

Phytoplankton functional types in marine services

Antoine Mangin
am@acri.fr

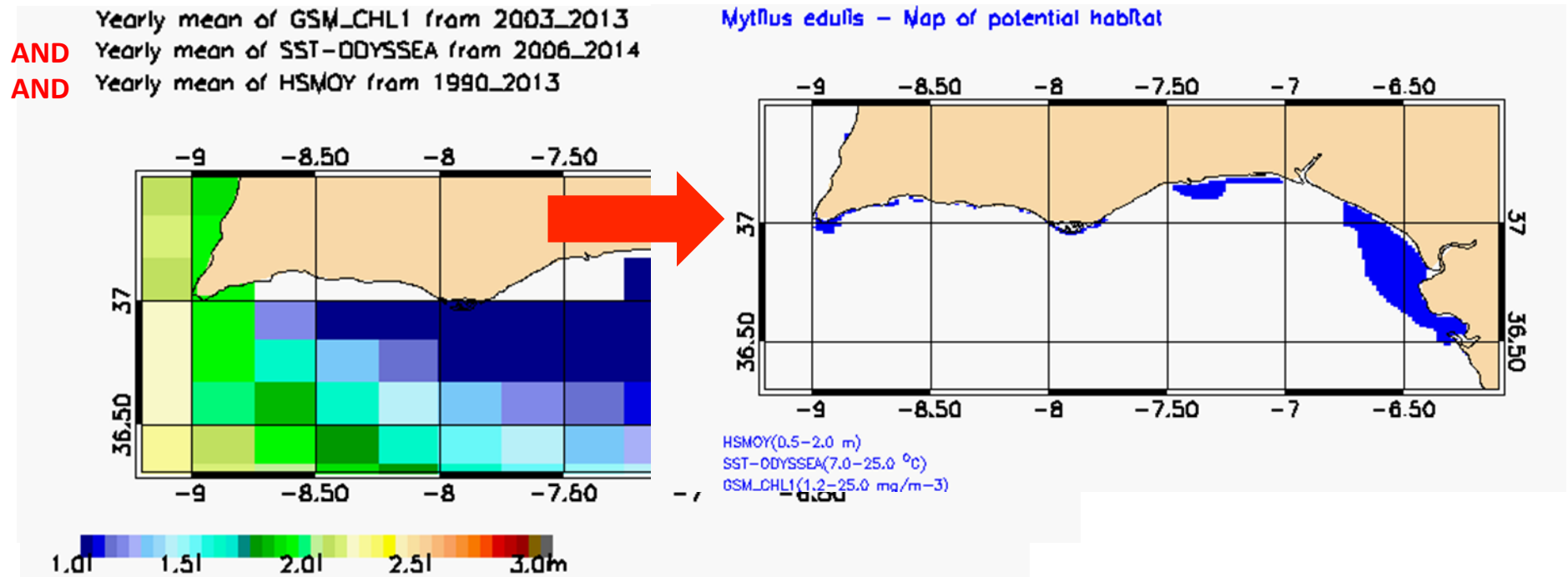
Phytoplankton Functional Types ? ... depend on the function (IOCCG report#15)

Pragmatically, we share into :

- PFT for global approach : climate, PP, acidification
- PFT for « biological » cycle and ecological « modelling » (habitats, recruitment, aquaculture..)
- PFT in environmental and hazards monitoring ((H)AB)
- PFT in BGC modelling (not used so far – some attempts (Astrid))

There is a very big potential to use “EO PFT” in ecological modelling.

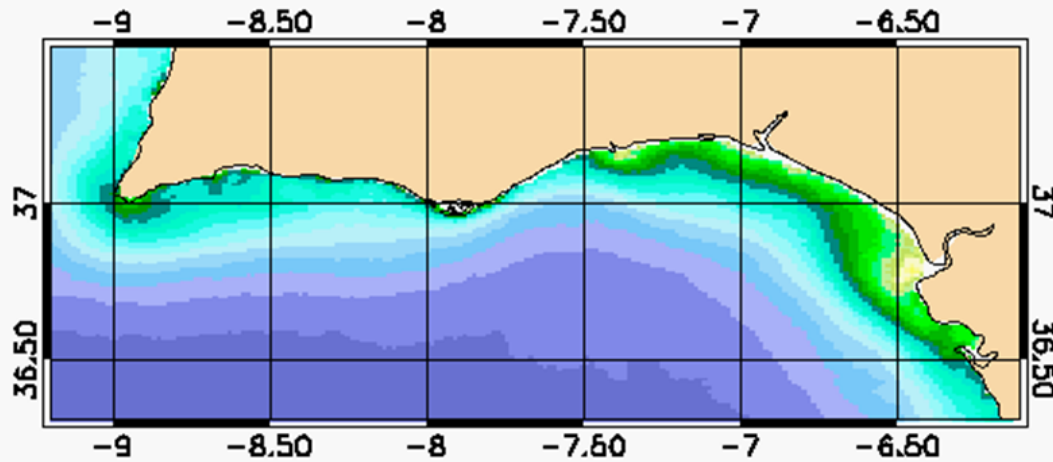
This potential is emerging thanks to a number of project promoting EO (not only Ocean Color) for fisheries and aquaculture.



