

# ► Project *brief*

Thünen Institute of Fisheries Ecology

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## The swimming physiology of the European eel under regulable hyperbaric conditions (SPEER)

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- During its spawning migration, the European eel covers a distance of 5000-7000 km
- Adequate fat reserves and low energy consumption during swimming are of fundamental importance for a successful participation in reproduction
- In a swimming tunnel with respirometer function, the influence of different environmental conditions and physiological parameters on the energy consumption of eels was examined
- The results should enable a better calculation of the required energy reserves

### Background and aims

To reach their spawning area in the western Atlantic, European eels (*Anguilla anguilla*) have to migrate between 5000 and 7000 km. During this month-long migration, the animals do not ingest any food, but fully rely on their stored energy reserves. A good state of health, sufficient fat reserves and efficient swimming are therefore basic requirements for a successful participation in reproduction. Knowledge of the energy consumption of eels during spawning migration and the influence of harmful factors on their swimming performance are necessary in order to better understand the population decline and to improve stock management of this endangered species.

### Objectives

Main project objectives were to analyze the influence of different environmental and physiological parameters on energy consumption of eels during swimming and to assess the effects of hyperbaric pressure and swimming on swimbladder physiology, gene expression and function with special emphasis on implications of *Anguillicola crassus* infestations.

### Key findings

Effects of different temperatures and hydrostatic pressures on oxygen consumption of eels were analyzed in a series of swimming experiments in a swimming tunnel with respirometer function. To quantify the effects and interactions of pressure and temperature on the oxygen consumption rate, eels were exposed to three different temperatures (19°C, 15.5°C and 12°C) and two pressures (1 and 8 bar). No interaction between

temperature and pressure was found, but the results revealed an increase of oxygen consumption at higher temperatures.

In a second approach, it was investigated whether energy requirements of female eels are influenced by the gonadal maturation. For this purpose, the animals were injected with hormones over a period of up to 136 days, which induced and promoted gametogenesis. The preliminary data indicate a slight increase in oxygen consumption with progressive maturation, which indicates an increased energy requirement due to gonad development.

Under the lead of our project partners from the University Innsbruck the effect of prolonged swimming under elevated hydrostatic pressure on swimbladder function was investigated. Transcriptomic analyses in gas gland cells were conducted and an effect of *Anguillicola crassus* infestations on gene expression was shown.

### Conclusions

The SPEER project significantly contributed to an improved understanding of the physiology of long-distance migration of the European eel, based on the collaborative effort of a multidisciplinary research team. The project results provide valuable new knowledge about the energy requirements of eels and important data for a recalculation of the energy reserves that are necessary for a successful completion of their complex life cycle.

### Further Information

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