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International Conference on Engineering and
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Jun 22nd, 9:45 AM - 10:00 AM

Eels II: Analyzing Small-Scale Movements in the Downstream Migration of European Eel: A Radiotelemetry Study

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Kreische, Florian; Borcharding, Jost; Havn, Torgeir; Heermann, Lisa; Teichert, Maxim; Thorstad, Eva; and Økland, Finn, "Eels II: Analyzing Small-Scale Movements in the Downstream Migration of European Eel: A Radiotelemetry Study" (2016). *International Conference on Engineering and Ecohydrology for Fish Passage*. 11.

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Presenter Information

Florian Kreische, Jost Borcharding, Torgeir Havn, Lisa Heermann, Maxim Teichert, Eva Thorstad, and Finn Økland

Analyzing small-scale movements in the downstream migration of European eel: a radiotelemetry study

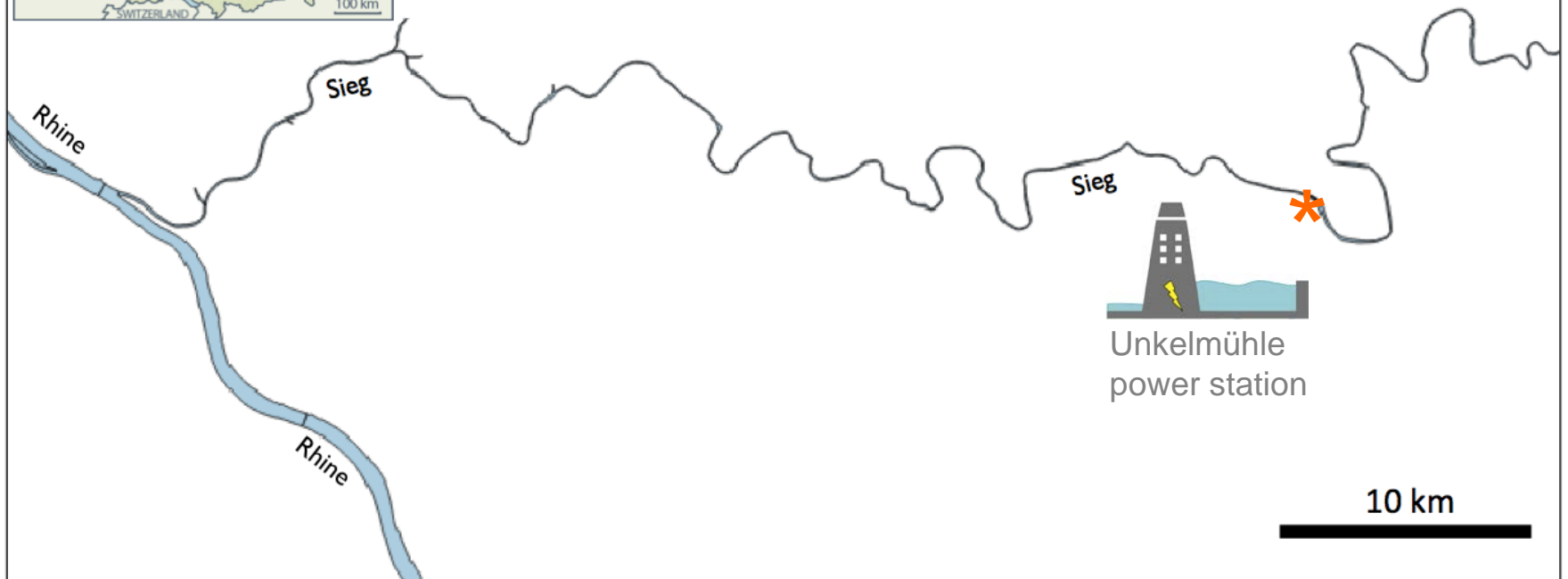
Florian Kreische, Jost Borchering, Torgeir Havn, Lisa Heermann,
Maxim Teichert, Eva Thorstad & Finn Økland

Analyzing ~~small-scale~~ movements in the downstream migration of European eel: a radiotelemetry study

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Maxim Teichert, Eva Thorstad & Finn Økland

Study site – River Sieg

- 153 km long, tributary to the Rhine
- Discharge: $53 \text{ m}^3 \text{ s}^{-1}$
- Power station Unkelmühle 44 km upstream of confluence Rhine

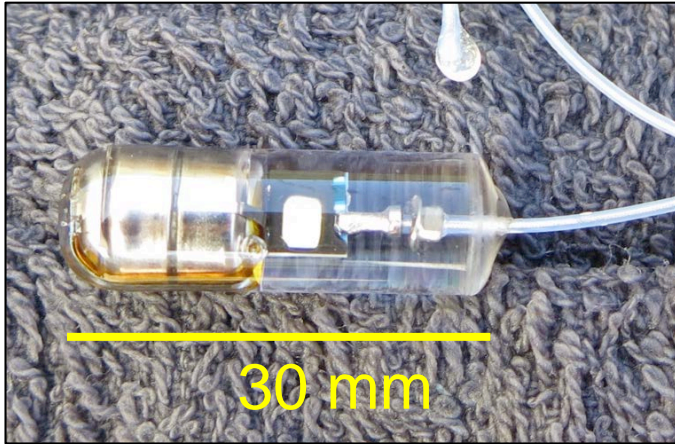


10 km



Method – radio telemetry

- 134 living + 20 dead eels
- Length: 65.5 – 81.8 cm
- Caught in River Rhine
- 2 release groups: 1) 10.10.2015 => 70
2) 13.10.2015 => 64



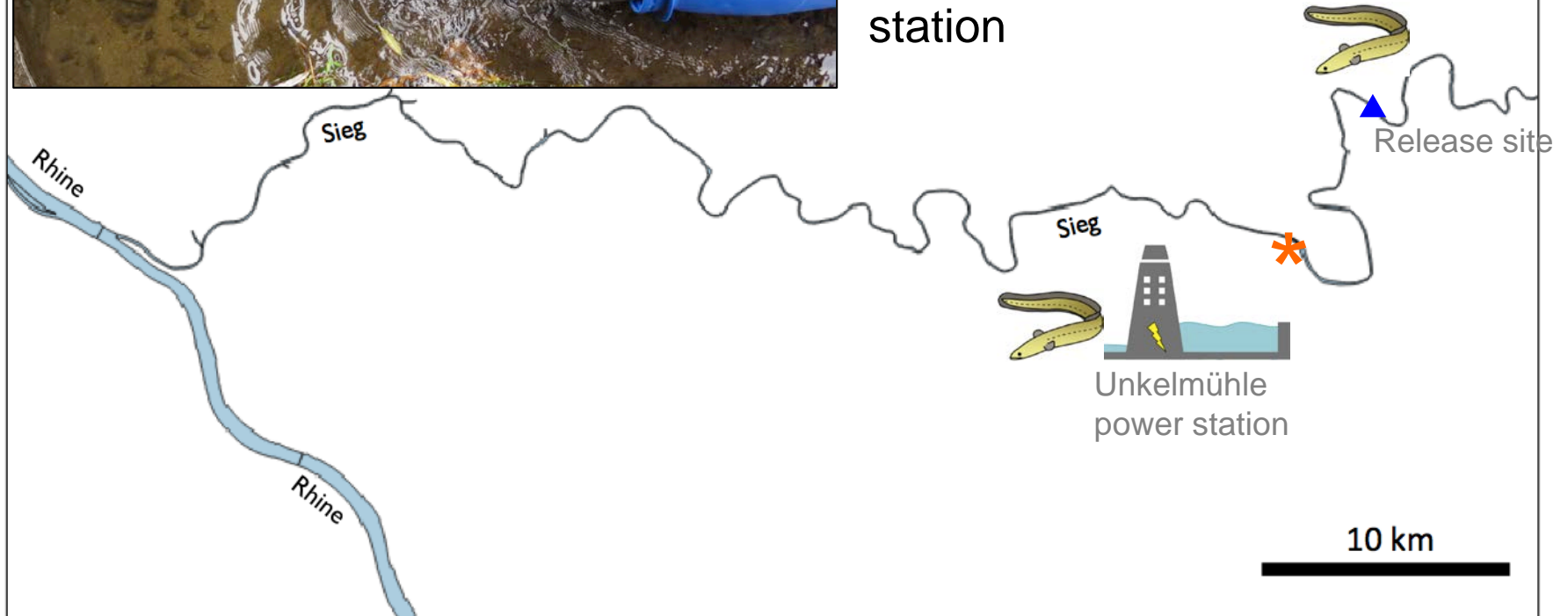
Lotek Nano Tag, weight in air 4.3 g, 9 x 30 mm

