RELATIONSHIP BETWEEN
BACTERIA AND HETEROTROPHIC NANOFLAGELLATES
IN THE COASTAL ADRIATIC SEA

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Abundance and production of bacteria and heterotrophic nanoflagellates (HNF) were studied over a year in Kastela Bay (Adriatic Sea). Enumeration of studied organisms was made by epifluorescence microscopy using the standard AODC technique (HOBBIE *et al.*, 1977) for bacteria, and proflavine staining technique (HAAS, 1982) for HNF. Bacterial cell production was measured with the H-thymidine incorporation technique (FUHRMAN & AZAM, 1982), whereas cell production of HNF was estimated using a filtration/inoculation method (SHERR *et al.*, 1984).

Bacterial abundance ranged from 0.40×10^6 to 2.06×10^6 cells ml^{-1} showing mean value of 1.31×10^6 cells ml^{-1}. The values for HNF varied from 0.18×10^3 to 3.45×10^3 cells ml^{-1}, with mean of 1.59×10^3 cells ml^{-1}. High bacterial abundance presented from May to September was followed with marked decrease in October-November period (Fig.1A). Another bacterial peak was observed in winter (December-January). On the other hand, HNF abundance was significantly higher during the warmer part of the year (July-November) in comparison to colder winter-spring period. HNF peak reached in August could be a response to bacterial summer peak, but there is no response to bacterial winter peak. Correlation between bacterial and HNF abundance was not established across the year, probably as a result of predator-prey oscillations, and complex trophic interactions with numerous feedbacks. The ratio between bacterial and HNF abundance ranged between 148 and 5225 with mean value of 1568, or expressed as carbon biomass ratio the mean value was 4.1. Bacterial production ranged from 0.37×10^4 to 12.42×10^4 cells ml^{-1}h^{-1}, with mean value of 4.45×10^4 cells ml^{-1}h^{-1}. Production of HNF varied between 3.08 and 166.21 cells ml^{-1}h^{-1} with mean value of 45.88 cells ml^{-1}h^{-1}. Expressed as carbon biomass, HNF production accounted on average 39% of bacterial production. Population doubling time ranged from 0.6 to 7.8 days (mean value was 2.1 days) and from 0.6 to 5.6 days (mean value was 2.7 days) for the bacteria and HNF, respectively. Both bacterial and HNF production were in maximum during summer (July-September) (Fig.1B). Therefore, high correlation between bacterial and HNF production was established ($R^2 = 0.81$; $P < 0.001$; $n = 48$) pointing at strong trophic relationship between these two groups of organisms.
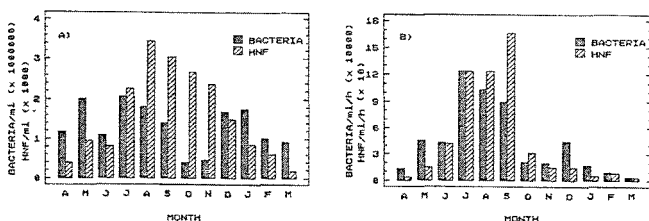

Fig.1 Seasonal oscillations of bacterial and heterotrophic nanoflagellates (HNF) abundance (A) and production (B).

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