

Effects of low-frequency pulsed direct current on captive-housed sea fish

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Introduction

The use of electric fields in freshwater to capture or control fish, has been a valuable and widely adopted sampling technique in ecology and management for over half a century. Due to the high conductivity of seawater the use of electrical fishing in marine water bodies is practically less evident and therefore applications are limited.

In the past, several experiments demonstrated that particularly shrimp species showed distinct responses when exposed to low-frequency pulsed direct current (PDC). As a result, research on the application of electric PDC fields in shrimp trawling started in the late 1960s. This technique resulted in a higher return due to reduced fuel consumption and increased commercial catches. It might also be used as an alternative stimulation to invoke a selective reaction from shrimps without stimulating fish and other vertebrates, and therefore reduces the unwanted by-catch, as well as decrease the ecological impact

The purpose of this study was to evaluate the effects of low frequency electric pulses, used for electro-fishing of shrimps, on 7 different sea fish species living near the coast of Belgium.



Materials and Methods

Seven different species were selected including plaice (n=21, length: 9.5-41.0 cm), sole (n= 22, length: 13.0-36.0 cm), dragonet (n=21, length: 8.0-21.0 cm), pogge (n=21, length: 6.0-14.0 cm), armed bullhead (n=14, length: 14.0-27.0 cm), fivebeard rockling (n=8, length: 12.0-19.5 cm) and Atlantic cod (n=20, length: 17.5-40.0 cm).

Different species were always kept separately and were divided over a series of 18 aquaria. The bottom of the aquaria was covered with rinsed sand and daylight was obscured to simulate natural conditions. Seawater quality was closely monitored and kept at a constant level.

All fish were exposed to electric pulses (60V, 0.5 milliseconds, 5Hz) during 10 seconds. Behaviour and mortality were recorded. All fish were euthanized and necropsied 24h after exposure. Control animals consisted of equal numbers of the same species which were not exposed to electric pulses.



Results

All fish survived the experiment. In almost all exposed fish, minor and brief fright reactions were observed. In general, gross and histological abnormalities were rarely present in exposed and control fish. In one control and two electrical exposed plaices, small multifocal cutaneous haemorrhages were observed. In one electrical exposed sole, a small focal interstitial haemorrhage in the muscle was present.

Conclusion

Alternative techniques such as electric pulses for catching shrimp could be promising since this appears to have low impact on fish, at least under experimental conditions.