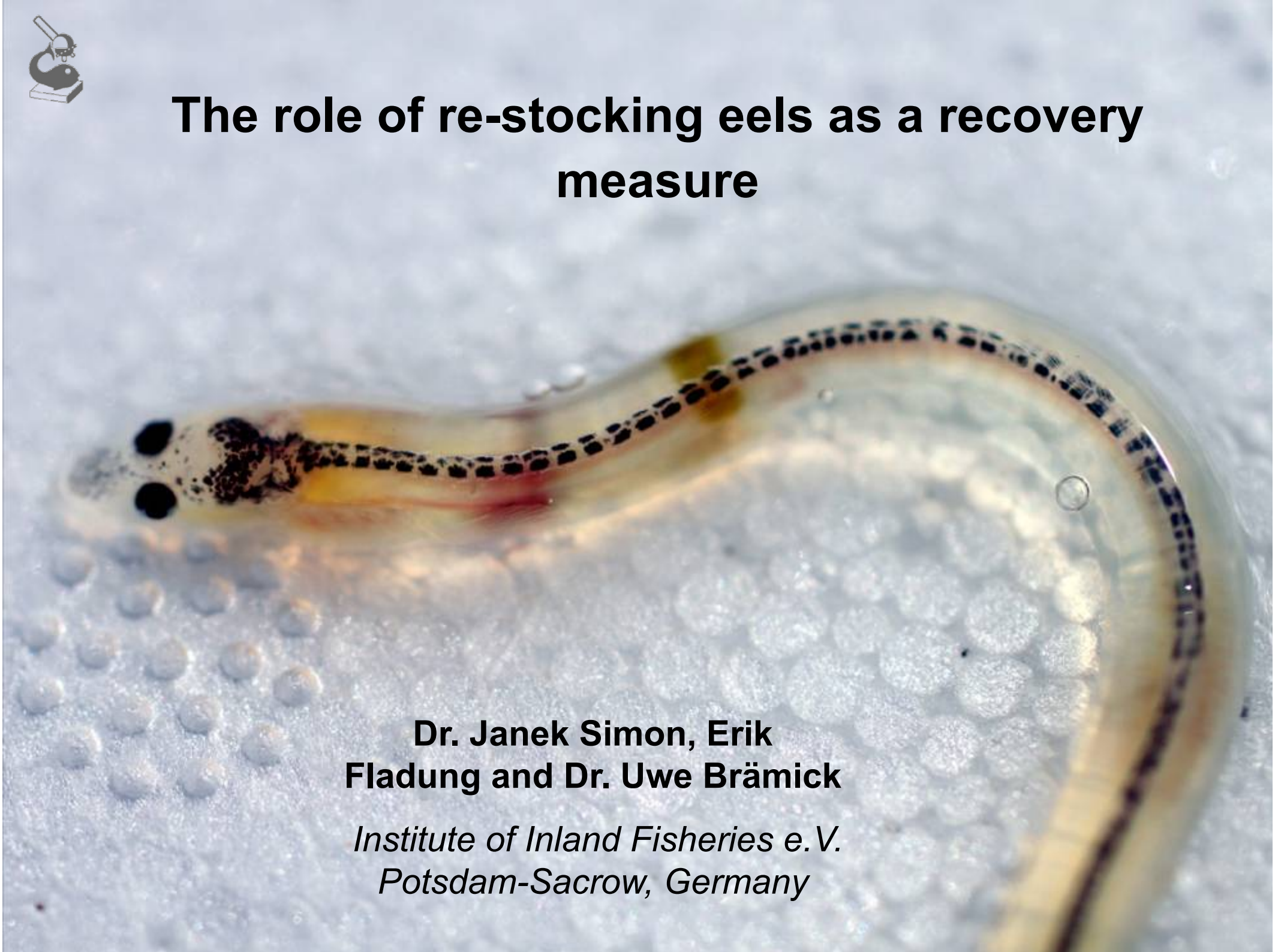
The role of re-stocking eels as a recovery measure



Dr. Janek Simon, Erik Fladung and Dr. Uwe Brämick

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Introduction

⇨ about 55,000 migration obstacles (dams, weirs) exist in Germany (Anonymous 2008)

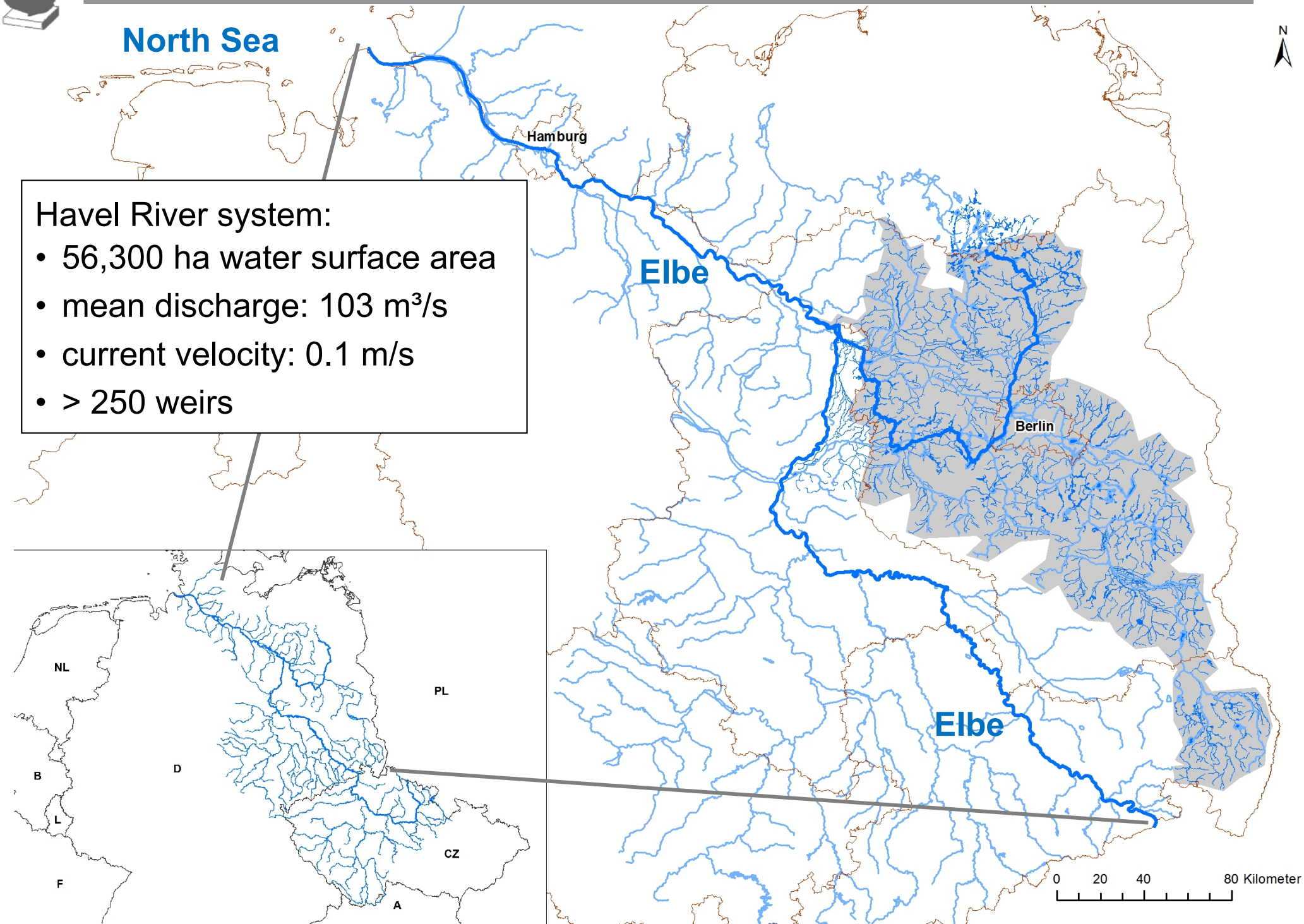
⇨ river regulation detains glass eels from their upstream migration

⇨ re-stocking is essential

Pilot project on eel stock enhancement in the Federal State of Brandenburg

Objective	**Increase silver eel escapement and sustain eel fishery**
Re-stocking volume	35 Mill. glass- & farm sourced eel (2006 – 2013)
Re-stocking value	>7 Mill. € (2006 – 2013)
Funding	50% EFF, 25% federal funds, 25% fishermen/angler

