

Towards an Agent-Based Model for Managing Recreational Fisheries of Western Baltic Cod

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Western Baltic Cod

Marine recreational fisheries (MRF) are complex socio-ecological systems which generate significant economic and social values. It has been shown that MRF can impact fish stocks through the removal of biomass.

In the western Baltic Sea (Fig. 1) Atlantic cod (*Gadus morhua*) is the main target species for commercial and recreational fisheries and supports industries and tourism (Fig. 2). The western Baltic cod is generally in a poor state, with a spawning stock biomass (SSB) around the biological limits (Fig. 3). One reason is that catches (Fig. 4) exceeded sustainable levels in the past.

Reduced commercial fishing pressure and a recreational bag limit (5 cod per day) in combination with a strong cohort in 2016 led to a SSB increase in 2017. The effects of the bag limit on recreational fisheries were underestimated (Fig. 4) with negative consequences for industries and tourism. Evidently, existing models are unable to predict the anglers' behavioral response to management decisions.

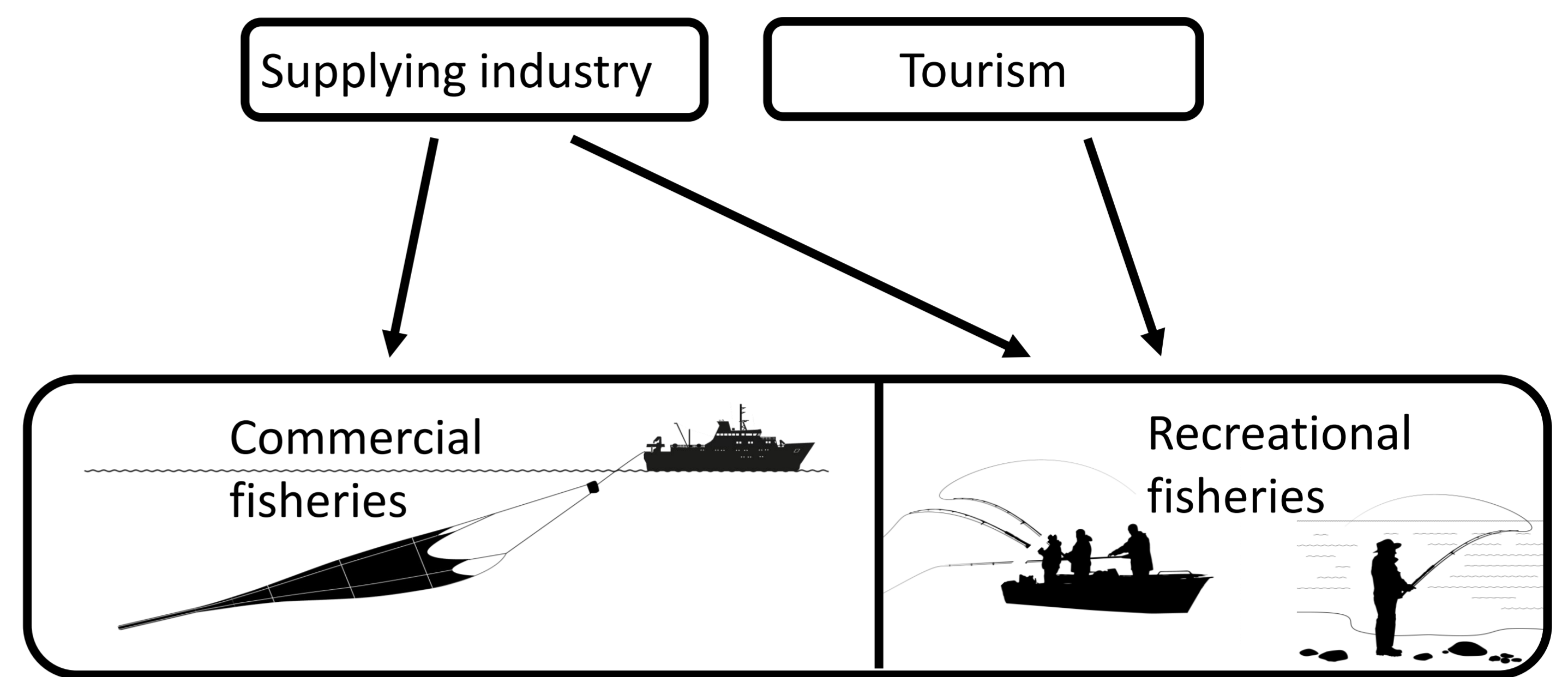


Fig 2: Flow chart of the western Baltic cod fisheries.

