OES-Environment Collision Risk Workshops: Workshop Report

March 16 & 18, 2021

7:30AM – 10:30AM PDT (14:30-17:30 UTC)

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Overview

OES-Environmental held two online workshops March 16th and March 18th, 2021, focused on fish collision risk and marine mammal collision risk, respectively. These workshops built on previous and ongoing efforts to examine pathways for determining data needs, monitoring requirements, and possible mitigation measures for ensuring that collision risk to marine animals from tidal turbines is better understood and may move toward "retirement" for consenting/permitting small installations of tidal and river turbines. These workshops brought together researchers, regulators, advisors, developers, and consultants with common interests in reducing uncertainty around collision risk for marine animals to engage in a structured discussion on this topic. The objectives of the workshop were to:

- Assess how collision risk and encounter rate models can help us understand collision risk between marine animals and turbines, and facilitate consenting/permitting requirements. For this, we needed to:
    - Highlight knowledge and data gaps limiting our understanding of collision risk
    - Identify methods for collecting the necessary data
    - Determine the suitability of models to assess collision risk and population effects
    - Identify the data needs for parameterizing and validating the models
- Leverage participants' interests and expertise to trigger international collaborations.

The workshop organizers sought to generate new actions to move collision risk closer to retirement for single devices and small arrays (2-3 devices), and to provide attendees with an updated understanding of the state of the knowledge around this risk. Both days, the workshop started with introductions and background presentations on collision risk models and current knowledge related to fish or marine mammals, followed by two sessions of breakout group discussions. The two breakout sessions were separated by the presentation of a collision risk model case study. For the breakout sessions, participants were divided into groups of no more than 8 participants from different sectors within the marine energy community, each moderated by a facilitator and a notetaker, to allow for efficient discussions.

The two workshops were well attended, with 41 experts from 7 countries (Australia, Belgium, Canada, France, Ireland, United Kingdom [including Scotland and Wales], and United States) attending the fish workshop on March 16th, 35 experts from 7 countries (Belgium, Canada, France, Ireland, Mexico, United Kingdom [Scotland and Wales] and United States) attending the marine mammal workshop on March 18th; 18 attended both days. The agenda for the workshop is included in Appendix A, and the list of workshop participants is in Appendix B. This report describes the key take-aways from the discussion during the breakout groups.

Key Workshop Take-aways

Knowledge gaps

- Do collisions actually occur, and if so, how do we detect them? What happens when marine animals are in close proximity to the turbine?
- Identify gaps that are generalizable across species and those that are species-specific
- Can we generalize from a species to another, from a species of most concern to one of lesser concern?
- We may know more than we think about fish density, behavior, migrations routes, etc., but this information needs to be shared broadly and made accessible
- Which fish are likely to be swept into a turbine vs. those that are capable of going around?
- What are the physical cues from a turbine (e.g., pressure field, sound, particle motion) that a fish can react to? How do they differ among turbine designs?
- Are fishes using specific areas of a site where they might encounter turbines? If so, what for?
- Fish behavior, especially avoidance and evasion ability, by species and by sites
- Understanding nearfield interaction of marine mammals with turbines and the distance at which they may detect the turbine
- Do marine mammals become acclimated to the presence of turbines over time?
- Prey-predator (i.e., fish and marine mammals) interactions around turbines
- Avoidance rates and behavior of marine mammals
- How do we scale up these findings to arrays?
- How are animals going to react to arrays and potential cumulative effects of other anthropogenic activities?

Data collection

- Strong need for year-round baseline data collection, site-specific data collection on the presence, biomass, abundance, distribution, behavior, etc., for fish and marine mammals before data can be transferred between sites
- Often, fish studies are added on after a project has started, but they should be designed and implemented from the start of the project and should span multiple seasons
- Focus on ecological-relevant scales rather than just a project site area
- Data acquisition should be tied to specific needs (filling knowledge gaps) on what matters most; using sensitivity analyses would help determine these needs
- Need for integrated instruments (acoustic, video) for detection as well as real-time monitoring instruments and automated image processing
- Underwater videos are useful and necessary but not always the best adapted for project sites (e.g., visibility, light)
- Increase the effort of data and data-collection standardization, using guidelines and recommendations to collect useful and comparable data; and be prepared to share those data
- Adapt stock assessment surveys to local tidal sites
- Using tags, passive and active acoustics, to get information on nearfield interactions

