Diet and behaviour of Wels catfish(*Silurus glanis*) at the weir and sluice complex Lith (river Meuse)

Effects catfish on migratory fish species (and invasive species)

26-11-2025 Jacco van Rijssel, Max de Koning, Maximilliaan Claus

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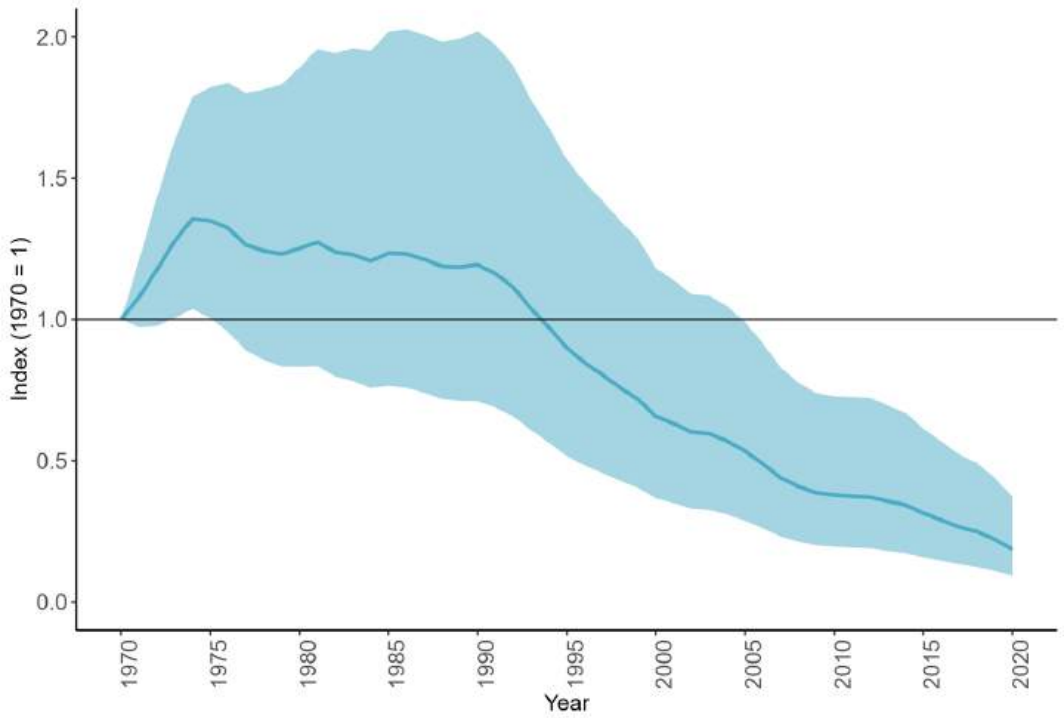
Migratory fish decline

Worldwide migratory fish species decline: 81% since 1970



Deinet et al. 2024

Effects of catfish on migratory fish

- 35% salmon predated by catfish in a fish ladder Garonne (France)

Video of Salmon in the fishway:

predated by European catfish (speed x0.5).

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Bouletreau et al. 2018, 2020, 2021

Effects of catfish on migratory fish

- 35% salmon predated by catfish in a fish ladder Garonne (France)
- 80% tagged sea lamprey predated by catfish in Garonne and Dordogne

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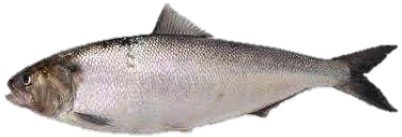
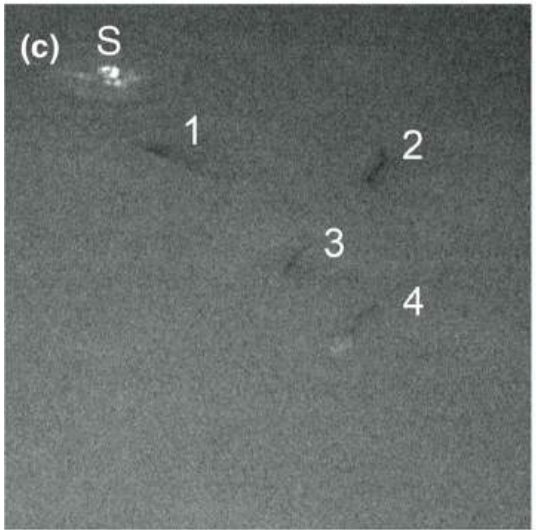
Bouletreau et al. 2018, 2020, 2021

Effects of catfish on migratory fish



- 35% salmon predated by catfish in a fish ladder Garonne (France)
- 80% tagged sea lamprey predated by catfish in Garonne and Dordogne
- 76% of catfish stomach contents contained

Allis shad during spawning season in Garonne



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Bouletreau et al. 2018, 2020, 2021

Effects of catfish on migratory fish

- 35% salmon predated by catfish in a fish ladder Garonne (France)
- 80% tagged sea lamp
  Dordogne
- 76% of catfish stoma

Allis shad during spawn

- Massive predation on

mullets in the Loire

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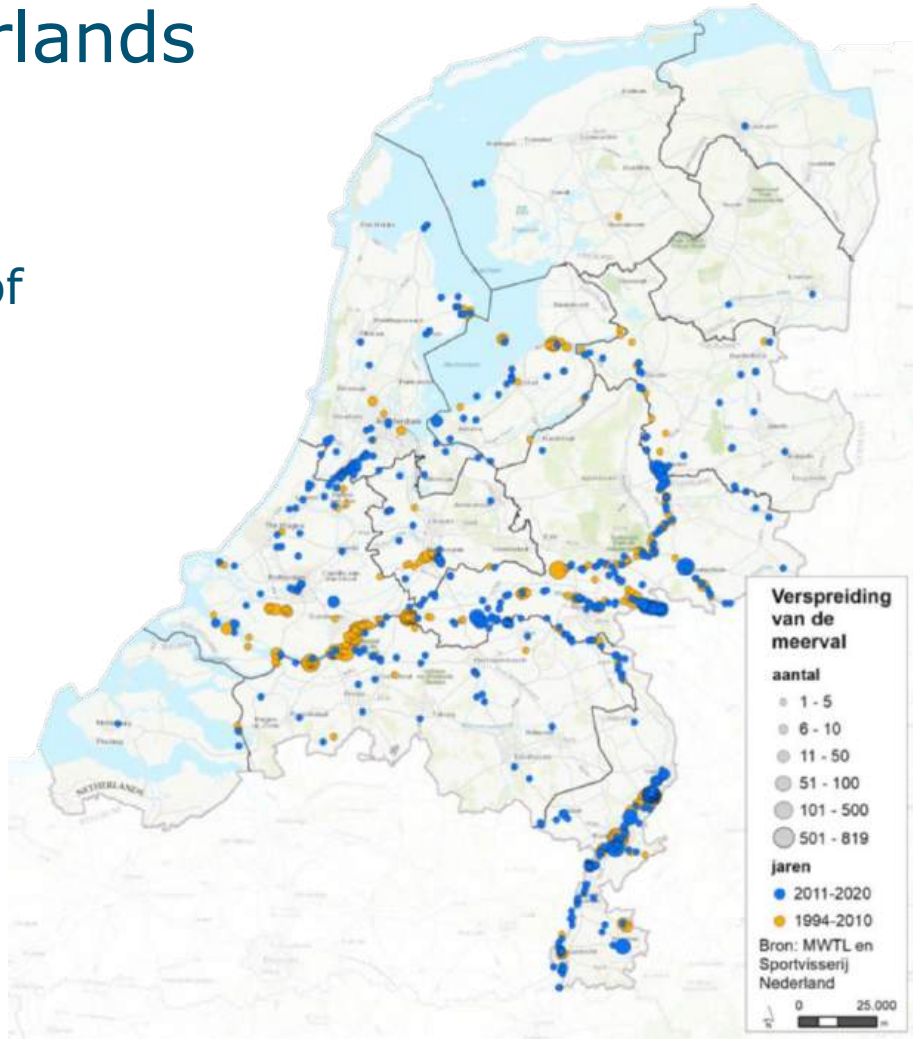
Abundance catfish Netherlands

