Zooplankton and Micronekton products from the CMEMS Catalogue for better monitoring of Marine resources and protected species

Copernicus Service Evolution – Marine Environment Monitoring Service – Contract until 30 March 2020

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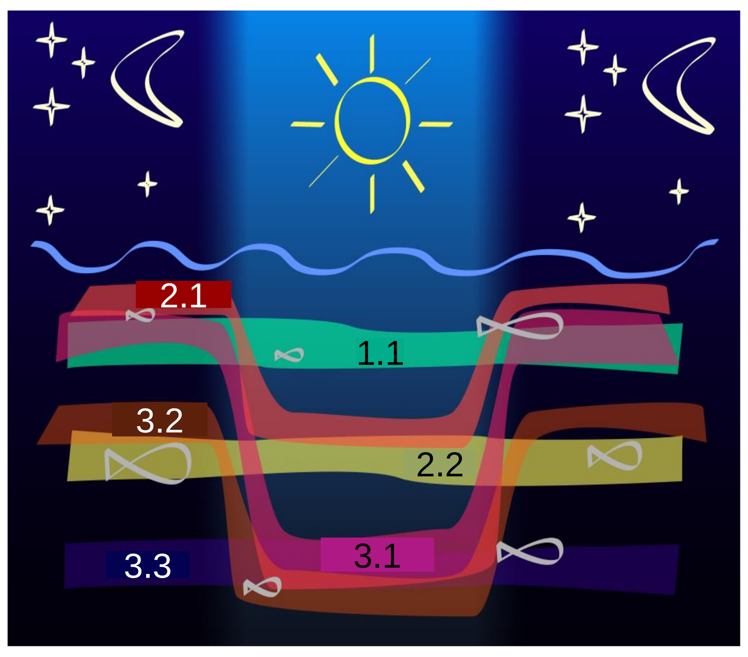
Zooplankton & Micronekton observations rely on net sampling and acoustic and imagery techniques

Selectivity and efficiency of fishing gears need to be considered

Biomass estimates from acoustic signal require observation modelling based on species composition and information on the intensity of signal reflexion (target strength) by organisms.

