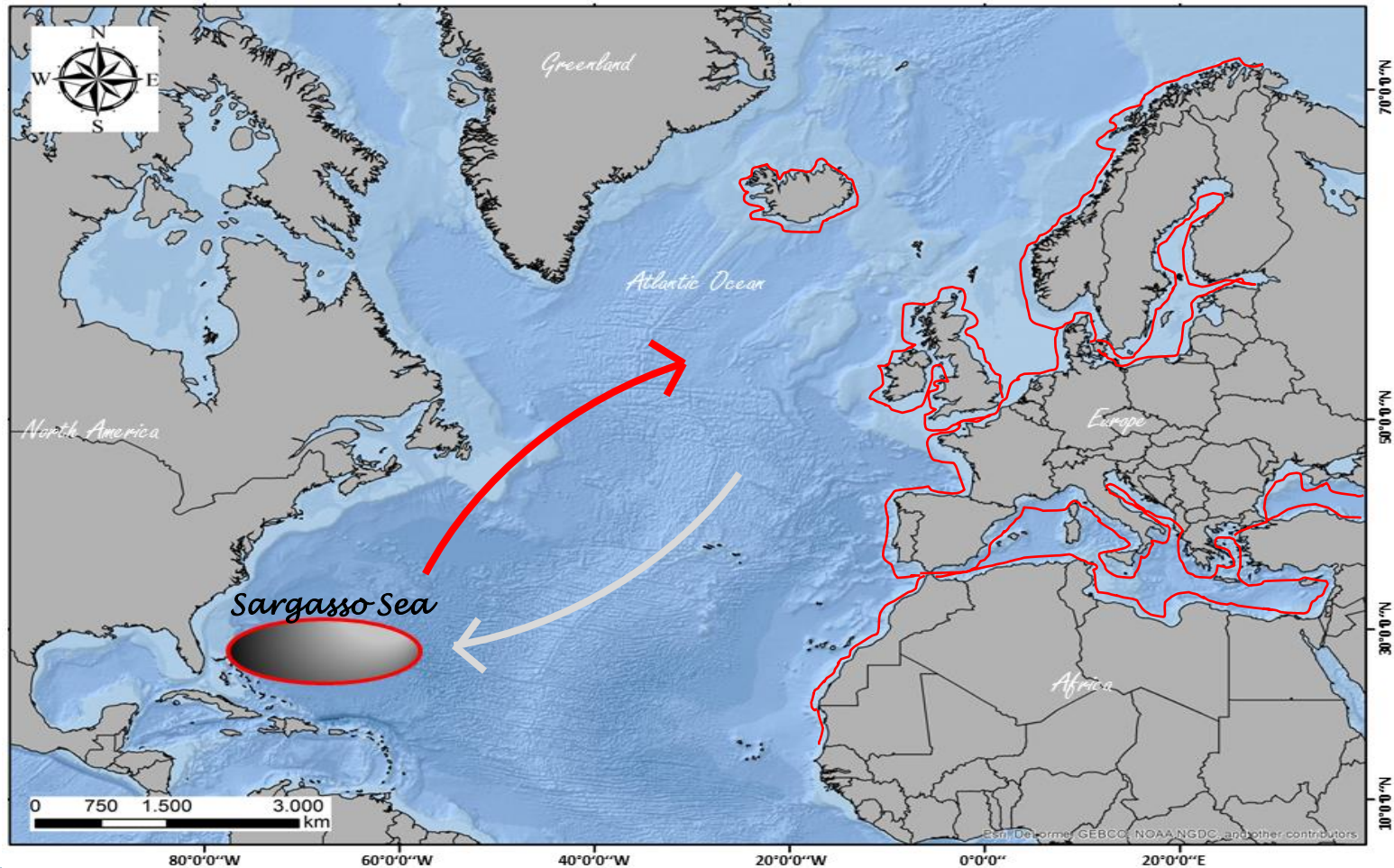


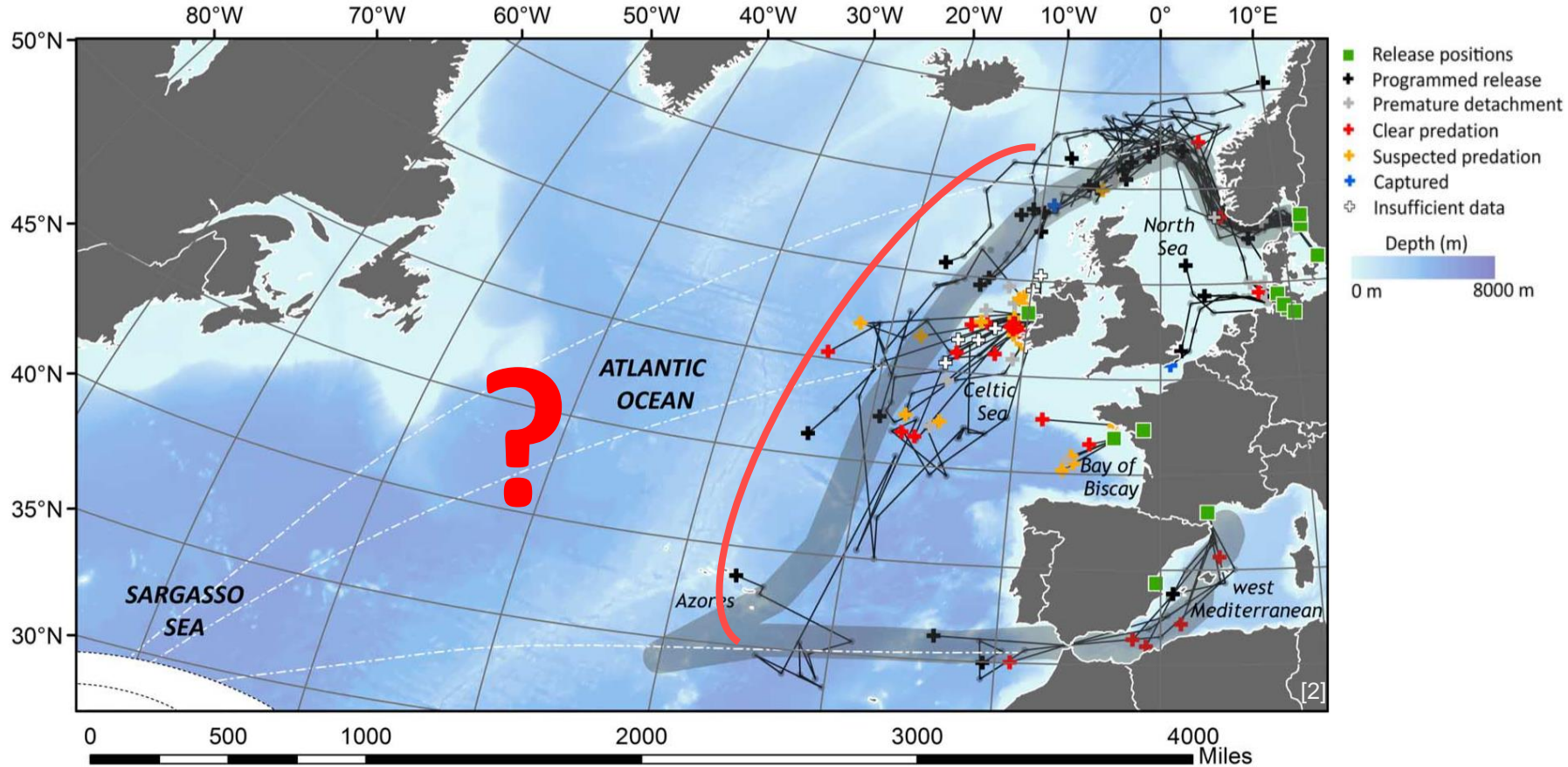
Preliminary results from a coastal stocking experiment indicate life-history effects & stocking site fidelity in European eels (*Anguilla anguilla*)

