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## Fish Passage Studies II: The Drifting Dead: Drift of Dead Fish in Three German Rivers

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**Presenter Information**

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## Drift of dead fish in three German rivers

Lisa Heermann, Torgeir Havn, Eva Thorstad, Finn Økland, Maxim Teichert, Stein-Are Sæther, Jost Borcharding and Meelis Tambets

Picture: WVG Medien GmbH



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Und Verbraucherschutz des Landes  
Nordrhein-Westfalen

Landesamt für Natur, Umwelt  
Und Verbraucherschutz  
Nordrhein-Westfalen



Good tool to evaluate...

...migration routes

...migration speed

...activity

...



Good tool to evaluate...

...migration routes

...migration speed

...activity

...

... fate and mortality rates





Good tool to evaluate...

...migration routes

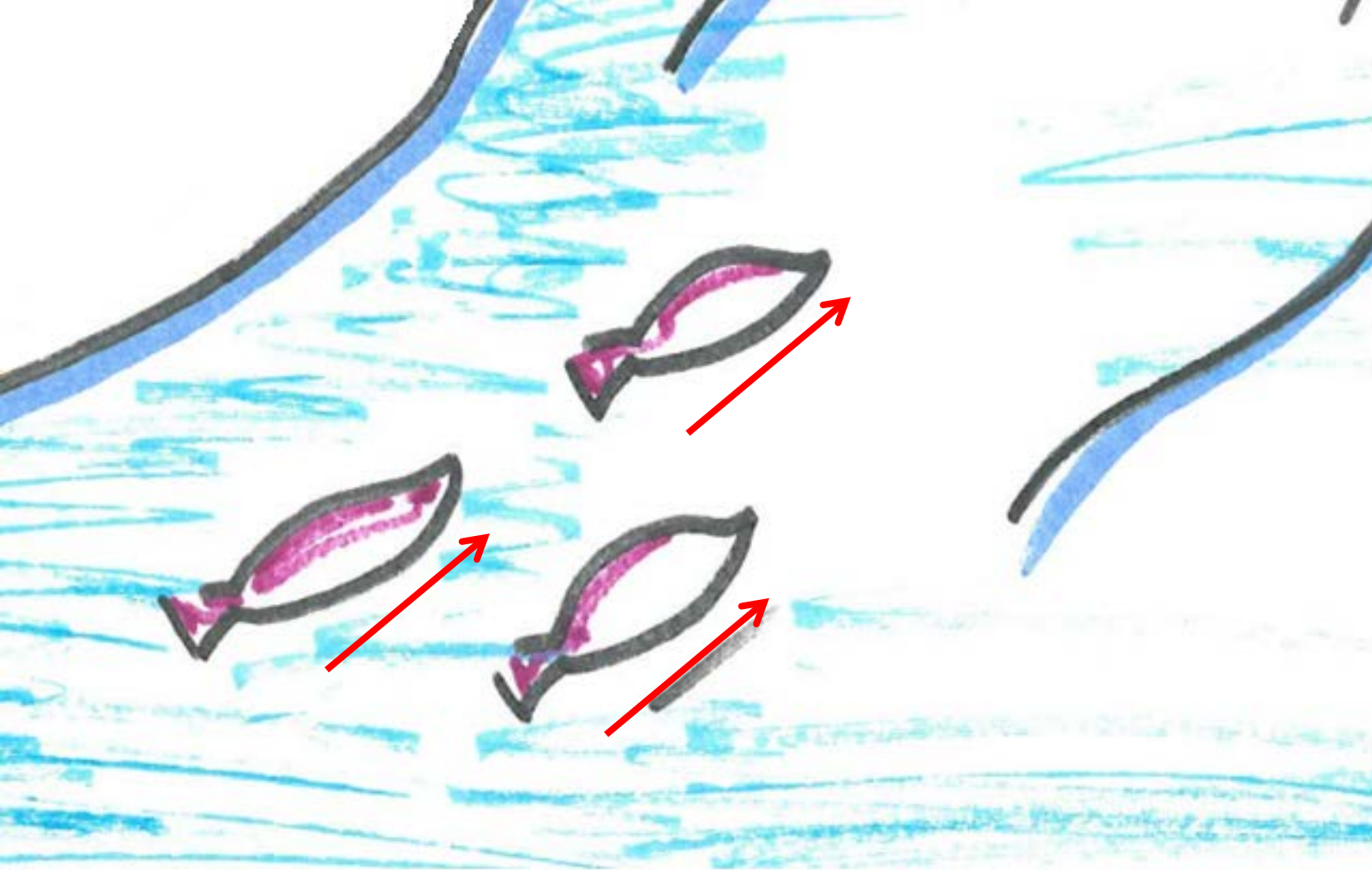
...migration speed

...activity

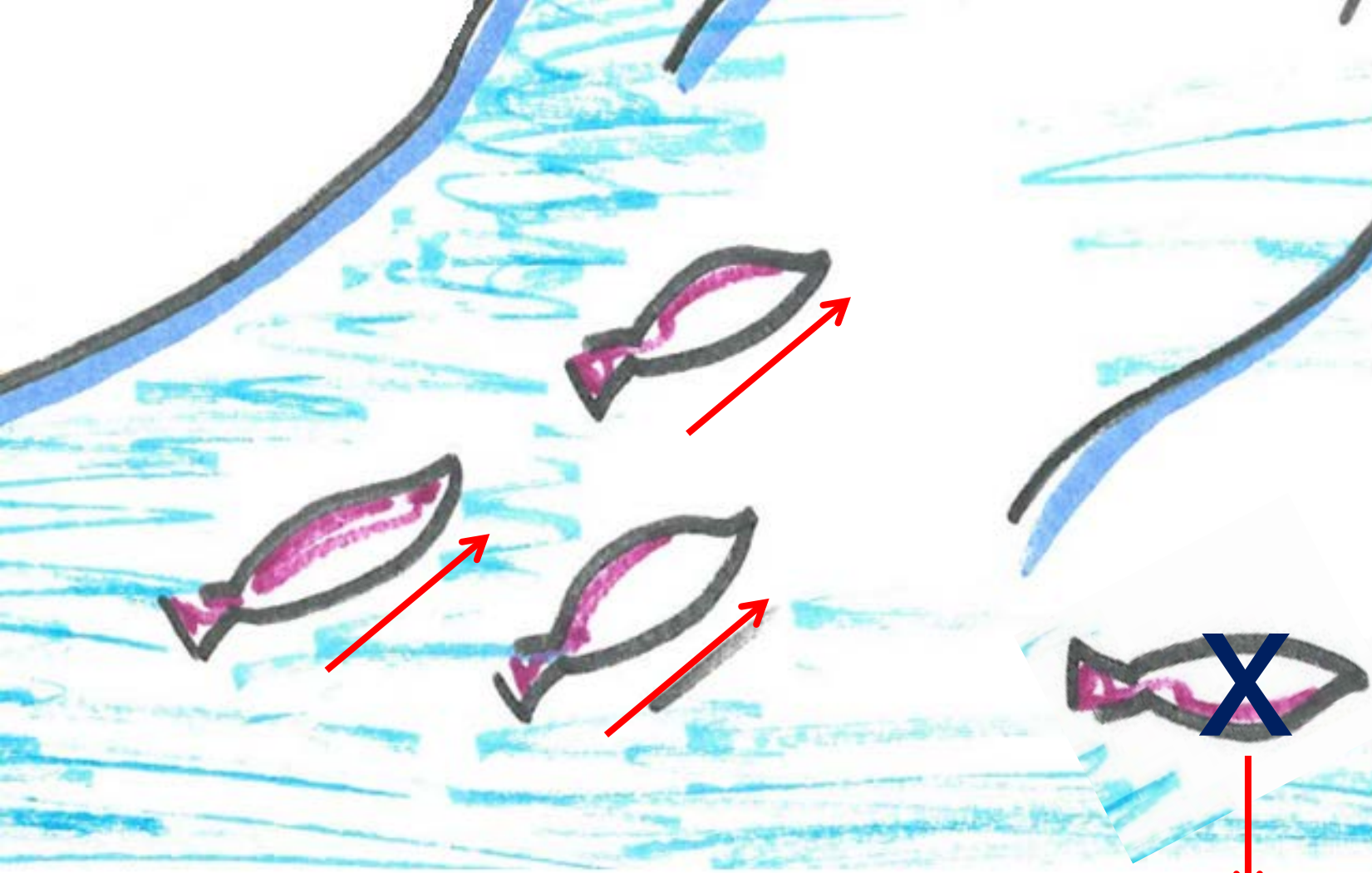
...

