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

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Study site – River Sieg

- 153 km long, tributary to the Rhine
- Discharge: 53 m³ s⁻¹
- Power station Unkelmühle 44 km upstream of confluence Rhine
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
Method - antenna stations

- 10 stationary receivers
- 23 antennas
Antenna stations

What happens in between stationary telemetry set-ups?
Manual 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

Signal range (average 199 m)
Results - manual tracking

- Concentrate on area of probable occurrence

Signal range (average 199 m)

Movement direction

Middle most powerful signal
Results – false codes

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

95 % < 101
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

- Frequency of Activity
- Water Temperature
- Days after Release

- Discharge
- Temperature
- Migrants
Results – Activity per tracking session
Results

Distance from Release Site [km]

Days since Release

Migrants
n = 73

Residents
n = 36
Results

Distance from Release Site [km]

Days since Release

Migrants
n = 73

Residents
n = 36

Stationary
n = 16

Dead
n = 20

n = 20

Stationary
n = 16

Dead
n = 20
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!