

Jun 23rd, 3:15 PM - 3:40 PM

## Session C5: Behavioural Patterns of Migrating Silver Eel at a Hydro Power Station in the River Meuse

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# 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



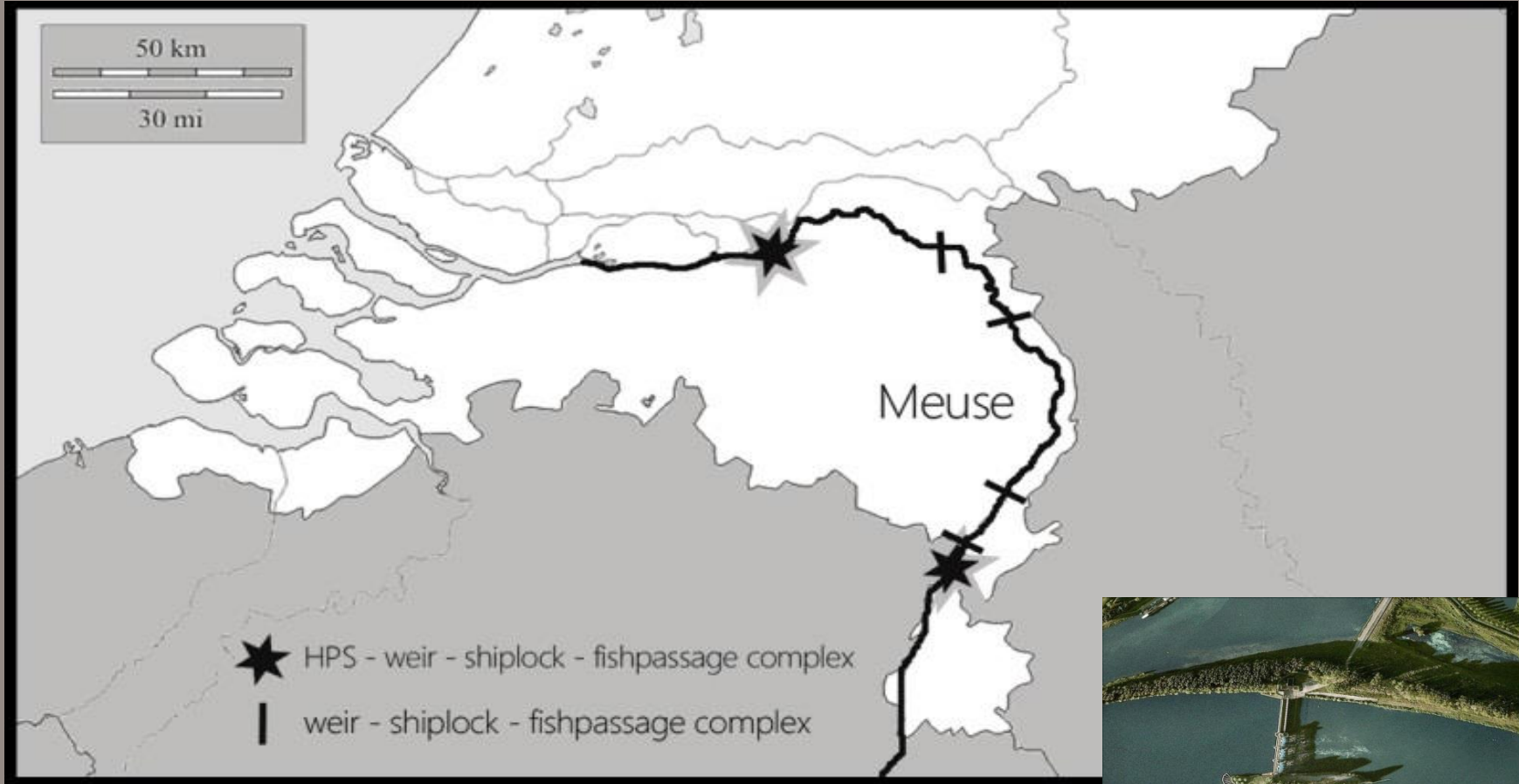
IMARES

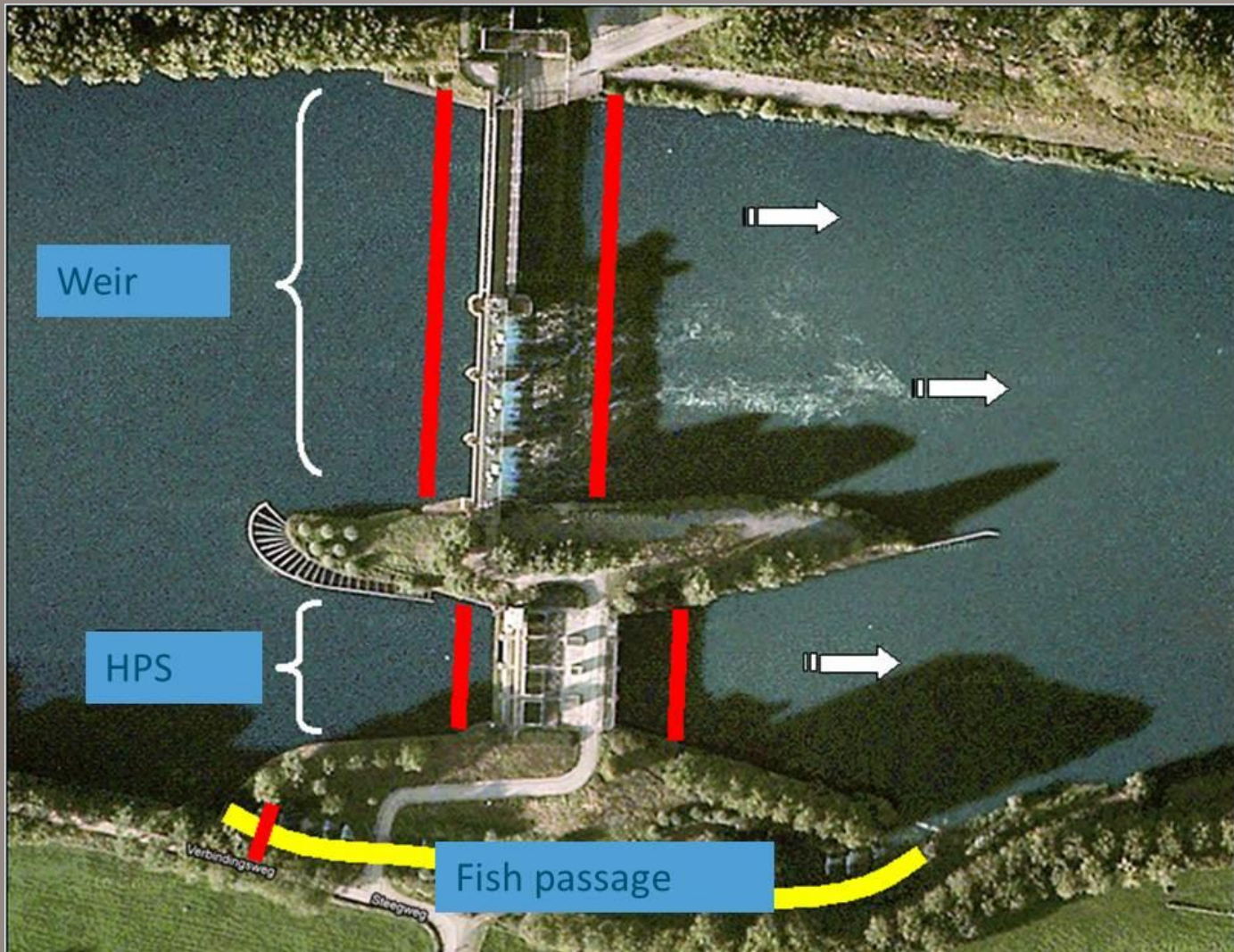
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# Research question

