Evaluating fish friendly German hydropower technology on downriver movement of salmon smolt and silver eels



### How hard can that be??

Founded by Ministry of Climate Protection, Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia

### Finn Økland, NINA

Project participants: Maxim Teichert, Univ. of Cologne Torgeir Havn, NINA, Norway Eva B. Thorstad, NINA, Norway Jost Borcherding, Univ. of Cologne Lisa Heermann, Univ. of Cologne Sten Are Sæter, NINA, Norway Ola Diserud, NINA Norway Richard Headger, NINA Norway In cooperation with LANUV NRW



sector»

# «Environmental / fishery sector»

# Communication





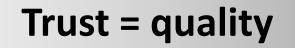


## **Trust = integrity**

### Norwegian Institute of Nature Research (NINA)



### Non profit foundation, 100 % independent.



Evaluation of biology, medicine and health research in Norway (2011)

- Commissioned by the Norwegian Research Council
- Panel 1: Botany, Zoology and Ecology-related Disciplines
- Page 82-86:
- Norwegian Institute for Nature Research (NINA)

## **Department of Aquatic Ecology** <u>Grading of scientific quality: Very Good</u>

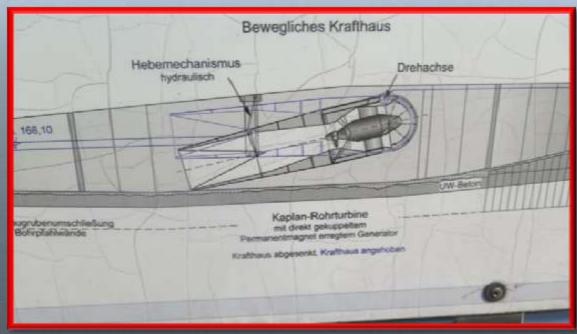
- General evaluation & recommendations
- The department has many strengths. Research involving fish telemetry is excellent and research on interactions between aquaculture and wild fishes is internationally relevant. Applications of SNP chips are quite useful for understanding the response of stocks to interactions between aquaculture and fishing. Staff have successfully used the national infrastructure for research. Publication week and internal research competitions are innovative ways to address the lack of time available to draft manuscripts for submission to peer-reviewed journals.

