains the description of the biogeochemical properties of the Adriatic and Ionian basins provided by a multidecadal reanalysis of the Mediterranean Sea for the past 20 years. (CMEMS data, <http://marine.copernicus.eu/>).

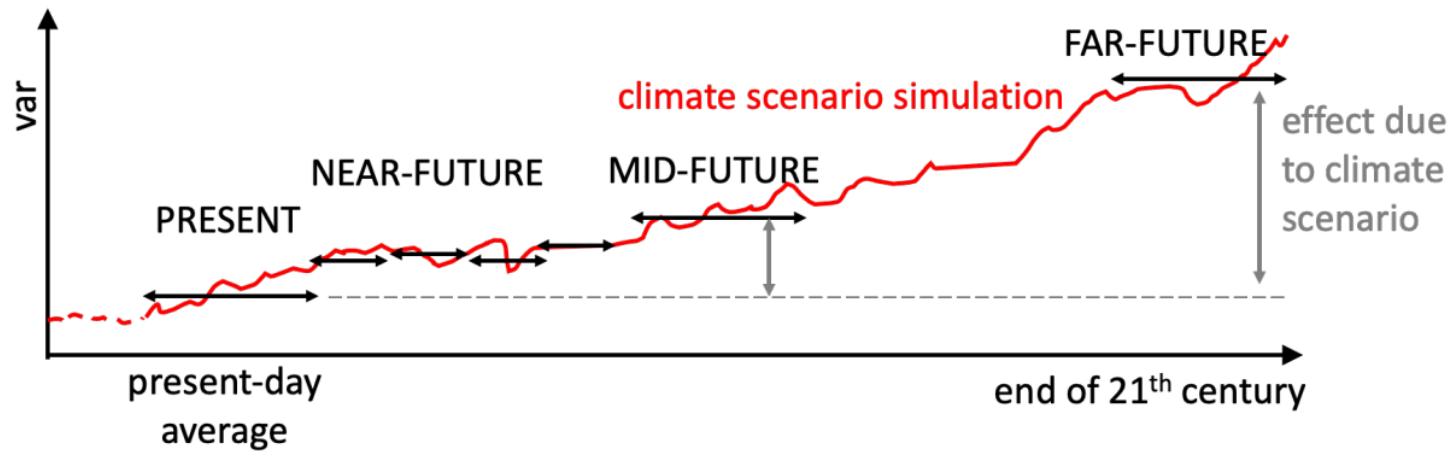
The variables selected for the period 1999-2018 are:

- Chlorophyll-a
- Dissolved Nitrogen
- Phosphate
- Dissolved Oxygen
- Phytoplankton carbon biomass
- Zooplankton carbon biomass
- Particulate organic carbon
- pH
- Net primary production



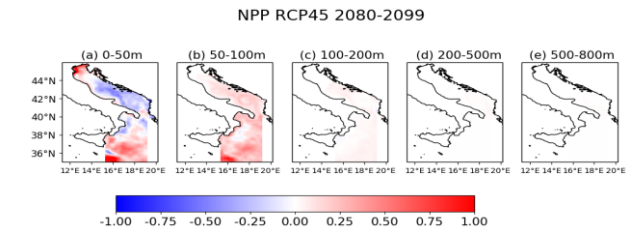
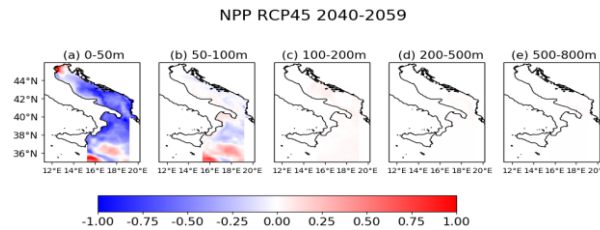
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## HYDRO & BGC: future scenarios

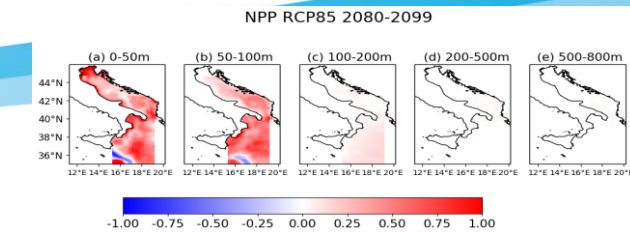
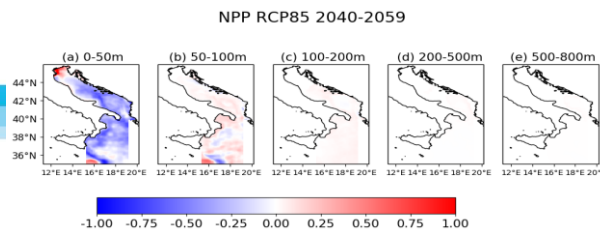


**2 main reference periods (20 yrs) + 4 additional periods (5 yrs)**

**RCP4.5**



**RCP8.5**



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## BSTAT – Spatial distribution of marine resources



These sub-modules (BSTAT GSA17, BSTAT GSA18, BSTAT GSA19) contain database of standardized indices and maps of commercial species distribution based on the knowledge from the past 20 years divided by GSAs.

Data are gathered from the main bottom trawl surveys conducted in the Adriatic Sea and in the Western Ionian Sea by several FAIRSEA partners:

**MEDITS (GSA17,18,19) & SOLEMON (GS17)**

Outputs from trawl surveys are provided thanks to specifically designed open source tools, as Rroutine BioIndex and BioStand (available at: <https://www.coispa.it>).

