Upstream passage success of large anadromous fish at the Haringvliet estuarine barrier

Using long-term telemetry monitoring

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Rijkswaterstaat
Ministerie van Infrastructuur en Milieu

ATKB
voor natuur
en leefomgeving

Estuarine barriers hamper large migratory fish

Restore migratory fish

Passage Success?

Environmental signals?

What were the migratory windows **and passage success** of large migratory fish at the Haringvlietdam **before Kier management**?

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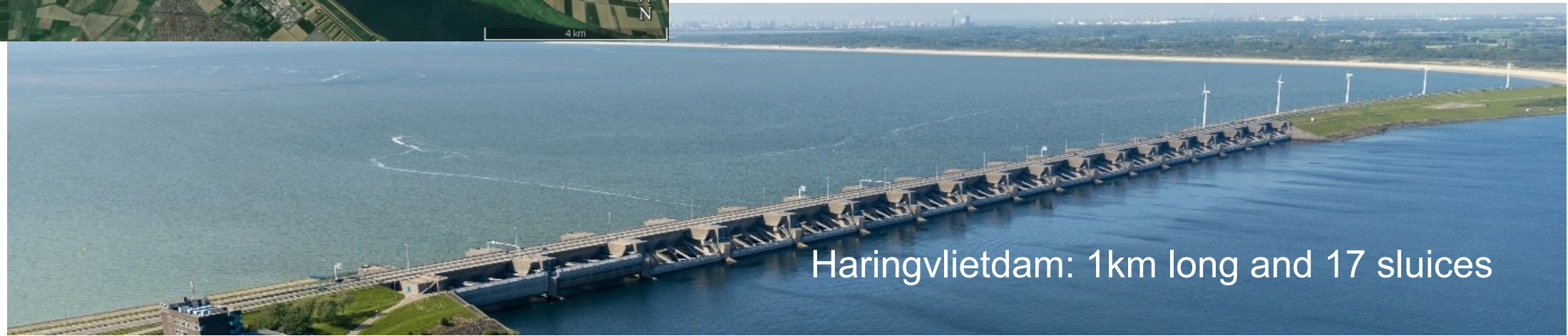
Research area and target species

Anadromous fish:

Atlantic Salmon

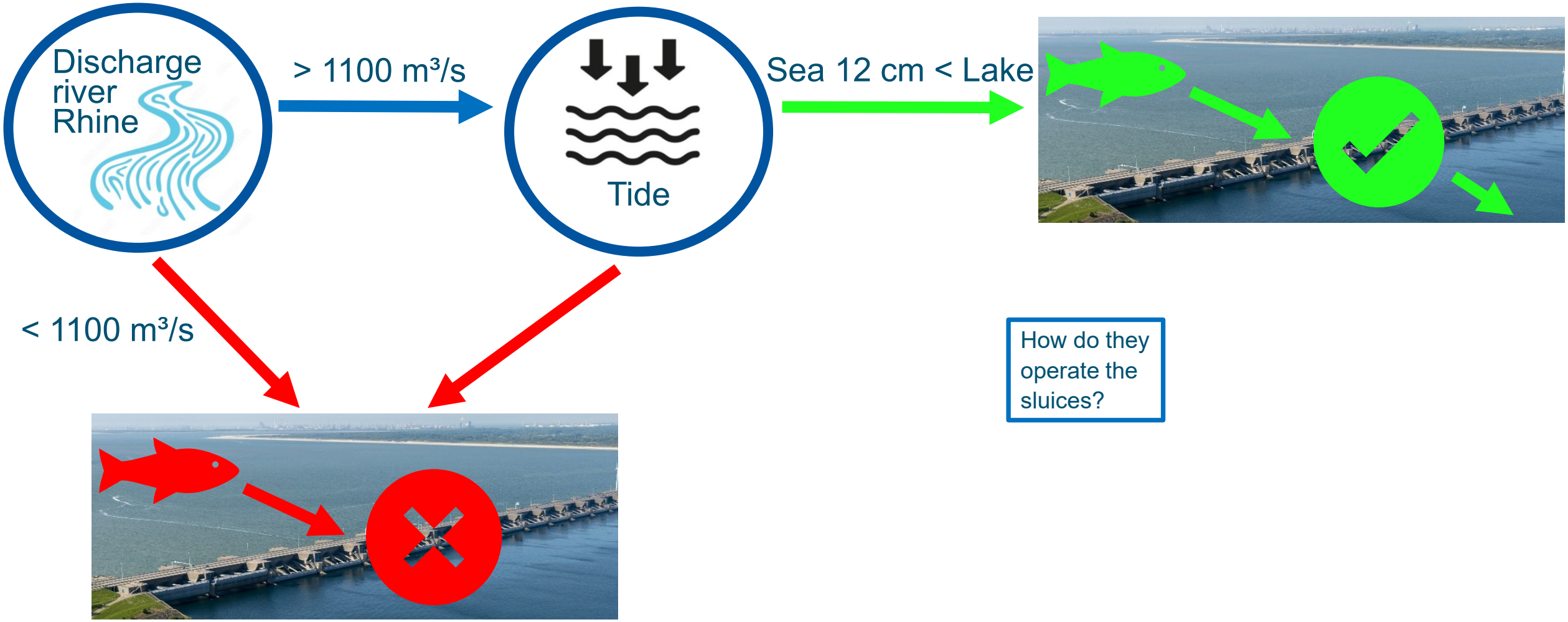
Seatrout

Sea lamprey



Haringvlietdam: 1km long and 17 sluices

Functioning Haringvliet sluices (HVS)



How do they operate the sluices?

Functioning Haringvliet sluices (HVS)

Discharge river Rhine

> 1100 m³/s

Tide

Sea 12 cm < Lake

How do they operate the sluices?

Velocity

Daylight

Can fish pass?

- Gate height
- Number of gates

Attraction

Season

Are fish present?

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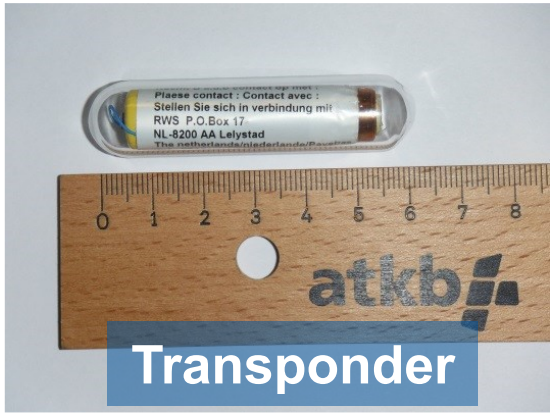
NEDAP Trail System