... fate and mortality rates





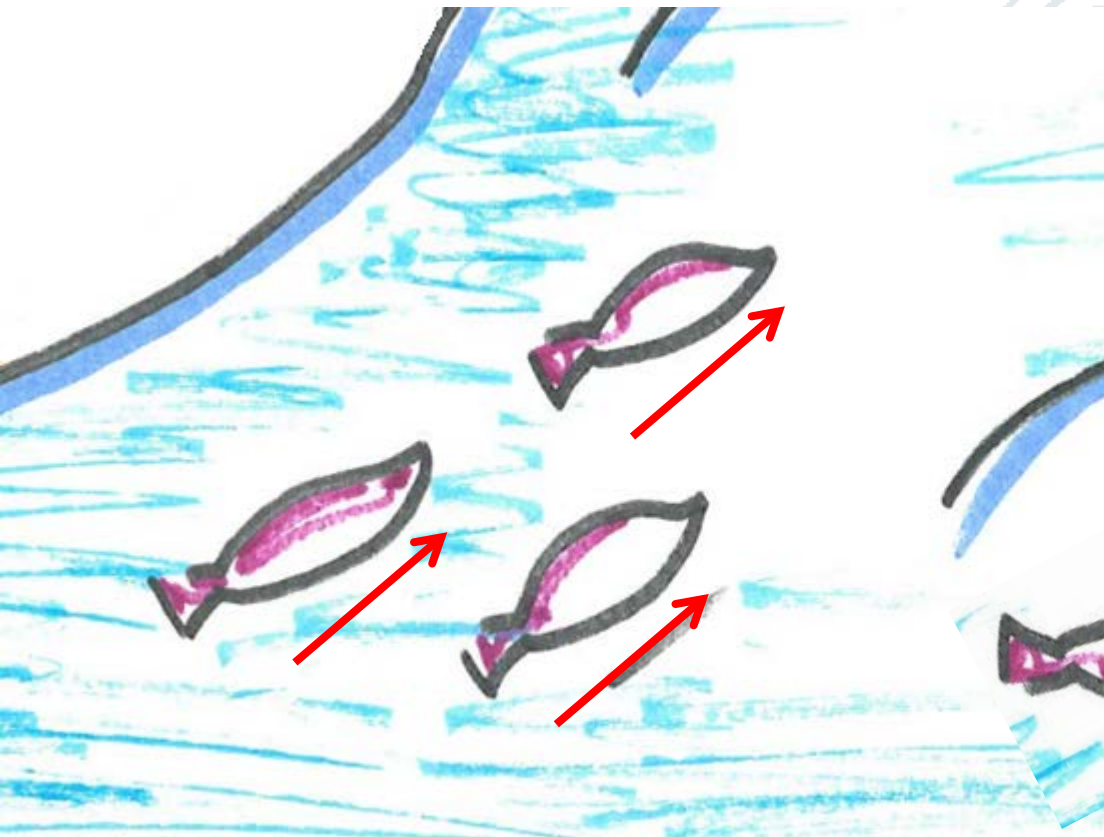
moving = alive



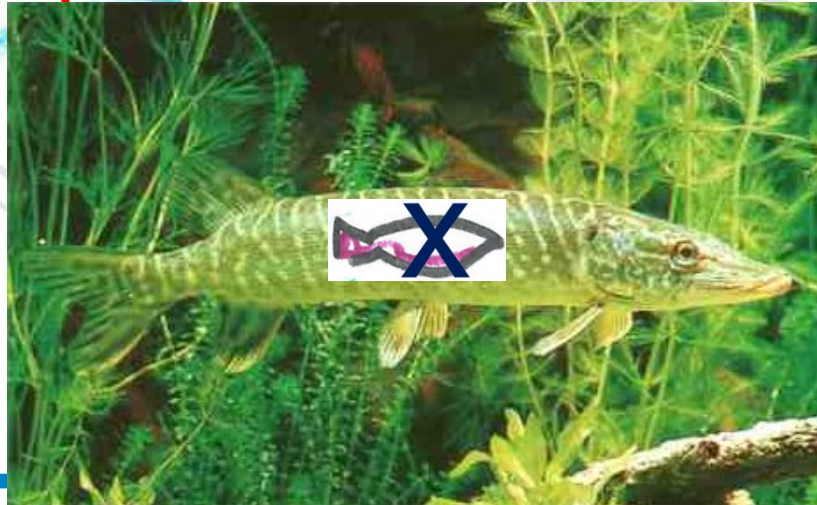
moving = alive

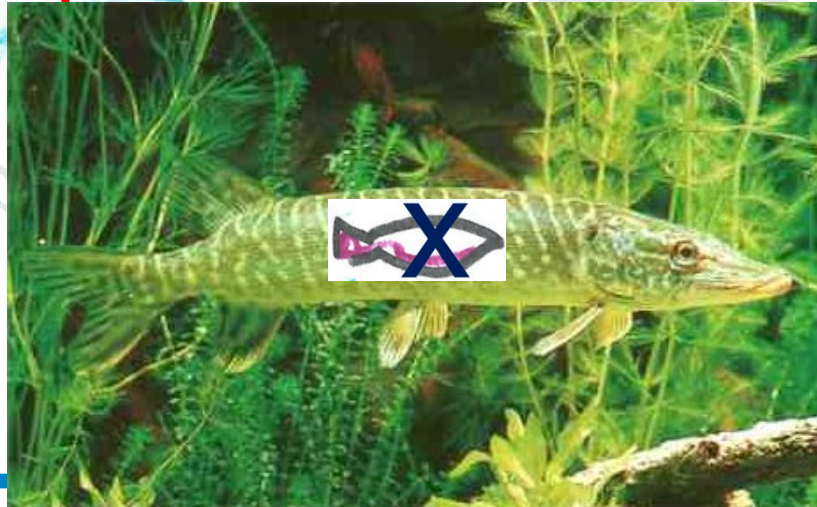
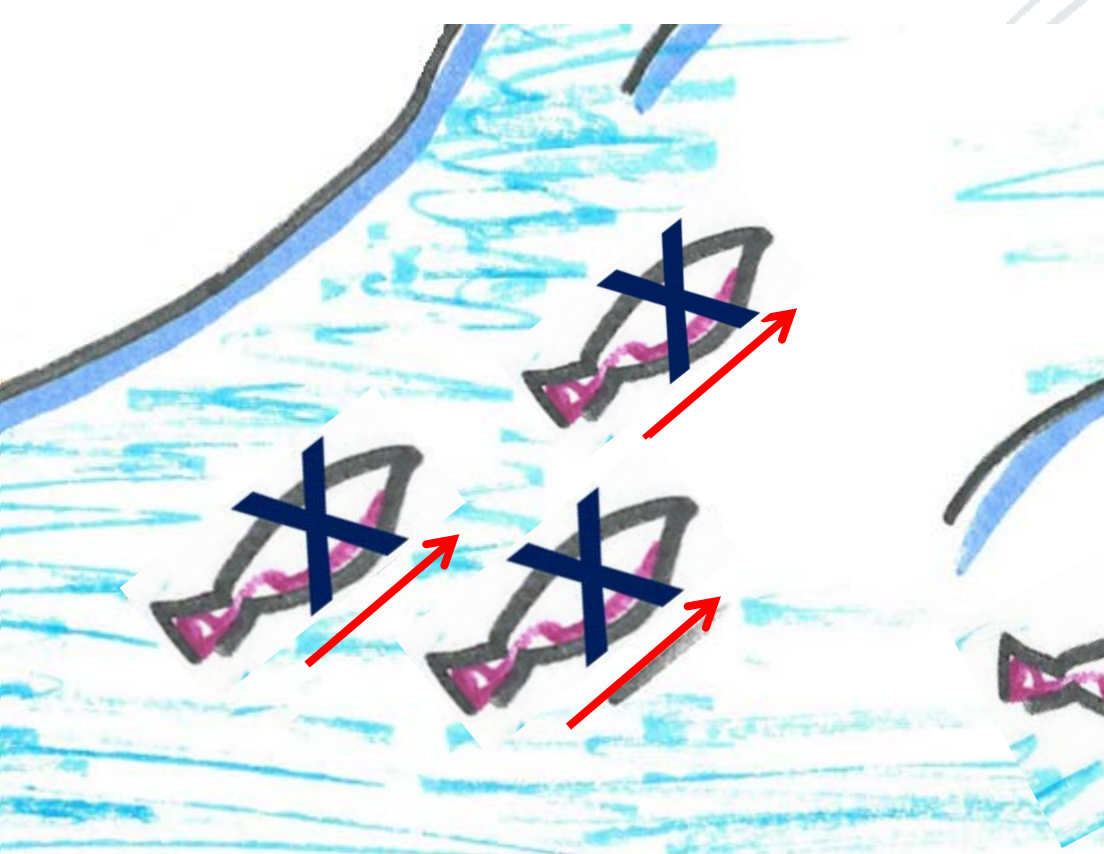
long-term stationary = dead  
location = place of death





