

STRUCTURE AND FUNCTIONING OF EPIPELAGIC MESOZOOPLANKTON IN THE MEDITERRANEAN SEA DURING SPRING PEACETIME CRUISE 2017

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Abstract

17 zooplankton samples were taken during PEACETIME cruise carried out between May and June 2017. The samples were analyzed using FlowCAM and ZOOSCAN to obtain a complete size spectrum from 100 μm to 1 cm. Dry weight, grazing, respiration and excretion rates were derived using established allometric equations. Results show that during the cruise transect, the average zooplankton grazing rate was 11.9 % of phytoplankton stock and 23.9 % of the primary production, and the ammonium and phosphate regenerated by zooplankton excretion contribute in average to 6.71 and 7.01 % of the total N and P requirements for primary production respectively.

Keywords: *Zooplankton, Mediterranean Sea*

The role of zooplankton in marine ecosystems is essential considering its impact on carbon and nutrients cycles and fate. For example transferring energy from primary producers to higher trophic levels giving them a crucial influence on fish stock recruitment [1,2] and modifying the pool of dissolved nutrients available for phytoplankton by grazing and excretion [3]. 17 stations were sampled in May/June 2017 during the PEACETIME cruise over the Western and Eastern Mediterranean Sea (Fig 1) on board the R.V. *Pourquoi pas?* using a bongo frame (60cm mouth diameter) equipped with a 100 μm and 200 μm mesh net and towed from 300m depth to the surface. Oceanographic variables were recorded with CTD (temperature, density, salinity) and chlorophyll-a concentration was estimated from Niskin bottle samples using HPLC. Phytoplankton stock was derived from the integrated value of total chlorophyll. Each zooplankton sample was analyzed later in the laboratory using FlowCAM (<300 μm ESD) and ZOOSCAN (>300 μm ESD). From the zooplankton size spectrum obtained at each station, we derived the dry weight using an area-weight relationship [4], the zooplankton carbon demand (ZCD) assuming phytoplankton as the single food source [5] and the metabolic rates using allometric models [6].

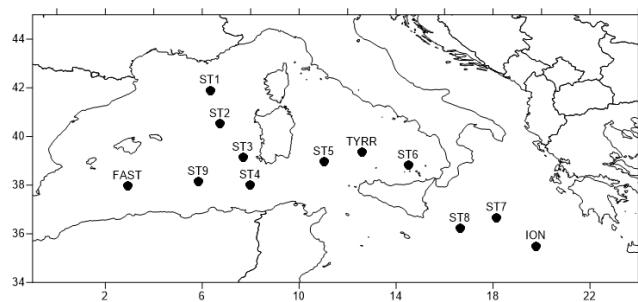


Fig. 1. Map of the PEACETIME study area. Black dots represent the sampling stations.

Total zooplankton abundance (fig. 2a) varies between 551 and 1643 ind m^{-3} , with an average of 1165 ± 332 ind m^{-3} . <300 μm size fraction has the most significant contribution (72 % on average). Zooplankton biomass (fig. 2b) range from 1.09 to 6.86 mg m^{-3} , with an average of 4.92 ± 1.51 mg m^{-3} . Copepods were the most abundant taxonomic group in all stations representing between 36 to 75% of the abundance and 30 to 84% of the total biomass.

The ZCD ranged from 0.14 to 0.94 mg C $\text{m}^{-3} \text{d}^{-1}$ which means a daily grazing pressure of 11.9 % (in average for all stations) of phytoplankton stock and a 23.9 % of the primary production. Average ammonium and phosphorus excretion for all stations was 0.33 mg $\text{NH}_4 \text{m}^{-3} \text{d}^{-1}$ and 0.005 mg $\text{PO}_4 \text{m}^{-3} \text{d}^{-1}$. This NH_4 and PO_4 regenerated by zooplankton contribute in average to 6.71 and 7.01 % respectively of the total N and P requirements for primary production.

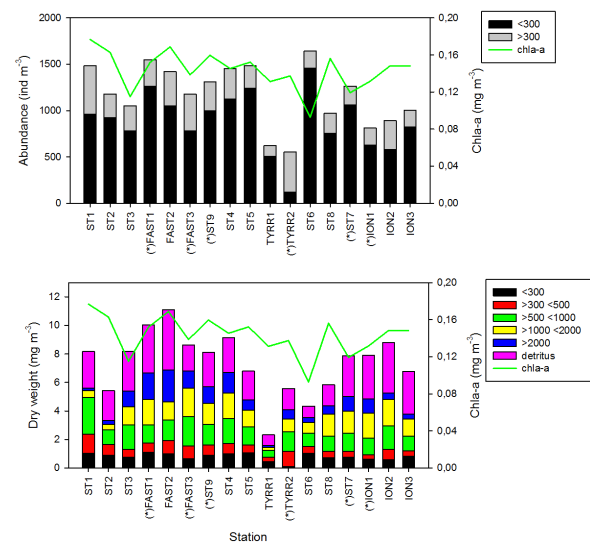


Fig. 2. A) Abundance of small zooplankton (ECD <300 μm) determined by flowcam and of large zooplankton (ECD >300 μm) determined by Zooscan. Averaged integrated Chl-a concentrations (straight line). B) Cumulated biomasses of zooplankton size fractions and detritus.

During Peacetime cruise zooplankton biomass and size structure showed no clear pattern with chlorophyll-a. Moderate grazing impact and nutrient regeneration also suggest a poor direct link between phyto- and zooplankton

References

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