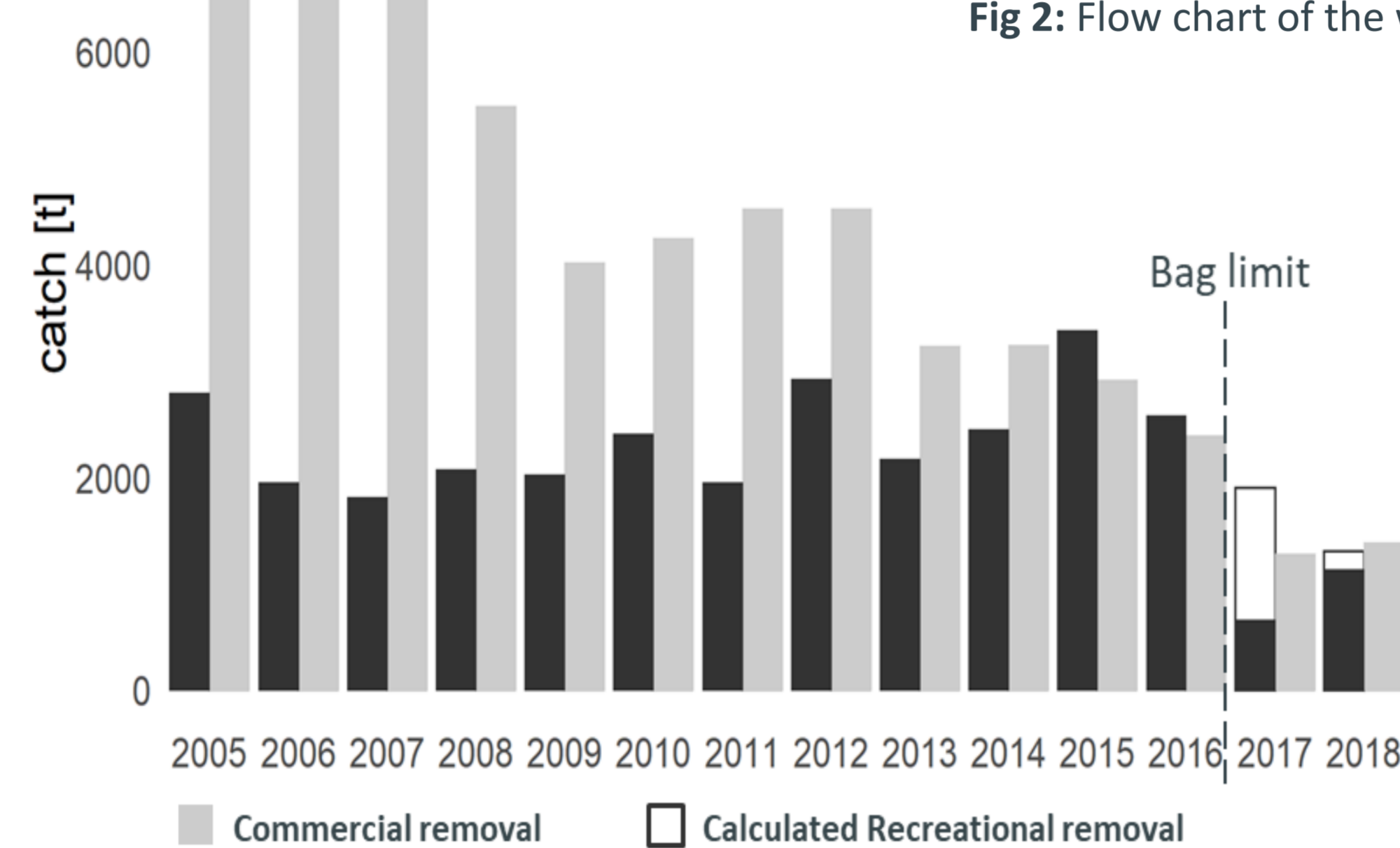


Fig 4: Western Baltic cod catches of commercial and recreational fisheries.

