Distributions of aerobic, anoxygenic phototrophic (AAP) bacteria in the N. Atlantic

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What are AAP bacteria??

- discovered to be widespread in ocean by Kolber et al. 2000
- contain bacteriochlorophyll
- genes found across wide groups of bacteria
- expected to be found in anoxic environments
- photosynthesis does not produce oxygen, uses alternative reductant source (organic matter?)
"New" ocean bacterial photo-metabolisms

Karl 2002 Nature 415:591
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Aerobic Anoxygenic Phototrophs

Georges Bank

Sargasso Sea

Diverse AAP Morphologies

Rods and cocci

Vibrios

Spirilla
AAPs are larger than the average marine bacteria.
Sargasso Sea
October
Vertical Profile
Microbial Community
AAPs are more abundant with higher chlorophyll and temperatures.
Summary of our AAP results

- AAPs are larger (more biomass per cell) than the average bacteria
- AAPs have diverse morphologies, especially in the open ocean
- AAPs are more abundant in productive, coastal waters than in the open ocean - they correlate with primary producers
- AAPs are a higher percentage of the total bacterial biomass in productive, coastal waters (2-12%) than in the open ocean (2-5%)
AAP Ecology

... SO: AAP cell and biomass distributions do not support the hypothesis that these cells are specifically adapted to the low nutrient, open ocean environment

- Analogous to mixotrophic eukaryotes
- Larger AAP cells may be more active, and/or avoid grazing in open ocean
AAP activity along the Atlantic meridional transect (AMT16, May-Jun 2005)

AAP growth vs. primary production

Photoheterotrophs: potential light-accelerated carbon shunt in the microbial food web