Distribution of free-living and particle attached aerobic anoxygenic phototrophic bacteria in marine environments.

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Aerobic anoxygenic phototrophic (AAP) bacteria are bacteriochlorophyll *a*-containing prokaryotes which can use both light and organic compounds as energy sources. This functional group is ubiquitous in the euphotic zone of the oceans. Nevertheless, life strategies, distribution patterns and physiology of AAP bacteria remain largely unknown. We combined infrared fluorometry, microscopic counts and HPLC pigment analysis to characterize free-living and particle-attached AAP bacterial populations. Using a size-fractionation approach, we found that the size distribution of AAP bacteria and the fraction of particle-attached cells varied greatly among different marine environments. In the open sea environments (Atlantic Ocean, offshore Mediterranean Sea), the main portion of AAP bacterial fluorescence was in the <0.8 µm fraction, which indicates that the majority of AAP bacteria in these regions were free-living cells <0.8 µm. In these environments, only a few particle-attached AAP bacteria were found. In coastal Mediterranean waters, the fraction of larger cells increased together with a few particle-attached cells, but >50% of AAP bacteria were free living. In a coastal lagoon and in the deep chlorophyll *a* maximum at an offshore Mediterranean station, particle-attached AAP bacteria formed up to half of the AAP bacterial community. The results presented here suggest that AAP bacteria can take on either free-living or particle-attached lifestyles depending on environmental conditions.