*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

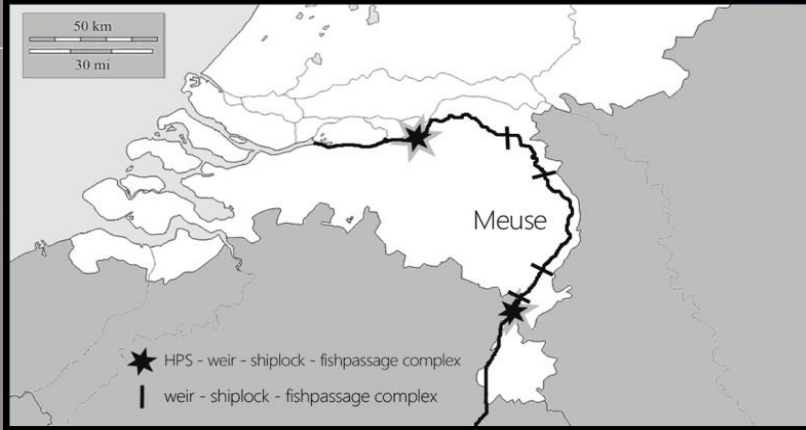
| Discharge m <sup>3</sup> /s | water is guided through/over |
|-----------------------------|------------------------------|
| ~0-30                       | weir                         |
| 30-500                      | HPS                          |
| 500-800                     | HPS/weir        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

# Management of HPS-weir complex

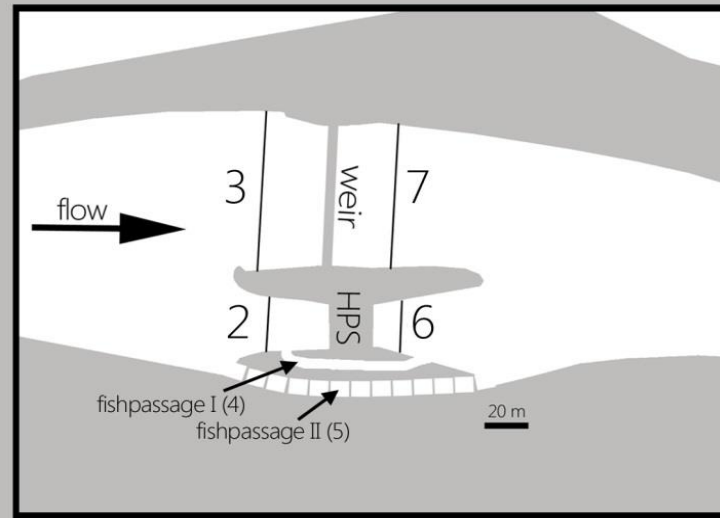
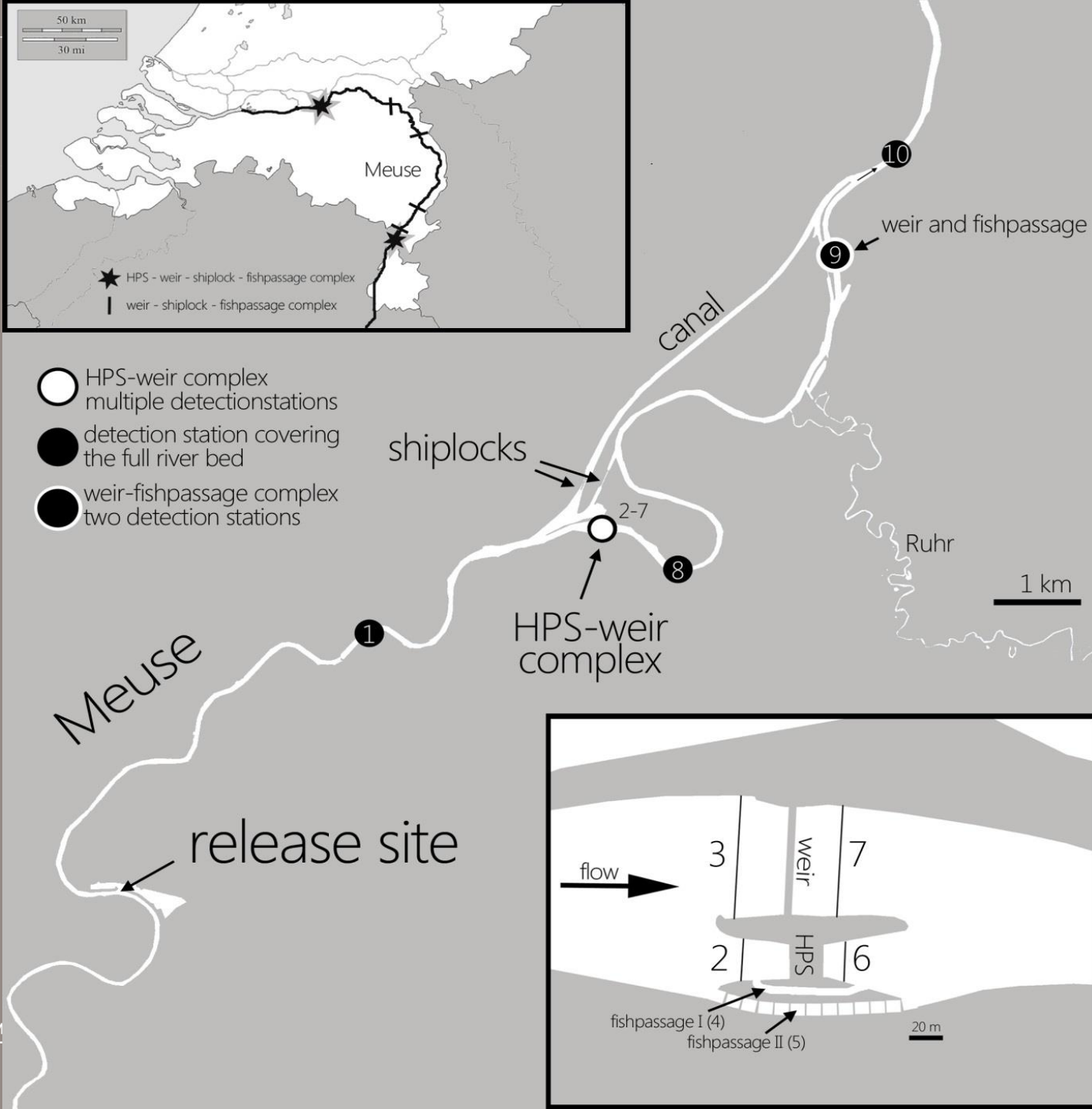
| Discharge m <sup>3</sup> /s | eel is guided through/over? |
|-----------------------------|-----------------------------|
| ~0-30                       | weir?                       |
| 30-500                      | HPS?                        |
| 500-800                     | HPS/weir?           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