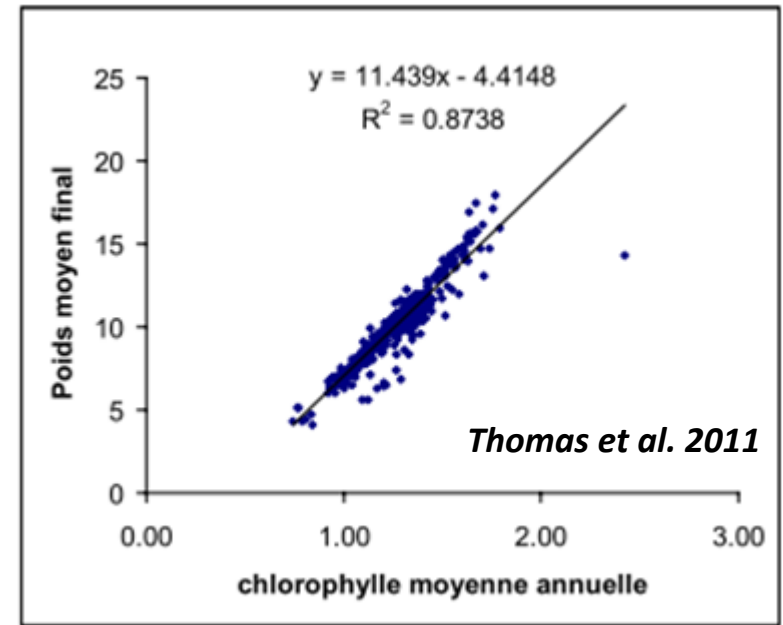
Example – SAFI – FP7-EU project

Moreover with a large-scale statistical law:

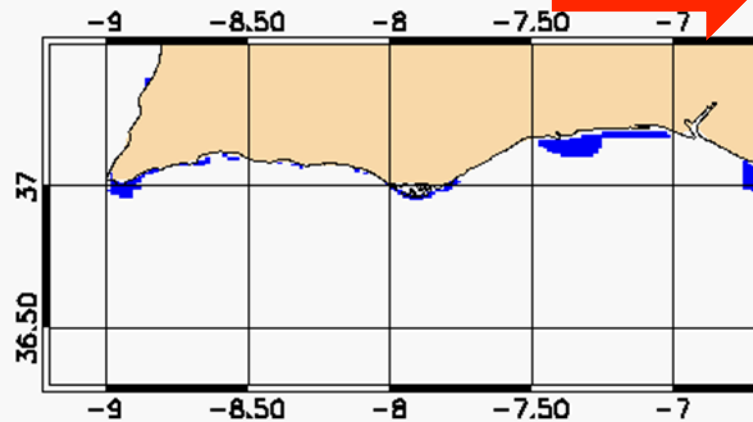
Yearly mean of GSM_CHL1 from 2003_2013



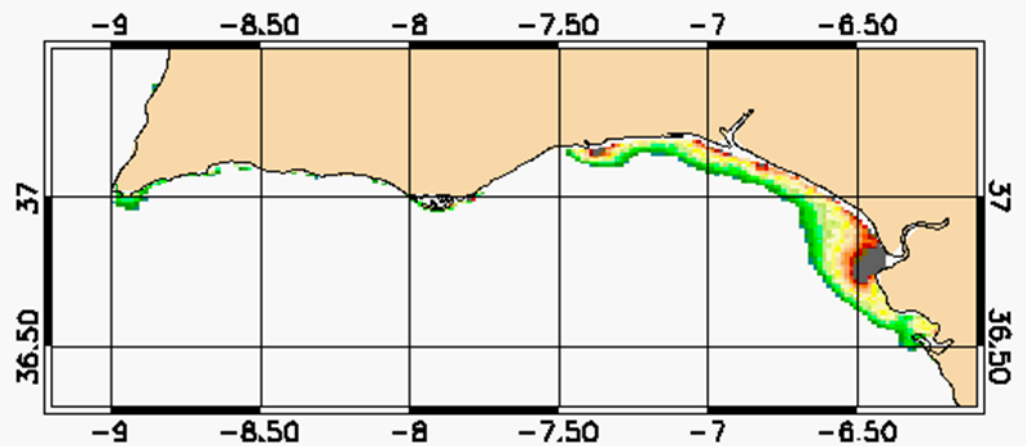
Mytilus edulis - Potential weight after 2 years



