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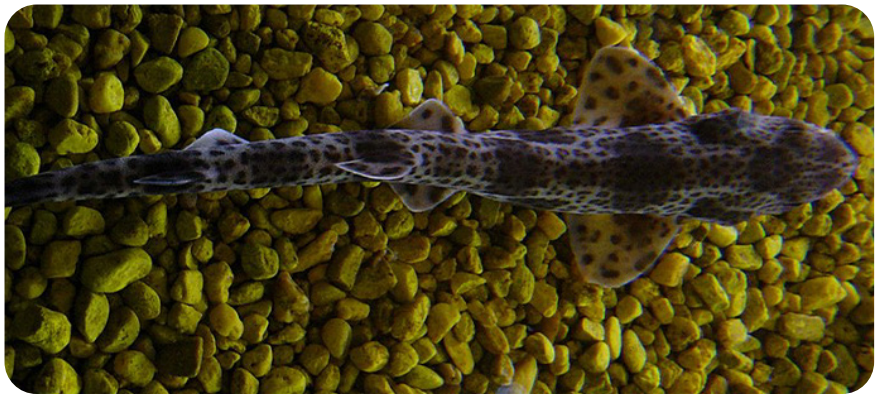
IMPACT OF WIND ENERGY ON BIODIVERSITY

Project summary



CEMARB_DC

Reconciling Marine Renewable Energy and Biodiversity – Direct Current

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Introduction

Offshore wind farms are developing rapidly, and their potential impacts on marine wildlife remain poorly understood. The Cemarb project aims to assess the effects of the local amplification of electromagnetic fields generated during the transmission of electricity to shore on the small-spotted catshark.

Context and objectives

In the context of climate change, renewable energy sources such as wind power are an alternative to fossil fuels. In Europe, offshore wind farms are developing rapidly, particularly in France, where 21 wind farms either in operation or planned are distributed across 11 million km² of coastal waters. Electricity generated by offshore wind farms is transmitted to shore via submarine cables, which locally amplify electromagnetic fields (EMFs). This may affect species that are sensitive to EMFs and use them for orientation and prey detection. The Cemarb project aims to assess and quantify the effects of amplified EMFs generated by submarine electricity transmission cables on elasmobranchs, which are sensitive to EMFs, and particularly on the small-spotted catshark (Scyliorhinus canicula).

The objectives were to assess and quantify the potential effects of amplified EMFs on the survival, growth and metabolism of small-spotted catsharks from the embryonic stage through to the juvenile stage (6 months).

Methods and approaches used for the project

Small-spotted catshark eggs were exposed in different tanks to electromagnetic fields generated by direct current at different intensities: a control condition with no EMFs and three conditions with amplified EMFs of 50, 100 and 500 µT, corresponding respectively to distances of 10, 5 and 0 m from the submarine cable.

Survival, growth and aerobic metabolic capacity parameters were monitored and analysed throughout the experiment.

Principal conclusions

The experiments conducted improved our understanding of how elasmobranchs respond to amplified electromagnetic fields.

Overall, the results of the Cemarb project suggest that exposure to direct-current EMFs may temporarily slow growth, but has no lasting impact on the survival, growth, development or metabolism of small-spotted catsharks (Scyliorhinus canicula) up to 6 months of age under controlled conditions. The experiment should be extended to investigate potential longer-term impacts on growth and reproduction, as well as on feeding behaviour and orientation.

These results provide crucial data for addressing the challenges associated with the development of marine renewable energy while preserving marine biodiversity, and provide essential information for managers and decision-makers.

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Anticipated (or actual) impact of these results for science, society, and public and private decision making

The conclusions of the Cemarb project contribute to the emerging field of research on the potential impacts of offshore wind farms on marine biodiversity, particularly during the operational phase. The small-spotted catshark, a model elasmobranch species, is sensitive to electromagnetic fields. Its use in the study is justified by its benthic lifestyle, the fact that its eggs remain attached throughout incubation, and the limited mobility of juveniles at birth. In addition, spawning areas overlap with the areas where submarine cables carrying electricity from offshore wind farms to shore are located, locally altering the Earth's magnetic field. Therefore, the species' potential adaptation to the presence of amplified artificial electromagnetic fields is an aspect that should not be overlooked. The monitoring of survival, growth, development and metabolism in small-spotted catsharks produced encouraging results and suggests that amplified electromagnetic fields have negligible impacts up to 6 months of age. However, further research is needed to assess potential longer-term impacts, particularly on individuals' reproductive capacity and feeding behaviour, as well as on other species, since impacts may be species-specific.