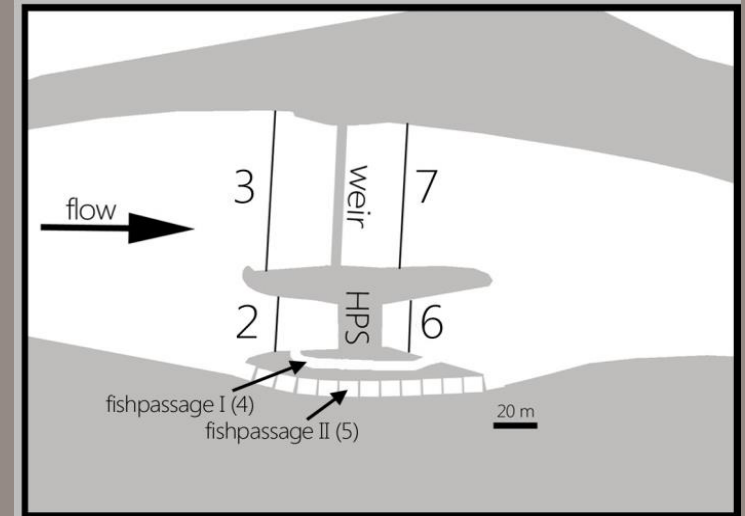


- HPS-weir complex  
multiple detection stations
- detection station covering  
the full river bed
- weir-fishpassage complex  
two detection stations



# 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



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# Research question

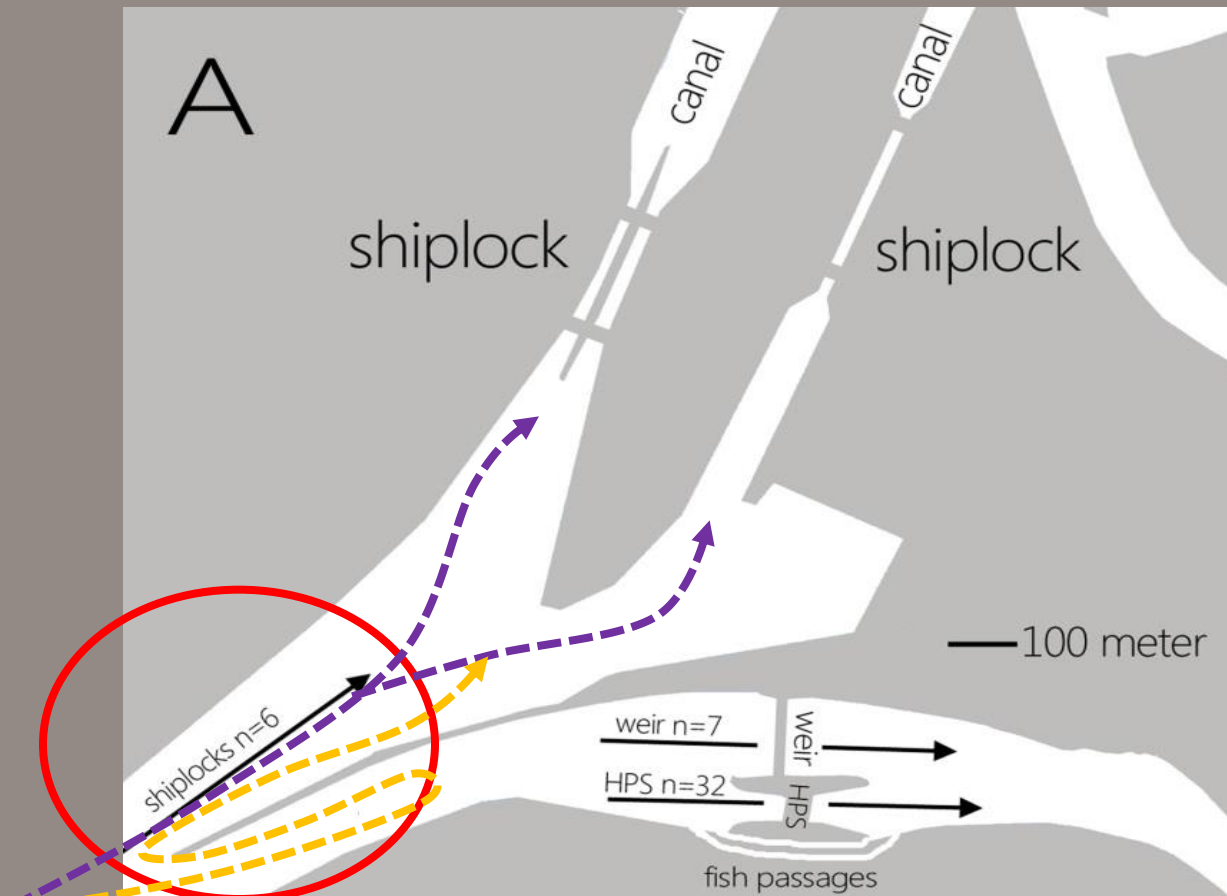
*What specific behaviour do eel show in the vicinity of a HPS – weir complex in relation to the river discharge?*

