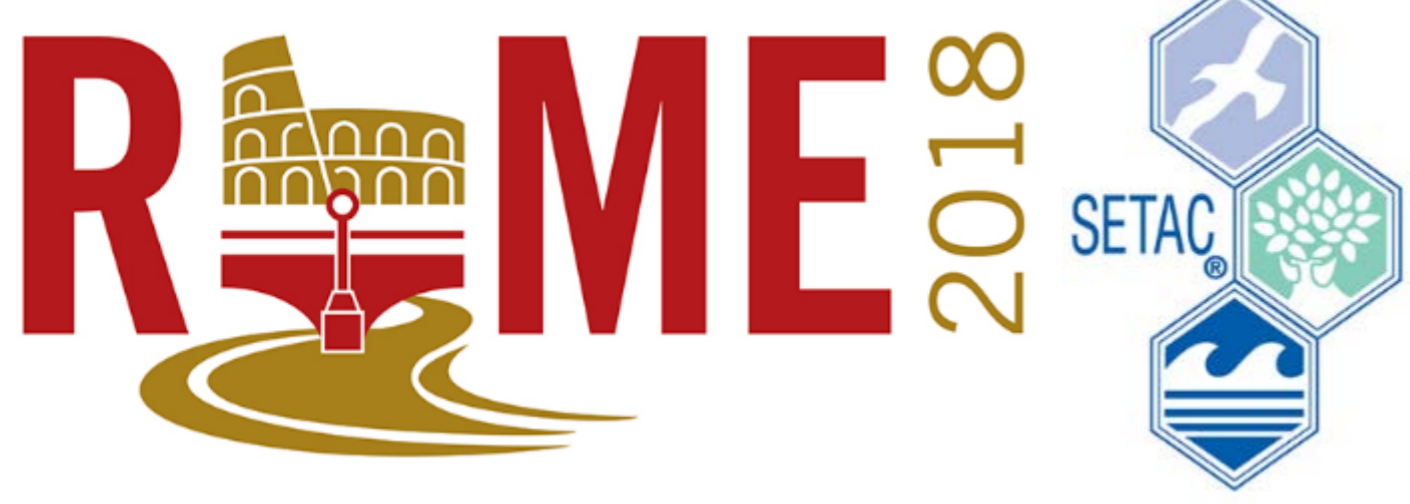# Filling the Gap of Overfishing in LCIA: Eco-factors for Global Fish Resources

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Introduction and objectives

More than two thirds of commercially used fish resources are overexploited or at risk of becoming overexploited.
However, there is a lack of Life Cycle Impact Assessment methods that assess the contribution of fish consumption to the global problem of overfishing.

Since this important aspect is not considered in LCAs, fish often has a lower environmental footprint than other sources of animal protein in LCA studies [1].
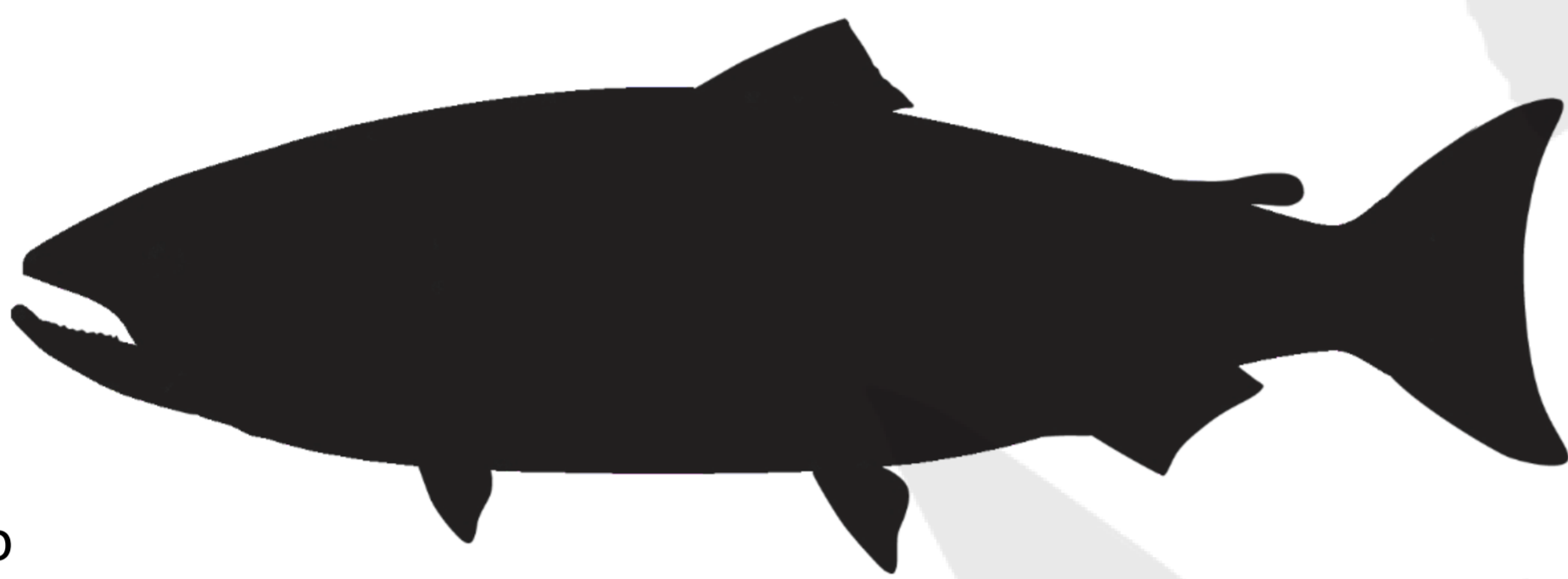
The aim of this poster is to

