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## **Potential Impacts to Crustaceans from Construction of Wind Farms in the Marine Environment**

### **Executive Summary of Key Topics**

#### **Topic Area 1: Electro-Magnetic Emissions from Power Cables**

Lobsters are not known to be “E” sensitive but are likely to be “B” sensitive. “Although there has been no targeted monitoring specifically to investigate whether distribution of crustaceans and molluscs have been affected by the presence of submarine power cables and associated magnetic fields, monitoring to meet other specific objectives relating to offshore wind farms has not revealed any evidence to show such an affect. However, it is not expected that the impact would be of significance, since the species that could be affected are known to be mobile and, as such, are able to avoid impacted areas. Generally the habitats that they inhabit are widespread and the effects of magnetic fields are usually highly localized around the cable.” (COWRIE 2004)

E-Fields = electric emissions. Studies indicate there are no E-fields detectable outside of protected cables.

B-Fields = magnetic emissions (induced E-field detection/magnetite-based detection). Magnetic sensitivity has been demonstrated in decapods (Greater Gabbard Offshore Winds, Ltd. 2005) and may be associated with orientation and direction finding ability. Studies indicate “induced E-fields” are created outside the power cable irrespective of shielding. Industry asserts the magnitude of B-field surrounding the cable falls to background levels within 20m and that burial of cable would mitigate any effects. However, “there is now a recognition that cable networks with EMFs in close proximity to each other (e.g. as may be the case at sub-station gathering points where cable may be less than 10m apart) may need site specific analysis due to the interaction of the fields as a single system.” (COWRIE 2004) the Phase 1 COWRIE EMF study concludes “cable burial was ineffective in “dampening’ the B field (and resultant iE field); however cable burial to a depth of a least 1m is likely to provide some mitigation...”

General consensus -- there is uncertainty surrounding effects of EMFs and more research is urgently needed for a thorough understanding of this topic area. Phase 2 COWRIE is in progress to address this.

## **Topic Area 2: Habitat Disturbance Due to Cable Installation**

As benthic creatures, this topic area is significant to crustaceans, and the impacts may be more significant to species such as lobsters that migrate across the seabed. Particular attention should be paid to habitat where lobsters winter over and in settlement areas for juveniles. Among the several key impacts to the environment identified as a result of cable installation, those of most concern to the lobster population include:

- Suspended sediment attaching to eggs.
- Damage to filtering mechanism of larvae from an increase in suspended sediment and subsequent settling.
- Release of contaminants previously in the sediment (i.e. oils, heavy metals), particularly near industrial areas.
- Possible negative impact on water quality from oil spills, hydraulics.
- Possible impacts on herring – the primary bait used in the American lobster fishery.
- Disturbance of sensitive habitat.
  - Spawning/nursery grounds
  - Over-wintering areas
  - Migration routes

The area impacted by cable installation would be a long, narrow corridor of approximately 2-3m width. The majority of the disturbed area returns to its pre-installation state, with the exceptions being in hard clay and rock seabed types where cable trenches would not normally backfill – creating trench scarring. If the crossing of cables is needed, this would disturb a larger area, as protective measures such as concrete mattresses would be required. It should be noted that sediment disturbance is also caused naturally (i.e. during storm periods) so there may be some tolerance to this phenomenon. Also suspension of sediment would be relatively localized and short in duration.

Suspended sediments and resultant blanketing and “smothering” of benthic animals could cause stress, reduce rates of growth or reproduction, and in the worse case the effects may be fatal. (Bray, Bates, & Land 1997)

The dumping of rocks to protect cables where burial is not possible, and use of concrete mattresses to protect cable crossings will cause permanent changes in the habitat. While this is seen as predominately a negative impact for commercial fisheries, the introduction of hard substrate creates habitat diversity that might benefit commercial lobster fisheries.

Herring is the overwhelming bait of choice for the American lobster fishery. Herring rely on light levels to aid migration and shoaling behavior. Low light levels caused by high levels of suspended sediment could impair the ability of herring to shoal as part of migration to spawning and feeding grounds.

Further research into the consequences of habitat disturbance during the installation of submarine power cables is needed to scientifically validate concerns as they relate to the American lobster.

### **Topic Area 3: Heat Radiating from Power Cables**

A rise of 0.000006°C in water temperature immediately above buried power cables was calculated in studies by the Connecticut Siting Council (CSC) as part of the Cross Sound Cable Interconnector project in 2001. It is considered so similar to natural fluctuations in the surrounding areas that impacts would be inconsequential.

### **Topic Area 4: Noise**

There is limited scientific monitoring data upon which to base conclusions as to the impacts of noise produced by offshore wind farms and the installation of their submarine power cables.

### **Sources of Information**

The COWRIE 1.5 Electromagnetic Fields Review – Final Report (Gill 2005) contains an extensive compilation of available references and literature review on the topics of electric and magnetic fields as they relate to marine organisms in general, and specifically in the context of offshore wind farms. According to the report, “main sources of information were Web of Knowledge (comprising, Science Citation Index, Social Sciences Citation Index, Arts & Humanities Citation Index, Cambridge Abstracts, Oceanic Abstracts and Scirus (www.scirus.com - the most comprehensive science-specific Internet search engine.” (COWRIE 2005)

In addition, the Lobster Institute has compiled a reference list of scientific 100 articles dealing with the possible environmental impacts of offshore wind farms on marine animals and habitat. This bibliography was drawn from a search of the “Aquatic Sciences and Fisheries Abstracts” and the “Oceanic Abstracts”, as well as a general Internet search using the following key words: electromagnetic, lobster, magnetic fields, wind turbines, wind farms. The reference list is attached to this report as Appendix I.

**Many of the abstracts and/or articles in this literature review are available in the Lobster Institute’s Lobster Library. A search of the Lobster Library is available at the Lobster Institute’s Web site, [www.lobsterinstitute.org](http://www.lobsterinstitute.org).**