

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

Request for Proposals Number: JIP III-14-01

Establishing the Sensitivity of Fish to Seismic Activities

Release Date: 5 September 2014

### Introduction

This Request for Proposals (RFP) seeks proposals to conduct research studies that will enable the offshore oil and gas industry to better understand, and appropriately mitigate, the effects of sound-producing activities, particularly seismic operations, on fish behaviours that could affect the viability of fish populations and fisheries.

The research called for in this RFP is required to meet the information needs of the above JIP, specifically Research Category 3 *Behavioural Reactions and Biological Significance Effects* (16. Reactions of non-mammals to seismic airguns) see [www.soundandmarinelife.org](http://www.soundandmarinelife.org) website.

The Proposals being requested must address the Objectives, Project Description, Project Components and Project Deliverables detailed below.

Organisations submitting Proposals should also adhere to the Application Procedure and Critical Dates set out below. In addition, the Terms & Conditions referred to in the RFP shall apply.

### 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](mailto:info@soundandmarinelife.org).

Those organisations submitting Proposals should refer to the outline contract on the JIP website. This sets out the terms & conditions under which any contract will be carried out under the management of the International Association of Oil & Gas Producers (OGP). In particular, attention is drawn to the specific term relating to management of health, safety, environment, and security aspects of a contract. All OGP 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 use of live animals in experiments* on the website.

### Critical Dates

Proposals are due by: **Friday, October 31, 2014.**

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 OGP (Tel +44 (0) 20 7633 0272; e-mail [info@soundandmarinelife.org](mailto: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.

### Objectives

Stakeholders, including government regulators, environmental organisations, and commercial fishing communities in several regions of the world have expressed concern about the perceived negative

effects of sound generated during geophysical seismic exploration surveys on fish and fisheries. Some suggest that seismic sound causes behavioural responses in fish that result in negative impacts on fish populations and fisheries. They speculate that alteration of reproductive patterns, diversion or delay of migrations, and displacement away from fishing grounds will reduce fish catches. Such responses may produce a net positive effect on fish populations, but they are alleged by some stakeholder groups to have negative impacts on fishery economics.

Practical examples that emphasise the business case for studies of the response of fish to E&P sound include:

- **Restriction of seismic operations because of potential effects on spawning fish.**  
The operational windows permitted by regulatory authorities to protect spawning fish and limit impacts to fisheries when added to delays or interruptions caused by weather make it very difficult to plan and conduct seismic surveys required to support development of mature fields and results in very strict limits on seismic operations. Local regulatory authorities use conservative (precautionary) principles to set restrictions on seismic operations near suspected spawning areas when spawning is expected to be occurring because of the lack of scientifically valid information about the effects on spawning of exposure of spawning fish to seismic sound. (Norway, UK, Australian and Greenland waters).
- **Restriction of seismic operations because of potential effects on fisheries.**  
Many nations have regulations that result in spatial/temporal restrictions of seismic activities to protect artisanal and industrial fisheries. For example, in Norway the Marine Resource Act (section 24) states: “It is prohibited to impede harvesting or spoil harvesting opportunities by means of shooting, noise or other improper conduct”. Other countries and regions have similar regulations (e.g. HELCOM for Baltic, UNCLOS internationally, Federal Fisheries Act in Canada) that ban noises when negative effects on fish are expected. At present the lack of fact-based knowledge about the effect of seismic operations on fish and fishing success opens the regulatory process to a wide range of interpretation and speculation about the possible response of fish to seismic operations and the effects of any responses on fishing operations.

This RFP seeks proposals to conduct research studies that will enable the offshore oil and gas industry to better understand, and appropriately mitigate, the effects of sound-producing activities, particularly seismic operations, on fish behaviours that could affect the viability of fish populations and fisheries. This research is needed to ensure that oil and gas industry E&P activities are performed responsibly in the vicinity of fish resources, to propose scientifically supported and appropriate mitigation measures, and to inform regulatory policies and actions that govern our activities. Through scientifically-sound research, we are seeking greater understanding of how behavioural responses to E&P operations, particularly seismic operations, might affect factors such as reduced survival and/or reproduction, the impacts on fisheries, and those elements of sound stimuli that elicit such reaction.