- present the **development of eco-factors** for fish resources and by-catch as an addition to the Swiss Ecological Scarcity Method 2013 [2].

- present the environmental impact of fish including overfishing and **compare it** with the impacts of **dietary alternatives** like chicken, pork, lamb, beef and veal.

Method

General Approach
- The method developed [3] uses a **distance to target** approach.
- The characterisation of use of fish resources is based on the relationship between the **fish stock for maximum sustainable yield (FSMSY)** and the **current fish stock (FS)** from the RAM Legacy Database [7], [8].
- The results are normalised with the Swiss share in the global marine fish consumption.

Regionalised & species-specific factors
- The eco-factors were calculated for **each fish species and fishing area**.
- For each fish species, the eco-factors in different fishing areas were aggregated to one factor using the weighted average of the total **catch per fishing area**.

By-catch
- Overfishing due to **by-catch** was included.
- The amount of by-catch was approximated with the dead discard of the walleye pollock (*gadus chalcogrammus*), which has the highest by-catch rate worldwide.

Factors per product weight
- The factors were corrected from live weight to **product weight** (45 % of live weight).

Results & Discussion

The comparison of the environmental impacts of fishery (production), by-catch and fish resources for **twenty different fish species** with dietary alternative (different meats) shows (see figure 1):

- Depending on the species, fish (e.g. bluefin tuna or atlantic cod) have significantly higher overall impacts compared to different types of meat.

- The contribution of the eco-factors for by-catch is minor compared to the **overfishing of the target species** but still relevant for the comparison with meat.
- The total **contribution of the eco-factors for fish resources exceeds the impacts of the fishery and fish processing.**