Laura Wichmann, Malte Dorow, Jens Frankowski, Björn Kullmann, Thomas
Schaarschmidt & Ralf Thiel

Life circle of *Anguilla anguilla*



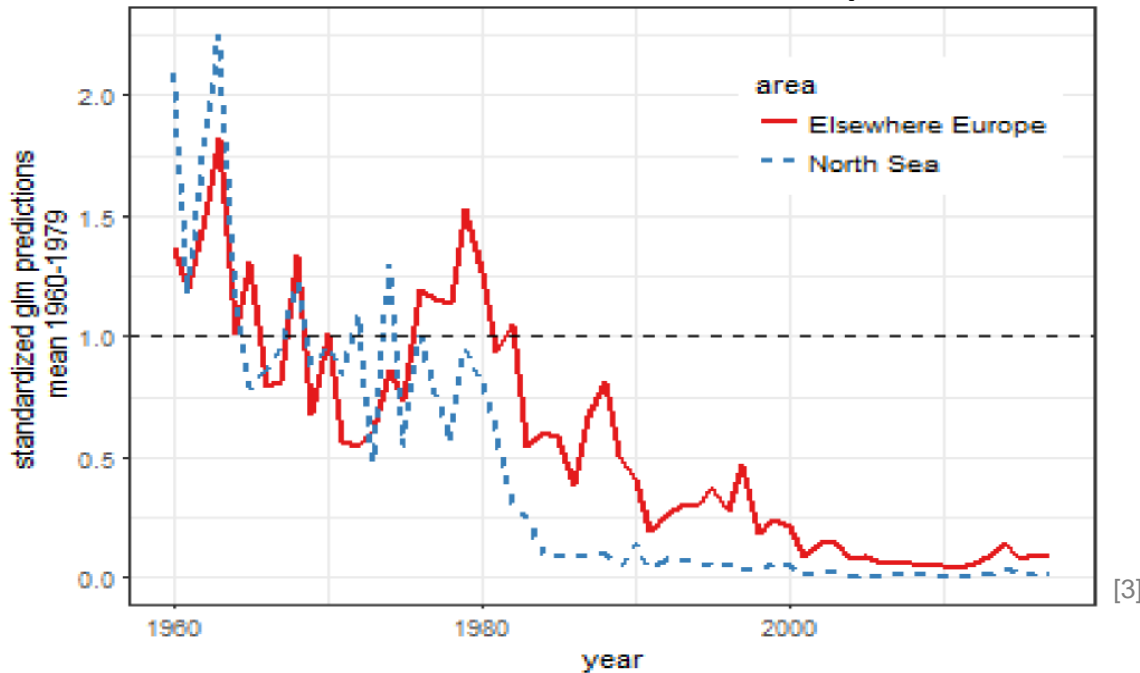
Life circle of *Anguilla anguilla*



Stock situation

The European eel – an endangered species!!!

