

## Reponses to questions on notice from the 18 March hearing

### Inquiry into the Impact of seismic testing on fisheries and the marine environment

#### Senate Environment and Communications References Committee

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Document No:

Date: 31/03/2021

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**1. What is your understanding of the use of baseline surveys of the marine environment when it comes to assessing the impact of seismic testing? When would a baseline survey be a useful in the evaluations NOPSEMA makes? Would you like to see more baseline surveys?**

Baseline surveys, for example regional baseline surveys, can be useful in areas that are currently data deficient to understand the species diversity and abundance as an input to environmental impact assessments. This is particularly relevant for Australian Marine Parks which in some cases are data deficient and have legal requirements for protection and in other locations that may not be well understood.

Baseline surveys of particular locations or sensitive populations that may be exposed and vulnerable to underwater noise from seismic surveys may also have utility in cases where a Before-After-Control-Impact (BACI) experimental design is proposed. BACI experiments may be needed by titleholders, for example where there are large spatial overlaps between the seismic survey area and fishing grounds and levels of scientific uncertainty as to outcomes are high, to demonstrate that underwater noise from their survey has not had unacceptable impacts on sensitive receptors. In these instances, a baseline survey serves to provide appropriate 'before' data on the status of a population/location ahead of a survey commencing and will only be required if existing available data is insufficient for comparison with 'after' data. These types of studies (including baseline surveys where necessary), together with evidence-based compensation schemes, appear to be a useful framework for assessing and managing impacts to fisheries from seismic surveys.

In many cases however, if there are high degrees of scientific uncertainty about the impacts from a seismic survey, titleholders will need to use the 'hierarchy of controls' to remove or substantially reduce the risk of unacceptable impacts rather than waiting for post-seismic survey monitoring to potentially reveal that they have had an unacceptable impact.

## **2. What are some best practice examples from other countries as to how fisheries and petroleum/extraction industries share ocean space?**

There are various marine spatial planning policies around the world that address intersecting marine user rights to varying degrees. It's important to recognise that the environmental, political and social contexts for these marine spatial plans are different to Australia and therefore it is unlikely that a system identified in another country could be easily applied in its entirety in the Australian context. Rather, it is likely that there are elements of several different marine spatial planning systems that may work in Australia.

A discussion on marine spatial planning and the management of seismic fisheries interactions internationally was included in Section 4.3 of the NOPSEMA submission to the Inquiry together with a full copy of the Norwegian Guidelines appended to the Submission (Appendix E). Further detail was provided in the main body of the submission about the guidelines used in Norway to manage seismic fisheries interactions (from section 360) and the elements of that framework that are appropriate to the Australian context are currently being used to develop a new Australian seismic fisheries interaction framework. This is a multi-sectoral, cross government initiative.

Canada is another country with a Fishery Advisory Committee that has been set up to better facilitate engagement and cooperation between the sectors. Further information can be found at the links provided below.

[https://www.cnsopb.ns.ca/sites/default/files/resource/fac\\_terms\\_of\\_reference.pdf](https://www.cnsopb.ns.ca/sites/default/files/resource/fac_terms_of_reference.pdf)

<https://www.cnsopb.ns.ca/engage>

## **3. What are the limitations of current research on seismic testing?**

A discussion on research opportunities was provided in section 4.1.12 of NOPSEMA's submission to the Inquiry into the Impact of Seismic Testing on Fisheries and the Marine Environment (2019). This section is copied below for ease of reference:

'Some of the opportunities for further development and improved levels of confidence in the existing body of research into the effects of anthropogenic sound, particularly noise emissions from seismic surveys are outlined below;

- Long term repeated experiments in space and time to secure confidence in current results, particularly for controversial studies (e.g. McCauley et al, 2017).
- Long term or cumulative effects of noise disturbance on animals, for example, in terms of the long term fitness impact from causing animals to deviate from their migratory pathway.
- Ecological consequences of impacts to larval stages of commercially important species.
- Threshold shifts in hearing – exposure and recovery times for various species and potential for threshold shifts to result in secondary consequences such as missed feeding periods or predator detection.

