

How can we make Deep sea mining more responsible?

Pat: We are currently working with the International Seabed Authority (ISA) on the development of Regional Environmental Management Plans (REMPs). This work is especially challenging due to lack of data and comparative reference to unmined areas in the deep sea. So this is definitely a work in progress. Please check out the ISA websites to review the ongoing REMP workshops and activities. I also feel that the public in general is not aware of these processes so there is not an active constituency.

Dr Halpin - do you think we will be using the ocean increasingly for carbon sequestration, given the urgency to draw down atmospheric carbon dioxide and the relatively large potential carbon fluxes into the ocean?

Pat: The potential for induced carbon sequestration is significant. I am personally very conservative about suggesting major ecosystem alterations (e.g. iron fertilization etc...) due to the potential for unintended consequences or controls. This would be a great topic for a future session.

Dr Halpin - it seems like the integrated approach to multi-sector ocean management is highly rational, but seems unlikely to be adopted or be implemented even if it is adopted by the UN unless the giant collective action problem of managing the ABNJ commons is solved somehow. The incentives do not seem to align with good common governance of the ocean at this time.

Pat: The ocean commons governance question is a vexing and fundamental problem equal to greater than the technical issues. So I agree 100% that this is a very crucial part of the problem.

How to accomplish international regulation of high seas fisheries/biodiversity conservation, in order to be sustainable? How to tackle this?

Guillermo: There is no silver bullet for the sustainable management of high seas human activities, however, we must continue improving the existing governance framework to ensure that all species and ecosystems are covered from a legal standpoint and make sure that all regions of the ocean have a competent management body to monitor and manage human activities. Filling geographic and legal gaps is a good place to start. Parallel to that, we must drastically improve the monitoring, control and surveillance of high seas human activities and, in the case of fisheries, the way those harvested resources enter the markets and under what environmental and social standards.

Is it possible to link specific fishing patterns to the unidentified companies?

Gabby: It depends on what you mean by fishing patterns. We know which gear types are more common in the list of vessels not attached to companies and we know where they are and when they're there. We don't know which ports their catch ends up in.

Is mapping and tracking extended to when AIS transponders go dark? I.e. is there the potential for corporations to be held accountable for turning off transponders when partaking in presumed illegal activity?

Gabby: We can see when a vessel goes dark because they're fishing in one area and then disappear and show up on the other side of the world 3 months later. We didn't analyze which corporations were connected to the most AIS 'tricks' but could be an interesting avenue for future research.

Dr Carmine - this is potentially transformative work. Are you aware of any shareholder actions or leveraged buyouts with sustainability requirements attached that have resulted from the identification of the corporations that are fishing the high seas? Did you get to use SAR /satellite data for the vessels?

Gabby: Thank you, Dr Fujita! This work was published only a month ago so there hasn't been any shareholder actions yet to my knowledge but I am hopeful since I believe it's a great way for accountability for high seas fishing. We didn't use SAR data for this project but used exclusively AIS satellite data for tracking the vessels.

For Gabrielle: Why did you choose a 5% threshold as a designation for high-seas fishing?

Gabby: We chose a 5% threshold because that has been the precedent for previous papers and I believe it's the best approach because it ensures that we weren't including vessels that weren't really high seas vessels and reduces the potential error.

Has there been a response to either of your work from the management bodies? In particular to Gabby, is there any interest from RFMOs in clarifying corporate ownership?

Gabby: There hasn't been any response from RFMOs in clarifying corporate ownership but I am interested to see if there will be in the future.

Are (if yes, how) cultural dimensions of high seas being considered within ongoing BBNJ negotiation?

Guillermo: While some of the negotiating Parties have defended the importance of involving coastal peoples in the process of generating knowledge for the protection of the high seas, there is hesitancy among most nations to grant coastal or island nations and peoples more say in how these negotiations should unfold. This means that while the livelihoods of some coastal communities may be disproportionately impacted by poor practices in the high seas, they are not granted additional decision-making authority.

What ways are you making this mapping data available to policy makers and NGO and private companies?

Gabby: The data from our paper is available on github, mendeley data, and it will be included into the global fishing watch portal in the coming months.

What are some relevant areas that students may study to contribute to this extensive area beside the "obvious" categories within oceanography? It seems that "many" is an understatement to describe all related disciplines.

Guillermo: It really depends on the type of research questions that motivate the student. I would encourage all students with an interest in marine conservation and management to have taken courses in statistics, maritime law and policy, GIS, ecology/animal physiology/genetics, economics or international relations. While many early career professionals may not specialize in the natural /social science dimensions of an ocean challenge, it is important for them to know how to interpret scientific results or policy decisions. Learning how to write policy briefs/memos is also quite important.

Gabrielle, Did you examine if the fishing corporate actors you ID'd in High sea fishing are also involved in the aquaculture industry?

Gabby: We didn't examine the aquaculture sector but we did compare our data to Österblom et al 2015 which does include the aquaculture sector in their keystone actor analysis.