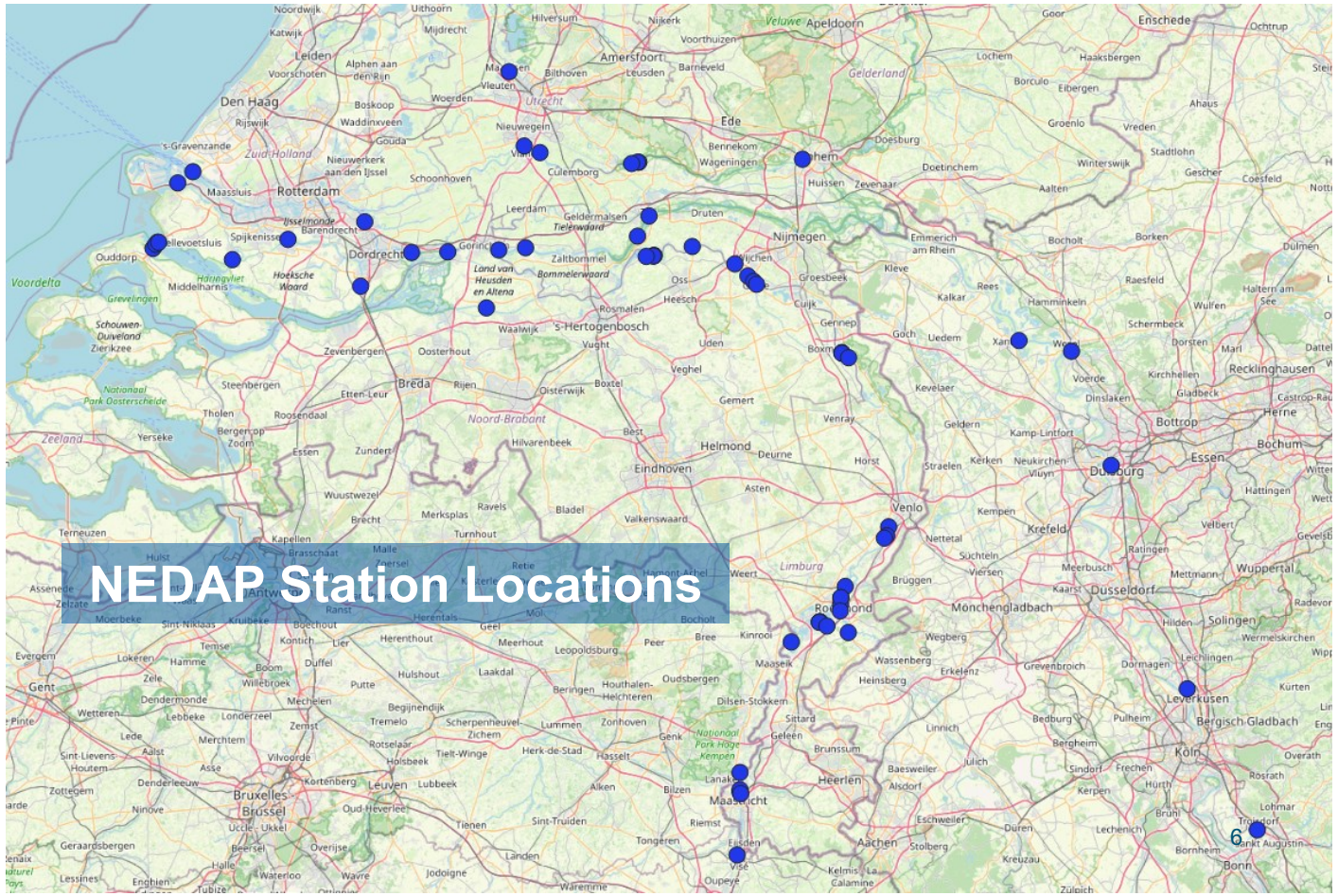
Since 1996

- Transponders (~ 2 years)
- Detection Stations in rivers



Transponder


Data logger of NEDAP Station



NEDAP Station Locations

Fish Tagging
1996-2018

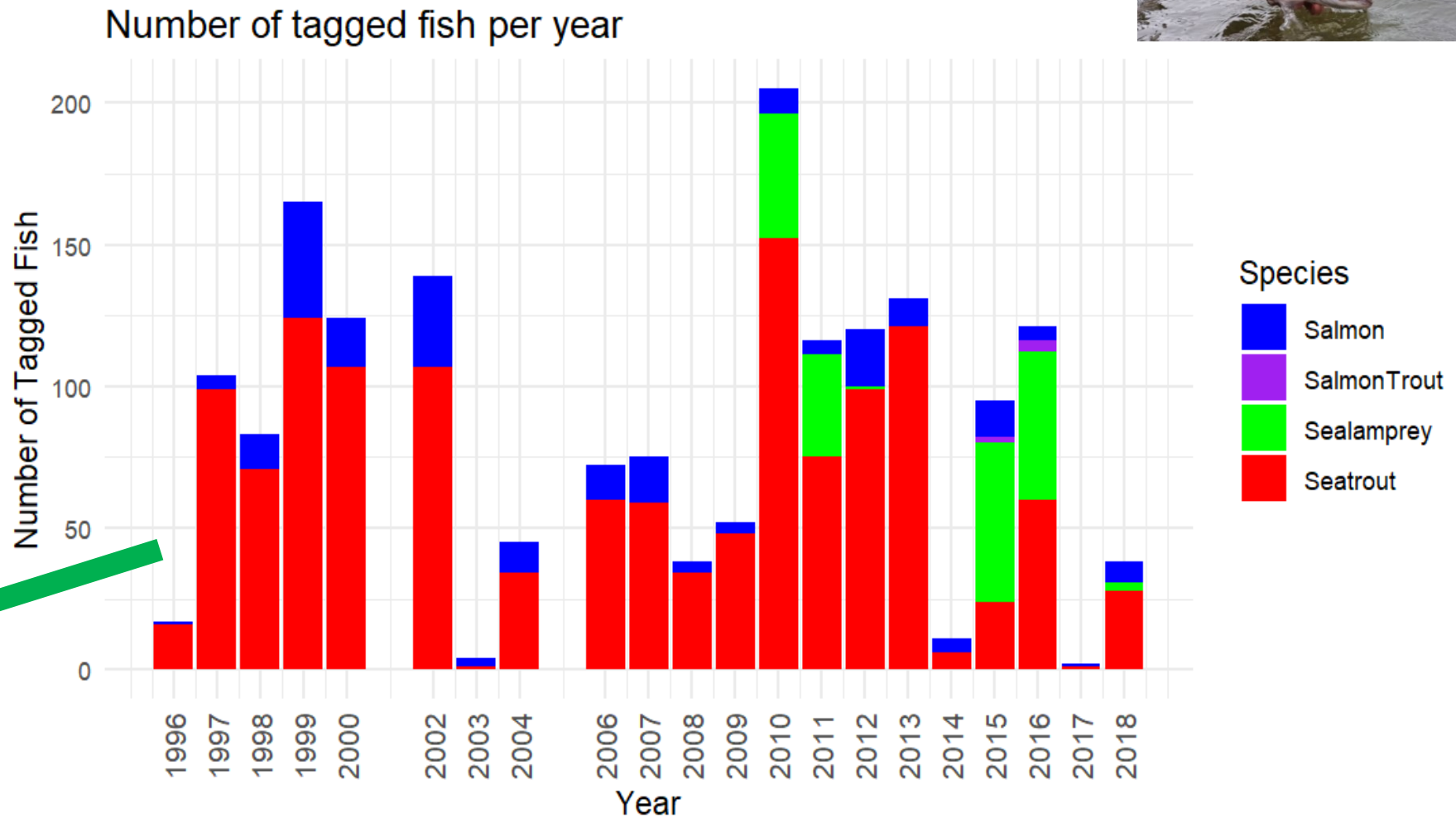
