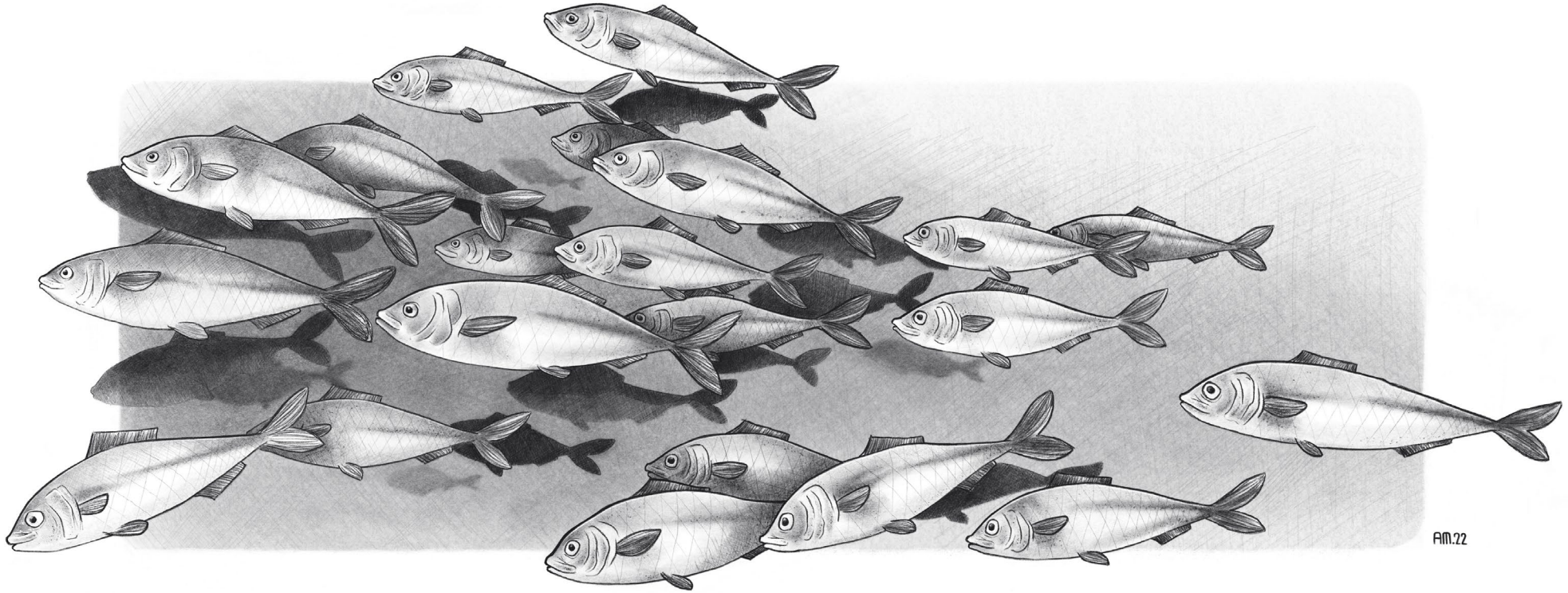
The early origins of commercial fishing: historical ecology, ancient DNA, and Atlantic herring



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ICES/PICES SPF2022

UiO : University of Oslo

CEES Centre for Ecological and Evolutionary Synthesis

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*"**The herring is one of those products whose use decides the destiny of empires.** The coffee bean, the tea leaf, the spices of the torrid zones, the worm which spins silks, had less influence on the wealth of nations than the northern ocean."*

-*18th century French naturalist Bernard-Germain-Étienne de La Ville sur-Ilan, Comte de Lacépède (Hunt 2017)*

The Baltic

- Oldest arena of intensive herring exploitation in Europe
- Case study:
  - Climate change
  - Exploitation pressure
  - Adaptation (salinity)

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Herring fishing in the Baltic

- Early fisheries ~800YBP
- Processing herring requires existing trade networks for access to wood for barrels and **salt for curing**
- Opportunistic targeting of **coastal spawning aggregations**

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Herring fishing in the Baltic

- First “industrial” fishery – Øresund, ~1200-1580 CE
  - Peak landings ~50 000 t p.a.
  - Compare to 10 000 t in recent years

“They present themselves in such large numbers off shore that they not only burst the fishermen’s nets, but, when they arrive in their shoals, an axe or halberd thrust into their midst sticks firmly upright.”

- Olaus Magnus
1555

16th century – Fishery Collapse!

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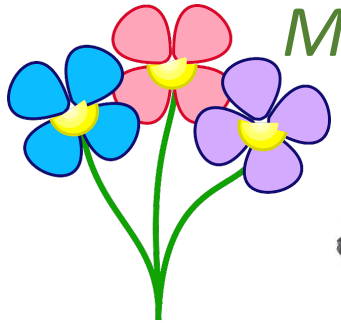
Spring vs Autumn



Modern fishery

JOURNAL ARTICLE

Evidence from the past: exploitation as cause of commercial extinction of autumn-spawning herring in the Gulf of Riga, Baltic Sea FREE

Brian R MacKenzie ✉, Henn Ojaveer

ICES Journal of Marine Science, Volume 75, Issue 7, December 2018, Pages 2476–2487, https://doi.org/10.1093/icesjms/fsy028

Published: 24 March 2018 **Article history** ▾

Historical sources indicate that overfishing of the Baltic herring began over 500 years ago and continues to have