Method - release site



Living eels:
9.5 km upstream of
power station

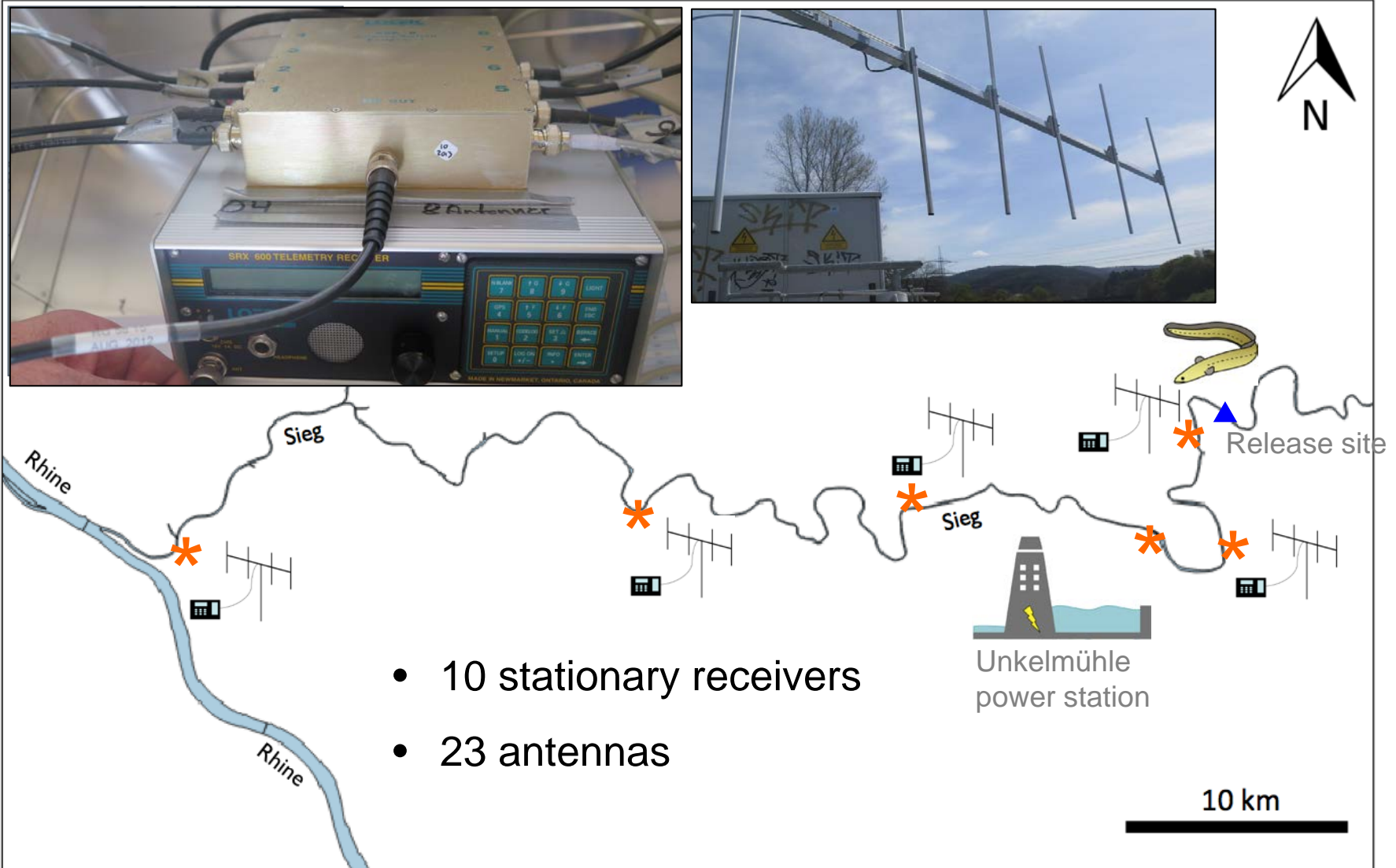
Dead eels:
Tailrace of power
station



10 km

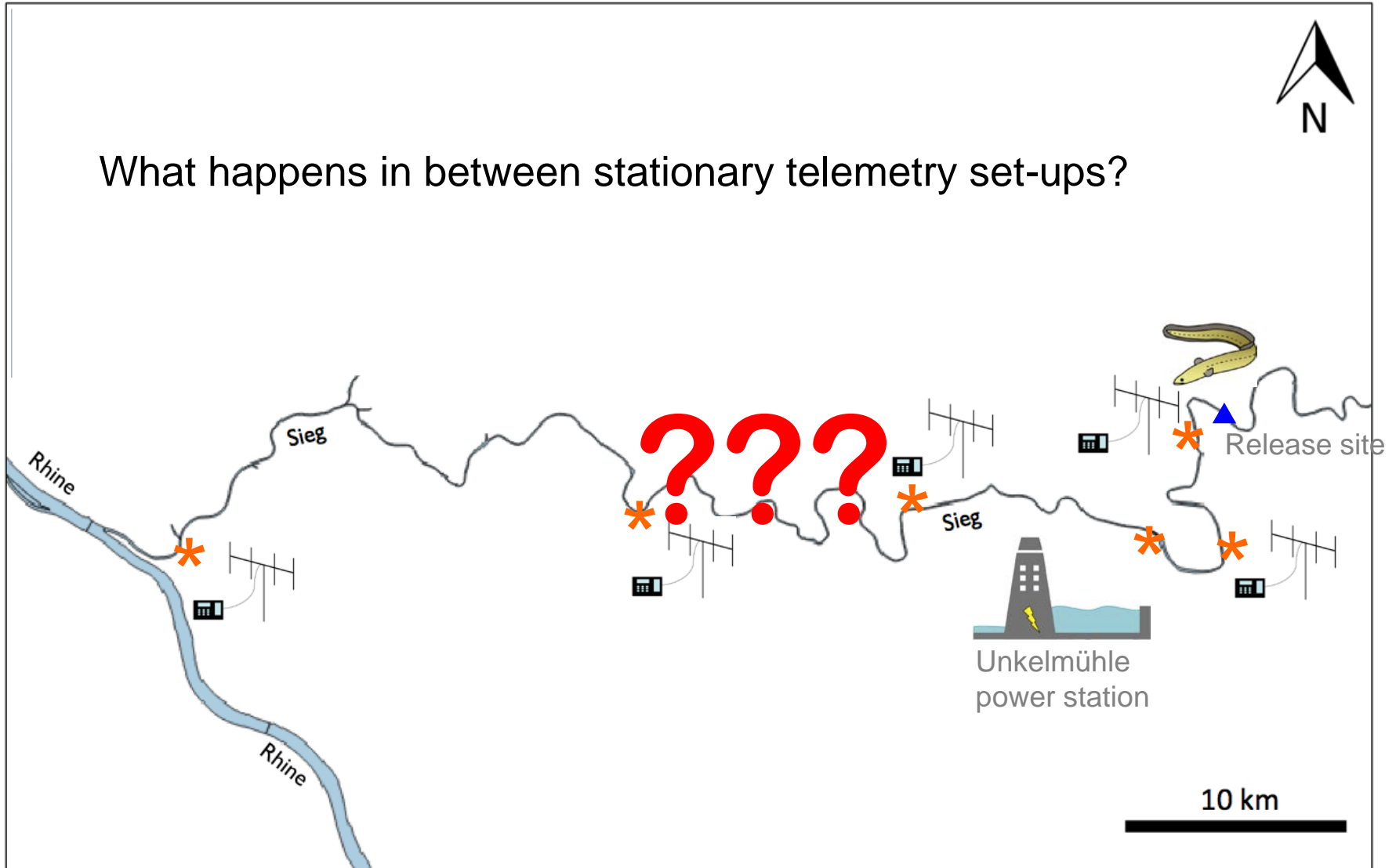


Method - antenna stations



Antenna stations

What happens in between stationary telemetry set-ups?