Atlantic Salmon

Seatrout

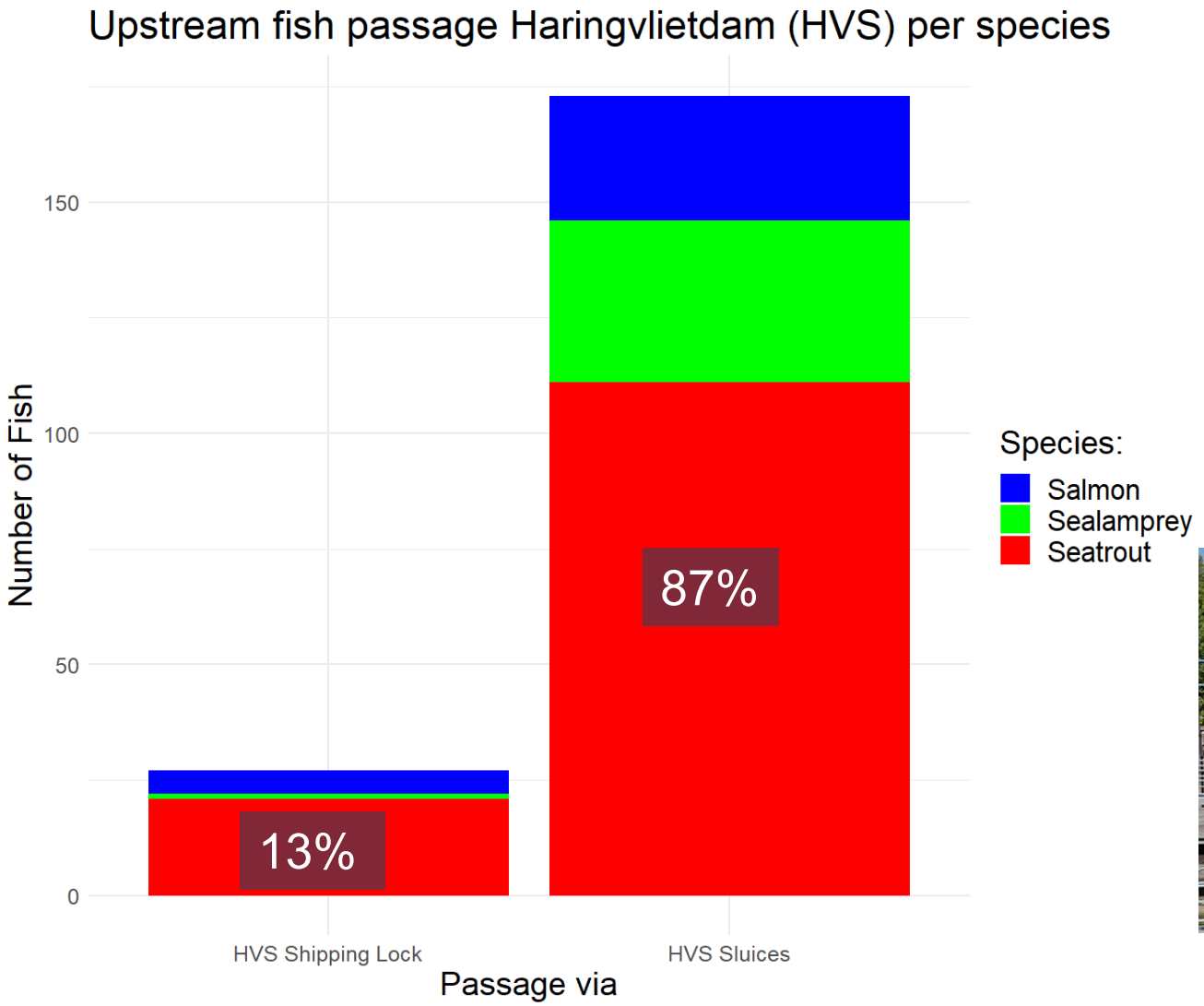
Sea lamprey

- ~17000 fish tagged
- 1757 fish selected

30% Migrated into Rivers



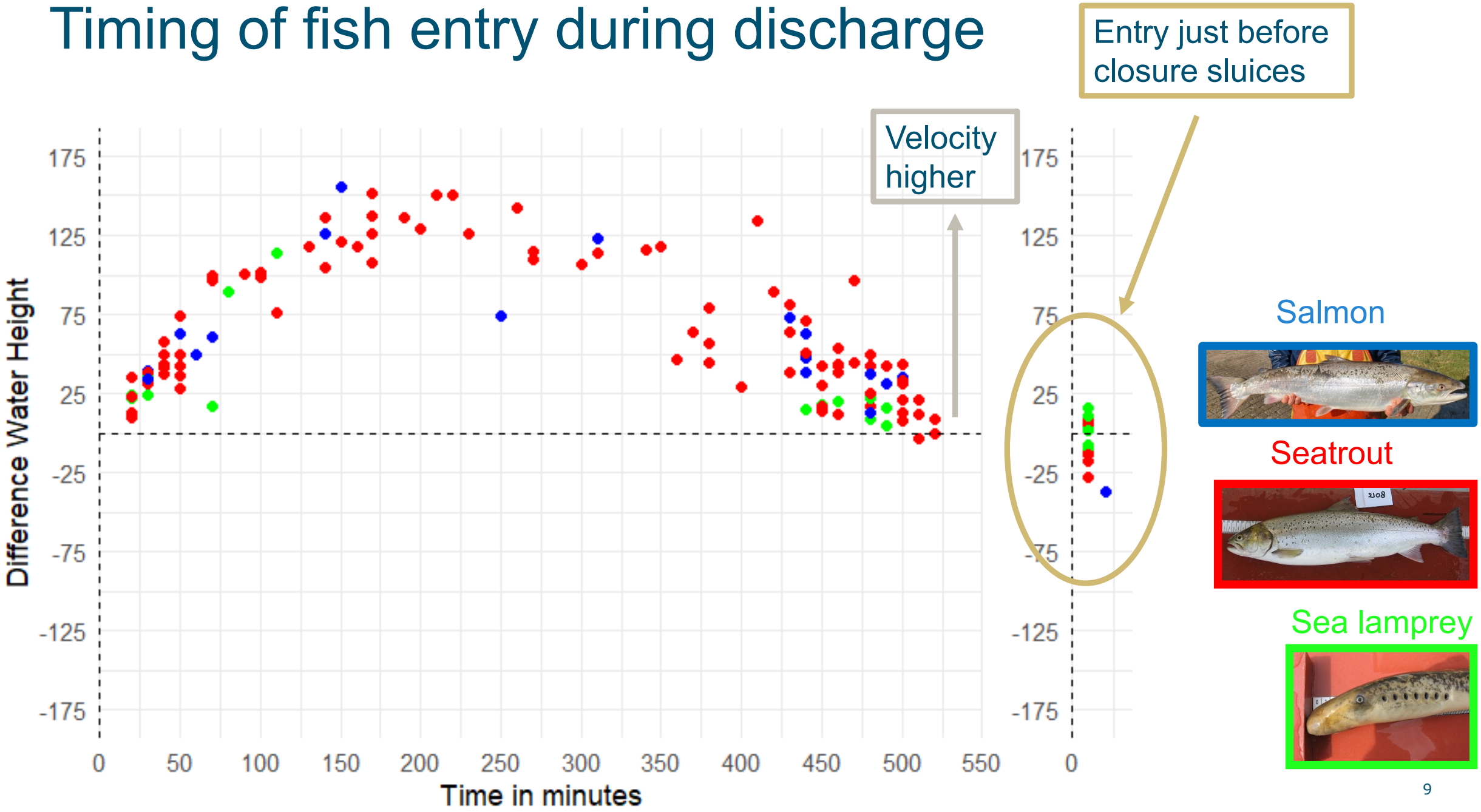
HVS Entry → 200 fish (38%)