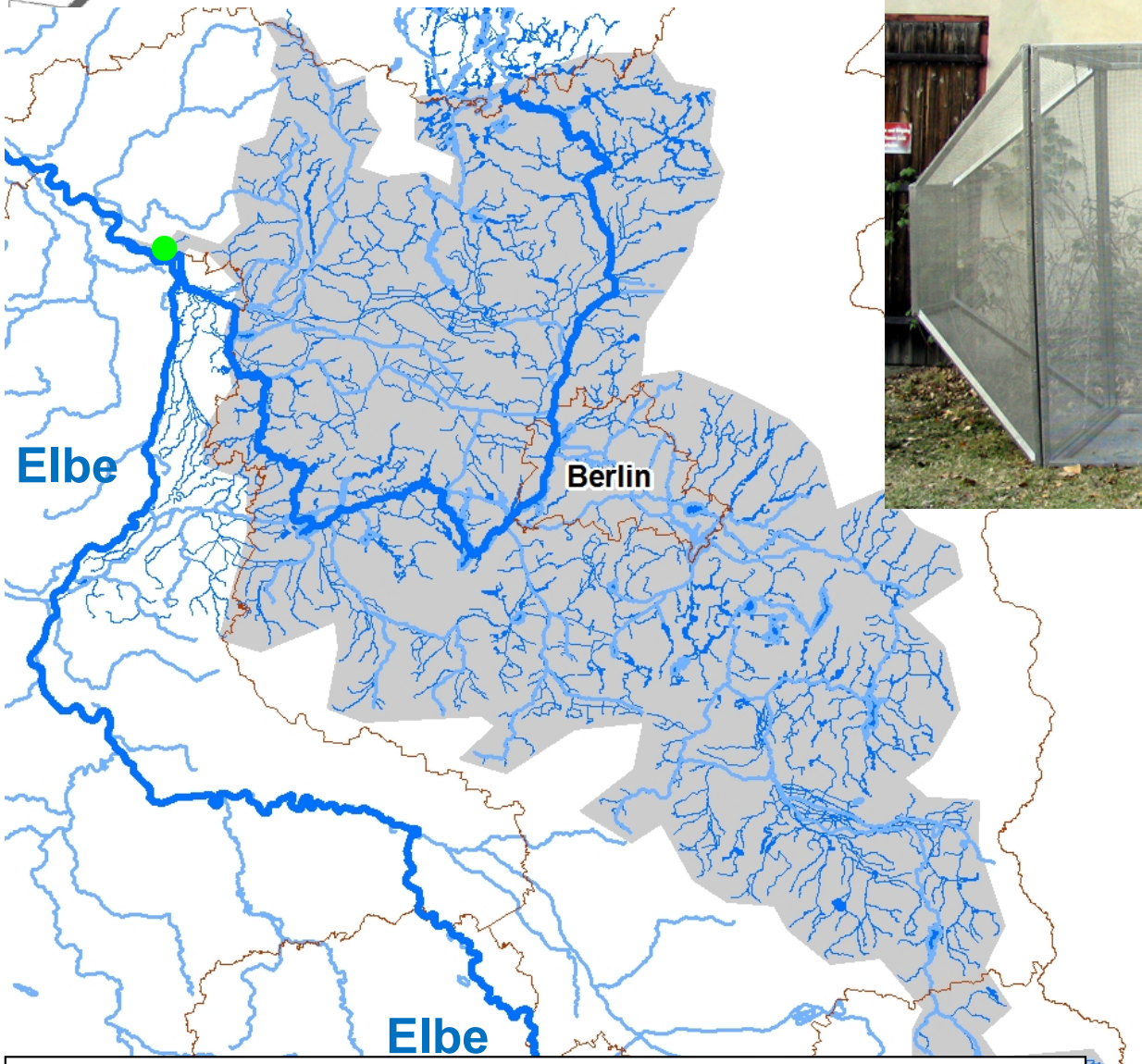
Study area



Havel River system:

- 56,300 ha water surface area
- mean discharge: 103 m³/s
- current velocity: 0.1 m/s
- > 250 weirs

Recruitment – Natural recruitment

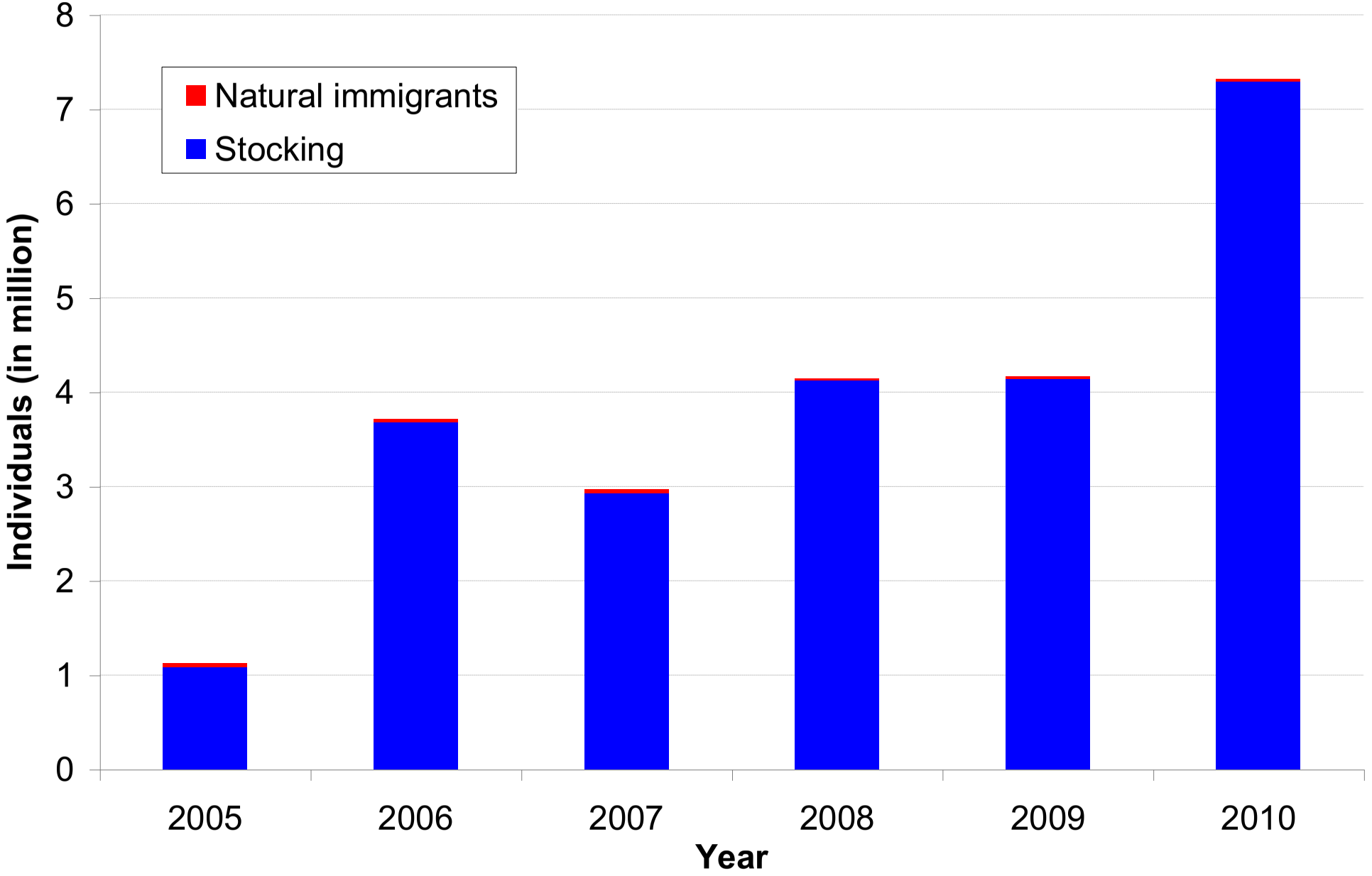


- stainless steel trap (4 mm #)
- operated from May to October over 5 years
- number and total body length of trapped eel

