Wired waters – investigating overlooked impacts of submarine power cables on marine life

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Imagine being a shark or ray, dwelling on the bottom of the North Sea. The waters are murky, leaving you almost blind, but you don't rely on sight. Your superpowers - an electric sense to detect prey[1] buried in the sand, and the Earth's magnetic field to navigate[2] - are your guides. Yet now, countless submarine power cables crisscross your world[3], throwing your electric and magnetic senses into chaos. For humans, it would be as if the colors around us suddenly shifted to unfamiliar hues.

Submarine power cables, used to transport electricity (for example from an offshore wind farm to land), emit electromagnetic fields [4]. Elasmobranchs, a group of cartilaginous fish that include sharks and rays, are particularly sensitive to such electromagnetic fields [5]. Laboratory studies suggest that unnatural electromagnetic fields (such as those from submarine power cables) potentially affect the behavior of elasmobranchs; for instance, small-spotted catsharks could not distinguish between artificial and natural electric fields emitted by prey items[6].

However, the spatio-temporal variability of cable-generated electromagnetic fields (resulting from different voltage levels, and both AC and DC cables being present) demand more knowledge about the cables' potential *in-situ* effects on sensitive marine life[7]. Since the North Sea is home to many elasmobranch species[8], but at the same time sees a rapid expansion of offshore wind farms, (especially in the Belgian North Sea)[3], it emerges as a priority area for this research. Technological advancements only recently allow for studying the effects of artificial electromagnetic fields on aquatic animals *in-situ*, through animal-borne acoustic sensors measuring the magnetic field strengths.

This study collected data using these novel sensors inside the Belgian North Sea to gain insights in presence and magnitude of magnetic fields generated by submarine power cables in space and time and how elasmobranch experience magnetic fields *in-situ.* Results obtained so far indicate that measured magnetic field levels a) don't uniformly decrease with distance to the documented position of a submarine power cable (which might be due to cable migration), b) fall within the known sensitivity ranges of elasmobranchs, and c) vary in magnitude over time, depending on wind conditions. These findings suggest that magnetic fields from submarine power cables could affect elasmobranchs, highlighting the importance of evaluating electromagnetic field monitoring regulations or enhanced cable shielding to ensure the sustainable coexistence of offshore wind energy expansion and a healthy marine ecosystem.

Literature Sources

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Keywords

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