- Number, abundance and number of large individuals is increasing



Problem / Hypothesis

- Catfish used to be absent in the large rivers (since Middle Ages)
- Protected species
- Relatively abundant around migration barriers
- Possibly forages on protected migratory fish species

Expectations – when do migratory fish migrate?

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

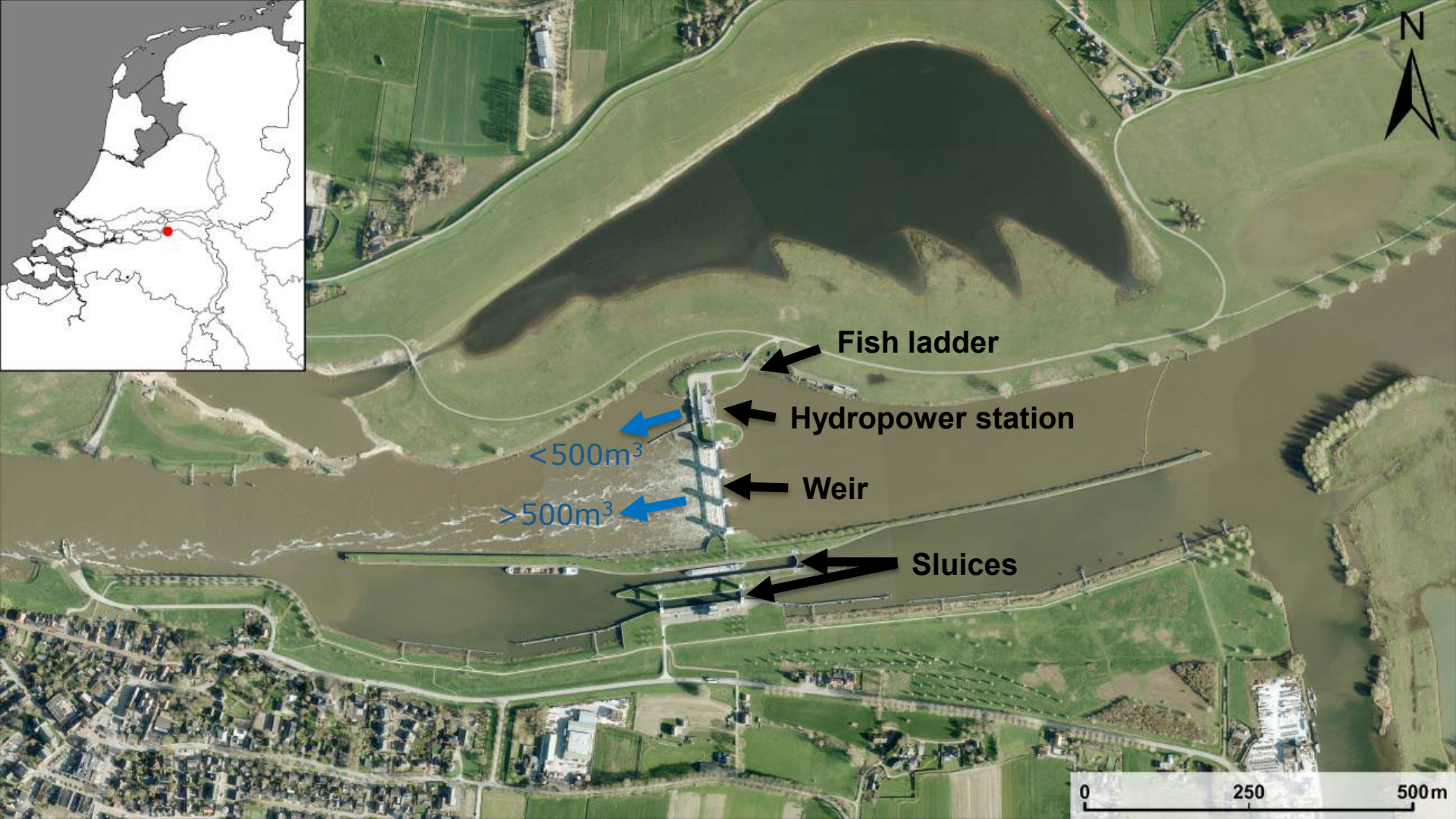
River lamprey / North Sea Houting

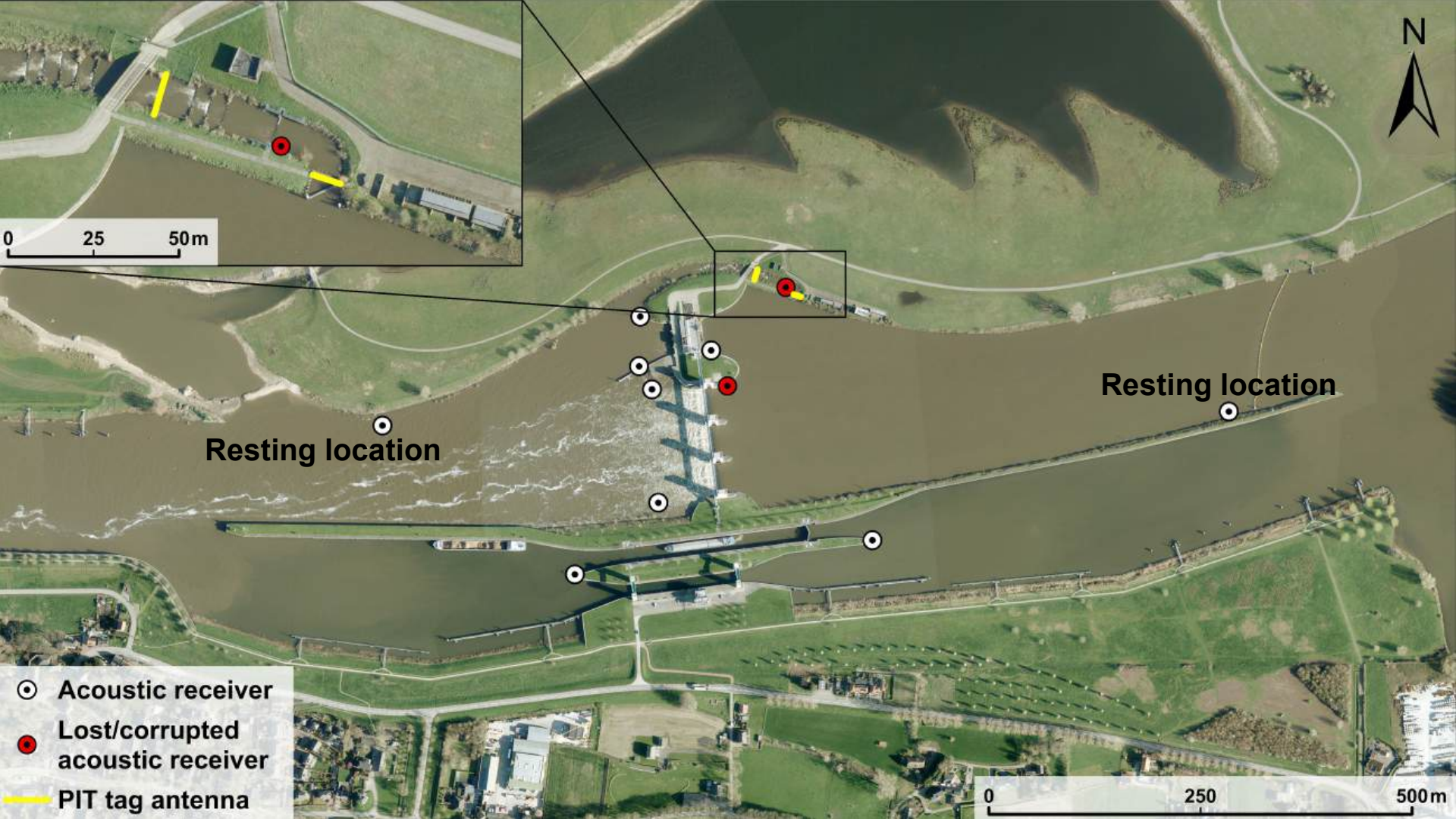
Atlantic salmon (smolts)

Sea lamprey

Reference (no migratory fish)

Silver eel


N
Fish ladder
Hydropower station
<500m³
Weir
>500m³
Sluices
0
250
500m


N
0 25 50m
Resting location