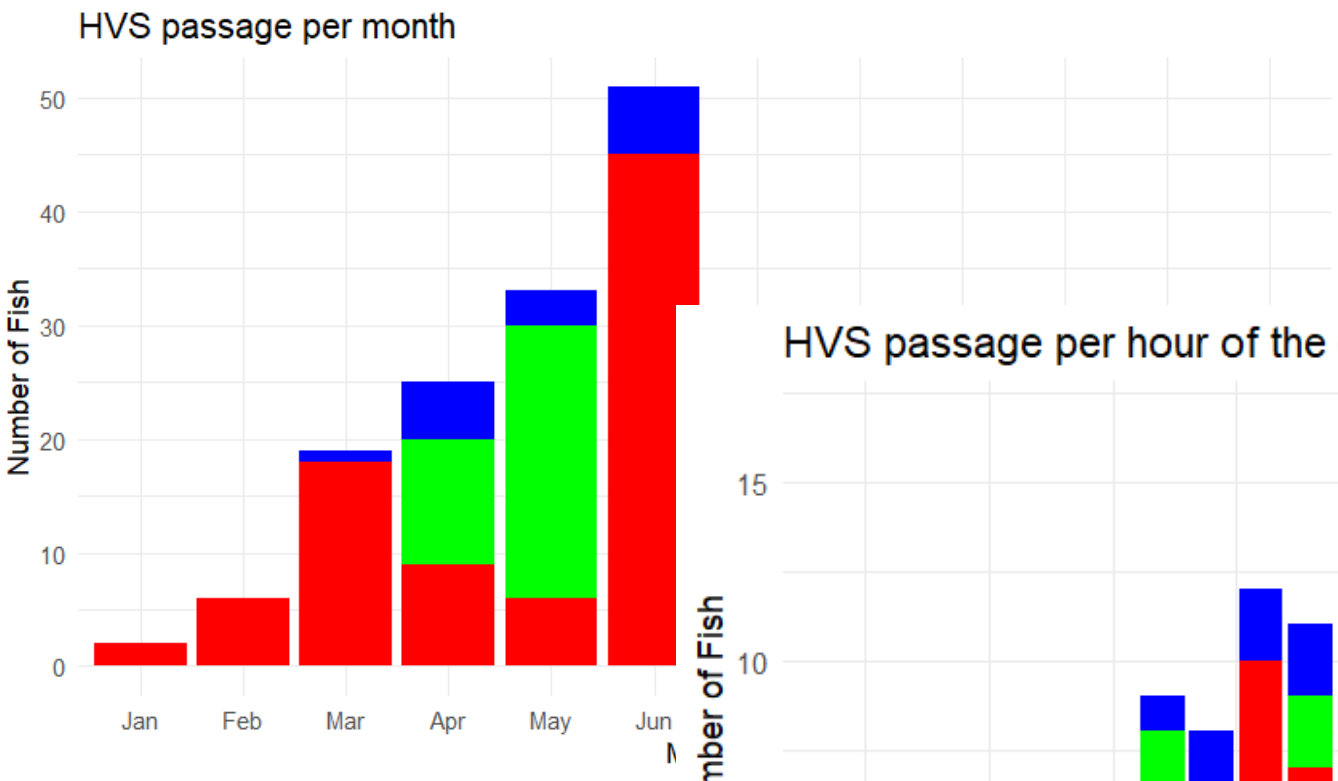
Shipping Lock

HVS Sluices

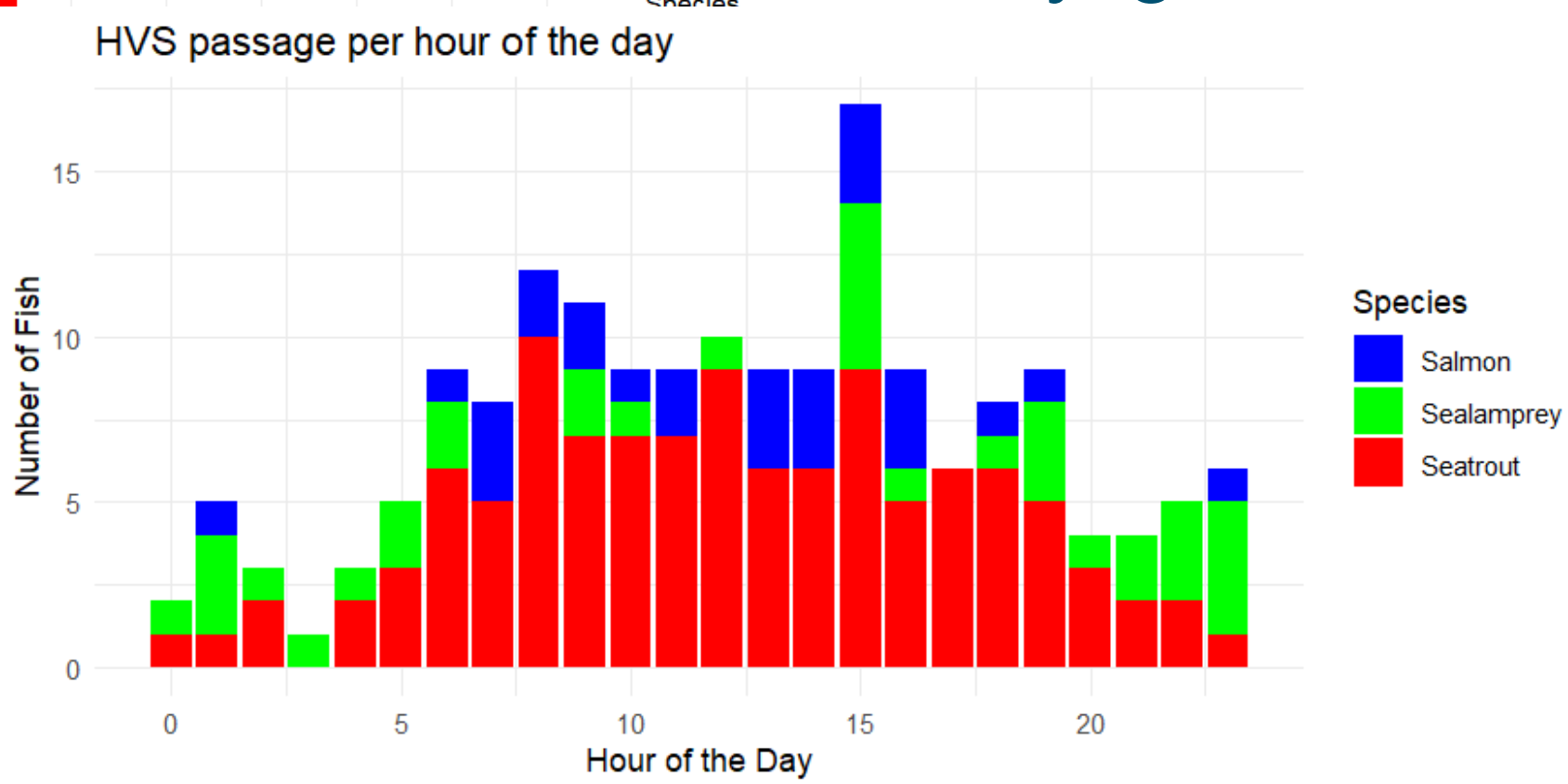
Timing of fish entry during discharge



Season



Daylight



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First conclusions before Kier management

Variation in HVS passage between species!

More fish enter HVS:

- with Lower Velocities
- End discharging period
- in Spring and begin Summer
- during Daylight