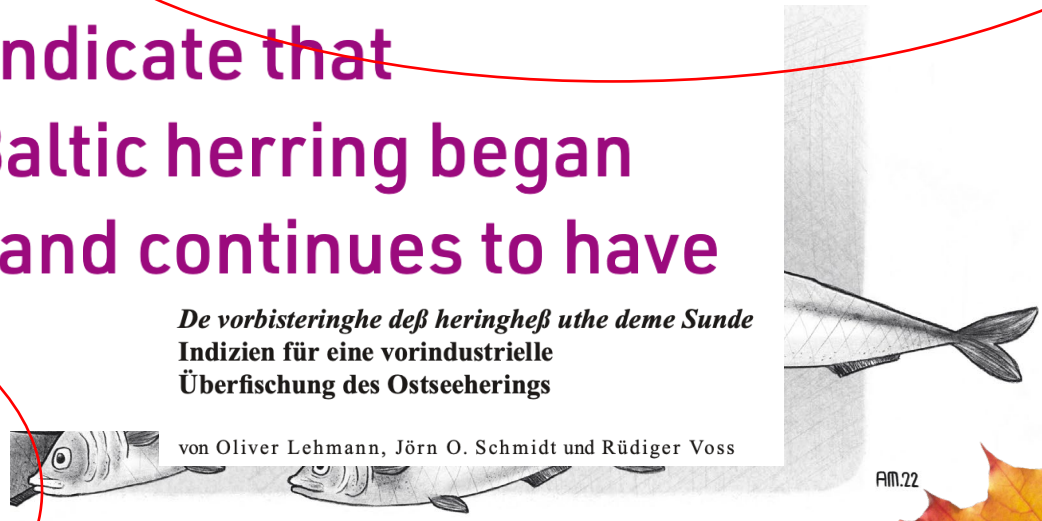
JOURNAL ARTICLE

Biological statistics regarding the Herrings along the Baltic coast of Sweden Get access ›

Chr. Hessle

ICES Journal of Marine Science, Volume 6, Issue 1, March 1931, Pages 21–27, https://doi.org/10.1093/icesjms/6.1.21

Published: 01 March 1931

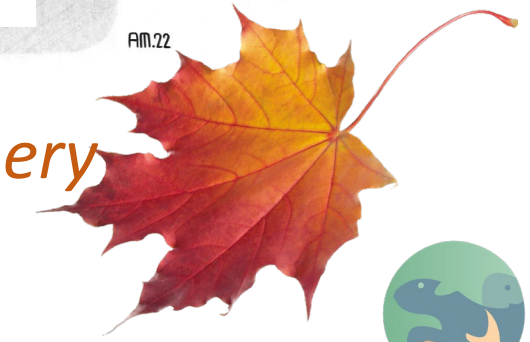


De vorbisteringhe deß heringheß uthe deme Sunde
Indizien für eine vorindustrielle Überfischung des Ostseeherings

von Oliver Lehmann, Jörn O. Schmidt und Rüdiger Voss

AM:22

Øresund fishery



Overfishing? Climate change? Demographic transition?

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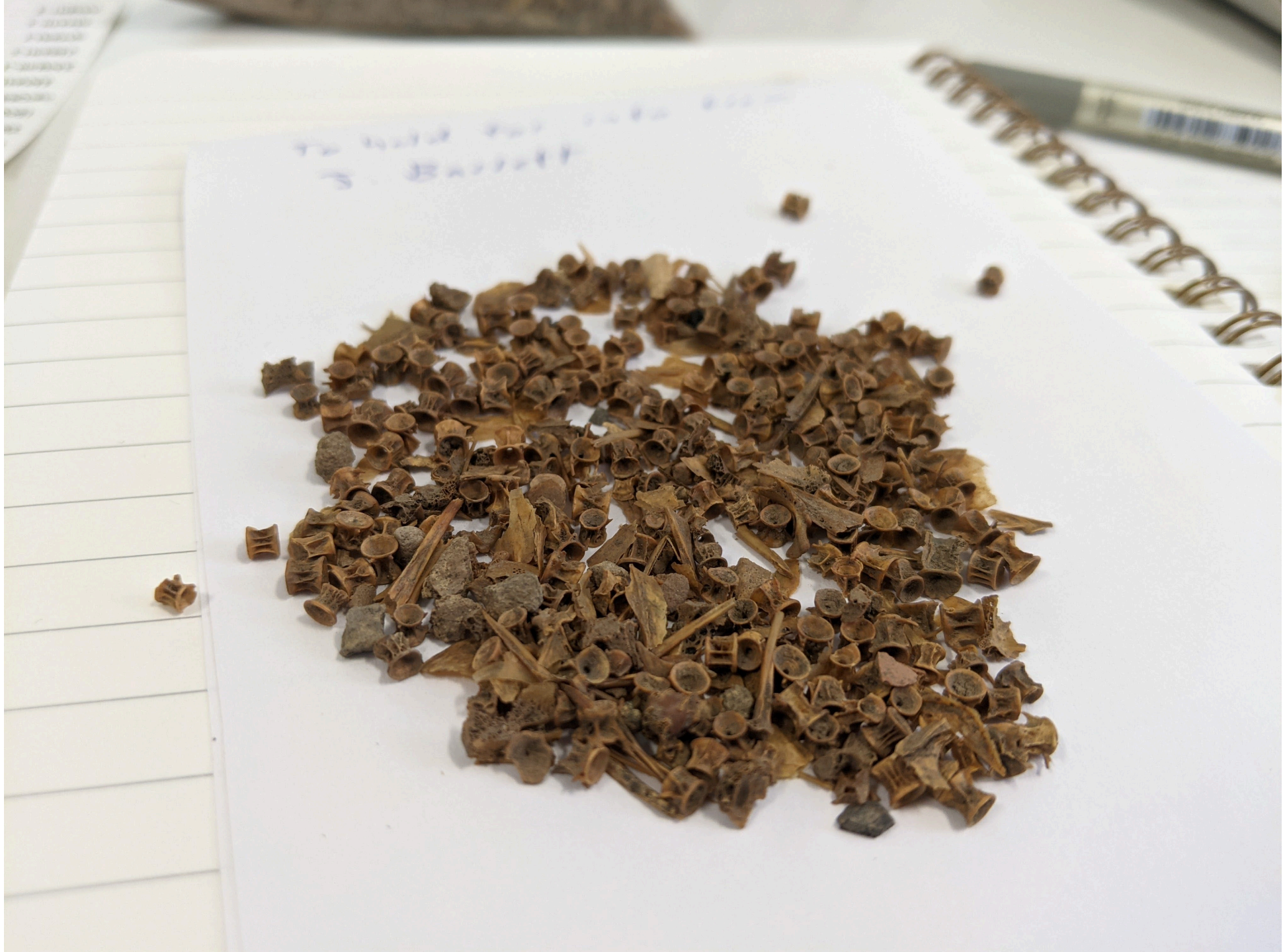