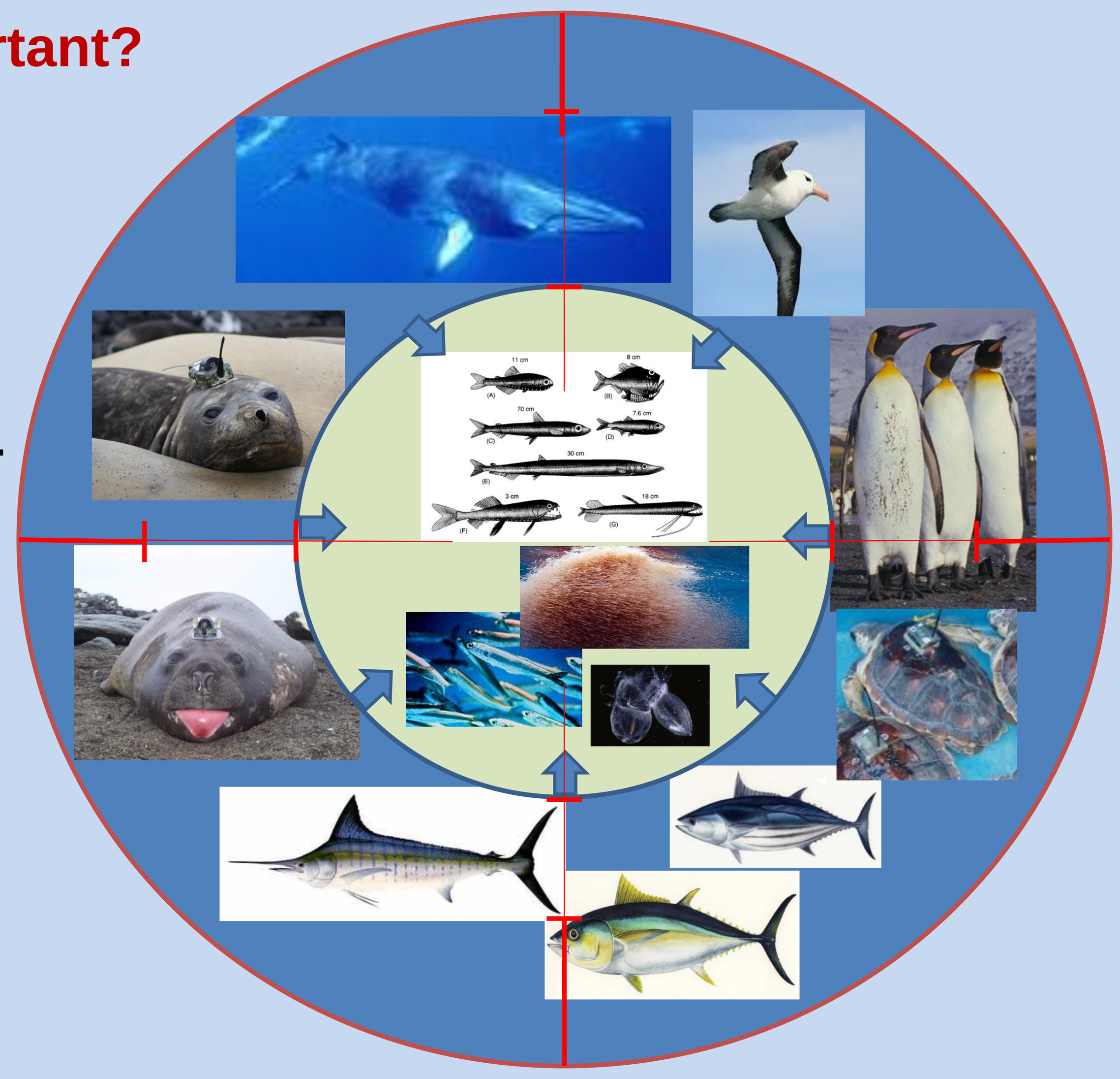
A parsimonious zooplankton and micronekton model parameterized with data assimilation



SEAPODYM-LMTL simulates biomass distributions of **1 zooplankton and 6 micronekton functional groups** (size 1 ~ 10g), according to their diel vertical migration behavior (Ref. 1, 2). Their dynamics are driven by **temperature** and **oceanic currents**. The amount of energy allocated from **primary production** to each group -- and thus the resulting biomass – can be estimated using a Maximum Likelihood Estimation approach.

Why are zooplankton & micronekton important?

They are small organisms at the low and mid-trophic levels of the ocean food chain. Zooplankton are prey of all fish larvae. Micronekton are prey of large fish and other oceanic predators, and predator of fish larvae. Zooplankton and micronekton distributions are key explanatory variables to understand individual behaviour and population dynamics of larger oceanic predators that are either targeted by fisheries (mackerel, tuna, swordfish, etc.), strictly controlled in by-catch (bluefin tuna, sharks), or fully protected (marine turtles, seabirds, marine mammals).