- Robust baseline data to enable effective post survey monitoring to allow assessment of management effectiveness for species where the potential for impact from underwater noise is high.
- Studies on the response of elasmobranchs (sharks and rays) to sound.
- Thresholds for auditory impacts for baleen whales which are currently based on extrapolation of a small number of studies on toothed whales which have a different auditory structure to baleen whales and use sound differently (i.e. echolocation).
- Implications of high levels of disturbance from underwater noise to marine turtles during critical life stages including physiological stress and impacts on nesting success.
- Research conducted in natural settings repeated over a sufficient timescale to account for natural variability. Similarly, tagging studies often used to inform movement patterns and distribution needs to reflect differences in the ecological context of the animal, such as gender, life stage etc.
- Greater understanding of the cause and effect relationships and the threshold levels for causing different effects on commercially important invertebrates such as scallops and rock lobster and the implications of these effects to relevant fisheries.
- Collaborative, inter-disciplinary research to investigate population level impacts of anthropogenic noise on fish and fisheries (Slabberkoorn et al. 2019)'.

#### **4. Could the government be doing more by way of compelling/funding research in this area?**

In some countries successful collaborative research frameworks have been developed that are supported voluntarily by industry, others through government funding and in other countries by funding through levies on industry. Collaborative industry focussed research that meets end-user needs and is funded by the industry that creates the risk is a sustainable model that would support ongoing research while the sector continues to operate and create risks that need to be well understood.

NOPSEMA notes an industry funded model exists for the fishing industry in the form of the Fisheries Research Development Corporation.

A decision about additional levies on industry to support marine research is a policy matter for Government.

#### **5. Could Australia have a spatial separation framework?**

A marine spatial planning framework may provide a mechanism to resolve competing industry conflict and provide for greater levels of community feedback in those regions where there is overlap between industries. In many locations around Australia the degree of petroleum industry overlap or intersect with competing industries may not be high enough to warrant a formal framework. A marine spatial planning framework that resulted in a plan that provides separation between competing industries is a matter for Government as this would likely impact on the existing rights of those industries. Please also see responses to question 2.

**6. Are there other industries utilising ocean space that potentially are disrupting marine life? i.e. renewables, shipping?**

Yes.

Marine noise comes from a variety of natural and anthropogenic sources and has a variety of different effects over different temporal and spatial scales (see section 4.1.4 of the NOPSEMA submission). Some of the anthropogenic sources include military sonar, shipping, construction, explosives and other vessels. Renewables is an emerging industry in Australia so the scale of impact to marine life from marine noise (and other possible disruptions from this industry) is currently is much lower. Ship noise is a continuous contributor to the marine soundscape and continues to increase as the oceans become busier, representing one of the most pervasive and enduring sources of anthropogenic noise.

Disruptions to marine life, other than from marine noise, comes from a variety of industries, the most destructive of which is fishing. Fishing is not only responsible for the death of target species but also secondary effects to the seabed and benthic habitats from trawling, releasing trapped carbon from the sediments and bycatch of many unwanted and species protected under the EPBC Act.

**7. The Tasmanian Seafood Industry Council and Seafood Industry Victoria have suggested that activity proponents should be required as a matter of course to re-consult if scientific findings are released while an environment plan is under consideration by NOPSEMA (Submission 50, p. 9). What is your response?**

Consultation requirements are included in the OPGGS Environment Regulations and are not necessarily linked to research per se. These requirements include an implementation strategy as part of the Environment Plan (EP) that provides for appropriate consultation with relevant authorities and relevant persons throughout the life of the EP. The regulations also require that the implementation strategy describes the environmental management system including specific measures to ensure that for the duration of the activity the environmental impacts and risks continue to be identified and reduced to a level that it ALARP and acceptable. If relevant new scientific findings are released while an EP is under consideration by NOPSEMA or indeed while an activity is underway, titleholders are required to consider this information and the need for further consultation where necessary. NOPSEMA would also need to consider any information that is available and is, or may be, relevant to making a decision. If research findings are relevant and available, they would be considered against the relevant regulatory decision making criteria.

