OES-Environmental Habitat Change Online Workshop Report

August 18, 2020

8:00AM – 10:00AM PDT

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Overview:

On August 18, 2020, OES-Environmental hosted an international, online workshop using the Zoom platform to present the evidence base for habitat change due to marine renewable energy (MRE) deployments. The purpose of the workshop was to examine pathways for determining data needs, monitoring requirements, and possible mitigation measures for working towards risk retirement of habitat change for consenting/permitting (hereafter "consenting") small installations of tidal turbines and wave energy converters. Additional event information, including the presentation slides and recording, can be found at https://tethys.pnnl.gov/events/risk-retirement-habitat-change-workshop.

The workshop included a presentation of the habitat change evidence base by Pacific Northwest National Laboratory, which described the current status of knowledge for habitat change split into key categories: learning from surrogate industries, effects of installation/removal on benthos, changes in community composition on and near devices, and artificial reef effect. The evidence base was followed by presentations of case studies from guest speakers from Scotland and Oregon, USA, then participants split into breakout groups for discussion. The full agenda of the workshop is included in Appendix A, and a list of workshop participants is included in Appendix B.

This report describes the content and findings of the workshop, focusing on the possibilities and caveats of risk retirement for habitat change, and a discussion of next steps.

Key Workshop Take-aways:

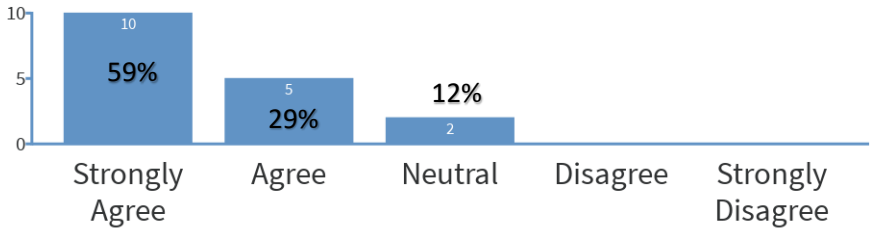
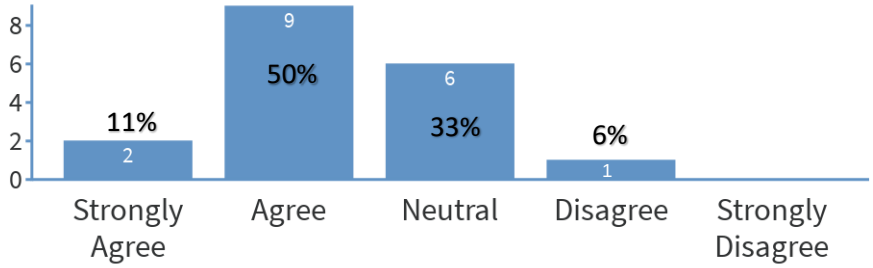
- Learning from surrogate industries can be helpful to understand effects of habitat change for comparable habitats, especially considering data from oil and gas, subsea cables, and offshore wind. However, there are no comparable industries for high energy tidal environments.
- Most experts agreed that risk can be retired from effects of installation on the benthos for small numbers of devices, though they would prefer to continue monitoring these effects to improve knowledge and prepare for understanding effects at the array scale. Effects from decommissioning or removal are less understood due to the status of the industry.
- Most experts agreed that changes in community composition on and near devices is a risk that can be retired for small numbers of devices, though ongoing concerns about biofouling and non-native or invasive species remain.
- While not everything is fully understood about artificial reef effect, most experts agreed that the risk can be retired for small numbers of devices. Concern about artificial reef effects should not prevent device installation.
- Habitat change is a risk that can be considered retired, with a few caveats.

