

Ecology of marine Bacteroidetes: a comparative genomics approach

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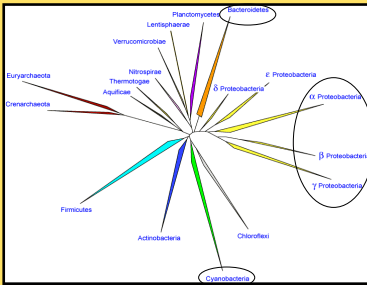


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Cyanobacteria, Proteobacteria, and Bacteroidetes are the most abundant bacterial classes in the oceans.



INTRODUCTION



Pure cultures of *Dokdonia* MED134 (above) and *Polaribacter* MED152 (below)

Cyanobacteria are responsible for oxygenic photosynthesis. Proteobacteria are the main organisms processing dissolved organic matter of low molecular weight (DOM).

Much less is known about the genetics, physiology and ecology of marine Bacteroidetes.

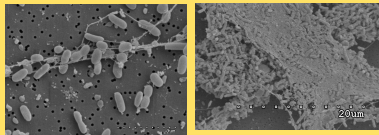
We postulated that they have a completely different role from those of Cyanobacteria or Proteobacteria, being specialized in degradation of polymeric organic compounds (POM).

We used the genomes of marine Bacteroidetes isolated in pure culture to find whether their genomic make up was consistent with this hypothesis.

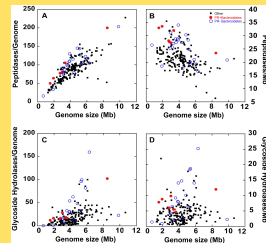
RESULTS

2. Commonalities Life attached

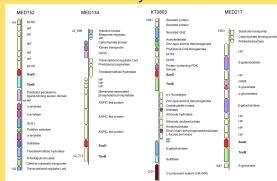
Bacteroidetes show gliding motility and adhesion proteins



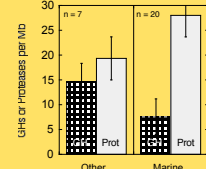
Bacteroidetes have more peptidases and glycosyl hydrolases than other bacteria



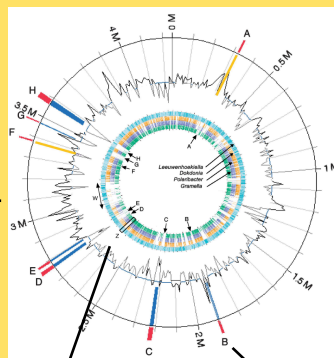
Bacteroidetes have many polymer degrading complexes including TonB dependent transporters plus degrading enzymes



Marine Bacteroidetes have more peptidases than glycosyl hydrolases unlike non marine Bacteroidetes

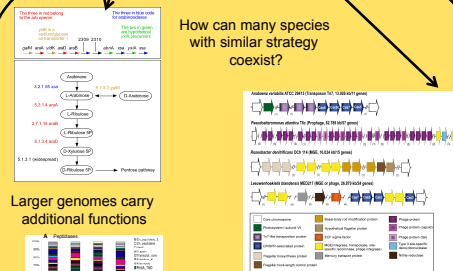


1. Genomes of 4 marine Bacteroidetes

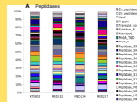


4. Differences

How can many species with similar strategy coexist?



Larger genomes carry additional functions

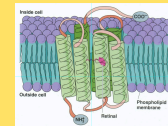


Genomic islands contribute additional genes

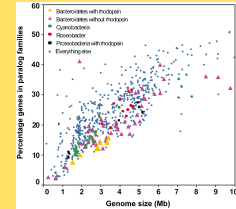
Slight differences in polymer degrading enzymes provide niche fine tuning

3. Commonalities Free living

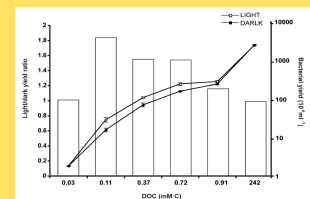
Some marine Bacteroidetes have proteorhodopsin (PR)



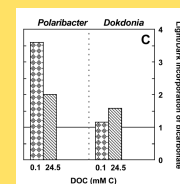
Bacteroidetes with PR have small genomes



Bacteroidetes with PR grow better and have larger yields in the light than in the dark



Bacteroidetes with PR fix more CO₂ anaerotically in the light than in the dark



CONCLUSIONS

Bacteroidetes prefer a life style where they attach to particles and degrade polymeric organic compounds (Strategy A)

Marine Bacteroidetes prefer to degrade proteins rather than polysaccharides

Marine Bacteroidetes with PR have small genomes and grow better in the light than in the dark. They also fix more CO₂ in the light. This will be particularly useful when free floating in the low DOC surface ocean in search of fresh particles to colonize (Strategy B)

REFERENCES

Fernández-Gómez et al. (2013) ISME J 7: 1026-1037.
Fernández-Gómez et al. (2012) BMC Genomics 13: 347-366.