Pros and cons of collision risk and encounter rate models

- Models are flexible, adapted to any species, data-driven, but can be very conservative in the likely adverse outcomes
- These models are relatively easy to understand and use but may be applied in an oversimplistic manner
- The models can be useful analytical and illustrative tools to communicate with regulators (to provide a quantitative measure of impact)
- Models can be iterative and continually updated with new information
- Models can be very useful, with the caveat that they are as good as the data that are going in ("garbage in/garbage out"), concern that models with poor input data (especially with large levels of uncertainty) can be taken as the truth and do more harm than good
- Assumptions made in models can lead to worse-case scenarios that can bring challenges for social acceptance and licensing, but they help explore what those worse-case scenarios could be
- Encounter rate and collision risk models may give very similar outcomes for small-size animals but will differ for large-size animals
- There is a need to be clear on language used for describing outputs when talking about the different models
- Lack of understanding of long-term consequences of collision on population effects is still to be adequately modeled
- Difficult to assess potential cumulative effects of multiple tidal projects in a same area, using models

<u>Input data for models</u>

- Need better density estimates (at larger scale around a region and at smaller scale around a turbine/array site) and long-term studies (e.g., seasonal and yearly patterns) to parameterize and validate models
- Need observations of animal behavior (e.g., avoidance), reactions to turbine, to noise
- Many species have site-specific behavior, which needs to be taken into consideration
- Better understanding of current speeds throughout tidal cycles and other site-specific characteristics
- Improve availability of turbine characteristics (e.g., geometry, speed) to adequately model encounters

<u>Population-level effects</u>

- Need to define what exactly a population is (i.e., ecological vs. evolutionary context), and how they relate to the scale of each project site, and the expected effects
- These models have been used to develop an unacceptable level of mortality (threshold), not to predict outcomes
- With good encounter rate and collision risk models, and animal population estimates (especially fish stock assessment models), the models may be useful in assessing population-level effects
- Using these models for population-level effects may be easier (and would make more sense) for small, localized populations that overlap with marine energy development areas than with large stocks
- Might be easier with marine mammals, for which population-specific data already exist, as opposed to fish

- Compare model results between sites and species to highlight patterns among study designs and related to species, to initiate a data transferability approach

Side notes

- What does solving all these knowledge gaps mean for consenting/permitting and licensing?
- How to manage expectations from various audiences around collision risk, based on the available data and knowledge?
- There is a need for increased communication and dissemination around expected and observed outcomes from collision risk to regulators, stakeholders, and general public.
- Improve communication between turbine designers and fish biologists also needed so that device designs can take into account fish behavior and provide spaces to escape through.

Conclusion and Next Steps:

The majority of workshop participants agreed that, in the absence of field observations of actual collisions and measurable data, collision risk and encounter rate models are helpful approaches for consenting/permitting and licensing purposes. However, these models require specific input data types that are not necessarily available yet for all species of concern, and collecting these data should become a priority. To move forward:

- There is a need to pinpoint critical data needs and design research projects that will fulfill these needs.
- Ensure that collision risk monitoring is required for each turbine deployment, designed to answer the important questions for collision risk for fish and marine mammals (as appropriate).
- Document and communicate the most appropriate set of instruments that will provide observations of collision risk, suited to a range of site conditions and specific species of concern.
- Continue to update the marine energy community on the state of the science of collision risk, and encourage the data collection that will lead to robust model development.
- As the industry progresses, ensure that collision risk and encounter risk models take the place of extensive data collection efforts at each new project site.

Appendix A – Collision Risk Workshop Agenda

Each day (fish and marine mammals) followed the same agenda. Specifics are noted.

TIMING	ITEM	NOTES
7:30 – 7:35 PDT (14:30 – 14:35 UTC)	Online welcome	
7:35 – 7:45 PDT (14:35 – 14:45 UTC)	Introduction & goal of the workshop	Andrea Copping (Pacific Northwest National Laboratory)
7:45 – 7:55 PDT (14:45 – 14:55 UTC)	Introduction to collision risk & encounter risk models	Lysel Garavelli (Pacific Northwest National Laboratory)
7:55 – 8:10 PDT (14:55 – 15:10 UTC)	Background presentation on fish or marine mammals	**Fish**: Andrew Seitz (University of Alaska Fairbanks) **Marine Mammals**: Carol Sparling (Sea Mammals Research Unit SMRU)
8:10 – 8:15 PDT (15:10 – 15:15 UTC)	Desired outcomes and instructions for the breakout sessions	
8:15 – 8:45 PDT (15:15 – 15:45 UTC)	First breakout session	• Introductions • Highlight gaps (in knowledge and data related to collision risk? What would solving these gaps mean? What would the end point be? • Discuss data collection: looking at the gaps highlighted previously, how do we get the missing pieces for baseline and monitoring purposes?
8:45 – 9:05 PDT (15:45 – 16:05 UTC)	Report out	
9:05 – 9:15 PDT (16:05 – 16:15 UTC)	Break	
9:15 – 9:25 PDT (16:15 – 16:25 UTC)	How models have been used so far	**Fish**: Raeanne Miller (Aquatera) **Marine Mammals**: Jennifer Fox (Aquatera)
9:25 – 9:55 PDT (16:25 – 16:55 UTC)	Second breakout session	• Suitability of the models: how are the collision/encounter risk models really working for what we are trying to do? What are the pros and cons of each type of model? • Input data for the models: what do we need to extract from the field data for them to be useful to parameterize and validate the models? What characteristics do we need to know from the field sites and from the turbine technologies? • Assessing population effects: can these models be used for assessing the effects on the population?
9:55 – 10:15 PDT (16:55 – 17:15 UTC)	Report out	
10:15 – 10:25 PDT (17:15 – 17:25 UTC)	Open discussion of collision risk progress	
10:25 – 10:30 PDT (17:25 – 17:30 UTC)	Wrap up and adjourn	