Recruitment – re-stocking

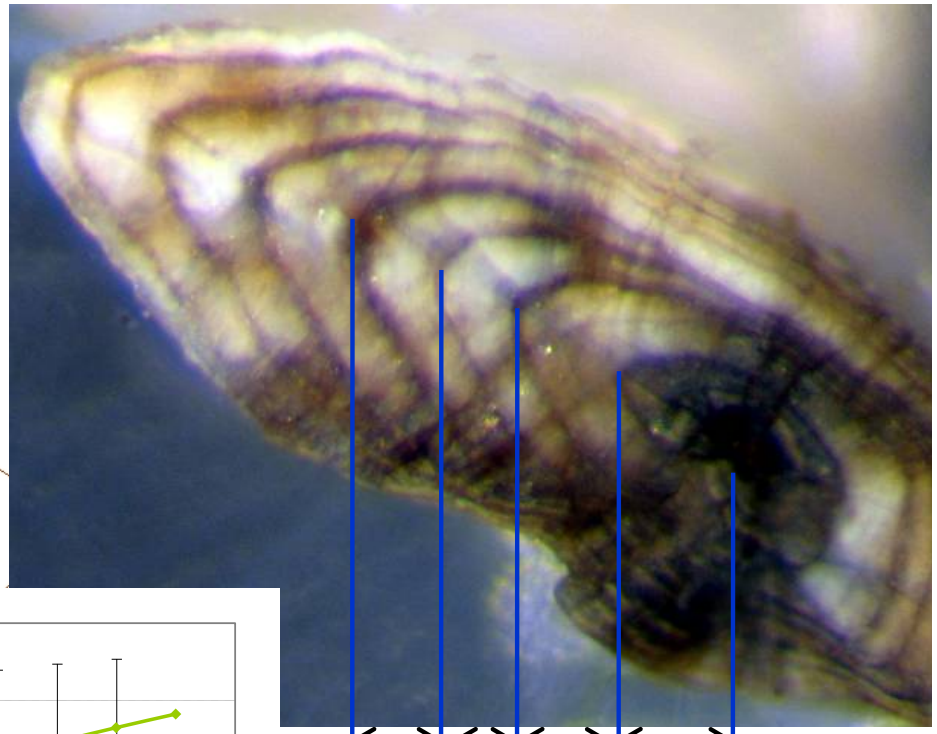
- official re-stocking statistics
- samples at re-stocking events since 2006

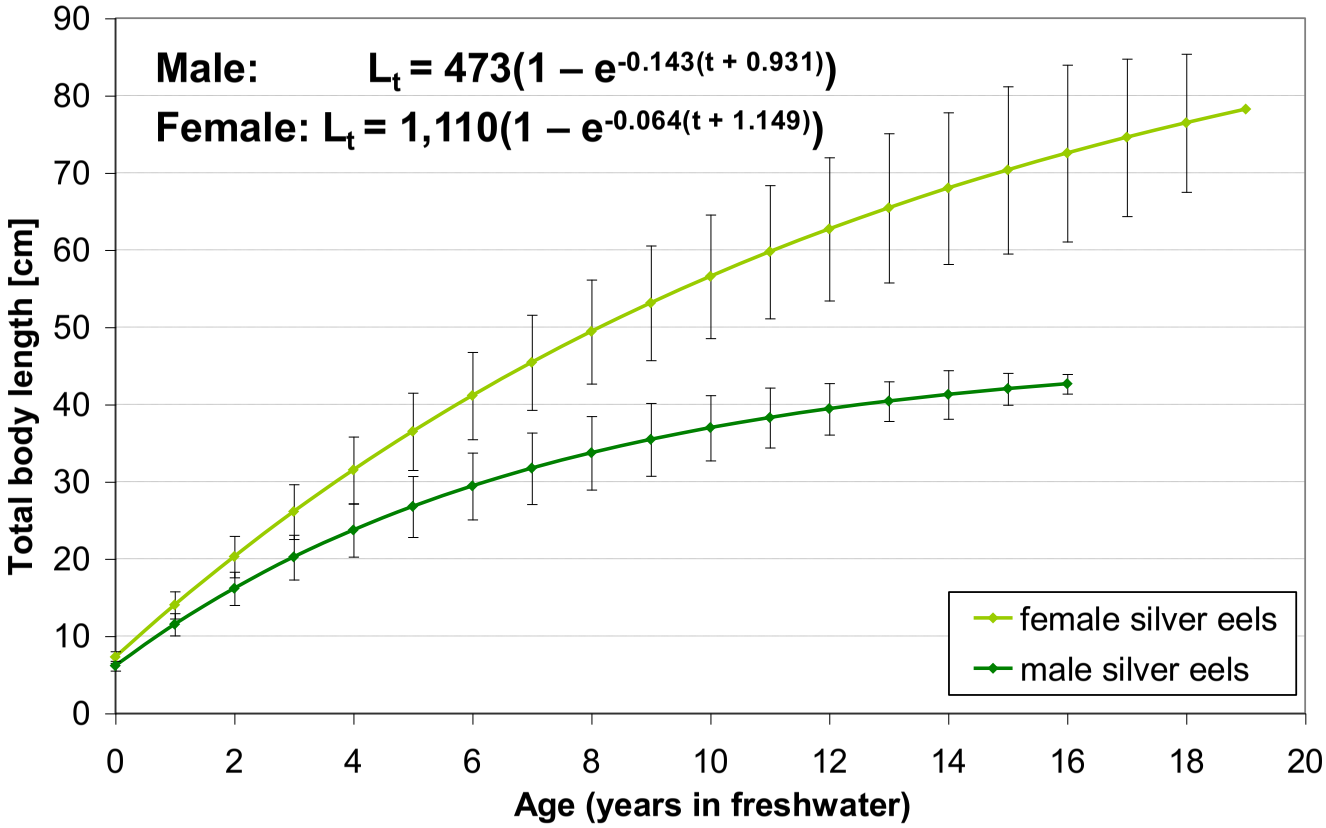
Recruitment



- 96 – 98 % of the respective total annual recruitment are re-stocked eels

Age and growth





- Method after Simon (2015)
- Sagittal otoliths
- Growth back calculation (Francis 1990)
- von Bertalanffy function (von Bertalanffy 1957)

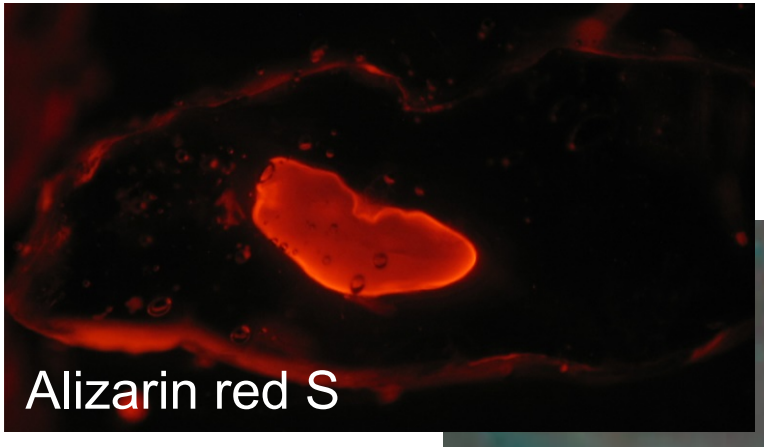
Study to comparing growth and survival of glass and farm sourced eel (Simon et al. 2013, Simon & Dörner 2014):

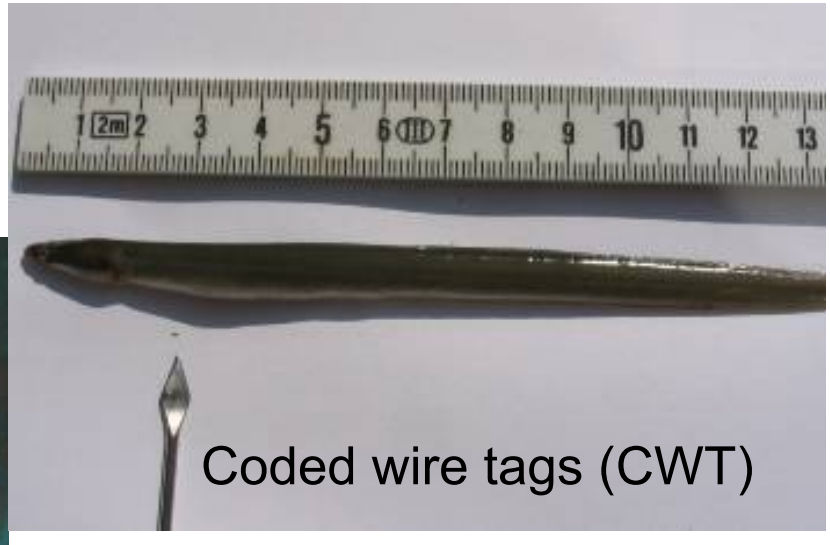
- 7 isolated lakes
- lakes were consecutively re-stocked with marked cohorts
- monitoring with fyke nets and electro fishing for 7 years

