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# EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

## Advancing marine monitoring and protection with Copernicus Marine Service

UCP Environment & Biodiversity

Muriel Lux, Mercator Ocean International

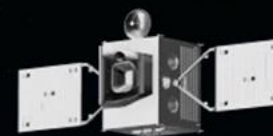




# Agenda

- Overview of the Copernicus Marine Service
  - Products portfolio
  - Visualisation tool
- Use cases for marine protection & biodiversity
- Ocean Monitoring Indicators
- Evolution of the service to better address biodiversity

# FULL, FREE AND OPEN ACCESS TO DATA

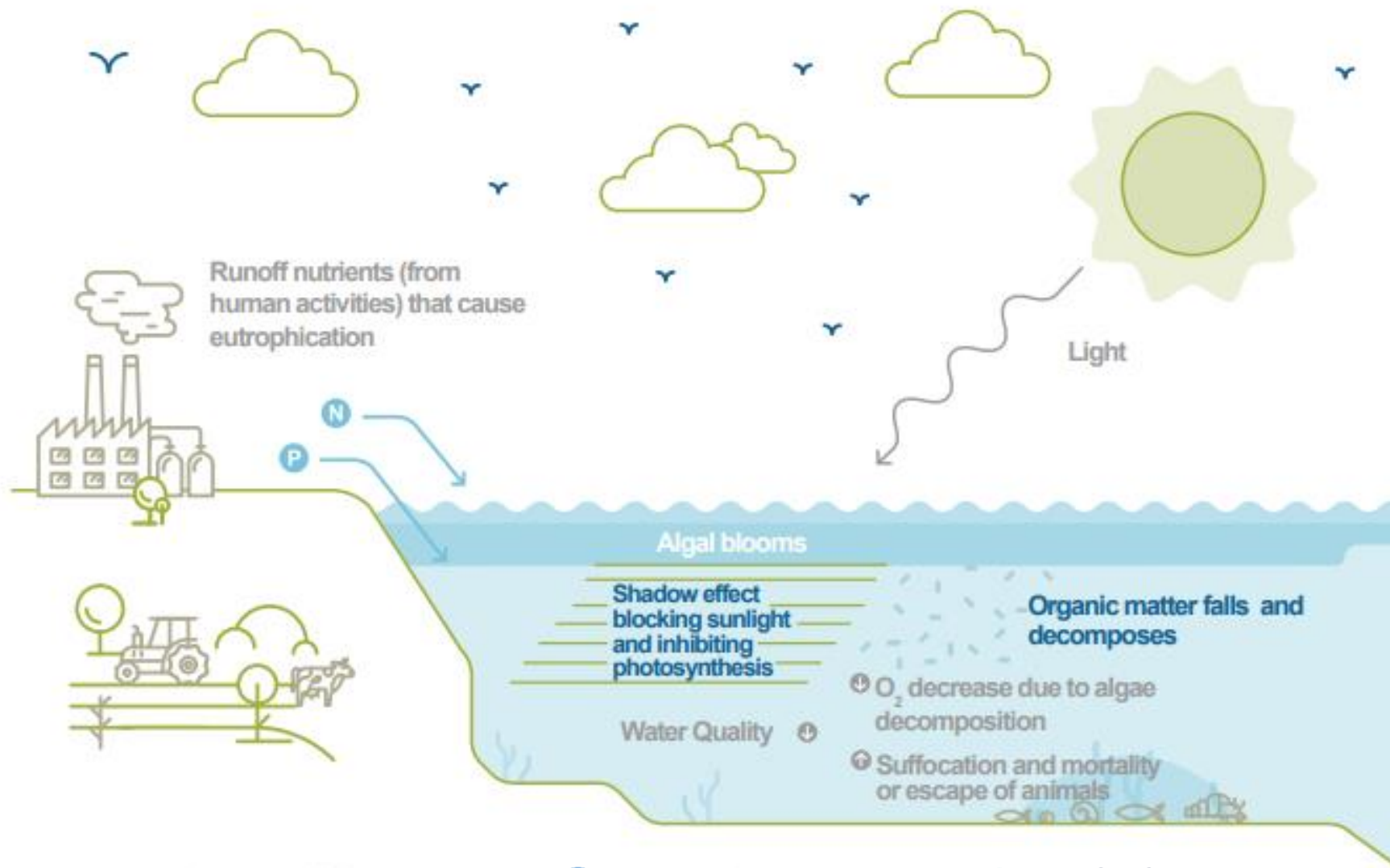


-  ATMOSPHERE MONITORING
-  MARINE ENVIRONMENT MONITORING
-  LAND MONITORING
-  CLIMATE CHANGE
-  EMERGENCY MANAGEMENT
-  SECURITY



# Challenges for Marine Conservation & Biodiversity

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## CHALLENGES:

- > Increasing Pollutions
- > Loss of Biodiversity
- > Over – fishing
- > Heatwaves
- > De-Oxygenation
- > Ocean acidification

## GOALS:

- > Environment policies
- > Protected marine biodiversity
- > Sustainable exploitation of marine resources