0.5l 1.0l 2.0l 3.0l 5.0l 7.0lmg/m-3
Mytilus edulis - Map of potential habitat



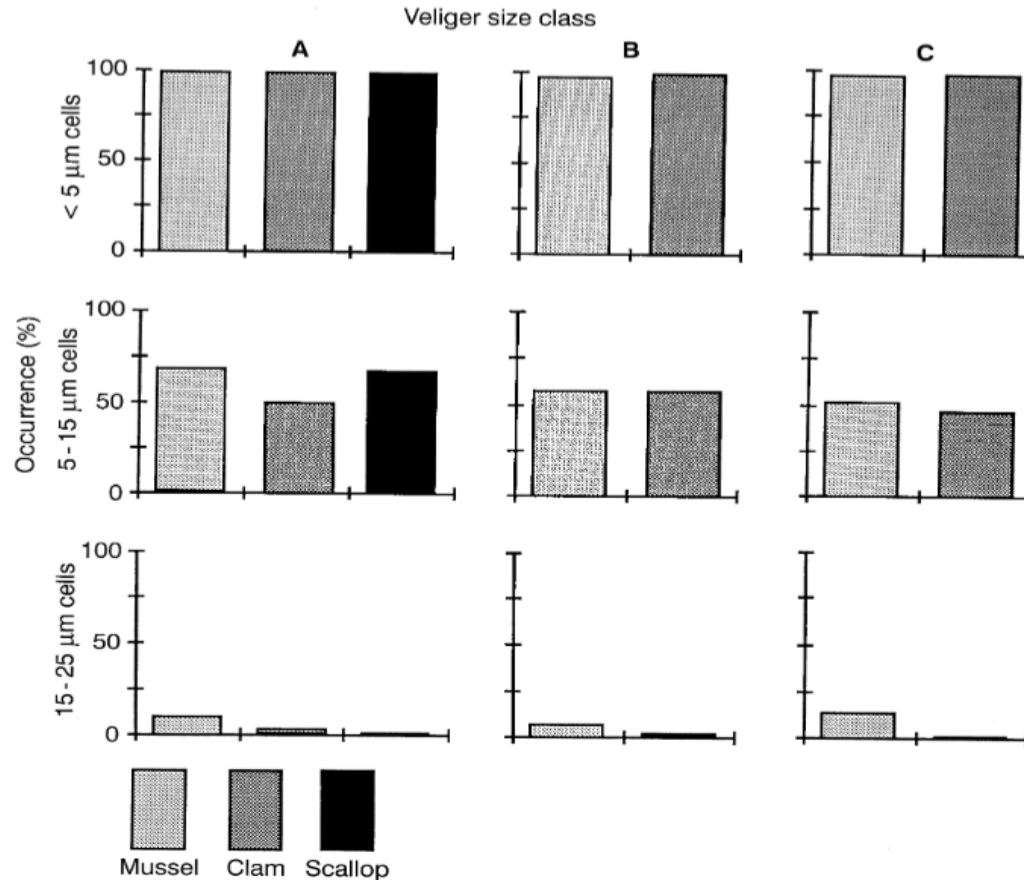
HSMOY(0.5-2.0 m)



4.0l 8.0l 12.l 16.l 20.g

Life is not so simple, and a large number of research works have been carried out to make the link between maturity, fish farming location, ... and PFT

Raby et al. 1997



There is a large underuse of these results, and EO-PFT could get a good role in this type of « modelling »

➔ The same observation can be done for oysters farming (Dupuy et al. 2000)

Table 5. Contribution of various taxonomic groups to the planktonic carbon resources available for oysters at the Thau lagoon Stn Z farming area from triplicate samples on 17 August 98