Marking

glass eels

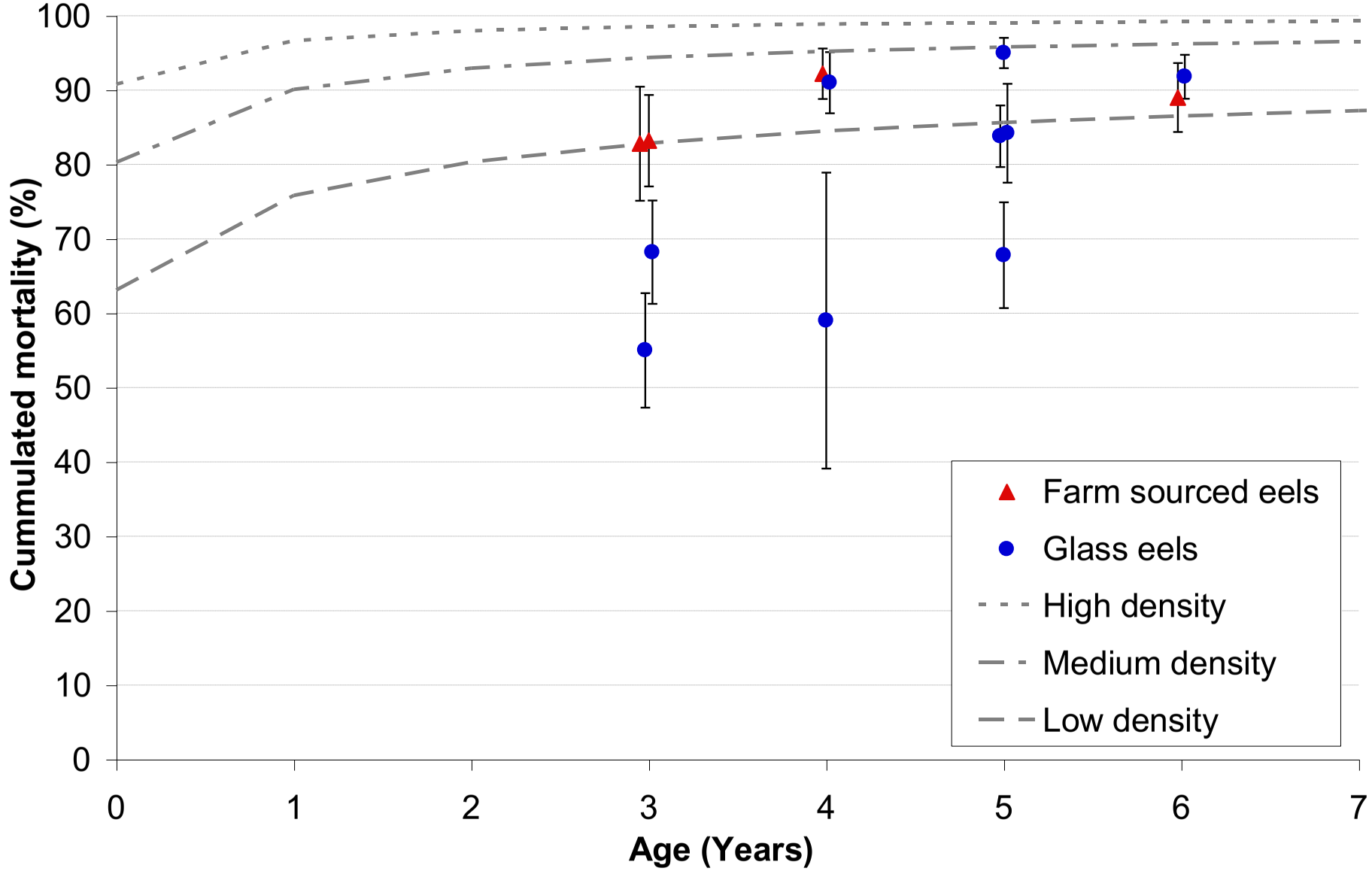
farmed eels





Natural mortality

Comparison of estimates of cumulated mortality of re-stocked eels and calculated cumulated mortality percentage from Bevacqua et al. (2011) for the Havel River system



- Comparison based on mean eel growth and a mean water temperature of 11.7°C

Mortality by cormorant

Based on:

- bird counts
- average time spent in the study area
- daily feed consumption
- proportion of eels in the cormorant forage (Brämick & Fladung 2006)

Mortality by commercial fishery

- 89 mixed species commercial fishing companies
- species-specific catch statistics

Mortality by recreational fishery

Als Dankeschön verlosen wir unter allen beteiligten Anglern
50 Angelrollen !

Ansprechpartner bei Problemen und Rückfragen

Erik Fladung
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Bitte senden Sie das Fangbuch nach Saisonende bis zum 15. März 2011
an die genannte Adresse zurück. Vielen Dank und weiterhin Petri Heil !

Institut für Binnenfischerei Potsdam-Sacrow

Wissenschaftliche Angelstudie

Aal in Brandenburg

Fangbuch 2010

von

Name * .....

Anschrift * .....

.....

* Angabe freiwillig

- ≈ 90,000 recreational fishery license holders
- logbook survey for eel catches (Fladung et al. 2012)
- return rate of the logbooks: 48%