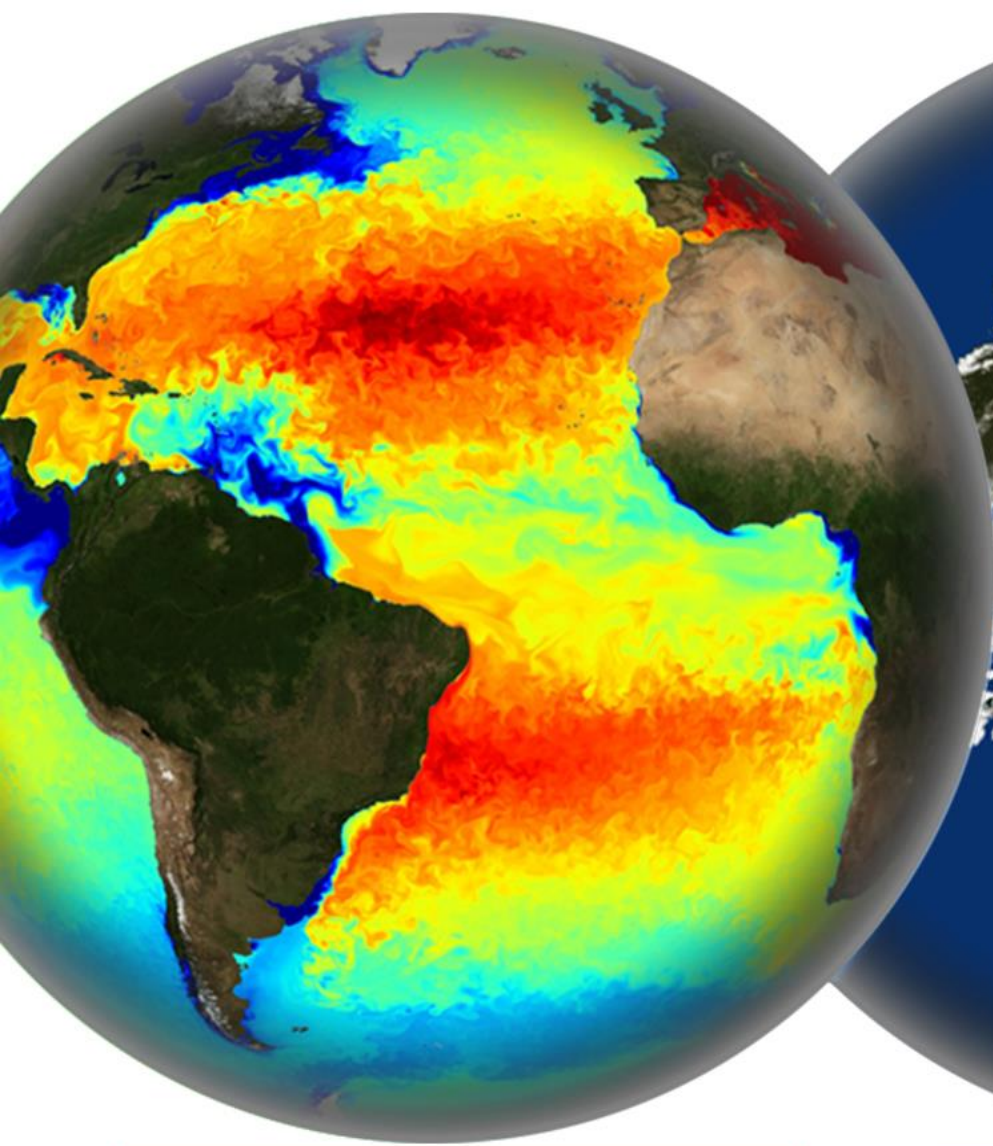
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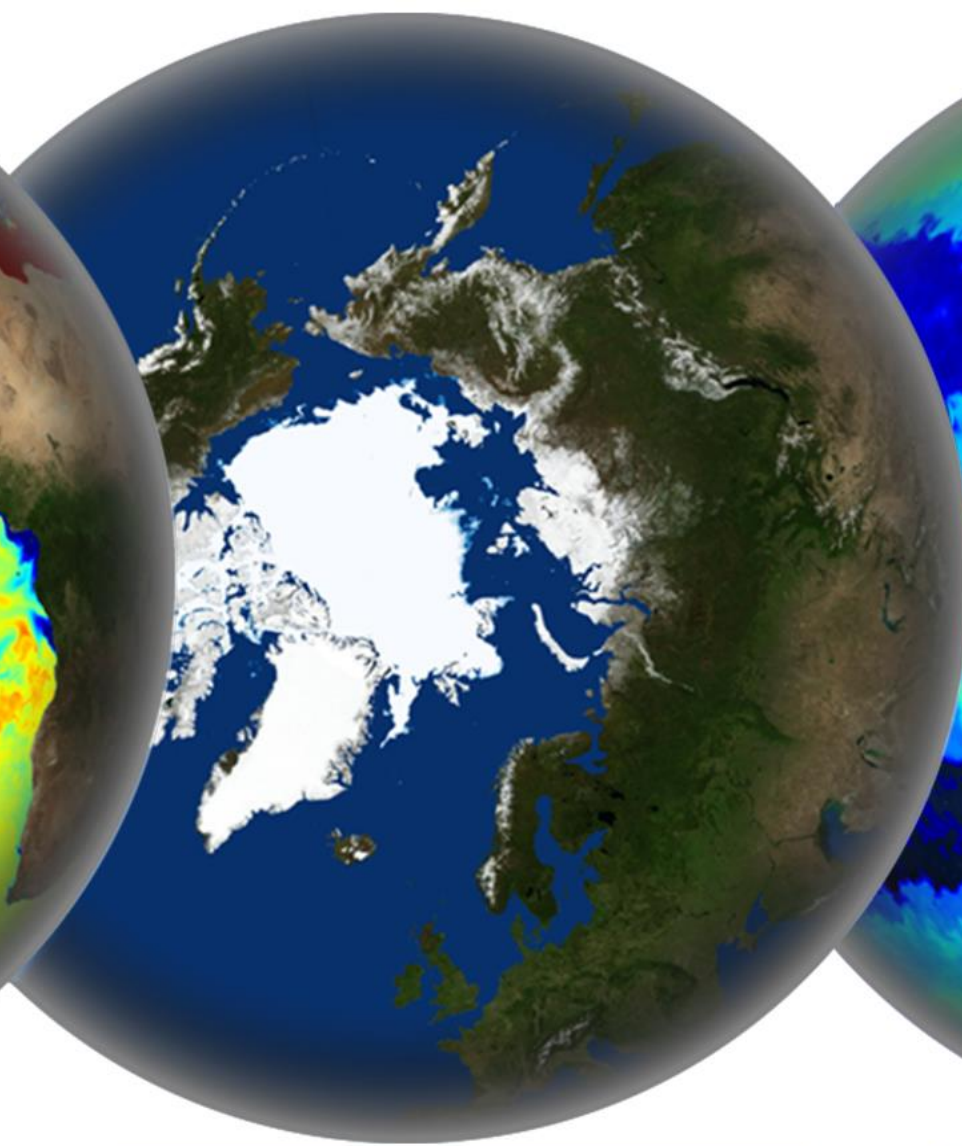


