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TITLE: Turbine Sound May Influence the Metamorphosis Behaviour of Estuarine Crab Megalopae

AUTHOR: ['Matthew K. Pine', 'Andrew G. Jeffs', 'Craig A. Radford']

ABSTRACT:

It is now widely accepted that a shift towards renewable energy production is needed in order to avoid further anthropogenically induced climate change. The ocean provides a largely untapped source of renewable energy. As a result, harvesting electrical power from the wind and tides has sparked immense government and commercial interest but with relatively little detailed understanding of the potential environmental impacts. This study investigated how the sound emitted from an underwater tidal turbine and an offshore wind turbine would influence the settlement and metamorphosis of the pelagic larvae of estuarine brachyuran crabs which are ubiquitous in most coastal habitats. In a laboratory experiment the median time to metamorphosis (TTM) for the megalopae of the crabs *Austrohelice crassa* and *Hemigrapsus crenulatus* was significantly increased by at least 18 h when exposed to either tidal turbine or sea-based wind turbine sound, compared to silent control treatments. Contrastingly, when either species were subjected to natural habitat sound, observed median TTM decreased by approximately 21?31% compared to silent control treatments, 38?47% compared to tidal turbine sound treatments, and 46?60% compared to wind turbine sound treatments. A lack of difference in median TTM in *A. crassa* between two different source levels of tidal turbine sound suggests the frequency composition of turbine sound is more relevant in explaining such responses rather than sound intensity. These results show that estuarine mudflat sound mediates natural metamorphosis behaviour in two common species of estuarine crabs, and that exposure to continuous turbine sound interferes with this natural process. These results raise concerns about the potential ecological impacts of sound generated by renewable energy generation systems placed in the nearshore environment.

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