

Joint Industry Programme on E&P Sound and Marine Life - Phase III

Request for Proposals Number: JIP III-15-01

Hearing Recovery in Marine Mammals Exposed to Intermittent Impulse Sounds

Release Date: 13 February 2015

Introduction

This Request for Proposals (RFP) seeks proposals to obtain data on hearing recovery between intermittent pulses of fatiguing sound:

- The sound sources of interest would be broadband short duration pulses, ideally compressed air sources typically used in seismic surveys (i.e. 'air guns');
- It is expected that common laboratory species of marine mammals such as bottlenose dolphins, or harbour porpoises, would be the test subjects, although highest priority species for the JIP are large baleen whales and harbour porpoises;
- While the typical metric of auditory fatigue in these kinds of studies is usually Temporary Threshold Shift (TTS), given the historical difficulty of obtaining TTS from single and multiple exposures to seismic sound sources, alternative metrics of auditory fatigue and recovery will be considered;
- Results are anticipated to generate a recovery function, suitable for application to inter-pulse intervals of varying duration.

The research called for in this RFP is required to meet the information needs of the above JIP, specifically Research Category 2 *Physical and Physiological Effects and Hearing* - see www.soundandmarinelife.org website.

Activities related to this subject area will contribute to effective assessment of environmental risk from industry activities. The objective is to establish strong, science-based metrics of environmental risk for use in activity planning, permitting and execution.

The Proposals being requested must address the Proposal Description, Proposal Features, and Project Deliverables detailed below.

Organisations submitting Proposals should also adhere to the Application Procedure and Critical Dates set out below.

Application Procedure

To respond to this RFP, please follow the relevant instructions given on the **Funding** page of the JIP website. Proposals should refer to the above RFP number and should be submitted electronically to info@soundandmarinelife.org.

Those organisations submitting Proposals should refer to the **outline contract** on the JIP website. This sets out the terms & conditions (which may from time to time be amended) of a contract with the International Association of Oil & Gas Producers (IOGP) acting as agent for the participants in the JIP. In particular, attention is drawn to the specific term relating to management of health, safety, security and environment aspects of a contract. All IOGP contracts have such a section, but the specific wording that will appear in this section depends on the type of activity (desk-top study, field work, etc.) to be

conducted. Please also note the guiding principles on the *Policy on the use of live animals in experiments* on the website.

Critical Dates

Proposals are due by: 27 March 2015.

We will confirm receipt of proposals. If you have not received confirmation of receipt of your proposal within 1 week of the above deadline, please contact John Campbell at IOGP (Tel +44 (0) 20 3763 9700; e-mail info@soundandmarinelife.org). The review of proposals will conclude within 2 months of the submission deadline, after which applicants will be notified by the JIP.

Background

Like other mammals, marine mammals have demonstrated partial hearing recovery in the intervals between intermittent fatiguing stimuli (Finneran, et al., 2010)¹, with the consequence that exposure risk thresholds for intermittent stimuli would be higher than would be predicted from exposures to a continuous sound, or to a sequence of pulses for which acoustic energy is summed without including recovery in the inter-pulse intervals (as in Southall et al., 2007)². There are insufficient data at this time to expand on the initial findings of Finneran et al. (2010) and derive TTS growth and recovery functions relative to signal duration and the interval between signals (i.e. signal duty cycle), particularly for broadband impulsive signals such as pile driving and seismic survey (air gun or water gun) sources.

Of particular interest are the findings by Lucke et al (2009)³ suggesting that harbour porpoises may experience TTS to impulsive sound from a compressed air source (“air gun”) at lower levels, and with more prolonged recovery, than has been obtained for other species (Finneran et al., in press). Several research groups (Finneran et al., Kastelein et al., Nachtigall et al., Kastak et al.) have found evidence that animals may be activating hearing protective mechanisms that inhibit the onset of TTS in the presence of impulse sounds. This same phenomenon is observed in effects on human hearing from impulse sources: the effects show more inter-individual variability than effects from continuous sound exposures. It may be necessary, therefore, to vary the number of pulses and interval between pulses to obtain an effect and characterize its growth and recovery.

Proposals of work should address these potential methodological challenges in justifying the proposed approach and its likelihood of success.