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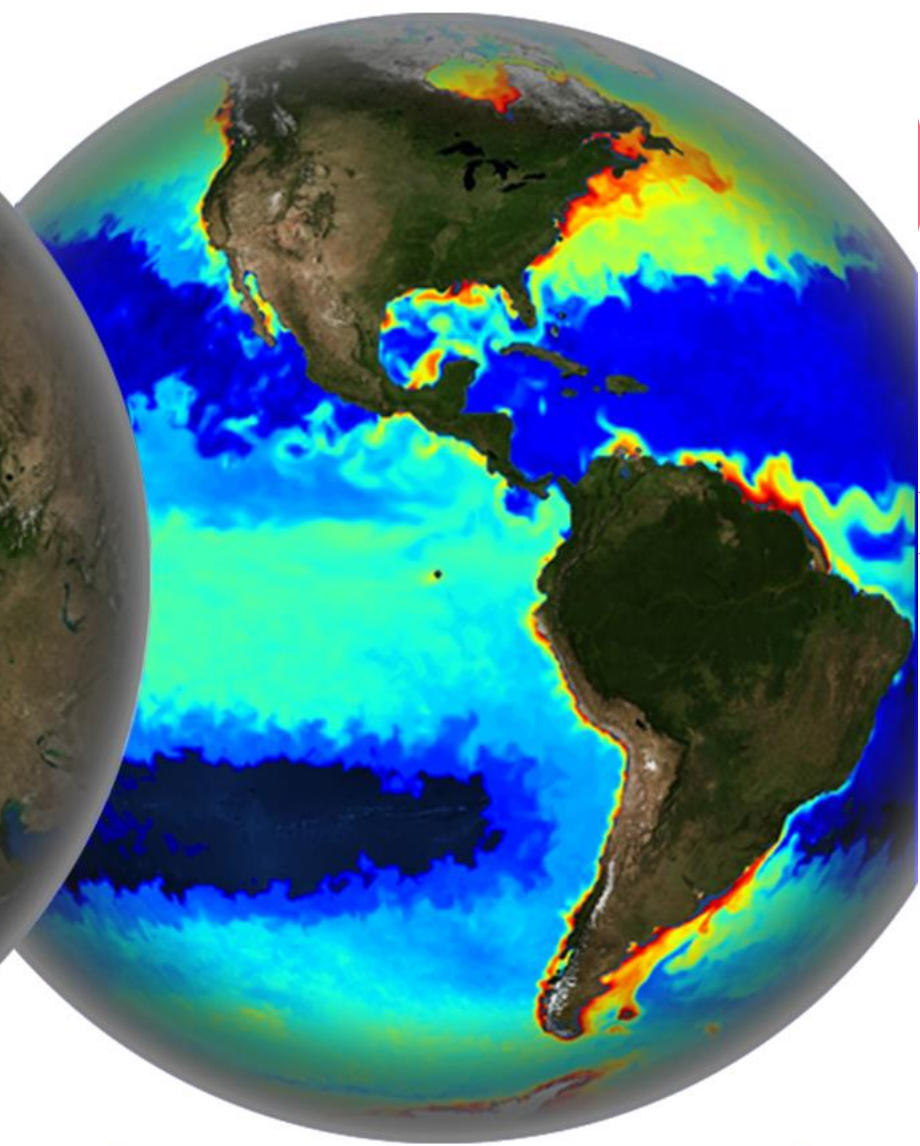
## BLUE OCEAN

Currents, temperature,  
waves, sea level, ...



## WHITE OCEAN

Ice coverage, velocity,  
concentration, Icebergs ...



## GREEN OCEAN

CO<sub>2</sub>, nutrients, oxygen,  
primary production, ...

# Copernicus Marine Service Portfolio

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Services Opportunities Access Data Use Cases User Corner About

## Copernicus Marine Service

Providing free and open marine data and services to enable marine policy implementation, support Blue growth and scientific innovation.

### Access Data

#### DATA

##### OCEAN PRODUCTS

A robust ocean data catalogue, to download or visualise data including hindcasts, nowcasts and forecasts.

#### EXPERTISE

##### OCEAN STATE REPORT

Extensive annual analysis on the state of the ocean over nearly 20 years and severe/notable annual events.

#### TRENDS

##### OCEAN MONITORING INDICATORS

Essential variables monitoring the health of the ocean over the past quarter of a century.

#### EXPLORATION

##### OCEAN VISUALISATION

Dive into our 4D digital oceans through our 3 visualisation tools for beginner, intermediate and advanced users

## Copernicus Ocean State Report 6 Release



The sixth issue of the Copernicus Ocean State Report and its summary is now available online, coordinated by [Mercator Ocean International](#), the implementing entity of the Copernicus Marine Service. This annual publication provides a comprehensive and state-of-the-art overview of the current state, variations, and changes occurring in the European regional seas and global ocean over the past decades and for recent years, particularly for 2020. It also highlights the importance of ocean data, how the collection of data on different aspects of the ocean can help us better understand and adapt to the challenges of ocean change.

[Learn more](#)

Online catalogue  
[marine.copernicus.eu](https://marine.copernicus.eu)

More than 300  
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Open and Free



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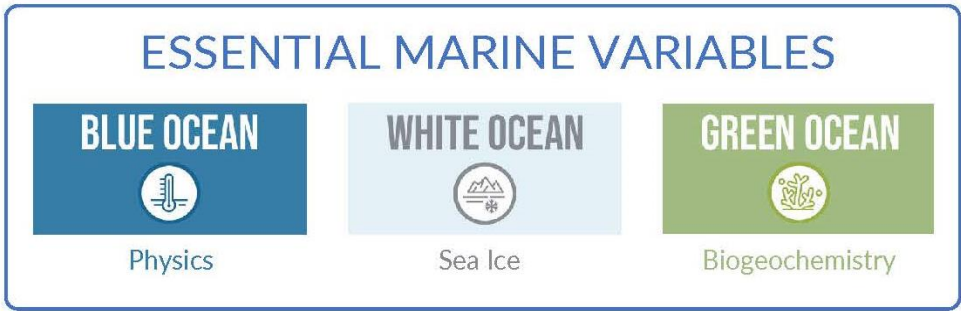
# Copernicus Marine Service Portfolio



**MULTI-YEAR**  
10 to 45 years

**REAL-TIME**  
Daily, hourly

**FORECAST**  
2 to 10 days



**OBSERVATIONS**  
In-situ & Satellites



**NUMERICAL MODELS**  
& data assimilation

[marine.copernicus.eu](http://marine.copernicus.eu)



## COPERNICUS MARINE REGIONAL OCEAN PRODUCT DIVISIONS

- ① Global Ocean
- ② Arctic Ocean
- ③ Baltic Sea
- ④ European North West Shelf Seas
- ⑤ Iberian Biscay Ireland Seas
- ⑥ Mediterranean Sea
- ⑦ Black Sea



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# Copernicus Marine Service Product Offer

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## BLUE OCEAN

- Temperature
- Salinity
- Currents
- Waves
- Sea Surface Elevation
- Wind
- Others

## GREEN OCEAN

- Nekton
- Plankton
- Organic Carbon
- Nutrients
- Oxygen
- Carbonate System
- Optics
- Others

## WHITE OCEAN

- Sea Ice Concentration & Thickness
- Sea Ice Extent
- Sea Ice Velocity
- Snow
- Ice Surface Temperature
- Others