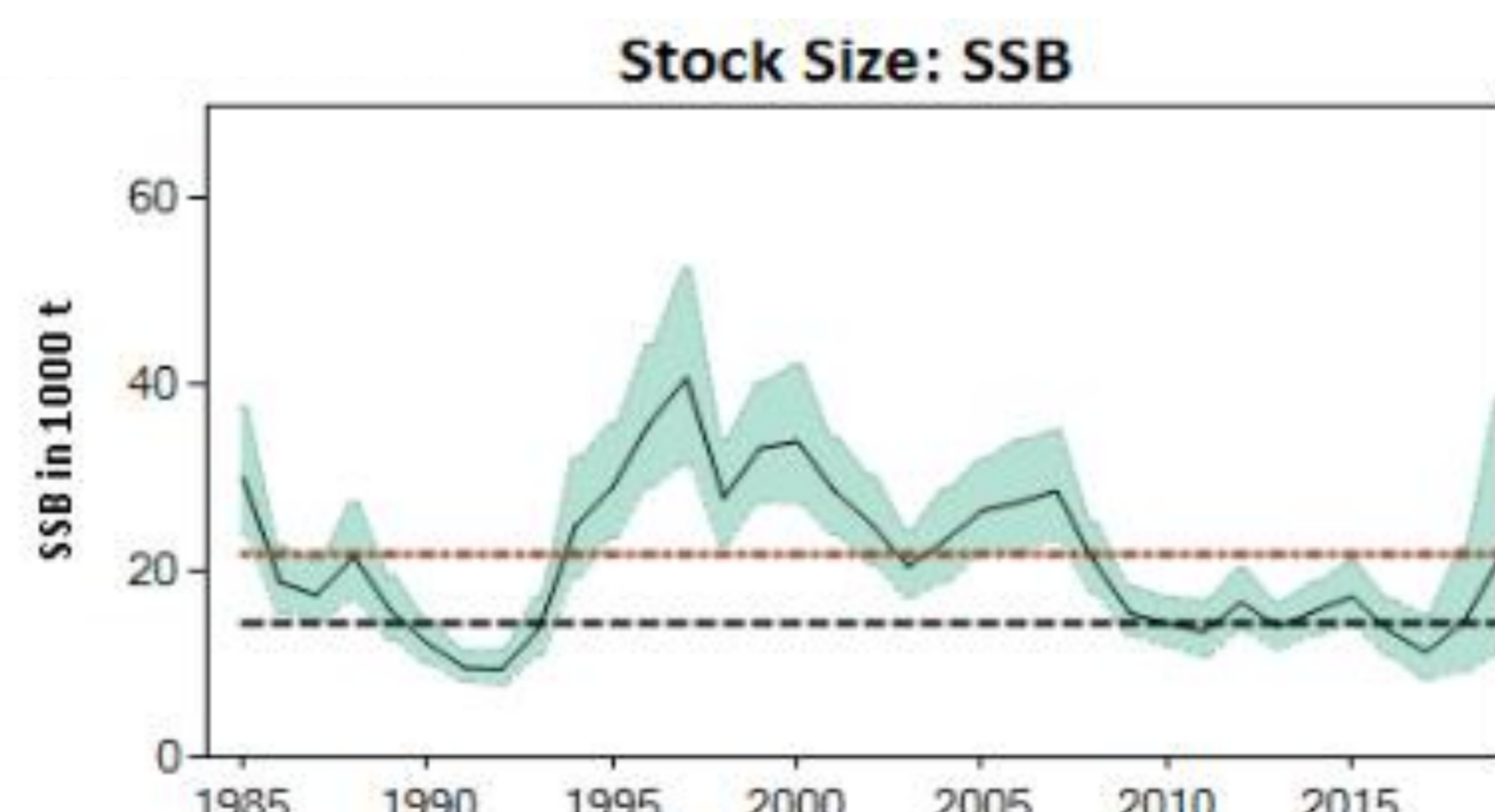
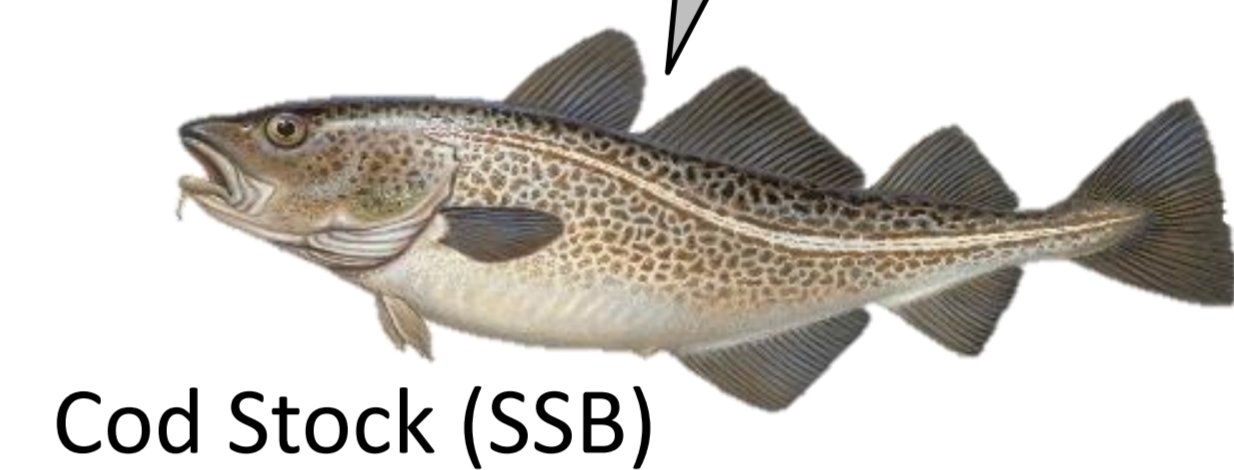


Fig 3: Stock development of western Baltic cod. The red line indicates the limit reference point. Taken from ICES Advice 2019.



