Bundesamt
für Strahlenschutz

Spotlight on EMF Research

Spotlight on “Effect of electromagnetic fields from renewable energy subsea power cables on righting reflex and physiological response of coastal invertebrates” by Chapman et al. in Marine Pollution Bulletin (2023)

Category [low frequency, animal study]

Spotlight - Jan/2024 no.3 (Eng)

Competence Centre Electromagnetic Fields (KEMF)

1 Putting the paper into context by the BfS

Magnetic fields are emitted into the marine environment by subsea power cables and induce electric fields in sea water. These anthropogenic fields are interfering with natural magnetic (e.g., the geomagnetic field) and electric fields (e.g., bioelectric fields). Offshore renewable energy devices have been expanding rapidly in recent years, as measures to counteract climate change. As a consequence, more subsea cables carrying more power are deployed in coastal waters worldwide, resulting in increased impact of anthropogenic fields on marine life, which has not yet been sufficiently investigated.

2 Results and conclusions from the authors’ perspective

The paper focuses on effects of magnetic fields emitted from subsea power cables on behavioural and physiological parameters of common coastal invertebrates. It aims to provide data for environmental impact assessments. In their laboratory, the authors simulated a scenario of a power cable located on a rocky substrate, where it cannot be buried due to geological circumstances [1]. They used a magnetic field of 500 µT, which corresponds well to the real exposure by a subsea cable. The investigated species are typical inhabitants of rocky substrates: common starfish (*Asterias rubens*), European edible sea urchin (*Echinus esculentus*), velvet swimming crab (*Necora puber*), and common periwinkle (*Littorina littorea*). They are edible and of commercial interest. Thirty specimens of each species were exposed or sham exposed for 24h. After exposure, they were turned to their dorsal side and their ability to right up to a normal position was tested. Furthermore, total cell counts and protein content were assessed in hemolymph or coelomic fluid, which are the body fluids of invertebrates and correspond to blood and

lymph in vertebrates. These parameters are a measure of physiological stress. Neither the time needed to right up, nor the two physiological measures were significantly changed after exposure in any of the species.

3 Comments by the BfS

The authors interpret the results with caution, as published results on the effects of magnetic fields on invertebrates are mixed. Several studies find no effects, while others report effects in certain species or under certain conditions [2]. Furthermore, even if magnetic fields alone do not cause stress in the investigated species, the authors state that they could have negative effects in combination with other environmental stressors.

The authors accurately simulate a situation with a cable on rocky substrate in a laboratory setting – they use a realistic exposure scenario and common coastal species. The animals were acclimated for 24 h within the experimental setup consisting of Helmholtz coils. Then, the current was either switched on for exposure, or remained switched off for sham exposure for another 24 h. This procedure does not follow recommendations to avoid artefacts due to e.g. sound or vibration. In these scenarios, it is recommended to use Helmholtz coils with antiparallel wiring for sham exposure, where the current is switched on, and the magnetic fields are canceled out [3]. Furthermore, the exposure was not blinded, which is a shortcoming and can lead to a bias. As no effects were found, these limitations are of minor importance.

As the exposure was limited to 24 h, it cannot be ruled out that a prolonged or lifelong exposure would cause an effect.

The study provides valid information for the described scenario, but the knowledge about effects of magnetic fields of submarine cables is still scarce and more research – field observations as well as well-designed laboratory experiments – is needed.

References

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[3] Kirschvink JL. Uniform magnetic fields and double-wrapped coil systems: Improved techniques for the design of bioelectromagnetic experiments. Bioelectromagnetics (1992) 13: 401-411.

Impressum

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Please always use the following URN when citing this document:
urn:nbn:de:0221-2024020141265

Spotlight - Jan/2024 no.3 (Eng)