- Recordings may reflect behaviour of predator instead of tagged fish





- Recordings may reflect behaviour of predator instead of tagged fish
- Dead fish drift



Unkelmühle, Sieg



discharge  $53 \text{ m}^3\text{s}^{-1}$

Kuhlemühle, Diemel

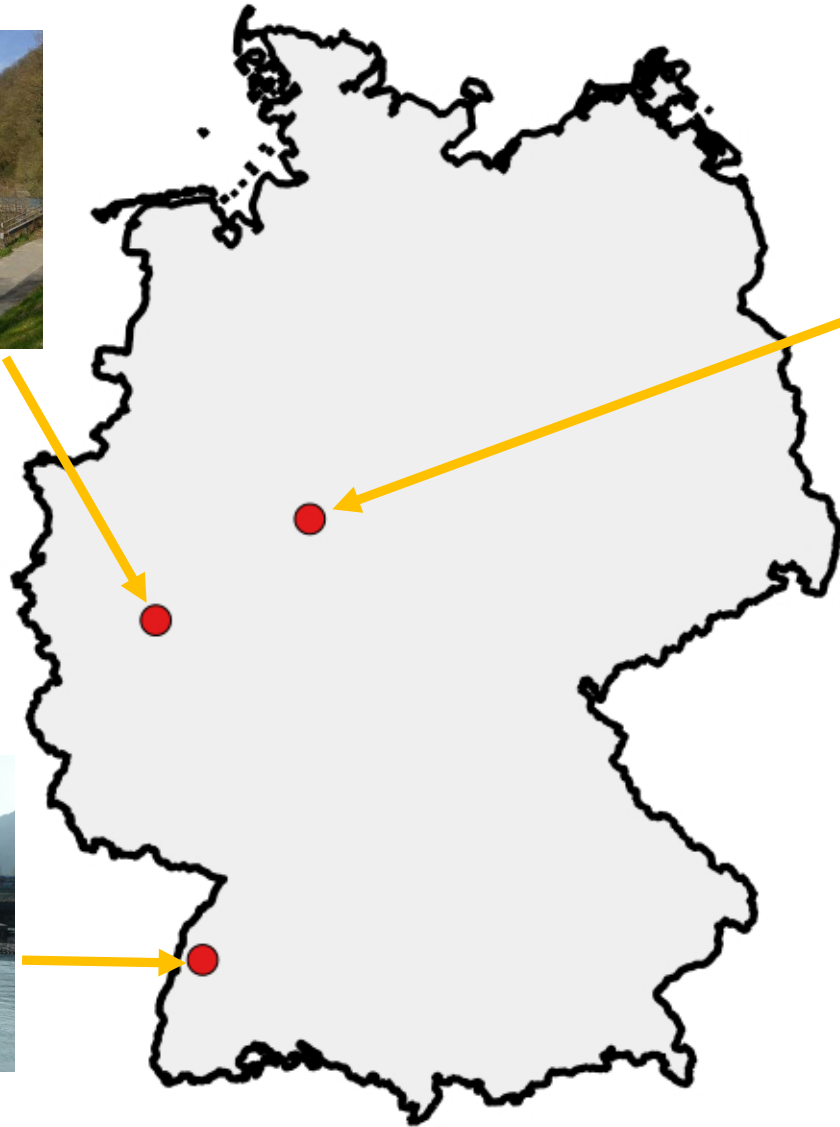


discharge  $16 \text{ m}^3\text{s}^{-1}$

Gengenbach, Kinzig



discharge  $3 \text{ m}^3\text{s}^{-1}$





60 dead Atlantic salmon smolt  
91-190 mm



55 dead European silver eel  
575-940 mm

- Killed with an overdose of anaesthetic and blow on head or cutting spinal cord
- Surgical implantation of radio-tags into body cavity