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# Copernicus Marine Service – Data Store



[Services](#) [Opportunities](#) [Access Data](#) [Use Cases](#) [User Corner](#) [About](#)

## Copernicus Marine Data Store



[Home](#) > [Marine Data Store](#)

### Filters

#### FREE-TEXT SEARCH

Free text

#### FAVOURITES

#### TIME RANGE

dd/mm/yyyy dd/mm/yyyy

Covering full interval

#### WITH DEPTH

#### DEPTH RANGE

#### UNIVERSE

Blue Ocean 8

Green Ocean 78

#### MAIN VARIABLES

Carbonate system 16

Nekton 1

Nutrients 16

Optics 40

Organic carbon 2

Oxygen 23

Plankton 75

Salinity 8

Sea surface height 8

Temperature 9

Velocity 8

Wave 7

#### AREA

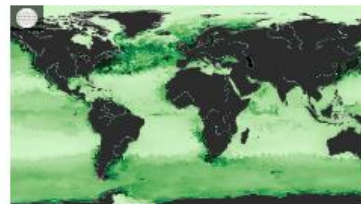
Global Ocean 24

Arctic Ocean 10

Atlantic: Iberia-Biscay-Ireland 7

Atlantic: NW-European Shelf 5

### Products 78



#### Global Ocean Biogeochemistry Analysis and Forecast

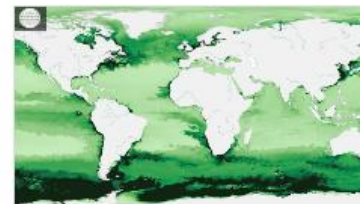
GLOBAL\_ANALYSIS\_FORECAST\_BIO\_001\_028

Models

Global, 0.25° × 0.25° × 50 levels

1 Nov 2020 to 13 Oct 2023, daily, monthly

Carbonate system, nutrients, oxygen, plankton



#### Global Ocean Biogeochemistry Hindcast

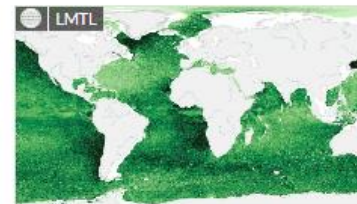
GLOBAL\_MULTYEAR\_BGC\_001\_029

Models

Global, 0.25° × 0.25° × 75 levels

1 Jan 1993 to 31 Dec 2020, daily, monthly

Carbonate system, nutrients, oxygen, plankton



#### Global ocean low and mid trophic levels biomass content hindcast

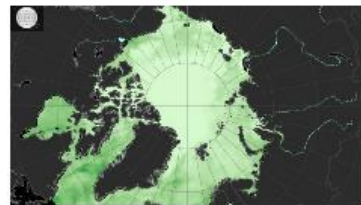
GLOBAL\_MULTYEAR\_BGC\_001\_033

Models

Global, 0.083° × 0.083° × 3 levels

1 Jan 1998 to 30 Jun 2021, daily

Nekton, optics, plankton, temperature, velocity



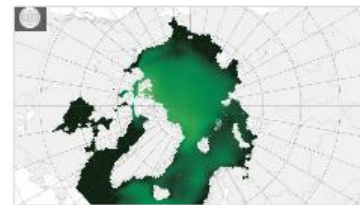
#### Arctic Ocean Biogeochemistry Analysis and Forecast

ARCTIC\_ANALYSISFORECAST\_BGC\_002\_004

Models

Arctic, 6.25 × 6.25 km × 40 levels

1 Jan 2019 to 1 Sep 2023, daily, monthly



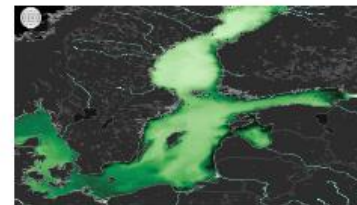
#### Arctic Ocean Biogeochemistry Reanalysis