Glass eel recruitment in Europe



Decline of juvenile eel stock since 1970s by 90 – 99 %

Stagnates at historical low levels^[3]

ICES declared in 1999: stock is „outside safe biological limits”^[4]



[3] ICES, 2017b: Report of the Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL), 3–10 October 2017, Kavala, Greece. ICES CM 2017/ACOM:15 99 pp.

[4] ICES, 1998: Cooperative Research Report, 13-22 May, 20-29 October 1998, Copenhagen, Denmark, No. 229 – Part 2, 446 pp & © ICES

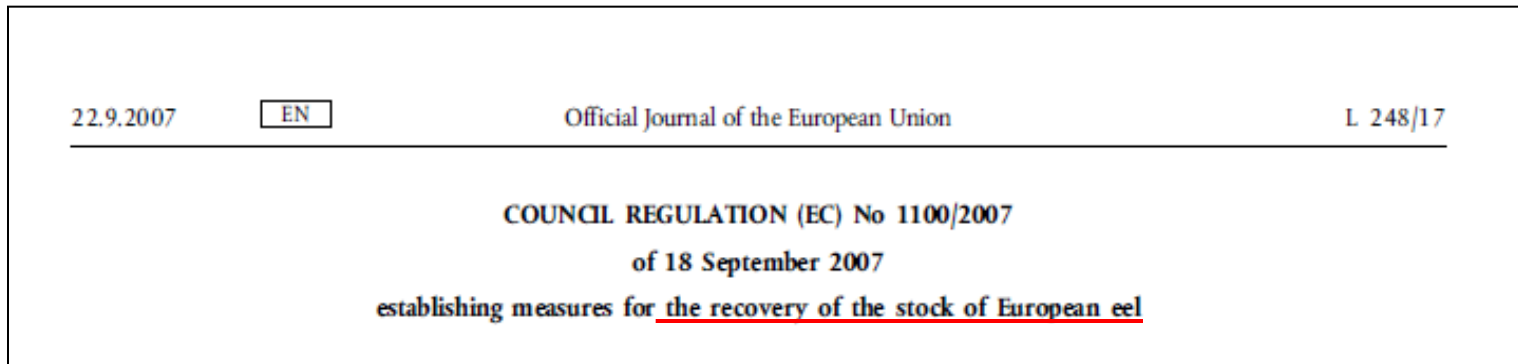
International protection, regulation & management



2008: “Critically endangered”^[5]



2008 listed in the Washington CITES
on Appendix II^[6]



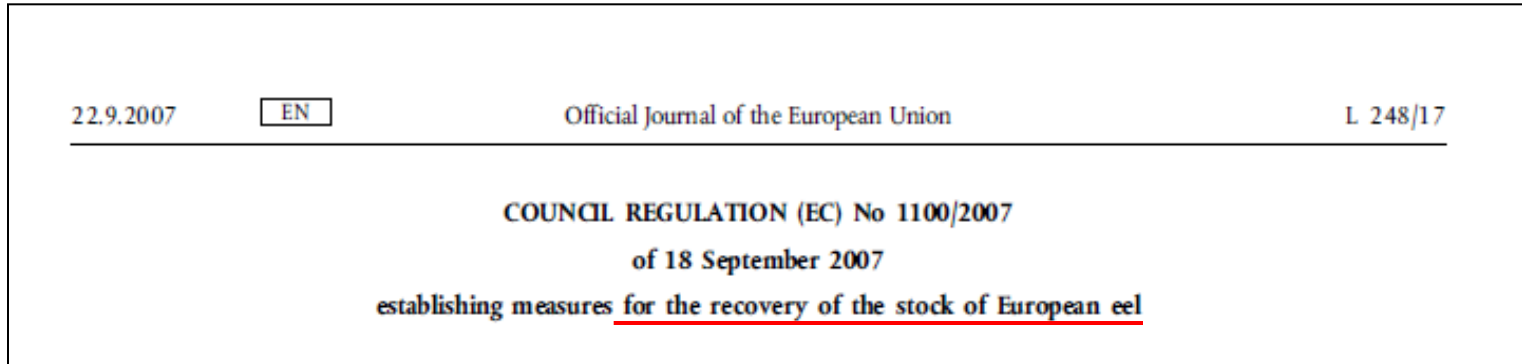
[7]

[5] Jacoby & Gollock, 2014: The IUCN Red List of Threatened Species & <http://www.iucnredlist.org/details/60344/0>, 24.05.2018

