Review of: "Effects of Sediment Disturbance by the Heart Urchin Echinocardium Cordatum on the Sediment–Seawater Solute Exchange: An Exclusion Experiment"

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Potential competing interests: No potential competing interests to declare.

General comment

Overall, the manuscript is well written. I liked the idea of how urchins may affect benthic-pelagic coupling and thus change the nutrient flow in the ecosystem. The urchin effect on the N-cycling pathways remains relatively rarely investigated, so I appreciate this effort to gain more understanding.

At the end of the second section of the Introduction, I encourage authors to be more specific about how sea urchins affect other benthic organisms, including microfauna and microphytobenthos.

Study site

When discussing terrigenous mud, do you consider its transport via riverine inputs? Are there any tributaries entering the bays? Could you provide any information about the salinity and trophic status of the system that could be useful for the readers?

You state that the upper 20 remains sulfide-free. Is this based on your observations and references to other studies?

Did you also estimate the natural abundance of sea urchins?

Laboratory setup

You collected 8 cores in total from the ring-protected area and outside it, but later, you stated that 5 cores were incubated. I'm a bit confused about the sampling strategy and experimental design. This needs to be better explained in the text. How do you know that a single core collected per ring is representative? It could be an outlier.

So, I understood that a wave maker was used to ensure a homogeneous water phase in the cores and maintain the exchange between cores and surrounding water. Was it enough?

For which purpose do you use a particle UV filter?

I have understood that the same core is incubated in the dark and light. Is this true? Under which irradiation conditions have you started your incubations?

How stable was the temperature over the incubation time? Did you measure the temperature at the beginning and the end of incubation, which is essential for estimating N2 concentration?

Sample analysis

Why did you not analyze chlorophyll? It could be important in explaining solute exchange, as urchins can graze it.

Solute flux estimates

I suggest adding a sentence explaining how net oxygen flux was calculated from the start-end points or using regression from continuous measurements with optical O2 sensors.

Statistical analysis

What do you mean by incubation time? I guess here you refer to light conditions?

Results

I would rather say that sediments assimilated or uptook N2 than removed N2 from the overlying water.

I am baffled. In Table 1, you show that at the control site, fluxes were measured only in the dark incubation, while at the urchin-affected site, they were measured only in the light. Figure 3 shows that you did it in both sites in light and dark conditions. Looking at panel A of Figure 3, I guess you should refer to dinitrogen gas. Overall, I suggest rewriting part of the results dealing with fluxes.

Discussion

You should be aware of N2-fixation, as in your case, it can be a phytosynthetic diazotrophic community that is dominating rather than a heterotrophic one. Second, poor organic sediments can be perfect habitats for diazotrophic fixers, which harvest light for energy.

I would suggest adding a sentence about further steps to see how specifically or under which conditions urchin may affect N-cycling pathways and what should be done in future studies.