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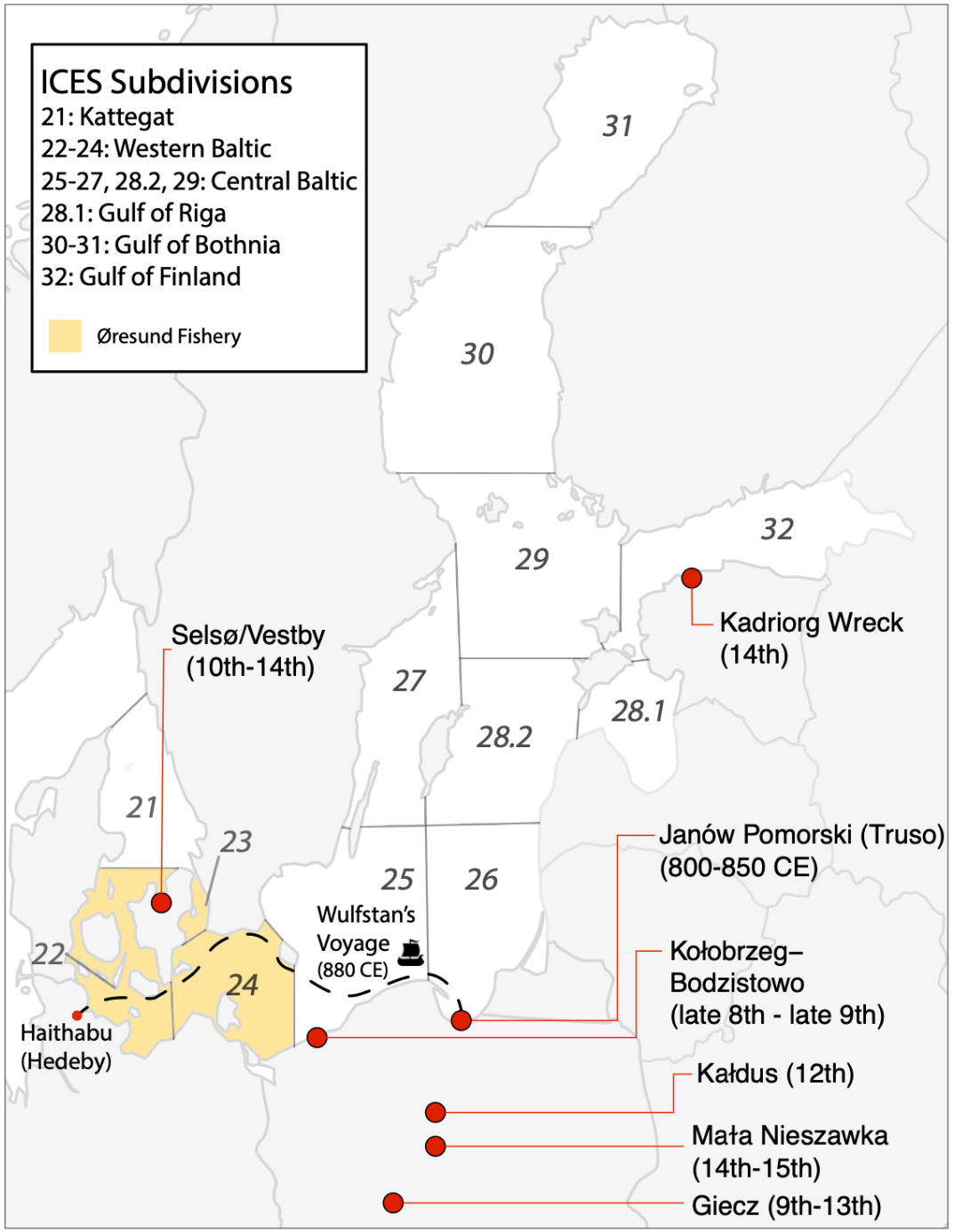

Atmore et al. 2022. *PNAS*

- 40 archaeological specimens
- 7 archaeological sites
- 750-15th century CE
- 0.0001X-3X

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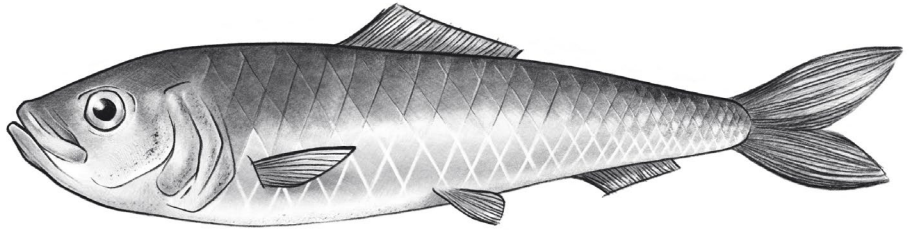

What are the source populations for archaeological specimens?