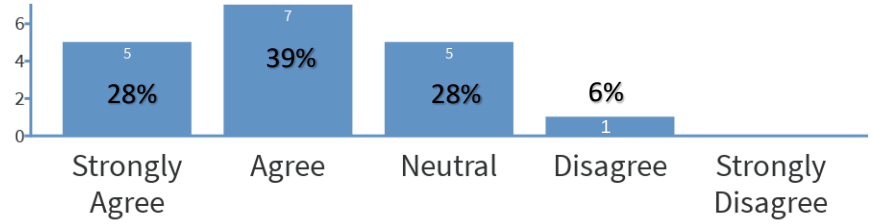
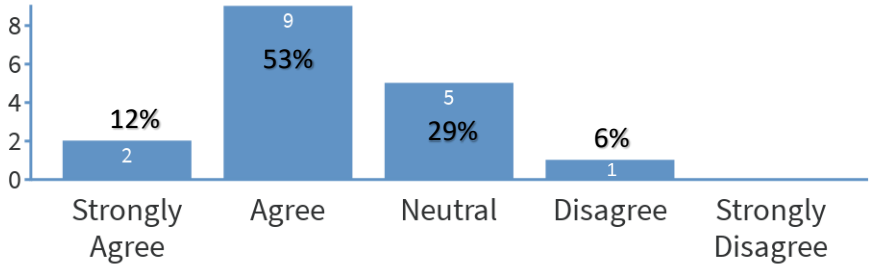
Feedback and Discussion:

This section describes the feedback, discussions, questions, and survey responses from the online workshop. Feedback was gathered throughout the workshop in several ways: participant responses to evidence base summary statements, discussion in breakout groups, and targeted questions about risk retirement. Poll Everywhere was used to ask specific questions and record responses. Additional feedback was gathered using the chat feature on the Zoom platform and by email. These findings are presented in the order in which they were collected.

Evidence Base Summary Statements

After the presentation of the evidence base for each category, meeting participants were presented with summary statements and asked to respond with how strongly they agreed or disagreed with them using Poll Everywhere. The results from these questions were shown in real-time during the presentation and are shown in the figures on the next pages.

Learning from surrogate industries (n = 17)	**Structures in the marine environment have been studied for many years, and we know a lot about these processes already. With some thought given to specific applications, data collected in other industries is relevant to MRE.** 
Effects of installation / removal on benthos (n = 18)	**For small numbers of devices, there may be a net positive or neutral effect from installation of underwater structures on the benthos. If properly sited, negative effects are minimal.** 

Changes in community composition on and near devices (n = 18)	**Hard structures in the water column or on the surface will become colonized and benthic communities in the near vicinity may change, but these changes are neutral unless they facilitate colonization of non-native, invasive species.** 
Artificial reef effect (n = 17)	**MRE devices display the same artificial reef effects as other industries. Impacts are likely to be neutral or may result in a positive effect on species abundance.** 

All experts either agreed or were neutral that data from other industries are relevant to MRE. Most experts agreed that effects of installation are net positive or neutral, but one expert disagreed and a third of the participants remained neutral. Two thirds of the experts agreed that changes in community composition on or near devices are neutral unless they facilitate non-native, invasive species – but one disagreed and several remained neutral. Nearly two-thirds of experts agreed that artificial reef effects from MRE are similar to other industries and have neutral impacts. The remaining third were neutral or disagreed. In the discussion, experts raised the concern that responding to some of these statements was difficult because of the use of 'positive' or 'negative' effects in some of them. The experts noted that these terms are complicated to assess and assign to effects, and require further definition.

Breakout Group Discussions

Workshop participants were split into two groups, Group A and Group B, to discuss a series of guided questions. Group participants are listed in Appendix C. The questions for discussion were as follows:

- Learning from surrogate industries:
    - Are there industries in your experience that are most relevant for data transferability?
    - Is it reasonable to transfer data from other industries to aid in risk retirement for habitat change?
- For each category of effects, experts were asked the following questions:
    - Do you feel confident there is enough data to understand the risk and retire it for small numbers of MRE devices (1-2)?
    - What are the caveats for risk retirement for this category?
- For habitat change overall, experts were asked:
    - What are your thoughts on the possibility of risk retirement for habitat change for small numbers of MRE devices overall?
    - What are the caveats for risk retirement for habitat change?

Comments and responses to each of these topics by category are listed on the following pages.