*Where did they arrive??*

*Weir, HPS, shiplocks??*

# Arrival at the HPS – weir complex

6 eel went through ship locks 'directly'



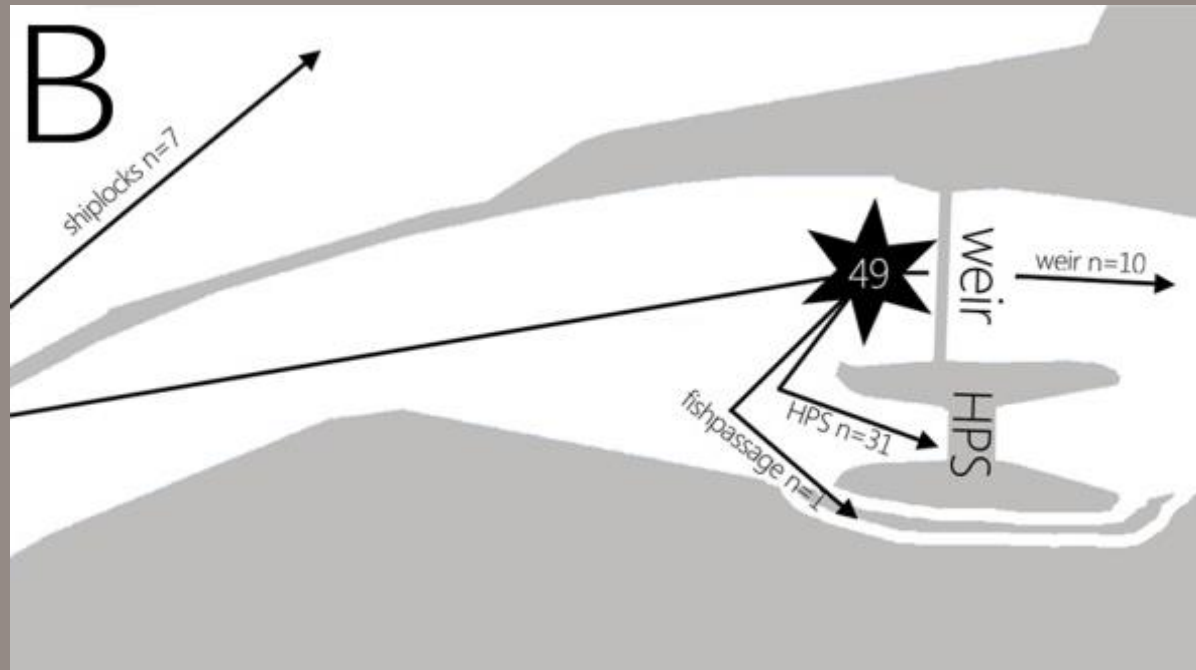
# Arrival at the HPS – weir complex

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



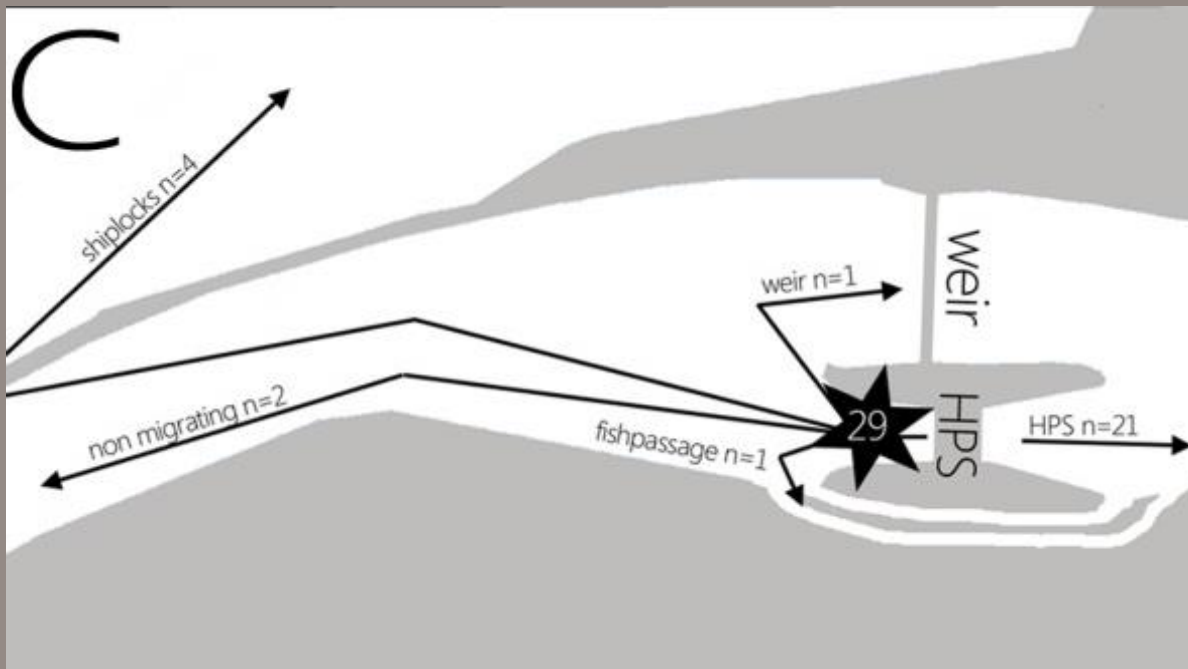
# Arrival at the HPS – weir complex

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



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# Research question

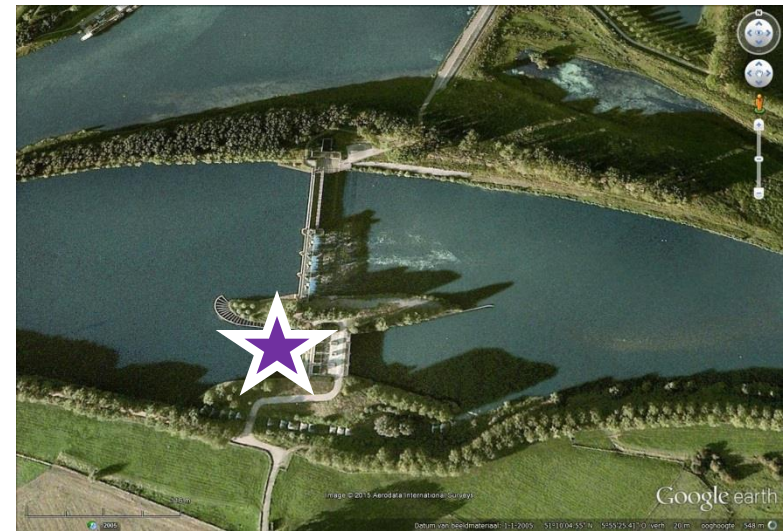
*What specific behaviour do eel show in the vicinity of a HPS – weir complex in relation to the river discharge?*