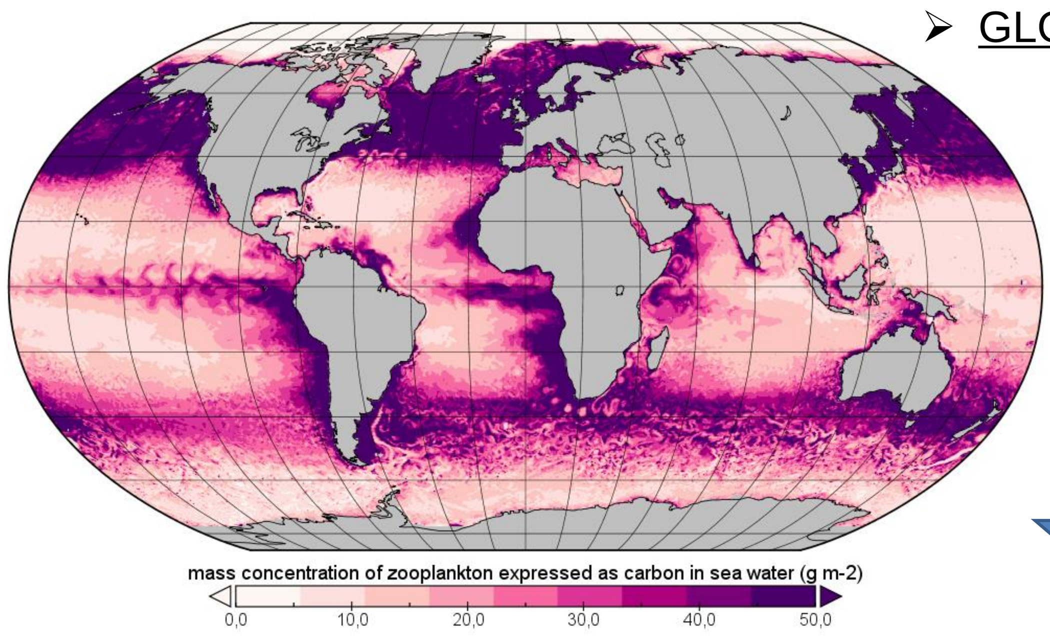
ZOOPLANKTON & MICRONEKTON

are the missing link to understand behaviour and dynamics of their large oceanic predators

The first global hindcast simulation of zooplankton and micronekton was released in 2019 in the Copernicus Marine Environment & Monitoring Service (CMEMS) catalogue of products (Ref 3)

CODE NAME:

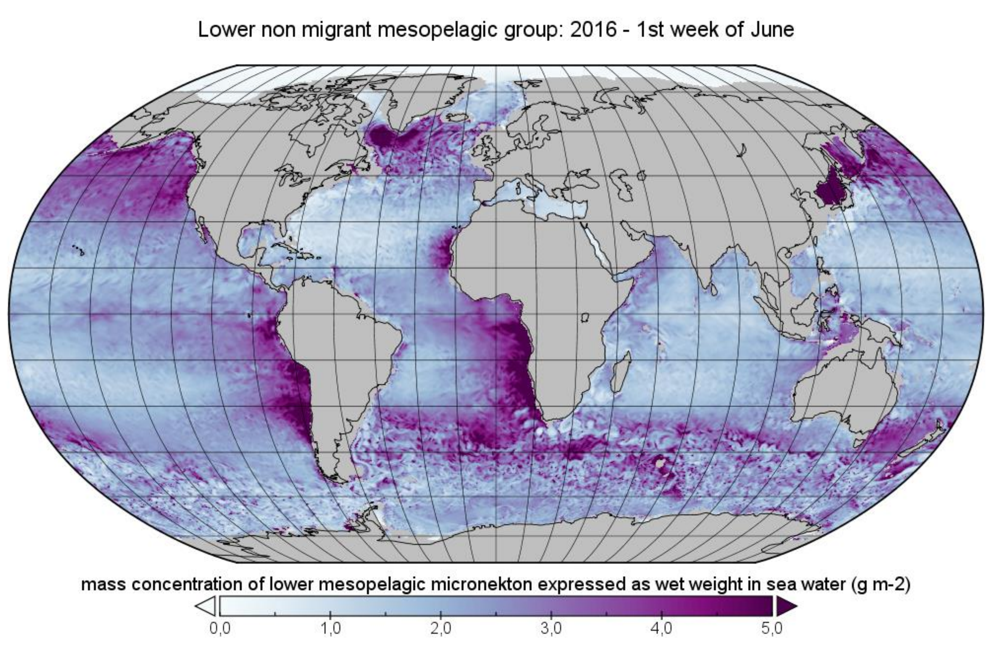
- GLOBAL_REANALYSIS_BIO_001_033



Zooplankton biomass (epipelagic layer)