Manual tracking



Aircraft tracking



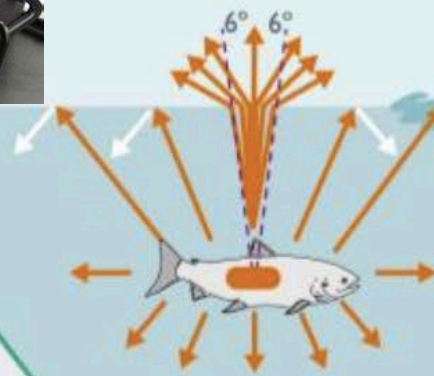
Boat tracking



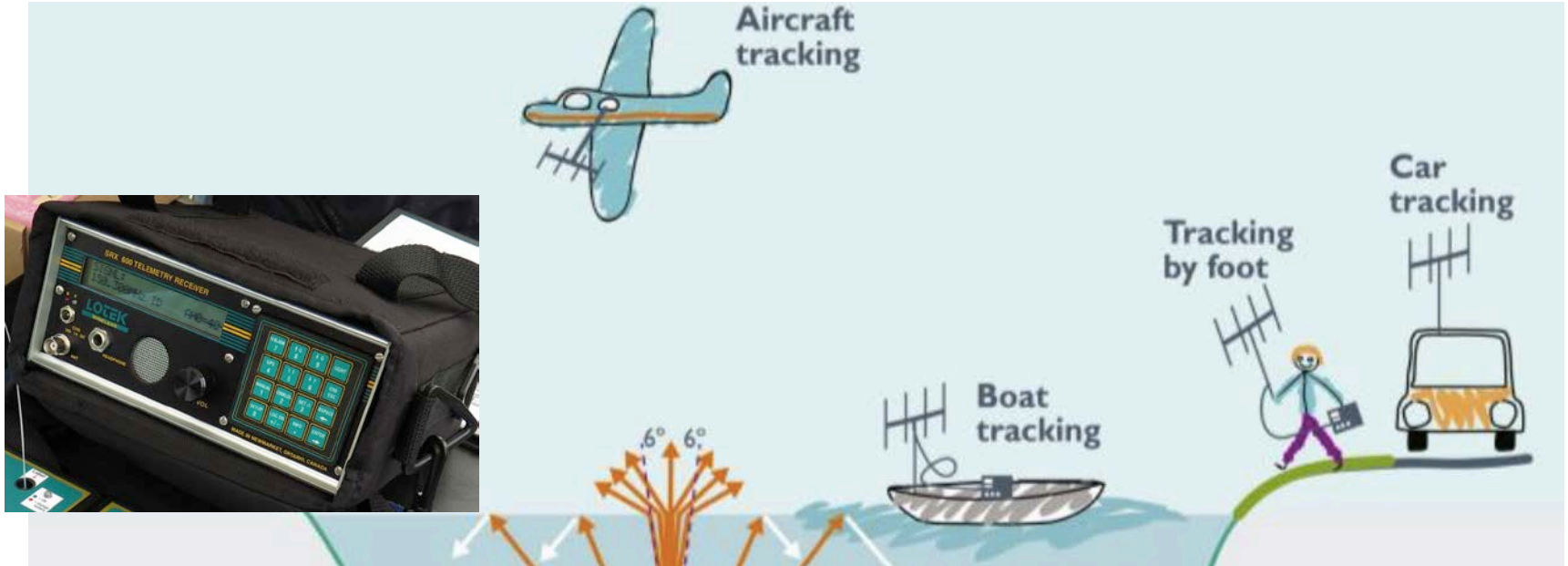
Tracking by foot



Car tracking



Manual tracking



High precision

- Time-consuming for each fish
- Limited applicability

Time effective

- Vague fish positions



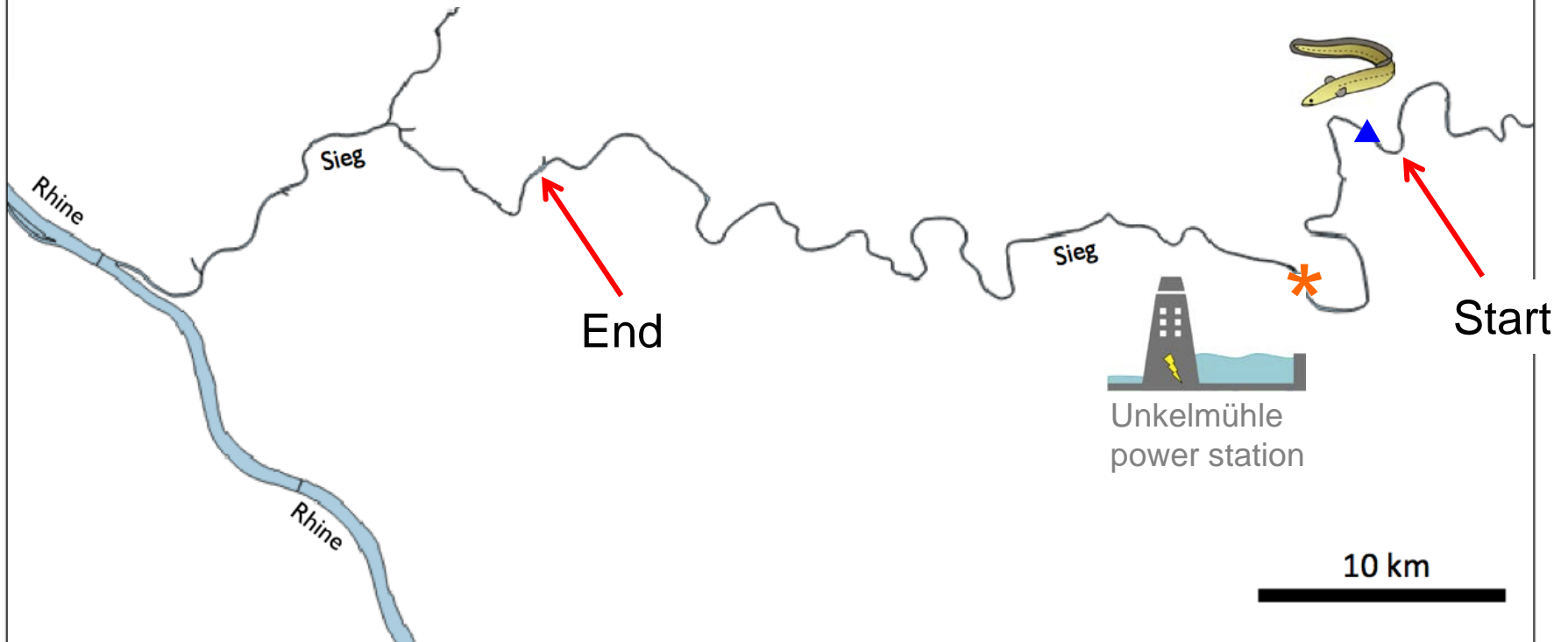
Manual tracking

- Portable receiver (Lotek SRX 600) and 3-E-Yagi antenna