ARCTIC\_MULTYEAR\_BGC\_002\_005

Models

Arctic, 25 × 25 km × 40 levels

1 Jan 2007 to 31 Dec 2020, daily, monthly, yearly



#### Baltic Sea Biogeochemistry Analysis and Forecast

BALTICSEA\_ANALYSISFORECAST\_BGC\_003\_007

Models

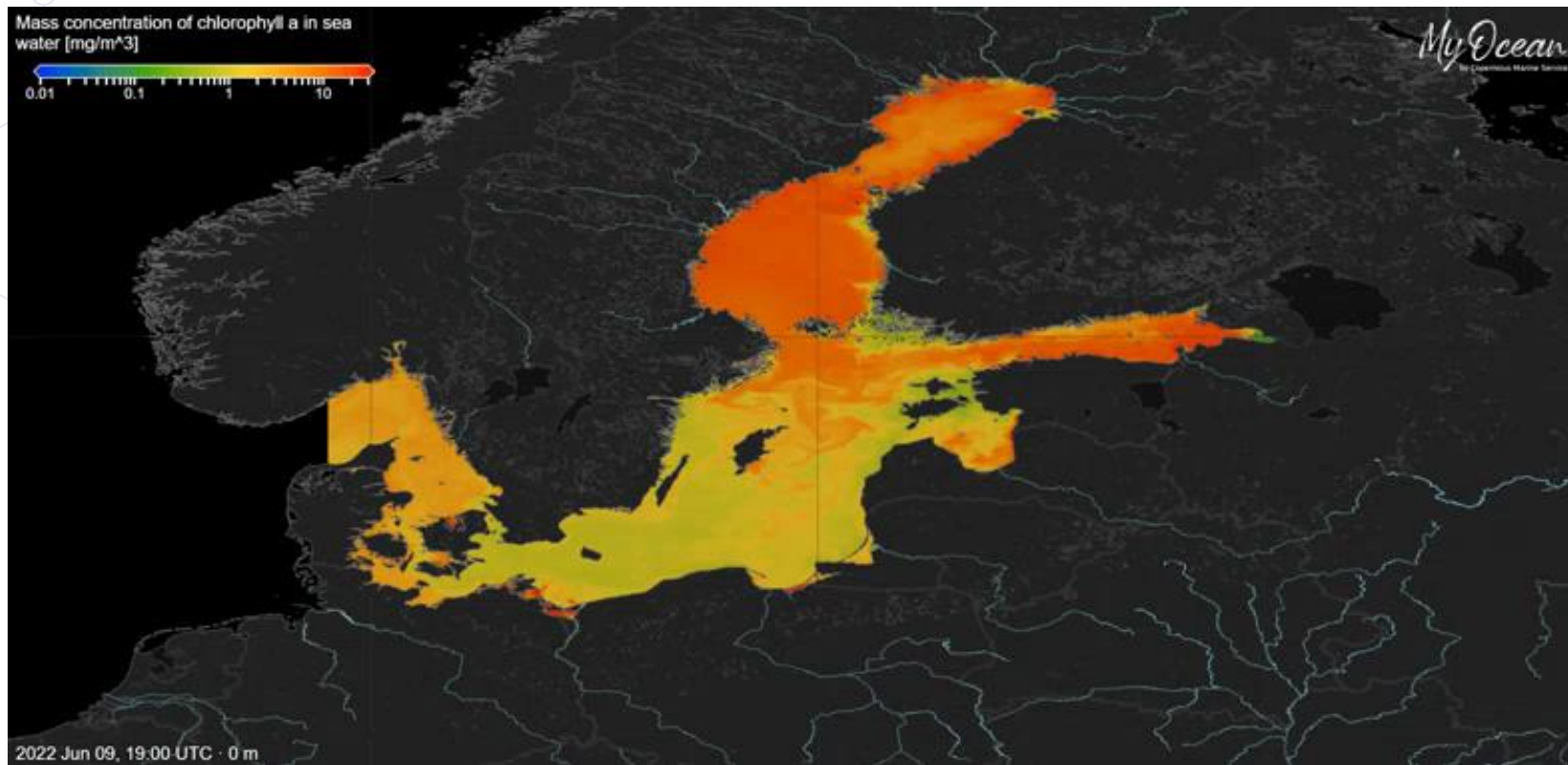
Baltic, 2 × 2 km × 56 levels

1 Oct 2020 to 16 Oct 2023, daily, monthly

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# Copernicus Marine Service Product Offer

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- Nekton
- Plankton
- Organic Carbon
- Nutrients
- Oxygen
- Carbonate System
- Optics



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# Copernicus Marine Service supporting markets and environmental policies



- 1 Polar Environment Monitoring
- 2 Climate & Adaptation
- 3 Ocean Health
- 4 Marine Conservation & Biodiversity
- 5 Science & Innovation
- 6 Policies & Ocean Governance & Mitigation
- 7 Education, Public Health & Recreation
- 8 Extremes, Hazards & Safety
- 9 Marine Food
- 10 Coastal Services
- 11 Trade & Marine Navigation
- 12 Natural Resources & Energy



Image Copyright: Copernicus Marine Service



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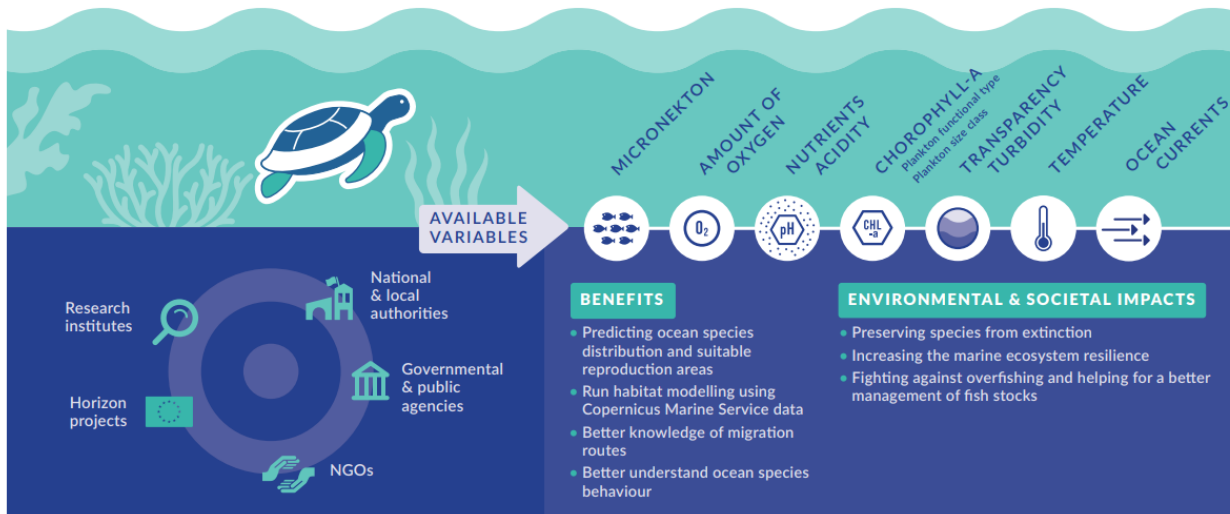


# Copernicus Marine Service supporting environmental policies



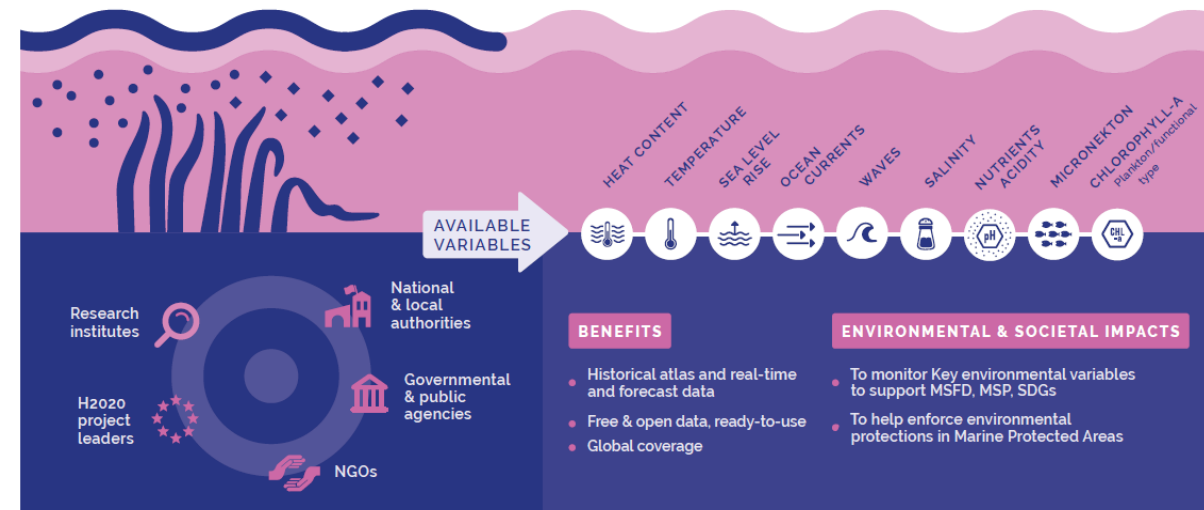
## MARINE CONSERVATION & BIODIVERSITY

The Copernicus Marine Service provides key data to monitor marine biodiversity and Marine Protected Areas, preserving at-risk ecosystems.



