

Behavioural patterns of migrating silver eel at a Hydro Power Station in the river Meuse

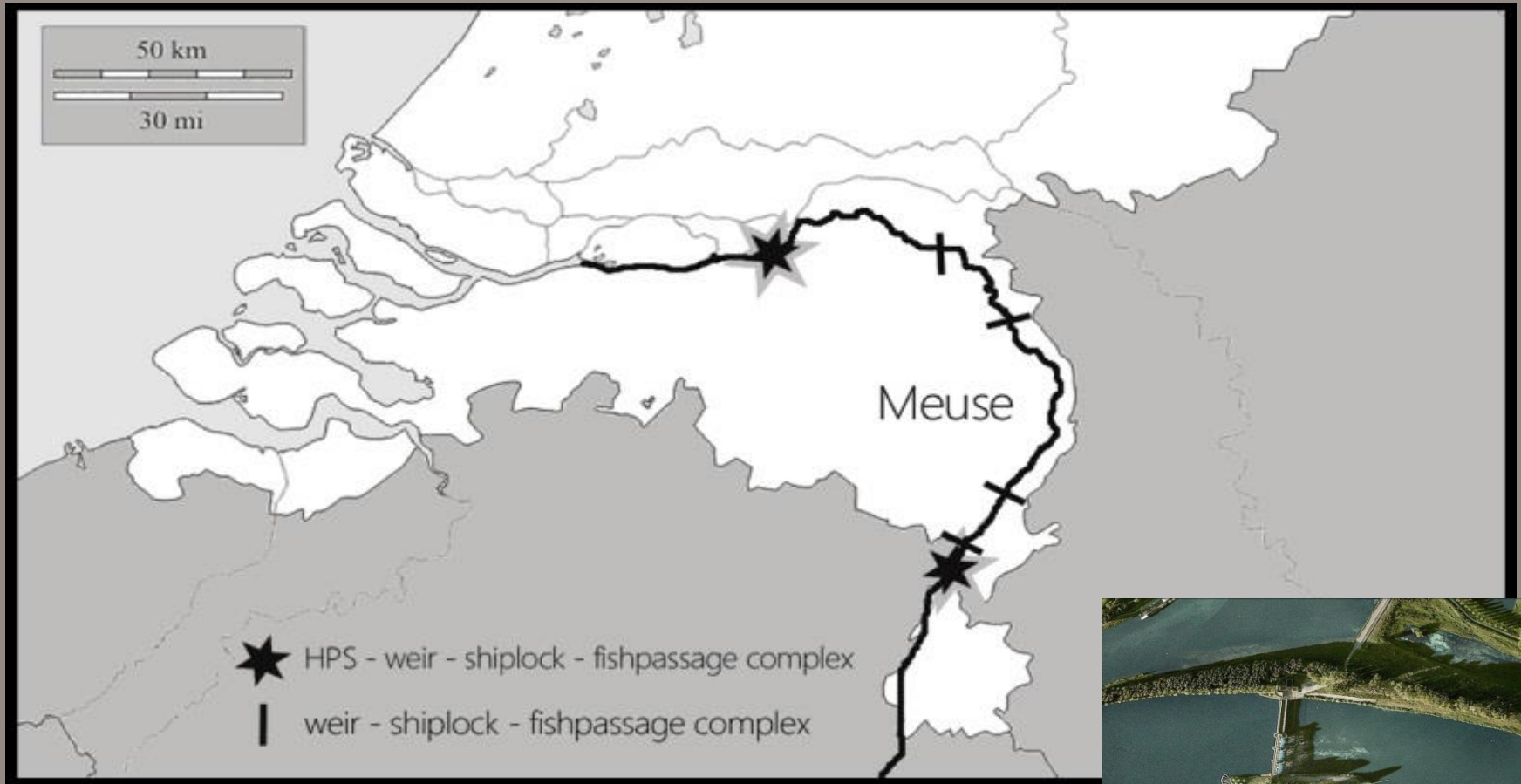
A.B. Griffioen, O.A. van Keeken and H.V. Winter