Learning from surrogate industries:

Group A	Group B
- Wave and tidal energy devices are deployed in pretty extreme environments. Wave is more comparable to other industries, especially to offshore wind and oil/gas platforms. - There is no way to go forward if we can't learn from other industries. Oil/gas and fiber optics are good areas to learn from, especially thinking about mitigation. - Some experts would prefer to learn from offshore wind instead of oil/gas since it is newer and more similar. We have plenty of information there. - Data transferability is important, but data needs to be evaluated by experts first.	- There is value to be learned from other industries, and lessons can be learned. - But there are key limitations, especially for colonization – there are not good surrogates for tidal environments, which we don't understand very well. This is a major difference between wave and tidal. - Marine shipping and offshore oil and gas may provide lessons for tidal energy environments as there are similar hydrodynamic forces, which could be helpful, but isn't exactly the same. - So much of what we can apply from other industries is context dependent, especially considering hydrodynamics and suspended sediment. - There are lessons for baseline situations, but there are other things we need to understand for data transfer, especially for unique environments. - We don't know what we don't know. We don't know how oil and gas responds to consenting challenges or what solutions they have, and it would be remiss to ignore them. - There is a lot of history and information on open ocean work – specifically monitoring studies in the North Sea. - Information from other industries can be particularly useful to understand biofouling and community composition, especially from oil and gas. - Some of the studies from oil and gas aren't scientifically robust, they don't look at succession and are often broad descriptive surveys, more qualitative or patchy quantitative. - MRE is subject to more stringent regulations than oil and gas, requiring more robust studies.

Effects of device installation/removal

Group A	Group B
- No lack of data, but often lack of quality data. Post-installation monitoring is not completed on long enough timeframes. - Recovery of the benthos may be site dependent. - Project scale is what really matters. We know that we see nothing for small projects and can let developers off the hook for 1-2 devices, but larger projects are another story. - Decommissioning is a tricky topic, so little has been done. Keeping single devices in the water may be the best option. - Monitoring is still needed to quantify for models to predict effects when scaling up to arrays. We know some about scaling up for physical changes (due to hydrodynamic models) but not for habitat changes.	- If standard mitigation measures are applied (non-natives, anti-biofouling, site selection) this risk can be retired. - An appropriate level of baseline surveys or existing information can be relied upon to predict impacts without monitoring. - The only way to understand impacts and close significant knowledge gaps is to continue to study this. For regulations/consenting, it may not be needed, but for our scientific knowledge it is important to continue data collection. - It may not be the role of a project team to fill gaps for the sake of knowledge, but this should fall on government and academics. How much can you ask developers to be involved in strategically addressing uncertainties?

Changes in community composition on and near devices

Group A	Group B
- Impacts for 1-2 devices are not really significant or measurable. - 1-2 devices are not expected to have effects on the seabed, but it depends on how long they are in the water and the colonizing species. - Potential for decrease in oxygen availability in pelagic/benthic habitats.	- We have a good idea of what will happen, but a certain level of site-specific study and monitoring is necessary. - Confirmation studies should be required to make sure. - In an area where there have been no deployments there may be a greater need for baseline studies or more monitoring than an area where many structures have been deployed and studied (e.g., test sites). - The facilitation of non-natives is not sufficiently well understood, though some data exists. There are not enough examples in a variety of geographic regions. - Spread of non-native species is much more likely for recreational craft, shipping, and offshore wind than for MRE due to the hydrodynamics of areas they are deployed. - It is beneficial for developers to have a better understanding of colonization from a biofouling standpoint for their devices, which should contribute to research on this.