	Abundance ($\times 10^3 \text{ l}^{-1}$)	Carbon resource ($\mu\text{g C l}^{-1}$)	Contribution to total POC (%)
Picophytoplankton	25000	2.4	1.3
Microphytoplankton	400	161.5	84.4
<5 μm flagellates	207	0.6	0.3
>5 μm flagellates	87	2.3	1.2
Dinoflagellates	11	16.6	8.7
Ciliates	7.2	3	1.6
Zooplankton	0.07	5	2.6
Sum	25712	191	100

Table 6. Phytoplankton gross growth rate and microzooplankton grazing rates. Data were collected from duplicate experiments

Size class	Gross growth rate K_e (d^{-1})	Grazing mortality G (d^{-1})	G/K_e
Picoplankton (0.7 to 0.9 μm)	2.58	3.32	1.29
Picoplankton (1 to 2 μm)	2.64	1.6	0.61
Nanoplankton (2 to 4 μm)	3.27	0.93	0.28
Nanoplankton (>4 μm)	2.65	0.83	0.31

➔ Statement of under-use applies also for the recruitment and abundance of small pelagic (depending on phytoplankton abundance and seasonal size) for which (EO) PFT is not applied (yet) but could significantly (if reliable) improve the statistical biomass estimation for fisheries ... probably more complicated



Problems of transposability of these results to others areas is, however, open

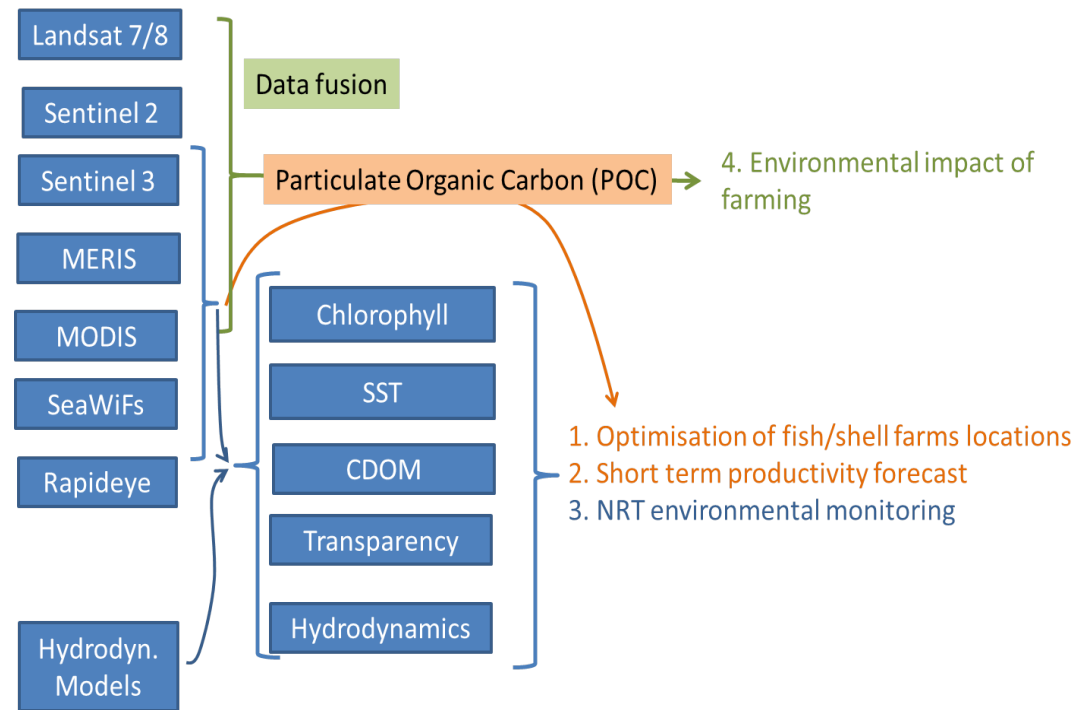
Several developments in POC retrieval (Loisel et al. 2015) open also the door to a better monitoring of the carrying capacity and of the environmental impact of fish/shrimp farming.