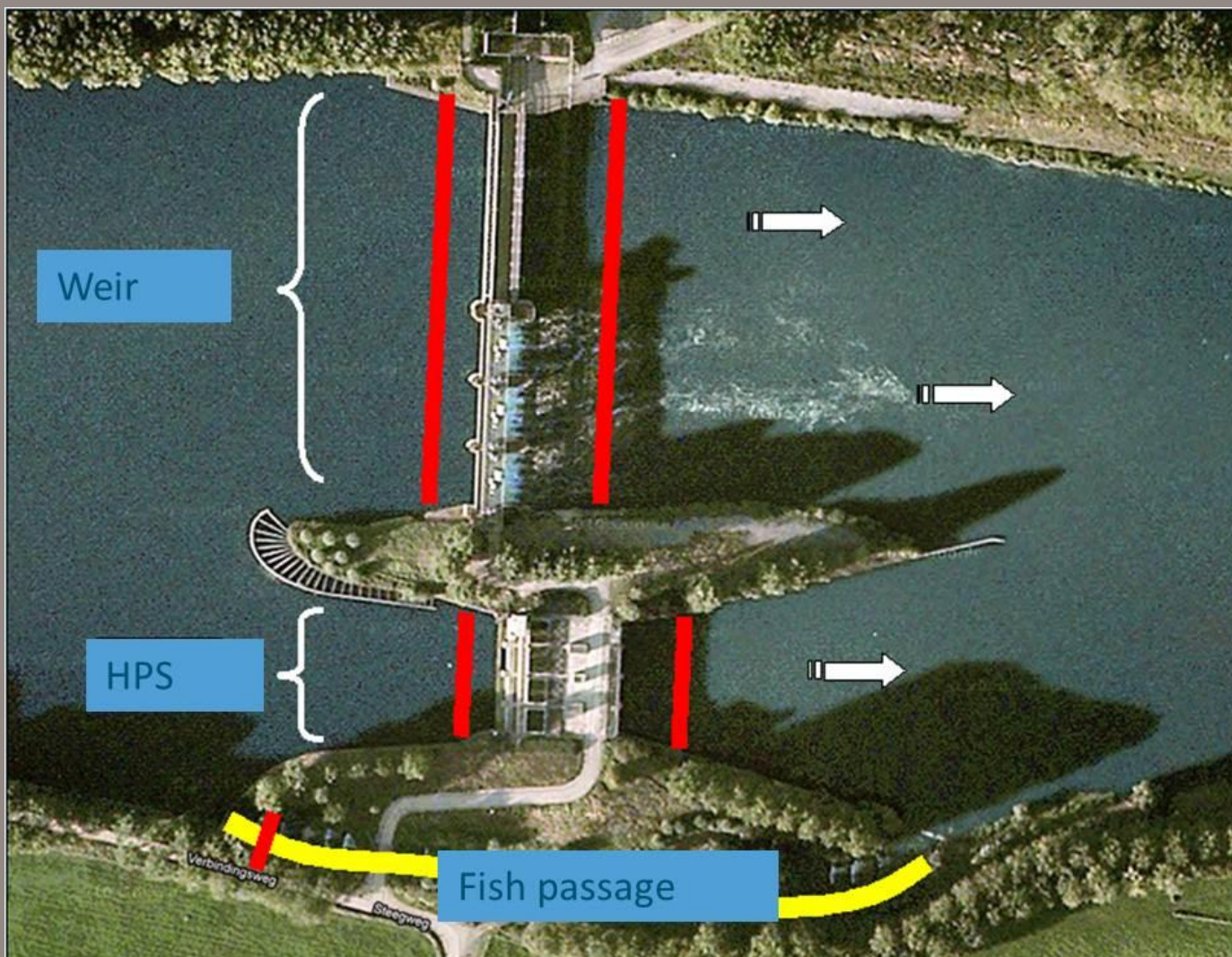


Research question

What specific behaviour do eel show in the vicinity of a HPS – weir complex in relation to the river discharge?

River Meuse





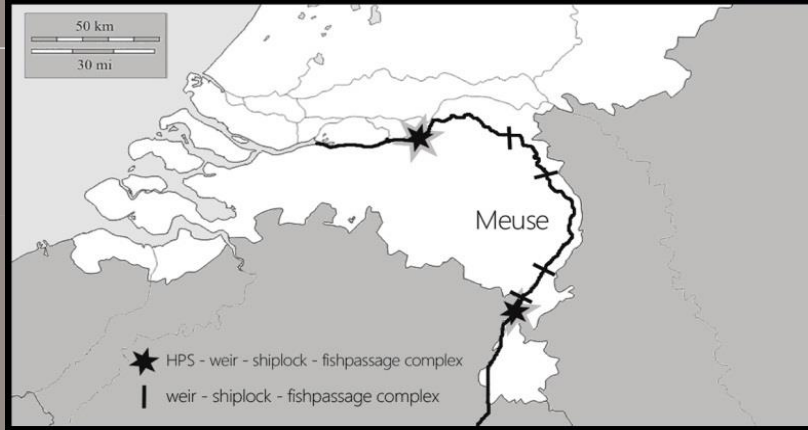
Management of HPS-weir complex

Discharge m ³ /s	water is guided through/over
~0-30	weir
30-500	HPS
500-800	HPS/weir
>800	weir

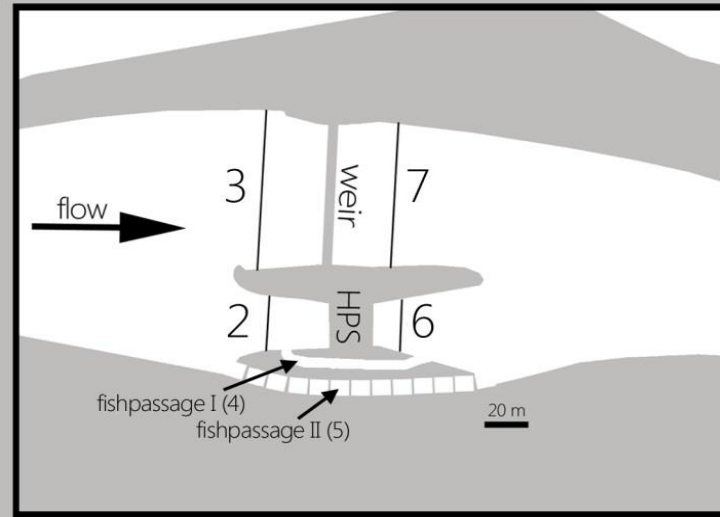
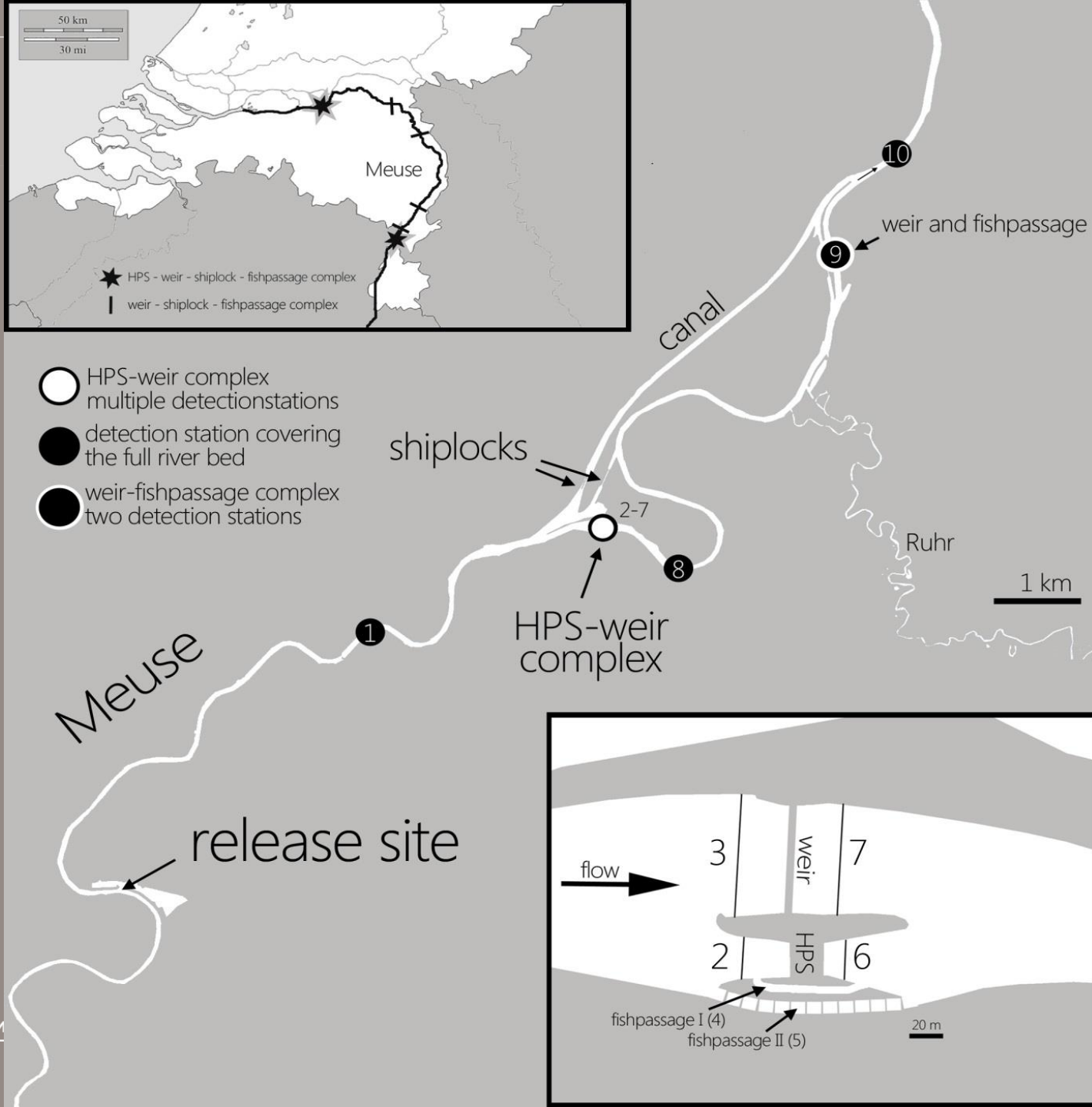
Management of HPS-weir complex