Artificial reef effect

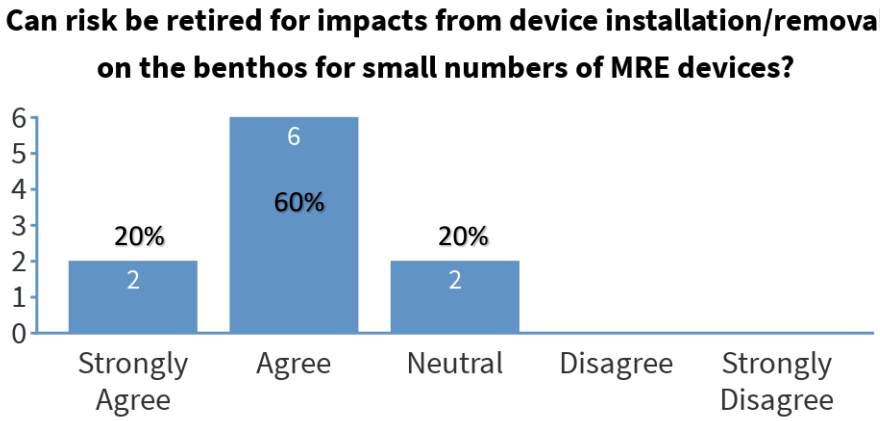
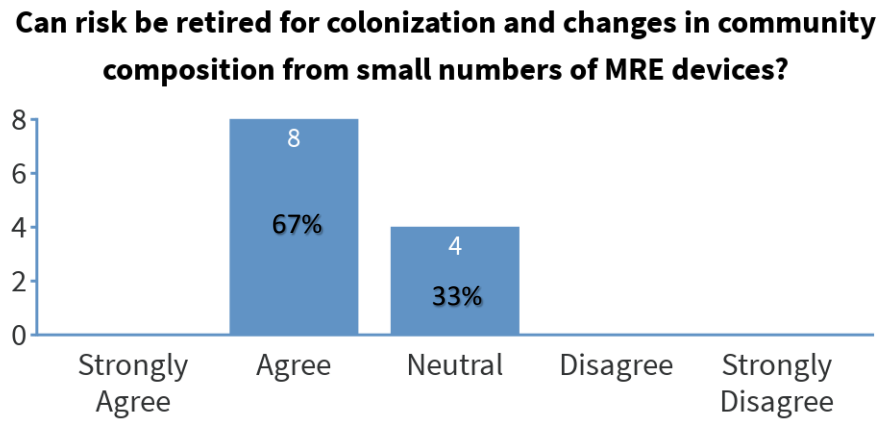
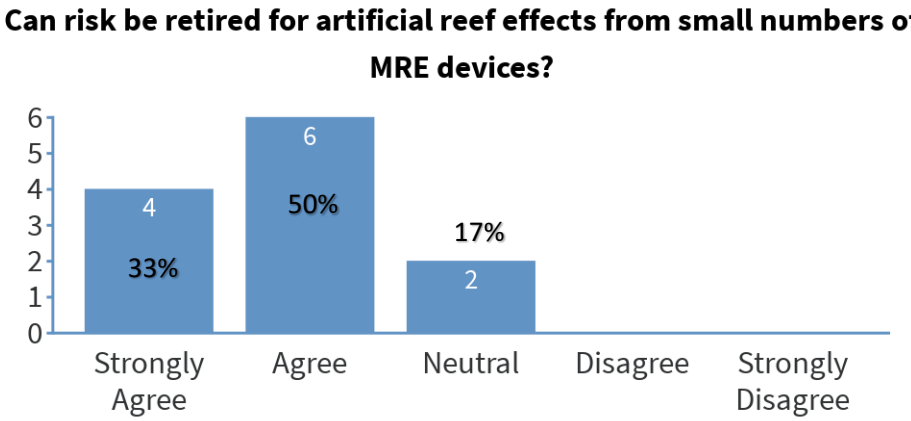
Group A	Group B
- The notion that artificial reefing is a positive effect has political implications. - This could be good for fish stocks or aquaculture, but we have no idea what will happen in the long run. - What matters is if the artificial reef is representative of the existing surrounding community, not attraction of new species. Identity of other species matters, and could lead to negative effects. - Artificial reef effects should not be used as a reason for not developing; it is more important to balance this with the positives of renewable energy when thinking about climate change. - Artificial reefs are happening. We need to evaluate their impacts on the ecosystem.	- Tidal habitats are less studied, but the kinds of effects expected from other devices are the same.