# Kuhlemühle, Diemel



## Archimedes Screw

5 eel in Oct 2014



## Tailrace of Francis turbine

5 eel in Oct 2014

# Kuhlemühle, Diemel



## Archimedes Screw

5 eel in Oct 2014

20 smolt in April 2015



## Tailrace of Francis turbine

5 eel in Oct 2014



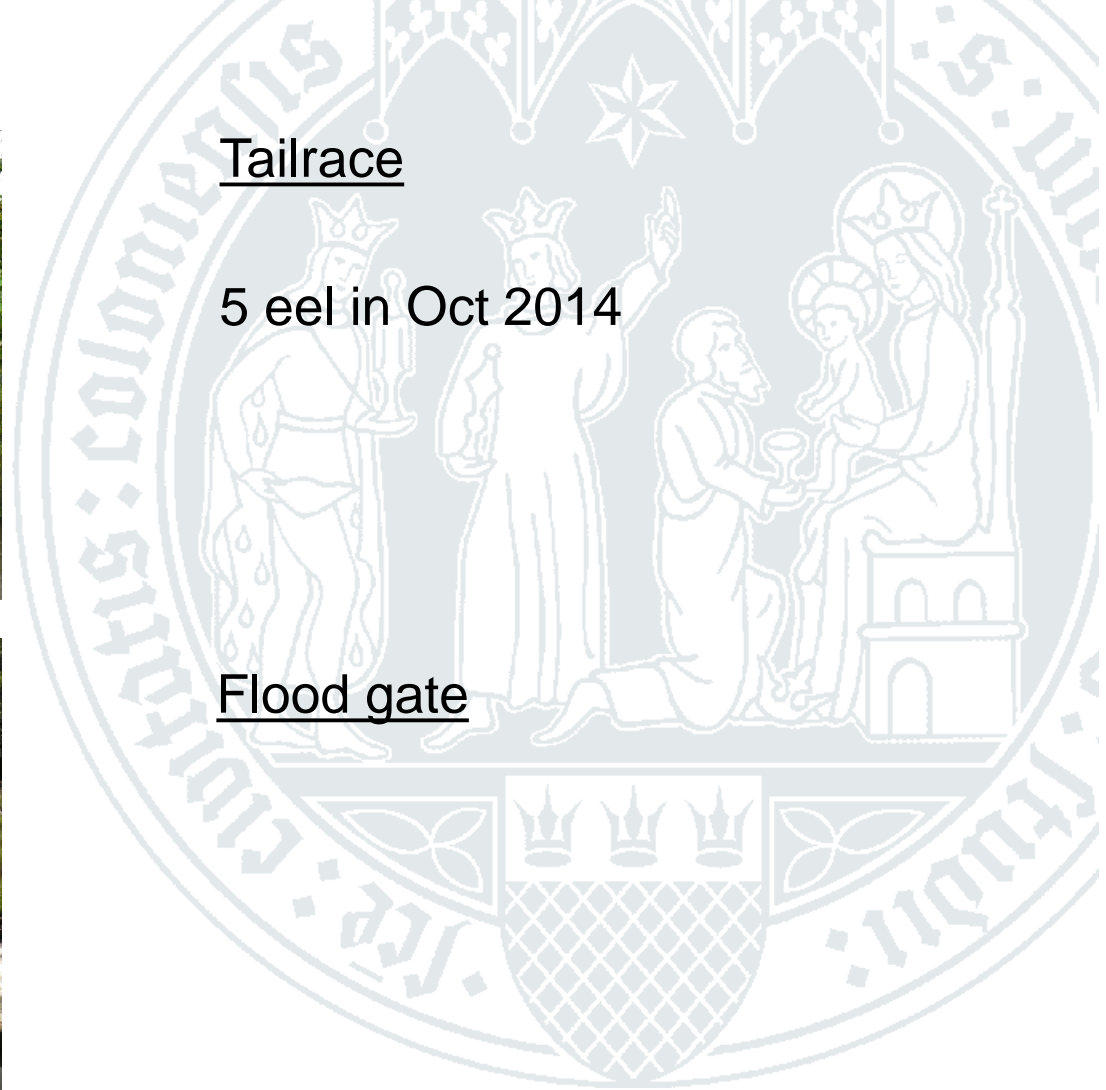
# Unkelmühle, Sieg



Tailrace

5 eel in Oct 2014

Flood gate



# Unkelmühle, Sieg



## Tailrace

5 eel in Oct 2014

25 eel in Oct/Nov 2015

## Flood gate

5 eel in Oct/Nov 2015





# Unkelmühle, Sieg



## Tailrace

5 eel in Oct 2014

25 eel in Oct/Nov 2015

20 smolt in April 2015

## Flood gate

5 eel in Oct/Nov 2015

# Gengenbach, Kinzig



## Tailrace

10 eel in Oct/Nov 2015

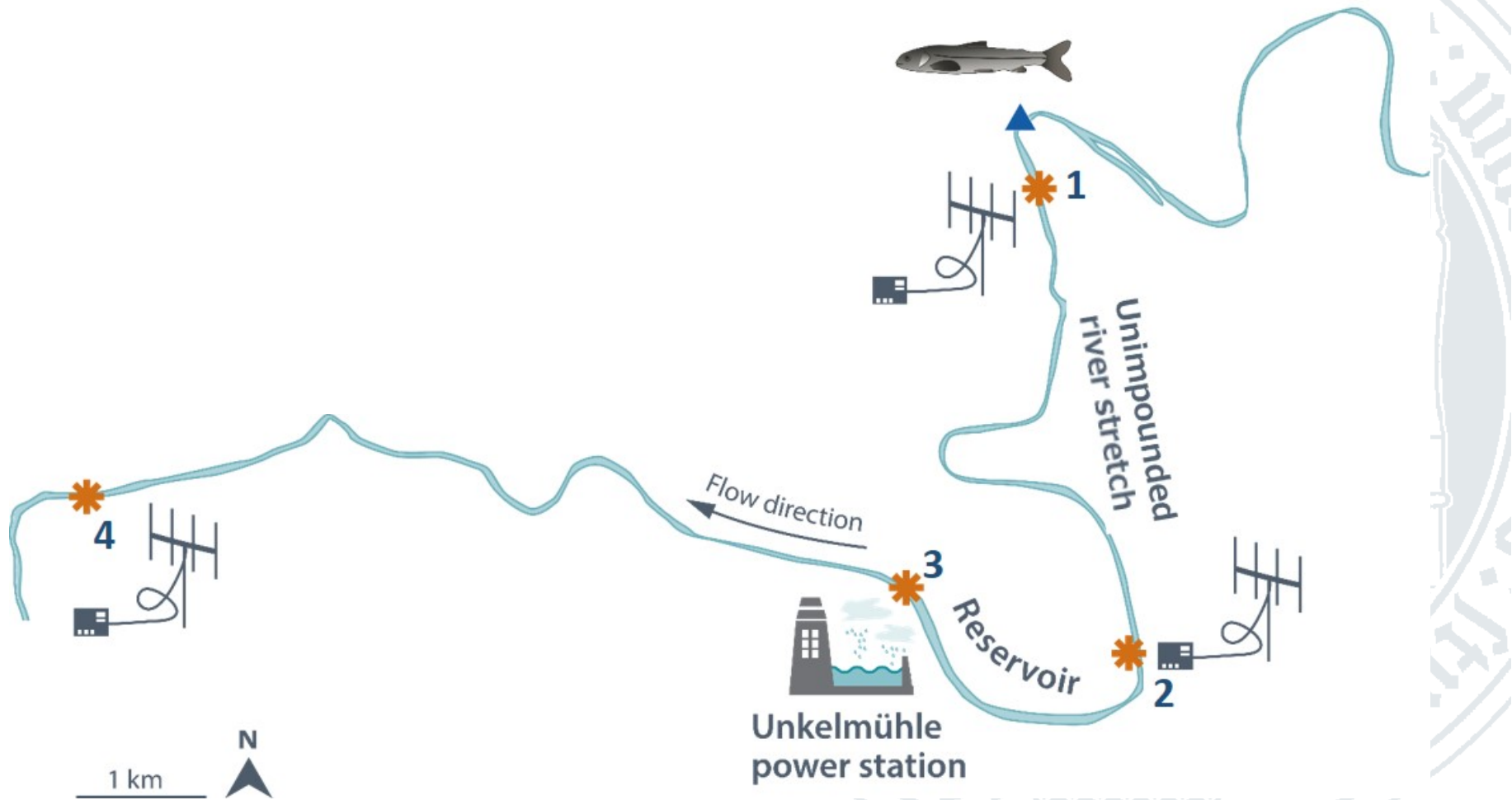
20 smolt in April 2015



## Manual tracking

- Portable receiver (Lotek SRX 600) and 3-E-Yagi antenna
- Every 2 – 7 days
- Distance smolt: up to 29 km
- Distance eel: up to 44 km