Discharge m ³ /s	eel is guided through/over?
~0-30	weir?
30-500	HPS?
500-800	HPS/weir?
>800	weir?



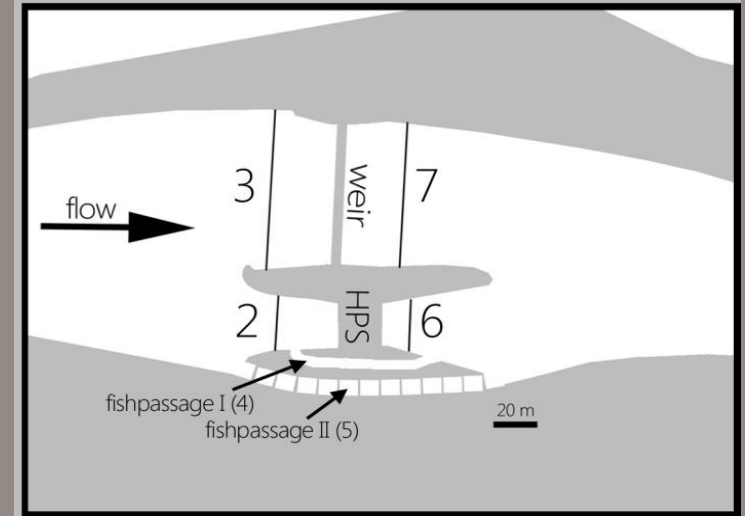


- HPS-weir complex
multiple detection stations
- detection station covering
the full river bed
- weir-fishpassage complex
two detection stations



Results

- 148 eel used
- 123 eel arrived the complex
 - 84 eel (68%) HPS
 - 18 eel (15%) weir
 - 17 eel (14%) shiplocks
 - 2 eel (2%) fishway
 - 2 eel (2%) upstream...
- At least 34 different patterns of subsequent order of detections at stations (all ten) were observed
- Time between first attempt and successful passage: immediate - up to several months



Research question

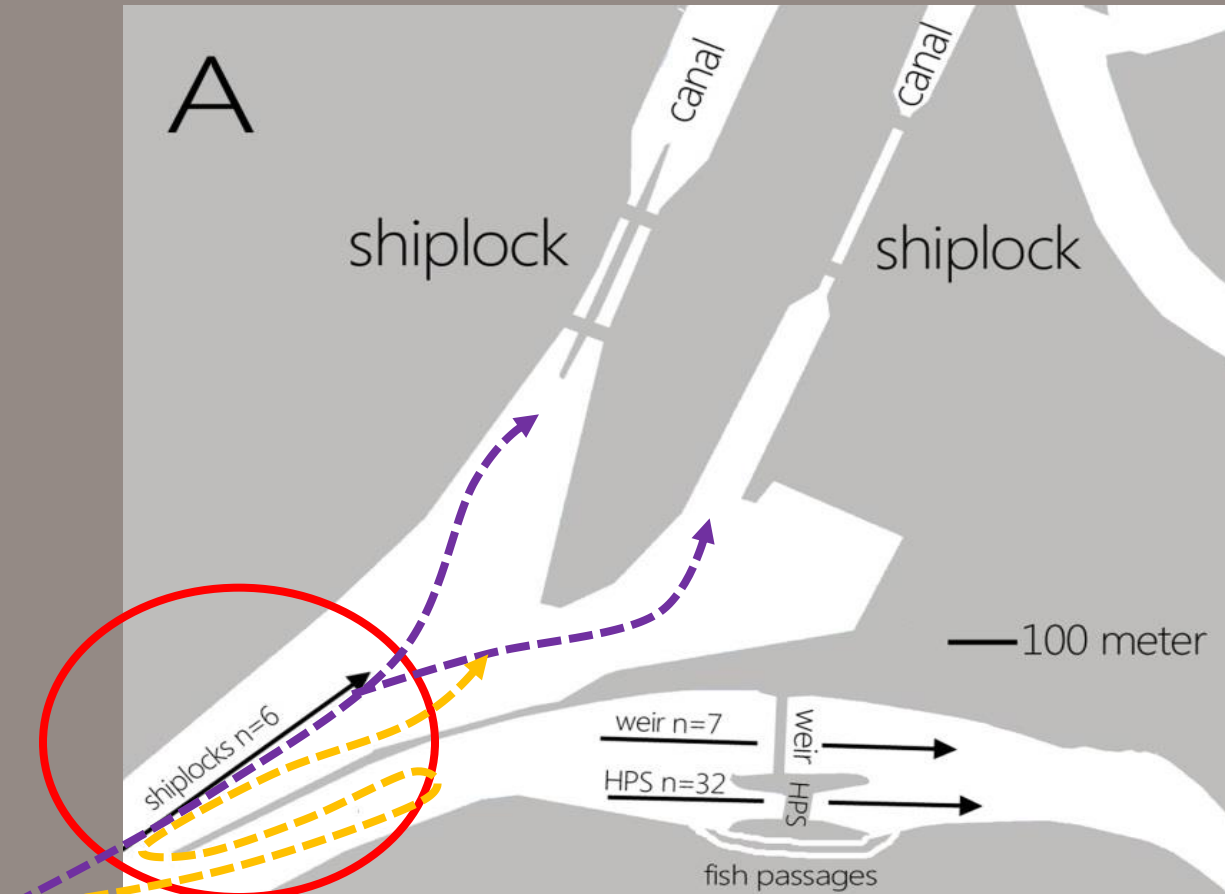
What specific behaviour do eel show in the vicinity of a HPS – weir complex in relation to the river discharge?