[6] <https://www.cites.org/eng/disc/text.php#II>; 07.08.2018

[7] EC, 2007: Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel

International protection, regulation & management



EU requested member states to elaborate **Eel Management Plans (EMP)**

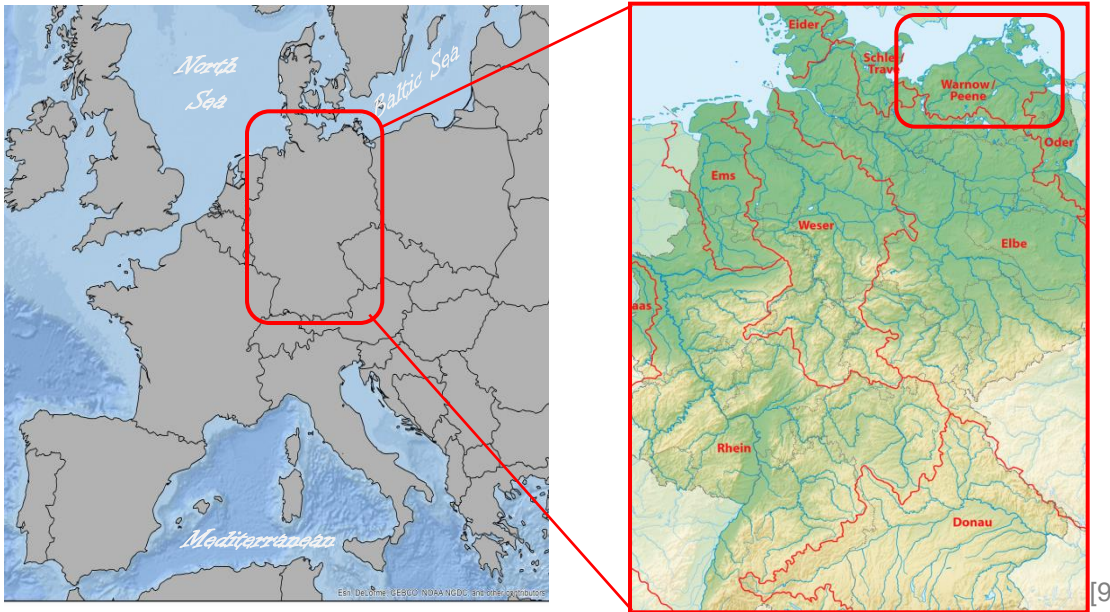
Objective: sustainable attainment of **40 % silver eel escapement** (biomass)^[7]

Measures: Most of these plans include monitoring, **stocking in inland waters** and reduction of mortality^[8]

[7] EC, 2007: Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel

[8] Aalbewirtschaftungspläne der deutschen Länder (Eel management plans of Germany), 2008: zur Umsetzung der EG – Verordnung Nr. 1100/2007

International protection, regulation & management

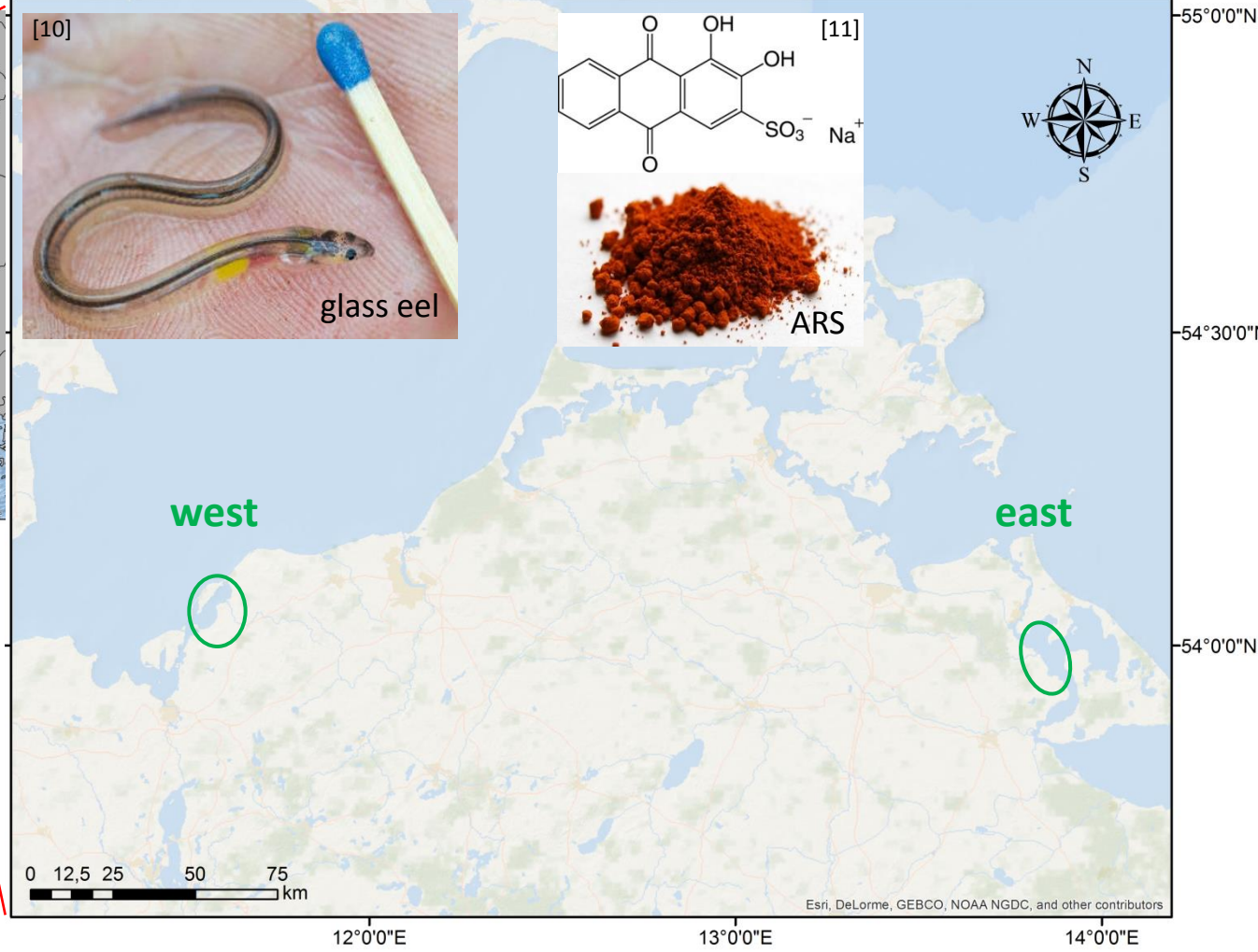
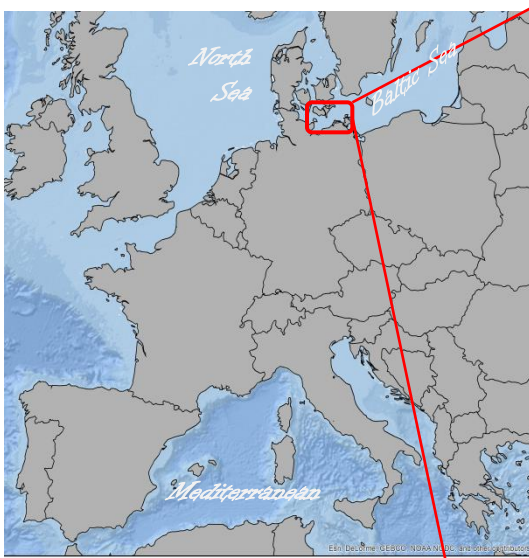