GSA17
<i>Mullus barbatus</i>
<i>Illex coindetii</i>
<i>Merluccius merluccius</i>
<i>Micromesistius poutassou</i>
<i>Merlangus merlangus</i>
<i>Trachurus mediterraneus</i>
<i>Trachurus trachurus</i>
<i>Eledone moschata</i>
<i>Boops boops</i>
<i>Loligo vulgaris</i>
<i>Pagellus erythrinus</i>
<i>Trisopterus capelanus</i>
<i>Parapenaeus longirostris</i>
<i>Solea solea</i>
<i>Squilla mantis</i>

GSA19
<i>Mullus barbatus</i>
<i>Pagellus acarne</i>
<i>Trachurus trachurus</i>
<i>Merluccius merluccius</i>
<i>Parapenaeus longirostris</i>
<i>Illex coindetii</i>
<i>Phycis blennoides</i>
<i>Pagellus erythrinus</i>
<i>Micromesistius poutassou</i>
<i>Aristeus antennatus</i>
<i>Trachurus mediterraneus</i>
<i>Aristaeomorpha foliacea</i>
<i>Lophius budegassa</i>
<i>Pagellus bogaraveo</i>
<i>Helicolenus dactylopterus</i>
<i>Eledone cirrhosa</i>
<i>Nephrops norvegicus</i>
<i>Galeus melastomus</i>

GSA18
<i>Mullus barbatus</i>
<i>Merluccius merluccius</i>
<i>Illex coindetii</i>
<i>Spicara flexuosa</i>
<i>Trachurus trachurus</i>
<i>Parapenaeus longirostris</i>
<i>Spicara smaris</i>
<i>Apitrigla cuculus</i>
<i>Loligo vulgaris</i>
<i>Phycis blennoides</i>
<i>Micromesistius poutassou</i>
<i>Pagellus erythrinus</i>
<i>Helicolenus dactylopterus</i>
<i>Bothus podas</i>
<i>Trachurus mediterraneus</i>
<i>Lophius budegassa</i>
<i>Eledone cirrhosa</i>
<i>Octopus vulgaris</i>
<i>Pagellus acarne</i>
<i>Boops boops</i>
<i>Todaropsis eblanae</i>
<i>Pagellus bogaraveo</i>
<i>Allotheutis media</i>
<i>Conger conger</i>
<i>Aristaeomorpha foliacea</i>
<i>Aristeus antennatus</i>



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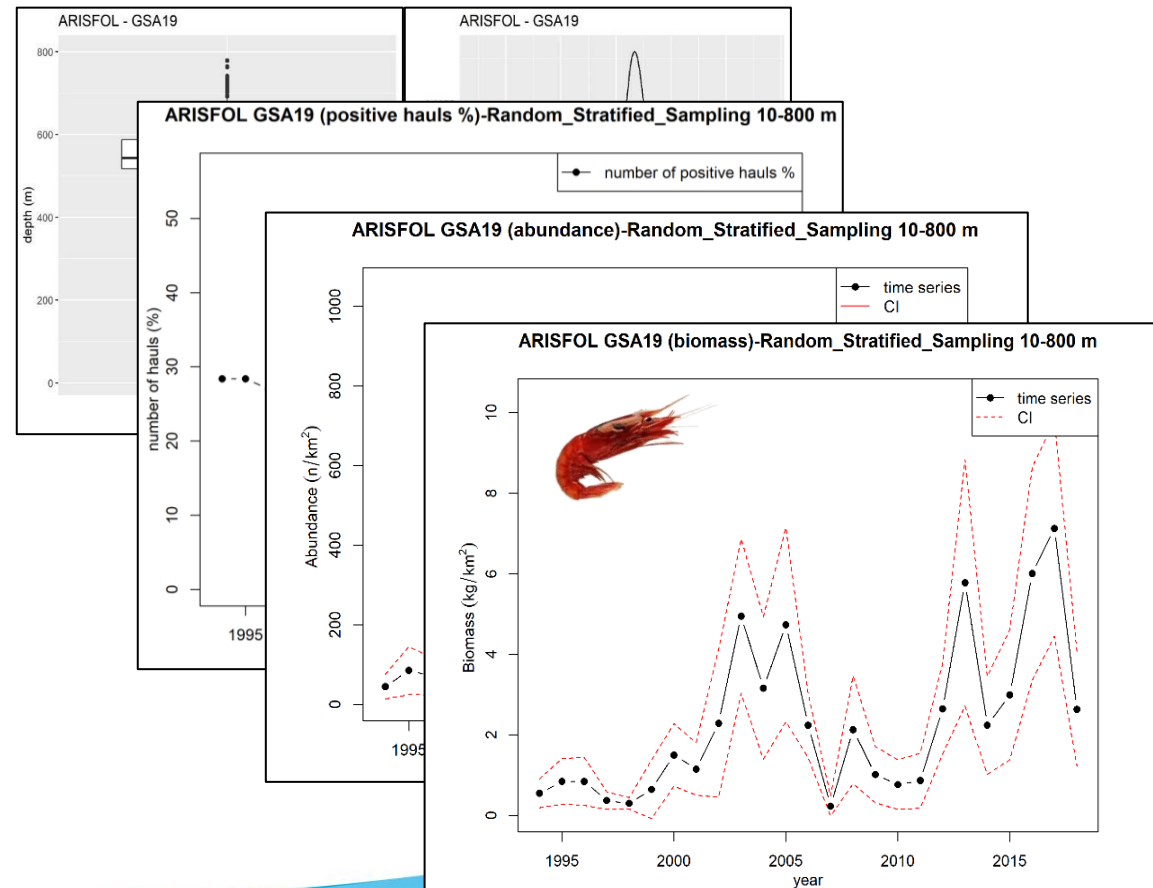
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## BSTAT – Spatial distribution of marine resources



**BioIndex** folders contains plots and data table of biomass and abundance index together with temporal and spatial trend of key population state-indicators providing comparable information among the various GSAs.

