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The Expedition PS117 of the Research Vessel POLARSTERN to the Weddell Sea in 2018/2019

Edited by

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with contributions of the participants

10. MOLECULAR ECOLOGY, PHYSIOLOGY AND LIFE HISTORY TOOLS TO MONITOR ANTARCTIC TOOTHFISH (*DISSOSTICHUS MAWSONI*) POPULATIONS IN THE WEDDELL SEA

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Objectives

The Antarctic toothfish *Dissostichus mawsoni* is a mesopredator in the Antarctic marine food web. It feeds mainly on the silverfish *Pleuragramma antarctica* (and thereby is a trophic competitor of penguins for it) and is the prey of larger predators (e.g. seals, killer whales). The toothfish has a commercial value worth between 20 and 100 dollars per kg and is therefore the target of an economically relevant fishery in the Southern Ocean (Hanchet et al., 2015). Current Antarctic fisheries management by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR, www.ccamlr.org) largely depends on mathematical/statistical models to determine stock sizes and catch rates, but these models frequently fail in the absence of adequate and accurate biological and physical data.

After 20 years of the fishery experiencing very high yields, still little is known about the biology of toothfish, and this lack of knowledge impinges on the sound management of the species. The hundreds of Agassiz and bottom trawl samples taken by AWI in the Weddell Sea over the last 35 years yielded less than 40 specimens.

The standard way of catching Antarctic toothfish applied by the commercially operated fishing vessels makes use of horizontal longlines, often several kilometres long with thousands of baited hooks. However, it is very difficult to deploy such longlines from a normal scientific research vessel such as *Polarstern*. Therefore, the project did pilot a novel, targeted approach by catching a limited amount (max. 5 tonnes) of toothfish with vertical longlines. Vertical longlines have been used occasionally to catch Antarctic toothfish in experimental settings (Kokorin & Serbin, 2009), through sea ice (Parker et al., 2013; Parker et al., 2016) and for special research surveys (Parker et al., 2015). Piloting the use of vertical longlines from *Polarstern* combines the long-term experience gained by AWI in deploying oceanographic moorings in the Weddell Sea with the fisheries expert guidance kindly provided by CCAMLR partners from UK and New Zealand.

Fishery is not the only factor potentially affecting the abundance and health of toothfish populations. Climate change – water temperature rise, ocean acidification, changes of sea ice coverage and further oceanographic parameters – have the potential to affect the entire Antarctic ecosystem, altering food and light availability and causing physiological stress. Thereby, these factors may act synergistically on population dynamics and structure especially on species already facing fishery pressure.