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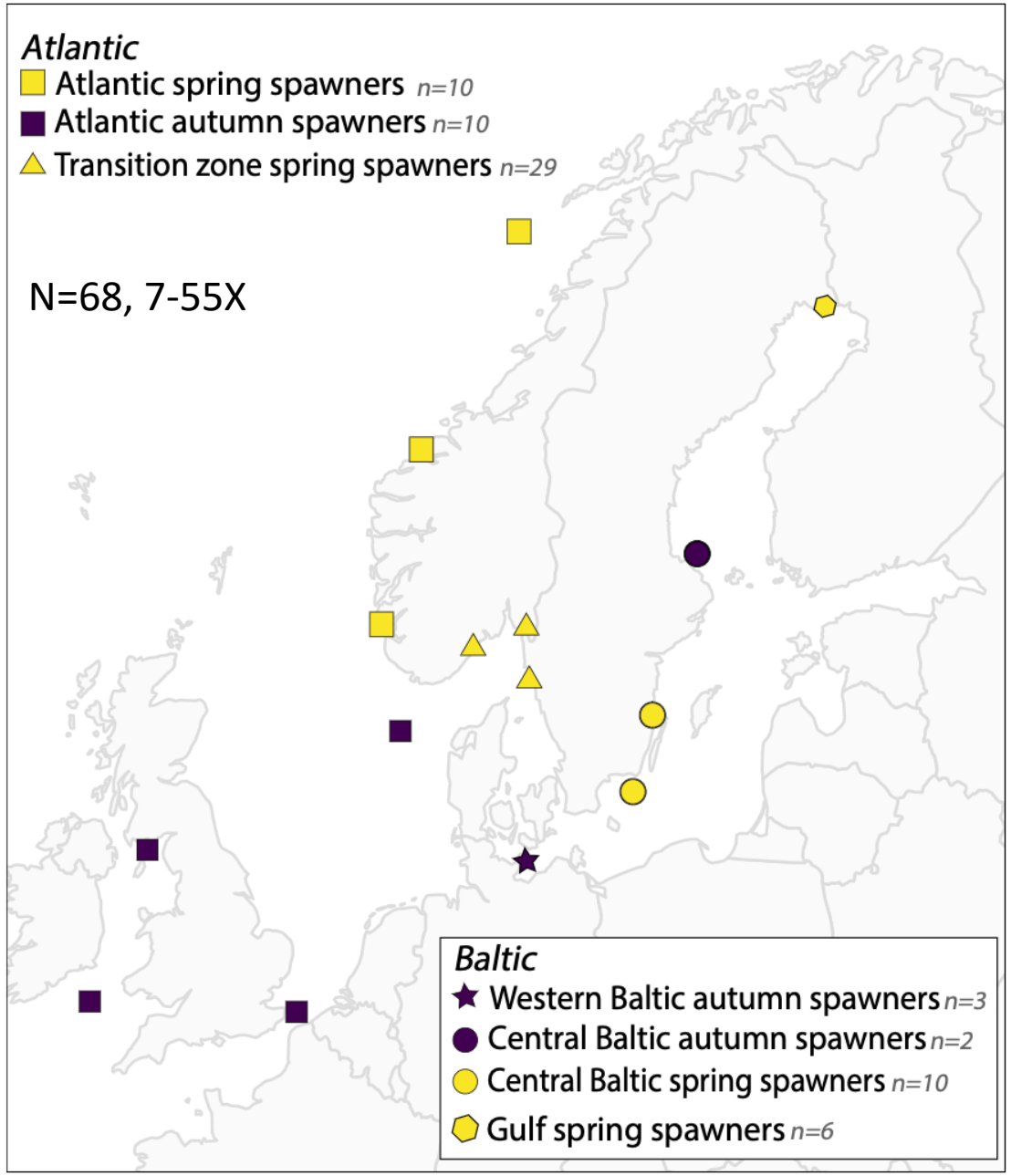