# Fish friendly technology?

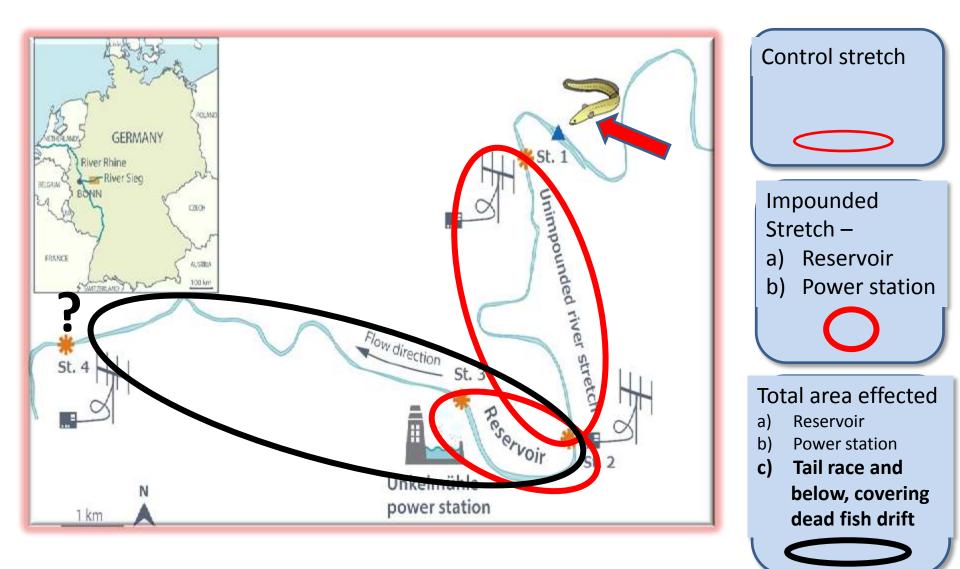




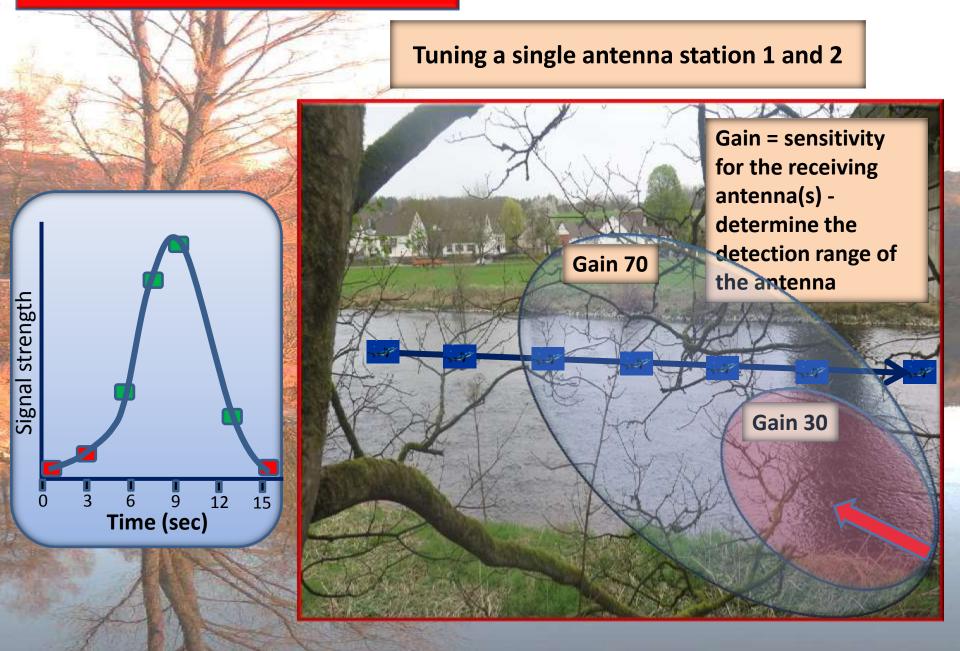




#### Project design for recording loss associated with Unkelmuhle power station



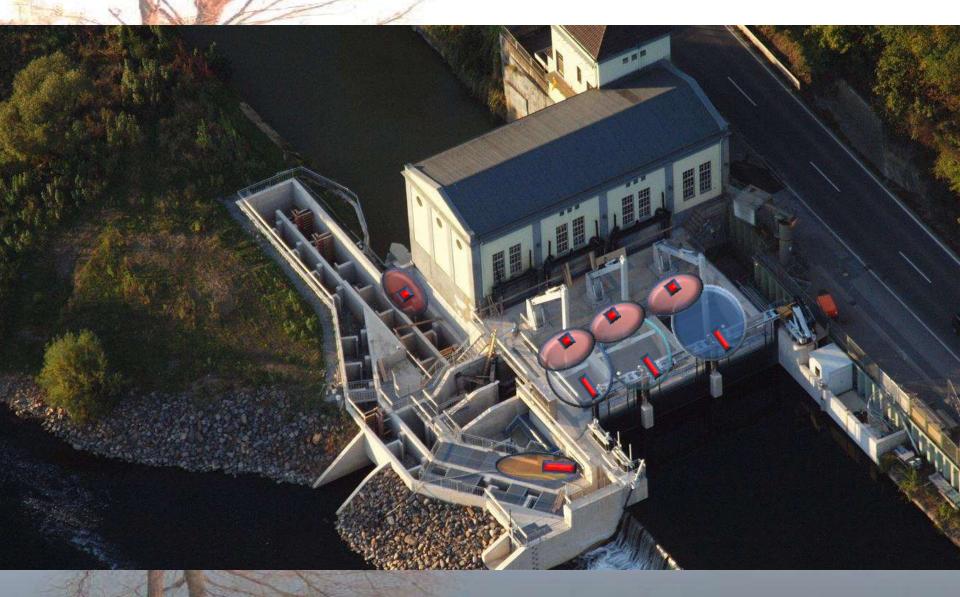
## Trust in technology



# Unkelmühle Powerstation



# Recording migratory