

Environmental Effects of MHK Research Survey Form

Name: Andrew Gill **Date Submitted:** 31st May 2012

Title of Research: Field based experimental studies of marine organism response to Electromagnetic field (EMF) associated with marine renewable energy devices: understanding the environmental impacts.

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Funding Source: COWRIE – offshore wind environmental fund; NERC – UK Research Council; Fisheries Society of the British Isles.

Location of Research: Cranfield University and Ardtoe, Ardnamurchan, West Scotland.

Date of Research: Field studies 2007, analysis and publication ongoing

General Description (Please keep brief, several sentences or less)

<p>Purpose</p>	<p>To determine whether EMF can be detected and responded to by EM-sensitive species, using benthic elasmobranchs as the indicators owing to their high sensitivity to EMF.</p>
<p>Technology</p>	<p> <input type="checkbox"/> Wave <input type="checkbox"/> Tidal <input type="checkbox"/> Ocean Current <input checked="" type="checkbox"/> Technology Neutral </p> <p><u>Description:</u> The studies were focused on subsea cables which is linked to all technologies in the marine environment (i.e. not shore based).</p>
<p>Stressor</p>	<p> <input type="checkbox"/> Physical Presence of device (static) <input type="checkbox"/> Physical Presence of device (dynamic) <input type="checkbox"/> Noise <input checked="" type="checkbox"/> EMF <input type="checkbox"/> Energy Removal <input type="checkbox"/> Water Quality <input type="checkbox"/> Foodweb <input type="checkbox"/> Other </p> <p><u>Description:</u> EMF of 50Hz AC (3 phase cable) at one emission level within the range of potential attraction to electrosensitive fish</p>
<p>Receptor</p>	<p> <input type="checkbox"/> Marine Mammals <input checked="" type="checkbox"/> Fish <input type="checkbox"/> Birds <input type="checkbox"/> Bats <input type="checkbox"/> Reptiles <input type="checkbox"/> Invertebrates <input type="checkbox"/> Other </p> <p><u>Description:</u> The most EM-sensitive taxa are elasmobranchs (sharks, skates and rays). This study focused on the benthic species thornback rays (<i>Raja clavata</i>) and small spotted catsharks (<i>Scyliorhinus canicula</i>)</p>

<p>Key Findings</p>	<ul style="list-style-type: none"> • S.canicula were found to non-randomly associate nearer to the cables when energized. • R. clavata individuals are able to response to the EMF from an energized cable; the response is variable and was not predictable • Acoustic telemetry techniques can provide a coarse level understanding of individual fish response to specific stressors • The use of large scale experimentation through mesocosms (40m x 5m), replicate studies and the inclusion of a control are a feasible way of understanding environmental effects at a scale appropriate to the marine renewable energy sector.
<p>Publications</p>	<p>Peer reviewed report: Gill, A.B., Huang, Y., Gloyne-Philips, I., Metcalfe, J., Quayle, V., Spencer, J. & Wearmouth, V. (2009). COWRIE 2.0 Electromagnetic Fields (EMF) Phase 2: EMF-sensitive fish response to EM emissions from sub-sea electricity cables of the type used by the offshore renewable energy industry. Commissioned by COWRIE Ltd (project reference COWRIE-EMF-1-06).</p> <p>Paper to be submitted in 2012 with new analysis of data looking at properties emerging from individual behaviour</p>