Where did they arrive??

Weir, HPS, shiplocks??

Arrival at the HPS – weir complex

6 eel went through ship locks 'directly'



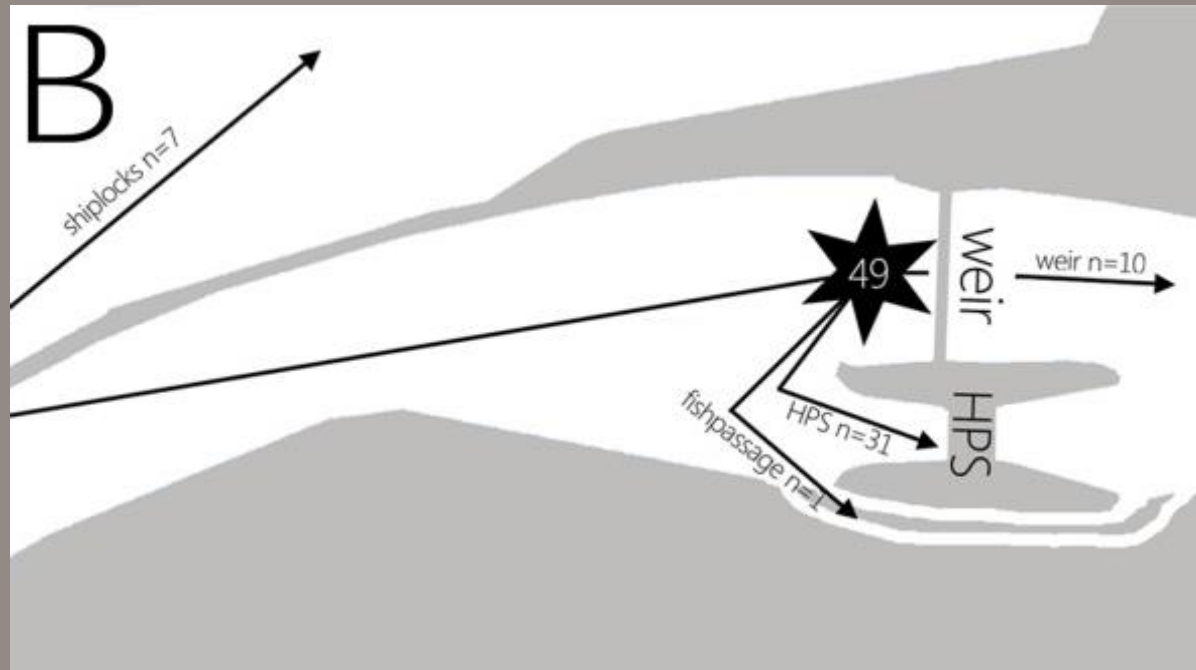
Arrival at the HPS – weir complex

Eel that showed recurrence or hesitation at the weir

56 eel arrived at the weir of which:

7 immediate passage (<10 min passage 7/56 → 13%)

49 (49/56 → 88%) showed hesitation or recurrence behaviour



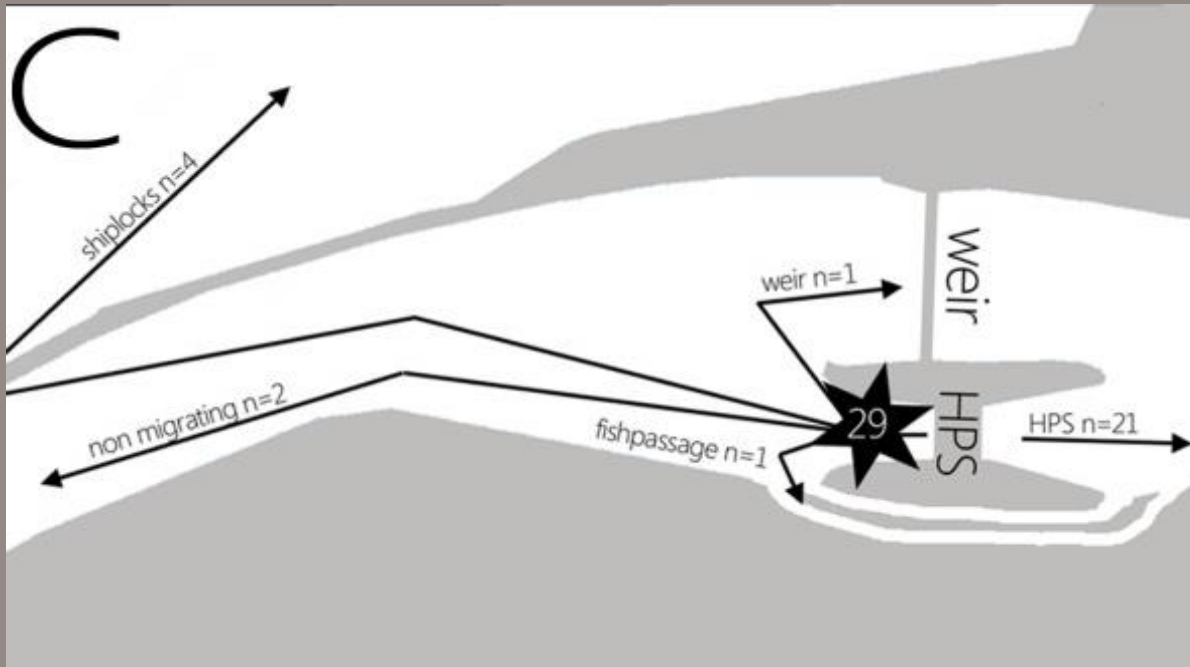
Arrival at the HPS – weir complex

Eel that showed recurrence or hesitation at the HPS

61 eel arrived at the HPS of which:

32 immediate passage (32/61 → 53%)

29 (29/61 → 48%) showed hesitation or recurrence behaviour



Research question

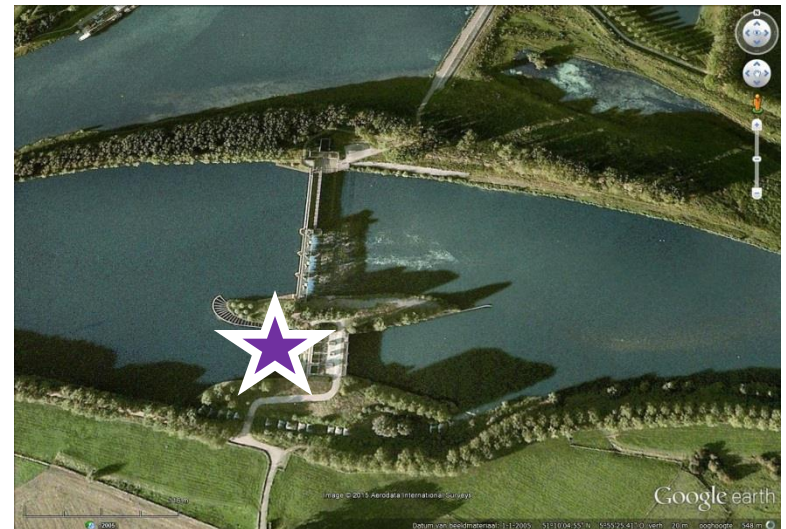
What specific behaviour do eel show in the vicinity of a HPS – weir complex in relation to the river discharge?