Cod Stock (SSB)



Fig 1: Map of the Baltic Sea. The red rectangle indicates the western Baltic Sea.

Agent-Based Model

The behavior of anglers and their reaction to management decisions depend on various drivers and differ between individuals and angler groups.

Agent-based models can capture the heterogeneity and decision processes of anglers and help to understand and predict angler behavior.

- We aim to develop an agent-based simulation model based on angler behavior (Fig 5).
- An extensive data collection about western Baltic cod recreational fisheries will inform the modeling process.
- For validation we plan to reproduce the policy changes in 2017.
- Such a model could be used to simulate the impact of different management decisions on recreational fisheries before their implementation.

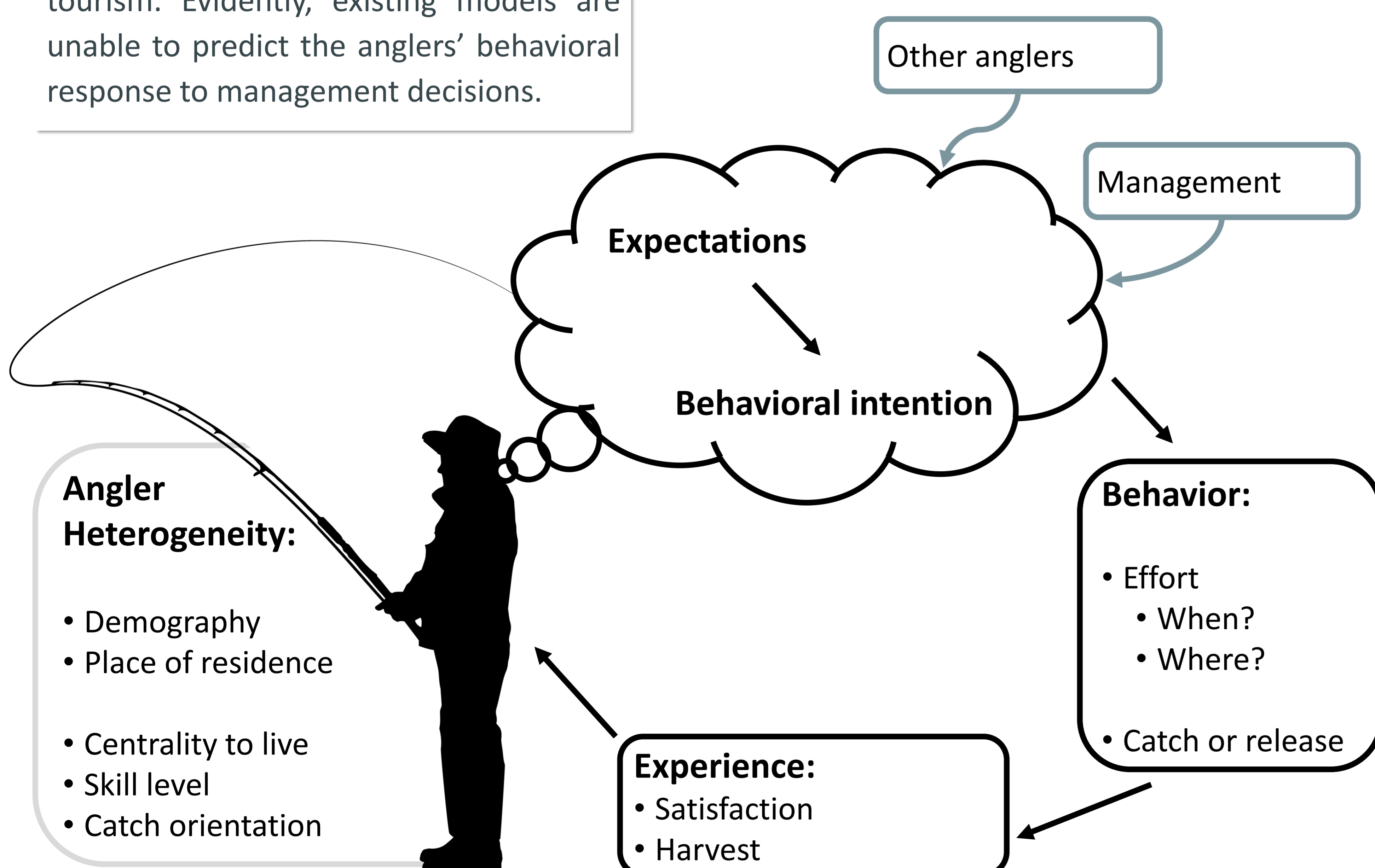


Fig 5: Illustration of angler behavior.