One EMP per eel river basin = 9

Institute of Fisheries is responsible for Warnow/Peene

Until 2014, eel stocking in freshwaters, only

Is stocking in coastal waters also a management option?

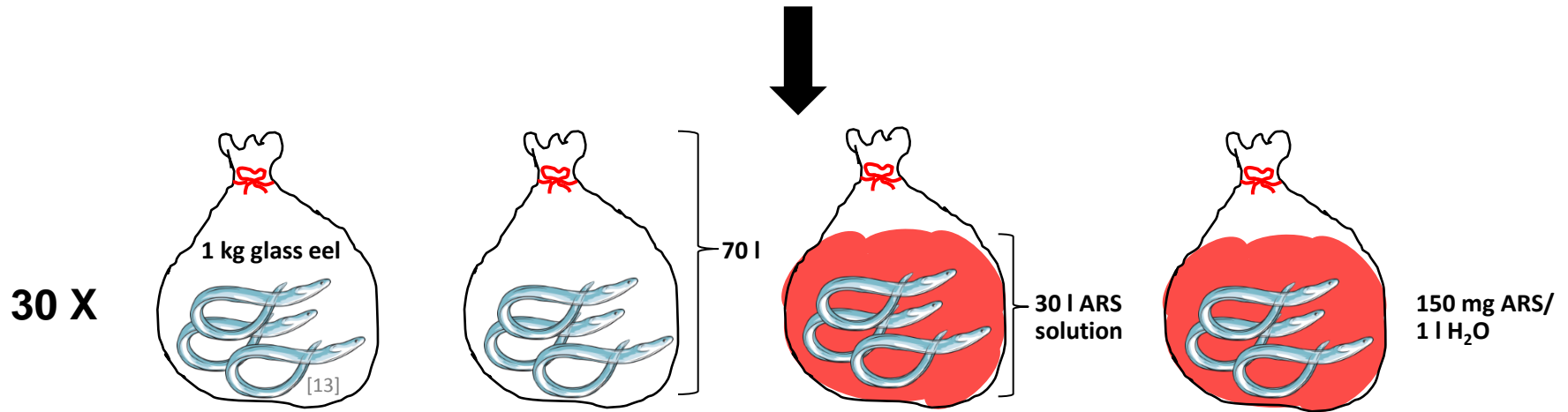


- 1 Mio glass eels
- 2 stocking areas
- 2014 – 2016
- Marked with alizarin red S (ARS)^[12]

[10] <http://www.ostsee-zeitung.de/Mecklenburg/Wismar/Wilde-Glasaale-in-Bach-entdeckt>; 07.05.2018
 [11] <https://upload.wikimedia.org/wikipedia/commons/thumb/1/1e/Alizarin-sample.jpg/1280px-Alizarin-sample.jpg>; 06.04.2018
 [12] Dorow & Schaarschmidt, 2015: Besatz mit Glasaaalen in Küstengewässern 2015. Fischerei & Fischmarkt in MV 1: 64-65.