Arrival of eel and discharge levels??

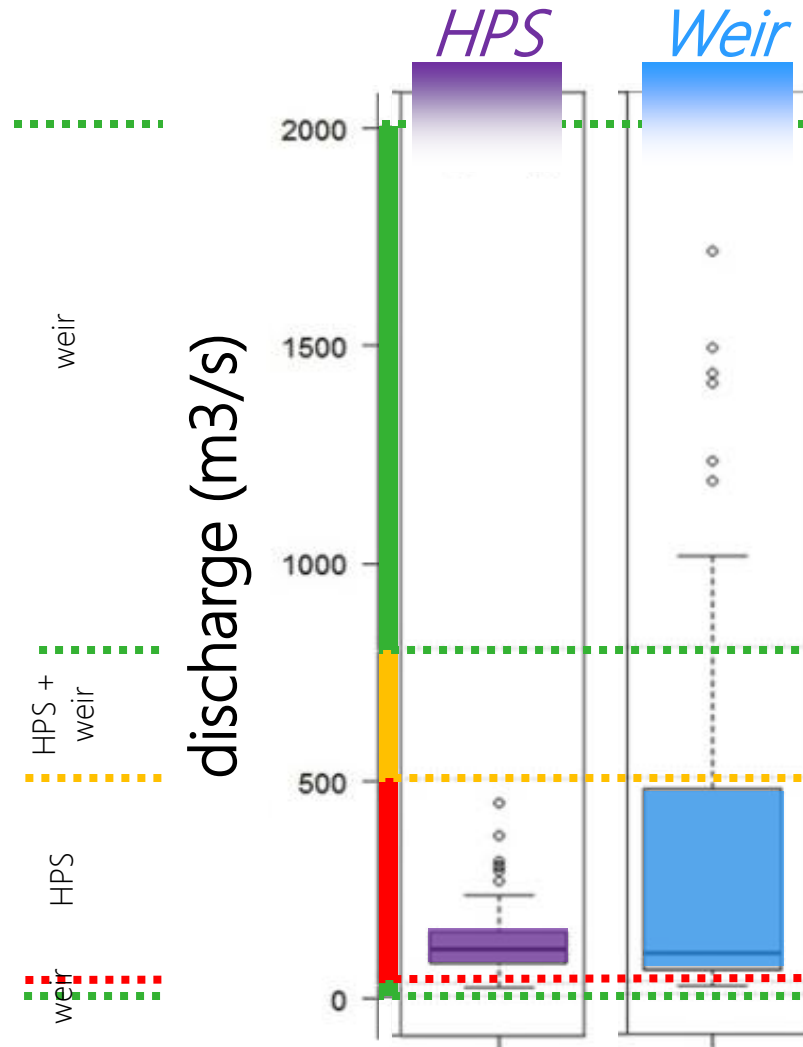
Estimated discharge at arrival



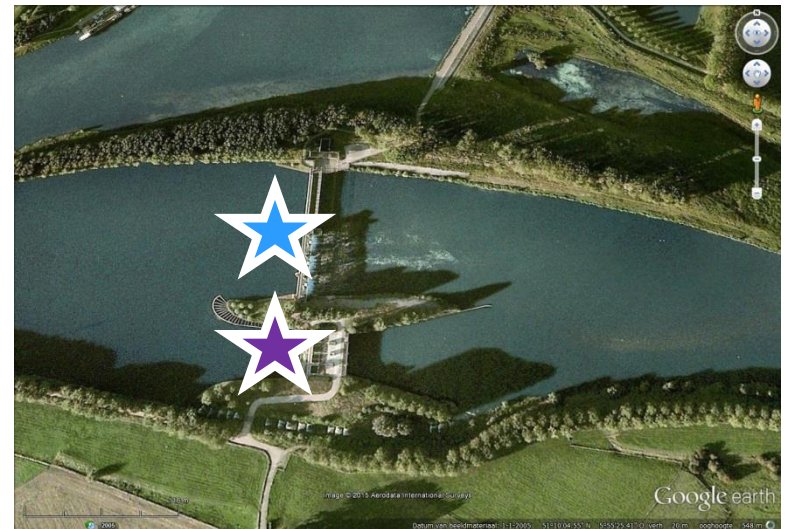
Estimated discharge for eel that were first detected at the *HPS*



