Ocean warming and phytoplankton size

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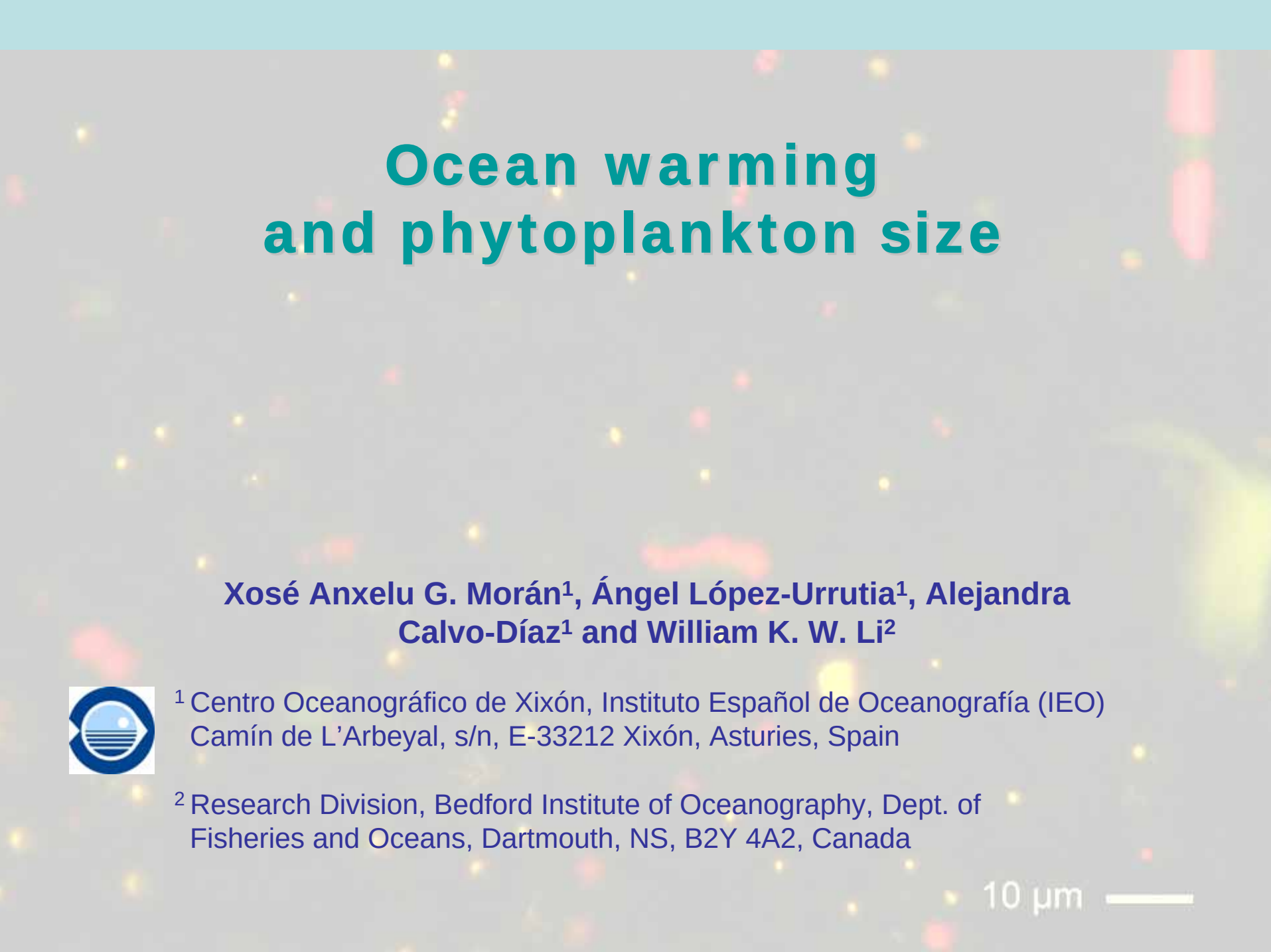
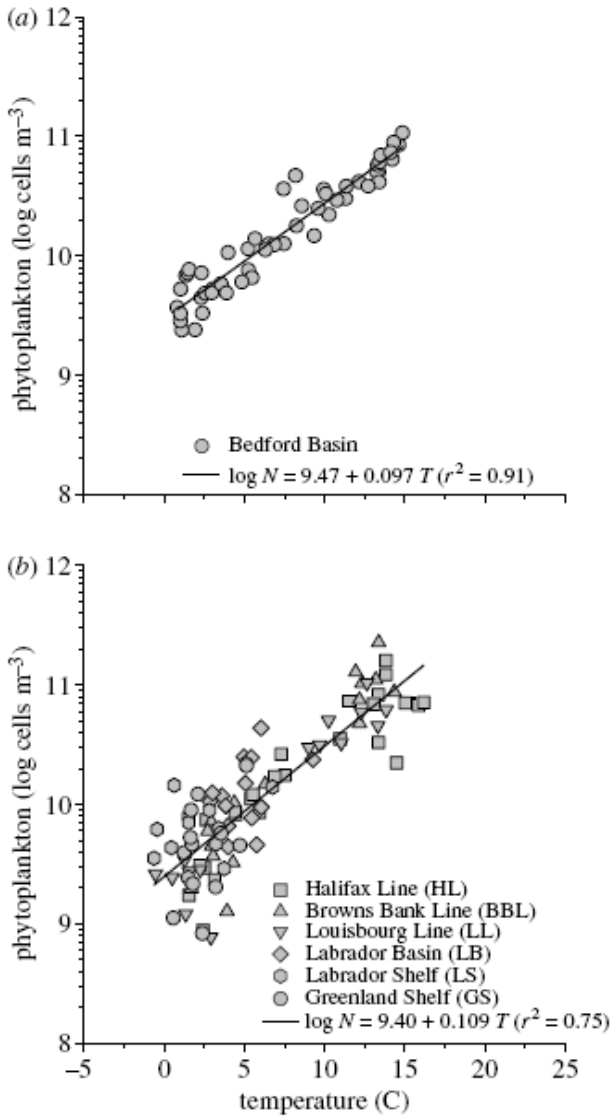
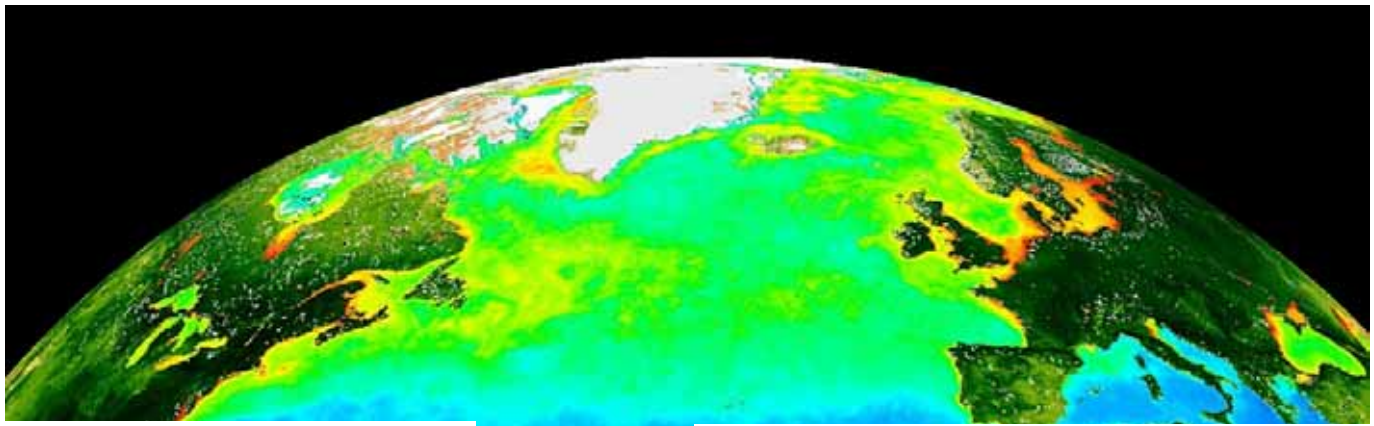