1. bathymetric distribution
2. number of positive hauls to the species
3. the mean biomass index ( $\text{kg}/\text{km}^2$ )
4. the mean abundance index ( $\text{number}/\text{km}^2$ ),
5. the inverse of mean abundance Coefficient of Variation (CV)
6. the mean individual weight (MIW)
7. the sex-ratio
8. the index of recruits ( $\text{number}/\text{km}^2$ )
9. the index of spawners ( $\text{number}/\text{km}^2$ )
10. the length at 95° percentile (L0.95)





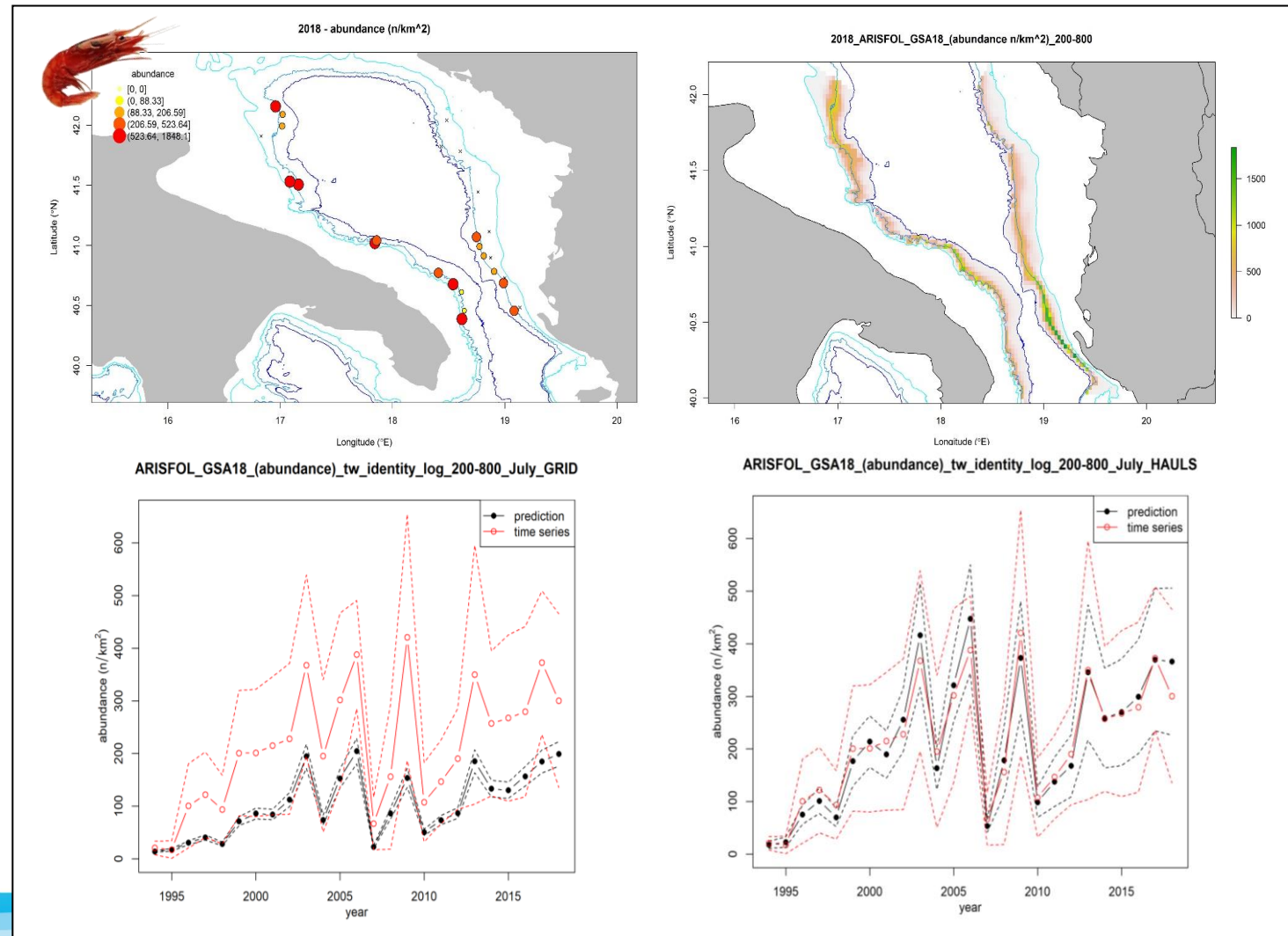
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## BSTAT – Spatial distribution of marine resources



**BioStand** folder contains plots and table outputs from the standardization procedure using Generalized Additive Models (GAM).

