Detecting habitats considering the mesozooplankton size structure and environmental conditions in the Gulf of Lion, NW Mediterranean Sea

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INTRODUCTION

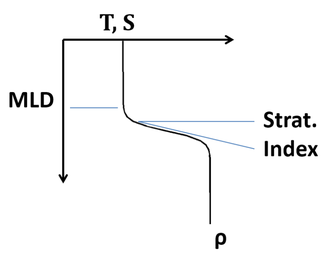
Quasi-synoptic measurements of zooplankton abundance and biomass at mesoscale are difficult to obtain. Zooplankton distribution in fact is highly variable on multiple spatial and temporal scales, especially on continental shelf where physical processes such as river inputs, wind and currents determine a complex dynamic and strongly impact the plankton distribution (Fig. 1). To investigate the links between physical processes and plankton distribution and to define potential habitat for zooplankton in the Gulf of Lion, two survey cruises at high spatial resolution were conducted on the continental shelf in spring 2010 and winter 2011.

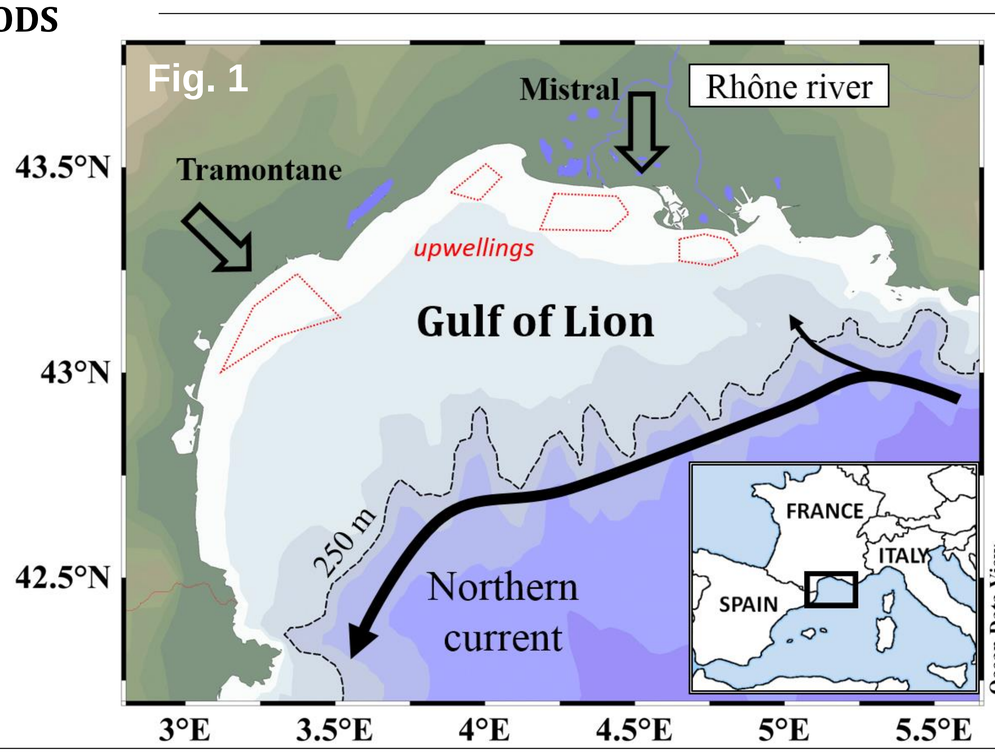
MATERIALS & METHODS

COSTEAU 6: January 23 to 27, 2011	COSTEAU 4: April 27 to May 2, 2010
70 stations	65 stations

Size spectra of zooplankton communities were provided by a Laser Optical Plankton Counter (LOPC, Herman et al. 2004) mounted on a Rosette system equipped with a CTD-fluorimeter. In that way, all parameters were sampled simultaneously. The statistical tests were done with the software R (R 2011; acp.dudi; kmeans; index.DB).

List of parameters used to characterize hydrological profiles and biological conditions.

Physical variables	Biological variables
	- Integrated Chl-a concentration - Abundances of 3 size classes particles (0.1-0.3 mm, 0.3-0.5 mm, >0.5 mm of ESD) - Slope of normalized biomass size spectrum (NBSS, Herman & Harvey 2006)