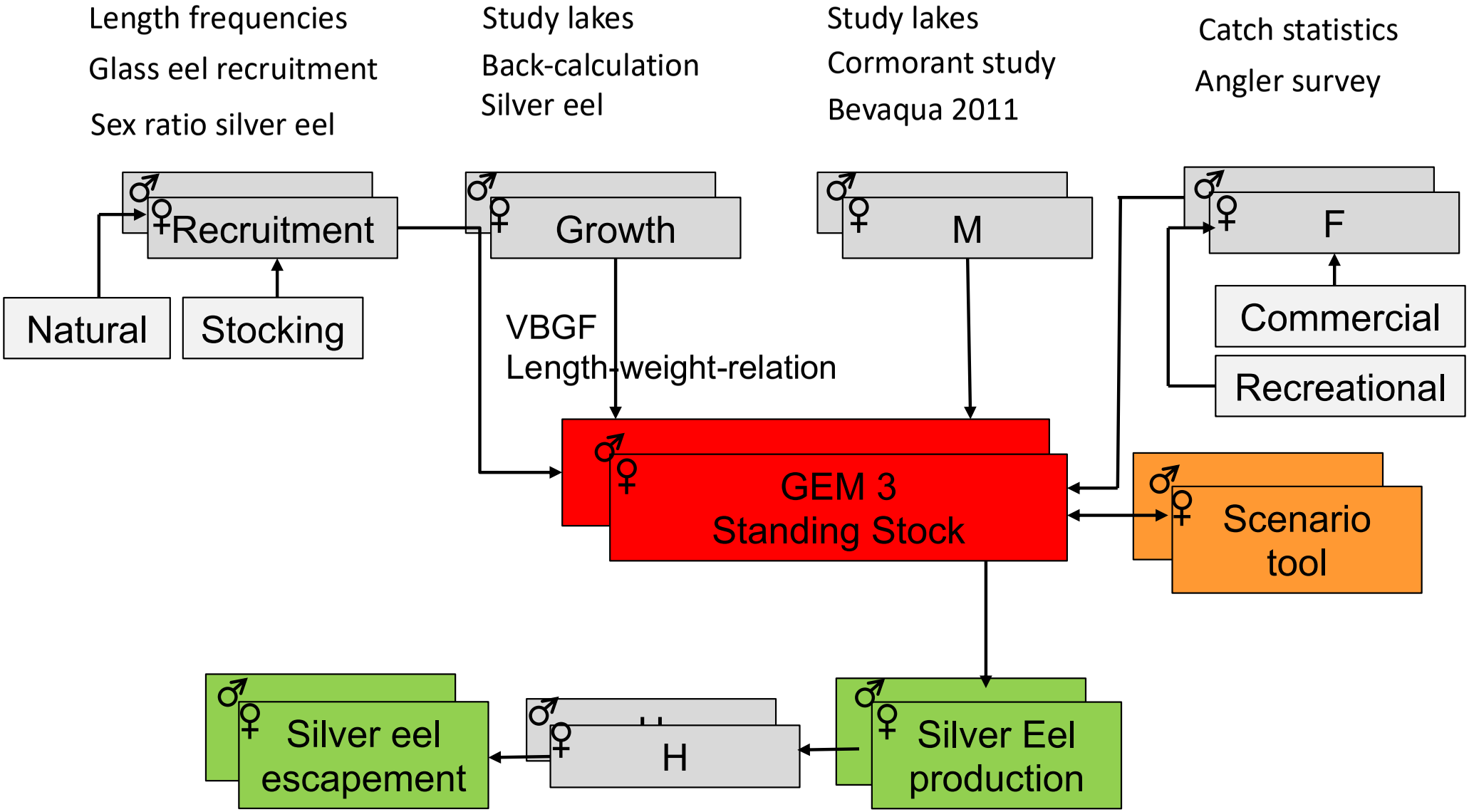
Mortality by hydropower stations

⇨ Mean mortality of a

- Hydropower station 30 % (ICES 2003)
- Pumping station 0.5 % (Rauck 1980)

The German Eel Model (GEM)

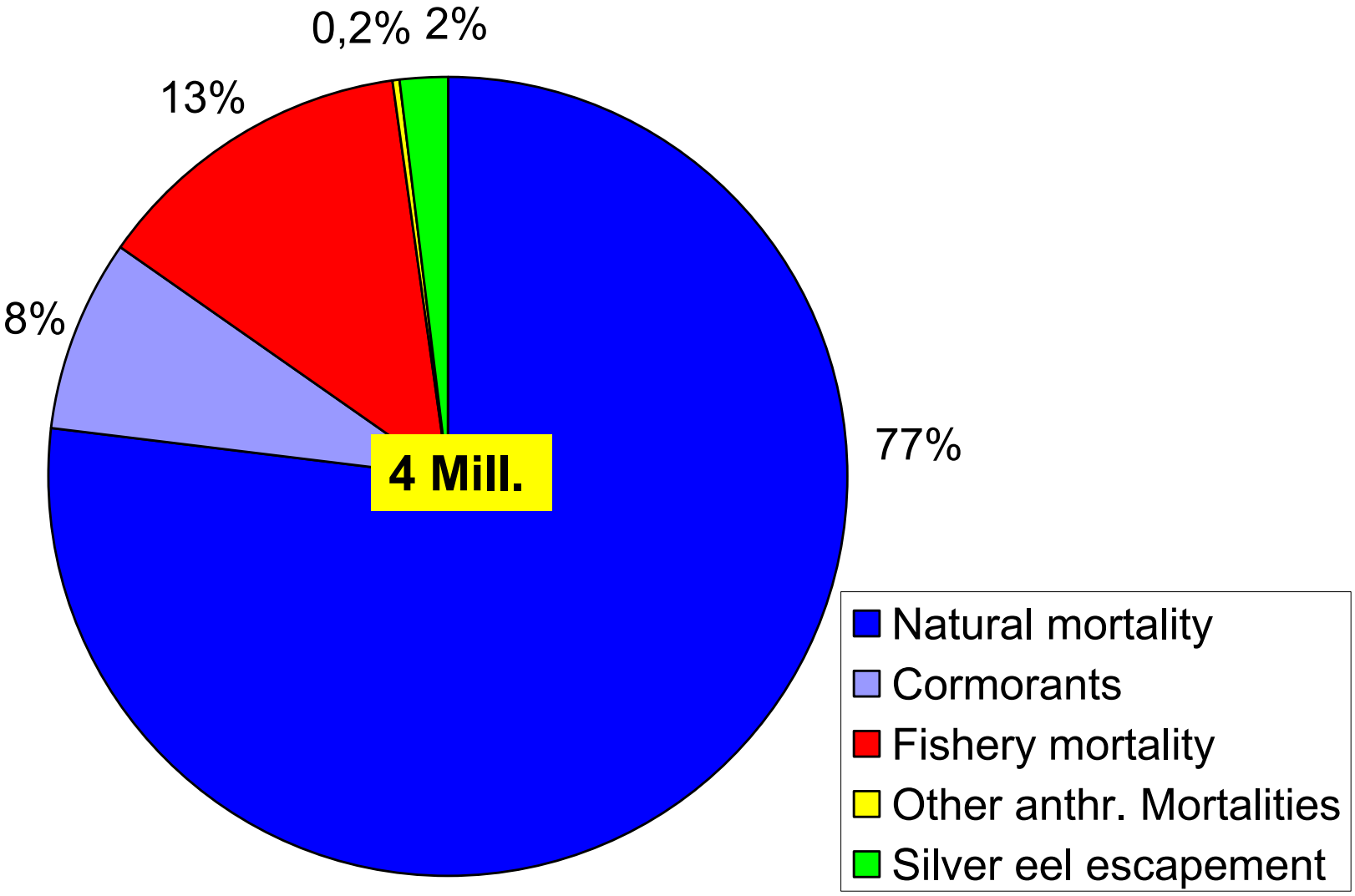
Version 3 of the German Eel Model



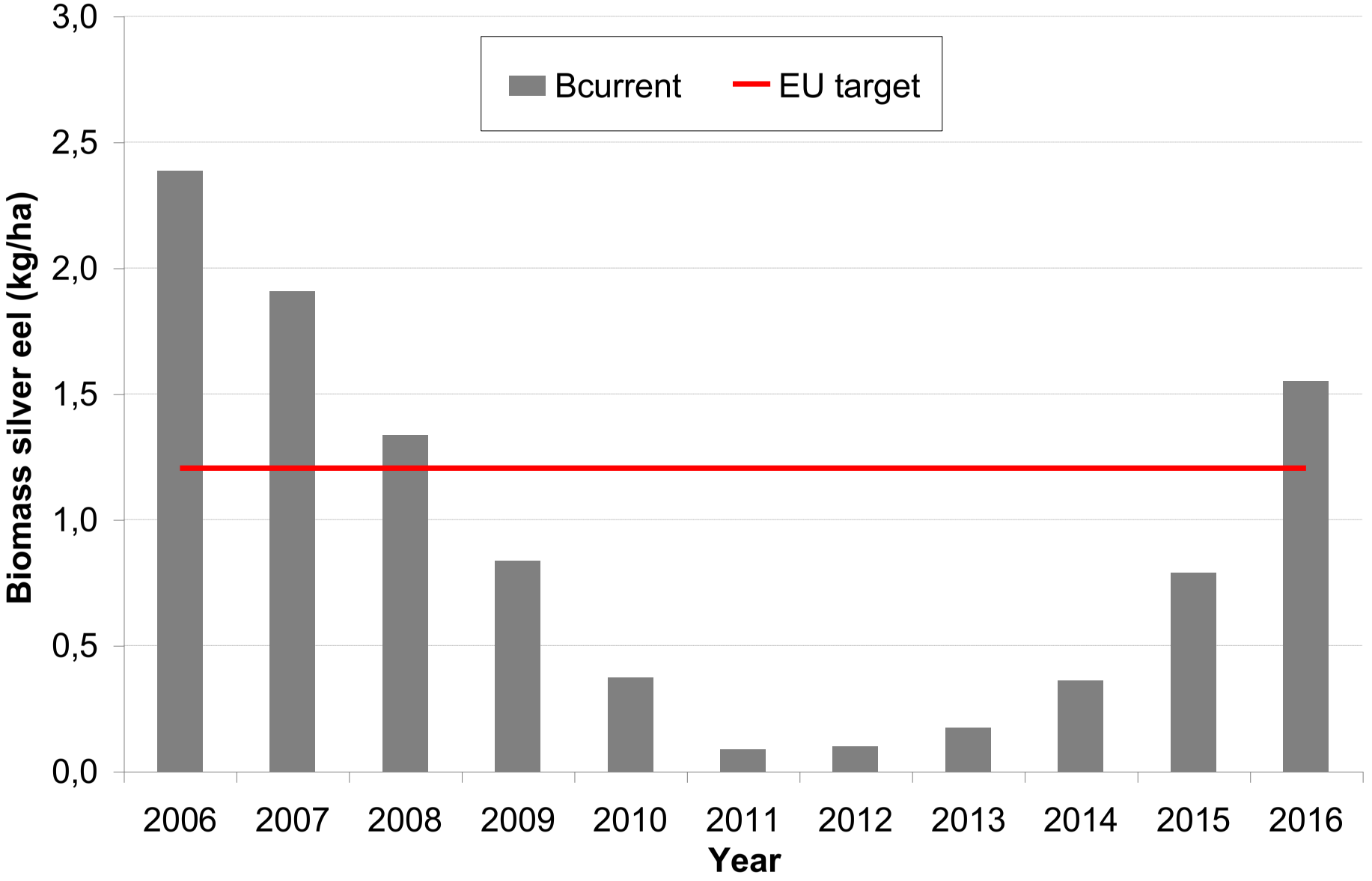
(Oeberst & Fladung 2012)