*Arrival of eel and discharge levels??*

# Estimated discharge at arrival

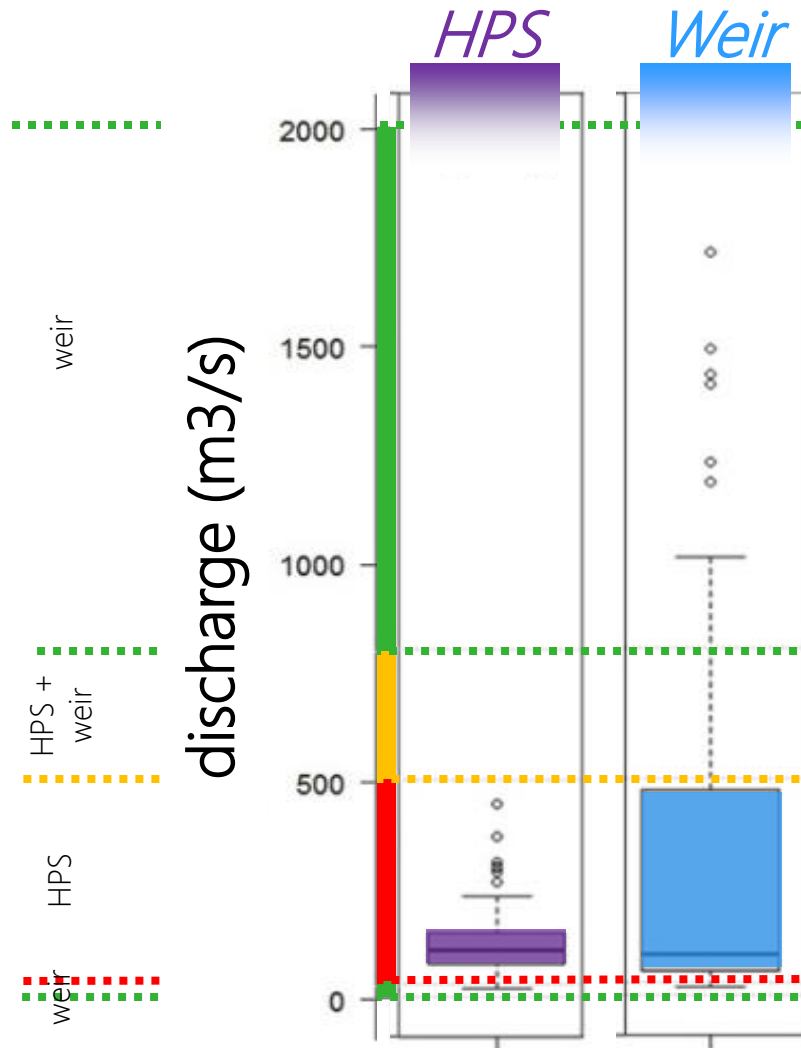


Estimated discharge for eel that were first detected at the *HPS*

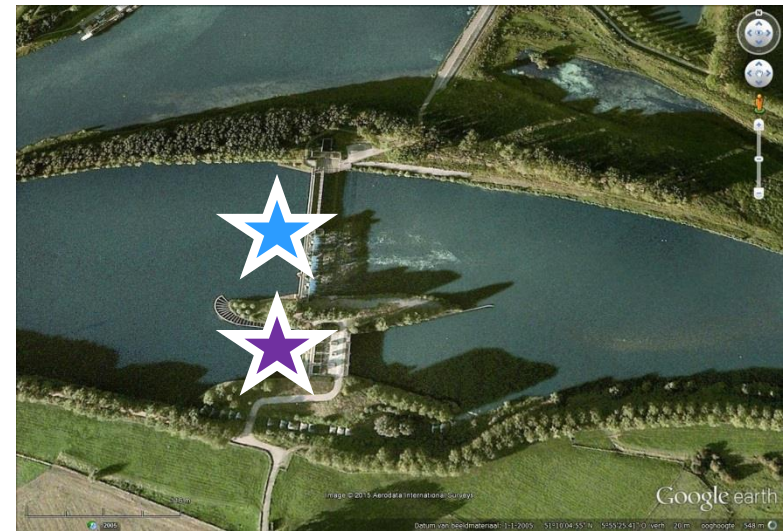