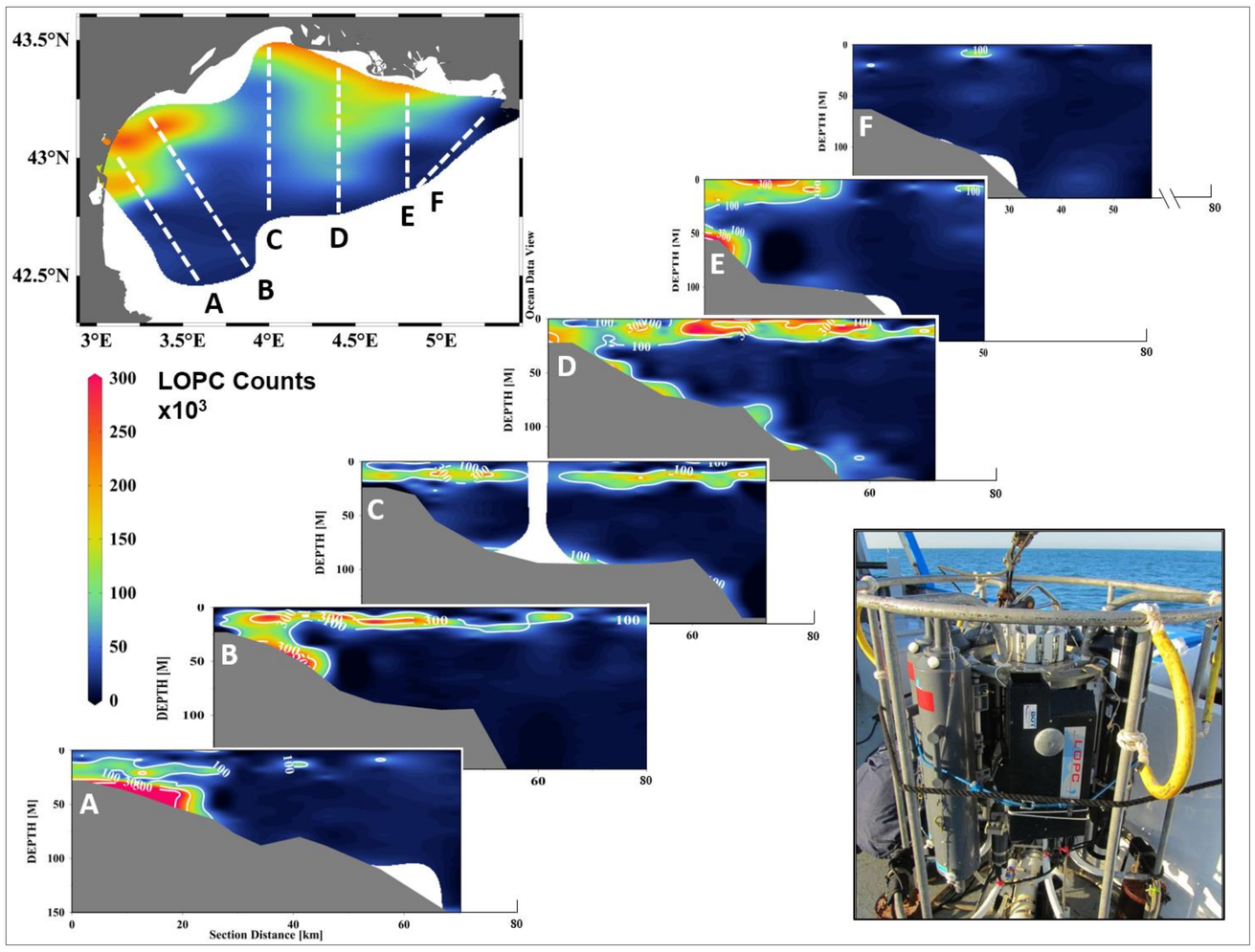


Fig. 2 Spatial distributions of the particle concentrations integrated on the water column (top left) and along the 6 transects during COSTEAU 4. LOPC mounted on a Rosette water sampler (bottom right).

RESULTS

Six transects across the continental shelf, including each 6 to 15 stations, were done for each survey cruise, detailing the vertical distribution of physical and biological variables (ex. LOPC counts, Fig.2).

A sequence of statistical tests described in Espinasse et al. was performed on the dataset in the aim to create sub-groups of stations. For the two periods, three zones were defined presenting the following characteristics (Fig. 3) :

-Zone 1, "Coastal area" : homogeneous water column due to winds or upwelling, high chl-a concentration, strong NBSS slope

-Zone 2, "Rhône plume" : influence of Rhône River inputs, stratified waters masses, weak NBSS slope

-Zone 3, "Continental shelf" : deep mixed layer depth, quasi-homogeneous vertical distribution of biological variables

Fig.4 NBSS within the three zones for the two surveys.