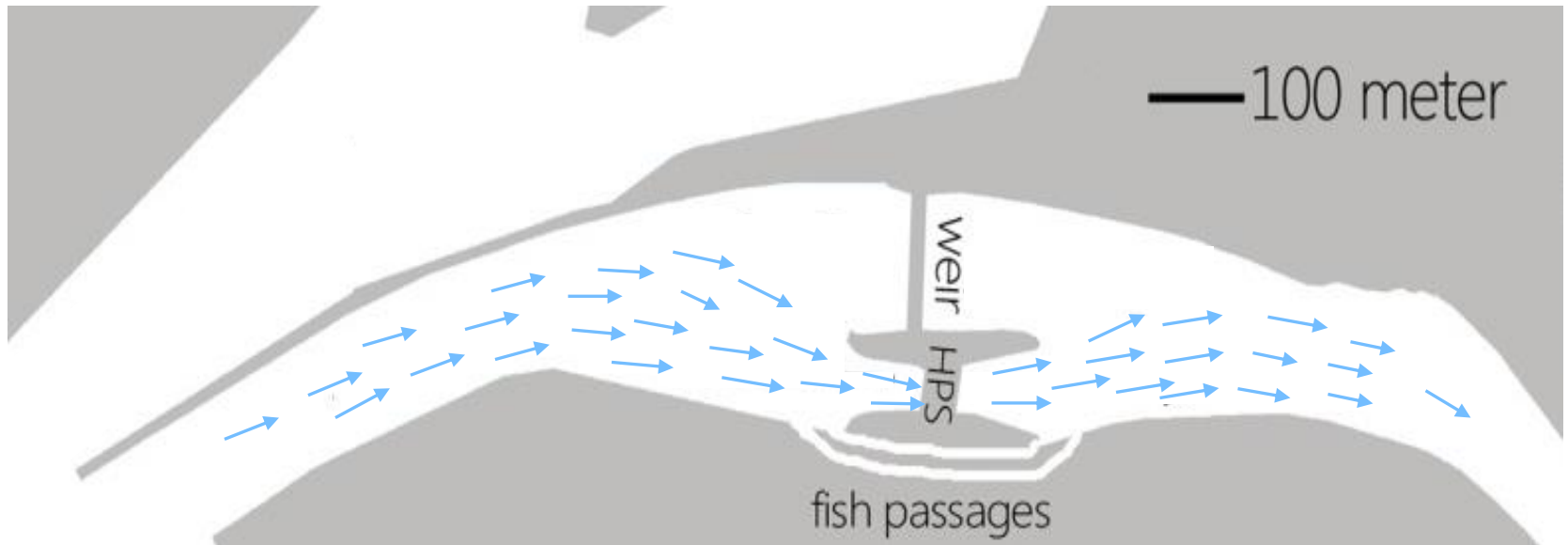
Estimated discharge at arrival



Estimated discharge for eel that were first detected at the *HPS* or *weir*



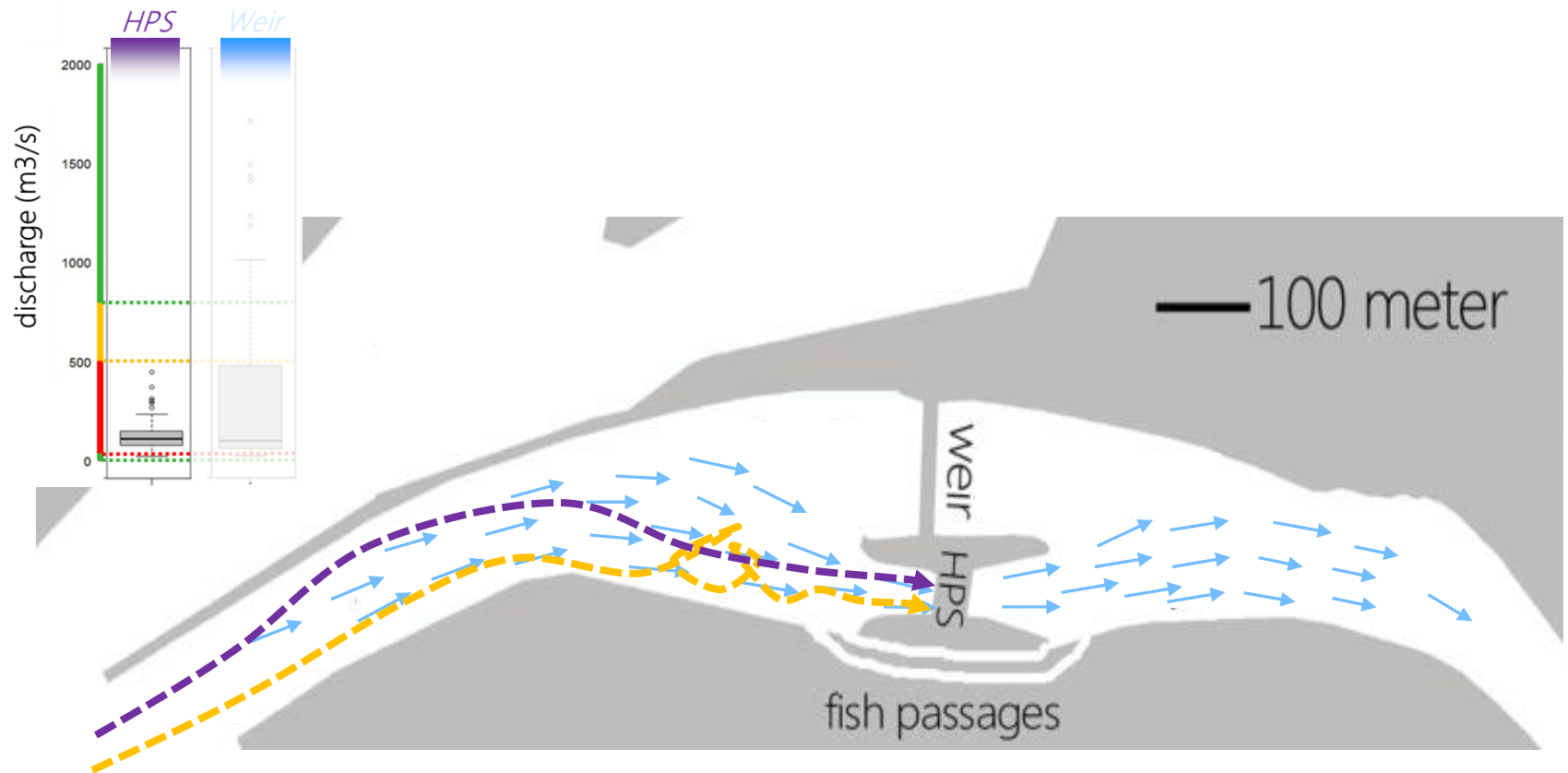
Discussion



IMARES

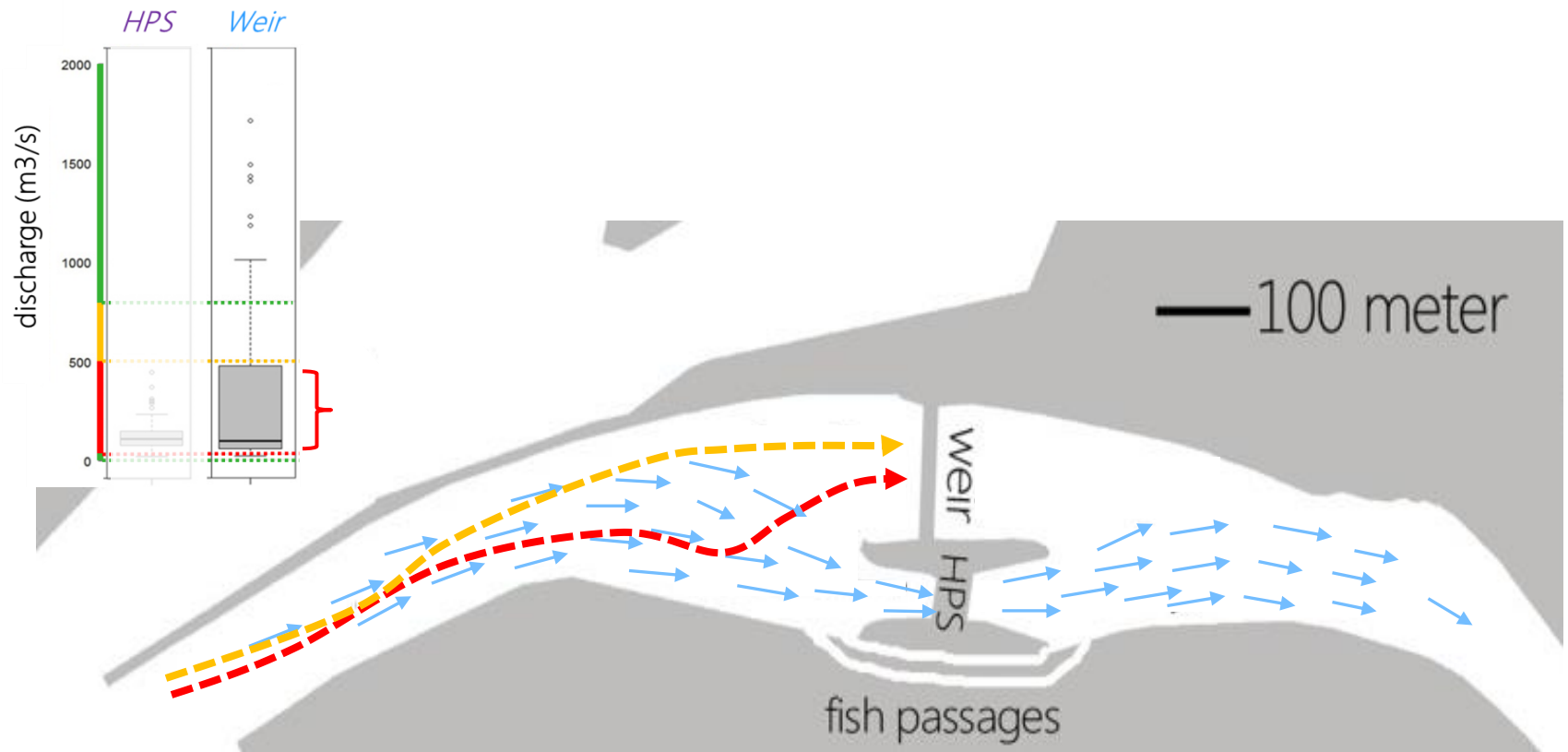
WAGENINGEN UR

Discussion



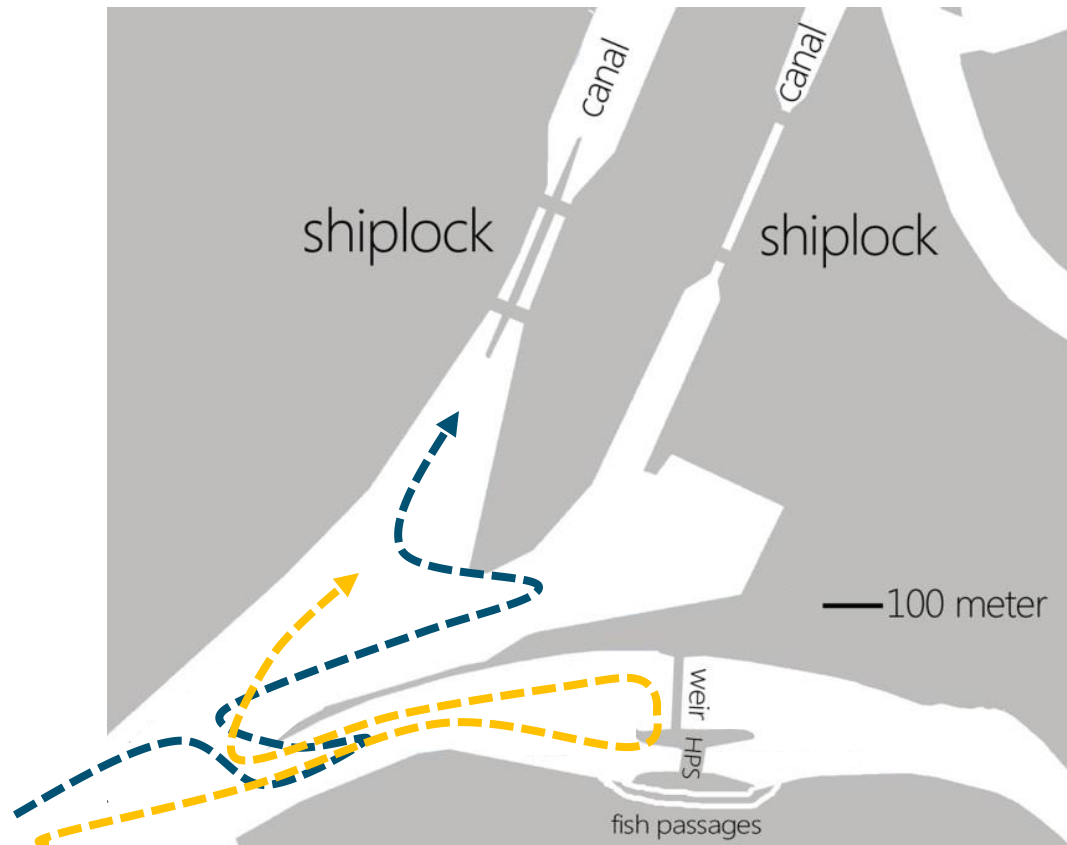
Eel did follow the main current?

Discussion



Many eel did not follow main current

Discussion

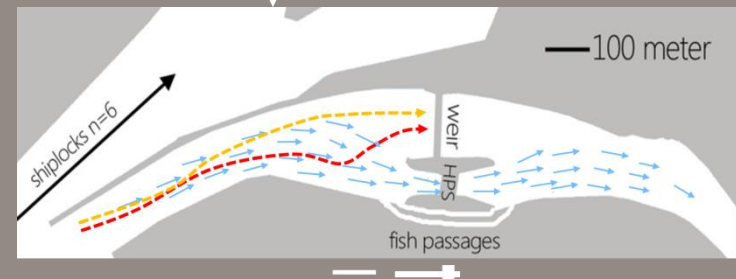


6/123 eel
11/123 eel

Discussion / Conclusion

What specific behaviour do eel show in the vicinity of a HPS – weir complex in relation to the river discharge?