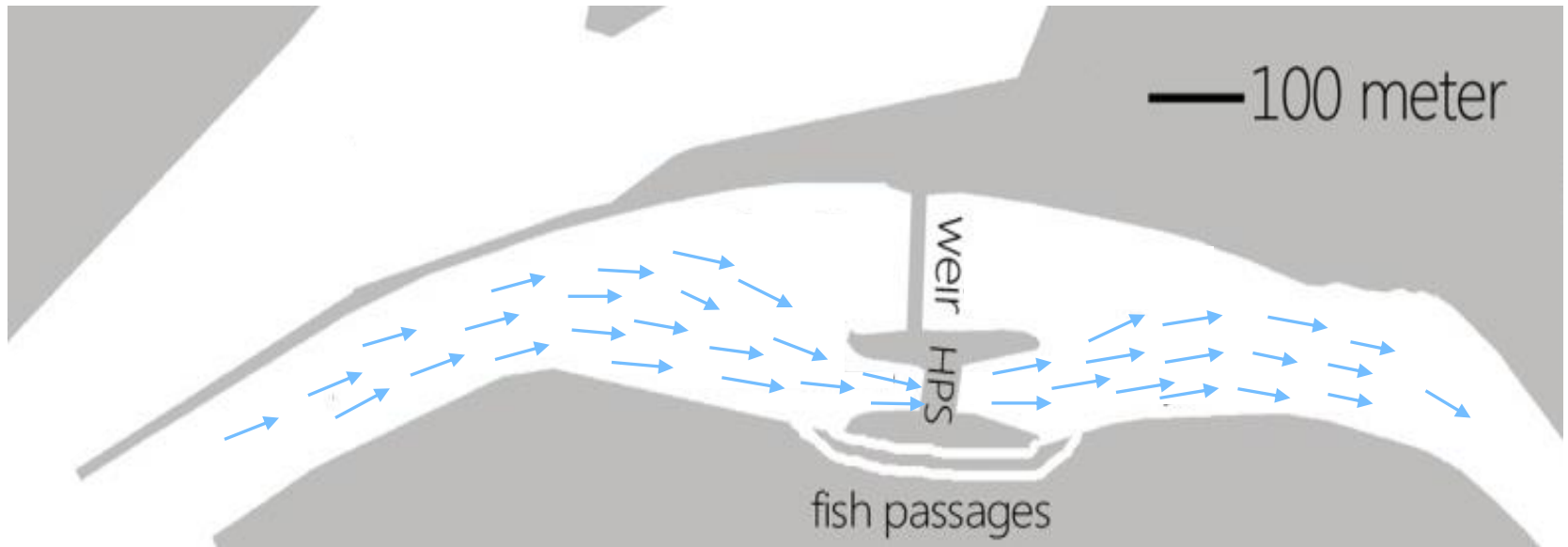
# Estimated discharge at arrival



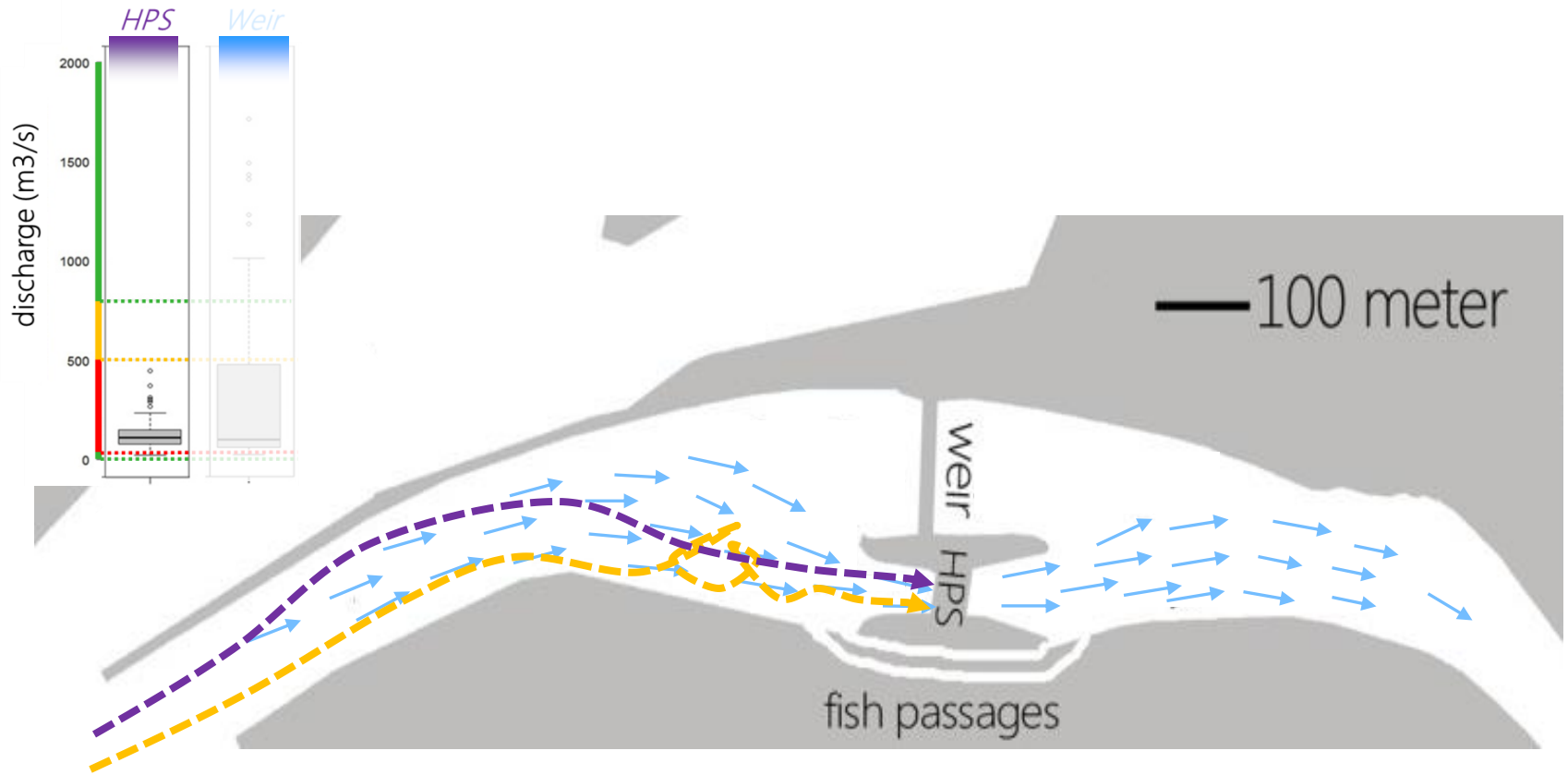
Estimated discharge for eel that were first detected at the *HPS* or *weir*



