

Long-term changes in the ichthyofaunal composition in a temperate estuarine ecosystem – developments in the Elbe estuary over the past 40 years

Jesse Theilen^{1,2}, Victoria Sarrazin^{1,2}, Elena Hauten³, Raphael Koll⁴, Christian Möllmann³, Andrej Fabrizius⁴ Ralf Thiel^{1,2}

¹Leibniz Institute for the Analysis of Biodiversity Change, Centre for Taxonomy and Morphology – Hamburg, Germany

²University of Hamburg, Department of Biology, Biodiversity Research – Hamburg, Germany

³University of Hamburg, Institute of Marine Ecosystem and Fishery Science – Hamburg, Germany

⁴University of Hamburg, Institute of Cell- and Systems Biology of Animals, Molecular Animal Physiology – Hamburg, Germany



Contact
 ✉ jesse.theilen@uni-hamburg.de
 ☎ +49 152 05246642

Introduction

With climate change and other human impacts, such as channel management, wastewater sewage and nutrient inputs, the Elbe estuary has faced several anthropogenic stressors in the past and in the present [1,2]. In estuarine food webs, keystone fish species are considered as suitable indicators for the assessment of ecosystem quality. The aim of this study is to quantify the change of the fish assemblage over the past four decades. First results are presented here.

Material and Methods

- Data from research catch hauls with commercial stow net vessels (Fig. 1) from 1984-1986, 1994-1995, 2009-2010 and 2021-2022 were standardized
- Five stations between Cuxhaven and Hamburg along the main channel of the Elbe estuary (reflecting the salinity gradient) were sampled
- Seasonal sampling was performed: spring, summer, autumn and winter



Figure 1: Stow net vessel „Ostetal“ (Photo: R. Thiel)

Results

- Total fish biomass was highest from 2009-2010 and decreased until 2021-2022 (Fig. 2a)
- Comparing the four time periods, smelt contributed the largest proportion (54 % and 74 %) of fish biomass
- In the 1990ies and 2009/2010 biomass proportion of smelt was largest (74 % and 70 %); in the 1980ies and 2020ies smelt biomass was lower (54 % and 55 %) (Fig. 2b)
- In 2021-2022, 45 fish species were recorded
- Smelt, flounder, and ruffe showed highest frequencies of occurrence (Fig. 3)
- Thinlip mullet *Chelon ramada* was recorded for the first time