routes



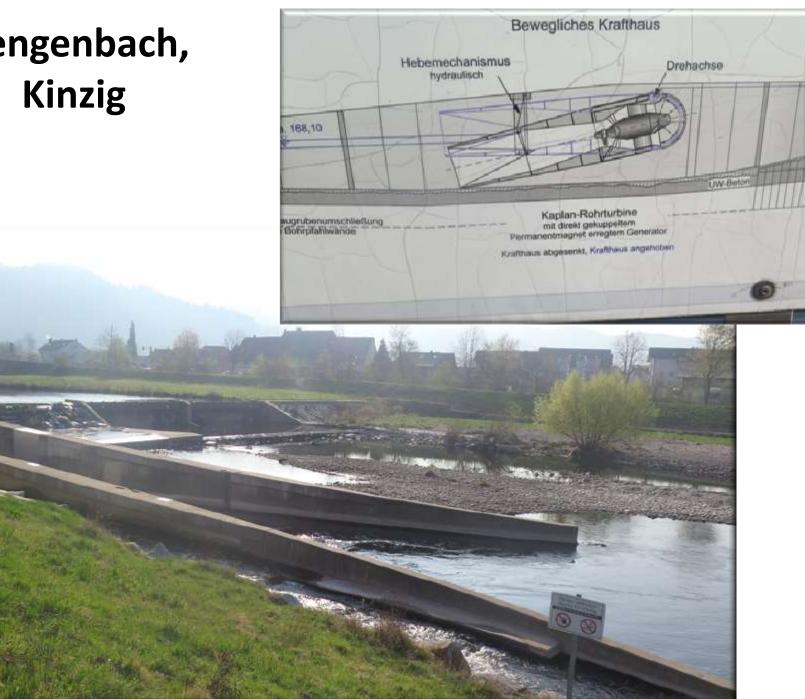
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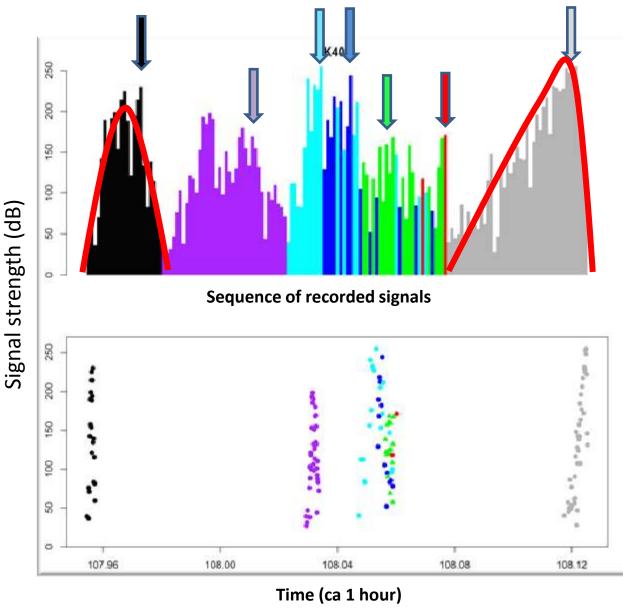
### **R-script developed for each site and location**

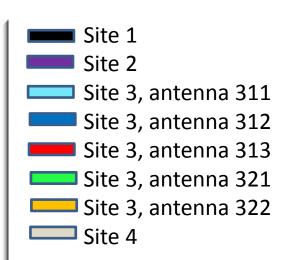
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# Gengenbach, Kinzig