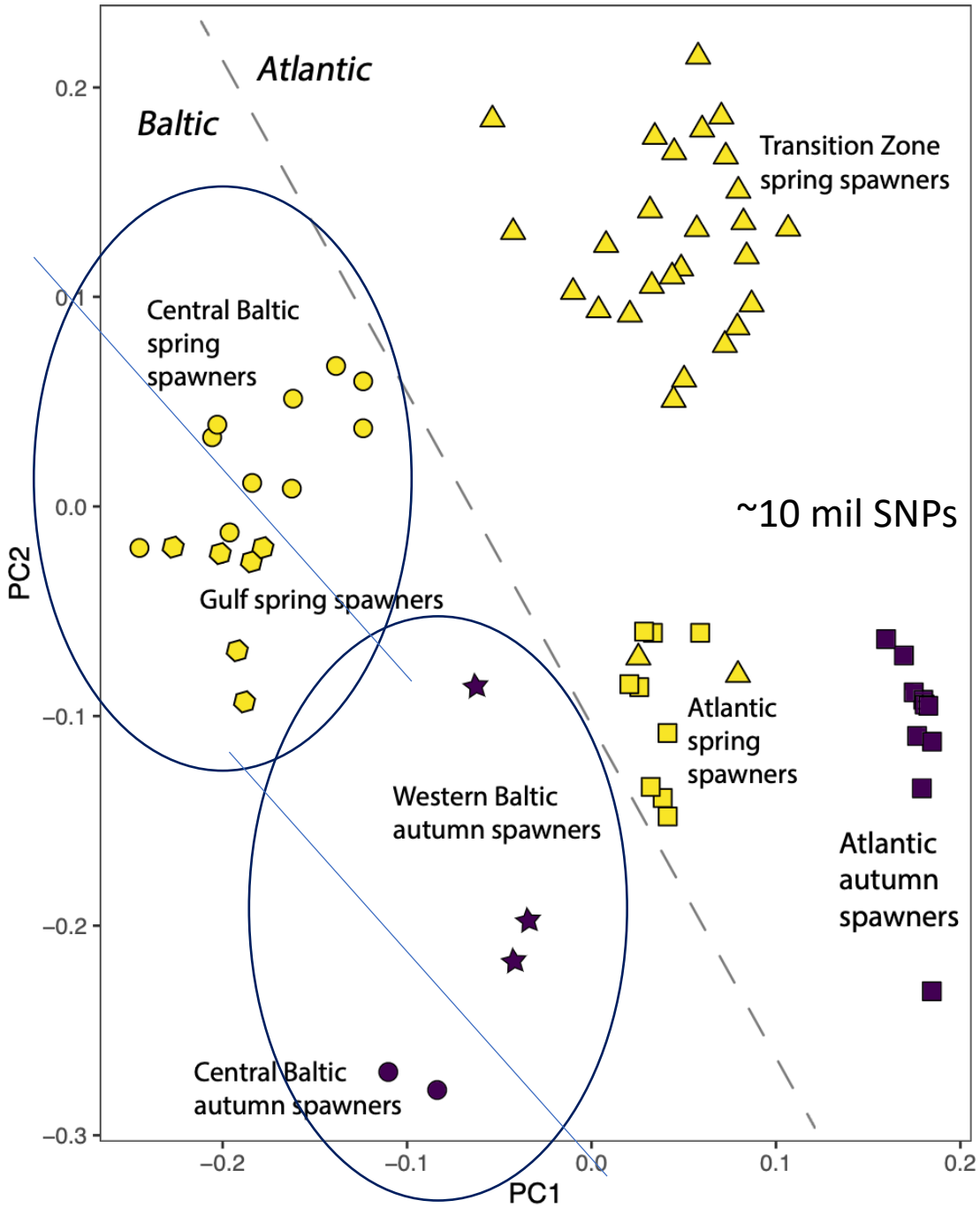

Atmore et al. 2022. *PNAS*

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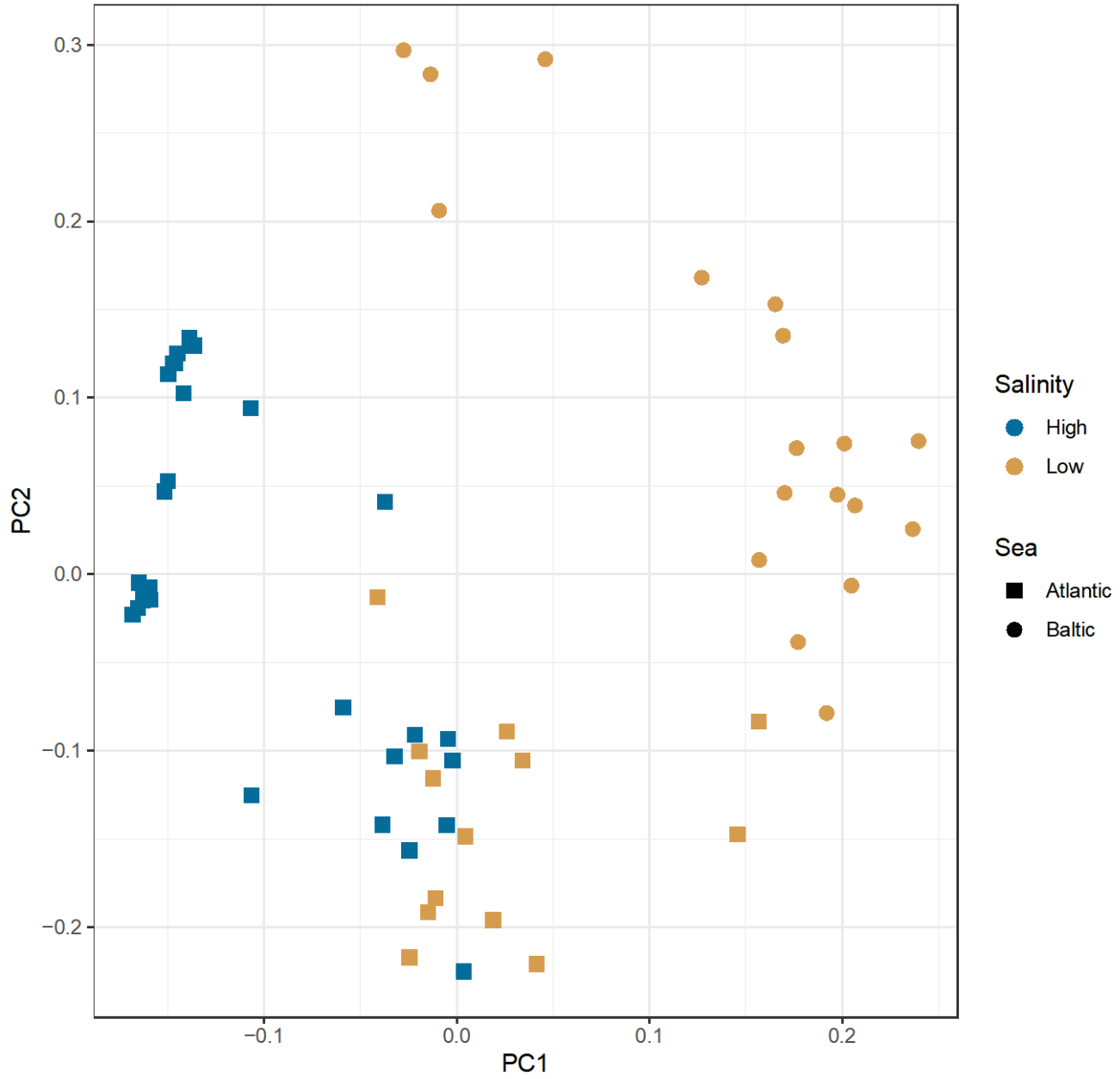
Spawning Season

Atlantic vs Baltic ecotype (chr12)