- Great variety of behavioural patterns
 - Immediate passage: weir / HPS / (shiplock) (32-39%)
 - Avoidance (?) at greater distance: did not follow stream of the river (33-39%)
 - Hesitation after arrival (27-35%)
- Eel swam upstream and used ship locks
- Time between arrival and passage:
 - 47% <1 day
 - ≥12% 1-7 days
 - ≥16% >7 days
 - 25% unknown

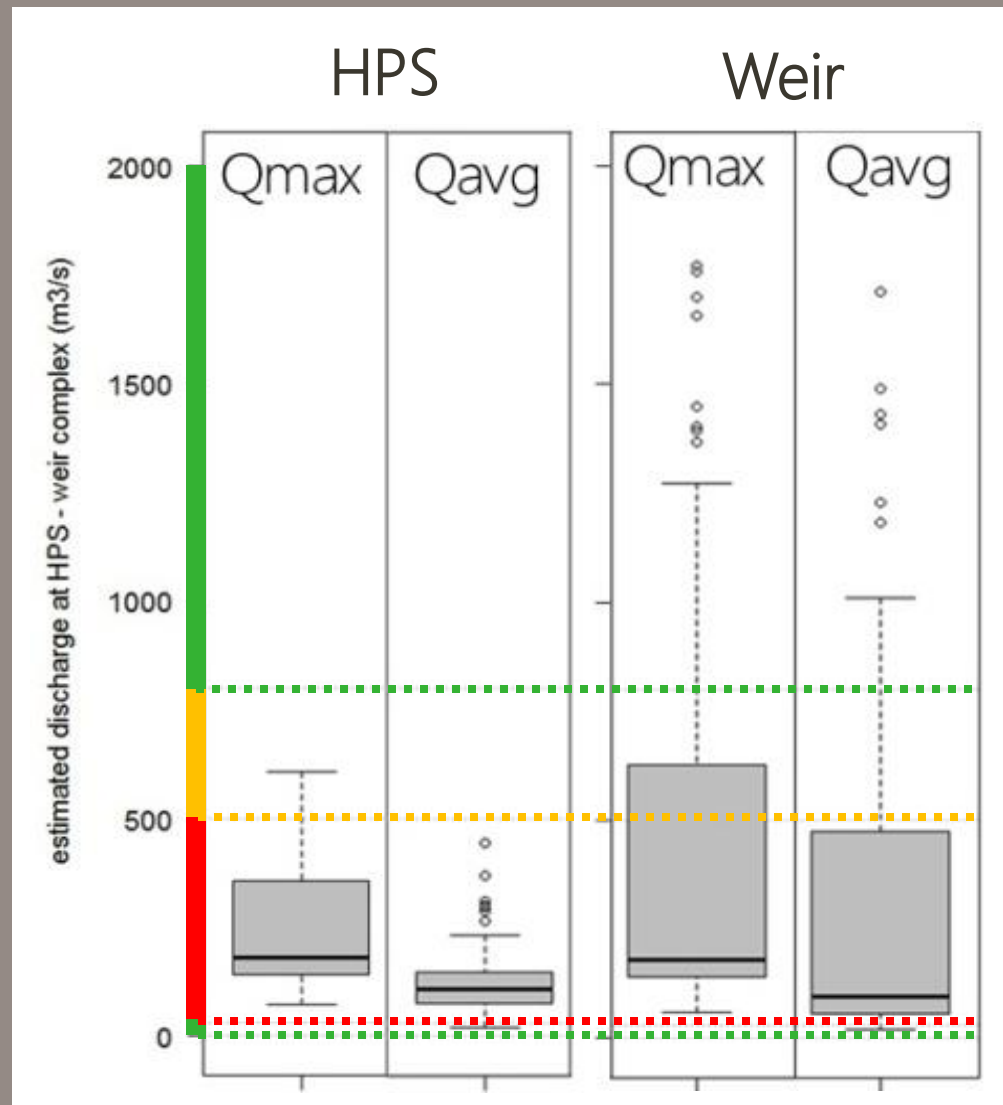


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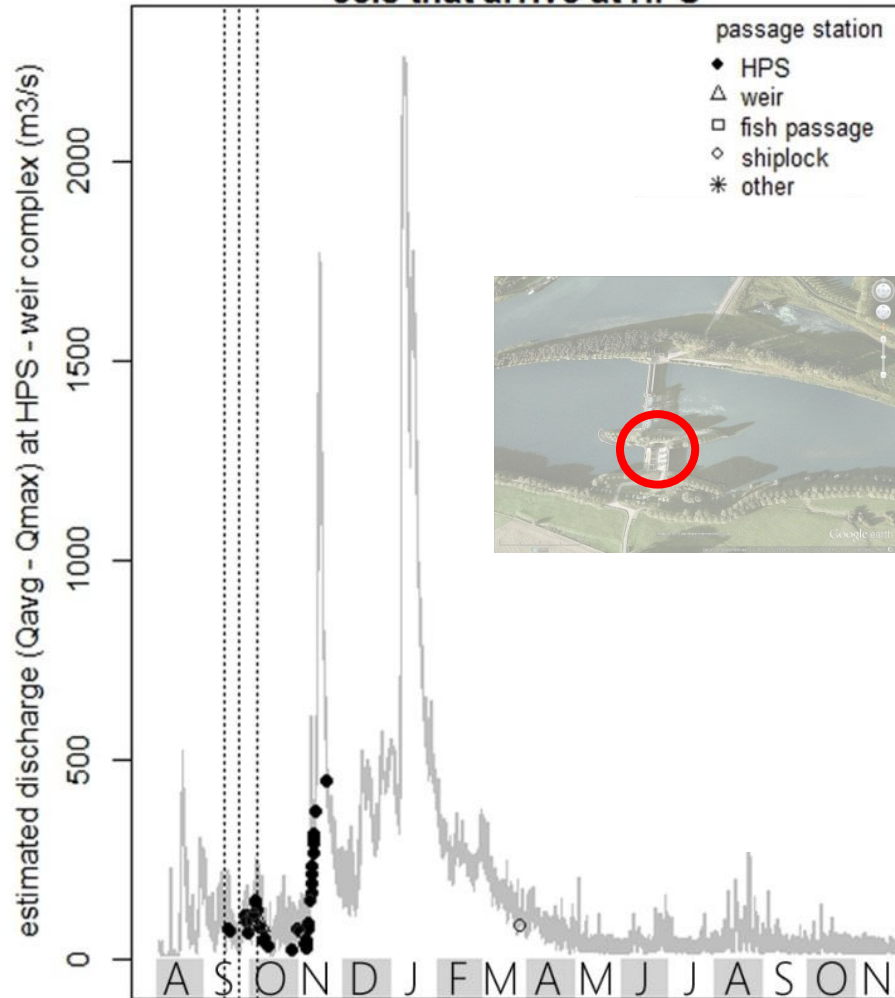


Estimated discharge at arrival



Arrival and discharge

eels that arrive at HPS



eels that arrive at weir