Marine phytoplankton and temperature

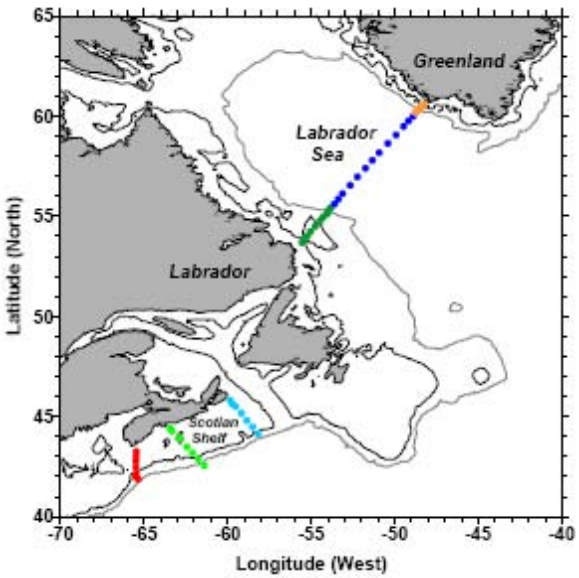


Li et al. 2006

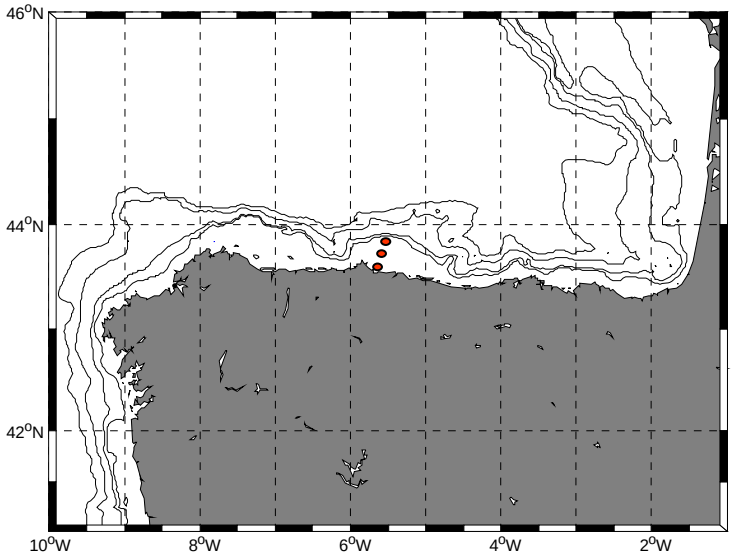
Study regions