Marking & stocking in 2014 – 2016

60 kg glass eel per stocking area per year^[12]



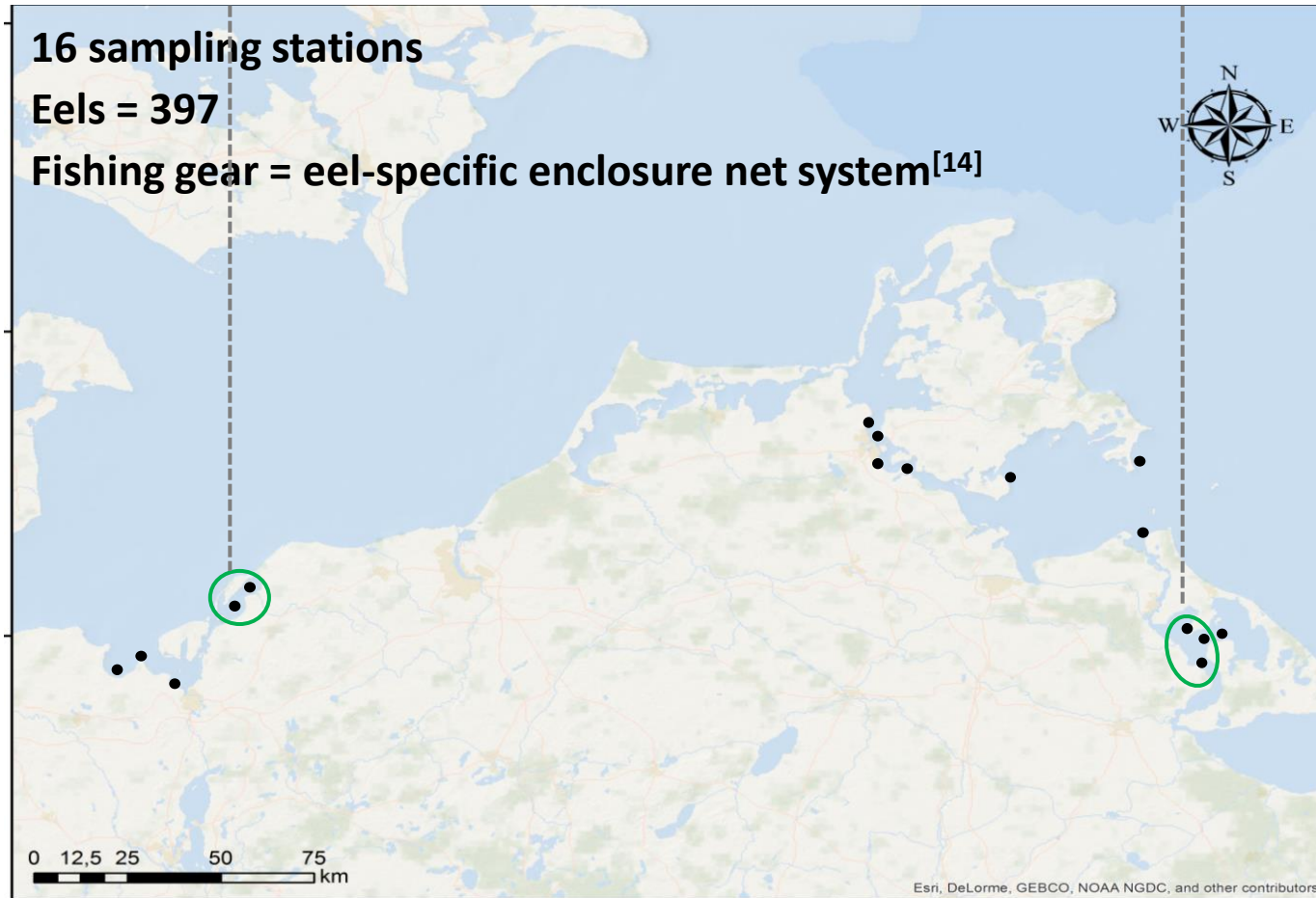
Exposure time: 3 – 4 h & transport to both stocking areas



[12] Dorow & Schaarschmidt, 2015: Besatz mit Glasaalen in Küstengewässern 2015. Fischerei & Fischmarkt in MV 1: 64-65.