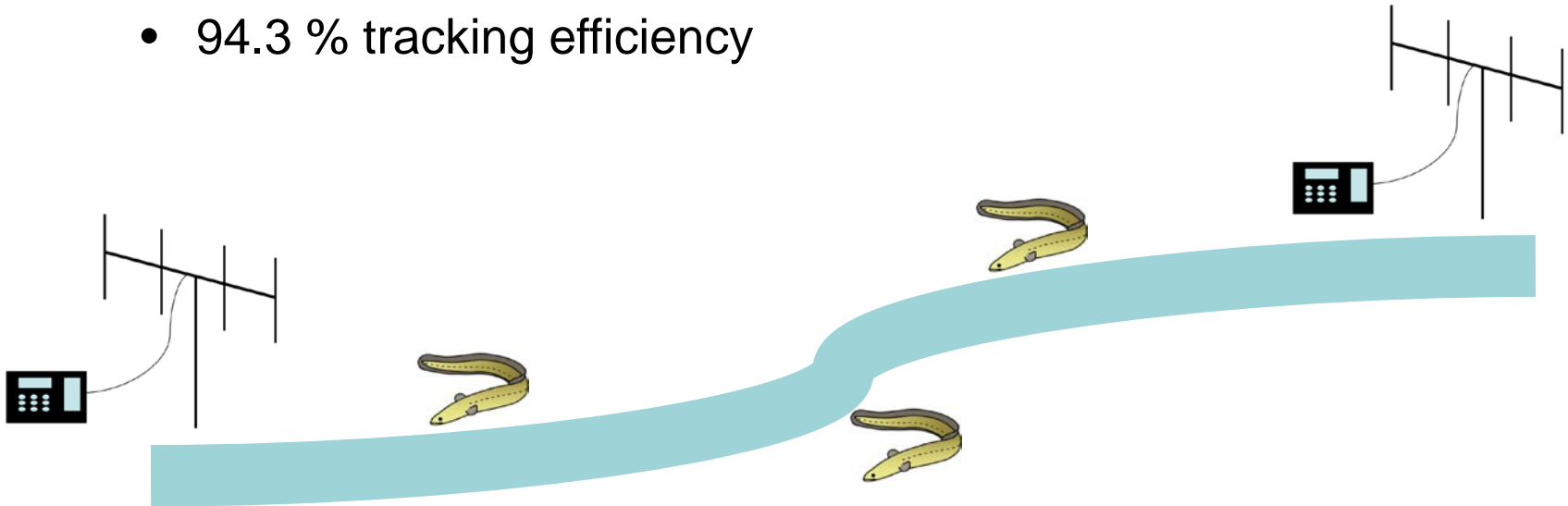
Manual tracking

- Start 1.3 km upstream of release site => 40 km d⁻¹
- Continuous movement
- Every 1 – 7 days



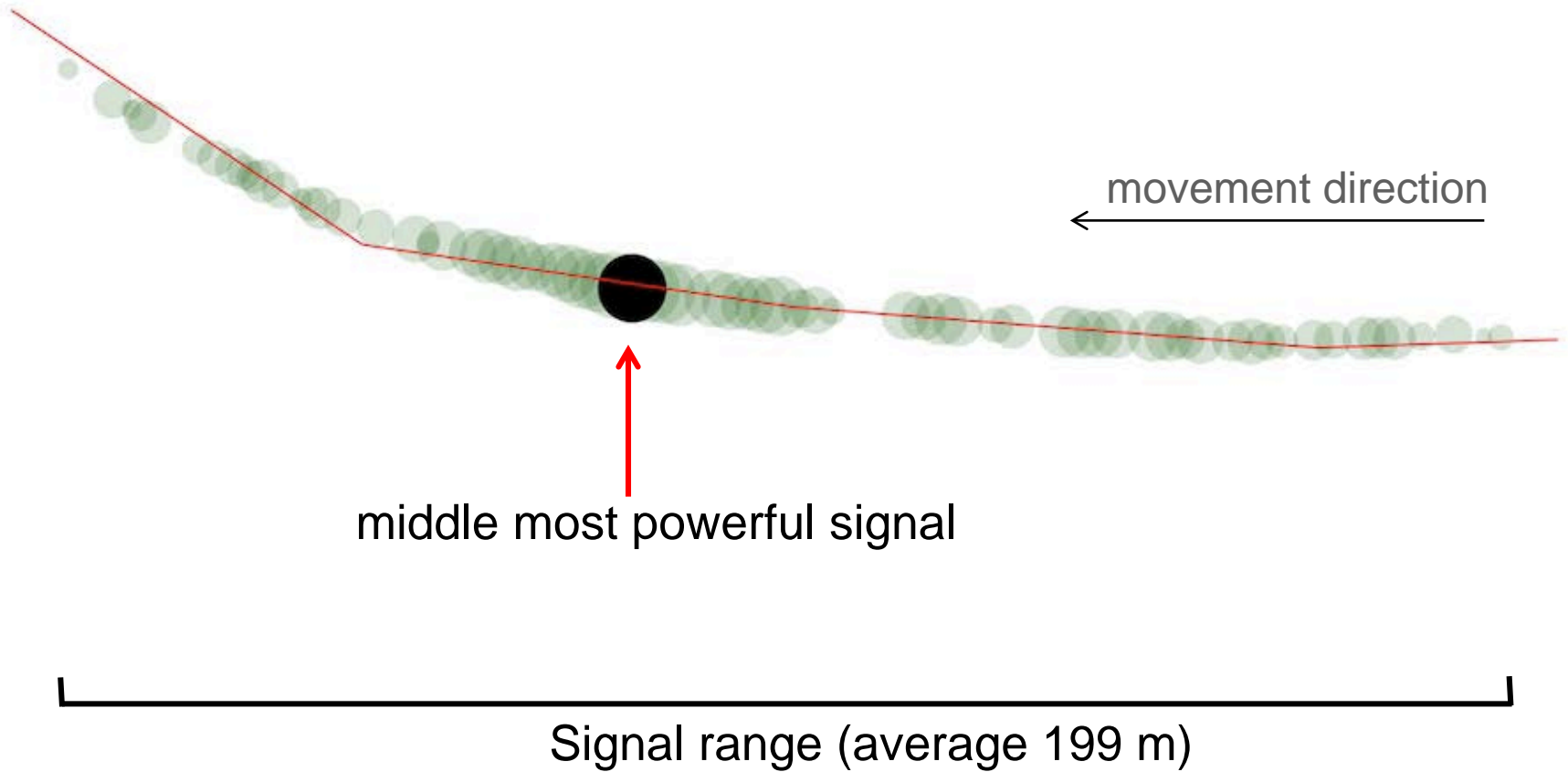
Results - manual tracking

- 27 tracking sessions => 1017 km
- 94 % (n = 126) redetection rate
- 25,850 valid signals => 1,291 fish positions
- 94.3 % tracking efficiency