Salinity Adaptation



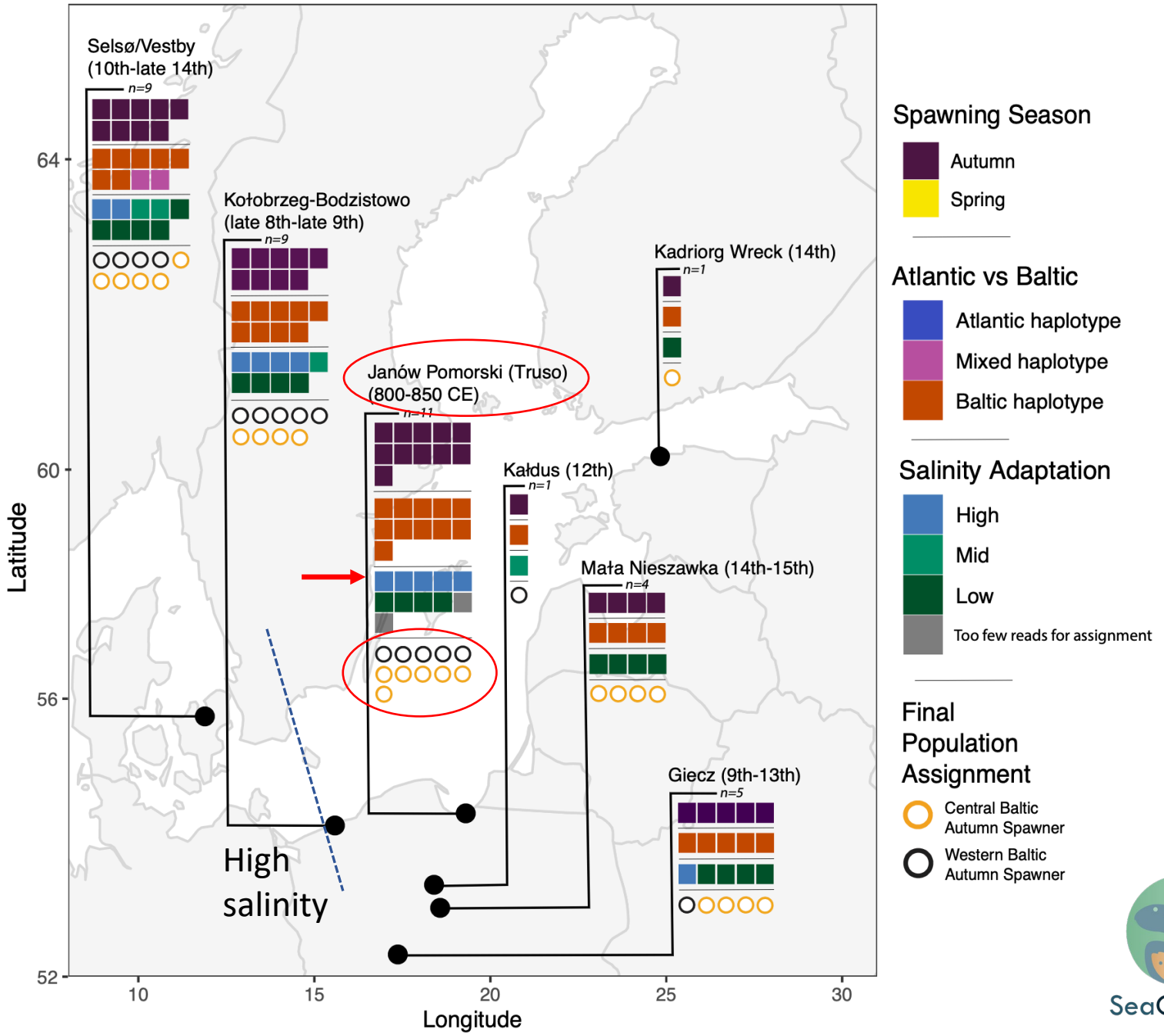
Atmore et al. 2022. *PNAS*

Origin of Archaeological Specimens

All autumn spawning

All Baltic herring

Mixed salinity adaptations – Exploitation shift



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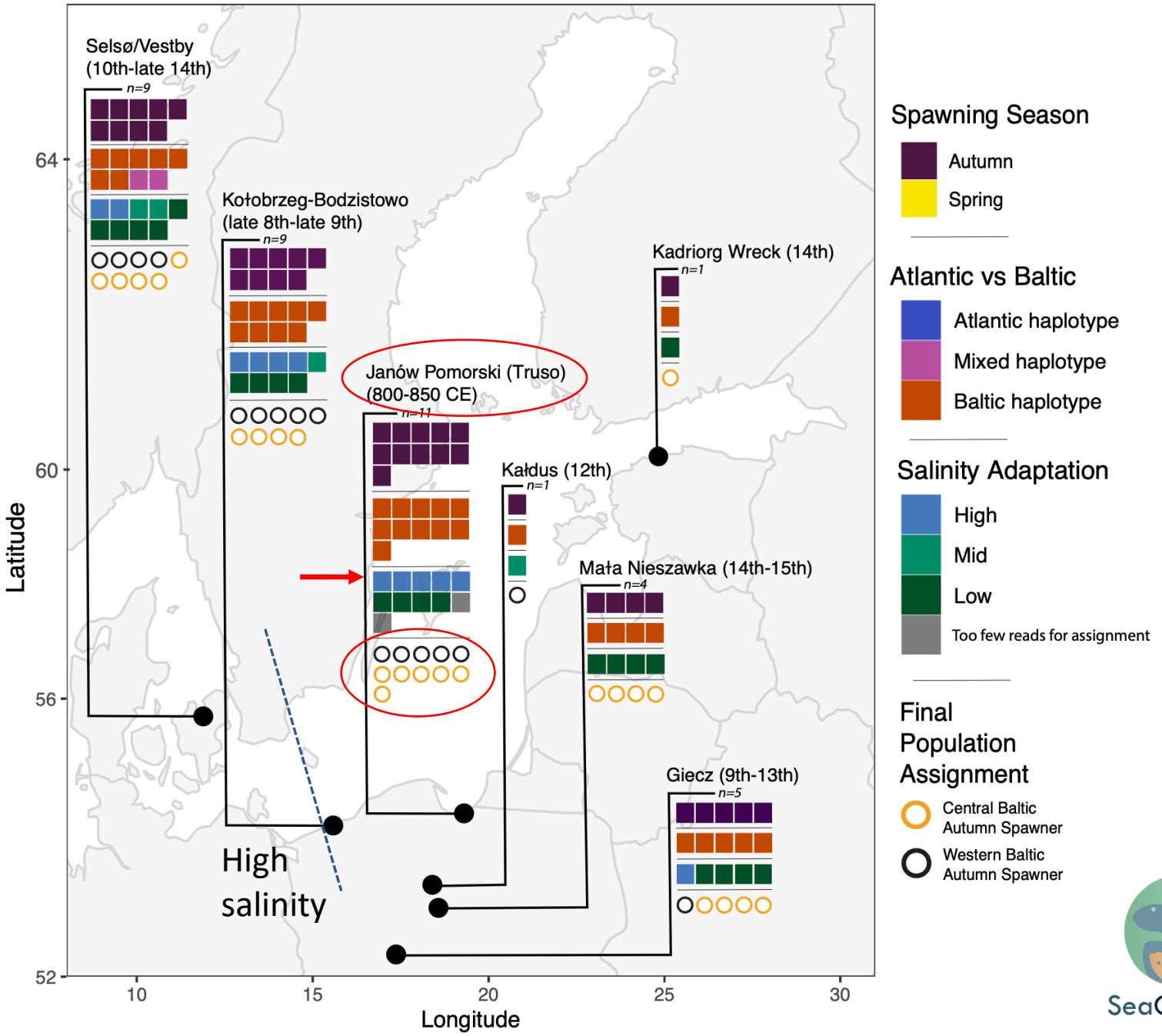
Atmore et al. 2022. *PNAS*

Origin of Archaeological Specimens

Commercial exploitation started during the Viking Age

(at least 400 years earlier than previously understood)



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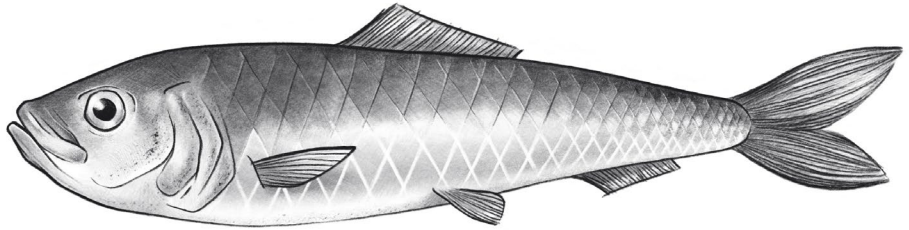

What has been the impact of long-term exploitation on the Baltic herring?