Work in progress…

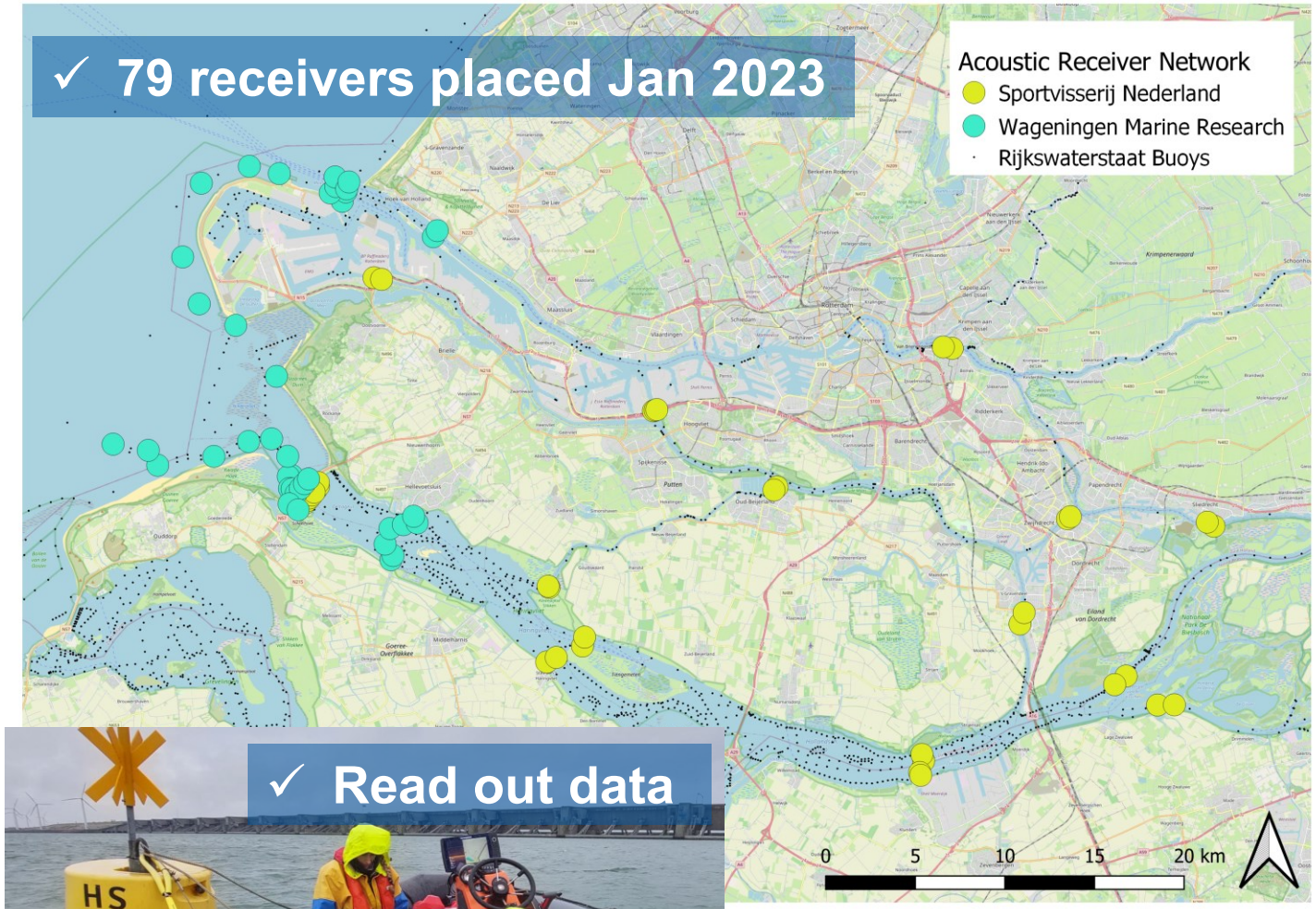
→ during Night
→ not via shipping lock

Atlantic Salmon

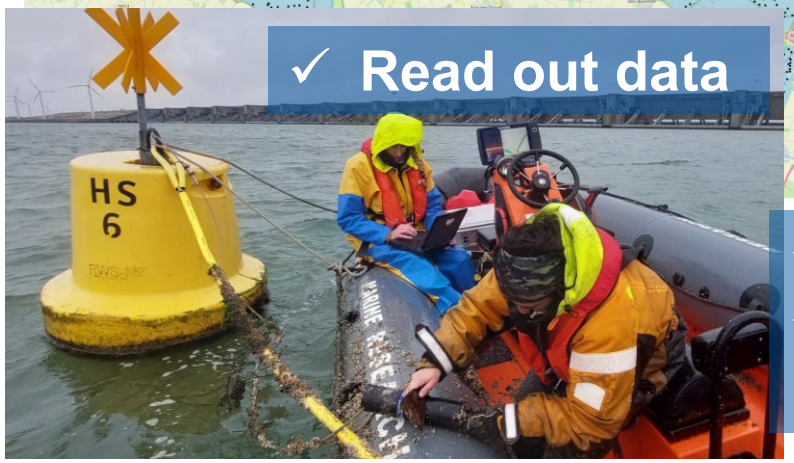
Seatrout

Sea lamprey

Acoustic Telemetry - after Kier management



- Collect new data to determine passage success
- Movement patterns
- Impact of predation and fisheries



✓ 164 fish tagged
✓ ID, acceleration/pressure and predation transmitters

Questions?

Arthur de Bruin 2023

Many thanks to **ATKB**, **Rijkswaterstaat** en **Sportvisserij Nederland**

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Additional info for potential questions