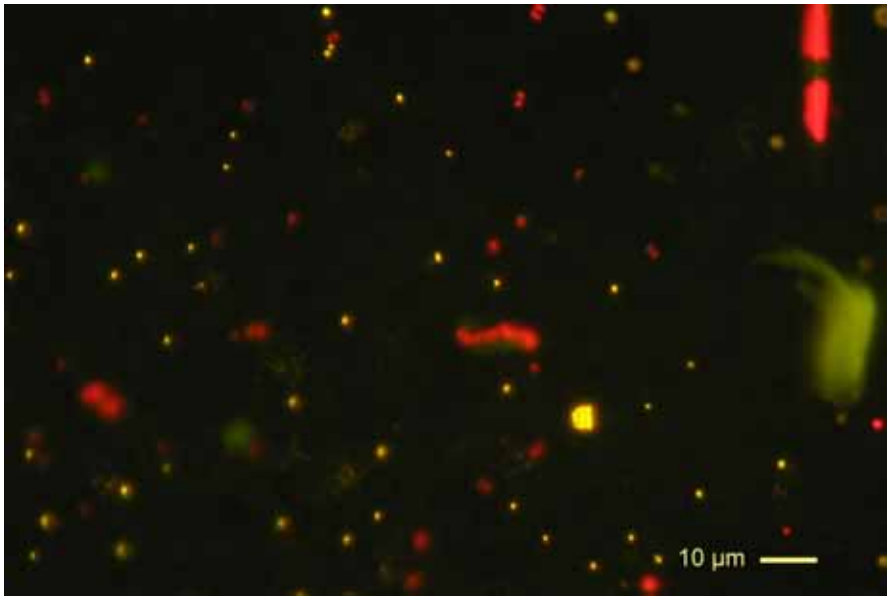
NW Atlantic

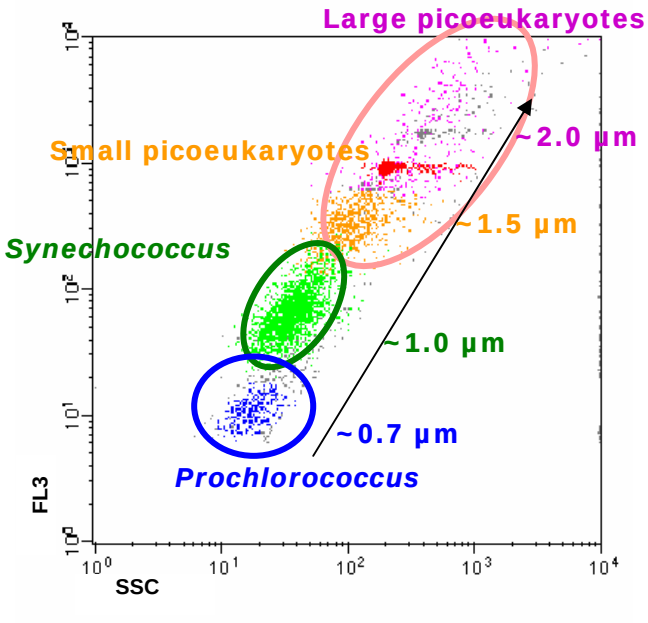


NE Atlantic



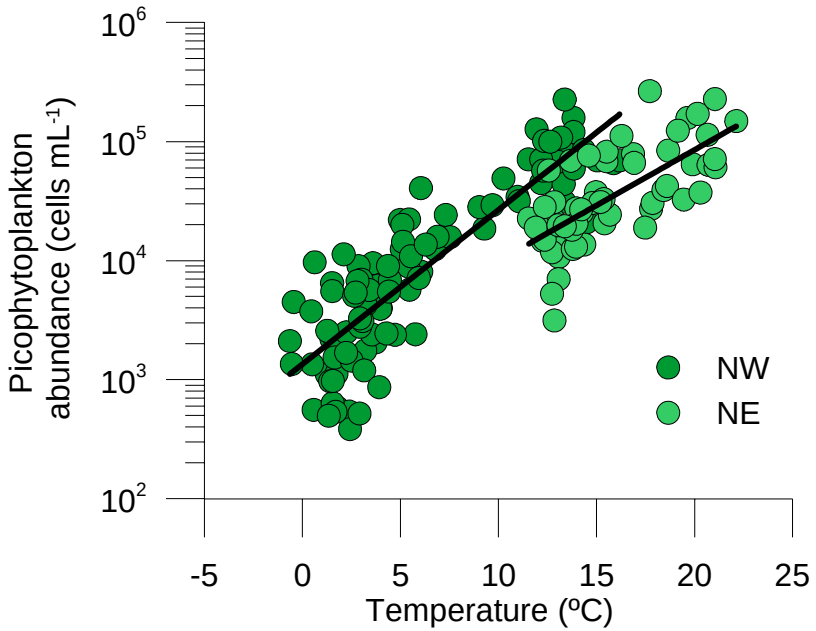
Picophytoplankton (0.2 – 2 µm ESD)