**8. The Wilderness Society—and many others—suggested that NOPSEMA is accepting far too many environmental plans that allow for unacceptable risks to the marine environment (Committee Hansard, 22 September, p. 4). Can you tell the committee about the proposals that you have rejected and how they were distinguishable from plans that were allowed to proceed with or without modification?**

The OPGGS Environment Regulations require that NOPSEMA must accept an EP if the Regulator is reasonably satisfied that the criteria set out in the Regulations has been met – one of those criteria is that all impacts and risks are reduced to levels that are acceptable. EPs are not accepted by NOPSEMA if that criteria isn't met.

If the Regulator is not reasonably satisfied that the EP meets the regulatory criteria, notice and reasoning must be provided to the titleholder and opportunity to modify and resubmit the plan be provided to the titleholder. The Regulations also allow for NOPSEMA to request additional information during the assessment process. The way that NOPSEMA administers these processes is described in policies and guidance material on the NOPSEMA website. If at the end of the assessment process NOPSEMA is not reasonably satisfied that the regulatory criteria have been met, NOPSEMA must refuse to accept the plan. The Regulations do not however prevent titleholders from submitting new EPs and starting the assessment process over again for the same activity if they have had an EP refused.

NOPSEMA has been publishing on its website the final decision outcome of all EP assessments including those for seismic surveys for many years. The website did not show the full EP and therefore no detail of the changes that were required by NOPSEMA to seismic survey designs during the assessment process to ensure that they ultimately meet regulatory requirements and reduce their impacts and risks to ALARP and acceptable levels. This often led to a perception by external parties that EPs were being accepted without required changes regardless of their proposed impacts. In reality this was not the case and several independent reviews of NOPSEMA, including one by Alan Finkel, Australia's Chief Scientist (at the time) concluded that NOPSEMA is appropriately regulating the petroleum industry.

In April 2019 legislative change led to the publication of full EPs for public comment prior to the assessment process and publication of full EPs at the end of the assessment process. The changes to survey design required by NOPSEMA during the assessment process are now evident in the final version of the EPs. External parties can also view the Key Matters Report that NOPSEMA publishes for all EPs where public comments have been received which helps to explain the key matters that were taken into account during decision making.

The vast majority of EPs (94%) that are assessed by NOPSEMA require some form of modification before they are accepted. These modifications to the EP and management of the activity are required to remove or reduce environmental impacts and risks until acceptable levels are reached. NOPSEMA has rejected 4 seismic survey EPs since 2012 because the EPs did not meet the acceptance criteria outlined in the Regulations. NOPSEMA accepted 2 seismic survey EPs with conditions/limitations imposed by NOPSEMA to change the way the activity was conducted to effectively reduce impacts and risks to levels that were ALARP and acceptable. Without these conditions/limitations these EPs would also have been refused by NOPSEMA.

**9. If NOPSEMA were to receive an environment plan that was supported by a non-peer reviewed scientific study, what weight would be given to that study?**

NOPSEMA must consider relevant information during assessments and decision making. Scientific studies that are related to the activity type, location, fauna group or species in question would be considered relevant information.

In cases such non-peer reviewed scientific studies, NOPSEMA uses highly experienced and technically qualified NOPSEMA staff (many with PhDs and Masters in relevant disciplines) to independently review the study design, implementation and outcomes to determine its applicability to the assessment of impacts and risks in the EP. NOPSEMA staff also take into account the credentials of the researchers that undertook the work and whether there has been any peer review of the study. While peer reviewed published literature does provide a greater level of confidence in the study outcomes, it does not guarantee that a titleholder

has interpreted it correctly in their EP so NOPSEMA assessment teams are also reviewing EP contents for these types of errors.

One of the major benefits of non-peer reviewed research over peer reviewed published papers is that the results are available for use to inform environmental impact assessments in a much faster timeframe.