¹ Finneran JJ, Carder DA, Schlundt CE and Dear RL. 2010. Temporary threshold shift in a bottlenose dolphin (*Tursiops truncatus*) exposed to intermittent tones. J Acoust Soc Am, 127 (5): 3267-3272

² Southall, BL, Bowles, AE, Ellison, W.T. et al. 2007. Marine mammal noise exposure criteria; initial scientific recommendations. Aquat. Mamm. 33(4); 411-521.

³ Lucke K, Siebert U, Lepper PA, Blanchett M-A. 2009. Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. J Acoust Soc Am, 125 (6): 4060-4070.

Description of Proposals being Requested

The IOGP E&P Sound and Marine Life JIP is requesting proposals which address the following:

- The onset of TTS or similar indicators of hearing fatigue such as changes to the amplitude or time delay in evoked potential in recordings from auditory nervous structures.
- Differences in the growth of TTS with varying intervals between impulses: the selected interval periods should be justified in terms of either real world practice (intervals commonly used in the seismic industry) or their utility in revealing the underlying recovery timeline (e.g. doubling intervals of 10, 20, 40, 80 seconds).
- The preferred impulse source should be a compressed air source ('air gun') of the type typically used in seismic surveys. The JIP may be able to assist with procurement of an appropriate sound source, although the cost of this equipment should be reflected in the proposal.
- The species of greatest interest to the JIP are large baleen whales and harbour porpoises. Given the challenges of working with the former, harbour porpoises may be viewed as the most feasible practical choice of test subjects. However, in view of the limits to available test subjects, use of substitute species such as bottlenose dolphins, will be considered.
- Work with pinnipeds can be a high priority for some localities and species, but the JIP recognizes that the taxonomic distance between pinnipeds and cetaceans may limit the degree to which results from one group can be extrapolated to the other.

Desirable Features of Proposals

Responses to this RFP should address each of the following (see also **RFP Response Format** page of website):

- A detailed scope of work to prepare and provide the deliverables detailed below.
- A description of the hypotheses being tested including a summary of technical work that leads to the approach being taken.
- A detailed work plan to show how the terms of the contract will be met.
- Timeframe for completion of project and significant milestone events during the project.
- A detailed cost estimate in US dollars, which includes:
 - Support for travel in order to interface with related company representatives or others with expertise in this subject area;
 - Assumptions to support the cost estimate; and
 - Any contingencies to address unknowns.
- A list of personnel to be involved in the project and their qualifications, and their proposed role in this project.
- Researcher experience in this area and previous work.
- Where appropriate to the project, a discussion on how you manage animal care and use in your proposed work (*see also Application Procedure above*).
- An overall proposal summary (one paragraph).

Project Deliverables

Project deliverables shall include:

- a) **Monthly Progress Reports** that summarise the work conducted, tasks planned for the coming month, amount spent (vs budget), and forecasts a spend plan for the duration of the project. The specific reporting formats will be determined following contract award.

b) Draft and Final Project Report to include:

1. An extensive review of existing resource materials on both marine mammal and human/lab animal hearing recovery functions and their basis in scientific data.
2. Results of the research.
3. Interpretation of the results in the form of a general rule or mathematical expression of hearing recovery from exposure to intermittent loud sounds.
4. A discussion of the application relevance to risk assessment modelling and regulatory guidance for minimizing hearing risk from exposure to loud intermittent sound.

c) One or more manuscripts submitted for publication in a peer-reviewed journal

Terms & Conditions:

By submitting a proposal to JIP, the potential contractor accepts the terms and conditions set out in this RFP. This RFP does not commit the JIP, through IOGP, to contract for any supply or service and the JIP shall not be deemed to have accepted any proposal submitted by any potential contractor unless and until a duly executed written agreement is in place and then only for such scope as specifically identified in the written agreement. The potential contractor acknowledges that IOGP and the JIP participants may accept or reject any proposal for any reason whatsoever. The JIP may decide to fund a study in part or as a whole.

Those responding to this RFP are advised that the JIP will not pay for any costs incurred in preparation of a response to this invitation, including without limitation costs and expenses of attending meetings and worksite visits related to this RFP.

All correspondence and documentation associated with this invitation will be in English. Submissions and information will not be shared with other potential contractors.