## POLICIES & OCEAN GOVERNANCE & MITIGATION

Copernicus Marine Service provides key data to support European Member States in the implementation of European Directives (MSFD, MSP, SDG). It also supports Marine Protected areas to preserve at-risk and coastal ecosystems.





# Marine Conservation & Biodiversity – Use Cases



Home > Services > Use Cases

Region:  Country:  Markets:   Mobile Application  Demo

**SEAPODYM - Evaluating Conservation Impact of Marine Protected Areas for Pacific Tunas**

**SEA CLEARLY - A tool to assess ocean plastic transport on and by aquaculture farms**

**Real-time assessment of MPAs with marine megafauna movements and bio-physical ocean variables**

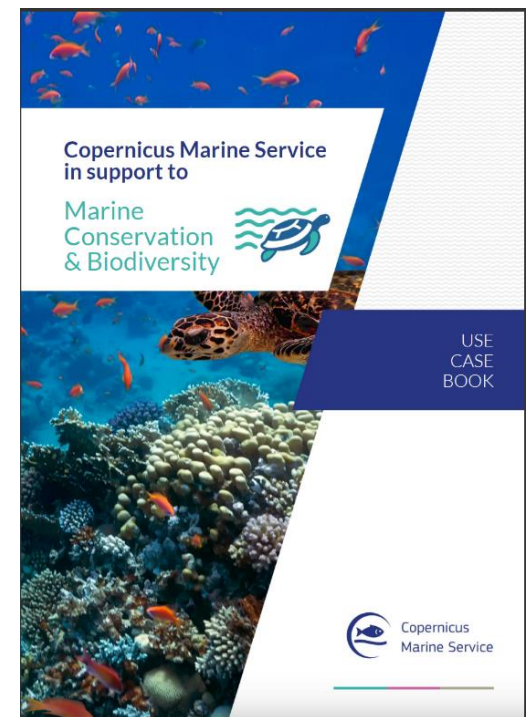
**Enhancing traceability and tracking in Aquaculture and fisheries supply chain through the use of blockchain and earth observation**

**T-MEDNet - Tracking the effects of climate change in the Mediterranean**

**The MarCOSouth Western Indian Ocean Coral Bleaching Monitoring Service**

**From open data to marine knowledge: A service for augmented data access and reproducible data analysis**

**TURTLES: Effects of swimming behaviour and oceanography on sea turtle hatchling dispersal**



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# Marine Conservation & Biodiversity – Use Cases



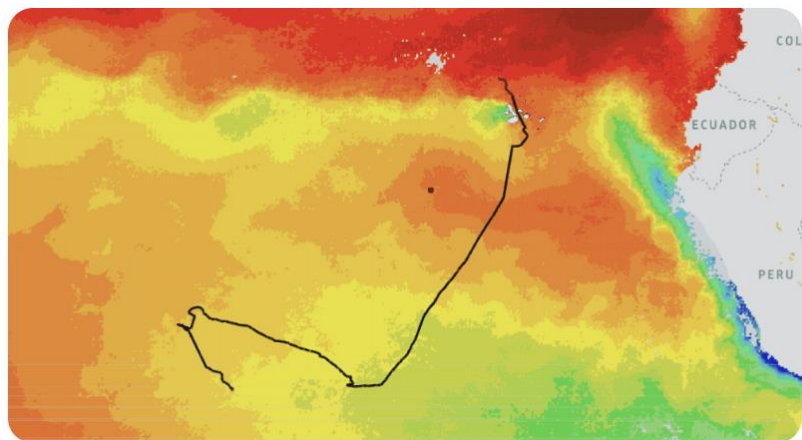
trajectories of juvenile turtles



Pacific Community  
Communauté du Pacifique



MERCATOR OCEAN  
INTERNATIONAL



SST + Copernicus chl a +  
in situ data → predicting  
movements



particle tracking model +  
Copernicus ocean currents  
+ in situ hatchling  
behavioural data.



ocean circulation model +  
PP (ocean colour), O2 +  
simulation of micronecton  
+ tuna model



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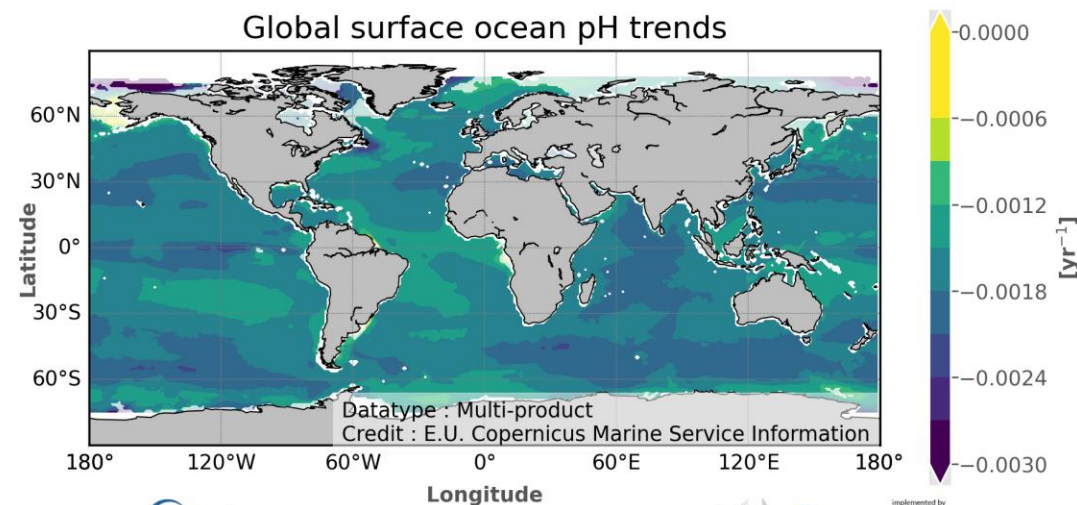
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# Ocean Monitoring Indicators – Ocean acidification



- Acidification makes the ocean much less hospitable to many forms of marine life since acidic waters dissolve calcium carbonate.