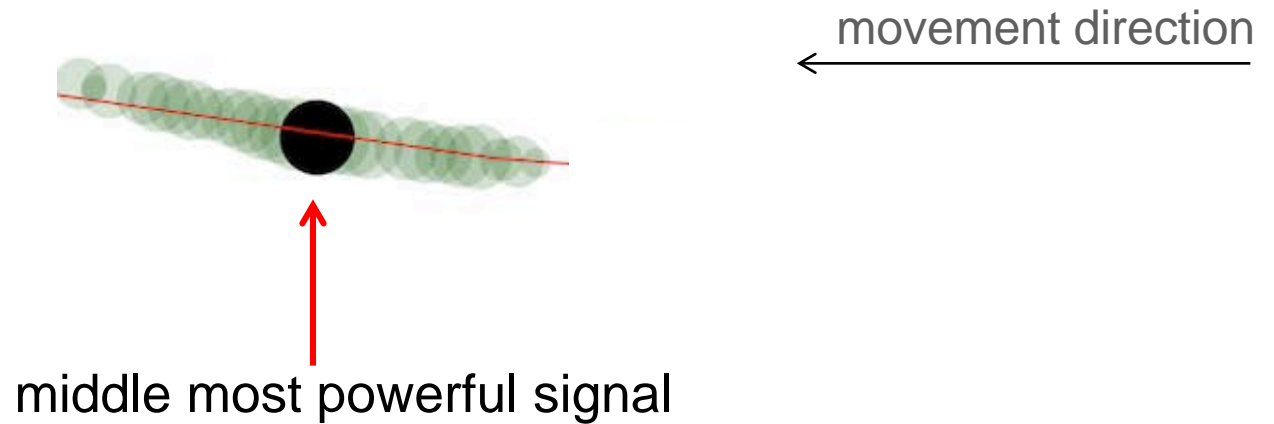
Results - manual tracking

- Sequence of signals for 1 fish on 1 day



Results - manual tracking

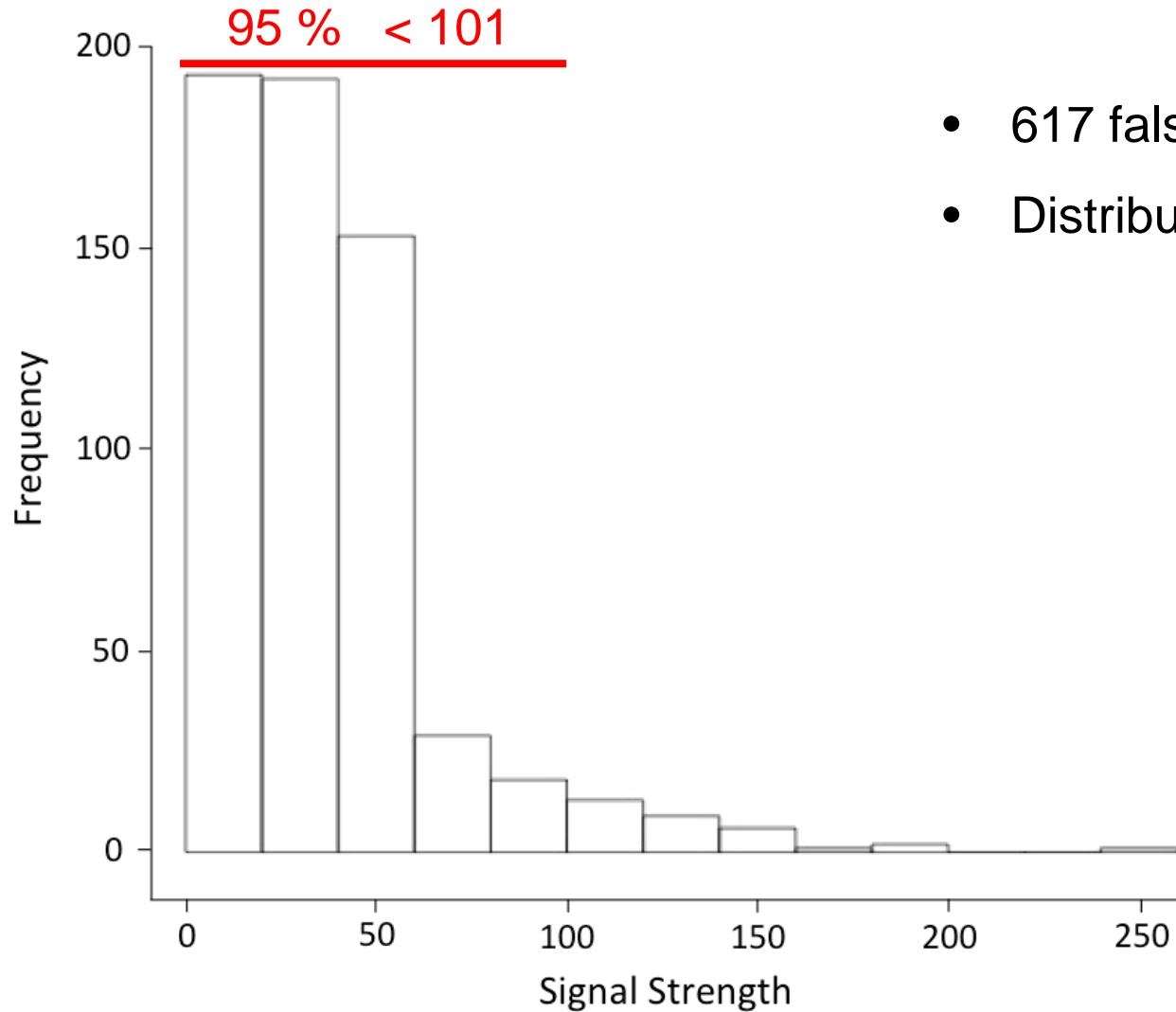
- Concentrate on area of probable occurrence



Signal range (average 199 m)