ESA supported project

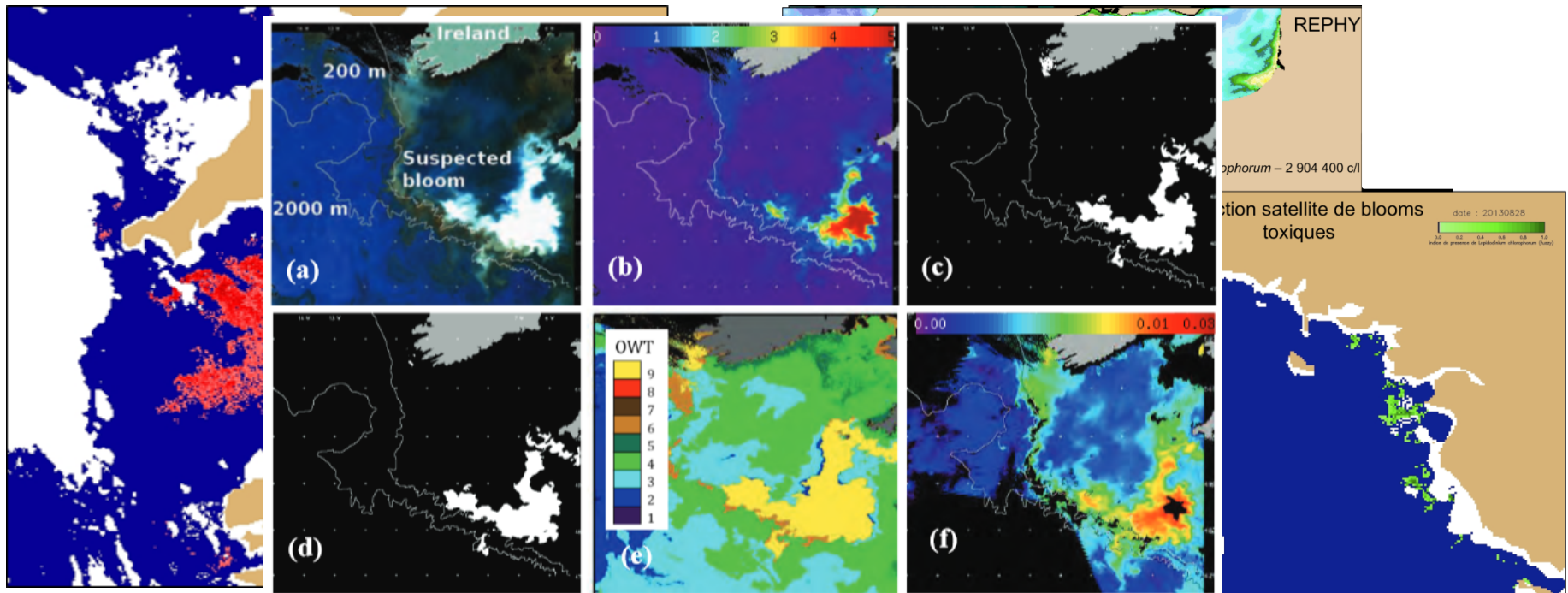


innovator
smart

Sustainable
Management of
Aquaculture through
Remote sensing
Technology



An increasing number of (H)AB can be detected (and/or alert can be triggered) from Ocean Colour – this « characterisation » of waters is of prime importance for farming (site selection and operation), bathing, sanitary purposes, water quality regulation and characterisation of anthropic pressures at coast.