Modeling results

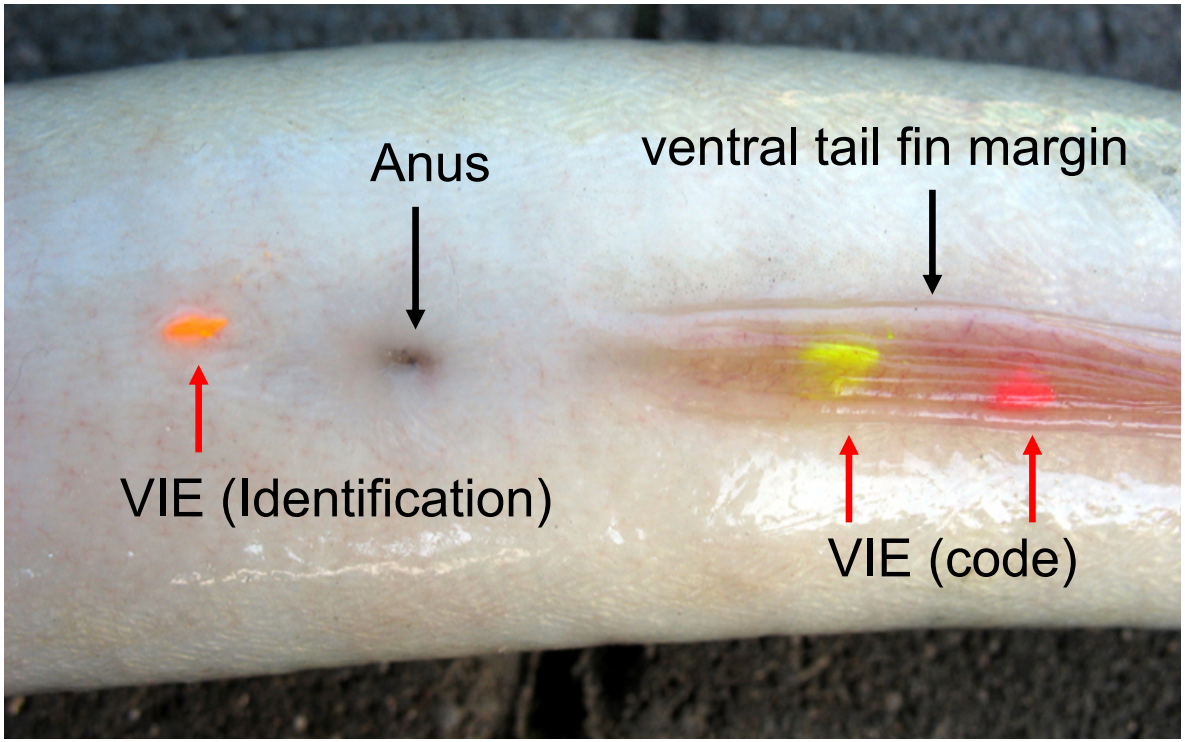
Stock losses



Silver eel escapement



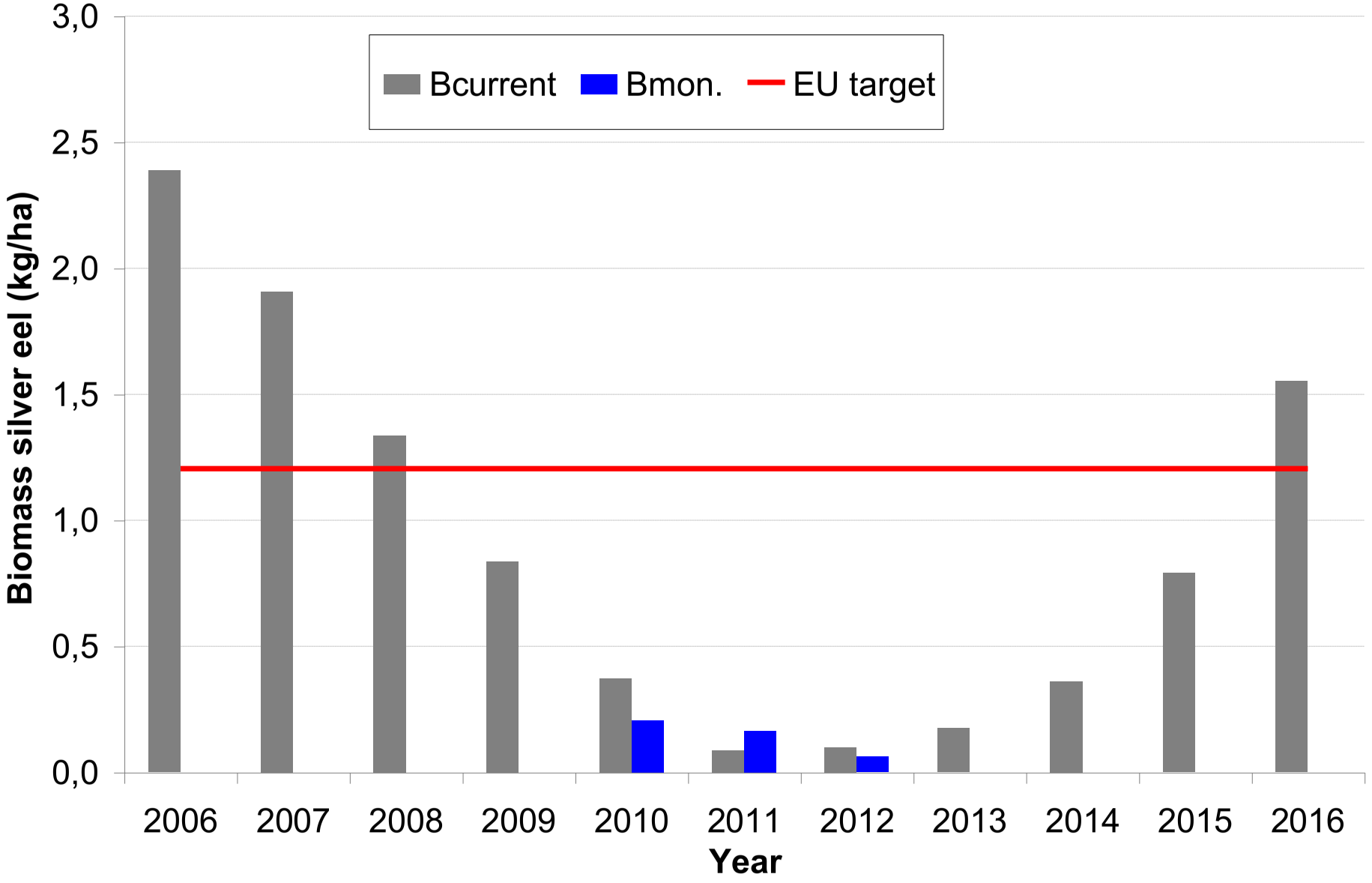
Real silver eel escapement



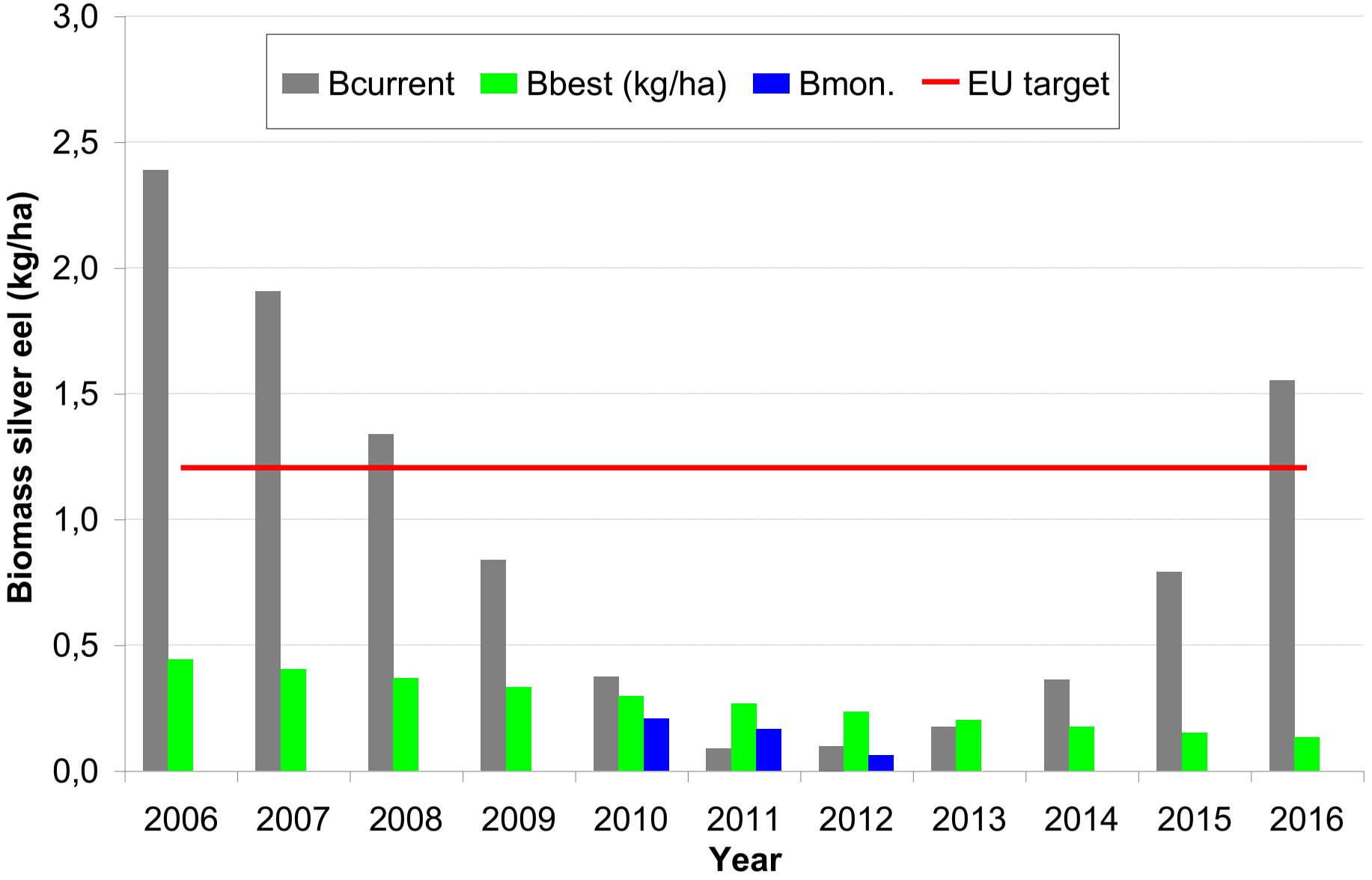
Marking with Visible Implant Elastomer tags (VIE)

- Monitoring station close to the outlet
- Special fyke net with wings spanning about half of the total river width
- Capture-mark-recapture study