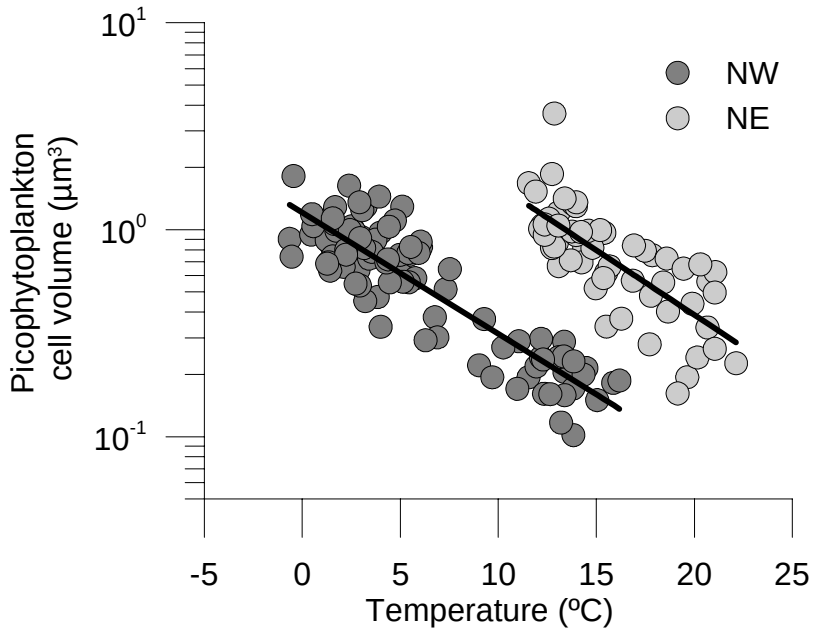




Vaulot 2004 – Pacific Ocean

Picophytoplankton abundance and temperature

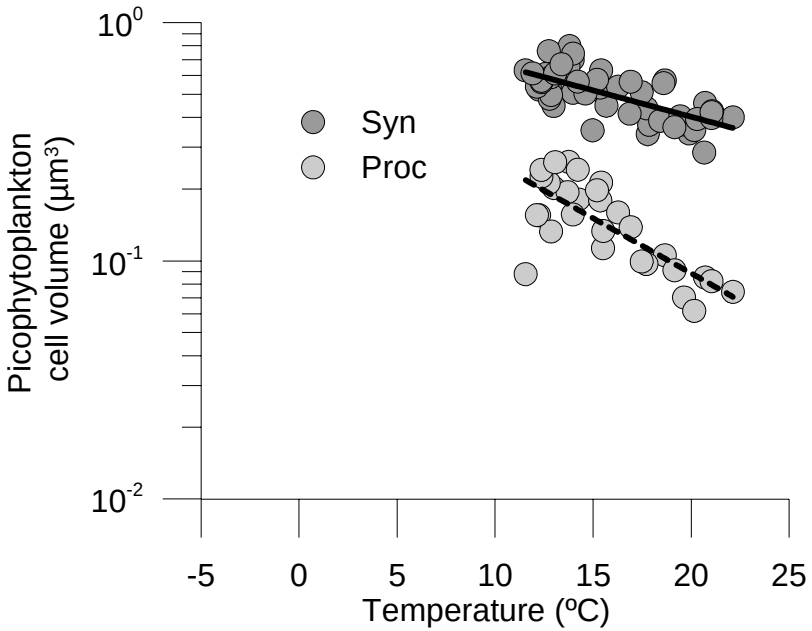


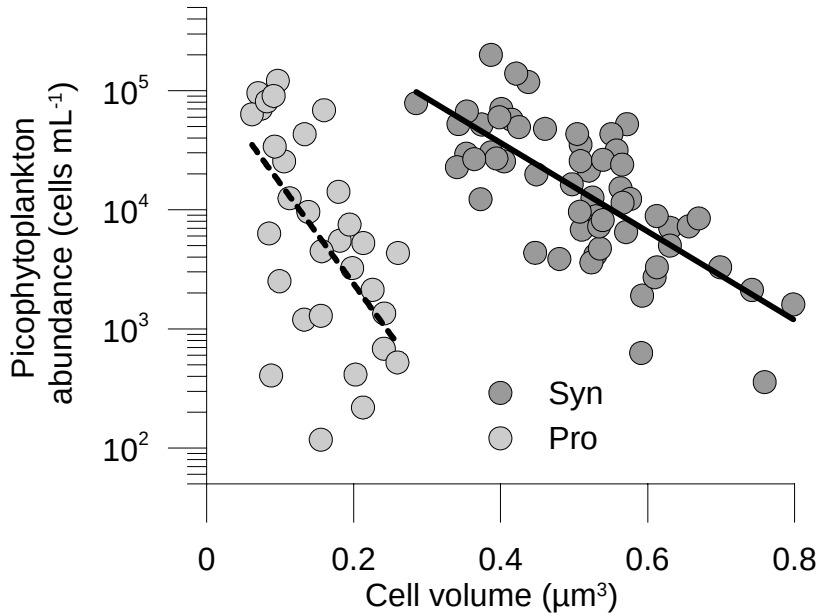


NW	r^2 = 0.75, p <0.0001, n=97
NE	r^2 = 0.49, p <0.0001, n=59

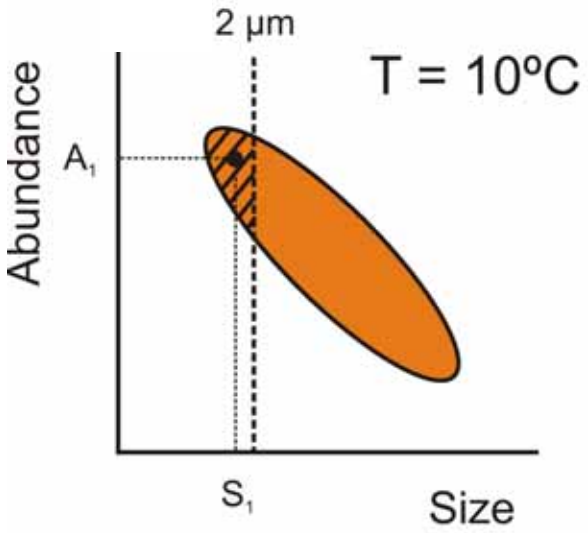
NW	r^2 = 0.79, p <0.0001, n=95
NE	r^2 = 0.71, p <0.0001, n=59

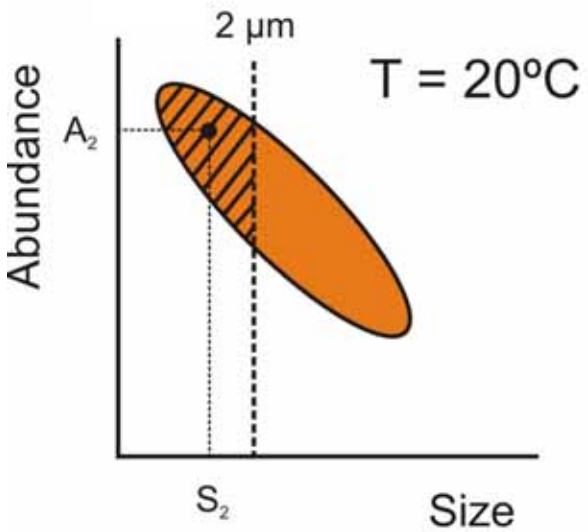
The temperature-size rule and the size-abundance scaling