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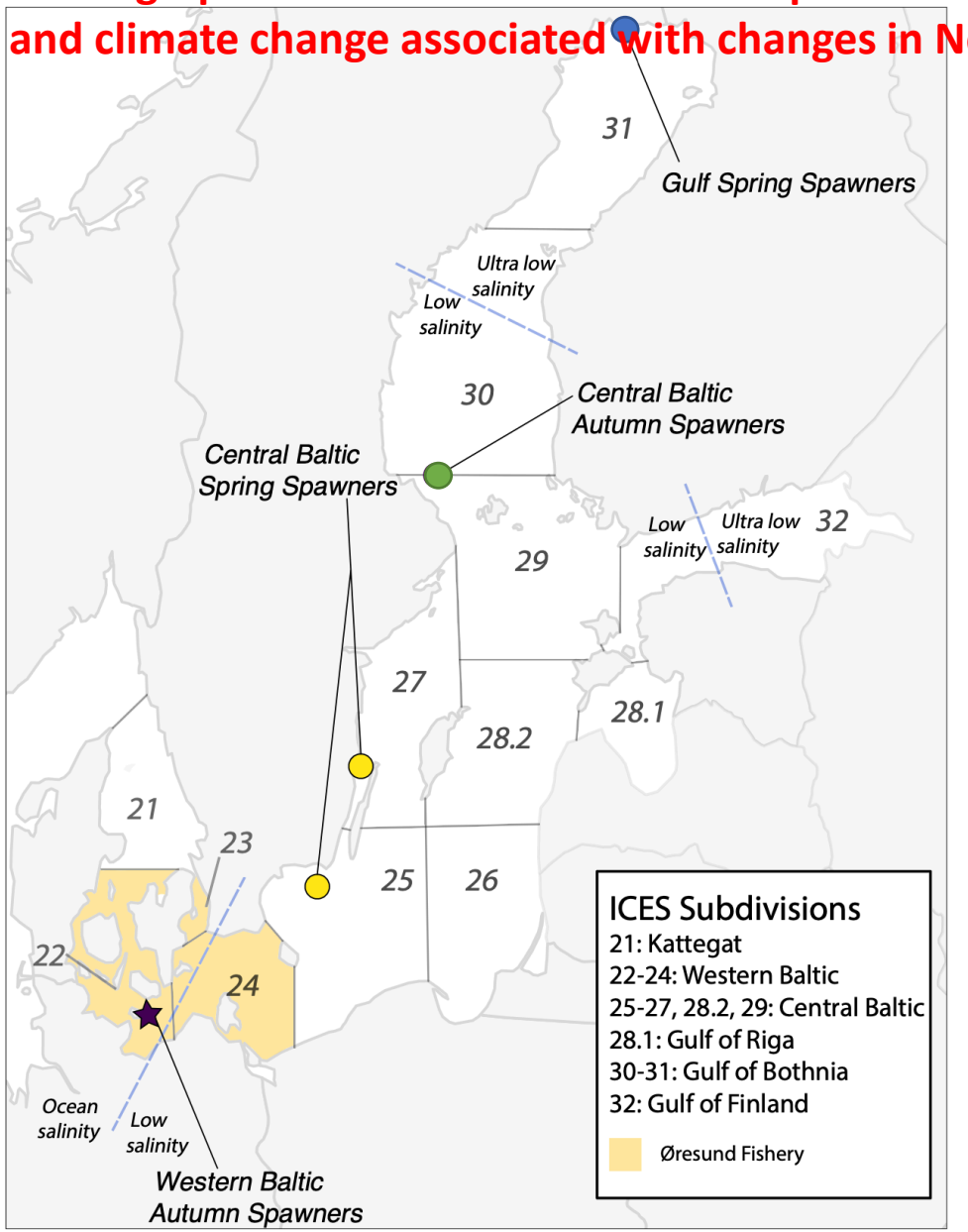
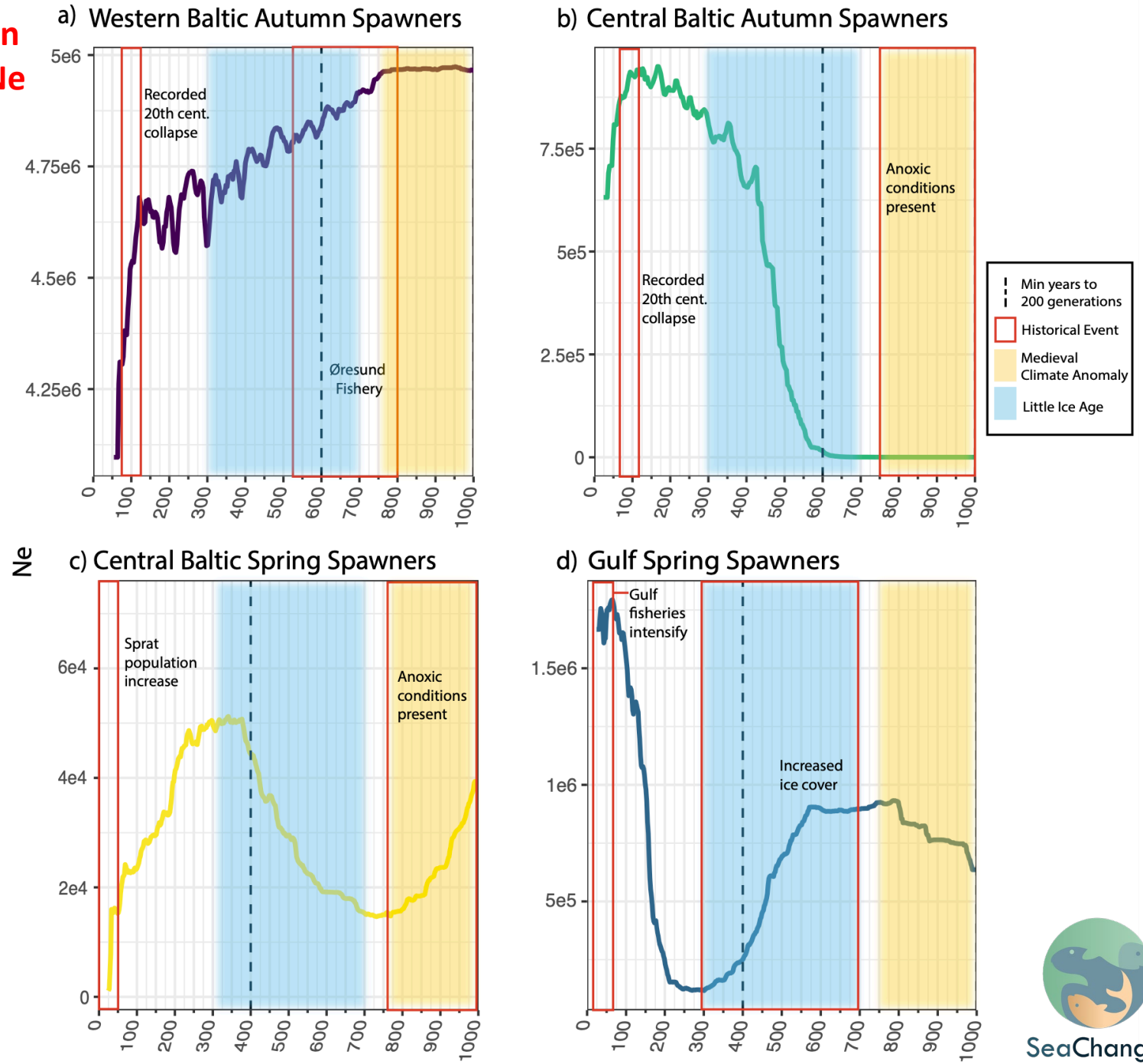
Demographic trends indicate human exploitation and climate change associated with changes in Ne