Resting location
Acoustic receiver
Lost/corrupted acoustic receiver
PIT tag antenna
0 250 500m

Methods

- September 2023 – August 2025
- 152 catfish, 13 cm - 181 cm

(fykes and recreational fishermen)

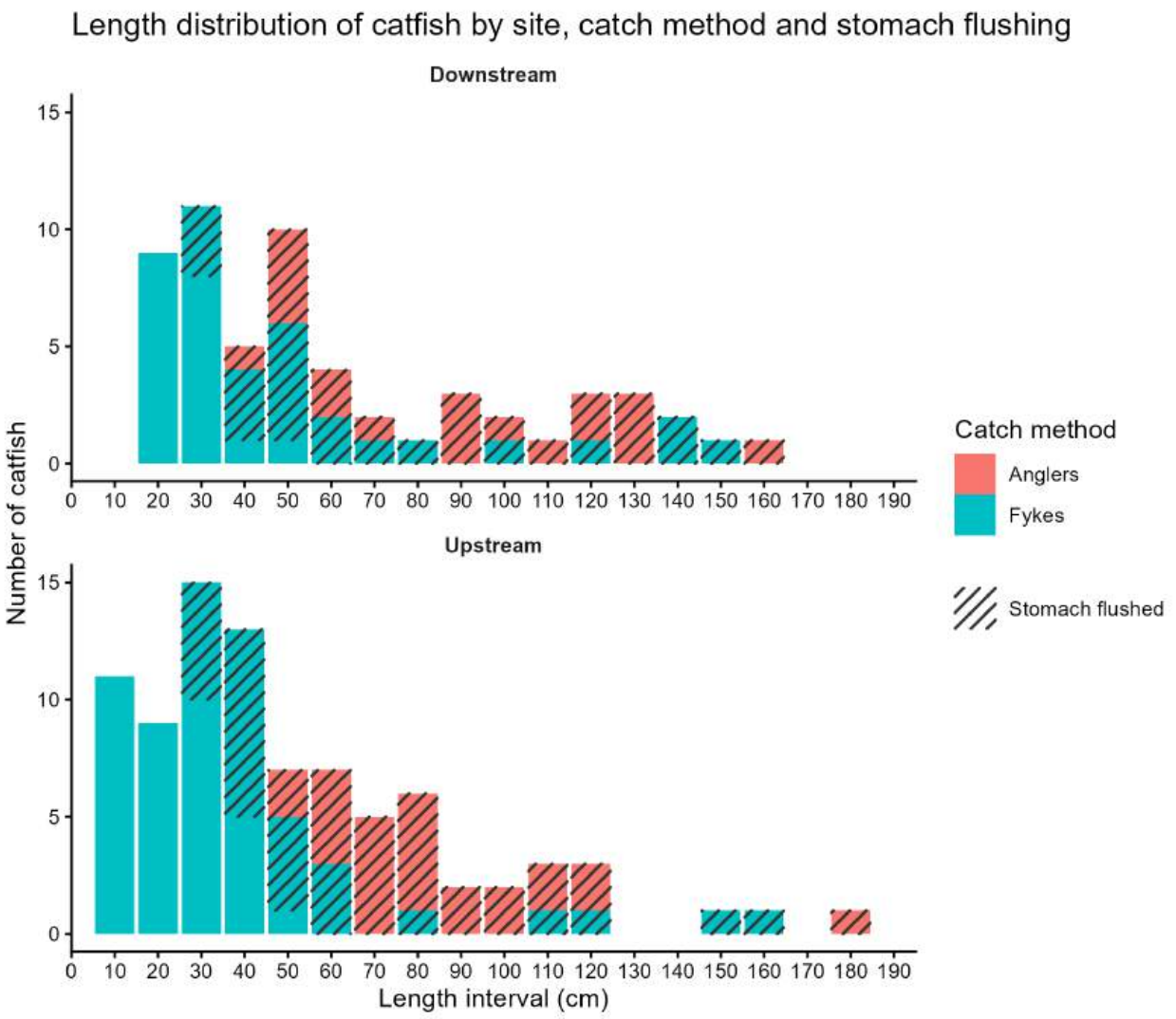
- 120 individuals <80 cm only PIT-tag
- 30 individuals acoustic transmitter (10 years)

(17 upstream, 13 downstream)

- Stomach flushing

Results: Mar

- 17 individuals c
  n=5)
- Schnabel-meth
- Assumption: cl
- Estimate: 399 i



Presence migratory species

- Fykes upstream – Fall 2023, Summer + Fall 2024
- Fykes downstream – Spring, Summer, Fall 2024
- Salmon fykes downstream – Spring + Fall 2024, Winter 2024, Spring 2025

