

Interactive comment on “Genotyping an *Emiliana huxleyi* (Prymnesiophyceae) bloom event in the North Sea reveals evidence of asexual reproduction” by S. A. Krueger-Hadfield et al.

Anonymous Referee #1

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Dear Editor,

Once again, I very much appreciate the nomination to review Dr. Krueger-Hadfield et al. manuscript (#bg-2014-84: Genotyping an *Emiliana huxleyi* bloom event in the north sea reveals evidence of asexual reproduction).

In this manuscript Krueger-Hadfield and co-authors revisited and improved the reliability of previously published microsatellites to assess the micro-diversity of the coccolithophore *E. huxleyi*. They further included a wide analysis of the so-called coccolith morphology motif (CMM). Upon analyses of this large data set they concluded that natural populations, including during blooms formation, diverge and evolve mostly

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asexually. Thus, sex appears to have a minor impact on the diversity and evolution of this cosmopolitan phytoplankter, and therefore a low impact on its rate of adaptation. Given the quality of the comprehensive analyses provided and most importantly by providing clear evidence for the prevalence of asexuality I support and recommend this paper for publication. It will provide an excellent technical and theoretical framework for assessing populations dynamics in *E. huxleyi* but also other phytoplankton species in the oceans.

Nonetheless, *E. huxleyi* sexual life cycle shouldn't be forgotten. Therefore, it should further highlight both the introduction and discussion. In fact *E. huxleyi* has a well documented sexual cycle, where multiple strains have been shown to produce haploid cells, most likely through meiosis. These haploid cells appear to be more light sensitive than diploid-calcified cells (Houdan et al. 2005), but are flagellated and resistant to viruses that specifically kill diploid cells (Frada et al. 2008). There is a clear niche differentiation between sexual phases. Moreover, although our current knowledge is still limited, haploids exist in nature. This was shown both by Rhodes et al. 1995 (NZ J Mar Freshwater Res) and by Frada et al. 2012 (Environmental Microbiology). In these studies it was shown that new calcified cells produced new haploid soon after collection (Rhodes et al. 1995) and that during *E. huxleyi* bloom, concomitant with viral infection, what seems to be 'pos-meiotic' structures appear in the water column and there is the expression of haploid specific genes (Frada et al. 2012). Thus, sexual transitions and newly formed haploid cells occur in nature. As Frada et al. 2012, the reported the fraction of 1N cells appears to be very minor, thus its impact on the species gene pool might be residual and not easily detectable. To make a long story short, a sexual cycle seems to prevail at least in some bloom-forming *E. huxleyi* genotypes in nature. Its impact on the resilience, adaptability and evolution of this species is most likely extremely relevant. The authors should therefore include this concept in the introduction and further take it into account in the discussion in order to provide a wider view of *E. huxleyi* ecology and the limitation that their analyses provides.

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PS. The sentence “This study challenges our current assumption that sex is the predominant mode of reproduction during bloom events” from the abstract should be modified, because it gives the idea that bloom are formed through cells multiplying by meiosis. Obviously, this is not the case. Instead what this work conveys is that asexual reproduction is the predominant mode of cell growth and, furthermore, asexual reproduction seems to be the predominant mode of diversification.

Interactive comment on Biogeosciences Discuss., 11, 4359, 2014.

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