Results – false codes

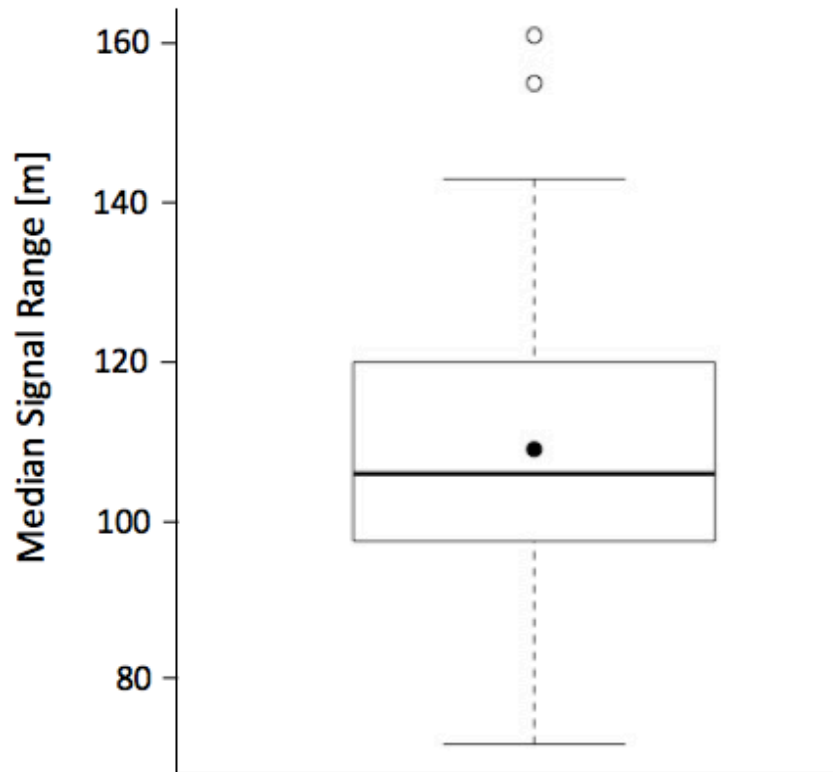


- 617 false codes (2.4 %)
- Distributed throughout study site



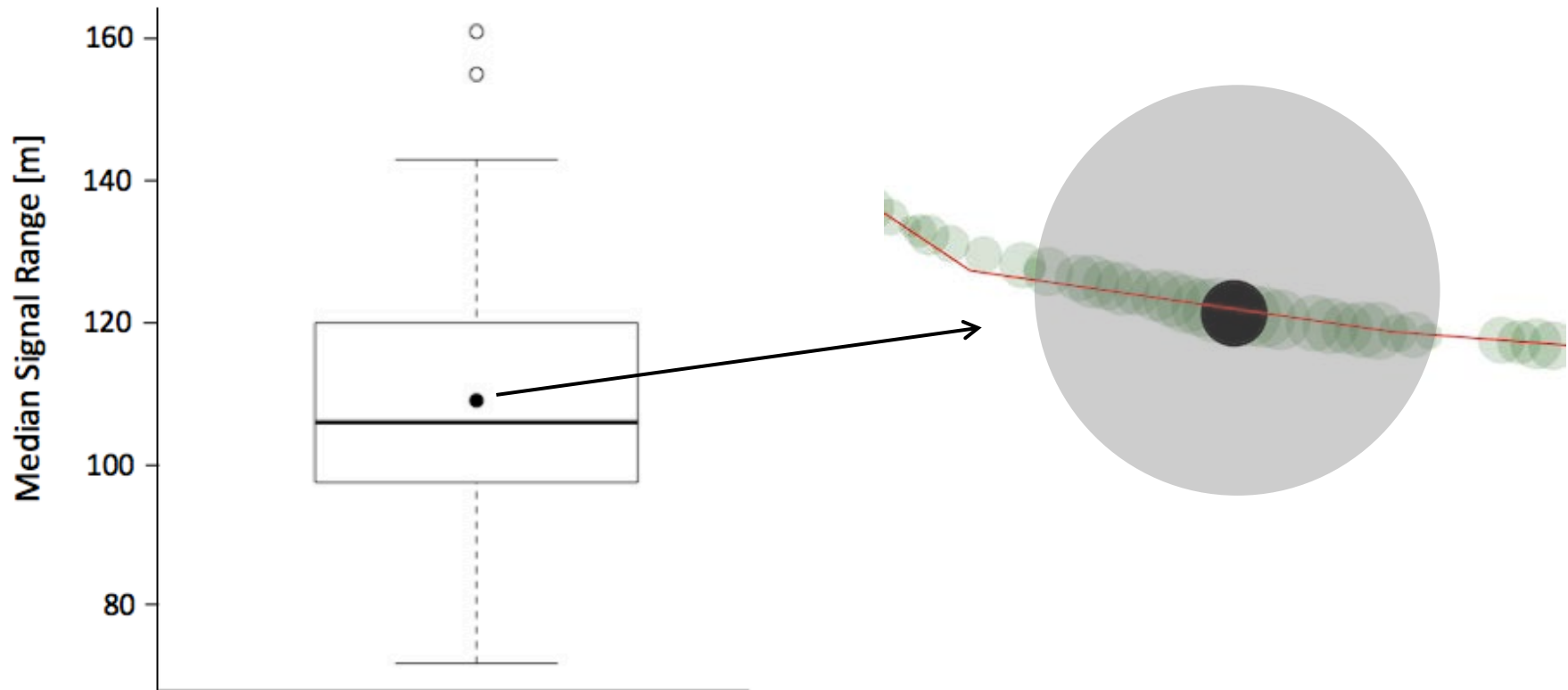
Results - manual tracking

- Median signal range for each tracking
- Signals with power > 101



Results - manual tracking

- Mean = 109 m
- Diameter of buffer zone