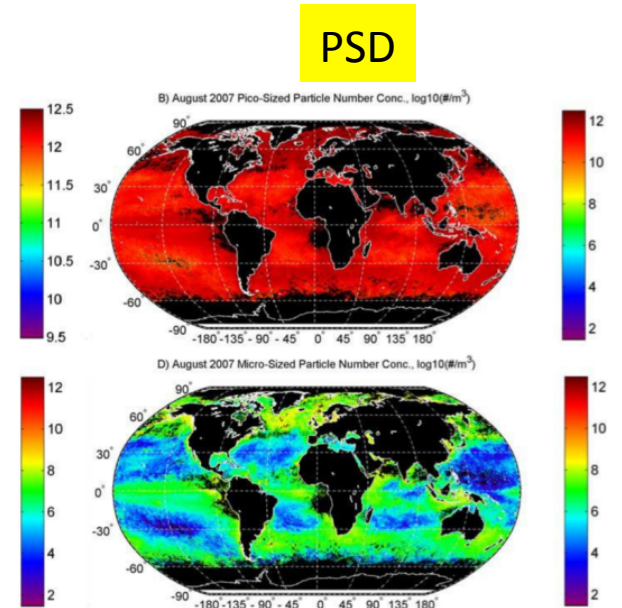
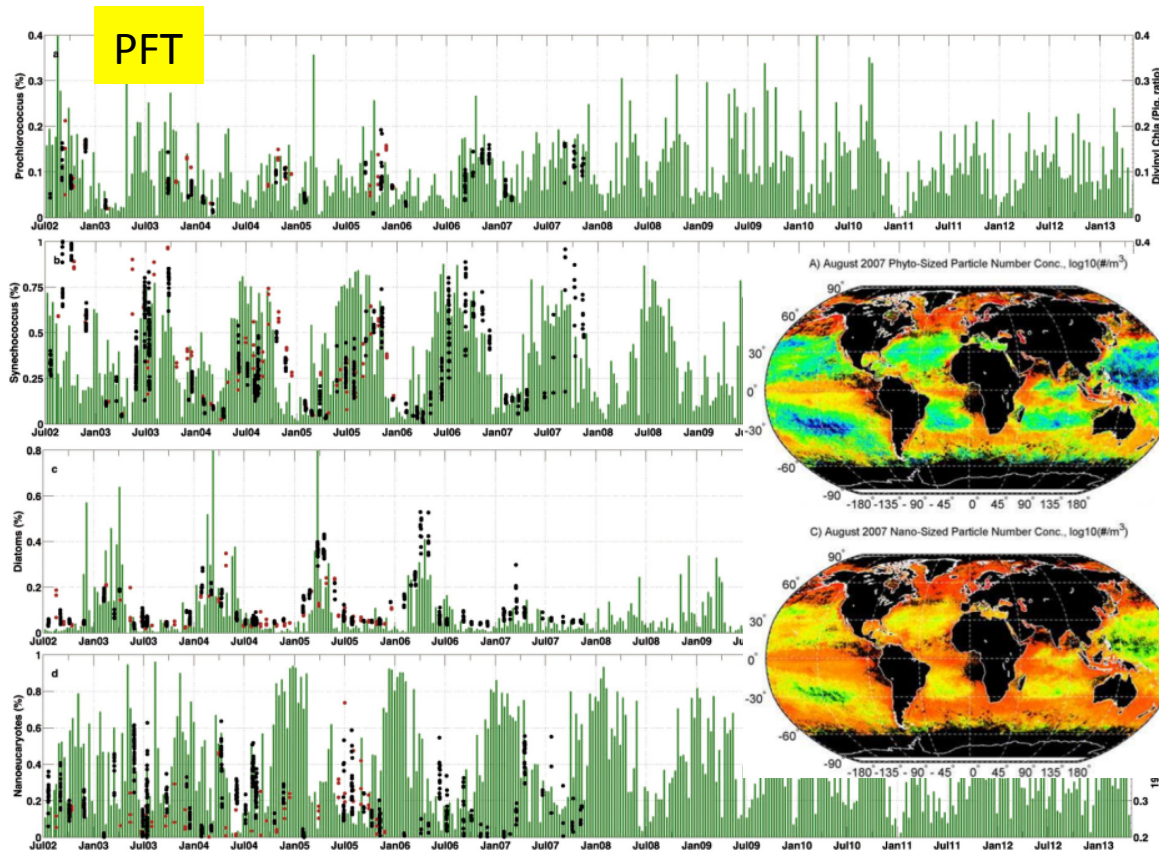


Karenia mikimotoi, *Lepidodinium chlorophorum*, *Coccolithophore*, *Karenia Brevis* ...

- PFT for « biological » cycle and ecological « modelling » (habitats, recruitment, aquaculture..)

Users ; Researchers and emerging services

Maturity/Distribution ; PSD and PFT processed and distributed through GlobColour and OSS2015 dataset



Number concentration (log scale) for phyto-, micro-, nano- and picoplankton classes

Kostadinov et al., 2009

Temporal percentage (green bars, left axis) of each phytoplankton group identified by PHYSAT-Med in the Ligurian Sea. Red and black dots (right axis) represent respectively the HPLC pigments ratio for DYFAMED and BOUSSOLE dataset in the first optical depth

Navarro et al. 2014

- PFT for « biological » cycle and ecological « modelling » (habitats, recruitment, aquaculture..)

Users ; Researchers and emerging services

Maturity/Distribution ; PSD and PFT processed and distributed through GlobColour

- PFT in environmental and hazards monitoring ((H)AB)

Users ; Researchers and emerging services

Maturity/Distribution ; distributed through various services (e.g. MCGS, Asimuth)

- PFT in BGC modelling

Users ; Researchers

Maturity/Distribution ; through GlobColour (OSS2015)

No PFT products distributed today through the Copernicus Marine Environment Monitoring Service - CMEMS

Phytoplankton functional types in marine services

Antoine Mangin
am@acri.fr

Thanks for attention