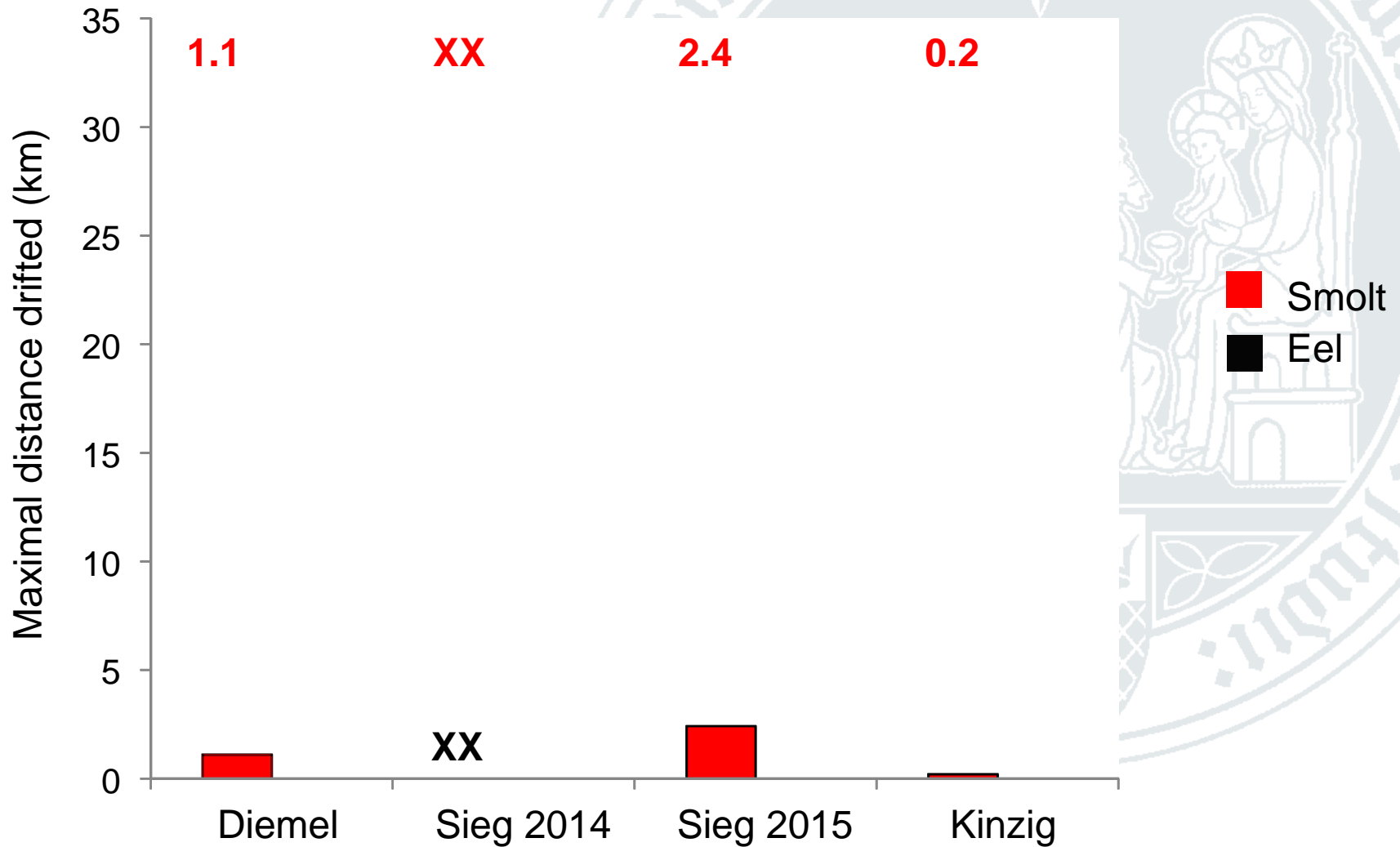


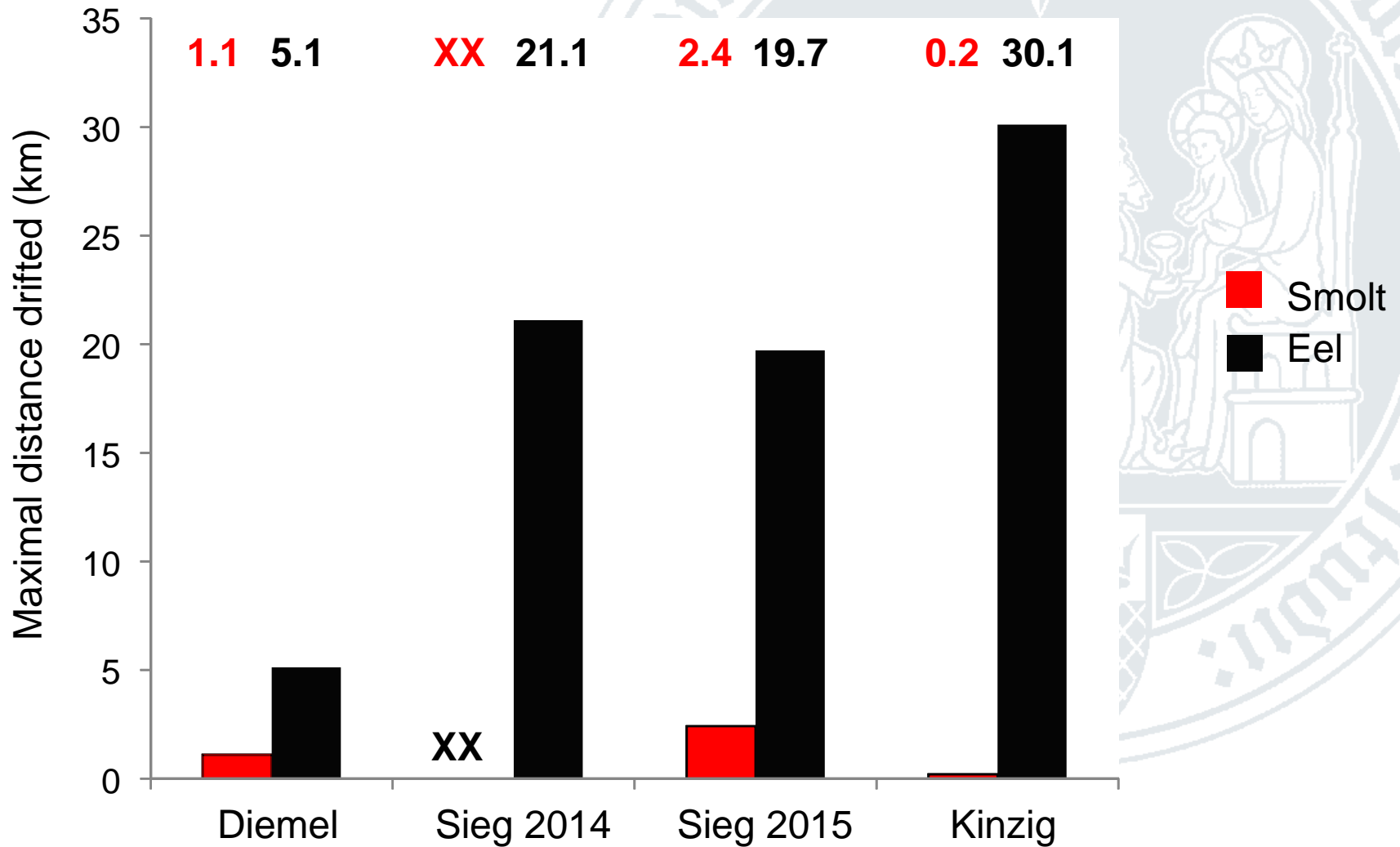


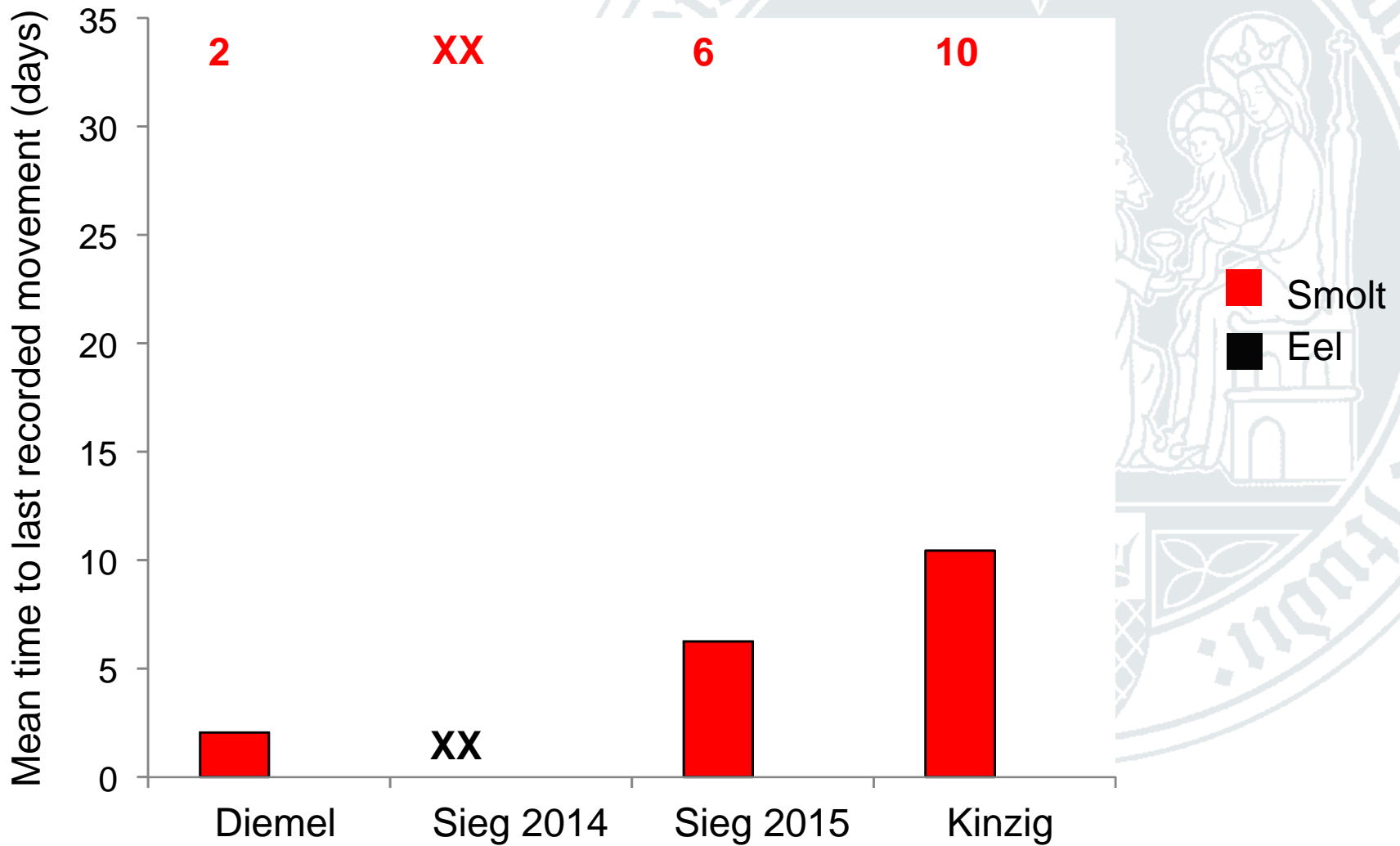
Stationary receivers along the river and several at power station