HVS Passage and Migration Routes

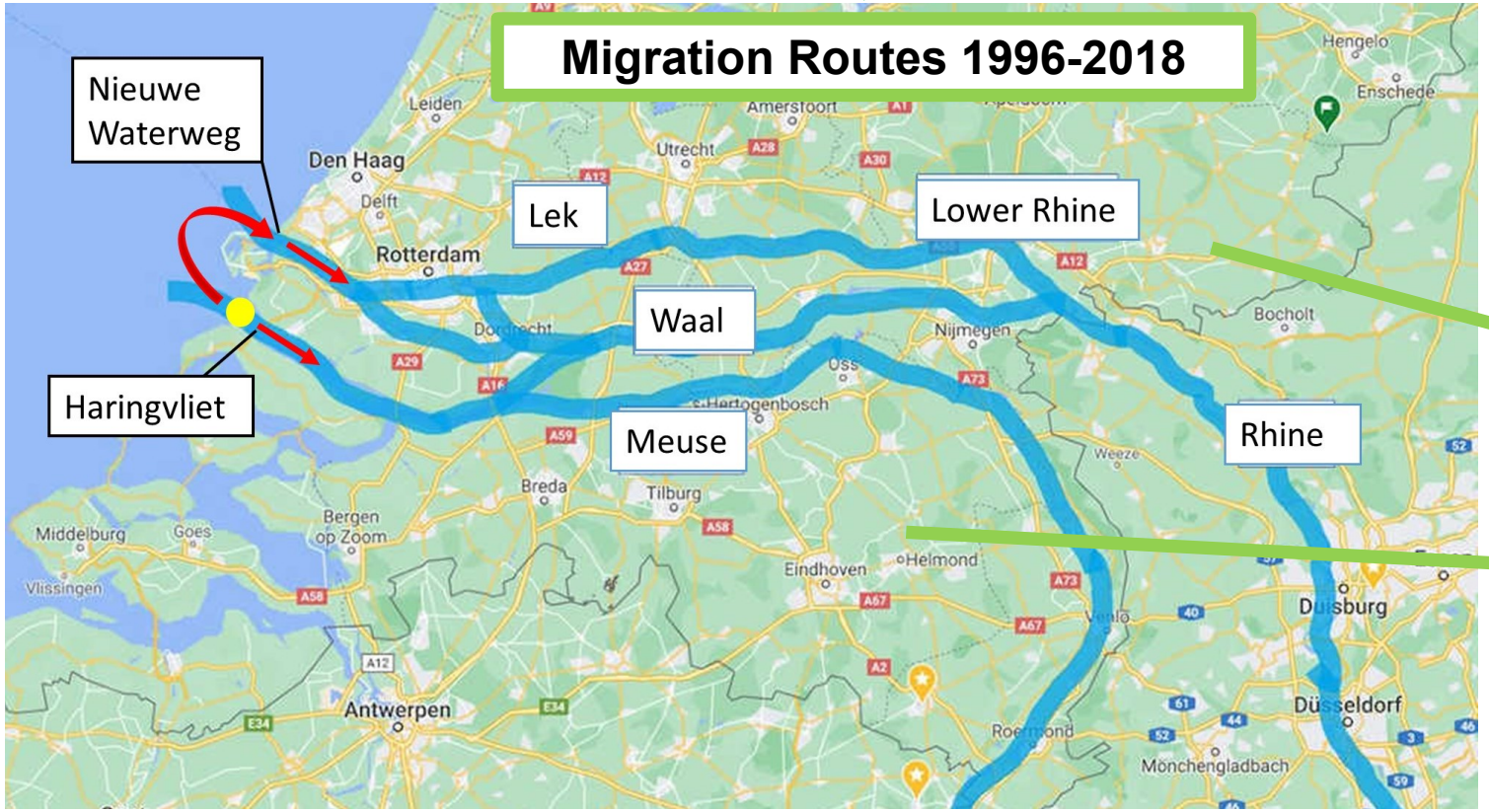
30% Migrated into Rivers

2002-2018

38%

Upstream Passage HVS N=200

Most fish entered within 25 days

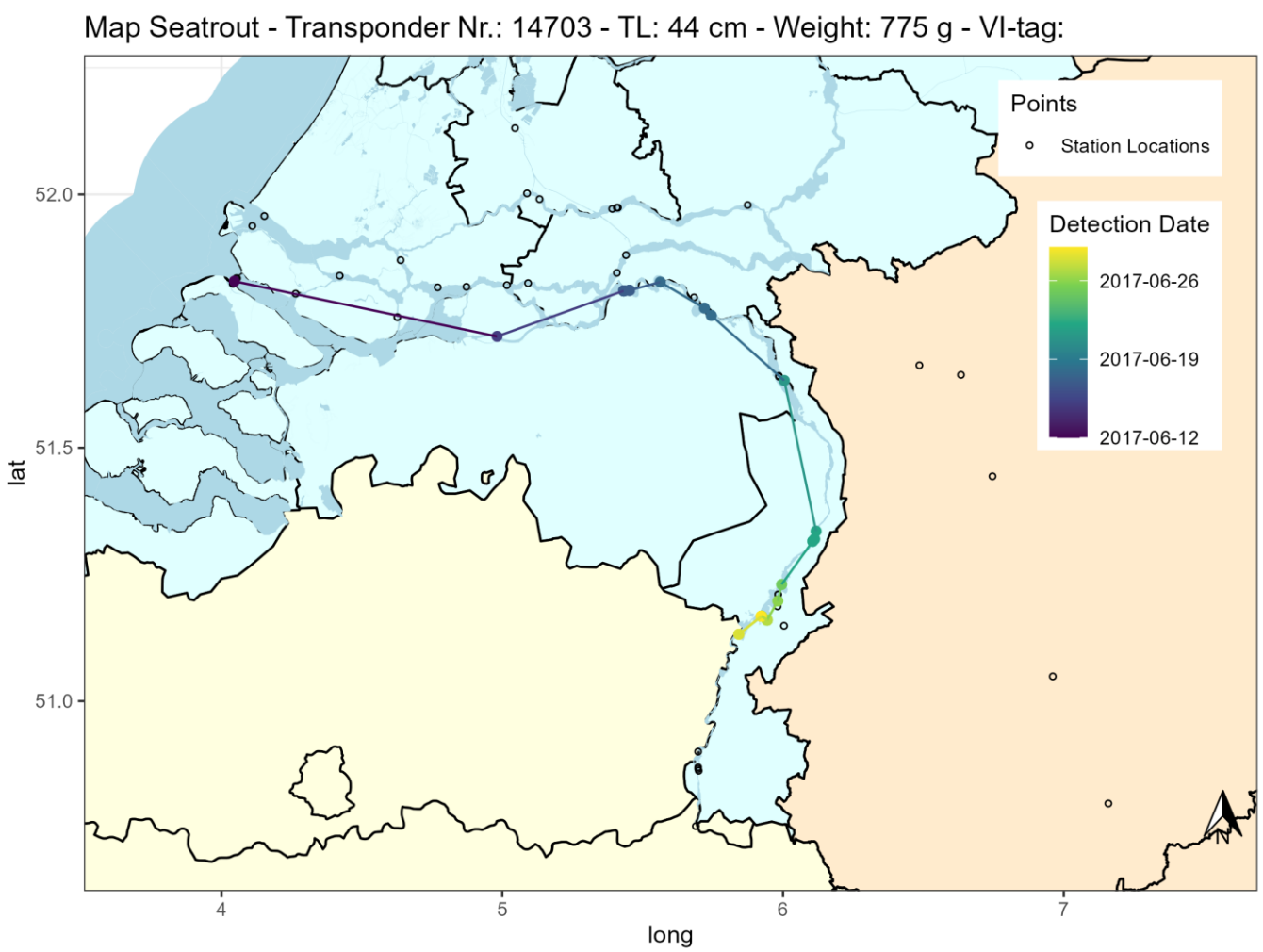


20% Migration unknown N = 103

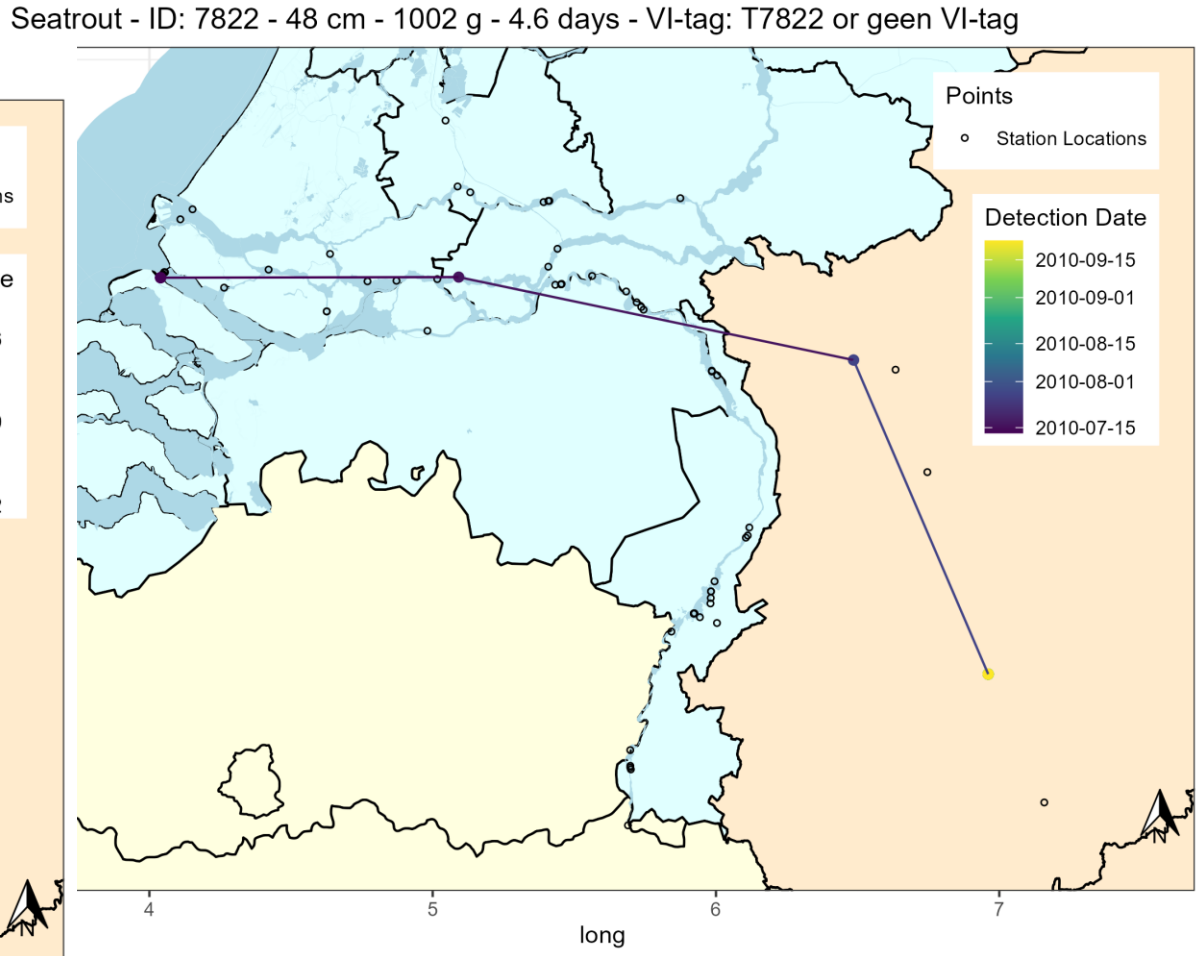
~34% entry via Nieuwe Waterweg (n=176+4)