1. Standardized biomass index (kg/km<sup>2</sup>)
2. Standardized abundance index (number/km<sup>2</sup>)
3. Various model diagnostic plots
4. Maps of predicted spatial distribution

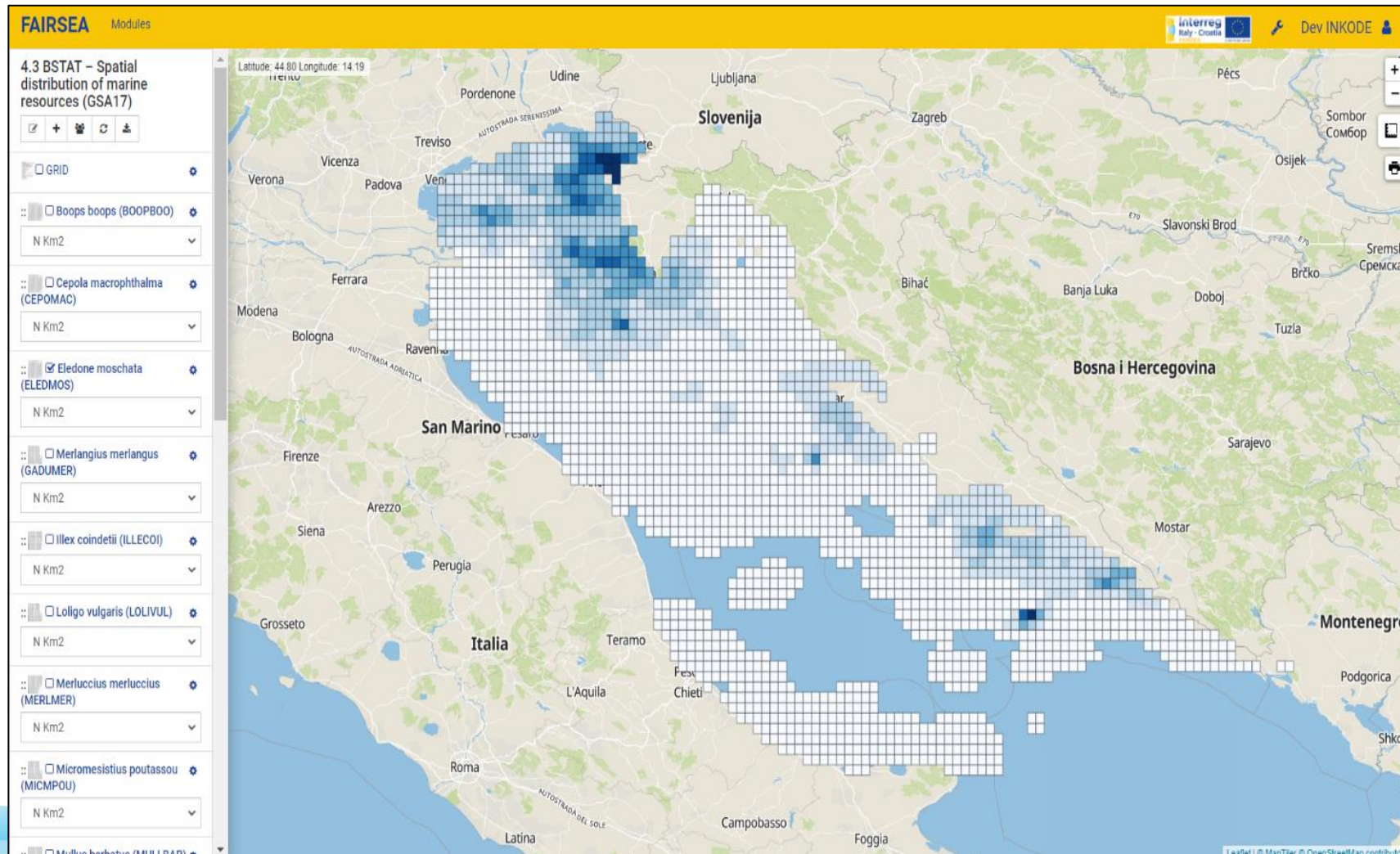


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## BSTAT – Spatial distribution of marine resources