Species	Number	Peak period
Atlantic salmon	52 (2)	March-April
Sea trout	17 (5)	June
Sea lamprey	17 (3)	May-June
River lamprey	7	March
European eel	2777	August-November

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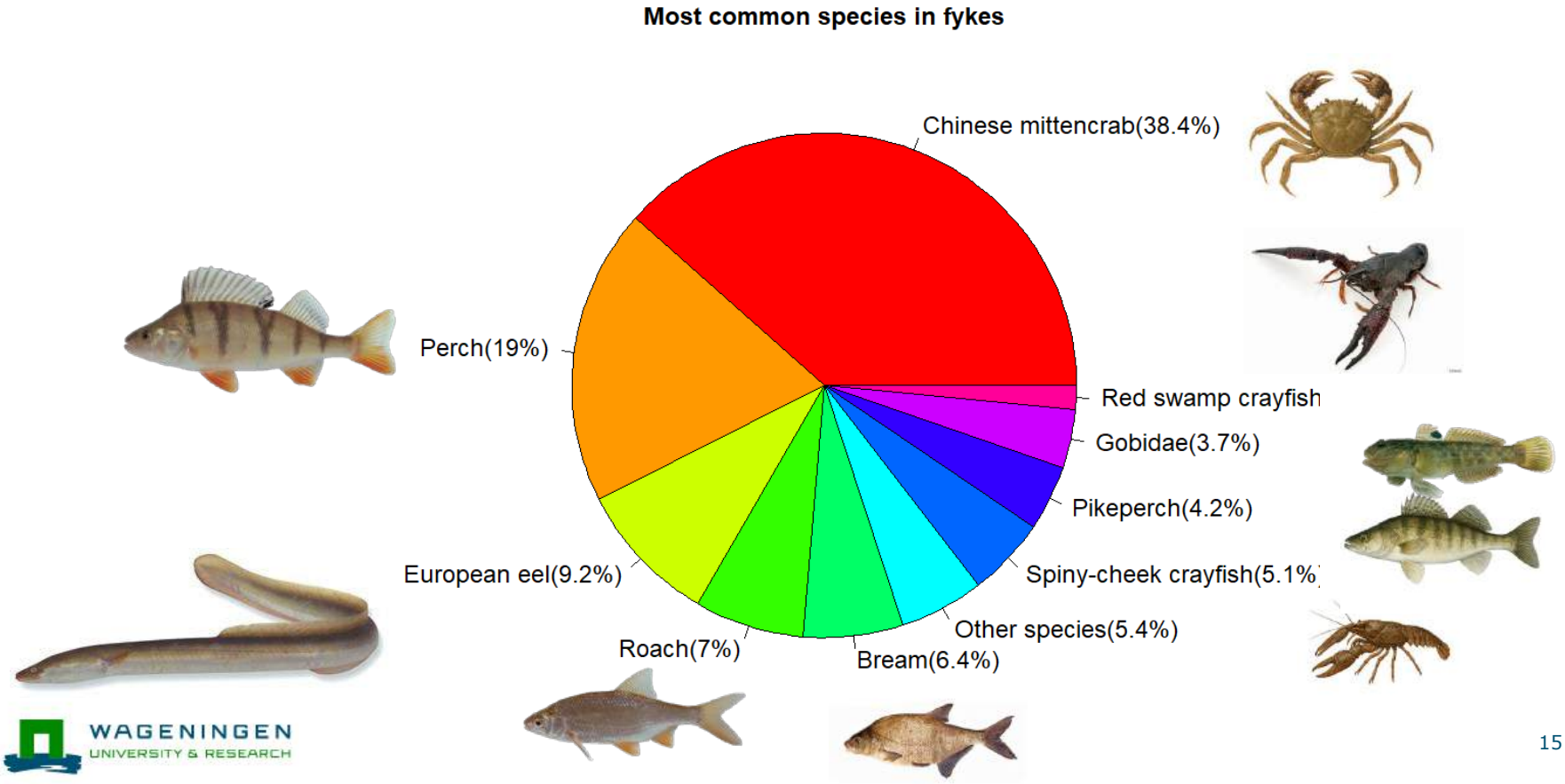
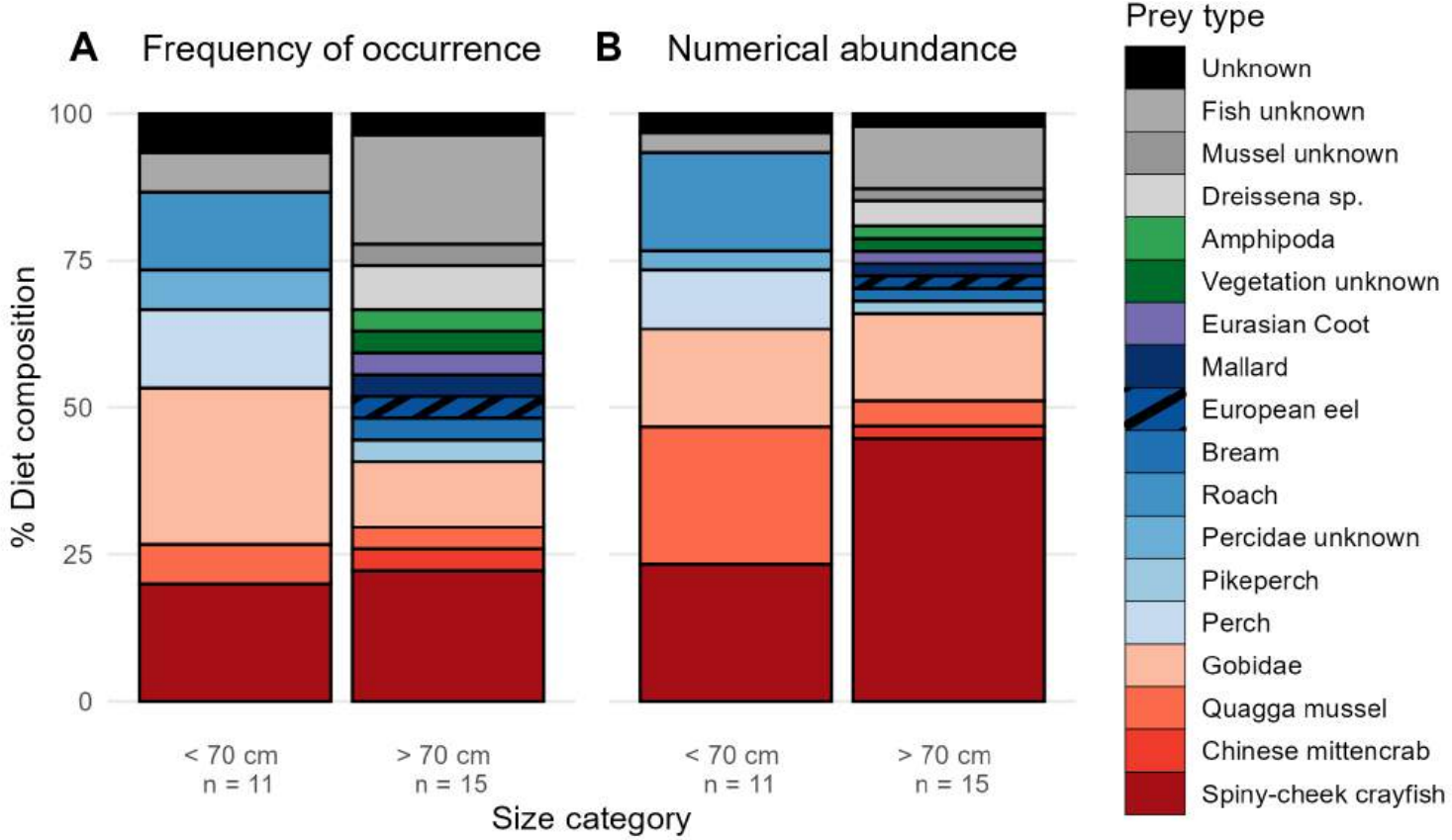
Presence other species