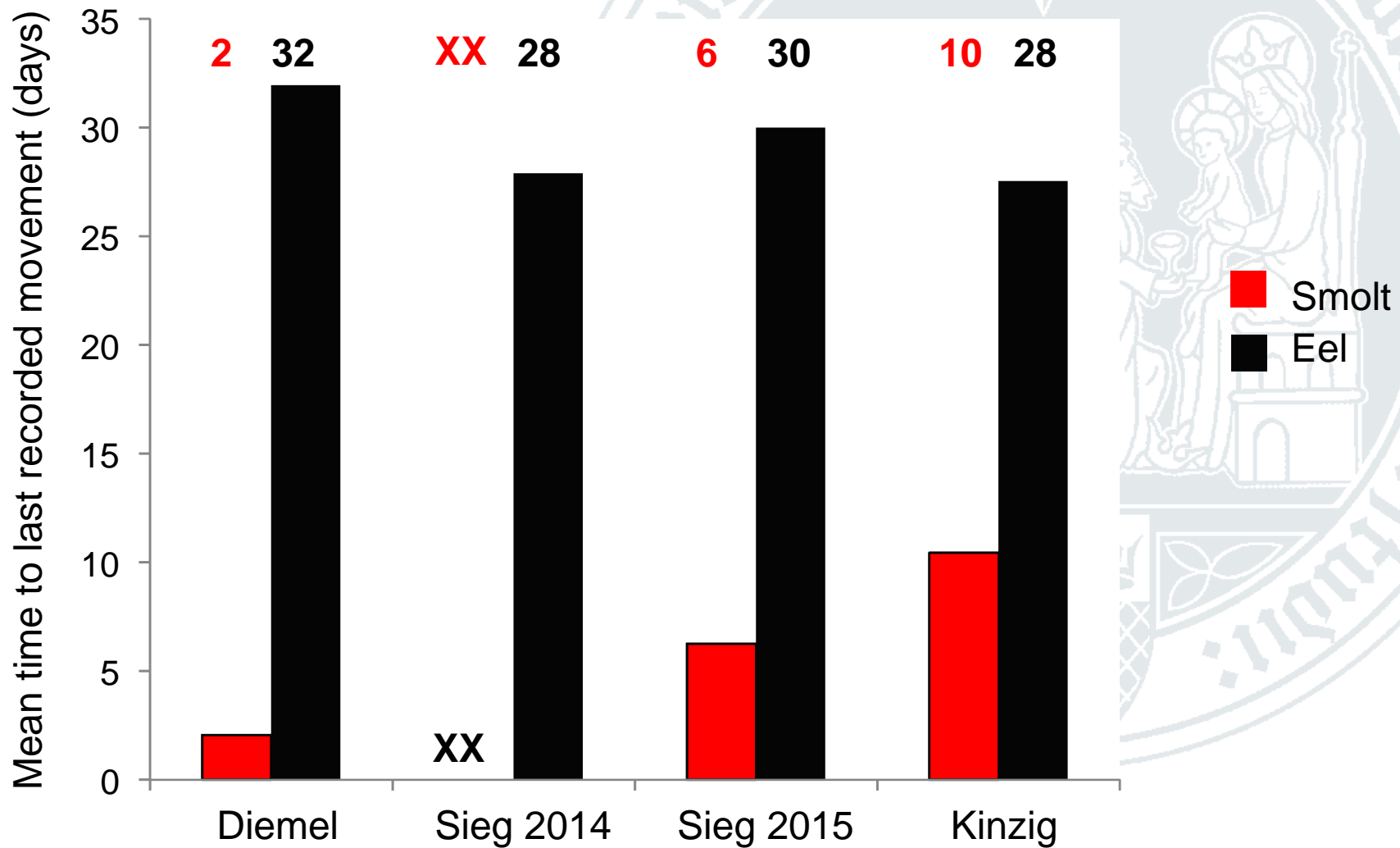
-> Detection of predation





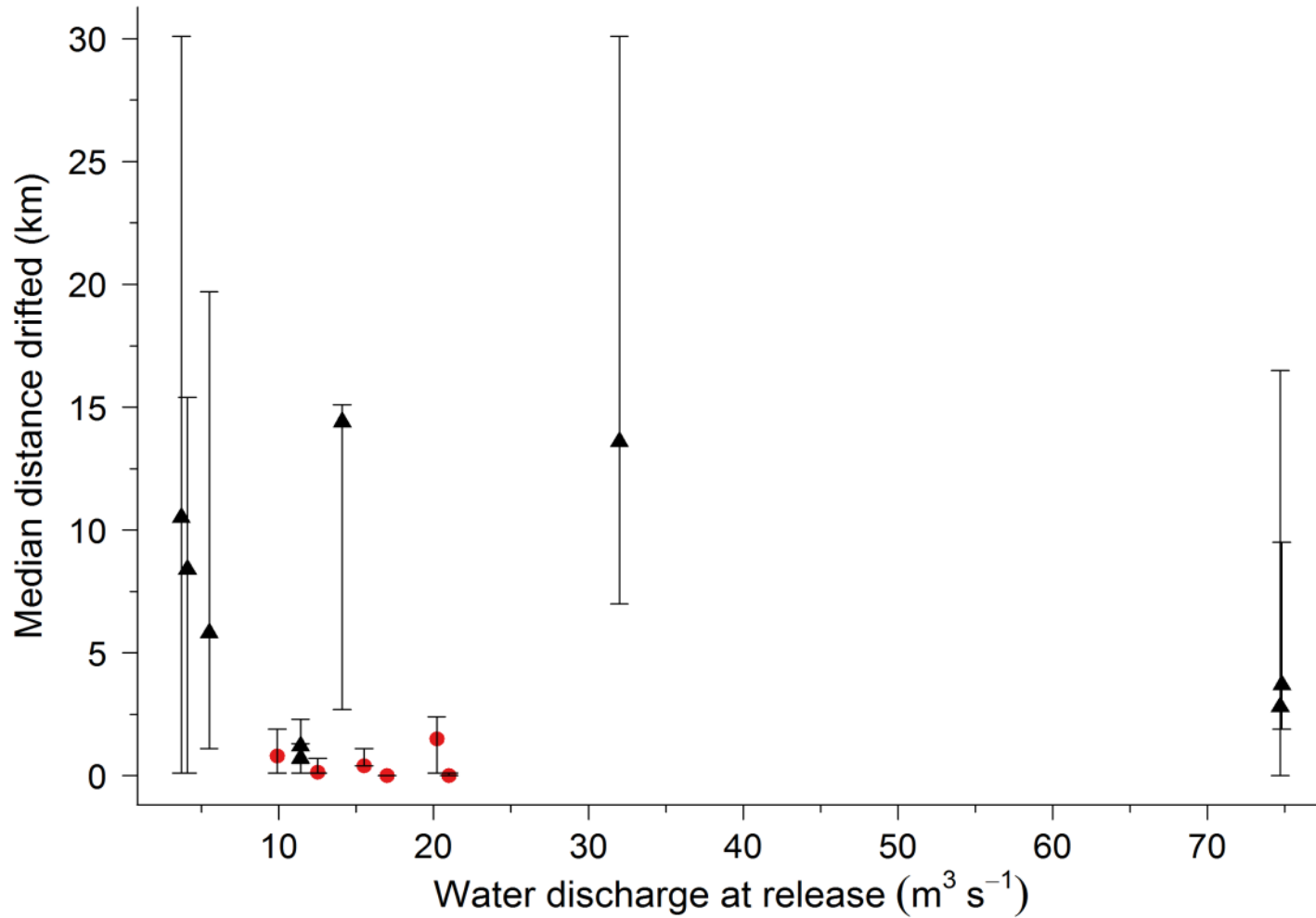




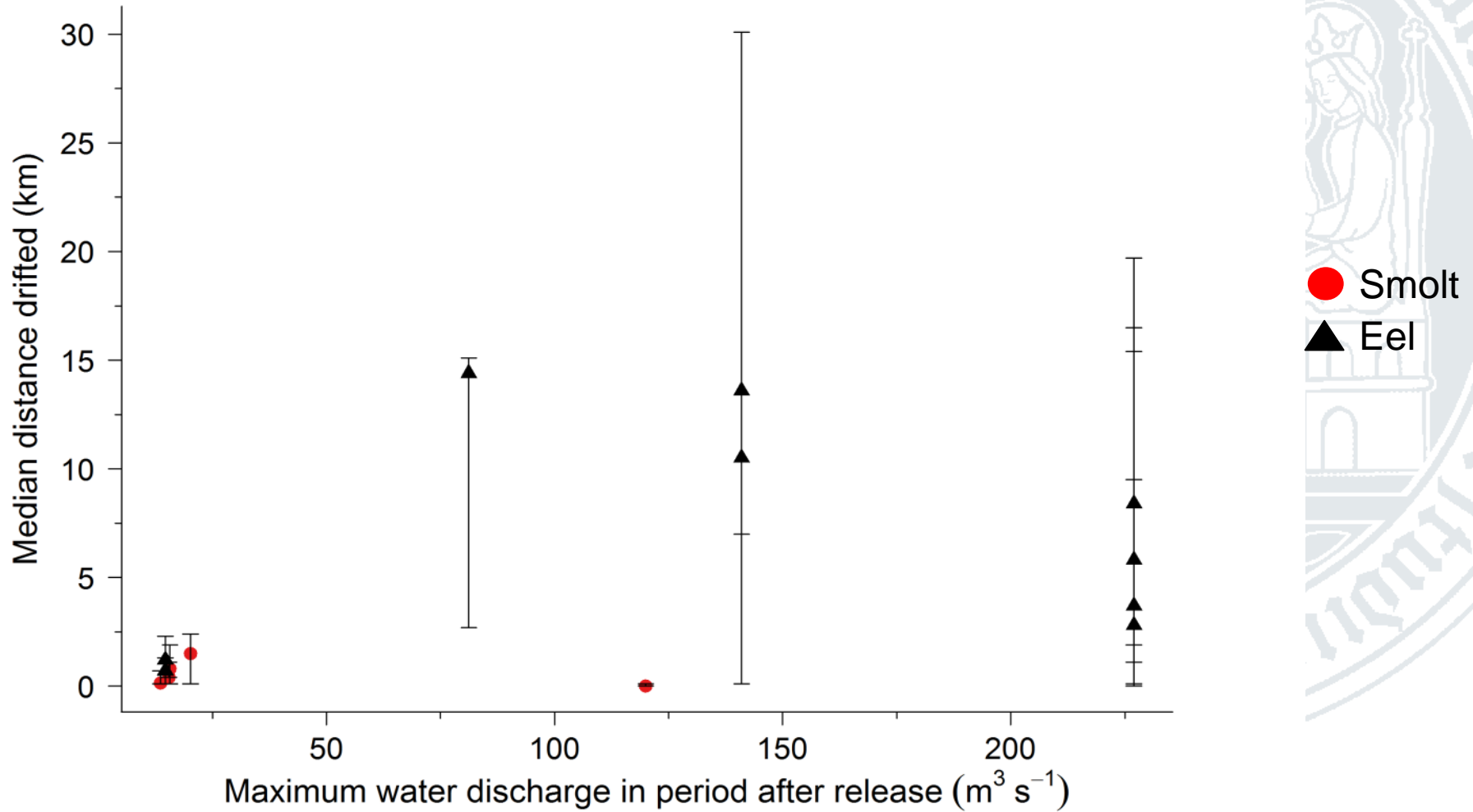




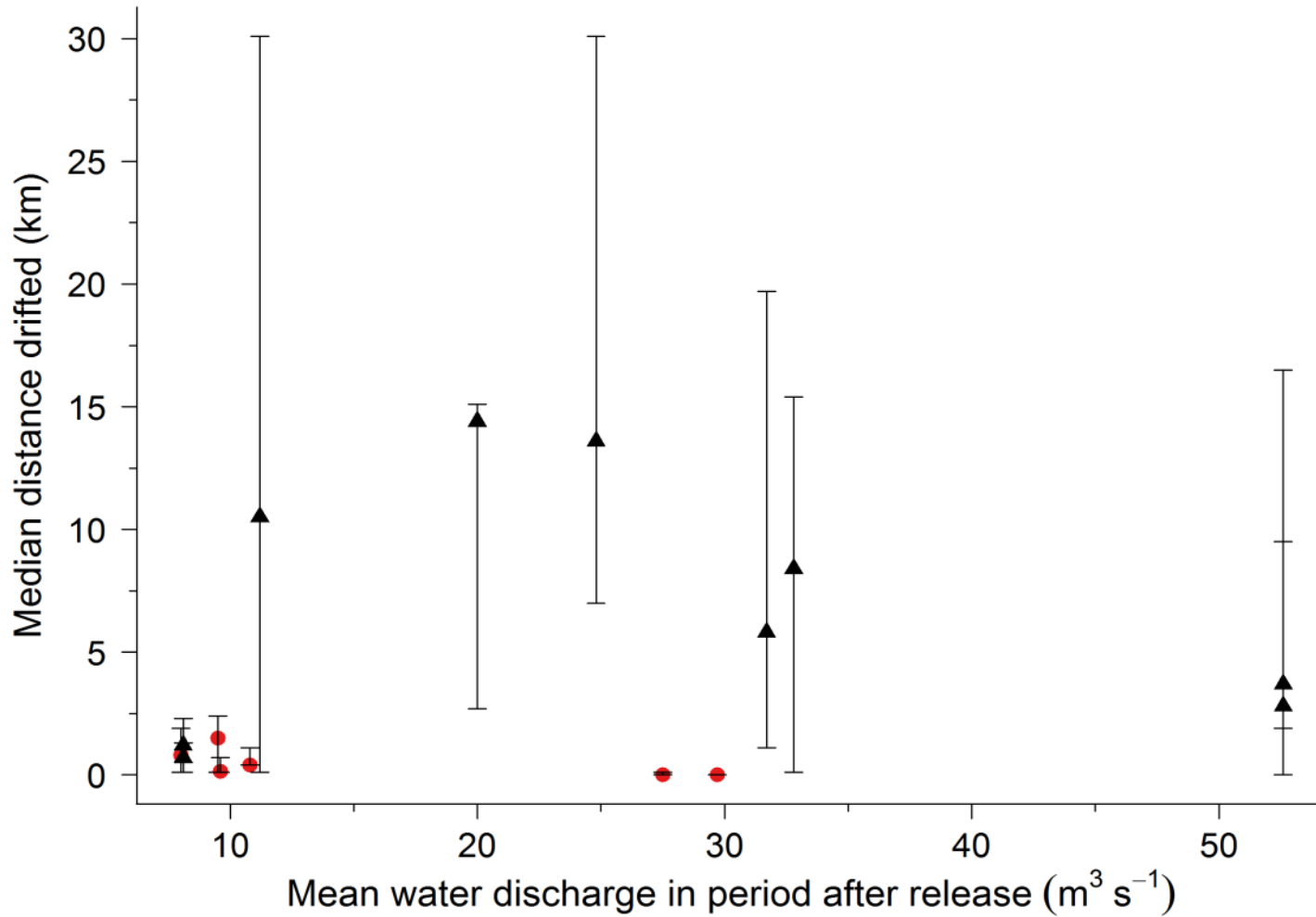
Smolt: 3 weeks after release  
Eel: 2 months after release



Smolt: 3 weeks after release  
Eel: 2 months after release



Smolt: 3 weeks after release  
Eel: 2 months after release



● Smolt  
▲ Eel

# Predation



Diemel



35%

Sieg

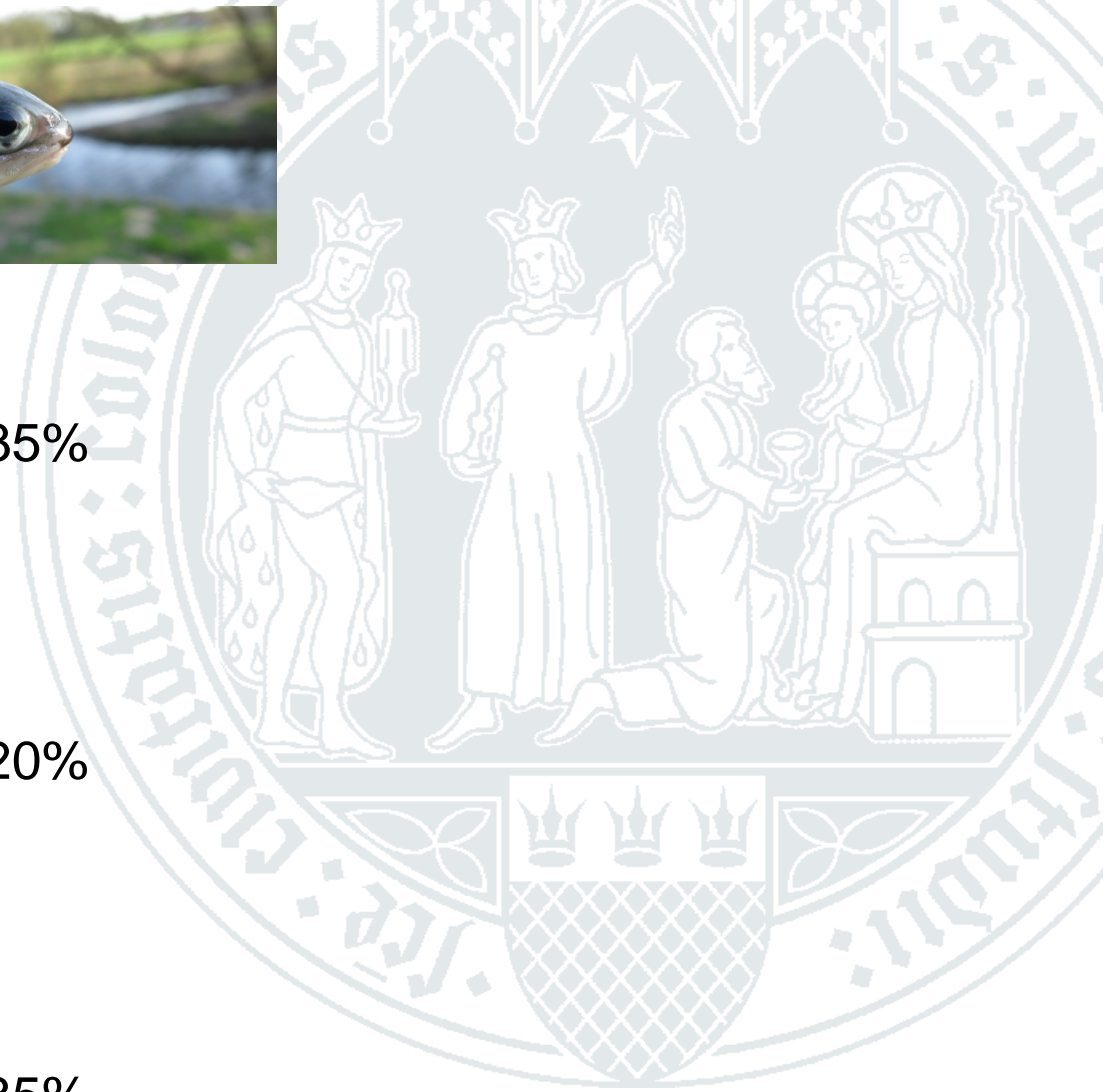


20%

Kinzig



35%



# Predation



## Diemel



## Sieg



## Kinzig



35%

30%

20%

20% (2014)

13% (2015)

35%

10%

# Predation

After 2.6 days



## Diemel



## Sieg



## Kinzig



35%

30%

20%

20% (2014)

13% (2015)

35%

10%



## Summary

- Drift species-specific and site-specific











## Summary

- Drift species-specific and site-specific
- Max drift distance up to 2.4 km for smolt and 30.1 km for eel
- No correlation to discharge
- Predation!