Spatial distribution of of interesting species in the GSA17 from MEDITS survey

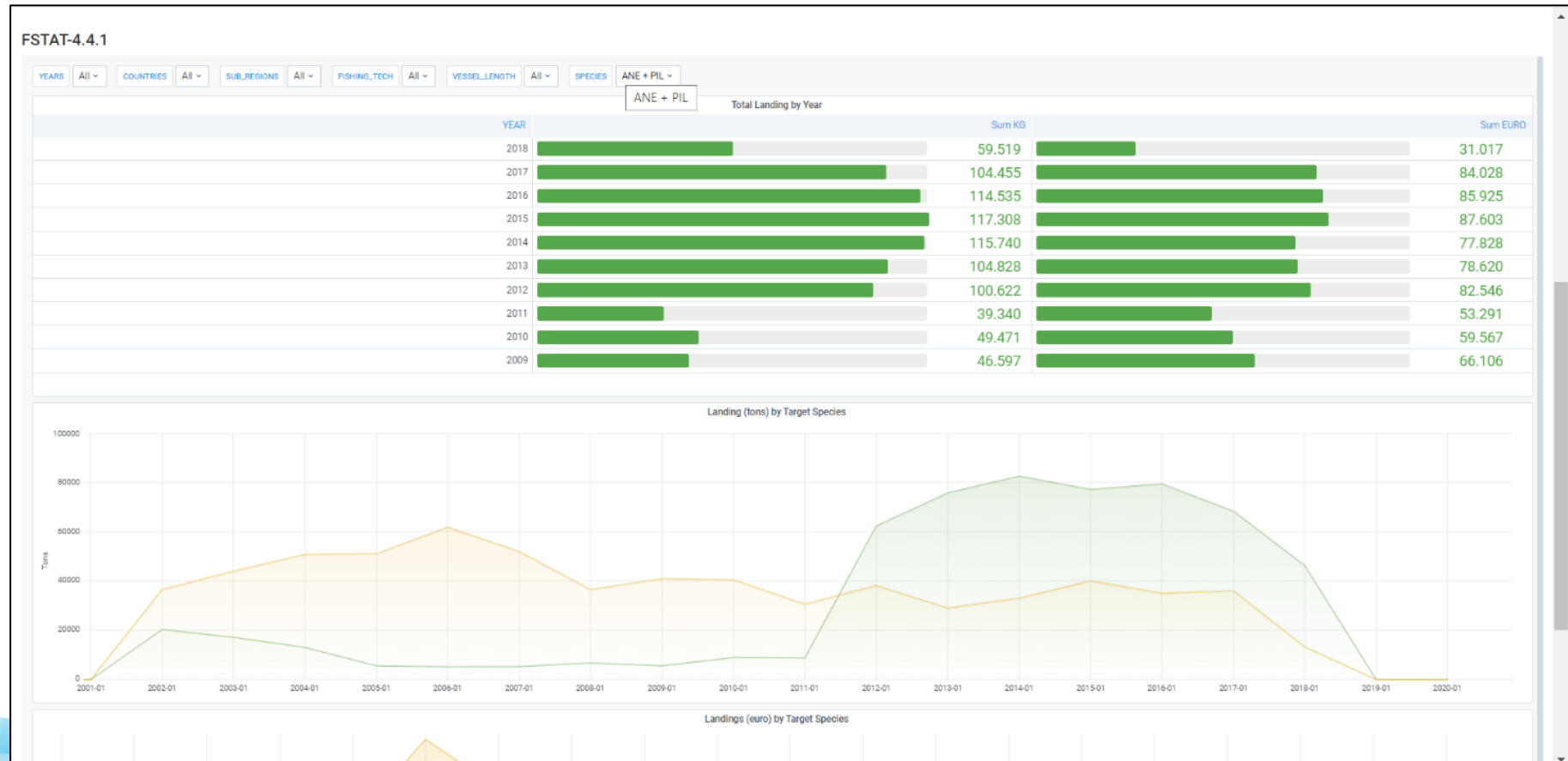


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## FSTAT – Catches and fishing capacity by fleet segment



This module contains a dataset of fisheries dependent information including data for the last decade in terms of catches (both quantities and price), length frequency distribution (LFD) and fleet capacity (number, GT, LOA, and fixed and variable costs) by species and fleet segment.

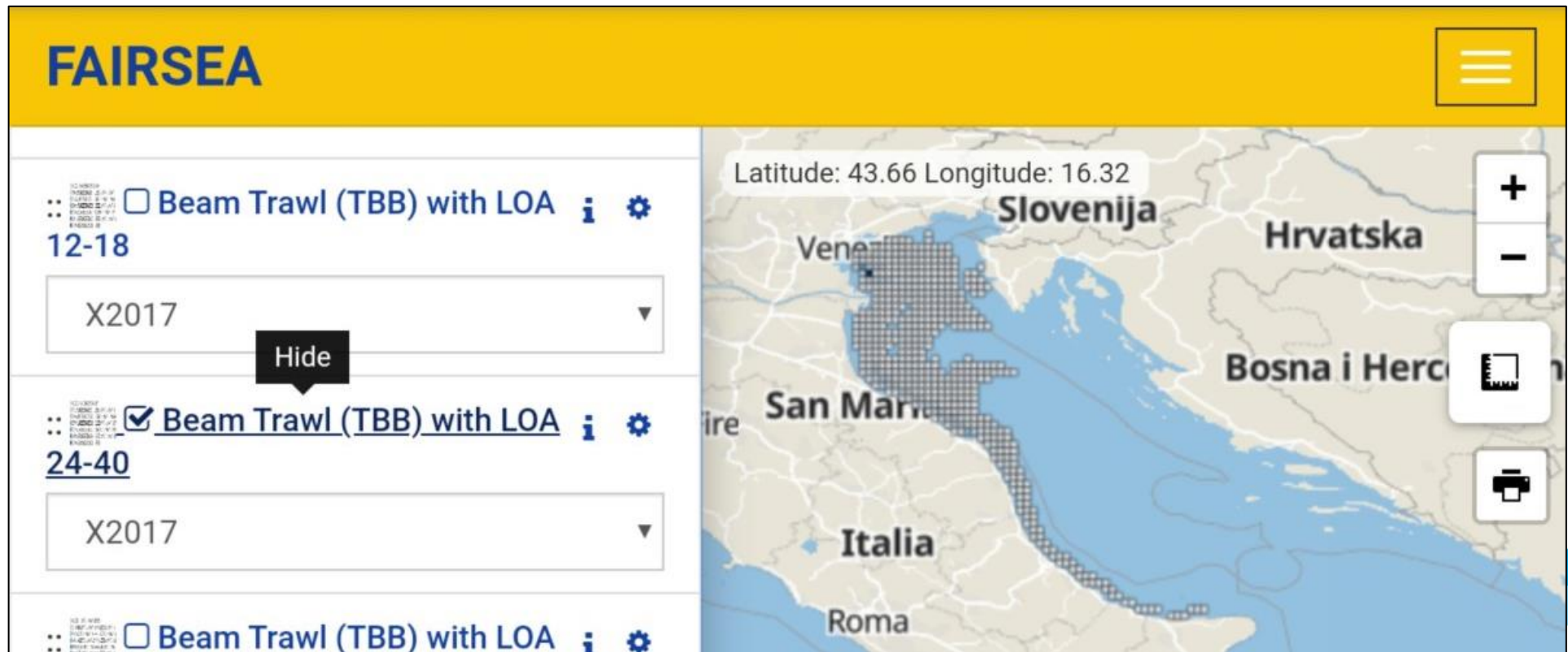


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## EFFORT – Effort distribution and fleet displacement