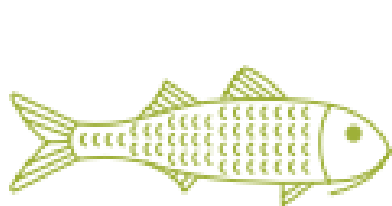


# Ocean Monitoring Indicators – Marine Heatwaves

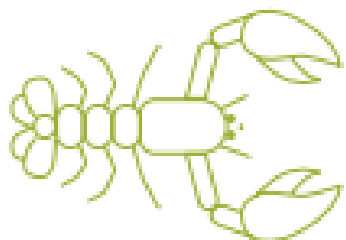


## THE EFFECTS OF MARINE HEATWAVES AND COLD SPELLS IN THE NORTH SEA

This issue of the Ocean State Report has analyzed the impact of marine heatwaves and cold spells on catch in the North Sea, with particular impact on five species, namely sea bass, sole, European lobster, edible crabs, and red mullet.



RED MULLET



EUROPEAN LOBSTER



SOLE



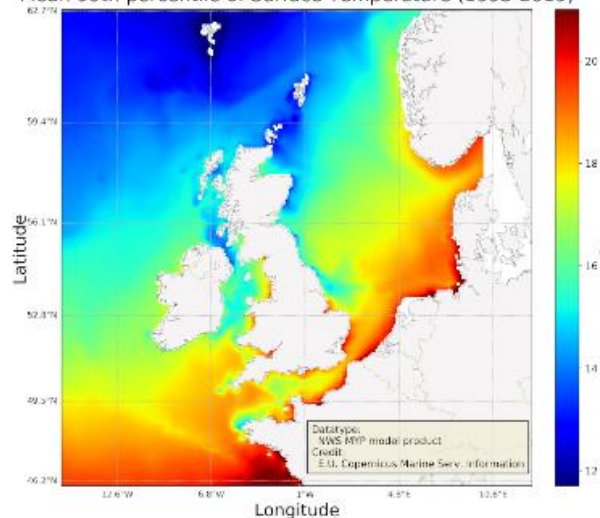
EDIBLE CRABS



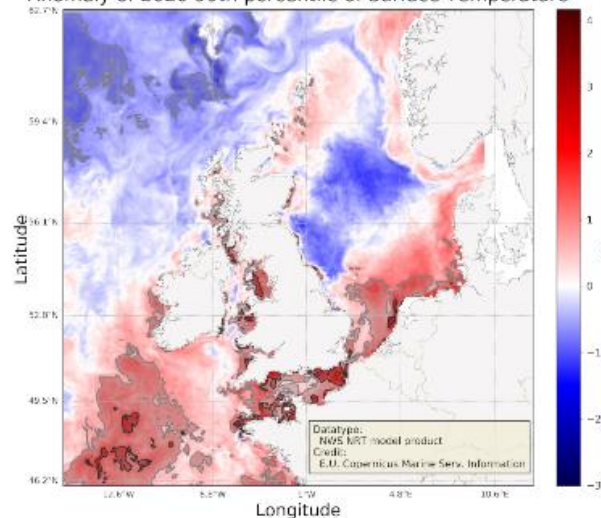
SEA BASS

Noth-West EU Seas temp. extreme variability mean and anomaly.

Mean 99th percentile of Surface Temperature (1993-2019)



Anomaly of 2020 99th percentile of Surface Temperature



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# Evolution of the service

## Towards new offer for marine biology

Gathering and processing of new biogeochemical and biology *in situ* and satellite **observations**

- **New processes** in biogeochemical models (benthic/pelagic coupling, riverine inputs).
- **Ecosystem modelling** ( low → mid → high tropic level) – NECCTON project
- **Assessing scenarios** for climate change impacts on stocks and protected species.
- **Digital Twin of the Oceans** (DTOs) includes ecosystem models and data, what-if scenarios.

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Inform marine biodiversity and food resource management



Convention on  
Biological Diversity



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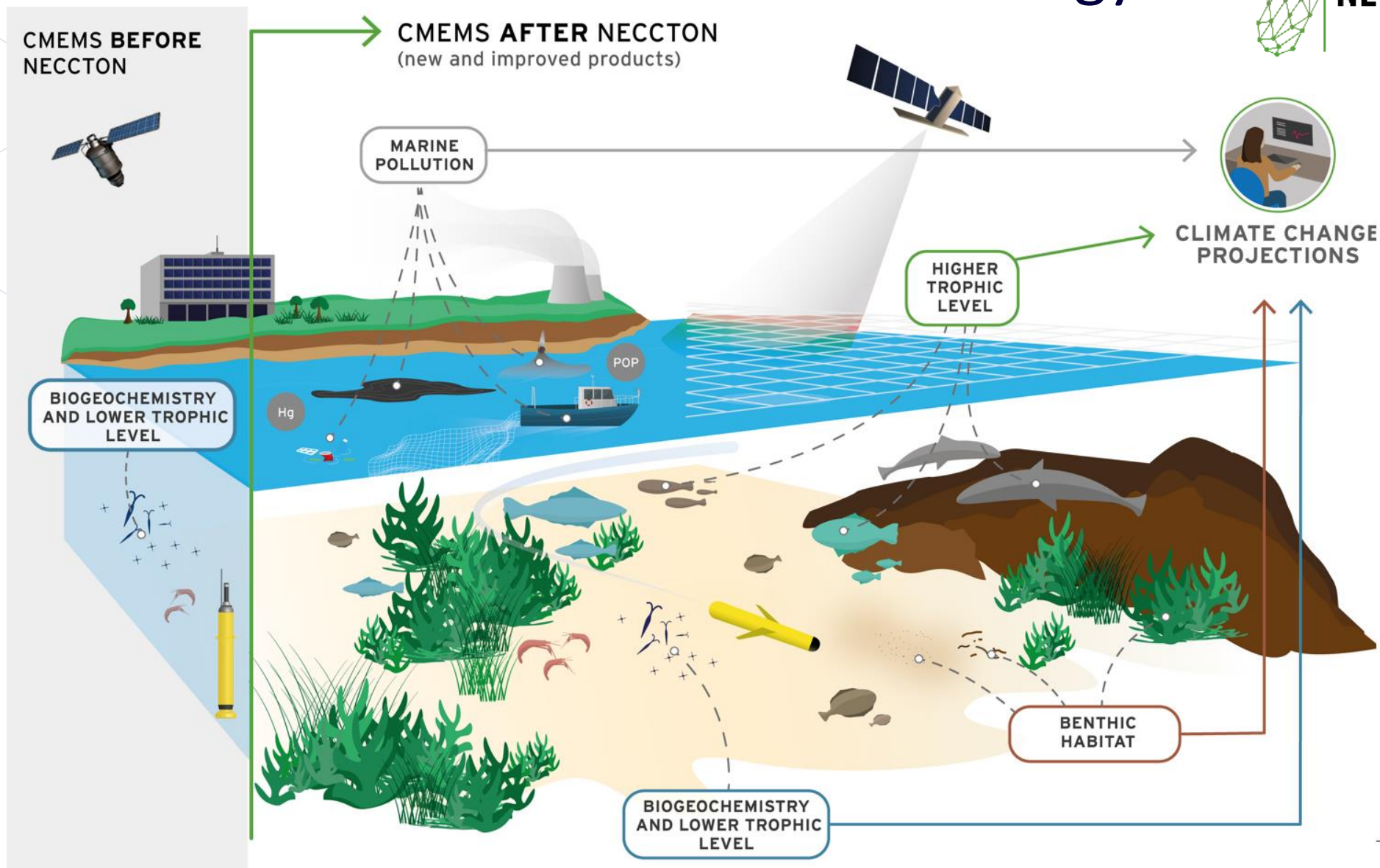