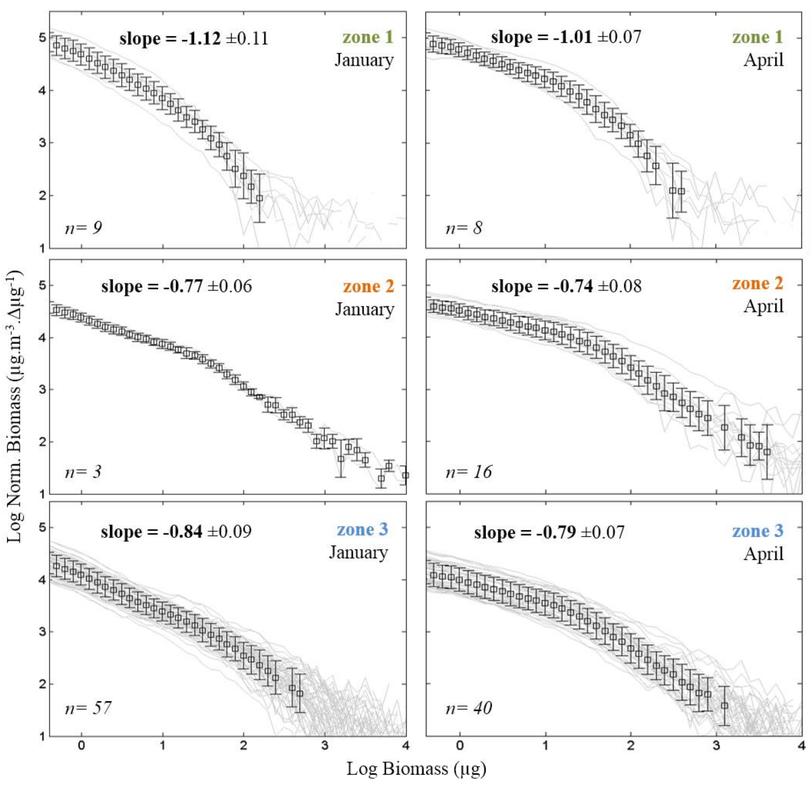
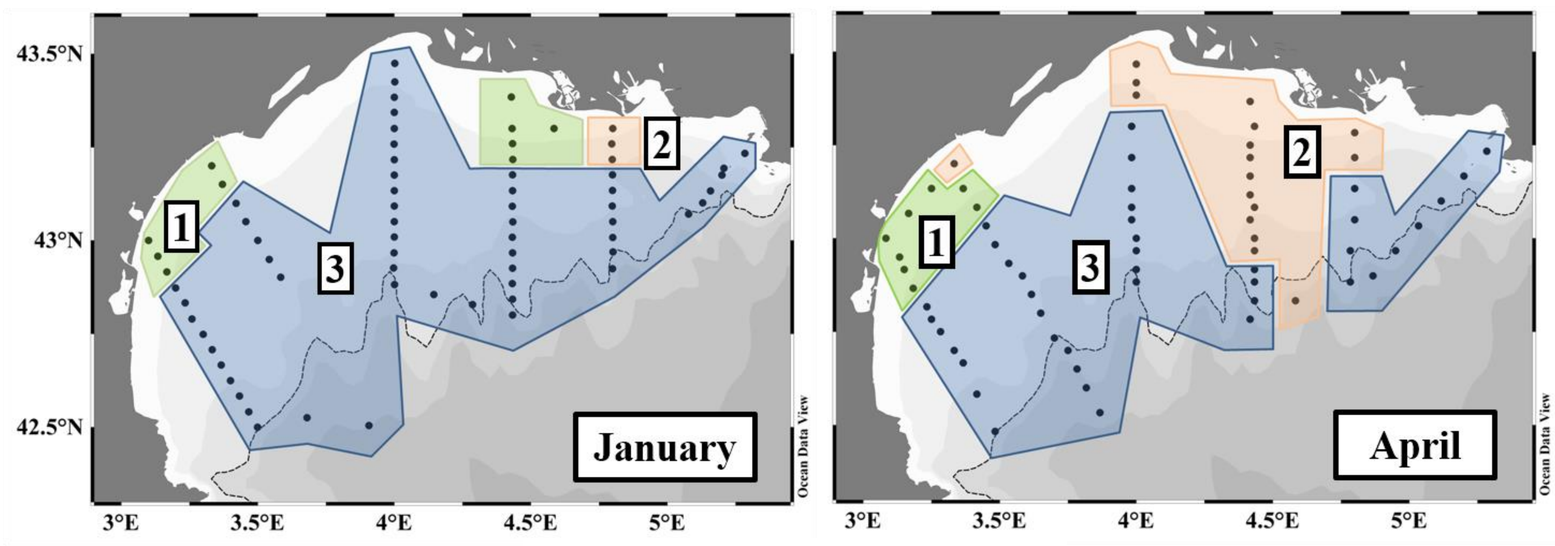


Fig. 3 Spatial distributions of the three habitats for COSTEAU 6 and COSTEAU 4.



CONCLUSION

The grouping of stations provides potential habitats corresponding to different size structures of zooplankton communities (Fig. 4). Hence, defining these habitats considering both physical and biological variables provide new possibilities:

- To create new time-saving zooplankton sampling strategies by defining a limited number of stations
- To assess stock of zooplankton within defined eco-regions and over the entire gulf
- To integrate zooplankton compartment in trophodynamics studies by adapting the spatial scale to the study of higher trophic level
- To validate zooplankton model outputs

References: Herman AW, Beanlands B, Phillips EF (2004) The next generation of Optical Plankton Counter: the Laser-OPC. Journal of Plankton Research 26:1135-1145
Herman AW, Harvey M (2006) Application of normalized biomass size spectra to laser optical plankton counter net intercomparisons of zooplankton distributions. Journal of Geophysical Research 111:1-9
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