Results - manual tracking

- Buffer zone around middle most powerful signals

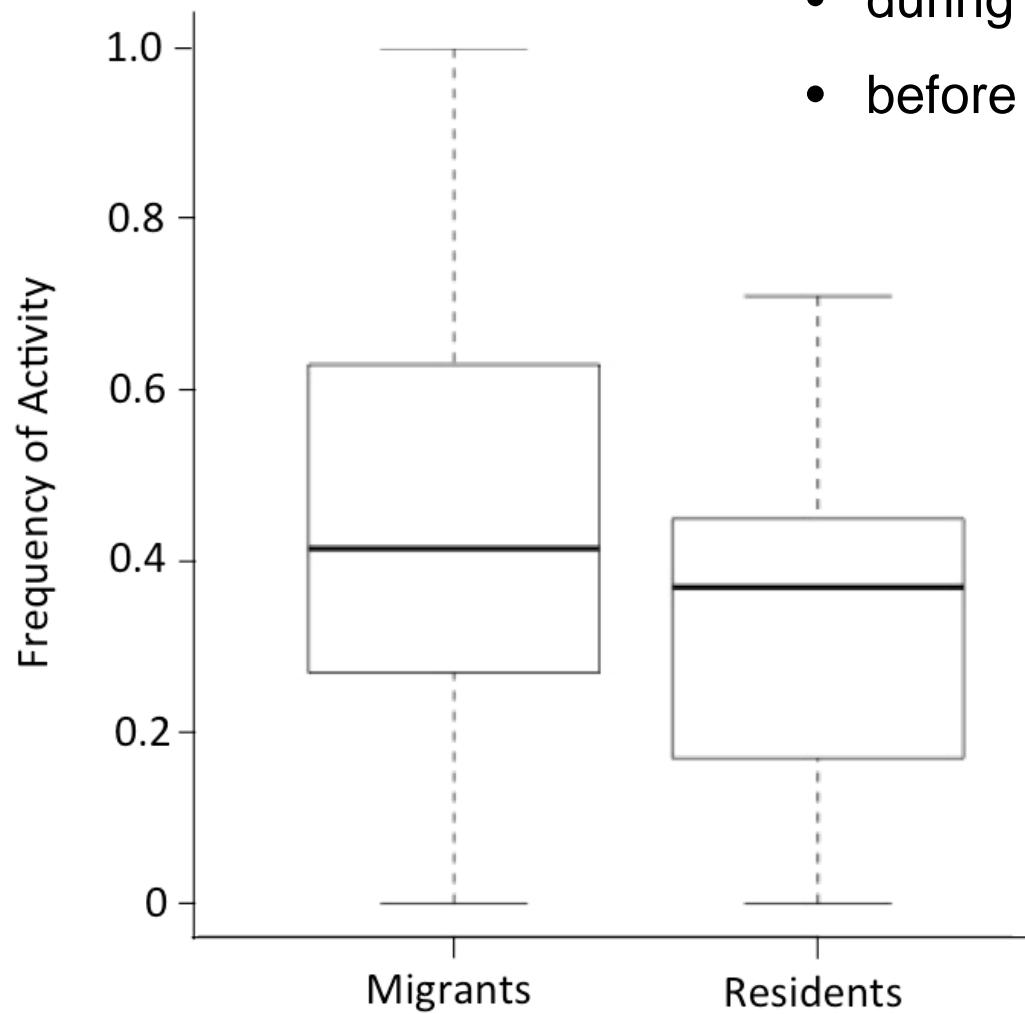


- Overlap => no movement => no activity

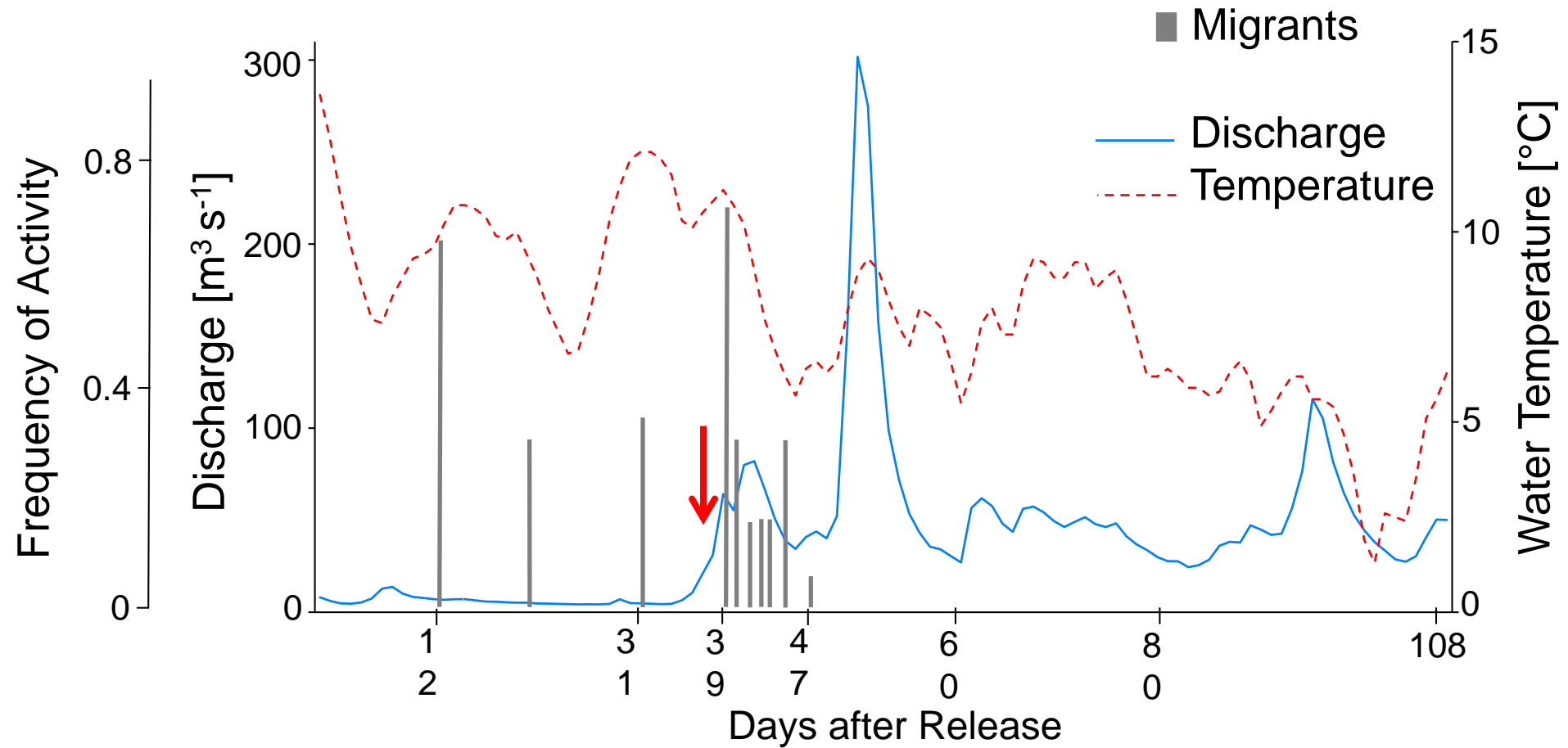


Results – Activity per individual

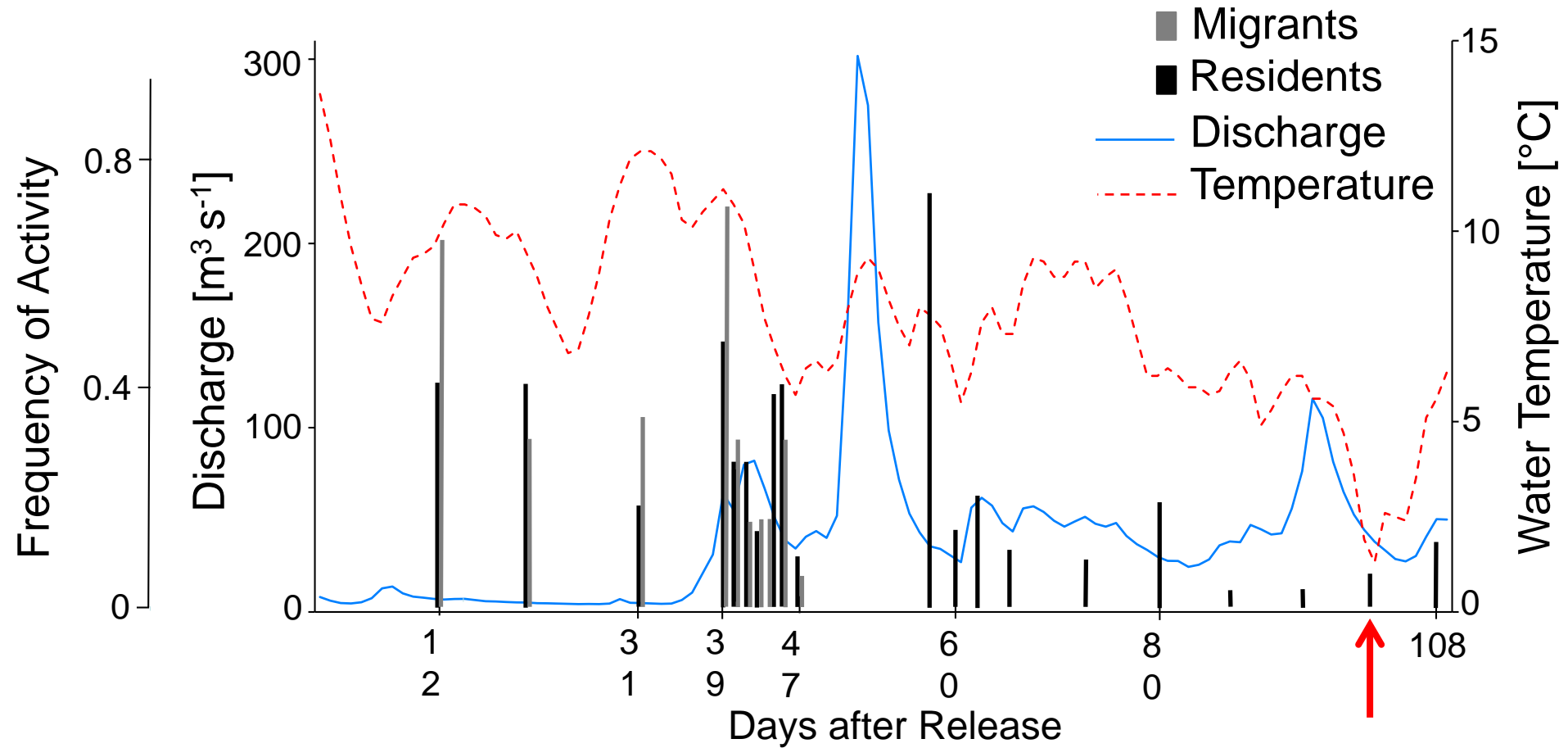
- during low water period
- before actual migration