This module contains fishing effort maps distribution by the main fishing segments obtained by VMS/AIS data on vessel displacement using the state-of-the-art **VMSbase** platform (Russo et al., 2014; D’Andrea et al., 2020)



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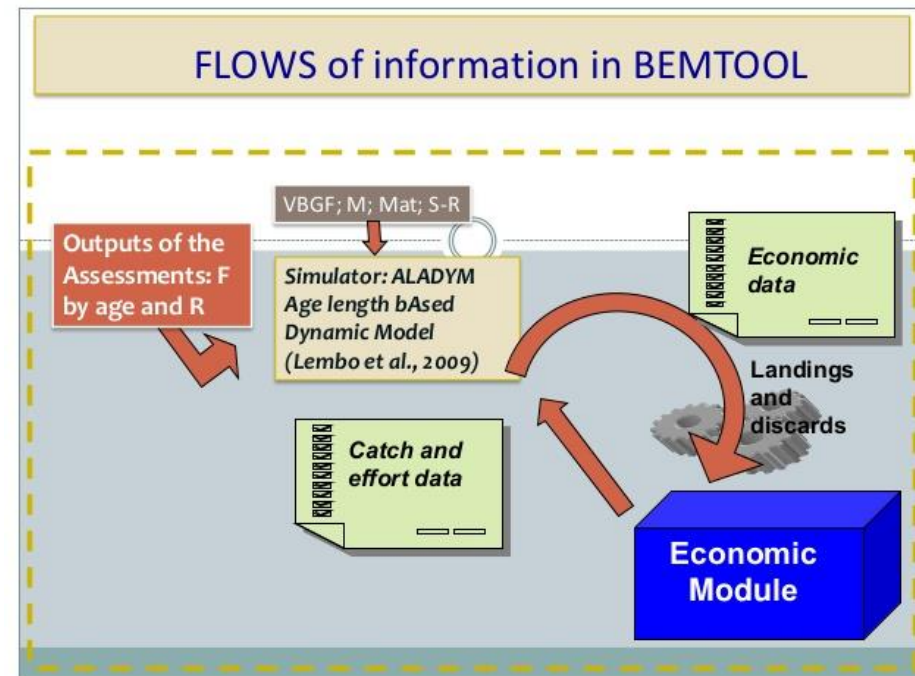
## BIOECO – Effort distribution and fleet displacement



This module will contain the output of different alternative management scenarios in the Adriatic-Ionian region obtained using **BEMTOOL** bio-economic model (Spedicato et. al 2016). This tool allows to set scenarios for evaluating how changes/shifts in population traits (e.g. natural mortality, growth), fishery-driven impacts (e.g. fishing mortality, population and gear selectivity) and management or fishing strategies (e.g. closed season, changes in fishing opportunity), affect stock and fisheries dynamics in terms of landings, discards and economic performance.

BEMTOOL model includes 6 sub-modules:

- a) biological;
- b) impact;
- c) socio-economic;
- d) policy/harvest rules;
- e) fleet behaviour;
- f) **MCDA**.

