

Interactive comment on “Trichodesmium and nitrogen fixation in the Kuroshio” by T. Shiozaki et al.

Anonymous Referee #1

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General Comments: Shiozaki et al. look at the abundance of *Trichodesmium* and nitrogen fixation in and around the Kuroshio Current and attempt to determine the factors influencing the distribution pattern. The authors observed that abundances were lowest in the Philippine Sea and similar everywhere else, despite similar nutrient distributions at all sites. The manuscript is disorganized and lacks flow, particularly the introduction. Sentences contain fragments of several thoughts, complicating comprehension. No rationale, questions, or hypotheses are clearly presented in the manuscript. The manuscript lacks details about the methods used, particularly about how N₂ fixation rates were measured. The authors conclude that there is a significant correlation between *Trichodesmium* abundance and N₂ fixation, yet they do not present the data.

Specific Comments: The title is very general and gives no information as to conclusions

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from the study. Also, the title implies that only the Kuroshio was studied, when in fact the whole area around the Kuroshio was studied.

The introduction is disorganized and very short. It is not clear what hypothesis is being tested by the study or how it is being tested. Some of the statements and generalizations made about nitrogen fixation are not entirely correct. For instance, it is true that phosphorus concentrations are thought to potentially limit diazotrophs, but it is not because diazotrophs consume phosphate. They do consume phosphate, as does the rest of the microbial community. The conclusions of Moore et al. 2009 and Mather et al. 2008 are not completely integrated into the introduction.

The materials and methods section was lacking key information for interpreting results. In section 2.1 algal blooms were defined very well, but no details about how or what calculations were done are included. No definition of which months are considered summer is included. It is also unclear why summer chlorophyll is used when 4 of the 5 cruises were conducted in September. A description of how stations were categorized into areas (ECS, Kuroshio, etc.) should be included. The method used to determine *in vivo* chlorophyll fluorescence is not described. More details are needed for the nutrient methods and detection limits and microscopy counts. How are filaments defined? How were different colony morphologies addressed?

The way the authors approached interpreting their N₂ fixation rates with consideration of the results of Mohr et al. 2010 and Dabundo et al. 2014 is inadequate. The authors need to add more information about how they measured N₂ fixation, including how much N₂ was added, the volume of the incubations, and the length of time for the incubations. The length of time and the time of day that the injections were made is critical for interpreting the results of Mohr et al. 2010. While the authors did look for potential contaminants in the ¹⁵N gas, they did not look at particulate isotopic species. Are the detection limits and associated errors of the nutrient measurement methods low enough to ensure that there was no significant contamination of the particulate ¹⁵N isotopic signal? Perhaps the authors could include some calculations to address

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this.

In the supporting information the authors present an MDS and ANOSIM analysis. Did the authors look at co-variability between the parameters? This analysis was not mentioned in the results, but is important for interpreting the results.

The authors state that there is a significant correlation between *Trichodesmium* abundances and N₂ fixation, but do not show the data. This is a major conclusion of the study and the data should be shown. It is not clear if the authors are comparing surface *Trichodesmium* to depth integrated N₂ fixation. The authors also state that *Trichodesmium* abundances decrease with depth. This data should be shown as well. It is unclear why the authors display only surface abundances of *Trichodesmium* and depth integrated fixation rates. The authors should display either surface data or depth integrated data for both parameters.

It is not clear why diatom abundances are included in the manuscript and what impact they have on the conclusions. This should be removed.

The authors claim that *Trichodesmium* abundances are higher in the Kuroshio than in the surrounding areas, based on others' results, yet they do not use their own data to test this. Looking at table 1, I do not think that there are any significant differences. The authors should test this and present the results.

Technical Corrections: Figure 1: It is very hard to see the station symbols. The print and symbols are very small. The color symbols overlaid on a color map also make it difficult. Figure 2: 'small box' – inset It is hard to read discrete values, compare the data points, or see any trends as the data is currently presented. Figure 3: Each panel should have a number and the legend should identify which panels correspond to the areas studied. Figure 5: The figures are small and it is difficult to identify islands. Pg 11062: Lines 1-5: These sentences are more introductory. They should be shortened into one sentence. Line 7: 'whose availabilities potentially control diazotrophy' This is introduction. Lines 9-10: 'since satellite...to the Kuroshio' More appropriate in

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the introduction. Line 11: remove 'and the' Line 19-21: This sentence doesn't make sense. How can a diazotroph's presence be important for determining diazotrophy? Maybe something is missing? Pg 11063: Line 2: 'via the ocean-atm.' Remove 'the'. Line 3: Remove 'furthermore' Line 8: Remove 'in addition' Line 14: Remove 'which is characterized by highly oligotrophic conditions'. This should be included in the general description of the Kuroshio. Line 16: Remove 'nevertheless'. Pg 11065: Lines 9-11: This sentence should be re-written. Pg 11066: Lines 11-16: Is this the protocol for preparing/cleaning the sampling bottles? If so, please state this, otherwise this method is unclear. Line 15: and 'stored in' double plastic bags?

Interactive comment on Biogeosciences Discuss., 12, 11061, 2015.

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