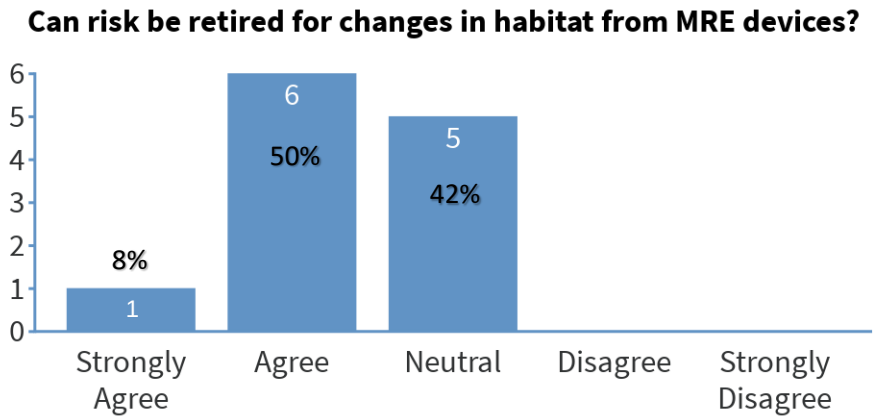
Habitat change overall

Group A	Group B
- Fairly confident that this is not a radical risk. - Need to separately consider wave and tidal. - Studying impacts on appropriate, longer timescales is important.	- More comfortable with risk retirement if baseline expectations are established for specific locations. - If key, standard mitigation measures and industry support of strategic research to move forward are applied, then this risk can be retired. - Tidal habitats will be most difficult to retire risk. Extreme environments will be difficult to convince regulators that there is no/little risk without some level of monitoring.

Questions about Risk Retirement

Following the breakout groups, experts were asked to respond to Poll Everywhere questions.

Effects of device installation / removal on benthos (n = 12)	
Changes in community composition on and near devices (n = 12)	
Artificial reef effect (n = 12)	

Habitat change overall (n = 12)	

None of the experts disagreed with the concept of risk retirement for any of the categories of habitat change, or habitat change overall. The strongest support was for risk retirement for artificial reef effect, followed by device installation/removal, then colonization and changes in community composition. Over half of the experts agreed that risk could be retired for habitat change overall, with the remainder of the experts being neutral.

Additional Feedback from Participants

Additional comments left in the chat throughout the webinar and from email responses after the event indicated that participants found the workshop and presentation well organized, effective, and a step in the right direction. Several experts indicated that they were thankful for the invitation and look forward to further presentations from OES-Environmental.

Several caveats to risk retirement were brought up in the chat box, including the following:

- Determining that an effect is positive or negative is a challenging task. The use of these terms needs to be carefully considered when looking at effects on an ecosystem scale.
- A long-enough timeframe after deployment is required to evaluate the impact from installation/removal.
- Effects of installation/removal from arrays are an entirely different story.
- Regarding changes to community composition, addressing functional diversity would be helpful to assess in addition to taxonomic diversity.
- Understanding local flow conditions is necessary for understanding artificial reef effect.
- Questions can be deceptively simple when there are a lot of complex things going on.

Summary of Findings:

This section presents what was learned from experts throughout the workshop. The results of each category and the remaining uncertainties are summarized.

Learning from Surrogate Industries

Experts agreed that information and data gathered from other industries is helpful, even essential, to understanding and predicting impacts from wave and tidal devices. Key industries to learn from for habitat change are offshore wind, oil and gas, and subsea cables. However, experts agreed that there are no truly suitable surrogates for high energy tidal environments. To be transferable, data must be collected in comparable habitats, including hydrodynamic conditions, and with significant scientific rigor, for long-enough timeframes to capture relevant changes.

Effects of Installation/Removal on Benthos

Most experts agreed that risk can be retired from installation for small numbers of devices. Decommissioning and removal of devices is still difficult to fully understand as there have been so few devices that are at this project phase. However, despite little concerns about impacts of small numbers of devices on habitats, most experts would prefer to continue monitoring programs in order to learn more about these effects and collect quality, long-term data to prepare the industry for the future of scaling up for arrays.