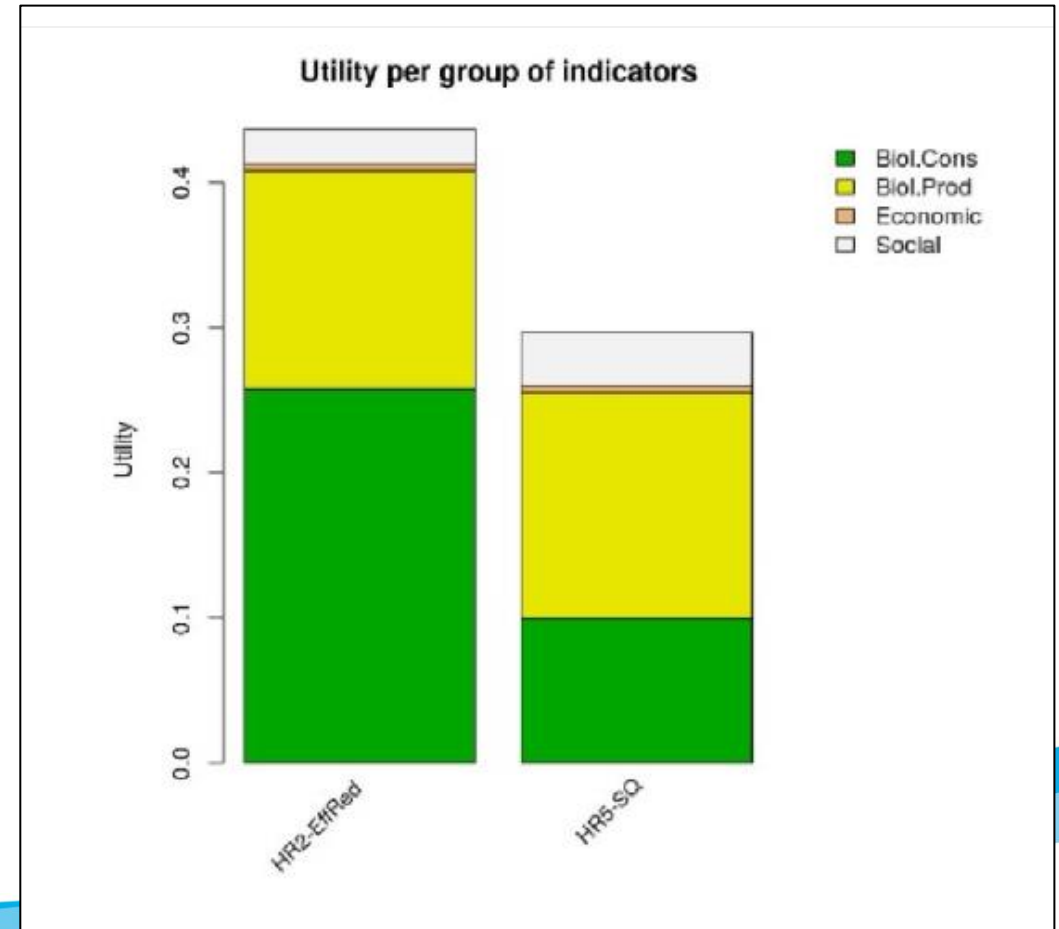
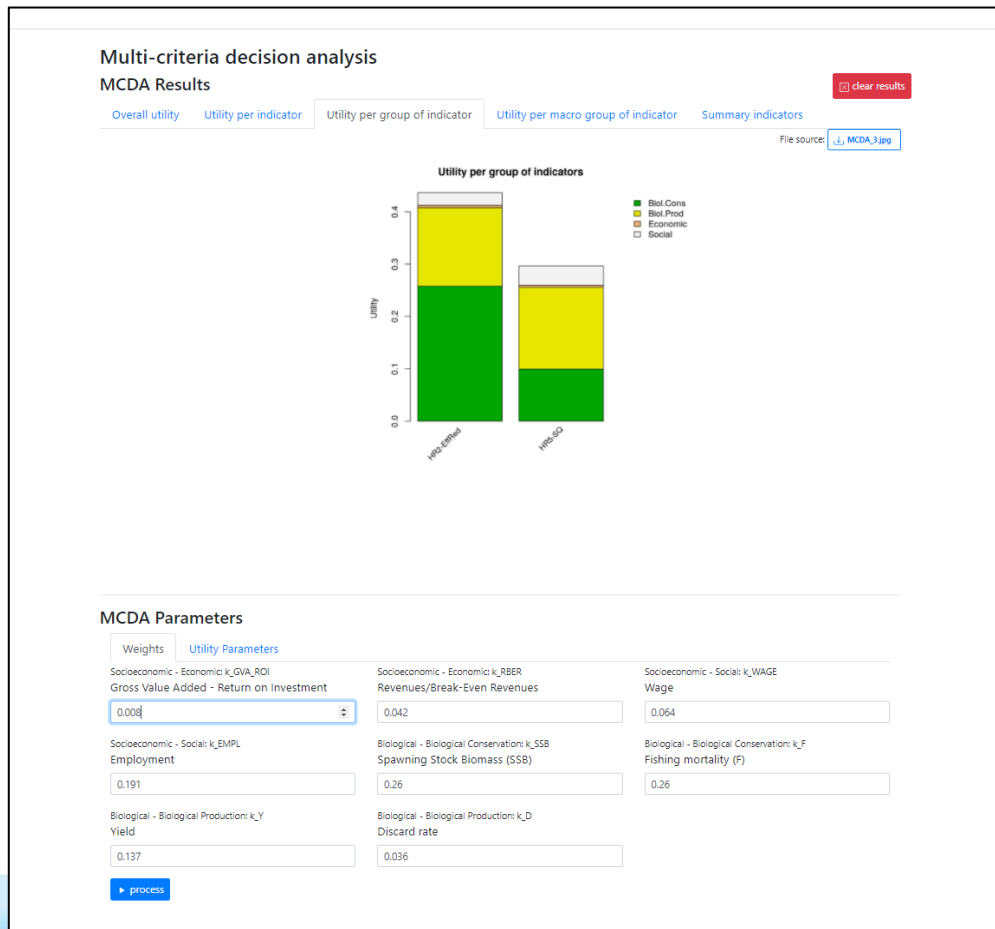


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## BIOECO – Effort distribution and fleet displacement



**MCDA** (Multiple-criteria decision analysis) : allow the dynamic generation of different scenarios results under different management criteria (e.g. socioeconomic vs. biological objectives)