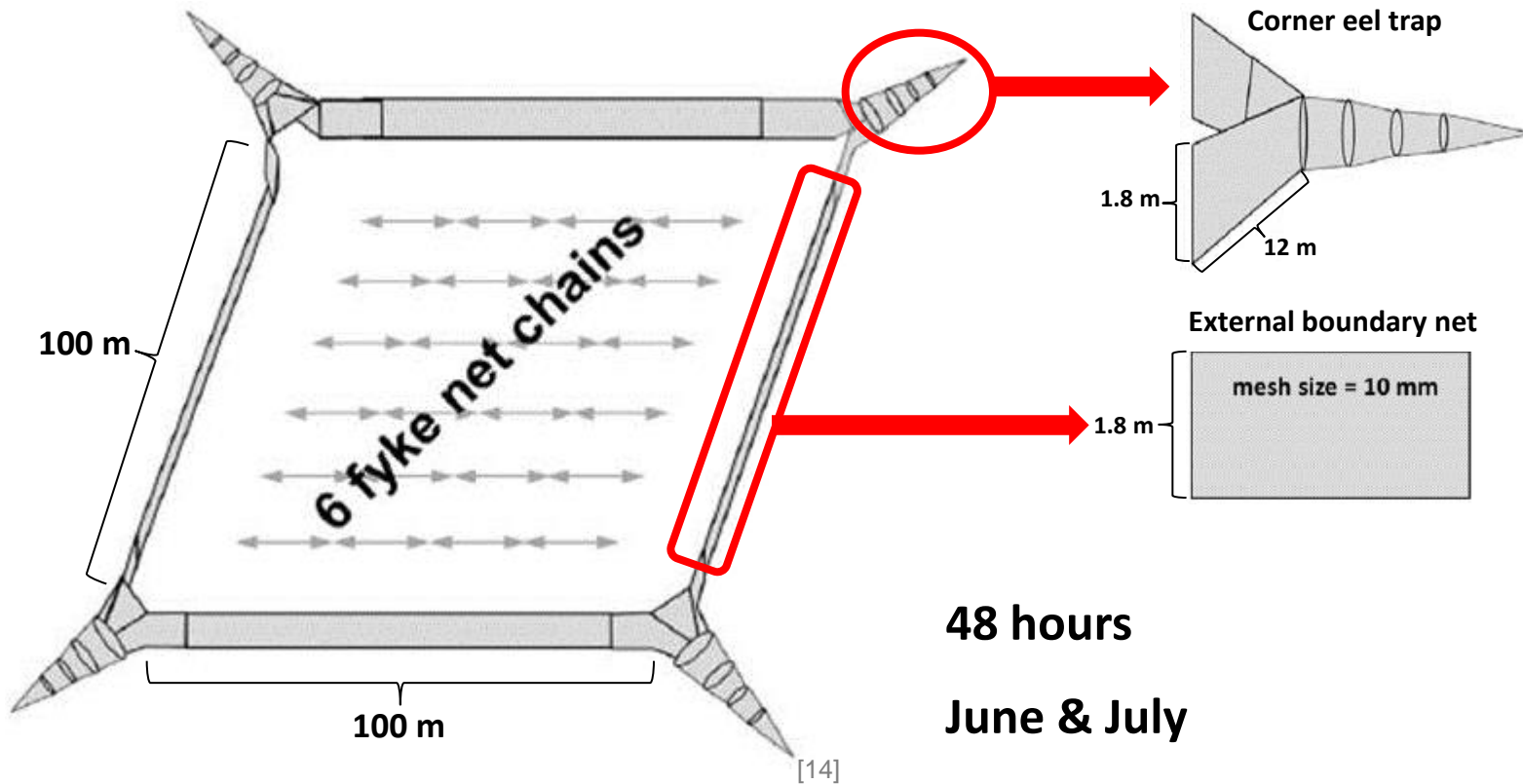
[13] https://www.pressherald.com/interactive/lifecycle_and_harvest_of_maine_elvers_interactive, 27.07.2018

Sampling in 2017

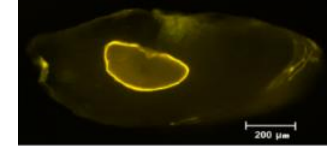


[14] Ubl & Dorow, 2015: An novel enclosure approach to assessing yellow eel (*Anguilla anguilla*) density in non-tidal coastal waters. Fisheries Research 161. pp 57-63

Fishing gear for sampling in 2017



First Results



16 sampling stations

Eels = 397

Fishing gear = eel-specific enclosure net system^[14]



Stocking site fidelity(?)

0 12,5 25 50 75 km

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

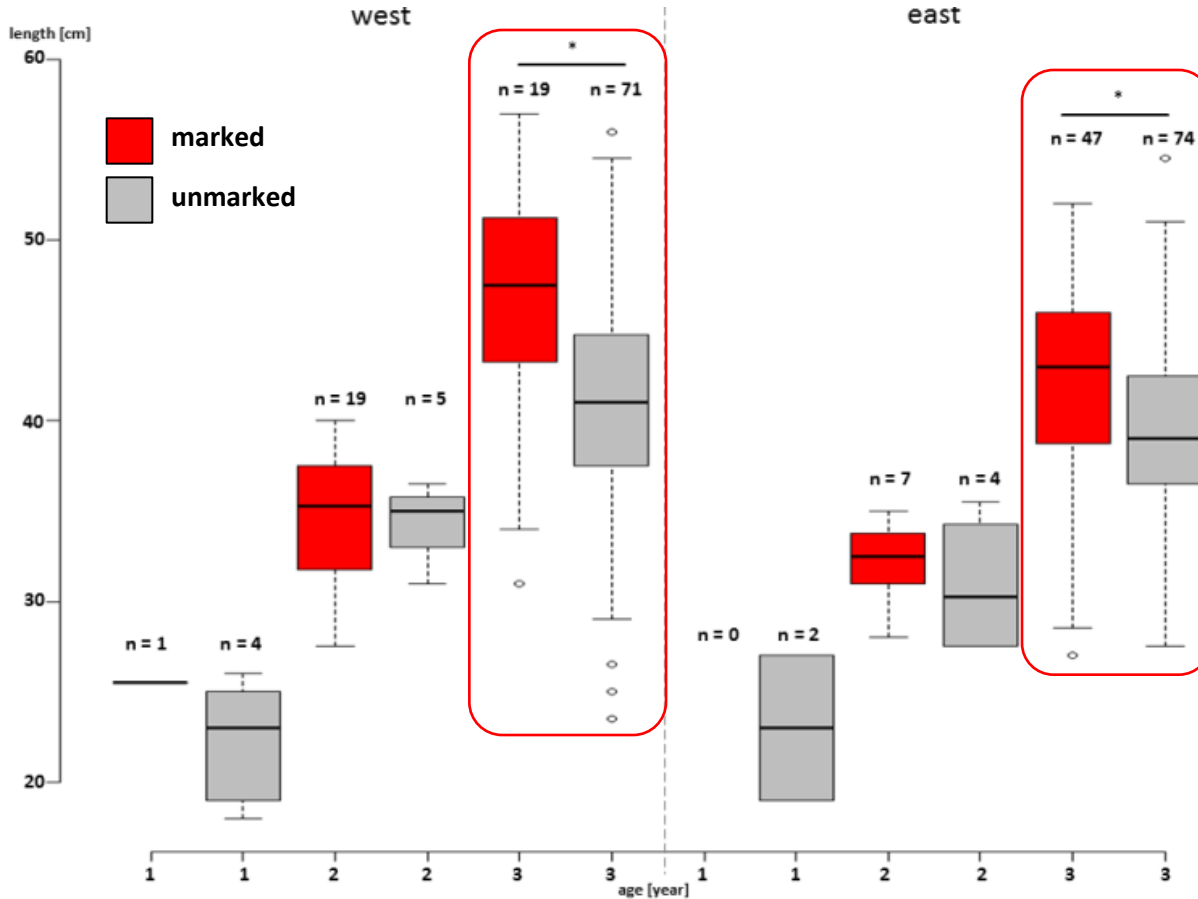
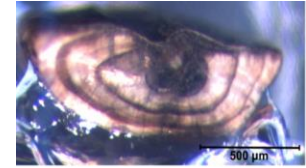
37 % of potential stocked eels (n = 253) were marked