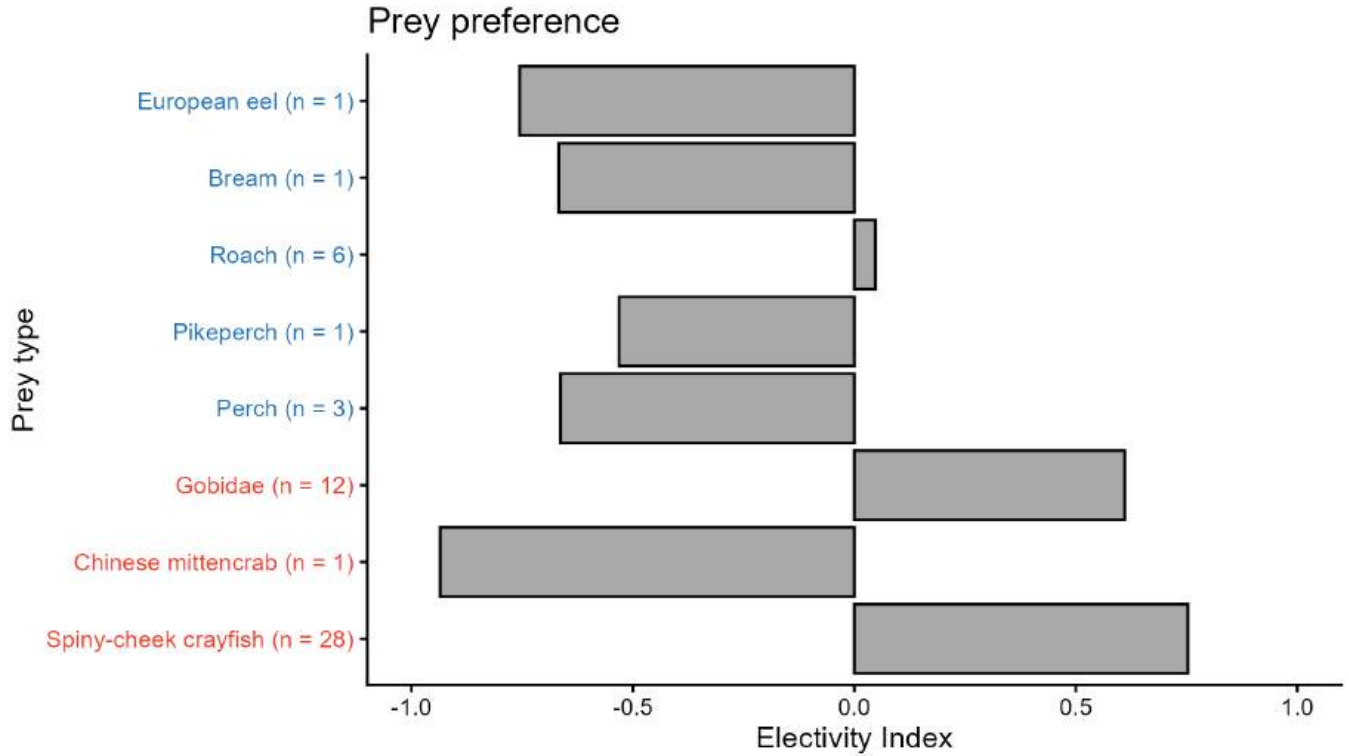
Diet – 41%-66% invasive species, May-August 2025

26 individuals (22%) stomach content

1 migratory fish (eel)