Our interest is to gain further knowledge about the potential effects of E&P industry sound sources on one or more fish species (especially commercially-valuable species) that inhabit several locations and habitats types in the world. A logical first step is to try to understand the nature, biology and/or fishery significance of the suite of possible responses. For example, understanding whether any population displacement in response to seismic operation is short-term, temporary, or longer-term or more permanent is important because the time scale of the effect can influence the magnitude of the resultant effect.

Proposals should include a comprehensive summary of relevant scientific studies for the species of interest. It is of particular importance to summarise what the proposed study adds to the literature base with emphasis on the importance to the E&P industry. It is of special importance to investigate whether behavioural disruption can cause a decrease in recruitment e.g., by affecting spawning or other critical life stages. Reactions to current mitigation methods, such as ramp up, are also a key interest. From the results, impact mitigation measures based on quality science, can be designed, tested and implemented if required.

The oil and gas industry has offshore operations and exploration interests in many areas of the world where there is a broad opportunity base for conducting sound related fish behaviour studies. Variables include, but are not limited to, geographic locations and physical settings, sound sources related to seismic surveys, fish species, habitat preference, developmental stage, life history strategy, behavioural patterns, commercial or artisanal exploitation of the fish resources.

**Project Objectives:**

- 1) Contribute to understanding the effects of E&P related sound sources, with emphasis on seismic airguns, fish behaviour, fish populations of ecological or commercial significance, and fisheries,
- 2) Determine the exposure thresholds and characteristics of sound that elicit behavioural or other responses that are biologically significant at the population level or have a significant impact on commercial or artisanal fisheries. This should include where possible dose/response relationships and contexts of exposure expressed in appropriate metrics. Reference to appropriate sound source signals should be given, including pulse repetition rate, decay characteristics and the pulse change due to multiple reflections from the subsurface and the water column,
- 3) Determine the nature, degree and duration of response as a function of different exposure conditions in a certain species or taxa and with relevance to actual conservation and/or fishery aspects,
- 4) Identify data required and/or develop a framework to relate the level and type of behavioural change to different consequence levels ranging from little consequence to impacts on fish populations in a risk assessment framework approach,
- 5) Show how the results can be interpreted in the context of industry operating practices,
- 6) Include plans to conduct a statistical power analysis to determine the number of studies required to appropriately detect effects.

**Project Description:**

Proposals may focus on different fish species, geographic areas, life stages, feeding habits, life history and behavioural strategies, or habitats. Preference will be given to proposals that use actual airguns in any field work, realistic airgun playbacks, or realistic components of sound outputs from air guns in a natural setting. Sound scenarios applied must be realistic in terms of operational setting, and the chosen sound source must be explained in terms of its specific sound characteristics. Any means of observing, recording, and measuring behavioural responses of fish may be proposed including video, active or passive acoustics, or the use of tracking devices including telemetry tags. Applicants are to describe the feasibility and limitation of the methods chosen.

Experiments with wild, free swimming fish will be favoured, but experiments with caged fish in natural environments or even in tanks will be considered if connected to experiments with free ranging fish and found to deliver relevant information. Preference will be given to species or ecological types that are sensitive to sound, most commonly encountered by industry operations, and that have economic importance.

Guidance can be found in Table 1 (From “Report of a Workshop on Fish Behaviour in Response to Seismic Sound” held in Halifax, Nova Scotia, Canada, on March 28-31, 2011). Shallow water reefs have recently been studied so other habitats will have priority. For example, a pelagic schooling fish such as mackerel is an important species of special interest because it is observed in several areas with E&P operations and is a targeted species of fisheries, but the proponent is welcome to suggest other fish species that are relevant and representative.

Table 1: Groupings of Fish by Sensitivity to Seismic Sound and Ecological Association

		Ecological Associations					
		Large Pelagic	Small Pelagic	Demersal	Reef	Shallow/Estuary	In River
Fish Categories Arranged by Sensitivity to Sound	gas bladder connected to ear		Herring Sprat Shad	Weakfish Deep-sea cod	Squirrel-fish	Catfish Carp Goldfish	Dace Minnow
	gas bladder close to ear			Cod Haddock Saithe	Red Snapper		
	gas bladder distant from ear	Dorado	Horse Mackerel	Spot	Wrasse	Sand-smelt	Salmon Eel
	no gas bladder	Sharks	Mackerel	Plaice Sole		Flounder	
	fish eggs and larvae	Dorado larvae	Herring Larvae	Cod larvae	Red Snapper larvae	Catfish larvae	Salmon eggs

Note: This table is a work in progress and suggestions for other fish species to be incorporated in the various categories are encouraged. Furthermore, the species identified are examples only and should not be interpreted as a set of research priorities either individually or collectively. Source: after A.D. Hawkins, OGP Fish & Seismic Workshop Stavanger Norway (2009).