83 % of marked eels were inside of both stocking areas

Observed **distribution range of marked eels: ~ 35 km**

Expanding study area in 2018 & 2019

First Results



Marked eels were significantly larger than unmarked conspecifics (age 3)

Different **life - history effects** of marked and unmarked eels?

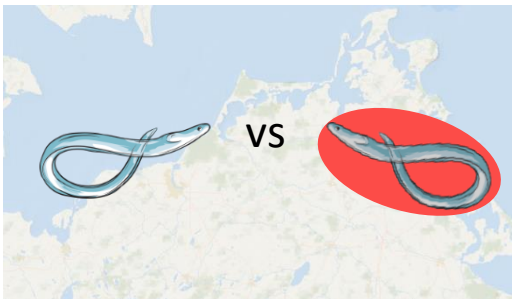
Similar results in European^[15] and American eels^[16]

[15] Lin et al., 2007: Growth differences between naturally recruited & stocked European eel from different habitats in Lithuania. Journal of fish Biology 71: 1773–1787.

[16] Stacey et al., 2015: A caution for conservation stocking as an approach for recovering Atlantic eels. Aquatic Conservation: Marine & Freshwater Ecosystems 25 (4): 569–580.

Further Studies/Outlook

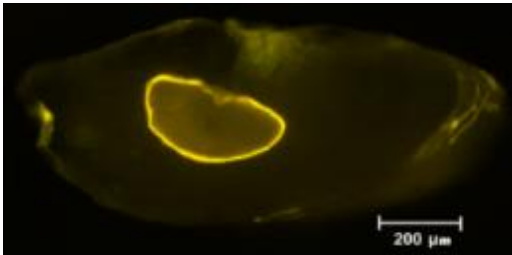
1.



Assessment and advice on glass eel stocking in coastal waters as a management option

- Additional parameter: sex ratio, health conditions (k, HSI), parasite infection (*A. crassus*) etc.
- Calculation and modelling of eel density and silver eel escapement

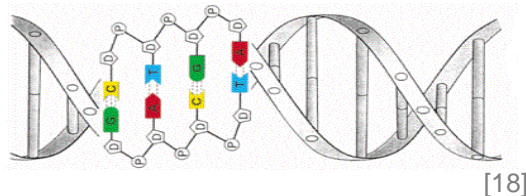
2.



Bioaccumulation potential of ARS in eel muscle tissue

- Risk assessment authority: use of ARS → not harmless^[17]
- Detection of ARS in muscle tissue depending on body length

3.



Genetical differences in ecotypes in relation to habitat preferences (salt – and freshwater)

- Marker genes selected homologous to American eel^[19]

[18]

[17] Bundesinstitut für Risikobewertung (Risk assessment authority), 2017: Stellungnahme zur Aalmarkierung mit Alizarin-Rot S und Strontiumchlorid, Gesundheitliche Bewertung des BfRs, 5-3520-01-9346217

[18] <http://themen-biologie.blogspot.de/2014/03/allgemeines-uber-die-dna.html>, 22.05.2018

[19] Pavay et al., 2015: RAD Sequencing Highlights Polygenic Discrimination of Habitat Ecotypes in the Panmictic American Eel, Current Biology 25:12, 1666–1671



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG

CeNak
Centrum für Naturkunde 

Mecklenburg
Vorpommern 

Landesforschungsanstalt
für Landwirtschaft und Fischerei

Thank you for your attention



[20]