In order to assess **by-catch more accurately**, the species affected by it and the fishing methods used have to be considered. This has not yet been incorporated in this method**.**
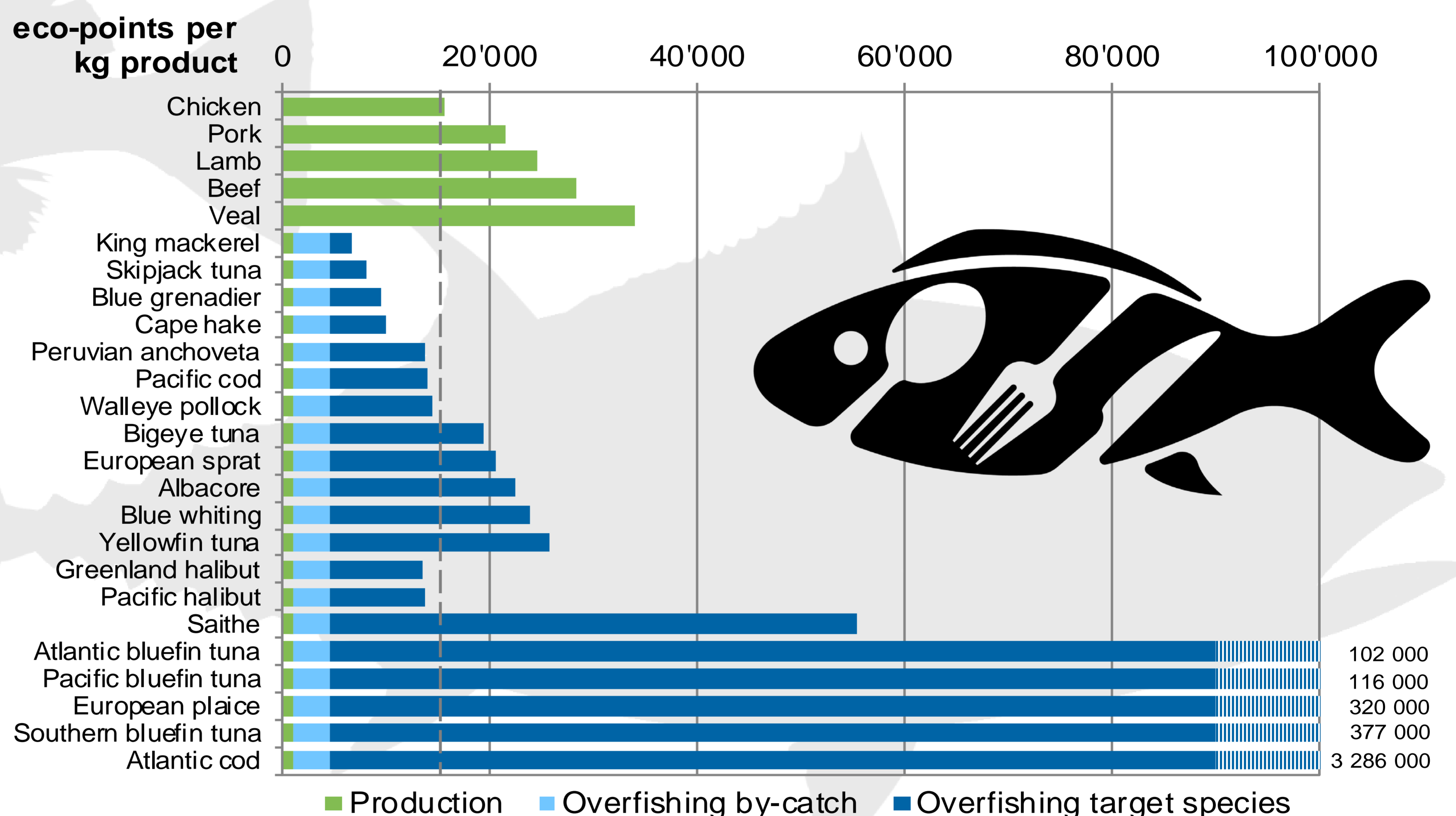

Figure 1: Environmental impact per kilogram of fish products including the impact of overfishing [3], calculated with the Swiss Ecological Scarcity Method. Results of meat products based on Stucki et al. [9]