# Discussion

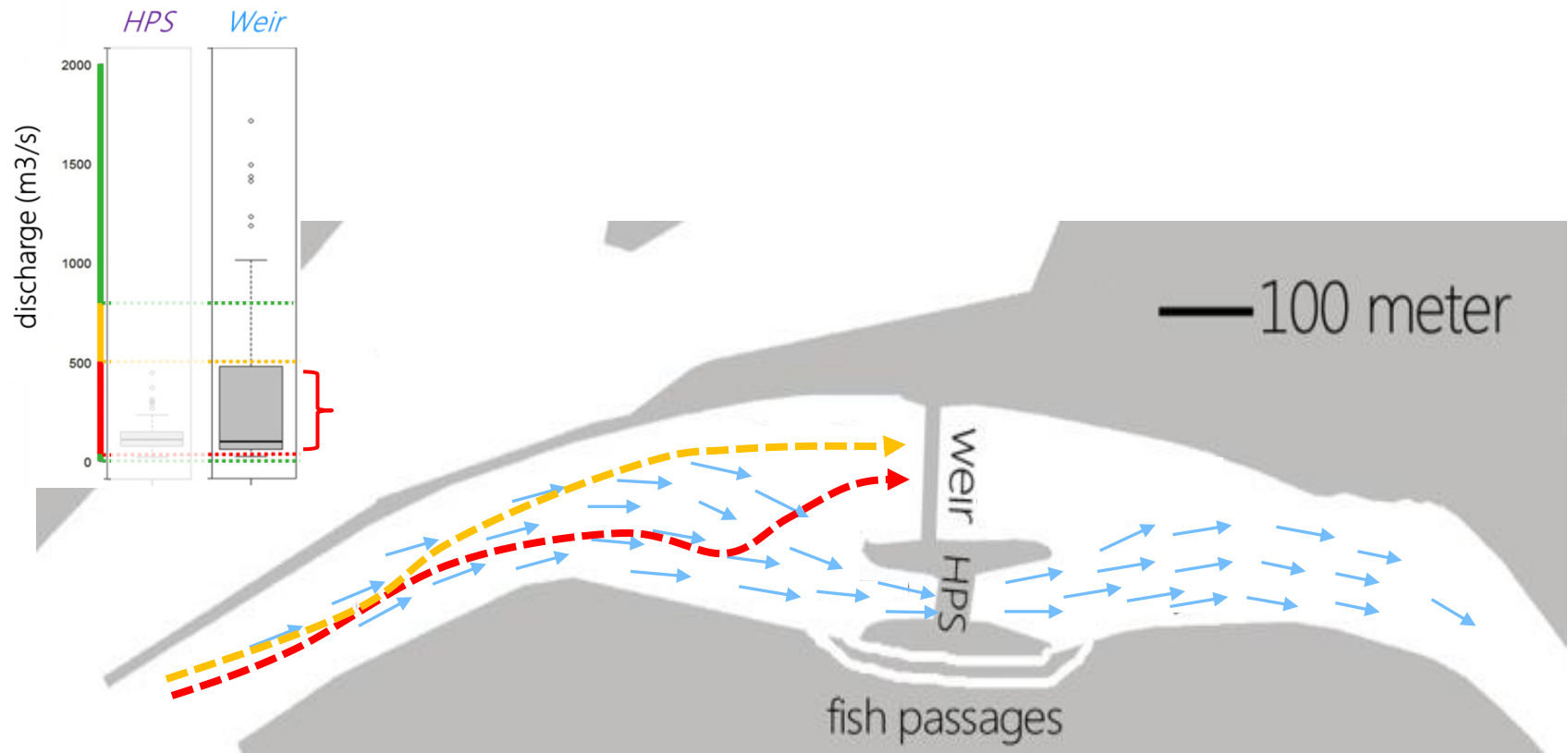


# Discussion



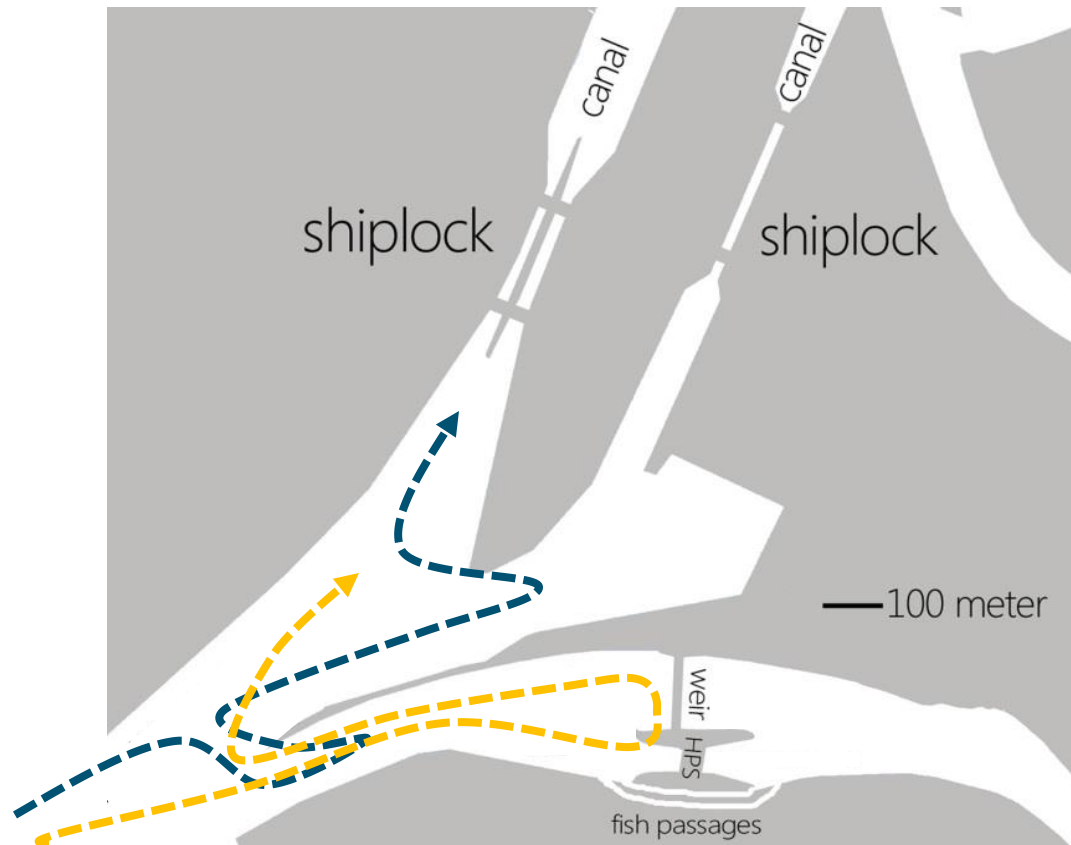
Eel did follow the main current?