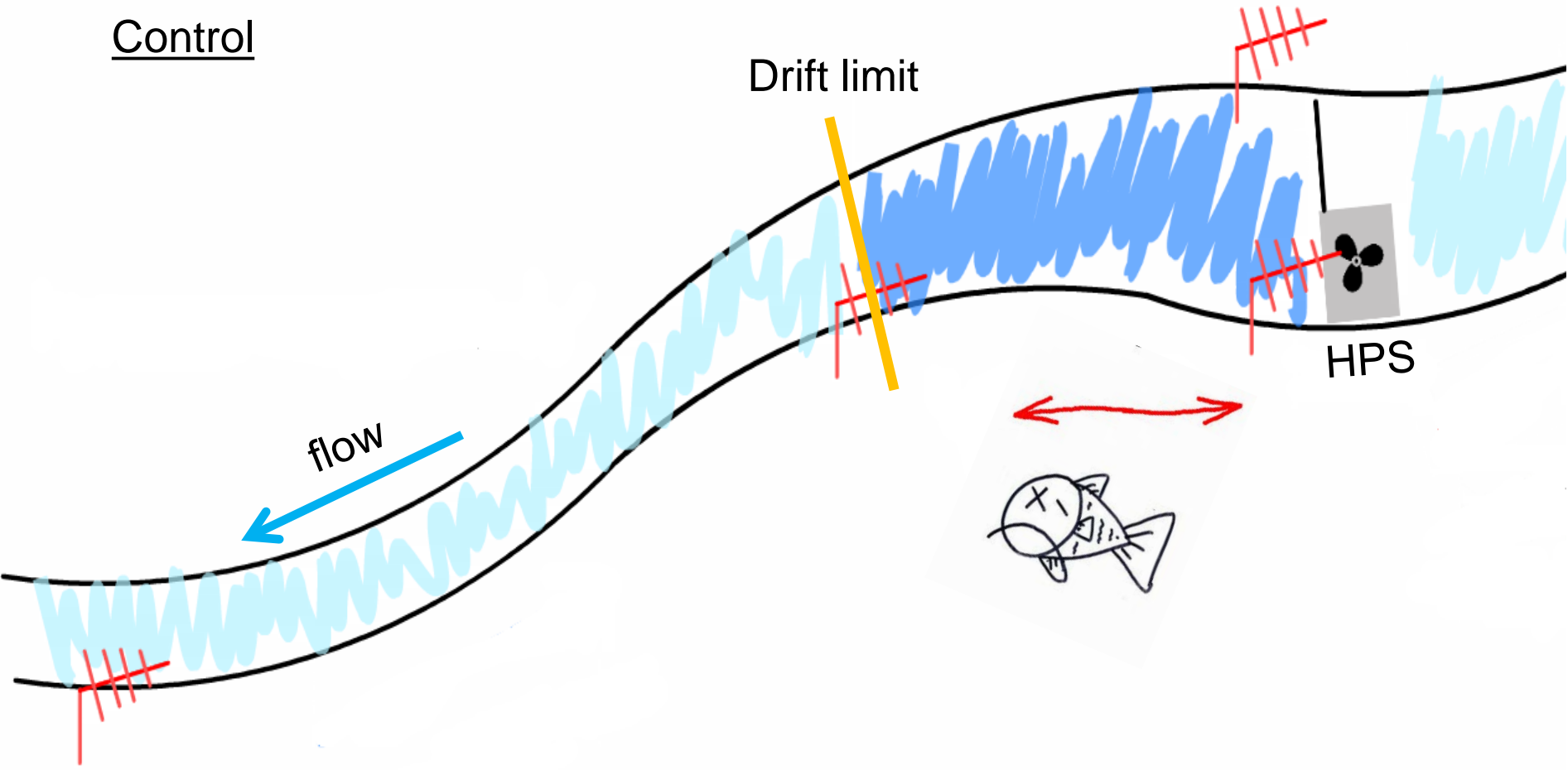
Dead fish as study-specific control group

Control

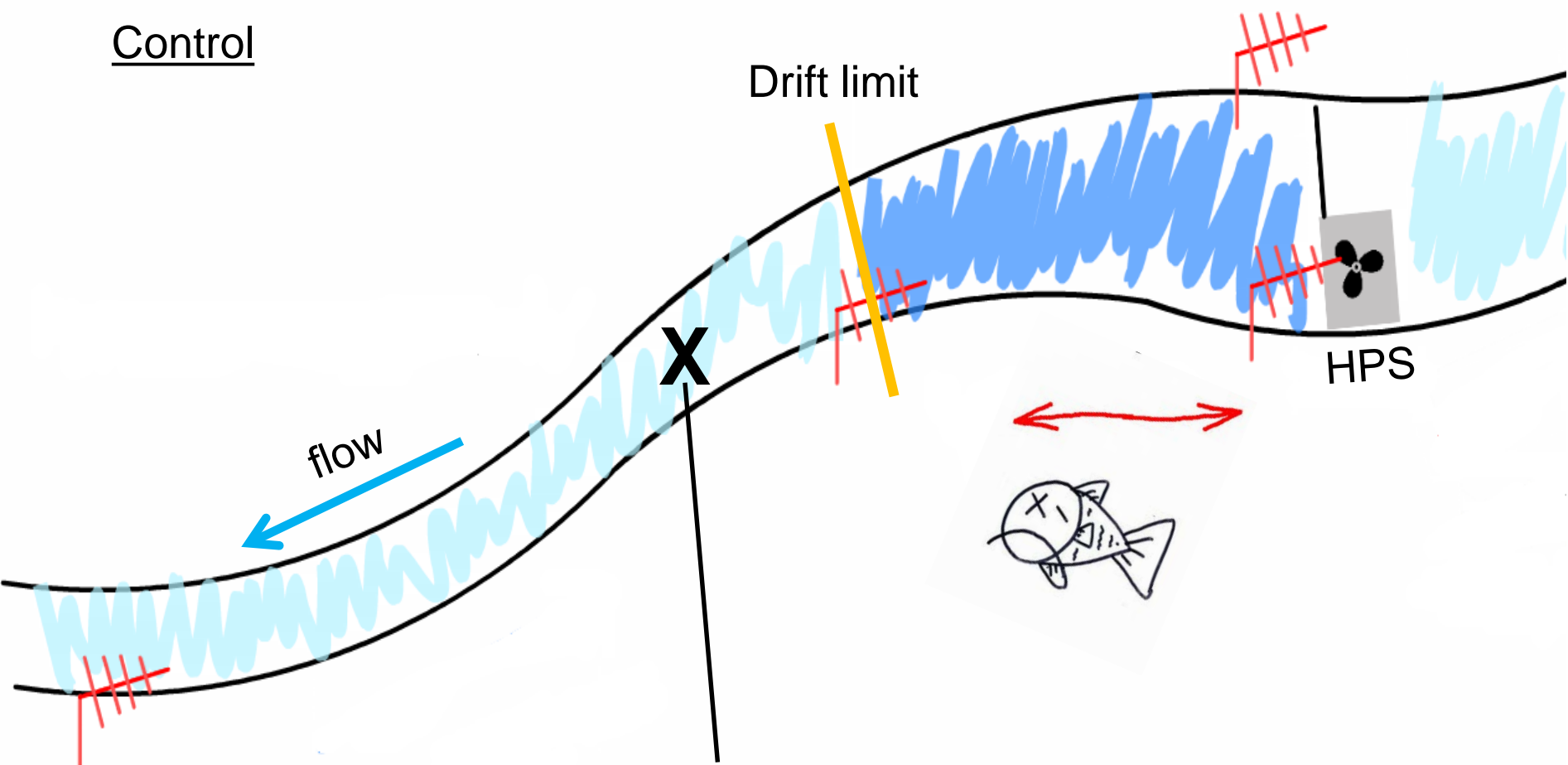
Drift limit

flow

HPS



# Control



A fish found after drift limit = alive  
or at least did not die directly at power station



Thank you