Atmore et al. 2022. *PNAS*

gone software: Santiago et al. 2020. *Mol. Bio. and Evo.*

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Main takeaways:

1. Commercial fishery started in the Viking Age
2. Demographic independence and differential stock responses to climate change
3. Serial exploitation consistent with classic patterns of resource depletion

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SUSTAINABILITY

Baltic Sea fish stocks at risk of 'commercial extinction'

WRITTEN BY
OCEANOGRAPHIC STAFF

CAMPAIGNERS HAVE CALLED ON FISHERIES MINISTERS TO END THE ANNUAL CYCLE OF BALTIC SEA OVERFISHING OR RISK THE COMMERCIAL EXTINCTION OF CERTAIN STOCKS.

The call has come in response to reports on Baltic fish stocks published today by the International Council for the Exploration of the Sea (ICES).

Input on management:

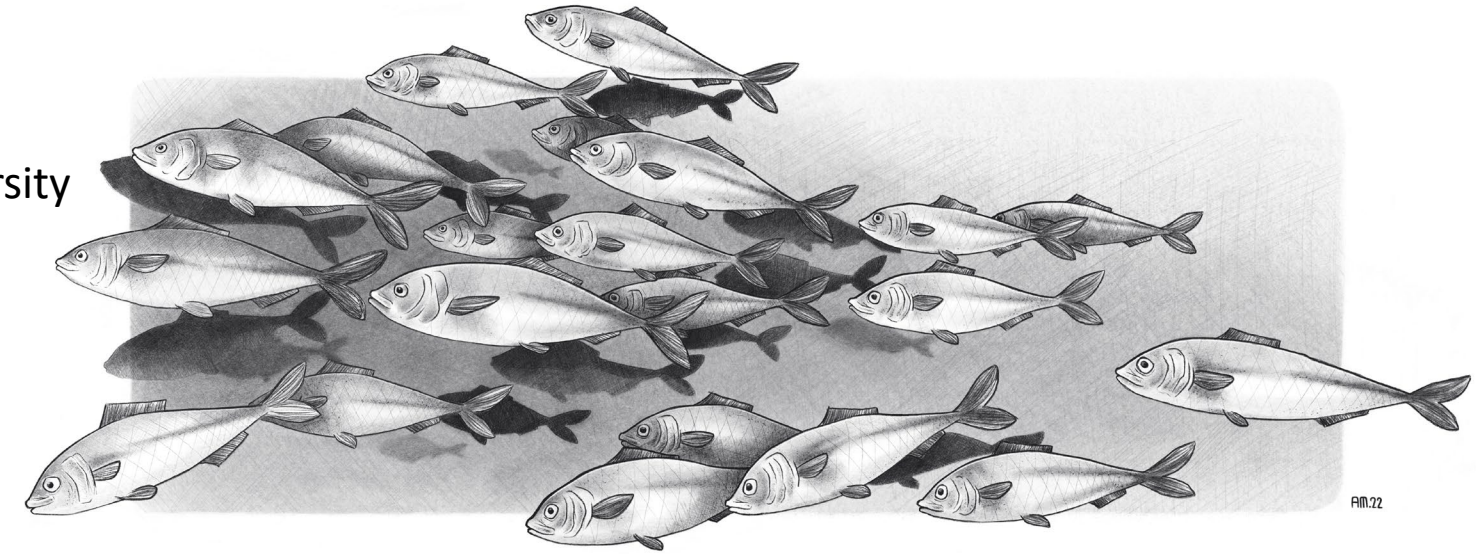
1. Warning not to repeat historical patterns (GSS)
2. Demographic independenceand differential impacts of climate change illustrate necessity of managing biological populations
3. Fish stocks recover quickly with good environmental conditions and low fishing pressure

Herring artwork by Alberto Marcías

Thank you!

Bastiaan Star, University of Oslo
James H. Barrett, NTNU
Daniel Makowiecki, Nicolaus Copernicus University
Lourdes Martínez-García, University of Oslo
Lembi Lõugas, Tallinn University
Carl André, University of Gothenburg

Archaeogenomics Group @ UiO



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