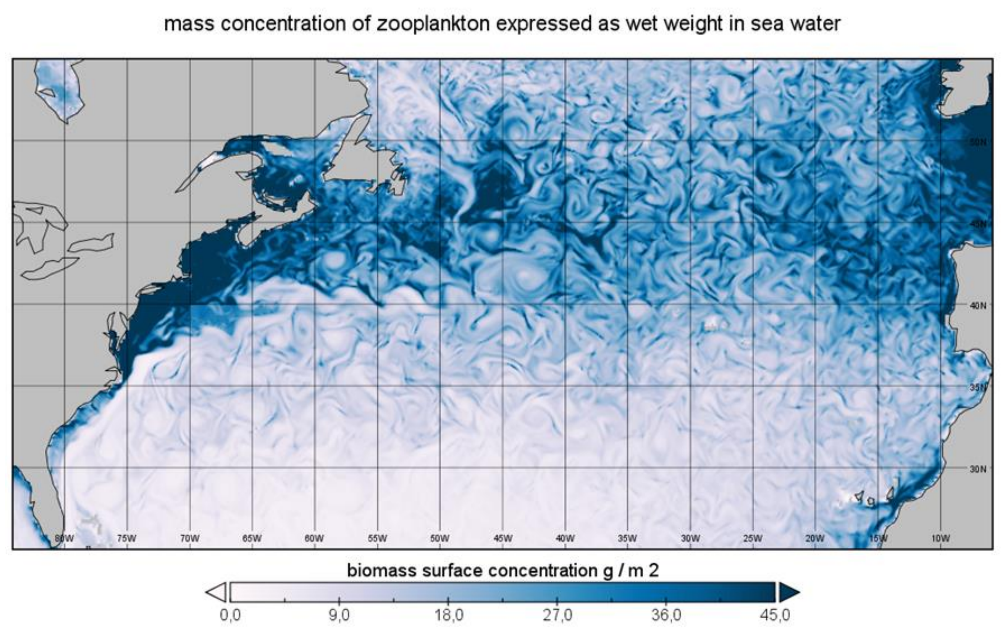
Micronekton biomass (lower mesopelagic)

The series covers the period 1998-2018 at a weekly 0.25° resolution. It is based on satellite-derived primary production and temperature and currents from the global CMEMS GLORYS ocean reanalysis using data assimilation.



A new major release in last quarter of 2020 will include:

- ❑ Increased resolution to 1/12° x day (with GLORYS 12v1)
- ❑ Improved satellite derived primary production
- ❑ Improved model calibration and additional validation



Test simulation of zooplankton at resolution 1/12° x day in the north Atlantic Ocean

Already, these biological variables together with physical variables have been shown useful to model movements, habitats and distributions of:

- Tunas and swordfish (see www.seapodym.eu)
- Jack mackerel (Dragon et al. (2018; https://doi.org/10.1111/fog.12234)
- Sardine & anchovies (Hernandez et al., 2014; https://doi.org/10.1016/j.pocean.2014.03.001)
- Marine turtles (Abécassis et al.; https://doi.org/10.1371/journal.pone.0073274)
- Elephant Seals (Green et al. 2020; https://doi.org/10.1111/ecog.04939)
- Cetaceans:
  - Lambert et al., 2014; https://doi.org/10.1371/journal.pone.0105958
  - Roberts et al., 2016; https://www.nature.com/articles/srep22615.pdf
  - Romagosa et al 2019; https://doi.org/10.1111/mms.12626
  - Perez et al. 2020; https://doi.org/10.1111/ddi.13038)

References

1 - Lehodey P, Murtugudde R, Senina I (2010). Bridging the gap from ocean models to population dynamics of large marine predators: a model of mid-trophic functional groups. *Progr. Oceanogr.* 84

2 - Lehodey P, Conchon A, Senina I, Domokos R, Calmettes B, Jouanno J, Hernandez O, & Kloser R (2015) Optimization of a micronekton model with acoustic data. – *ICES J. Mar. Sci.*, 72(5).

3 - LMTL CMEMS Quality Information Document: http://marine.copernicus.eu/documents/QUID/CMEMS-GLO-QUID-001-033.pdf

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