#### Project proposals must:

1. Develop a conceptual framework for assessing the potential impacts of acoustic disturbance on fish that is consistent with the PCAD model. This should include a description of the life cycle of relevant fish species, identification of important life stages, and data needs related to the transfer functions between behaviour and life functions, vital rates and population. It should also review the current knowledge on how sound may affect these important transfer functions, identify and prioritise knowledge gaps, and suggest how these gaps can be addressed.
2. Using the above framework, complete a project plan that outlines laboratory and/or field studies to address the identified knowledge gaps to obtain data pertinent to the model's transfer functions. The exposures should include several aspects of E&P sound that fish could experience in the field, both short pulses and more "rumble" like signals representative of airgun sound received at distances. The exposures should also include the context of exposure, such as the sound approaching or receding from the subjects. Proposed studies need not include all variations of industrial sound but can focus on one type only if good justification is given.

Startle responses, direct physical impact and other brief or temporary, small scale movements are not of interest in this RFP, unless they can be linked population effects or effects on commercial fisheries (such as effects on life functions, reproduction, survival or avoidance). Greater weight will be given to proposals that characterise exposures using a variety of acoustic metrics, including particle motion if found to be relevant in Part 1. The natural behaviour of fish at the time of the exposure should be specified in some detail, including whether they are feeding, migrating, resident in the area, or engaged in spawning activities etc. The observed behavioural responses should be linked to increased energy expenditure, displacement away from preferred habitats or fishing grounds, disruption of

migrations, deleterious effects upon spawning behaviour, or their ecological or reproductive consequences. If displacement is observed, the dispersal range and duration should be measured. To the extent possible, the above data should be used to develop or refine 'fitness models' based on energy consumption and describe habitat displacement, vulnerability to predators, social disruption and ecological effects.

Projects focusing on parts of the objectives described above will also be considered but an experimental approach is mandatory. Project proposals should define decision gates between Part 1 and 2. The JIP may only fund parts of the proposal.

### **Project Components:**

- Review of previous seismic-fish studies, mapping of relevant species, and delineation of most relevant indicators of response as related to risk assessment.
- Summary of proposed work plan and schedule to address the above questions and objectives. This should include descriptions of the specific hypotheses, geographic locale, experimental approach and design, sound source(s), fish species, life stages, life history and behaviour strategies, habitats, sound measurement method, fish monitoring and measurement methods.
- Approach to delineate statistical power.
- Outline of relevant experience and publications with respect to the overall project goals including data gaps identified in previous studies.
- Outline of possible partnerships with other industries, government or research entities.
- Limitations of any of the approaches and methods to address the chosen questions/hypotheses.
- Identification of study risks and proposed risk mitigation methods for these studies.
- Description of scientific and project management personnel to be involved in the project, and their qualifications, experience and proposed role in the project.
- Description of needed and available facilities both onshore and offshore for conducting the proposed research, including linkages to related organizations.
- A detailed cost estimate in US dollars, which includes:
  - Support for travel in order to interface with others with expertise in this subject area;
  - Assumptions to support the cost estimate; and
  - Any contingencies to address unknowns.
  - Where appropriate to the project, discuss animal care protocols in your proposed work (*see also Application Procedure above*).
  - An overall project summary and info-graphic (one page)
  - Publication costs for suitable form of publications in the public domain.

### **Project Deliverables:**

Project deliverables shall include:

- a) Periodic Progress Reports that summarize the work conducted, tasks planned for the coming reporting period, amount spent (vs. budget), and forecasts of spending for the duration of the project. The format and frequency of reports will be determined following contract award.
- b) HSE and Animal-care plans
- c) Draft and Final Reports on each of the suggested project objectives.
- d) Draft and Final Reports on the overall project, and containing all data collected.
- e) Papers or posters at professional conferences at the discretion of the Principal Investigator
- f) Written annual review progress report (if not covered under c)
- g) Submission of the results to a peer-reviewed journal.

It will be a requirement of any contract award that two years after the contract ends the data from the study will be posted in a publicly-accessible data archive.

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 OGP, 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 OGP 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.