**Research Review 8: Climate Change**

**Summary:**

Climate change and rising carbon dioxide levels are associated with changes in ocean acidification, oxygen content, nutrient input, temperature, circulation and other biological effects. These marine ecosystems are maintained as energy flows through food webs the base of which are phytoplankton an important primary producer. These ecological networks are linked both directly and indirectly through multiple biological interactions that are influenced by biological and physical processes (Doney, 2012). Phytoplankton fix 50% of the carbon dioxide annually so changes to their environment from temperature could be far reaching.

The first article was more of a large review of dynamics climate change is having on biological ecosystems. The article reviewed here focuses on a specific problem related to the effects that temperature fluctuations have on phytoplankton metabolism. This research is important because currently there is still a limited understanding of the role that temperature plays on the metabolism, composition and growth of eukaryotic marine phytoplankton. In order to look at this the researchers utilized an approach that combined metatranscriptomes, biochemical data, cellular physiology and emergent phytoplankton growth strategies in a large global model. The study was quite large drawing on about 1.5 million cDNA sequences whose average length was 242 bp. The study found that temperature accounts for around 28% of metabolic variability which means that temperature is as important to phytoplankton as both light and nutrients. Their analysis revealed that temperature has the strongest correlation compared to all of their other tested variables. Another important finding was that temperature could play a role in the N:P stoichiometry of phytoplankton.

**Discussion:**

This research seemed to be well done and provide strong support that temperature can affect not only the metabolism of phytoplankton but also their stoichiometry. The study seemed to lay the foundation for these effects but it seems that further research could look more into this to analyze the effects of these temperature fluctuations in more detail. One potential experiment could potentially isolate samples from smaller regions to further understand just how much metabolism fluctuates dependent on temperature and the magnitude needed for this to become detrimental. Different samples could be subject to a range of temperature changes and metabolism rates could be measured. Some other things that could be taken into account is the average temperature the phytoplankton experience to see if being in a climate with extreme temperatures has a role in how severe these affects are on metabolism. Research could also be done to look at how these changes affect other trophic levels or top down or bottom up forcing.

**Citations:**A. Toseland, S. J. Daines, J. R. Clark, A. Kirkham, J. Strauss, C. Uhlig, T. M. Lenton, K.

Valentin, G. A. Pearson, V. Moulton, and T. Mock. "The Impact of Temperature on Marine Phytoplankton Resource Allocation and Metabolism." Nature Climate Change 3.11 (2013): 979-984. Web.