Results – Activity per tracking session

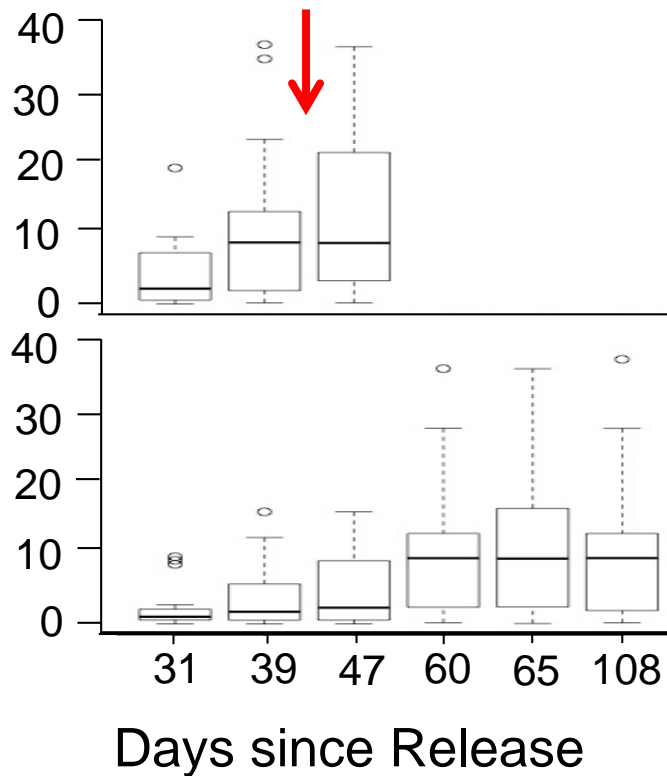


Results – Activity per tracking session



Results

Distance from Release Site [km]

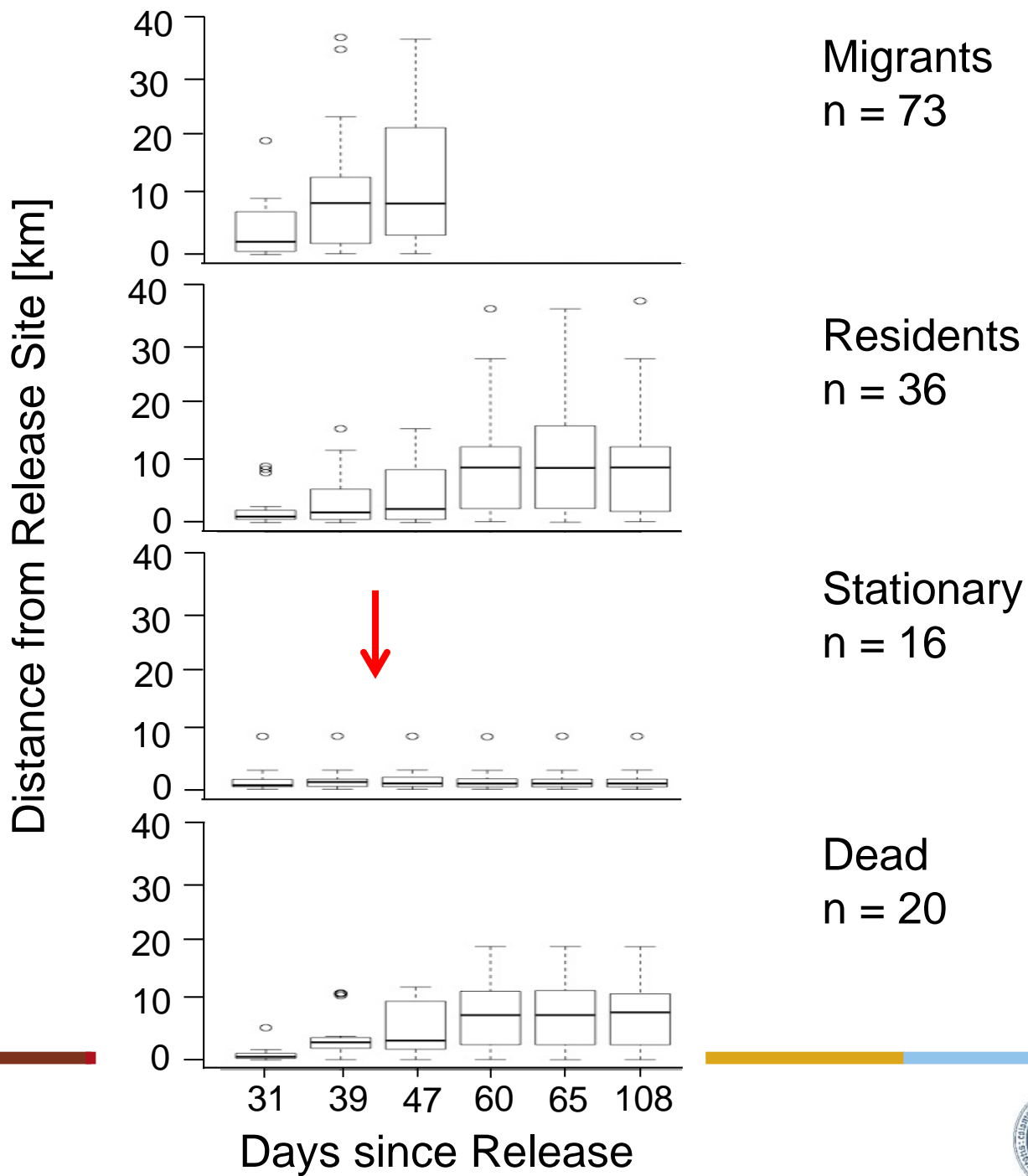


Migrants
n = 73

Residents
n = 36



Results



Summary

Manual tracking

- High redetection rates
- High tracking efficiency

- Fish position can be circumscribed
- Able to determine activity



Summary

Manual tracking

- Eels migrate once water levels increase
- Residents do not react to increase of water levels
- Manual tracking frequency needs to be adjusted to the conditions



Thank you!