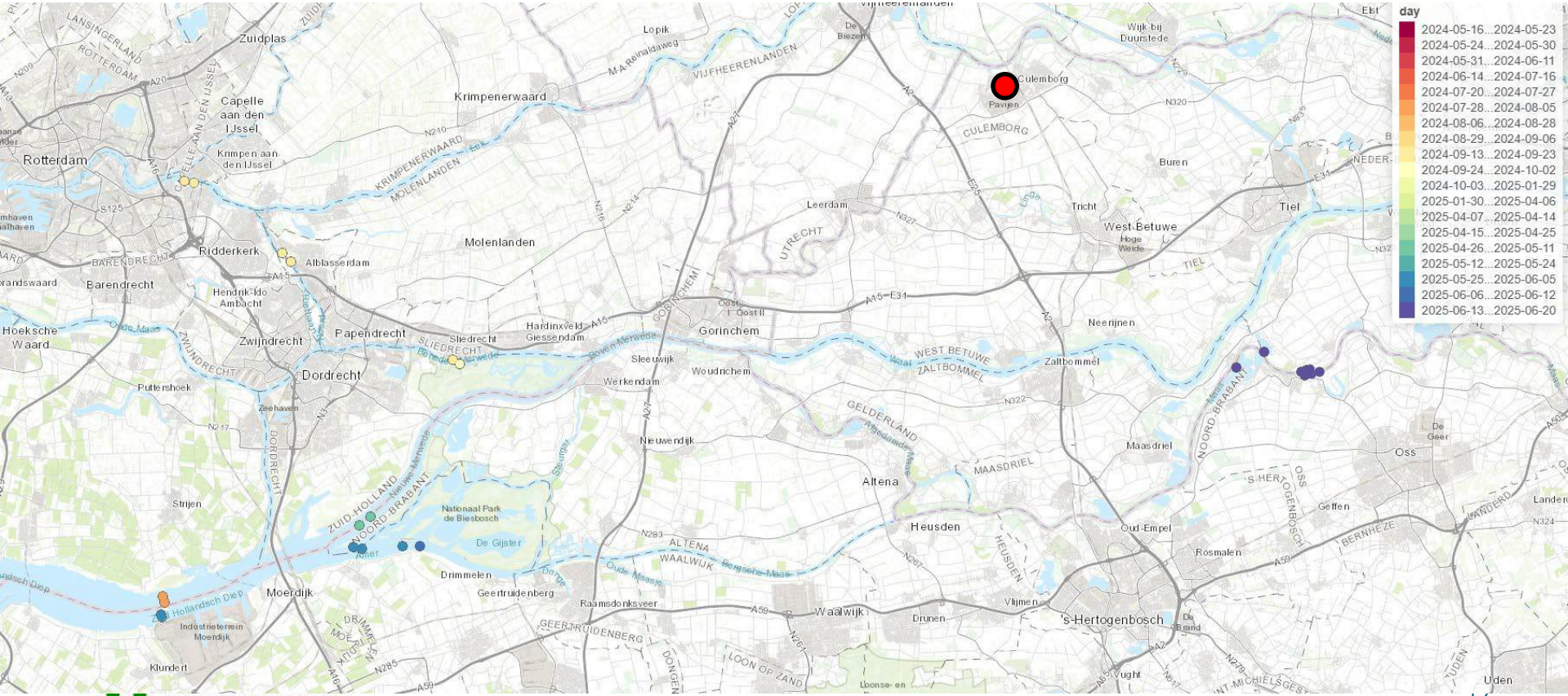
Prey preference



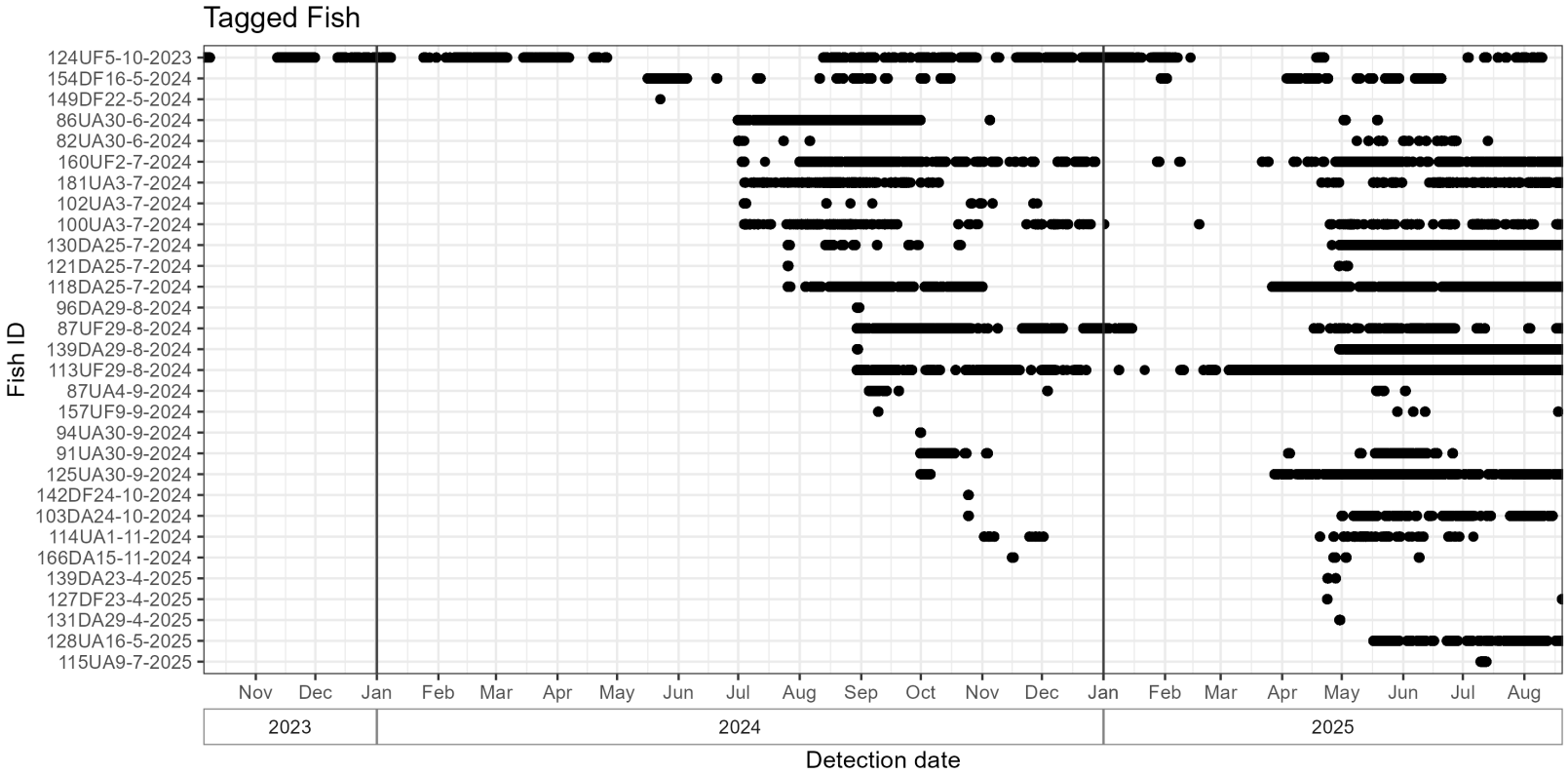
Behavioural analysis

- 10 catfish left the study area within 3 days
- 3 upstream individuals went downstream
- 7(!) towards Biesbosch 70 km downstream
- Downstream (n=8), upstream (n=12)
- Periode 6 July 2024-20 August 2025