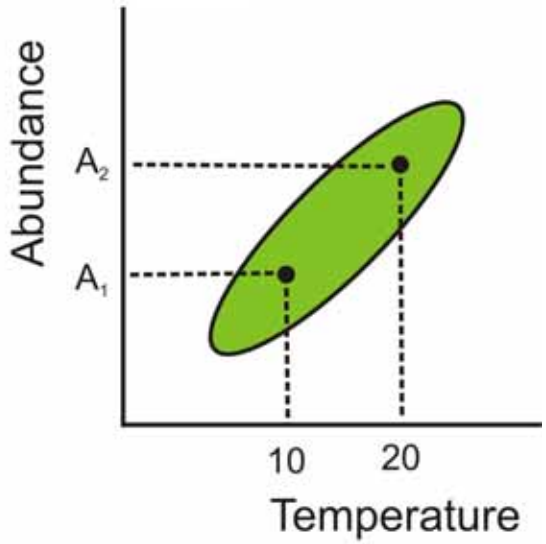


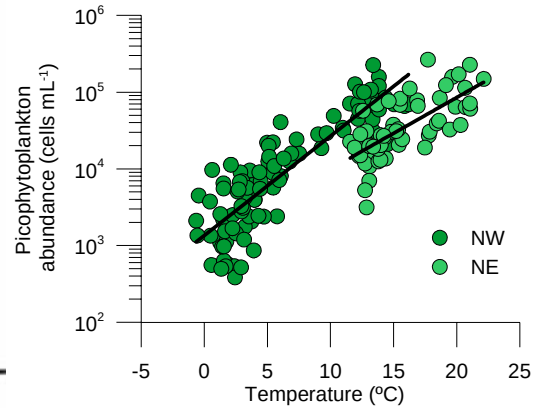


Temperature and size-abundance distributions

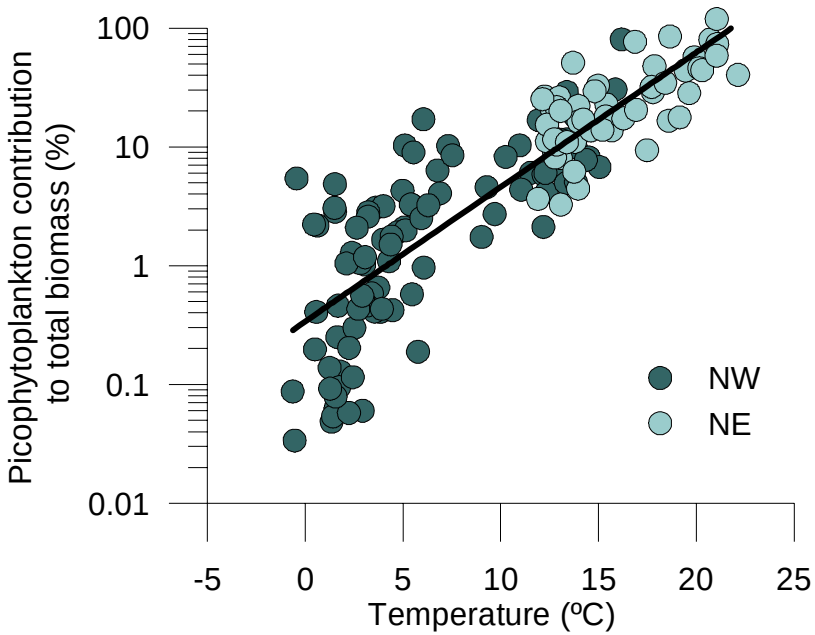






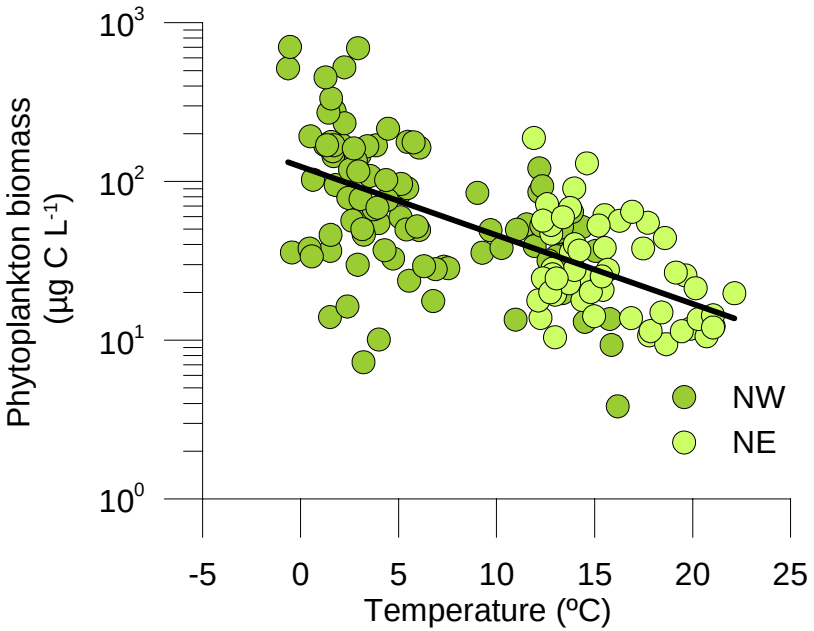


Relative contribution of picophytoplankton biomass vs. temperature

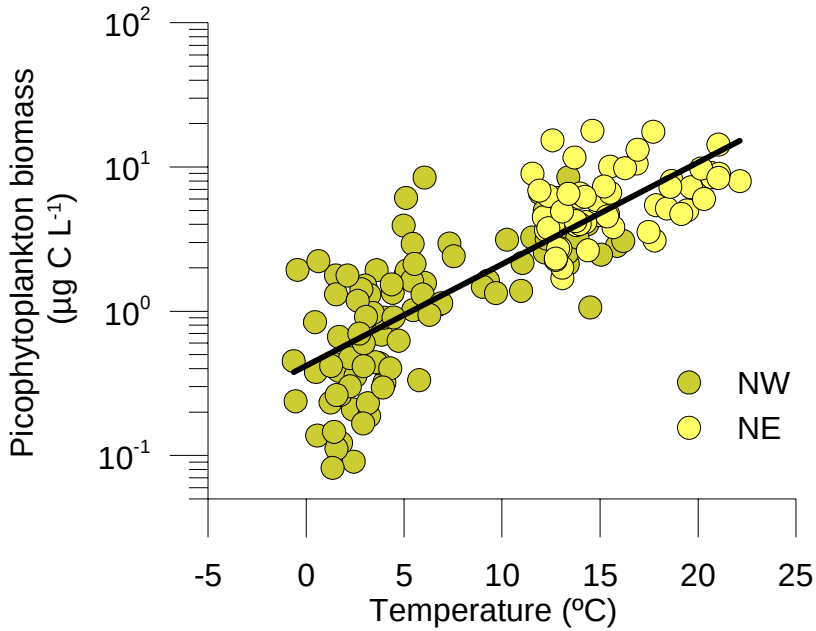


NW & NE $r^2 = 0.73$, $p < 0.0001$, $n = 152$