~44% entry via Haringvliet (n=204+28)

Migration routes



Migration via the Meuse



Migration via the Rhine

First conclusions before Kier management

Atlantic Salmon

- Entry: start or end discharging
- Lower velocity

- Spring and summer
- Daylight

Seatrout

- Entry: more variation, but most during end discharging
- Different velocities

- Whole year
- Daylight

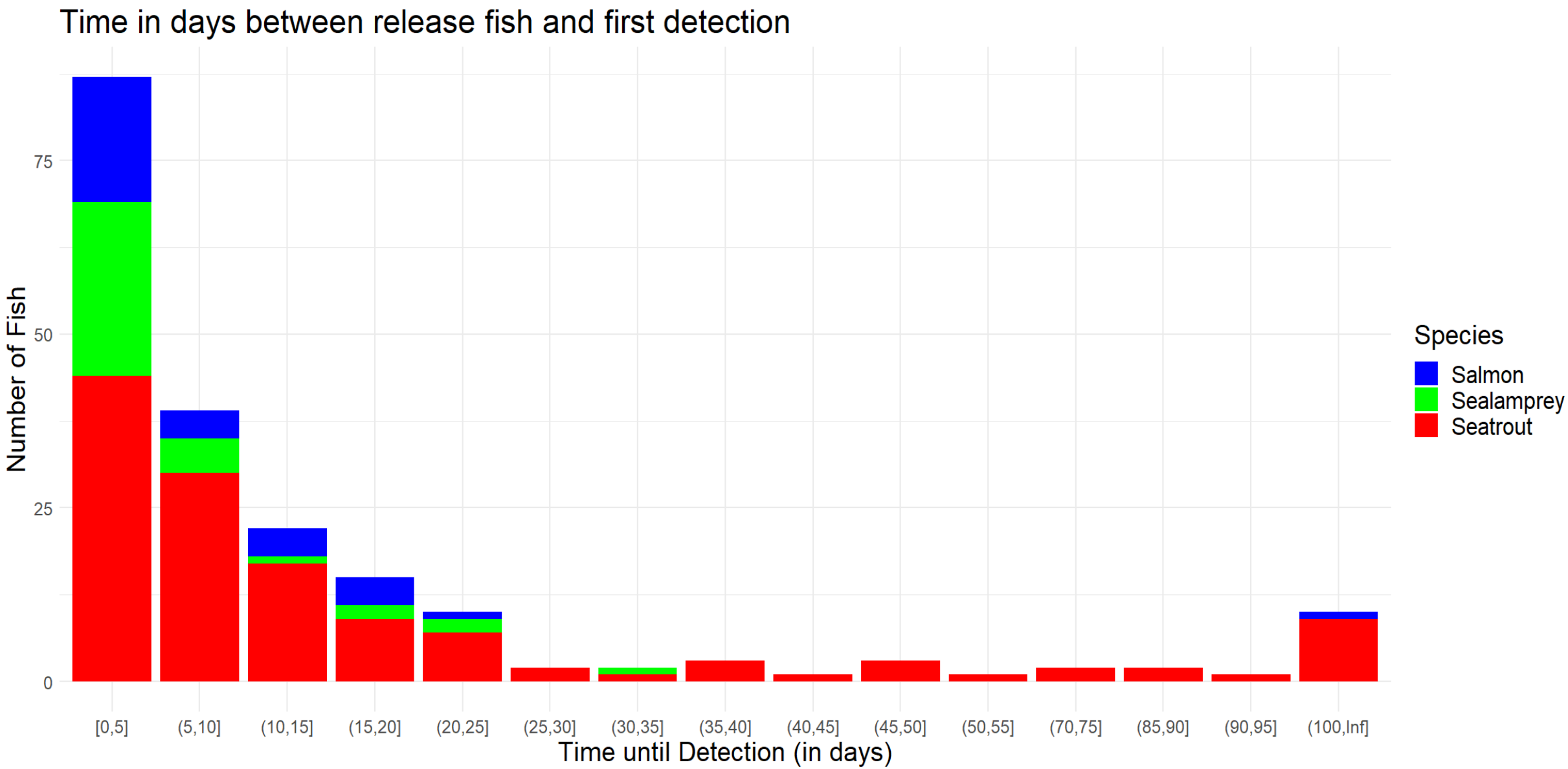
Sea lamprey

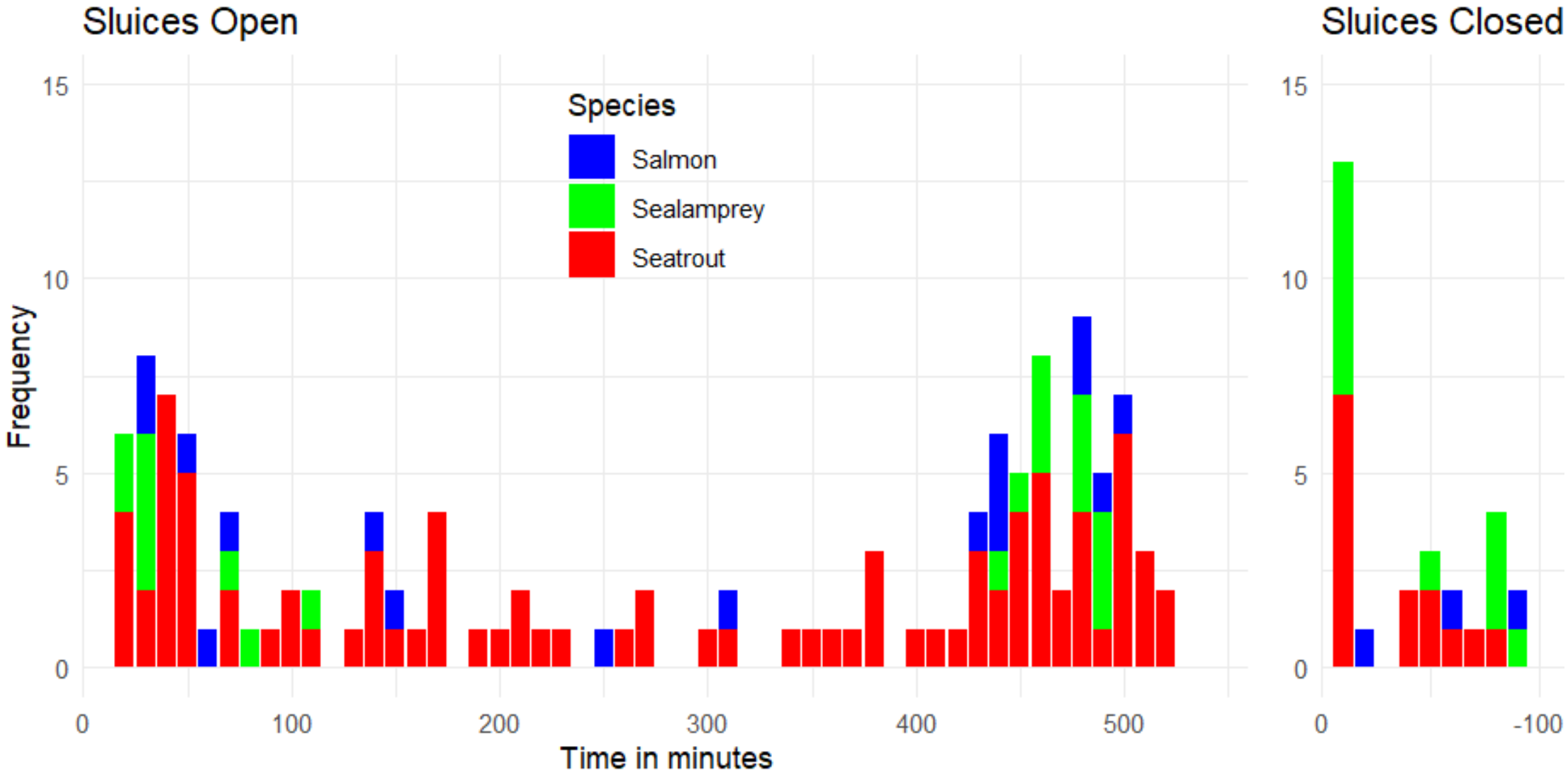
- Entry: end discharging period
- Low velocity