Catfish “Willie” is adventurous

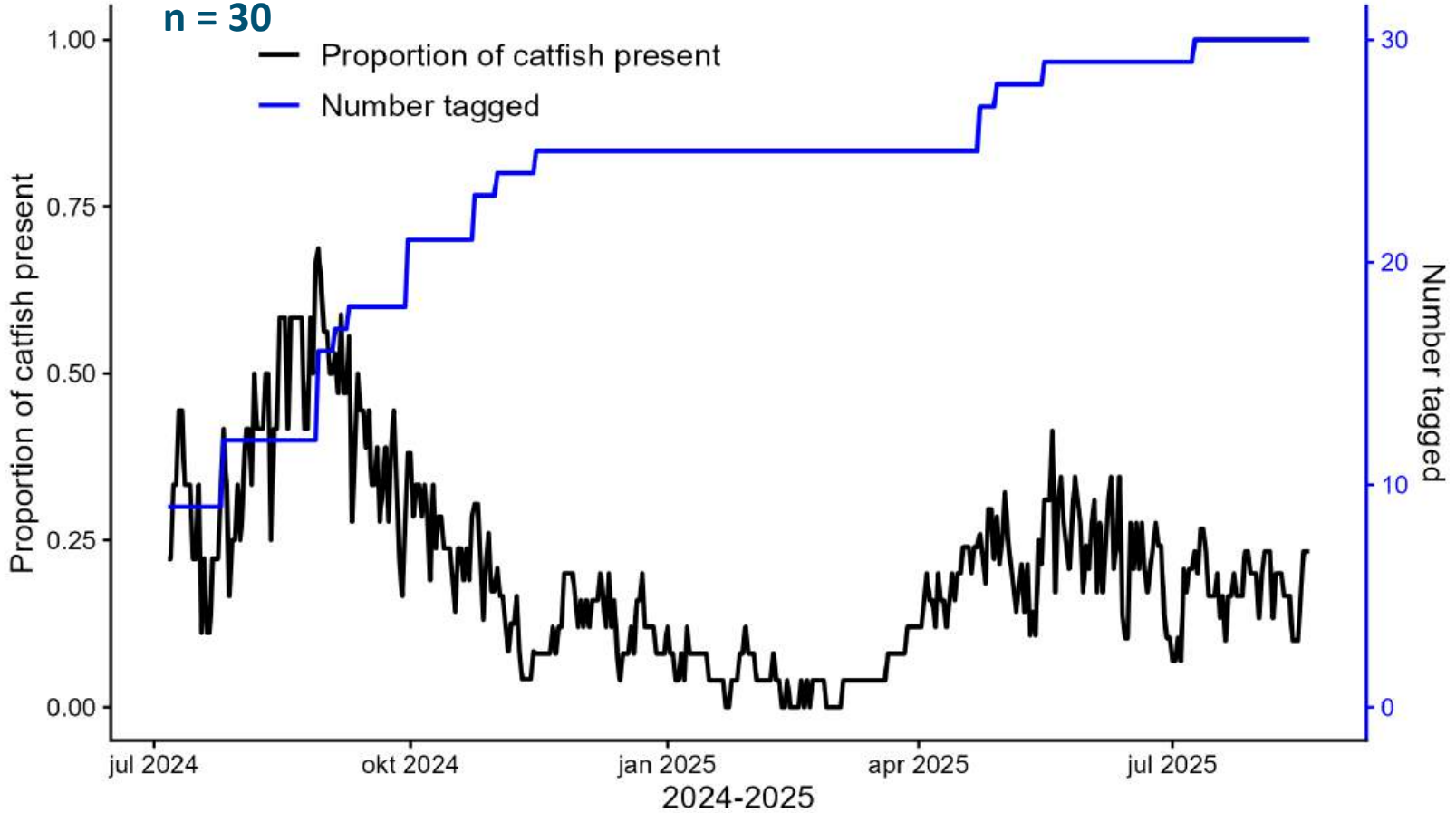


Catfish leave for the winter

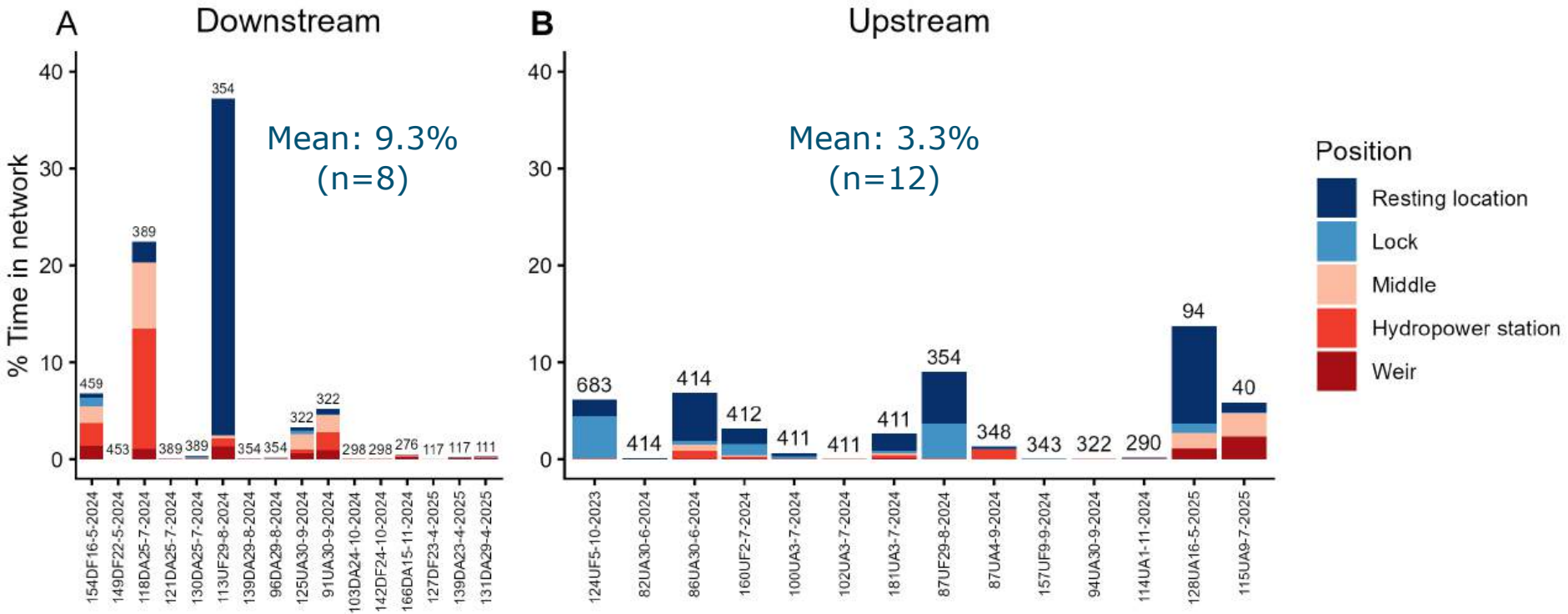


Presence near the sluice and weir complex

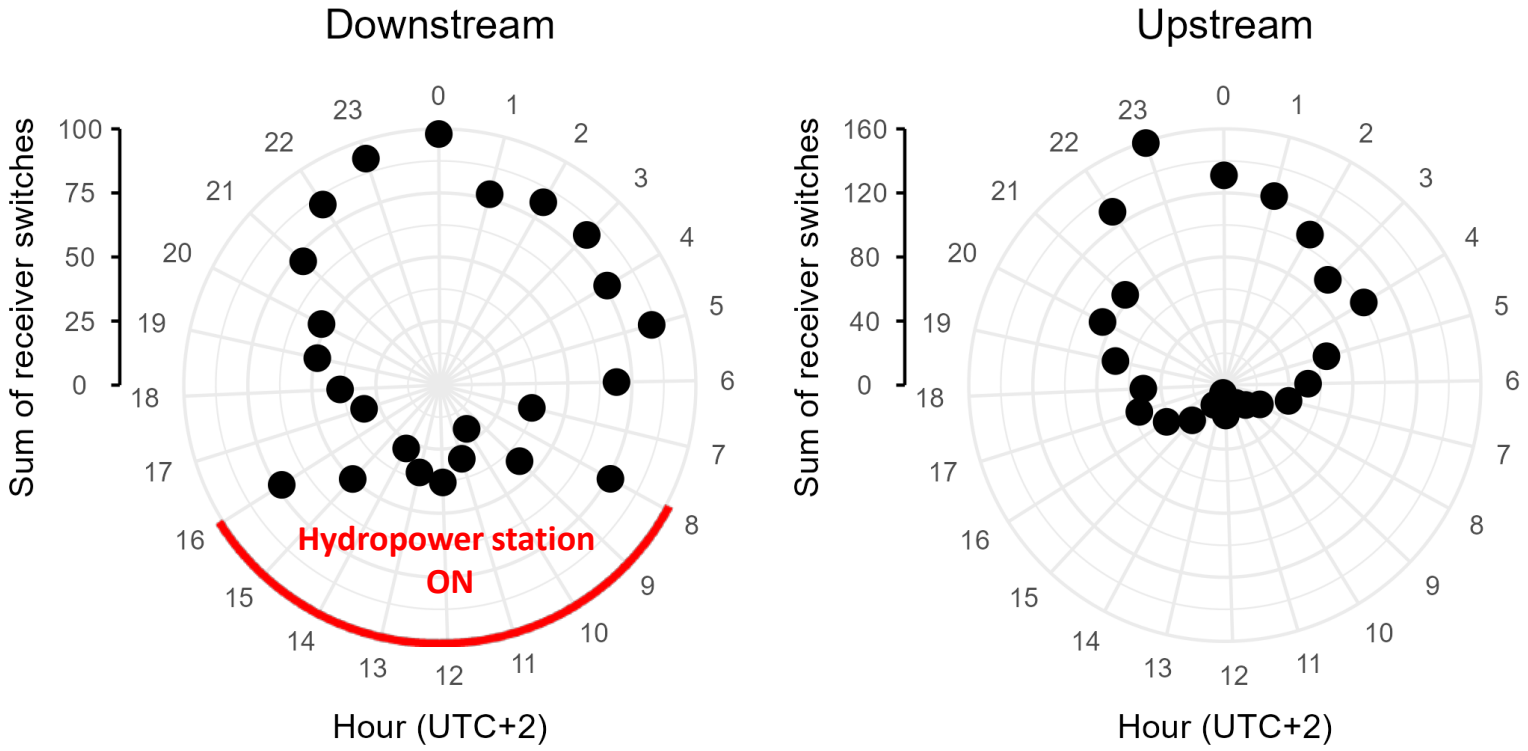
Positive correlation temperature ($p < 0.001$)



Time spent near the sluice and weir complex



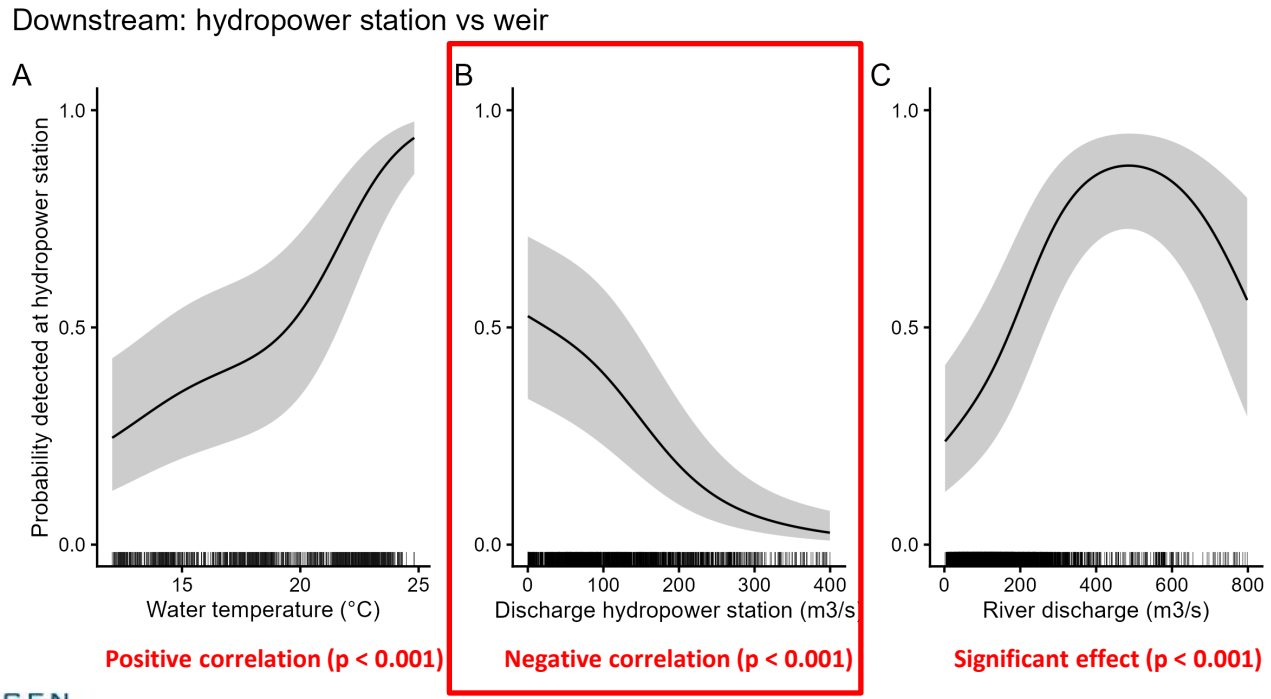
Activity dependent on time and hydropower switch



Downstream position dependent of temperature, discharge and discharge through HPS

Hydropower station (HPS)

Weir



Positive correlation (p < 0.001)

Negative correlation (p < 0.001)

Significant effect (p < 0.001)

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Discussion and conclusions

- Number of (large) catfish low compared to French situations
- Diet mostly reflects prey abundance → Opportunistic predator
- Catfish mainly present during late spring and summer
- No catfish in residing in the fish ladder
- Catfish spent relatively little time near weir and sluice complex
- Downstream → catfish mostly near weir and hpc and adjust behaviour to weir management (!)
- Upstream → catfish mostly near sluice and resting location (suitable habitat)

Conclusions

- Are migratory fish “save” from catfish in the Netherlands?
  - No strong evidence that they are not safe, however…
  - Very low numbers of migratory fish
  - Number of large (>1.5 m) catfish in current study also low
  - Many empty stomachs
  - Large part of the large catfish were caught >3 km from sluice and weir complex
  - An increase of (large) catfish numbers might prevent recovery of migratory fish species

Predation risk

Species and life stage	Estimated migration period	Barrier passage	Estimated spatial/temporal overlap (predation risk)	Assumed location of highest predation risk
Silver eel	September– January	Nocturnal	**Moderate**	Upstream and downstream
Atlantic salmon (adult)	February–May	Diurnal	**Low-moderate**	Downstream
Atlantic salmon /sea trout (smolt)	March–May	Nocturnal	**Moderate**	Upstream and downstream
Sea lamprey (adult)	May–July	Nocturnal	**High**	Downstream
Sea trout (adult)	June	Diurnal	**Moderate-high**	Downstream
River lamprey (adult)	December–February	Nocturnal	**Low**	Downstream

Thank you for your attention!

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Ministerie van Landbouw, Visserij, Voedselzekerheid en Natuur

Rijkswaterstaat
Ministerie van Infrastructuur en Milieu