Biomass of total and small phytoplankton

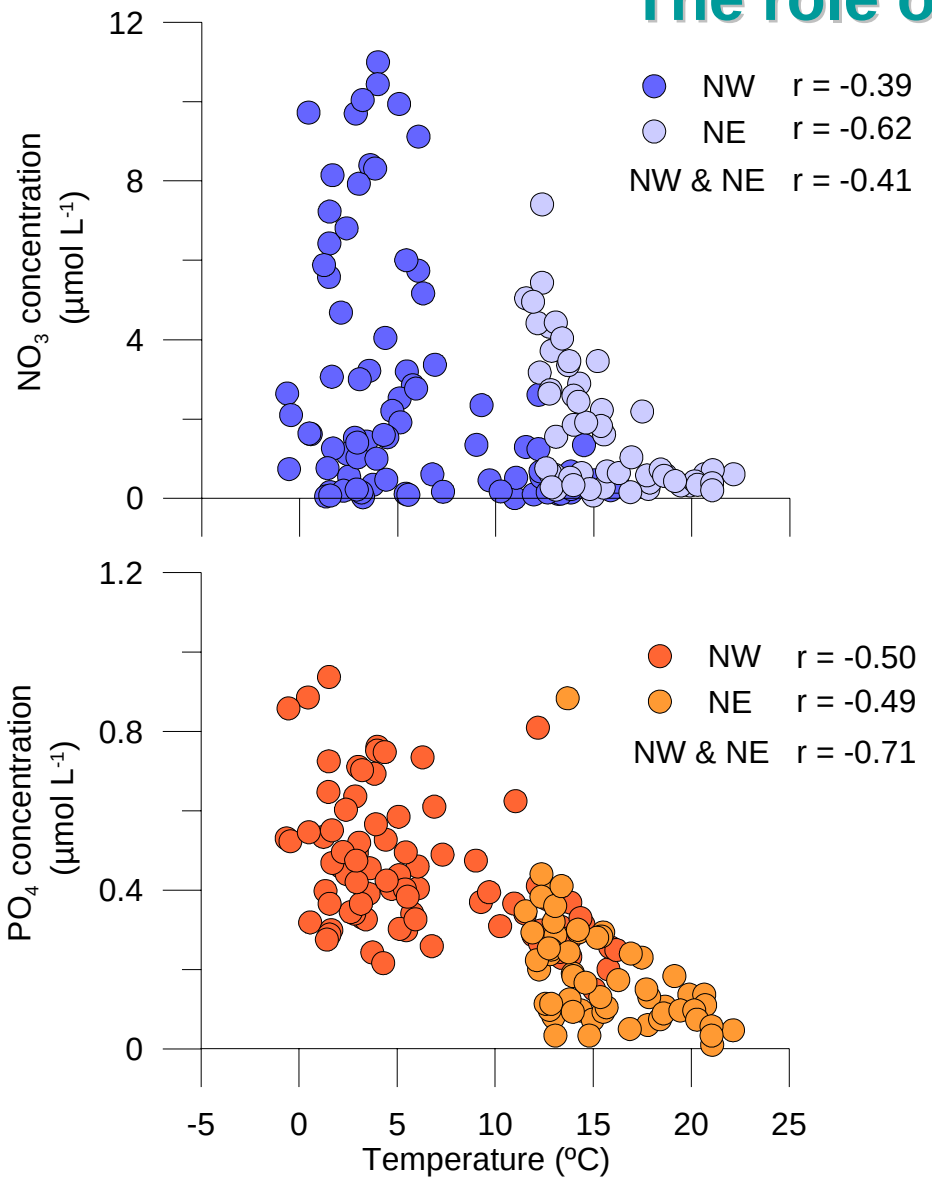


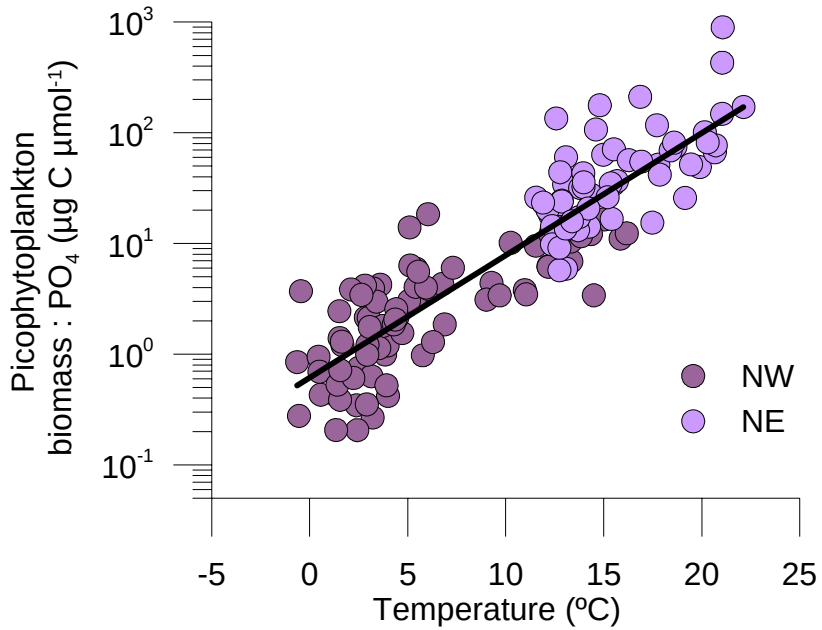
NW & NE $r^2 = 0.39$, $p < 0.0001$, $n = 152$



NW & NE $r^2 = 0.66$, $p < 0.0001$, $n = 154$

The role of nutrients





NW & NE $r^2 = 0.79$, $p < 0.0001$, $n = 154$

Conclusions

A combination of the temperature-size rule and the size scaling of phytoplankton abundance was able to explain two general patterns:

- The increase in small phytoplankton cell abundance over the -0.6 – 22ºC range in the North Atlantic

- The increasing contribution of picophytoplankton to total phytoplankton biomass with higher temperatures

A gradual shift towards smaller primary producers in a warmer ocean?

Acknowledgements

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