Conclusions

- Using regionalized data for FS and FSMSY to calculate eco-factors based on distance to target method enables **aggregation** into a single-score with other environmental impacts.
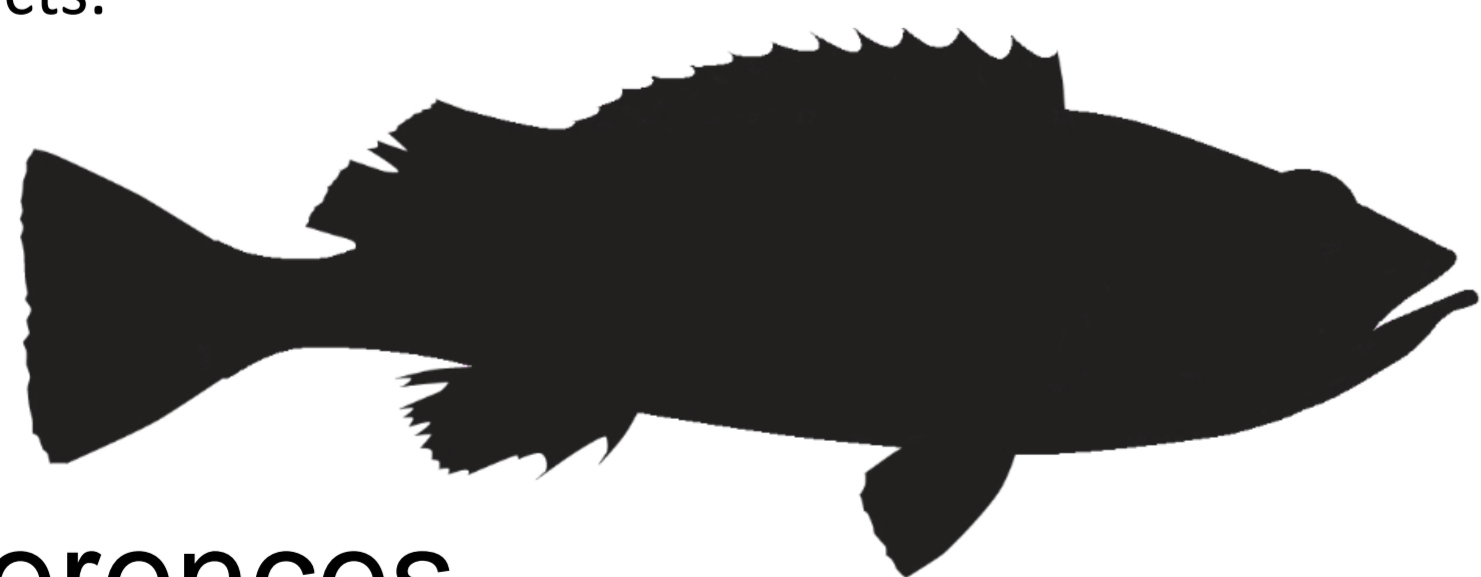
- The overexploitation of fish resources is **highly variable** for different fish species and fishing areas.
- If overfishing is included, many considered fish have a lower impact, whereas **few fish species have a considerable higher environmental impact compared to different meats.**
- The approach reflects the regionalised impacts caused by the overexploitation of fish resources for different species and fishing areas and includes impacts associated with **by-catch.**
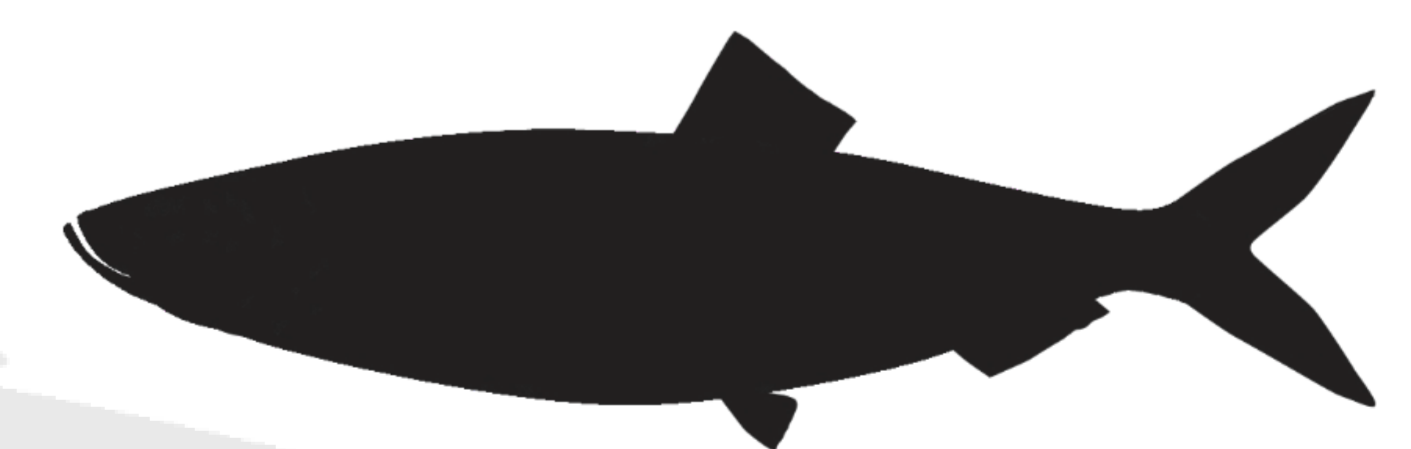
- **Overexploitation of fish resources is relevant in the Life Cycle Assessment** of fish products in different diets and can be used in a full single score assessment of meals.

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