Silver eel escapement



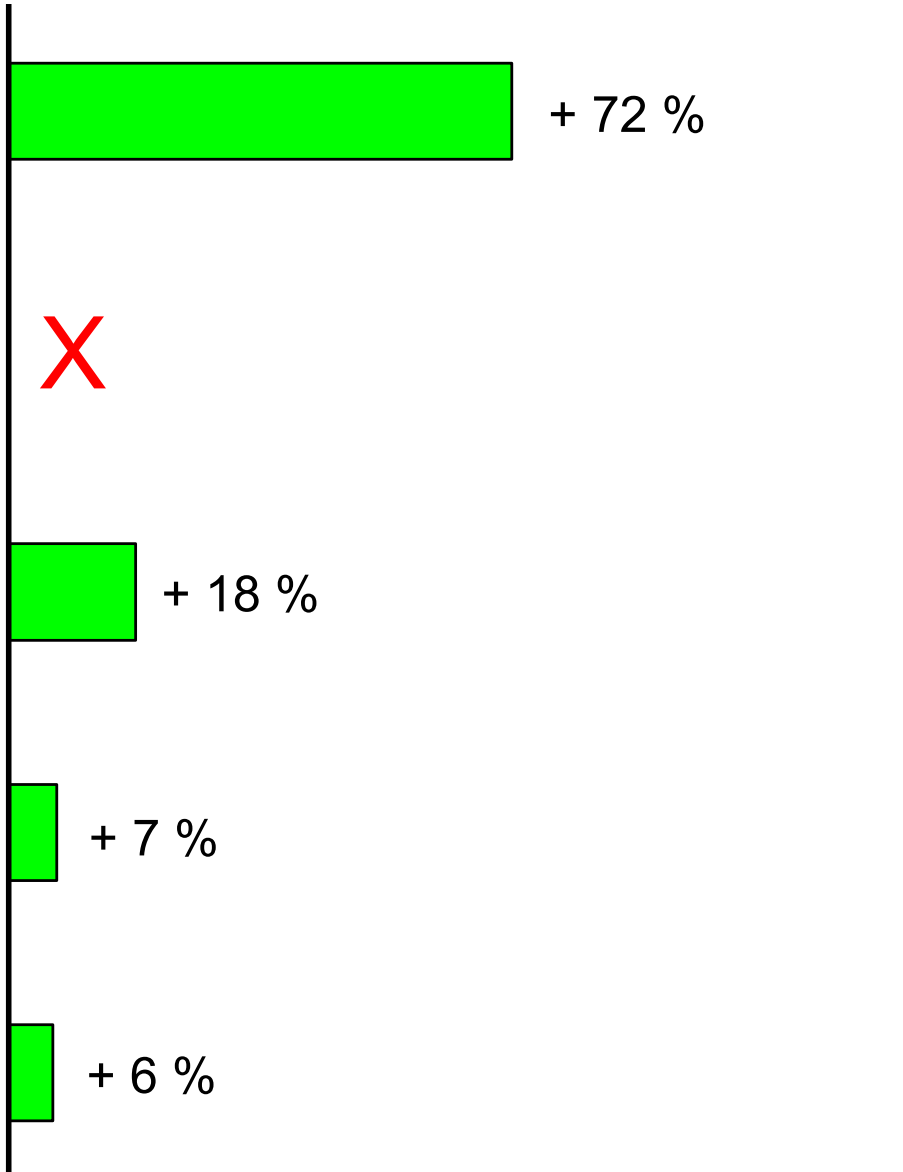
Silver eel escapement



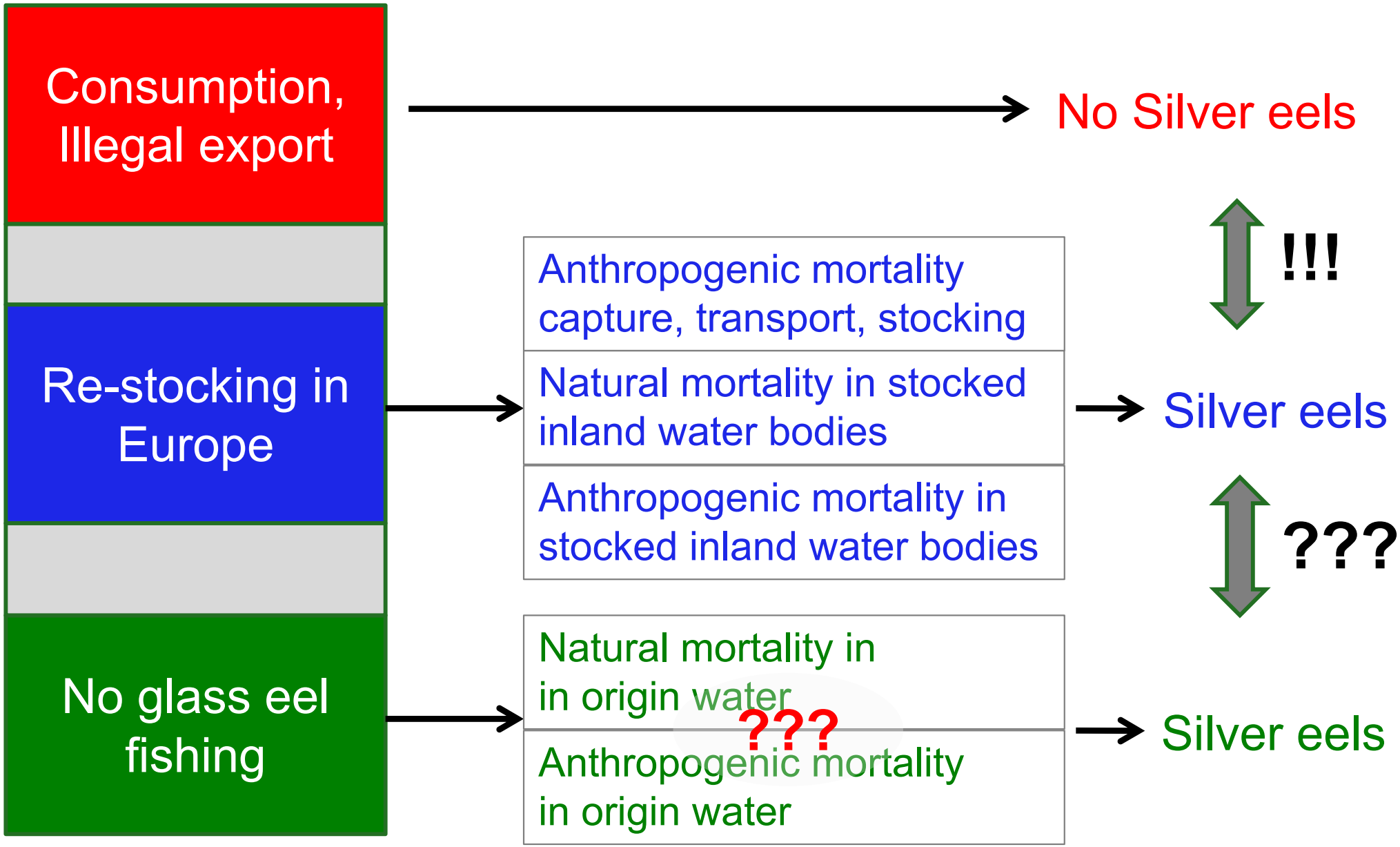
- Without stocking, there will be no chance to meet the target of the eel regulation due to low natural immigration numbers, even if all anthropogenic mortality factors could be stopped completely.

Modelled effects of management measures in the Havel River system

Measure	Action	Result by silver eel escapement
Eel re-stocking	⇧50 %	+ 72 %
Fishery (re-stocking 10 %)	⇩50 %	X
Fishery (re-stocking constant)	⇩50 %	+ 18 %
Cormorant	⇩50 %	+ 7 %
Hydropower stations	⇩50 %	+ 6 %



Net benefit of eel stocking



(from WGEEL 2016)

Why stocking?

Biology:

- panmictic species (one large stock) (Als et al. 2011)
- re-stocked eels show no differences in upgrowth (e.g. Pawson 2013, Westerberg 2013, Westerberg et al. 2014)
- sex development & survival is density depended (e.g. ICES 2007, Feunteun et al. 2009)
- faster growth & earlier puberty in costal waters (e.g. Simon et al. 2014)

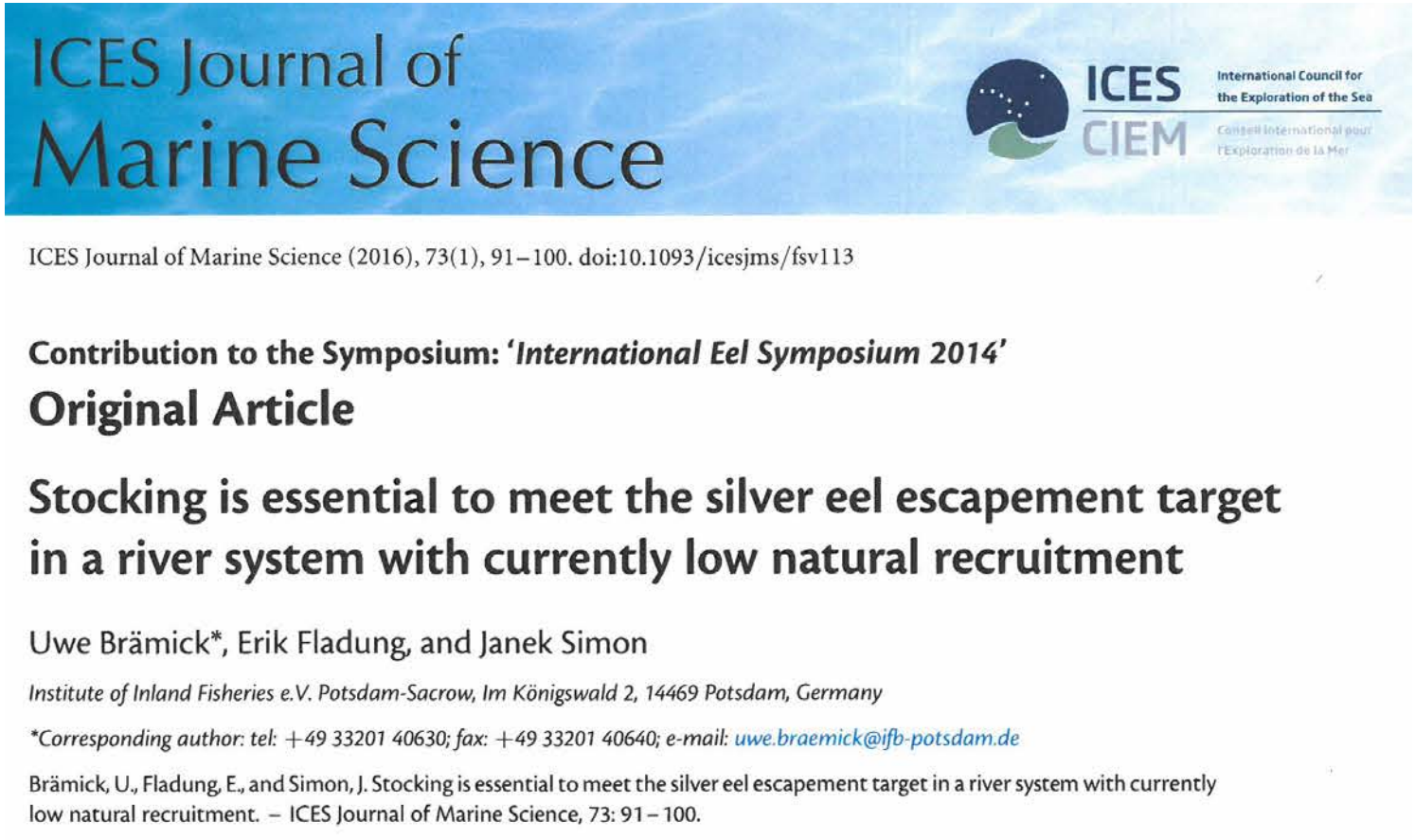
Reasons for stocking inland water bodies:

- compensate for habitat losses & sustain the common distribution area
- increase of silver eel escapement & reach the target of the eel regulation (e.g. Brämick et al. 2016)
- maybe decrease mortality in the origin waters
- produce higher ratios of females and older & larger females (e.g. Moriarty 2009)
- extension of generation time (survival strategy)
- sustain eel fishery, eel consumption and civil engagement

End

Thank you for your attention!

- For more details of our study please read here…



ICES Journal of Marine Science

ICES International Council for the Exploration of the Sea
CIEM Conseil international pour l'Exploration de la Mer

ICES Journal of Marine Science (2016), 73(1), 91–100. doi:10.1093/icesjms/fsv113

Contribution to the Symposium: '*International Eel Symposium 2014*'

Original Article

Stocking is essential to meet the silver eel escapement target in a river system with currently low natural recruitment

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