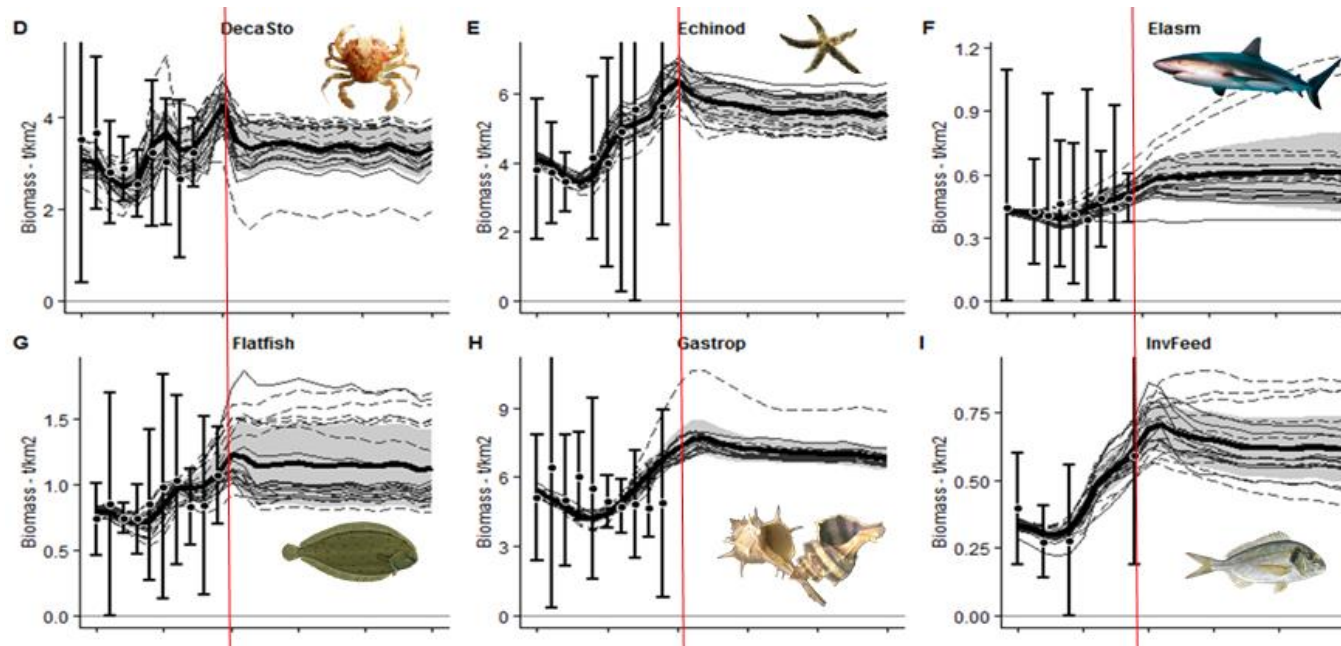


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## FWM – Food web modelling



This module will contains the output from **Ecopath** approach applied to 3 food web models describing the trophic structure of the Adriatic and Ionian Sea.



Example from the North Adriatic model (Celić et al. 2018)

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## Summary Module

Interaction workspace between different modules. Possibility of simple calculations on the layers on a regional/county basis (mean, sum, min and max value)

Eledone moschata (ELEDMOS)
Metrics on N_Km2
Grid filter: Marche
Average: 4.004161743697478
Min: 0
Sum: 952.9904949999997
Max: 66.91217

Bottom Otter Trawl (OTB) with 18-24
Metrics on X2018
Grid filter: Marche
Average: 825.5096899224806
Min: 0
Sum: 141987.66666666666
Max: 8332.66666666667



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Alpha/testing version 0.8 running at  
<http://fairsea.caspar.inkode.it:8887/#/login>

View-only credentials:

username → **viewer**

password → **fairsea2020**

**Interreg Italy - Croatia FAIRSEA** EUROPEAN UNION

## Fisheries in the Adriatic Region – a Shared Ecosystem Approach

The FAIRSEA is a European Territory Cooperation project financed under the priority 1 "Blue innovation", Specific Objective 1.1 "Enhance the framework conditions for innovation in the relevant sectors of the blue economy within the cooperation area" of the INTERREG V-A Italy-Croatia Programme 2014-2020. The project focuses on the fisheries sector, key driver for the blue growth of the Adriatic communities, towards a sustainable co-management of resources and marine ecosystem protection.

The transboundary nature of marine resources requires a cross-border cooperation and a shared "Vision" to properly tackle and address the different socio-economic and environmental challenges related to fisheries activities management.

In this context, FAIRSEA Project aims at enhancing transnational capacity and cooperation in order to promote the sharing of knowledge and good practices between regional and transnational key actors in the sector of sustainable fisheries management in the Adriatic Sea as well as to implement innovative approaches adopting an ecosystem approach to fisheries (EAF).

Coordinated by the OGS of Trieste (IT), the project involves a consortium of 12 strategic and operational partners from Italy and Croatia that will make to best use of their complementary expertise to address and support the application of the EAF ensuring a strong and interactive engagement of institutional, technical and socio-economic stakeholder in project activities.

### FAIRSEA integrated platform v. 0.8

The main result of the FAIRSEA Project will be the development of an integrated platform for a quantitative ecosystem approach to fisheries that goes across territorial boundaries and across several disciplines.

The platform will integrate biological/ecological processes (i.e. considering water mass circulation, physical-chemical properties, plankton productivity, dynamics of resources including their interactions) and fisheries bio-economic dynamics (including fisheries displacement). This high technological and innovative platform will be used as a planning tool to implement demonstrative testing of applicable fisheries policies both at local (subareas) and Adriatic scales.

It will provide a scientific basis for formulating and evaluating the shared management advice in the local and international participatory processes, involving management authorities, experts and stakeholders.

The Project will also provide an answer to the need of reference points, best practices and guidelines for the optimisation between ecological and socio-economical sustainability of fisheries in the Adriatic Sea.

Platform access

Username

Password

Login


# THANKS for the attention

CNR-IRBIM, Ancona  
Francesco Masnadi  
Giuseppe Scarcella



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