**10. Are there any other ways in which transparency could be improved, for example, public notification of the commencement of 'relevant person' consultations or, as in the United Kingdom, a longer period for public consultations?**

As per question 5 above, a formalised marine spatial planning framework may provide greater levels of transparency and opportunities for community feedback at a much earlier stage rather than waiting for consultation prior to an EP submission. Decisions in relation to the possible introduction of a marine spatial planning framework or other transparency initiatives related to consultation is however a matter for Government.

**11. Can you tell the committee how many environmental impact assessments were conducted following the introduction of the EPBC Act but prior to NOPSEMA becoming the regulator in this area (Submission 66, p. 13)?**

This is a matter for the now Department of Agriculture Water and the Environment. As reported in NOPSEMA's submission to the Inquiry, it is NOPSEMA's understanding that not all seismic surveys were referred under the EPBC Act for assessment by the Department and of those that were referred not all received a controlled action decision requiring full assessment. These assessments occurred prior to NOPSEMA becoming the regulator.

**12. Some submitters referred to the Behavioural Responses of Australian Humpback whales to Seismic Surveys, part of the Joint Industry Programme. Are the findings of this study—and other research of the JIP—considered in the environmental impact assessment process? Are there any doubts about the credibility of the JIP-led research?**

The findings of the BRAHHS study, captured in published research papers, have been used to support environmental impact assessments and have been referenced in various EPs over time. The results of the BRAHSS studies have also been used to inform NOPSEMA assessments of EPs where relevant. NOPSEMA has no doubts about the credibility of the JIP-led research.

**13. What proportion of marine seismic surveys currently use lower-impact technologies?**

A very low number of seismic surveys have been conducted using ocean bottom cable techniques however this technology is only able to be deployed in limited circumstances. It is NOPSEMA's understanding that other technologies are under development although not commercially available at this time. It is also possible that while they present a different type of technology and may reduce some impacts they may introduce different impacts (e.g. such as vibration) which are currently less well understood than underwater noise.

**14. What proportion of scientific studies into the impacts of marine seismic survey are field-based studies?**

NOPSEMA is not aware of any published analysis reviewing the proportion of field-based vs non-field based studies.

Whether a study is field or lab based would be dependent on the feasibility and logistics of conducting the study and the research question that needs to be answered. Field based studies also aren't necessarily indicative of realistic seismic exposure conditions if conducted in very shallow water or if fish are caged for example.

From NOPSEMA's experience we estimate that around 80% of studies into the effects of seismic on fish are field-based although the majority of these studies cage the fish to prevent them from swimming away which is not representative of natural conditions. For invertebrates roughly half are field based studies. No studies examining hearing impairment in mammals are field based and the majority of the studies looking at behavioural responses in mammals are likely to be field based with the exception of dolphin and other small marine mammals that could be studied in captive environments.

**15. In your view, is there sufficient international collaboration on research into the impacts of seismic signal exposure?**

There is a significant amount of international collaboration on relevant research, however collaboration could be improved, particularly at a National level on location or species specific environmental impact issues. In addition, a formal framework for collaboration and funding of research at a National level would be beneficial to ensure long term sustainability and support of studies.

**16. The NOPIMS database provides information on 2D and 3D seismic surveys that have occurred in Commonwealth waters over time. What clear trends have there been in the past 50 years? Is this related to exploration costs and petroleum prices or other factors?**

The NOPIMS database is managed by NOPTA. NOPSEMA has not analysed the numbers of seismic surveys over the last 50 years, however can report that there has been a significant decline in seismic survey activity (number and coverage of 2D and 3D surveys) since 2012 when NOPSEMA began regulating environmental management of offshore petroleum activities. Seismic survey activity fluctuates up and down annually depending on a number of factors including oil and gas demand and price, availability of vessels, project development stages, COVID and various other factors.