# Discussion



Many eel did not follow main current

# Discussion

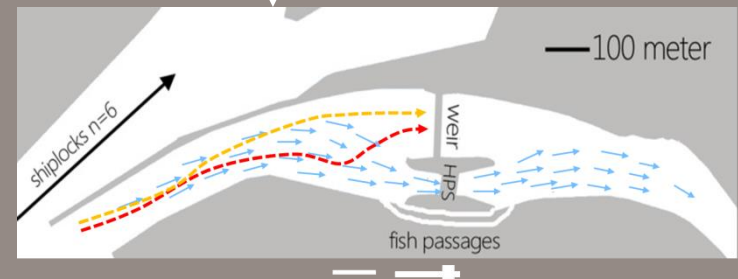


6/123 eel  
11/123 eel

# 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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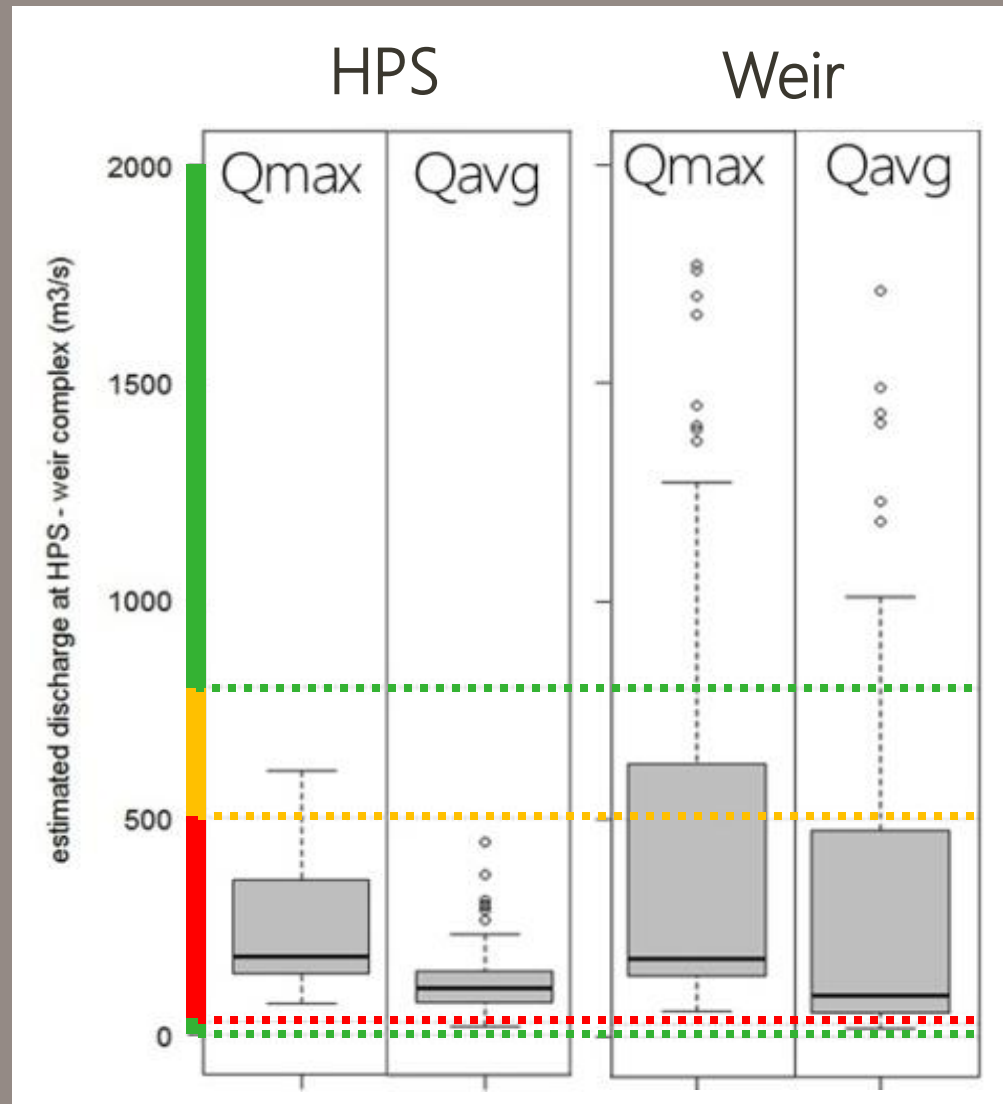
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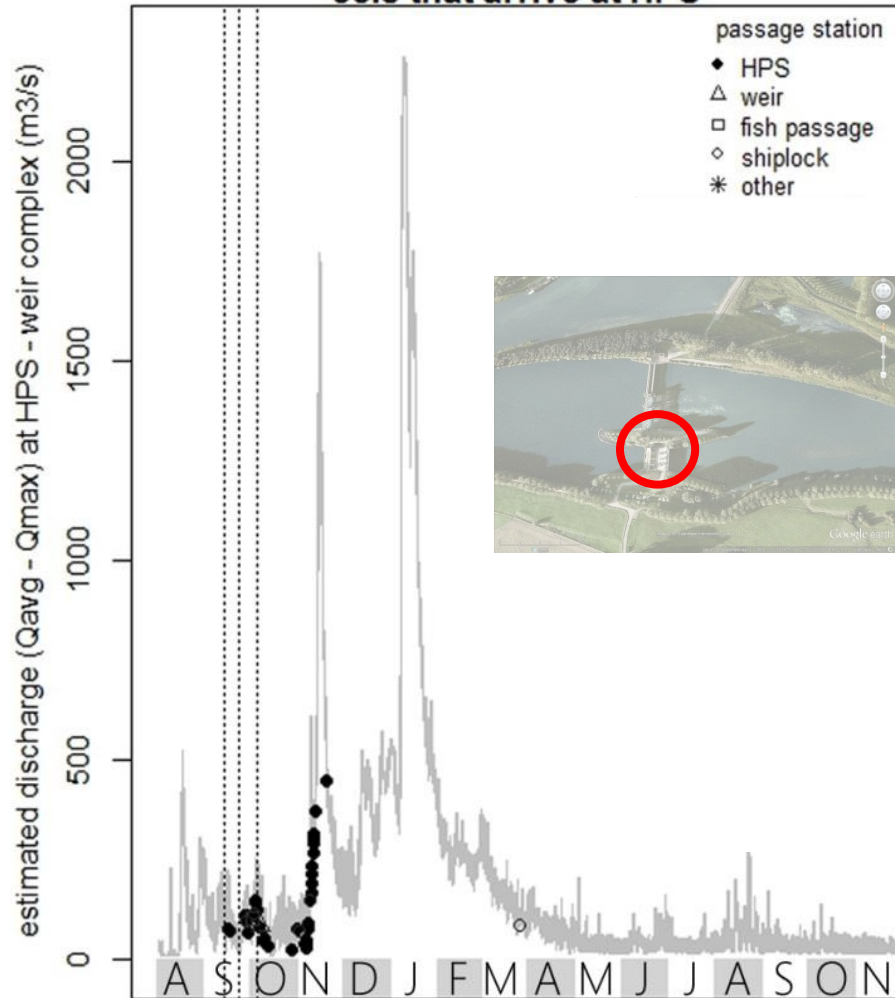
# Estimated discharge at arrival





# Arrival and discharge

eels that arrive at HPS



eels that arrive at weir