Changes in Community Composition On and Near Devices

Most experts agreed that changes in community composition on and near devices is a risk that can be retired for small numbers of devices, though ongoing concerns about biofouling and non-native or invasive species remain. Established guidelines, standard mitigation, and frameworks for monitoring and characterizing risks are recommended. Understanding colonization patterns, especially in high energy, tidal environments, is still necessary. Also, studies to understand changes in functional diversity due to colonization, as opposed to simply taxonomic diversity, are recommended.

Artificial Reef Effect

While not everything is fully understood about artificial reef effect, experts agreed that the risk can be retired for small numbers of devices and that concerns about artificial reef effects should not prevent device installation. Identification of species and an understanding of baseline conditions is still recommended.

Conclusion and Next Steps:

The majority of experts participating in the workshop agreed that risk could be retired for habitat change overall, while the remaining participants were uncertain. This suggests that additional outreach is needed to support risk retirement for this stressor. One of the main take-aways from this workshop is that each aspect of habitat change has caveats with varying degrees of concern. This workshop clarified the remaining concerns for future research and strategic monitoring plans and confirmed that experts were ready to retire risk from habitat change for small numbers of devices, with consideration of those caveats. At a high level, this includes characterization of effects at high energy tidal sites, biofouling by non-native species across a range of geographic regions, a better understanding and definition of what would constitute a positive effect on habitat, and the requirement of ongoing monitoring to be able to inform future development of the industry in scaling up to arrays of devices.

The information and results of this expert workshop was presented along with the risk retirement of underwater noise and electromagnetic fields in a public webinar in September 2020. A guidance document on habitat change will also be developed for regulators, and will be informed by the findings of this workshop.

Appendix A.

Agenda

8:00 –8:05 Introductions

8:05 –8:15 Risk retirement presentation

8:15–8:40 Overview of habitat change and evidence base presentation

8:40–9:00 Case Studies

- Scotland example – presented by Jennifer Fox, Aquatera & ORJIP Ocean Energy
- Oregon example – presented by Sarah Henkel, Oregon State University

9:00–9:45 Breakout groups: risk retirement for habitat change

- Learning from surrogate industries
- Effects of installation/removal on benthos
- Changes in community composition on and near devices
- Artificial reef effect

9:45–9:55 Report out

9:55–10:00 Next steps and wrap-up

10:00 Adjourn

Appendix B.

Attendees

Pacific Northwest National Laboratory: Andrea Copping, Deborah Rose, Lenaïg Hemery, Levy Tugade, Lysel Garavelli, Mikaela Freeman

Country	Name	Affiliation
Canada	Daniel Hasselman	FORCE
	Matthew Baker	Fisheries and Oceans (DFO)
Chile	Mirtala Parragué	MERIC
Denmark	Hans Soerensen	Wave Dragon
France	Gwenaël Caër	Sabella
Portugal	Pedro Vinagre	WavEc
Sweden	Jan Sundberg	Uppsala University
United Kingdom	Andrew Want	Heriot-Watt University
	Janelle Braithwaite	Marine Scotland
	Jennifer Fox	Aquatera & ORJIP Ocean Energy
	Lilian Lieber	Queens University
	Raeanne Miller	University of Highlands and Islands
United States	Allan Creamer	FERC
	Sarah Henkel	Oregon State University
	Kathryn White	Ecology and Environment
	Katie Morrice	DOE
	Lisa Gilbane	BOEM
	Sharon Kramer	HT Harvey & Associates

Appendix C.

Breakout Groups

	Group A	Group B
Group Leader	Andrea Copping	Lenaïg Hemery
Notetaker / Recorder	Lysel Garavelli / Deborah Rose	Mikaela Freeman
Participants	Sarah Henkel	Jennifer Fox
	Jan Sundberg	Andrew Want
	Raeanne Miller	Dan Hasselman
	Pedro Vinagre	Katie Morrice
	Allan Creamer	Lisa Gilbane
	Matthew Baker	
	Kathryn White	
	Mirtala Parragué	