

High Contribution of SAR11 to Microbial Activity in the North West Mediterranean Sea.

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We investigated the abundance and activity of SAR11 on a monthly time scale between January 2008 and October 2008 in the oligotrophic NW Mediterranean Sea. Applying MICRO-CARD-FISH, we observed that SAR11 had a large contribution to bulk abundance ($37\pm 6\%$ of DAPI-stained cells) and to bulk bacterial heterotrophic production (BHP), as estimated from leucine incorporation ($55\pm 15\%$ of DAPI-cells assimilating leucine) in surface waters (5 m) throughout the study period. SAR11 contributed also substantially to the assimilation of glucose, ATP, and a combination of amino acids ($44\pm 17\%$, $37\pm 14\%$, and $43\pm 12\%$ of DAPI cells assimilating these compounds, respectively), organic compounds that provide either single or combined sources of C, P, and N. Temporal changes in the abundance of SAR11 cells that assimilated leucine, glucose, amino acids, and ATP revealed a pattern consistent with that of substrate-active DAPI cells, suggesting that the activity of SAR11 can explain to a large extent the variability in total cells contributing to the utilization of these compounds. Short-term nutrient enrichment experiments performed on each sampling date revealed a strong co-limitation of at least two of the three elements analyzed (C, N, P), in particular, during summer and early autumn. The in situ abundance of SAR11 cells assimilating leucine appeared to increase with P limitation as determined in the nutrient enrichment experiments ($r=0.81$, $p=0.015$). Our results demonstrate that SAR11 is an important component of the active bacterial community in the NW Mediterranean Sea. Our observations further indicate that the activity of the bulk bacterial community is linked to the activity of SAR11, possibly due to its adaptation to nutrient limitation.