Appendix B - Attendees

PNNL: Andrea Copping, Lenaïg Hemery, Lysel Garavelli, Deborah Rose, Mikaela Freeman, Levy Tugade, Hayley Farr, Dorian Overhus

Aquatera: Jennifer Fox, Raeanne Miller, Catherine Tait, Helen Hedworth, Rebecca Shanks

Country	Name	Organization	16	18
Australia	Haley Viehman	Echoview	X	
Belgium	Lotta Pirttimaa	Ocean Energy Europe	X	X
Canada	Charles Bangley	Dalhousie University	X	X
	Dan Hasselman	FORCE	X	X
	Louise McGarry	FORCE	X	
	Jenna Munden	Herring Science Council	X	
	Craig Chandler	Mersey Consulting Ltd.	X	
France	Karine Heerah	France Énergies Marines	X	X
	Marie Le Marchand	France Énergies Marines	X	X
	Ophélie Nourrisson	Sabella	X	
Ireland	Sarah Thomas	DP Energy	X	X
	Joyce Acheson	Sustainable Energy Authority of Ireland	X	X
Mexico	Marisa Martinez	INECOL		X
	Alejandra Alamillo Parades	Técnico INECOL-CEMIE Conservación de Vertebrados		X
	Dora Ruiz	UNAM		X
UK	Jack Bush	Alderney Wildlife Trust		X
	Mel Broadhurst-Allen	Alderney Wildlife Trust	X	
	Richard Montague	Blue Marble Engineering Ltd	X	
	Jim McKie	Consenting Strategic Advisory Group		X
	Damien Kirby	MarineSpace Ltd	X	
	Kate Smith	Nova Innovation		X
	Lilian Lieber	Queen's University of Belfast	X	
	Nicholas Horne	Queen's University of Belfast	X	X
	Gemma Veneruso	SEACAMS		X
	Vicki James	Whale and Dolphin Conservation		X
	Jennifer Smith	Xodus Group		X
UK - Scotland	Paul Tait	EMEC	X	
	Janelle Braithwaite	Marine Scotland		X
	Kirsty Wright	Marine Scotland	X	
	Ross Gardiner	Marine Scotland	X	
	Karen Hall	NatureScot	X	X
	Bob Batty	Scottish Association for Marine Science	X	X

	Steven Benjamins	Scottish Association for Marine Science		X
	Ana Couto	University of Aberdeen	X	X
	Joe Onoufriou	University of the Highlands and Islands		X
	Carol Sparling	University of St. Andrews		X
UK - Wales	Tim Whitton	Bangor University	X	
	Stephanie Muller	Cardiff University	X	
	Alexander Scorey	Natural Resources Wales	X	
	Ceri Morris	Natural Resources Wales		X
	Ida Tavner	Natural Resources Wales	X	
	James Moon	Natural Resources Wales	X	X
	Nicholas Flores Martin	Natural Resources Wales	X	X
	Tom Stringell	Natural Resources Wales	X	X
	Holly Self	Natural Resources Wales		X
	Sharon Davies	Welsh Government		X
USA	Katie Morrice	DOE - WPTO	X	
	Sarah Loftus	DOE - WPTO		X
	Andrew Bernick	FERC	X	X
	Laurie Bauer	FERC	X	X
	Maria Egget	Maine Department of Environmental Protection	X	
	Kerry Grantham	Ocean Renewable Power Company	X	
	Garrett Staines	Pacific Northwest National Laboratory	X	
	Shari Matzner	Pacific Northwest National Laboratory	X	
	Andrew Seitz	University of Alaska Fairbanks	X	
	Chris Bassett	University of Washington	X	X
	James Joslin	University of Washington	X	
	John Horne	University of Washington	X	X