- Spring
- Night

- Not via shipping locks

Work in progress → Influence of environmental factors on passage success


Time in days between release fish and first detection
Number of Fish
75
50
25
0
[0,5]
(5,10]
(10,15]
(15,20]
(20,25]
(25,30]
(30,35]
(35,40]
(40,45]
(45,50]
(50,55]
(70,75]
(85,90]
(90,95]
(100,Inf]
Time until Detection (in days)
Species
Salmon
Sealamprey
Seatrout



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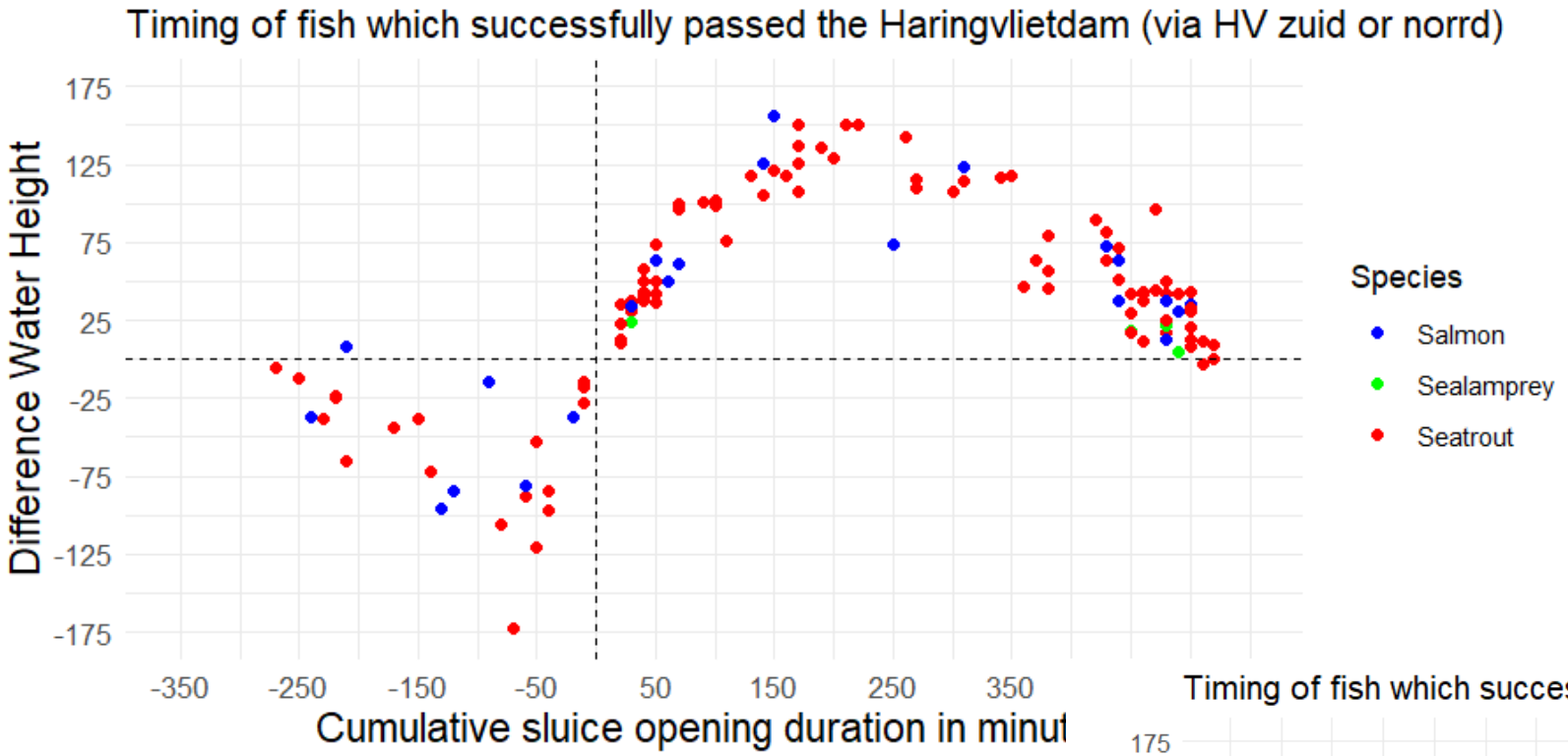

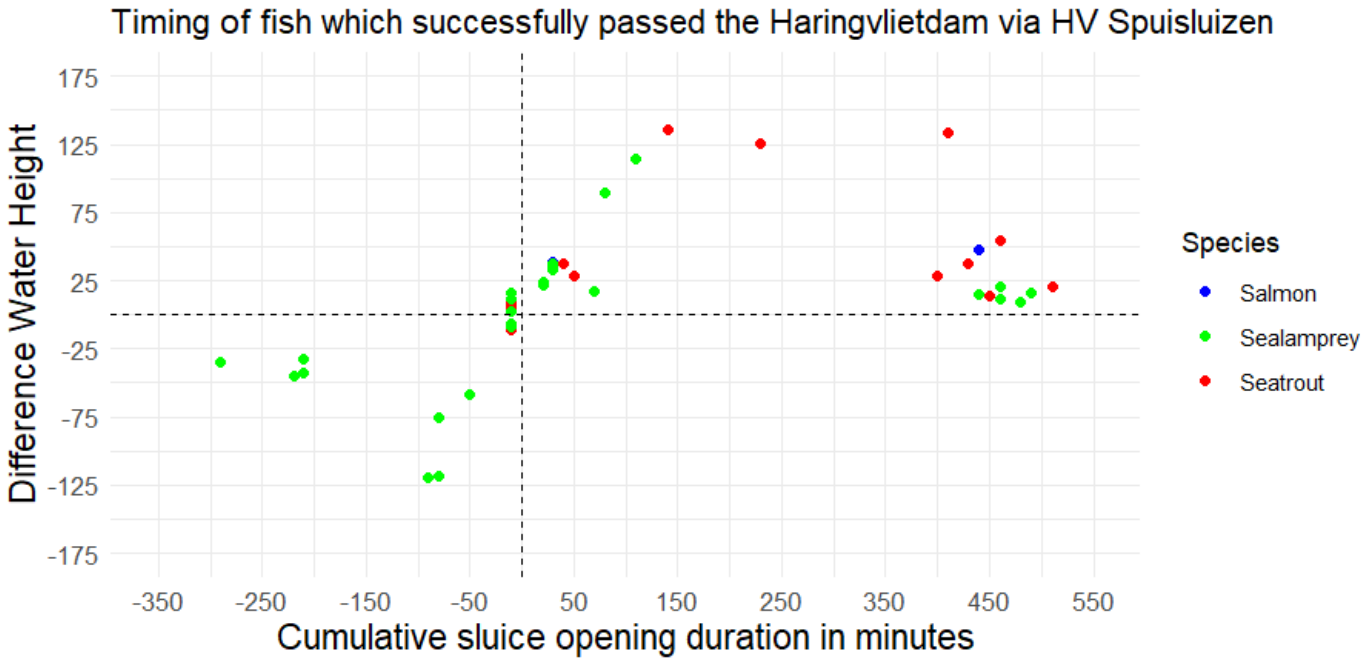

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