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# Evolution of the service

## Towards new offer for marine biology



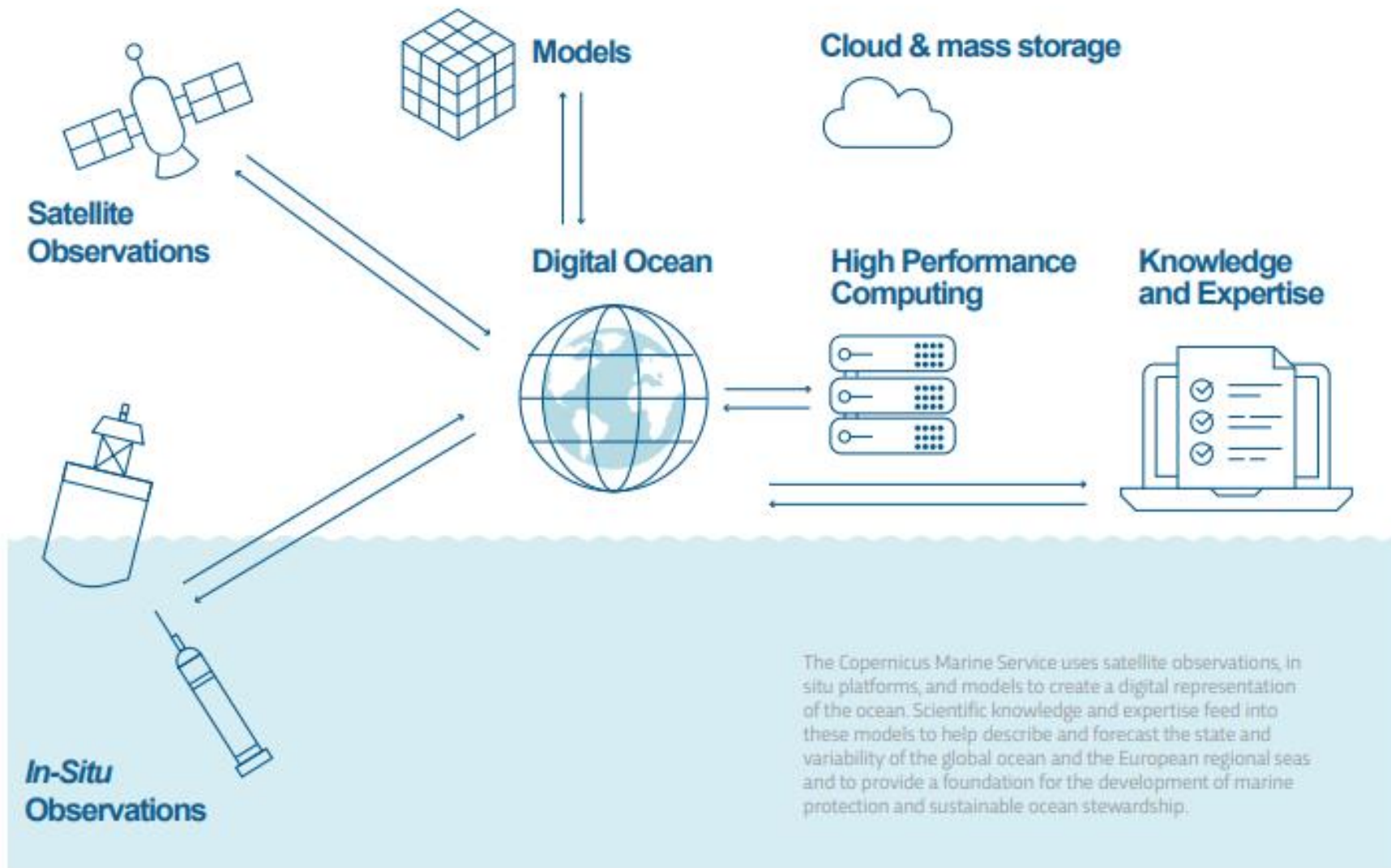
[neccton.eu](http://neccton.eu)

→ enable CMEMS to inform marine biodiversity conservation and food resources management, by fusing innovative ocean ecosystem models and new data

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# Copernicus Marine – Home Take Message



- ✦ Copernicus Marine provides a comprehensive monitoring of the marine environment that allows a better understanding of marine biodiversity and adopt protection strategies
- ✦ Important part of integrated (observations, models) Copernicus Marine offer” - Sentinel missions (S2, S3 and future (CHIME) and in-situ observations
- ✦ Major evolutions planned are prepared through R&D programmes (H2020, Horizon Europe) for biology → improved offer for marine biodiversity monitoring and protection in response to EU policy needs (Green Deal).



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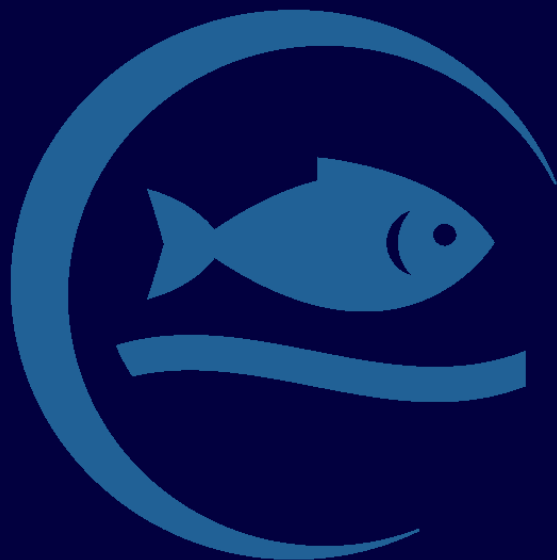


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Thank you for your attention




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Copernicus Marine Service



Newsletter



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