QUESTIONS EXTRACTED FROM HANSARD:

- 1. Dr Beck, could you take on notice, what was that study in the field that you just referred to? We heard tonight—and we're pleased—that Beach Petroleum is going to do a study in the field using a full seismic array of these same scallops in a similar area. If you've got another study that you think is illuminating, could you provide that on notice? In terms of this Day et al study that I think you dismissed in your submission, did you, as the regulator, use that adaptive continuous improvement in any of your corresponding seismic surveys? Did you take that study and actually apply it?**

Please see attached three papers examining the impacts of seismic on scallops in a field-based setting, none of which resulted in mass mortality and could not attribute impacts directly to seismic surveys. The Day (2016) paper found elevated mortality post multiple seismic exposure in some samples, however it's important to note that the scallops for this study were caught, held in tanks, then translocated to the field site, placed on the seabed by divers and then exposed to seismic sound. The study talks about the potential for seismic exposure to add to cumulative stressors, which is a theme in the other papers as well. This may explain why there was evidence of mortality after multiple exposures in this study but not others, noting the scallops may have already been stressed. NOPSEMA has applied the learnings from these papers and others in our EP assessments.

- 2. Under No. 267 in your submission, you list the other ESD principles, which include:**

**Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.**

**and the one we've just discussed, intergenerational equity. There are a number of things there that perhaps might align more with community expectations. But I don't have time now to go through that with you in detail, so I might put some questions on notice. One thing that came up in the inquiry in Hobart, when speaking to the fishermen—and, sorry, they were fisher 'men' at that particular inquiry; one of them was a scallop fisherman—was that they talked about regulations, about not being able to dive commercially for scallops within a buffer zone of seismic testing. Are you aware of any regulations? I haven't been able to find anything. There's lots of good stuff in your submission about human noise in the marine environment, but are there regulations for commercial divers around seismic testing?**

There are no regulations in Australia that prescribe exclusion zones for diving around an operating seismic vessel, however there is some international guidance published by the Diving Medical Advisory Committee: [Safe Diving Distance from Seismic Surveying Operations \(DMAC 12 Rev. 2.1 – June 2020\)](#).

- 3. Are there any scientific studies that you know about on human hearing and seismic testing? Obviously, our hearing's not adapted to the marine environment like a marine creature's would be. I'd have to check the *Hansard*, but I think the commercial fishermen said it was within 20 kilometres of seismic testing that they were told not to go diving. I'd be quite interested if you had any more information on that.**

The studies that NOPSEMA is aware of relating to underwater noise and human hearing have not been specific to seismic surveys but have investigated diver experience in relation to different received sound levels and frequencies. For example:



- Parvin, S. 2005. Limits for underwater noise exposure of human divers and swimmers. Subacoustech. Presented at the National Physics Laboratory Seminar on Underwater Acoustics, Teddington, UK. <http://www.subacoustech.com/wp-content/uploads/NPLDiverNoisePresentation.pdf>.
- Parvin, S.J. 1998. The effects of low frequency underwater sound on divers. Undersea Defence Technology. Wembley, UK. pp. 227-232.
- Fothergill, D.M., J.R. Sims, and M.D. Curley. 2001. Recreational SCUBA divers' aversion to low frequency underwater sound. Undersea and Hyperbaric Medicine 28(1): 9-18.
- Pestorius, F.M., E.A. Cudahy, and D.M. Fothergill. 2009. Evolution of navy diver exposure standards for deterministic underwater sound in the 100-500 Hz band. Meetings on Acoustics. Volume 8(070002), 26-30 Oct 2009. Journal of the Acoustical Society of America, San Antonio, Texas. <https://doi.org/10.1121/1.3280165>.
- Sims, J.R., D.M. Fothergill, and M.D. Curley. 1999. Effects of a neoprene wetsuit hood on low frequency underwater hearing thresholds. The Journal of the Acoustical Society of America. Volume 105(2). 2, pp. 1298-1298. <https://asa.scitation.org/doi/abs/10.1121/1.426183>.

Review of Diver Noise Exposure: [Review of diver noise exposure \(hse.gov.uk\)](http://www.hse.gov.uk/nosexposure/)