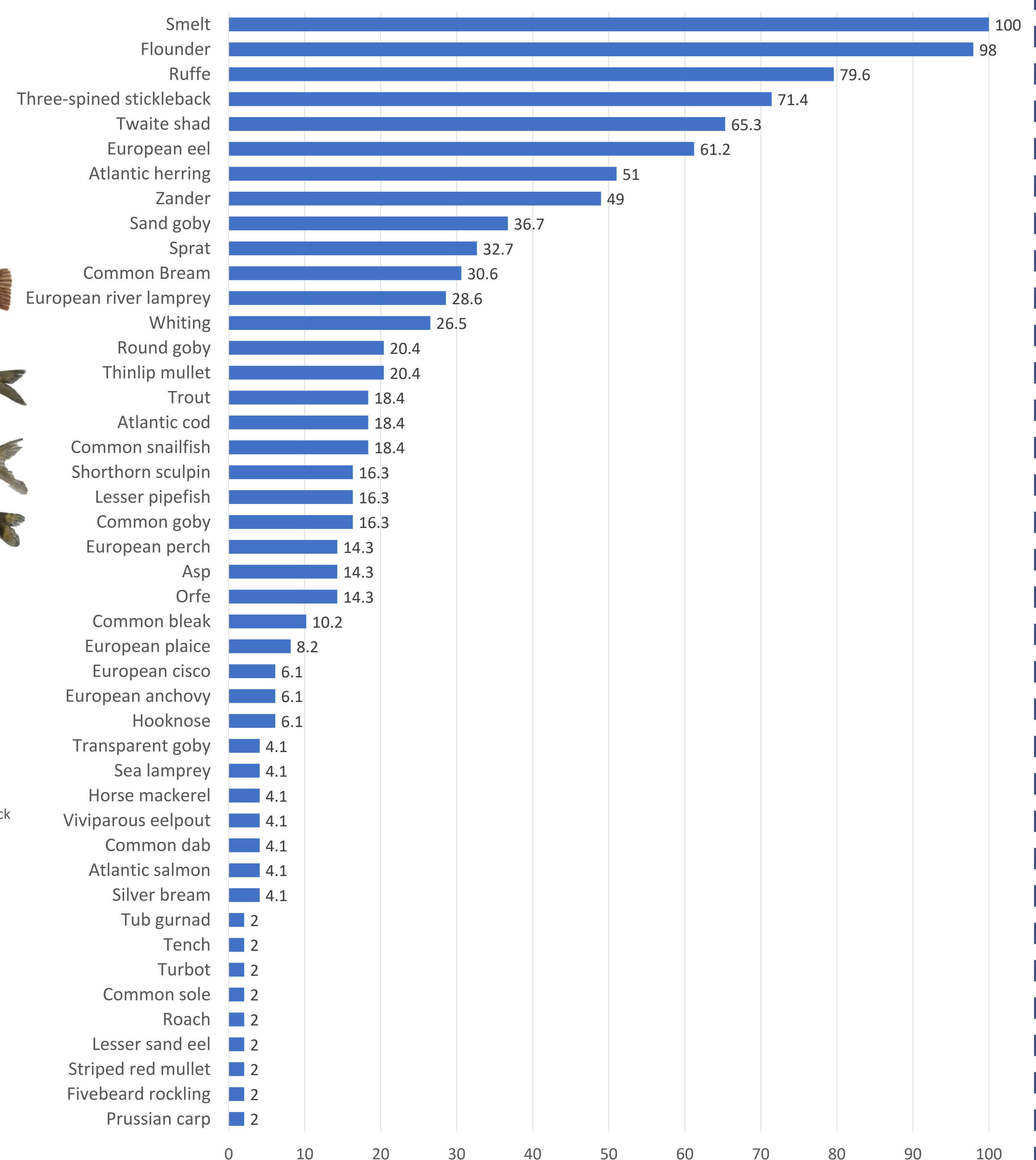
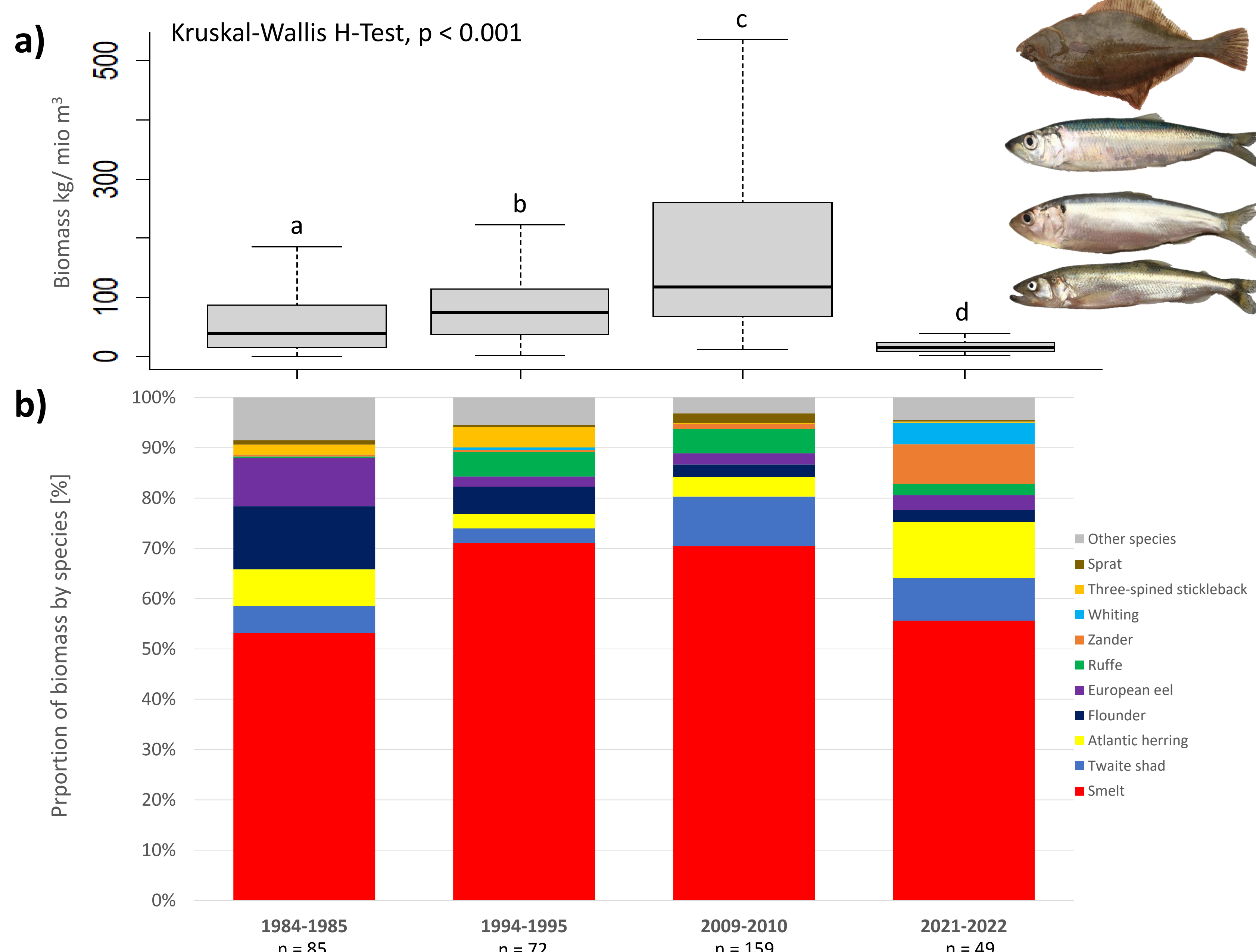


Figure 2: Ranges of fish biomass per haul in the Elbe estuary between 1984 and 2022 (a) and relative biomass proportions [%] of the important fish species (b)

Figure 3: Frequency of occurrence [%] of the fish species caught with the stow net vessel "Ostetal" in the Elbe estuary between 2021 and 2022 (hauls: n = 49)

References
 [1] Thiel, R. (2011): Die Fischfauna europäischer Ästuarie - Eine Strukturanalyse mit Schwerpunkt Tiedeelbe. Abhandlungen des Naturwissenschaftlichen Vereins in Hamburg. Dölling und Galitz Verlag GmbH München · Hamburg. ISBN 978-3-86218-025-7, 160 pp.
 [2] van Beusekom, J.; Thiel, R.; Bobsien, I.; Boersma, M.; Buschbaum, C.; Dänhardt, A.; Darr, A.; Friedland, R.; Kloppmann, M.; Krönke, I.; Rick, J.; Wetzell, M. (2018): Aquatische Ökosysteme: Nordsee, Wattenmeer, Elbeästuar und Ostsee. In: Hans von Storch, Insa Meinke und Martin Claußen (Hg.): Hamburger Klimabericht – Wissen über Klima, Klimawandel und Auswirkungen in Hamburg und Norddeutschland. Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 89–107.

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