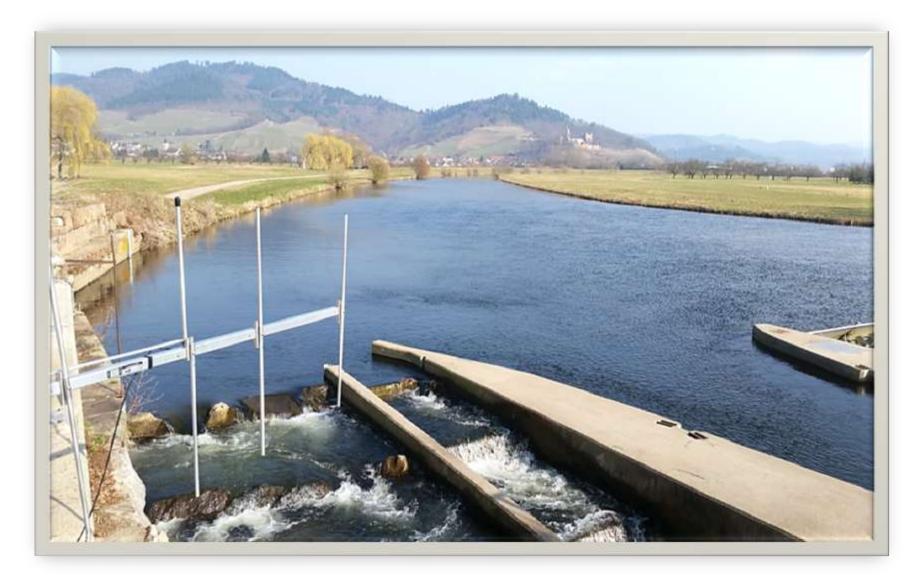
### Surviving migratory smolt



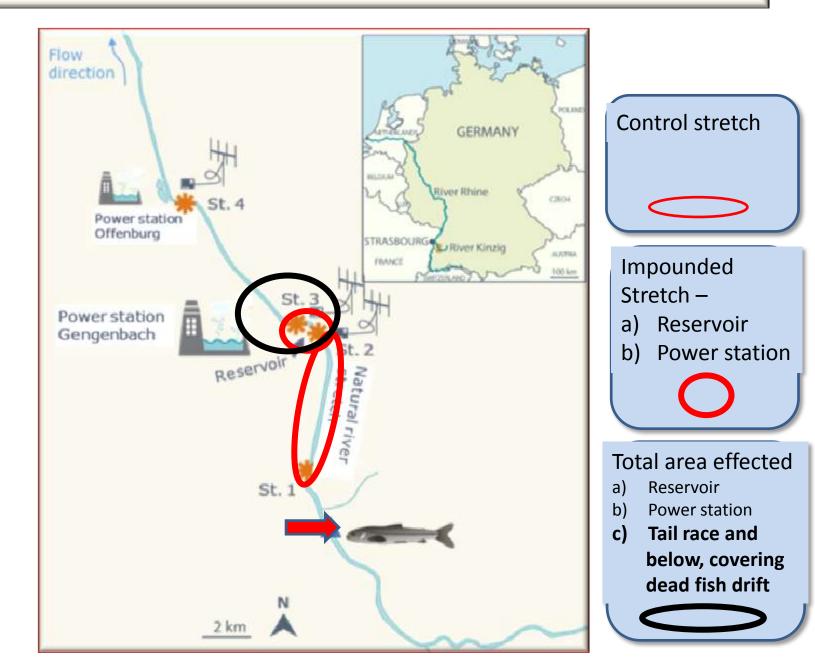


Site 1, entrance to unimpounded stretch Site 2, entrance to reservoir Antenna 311, entrance to power station Antenna 312, entrance to turbine intake and fish way Antenna 313, covering tailrace area across river Antenna 321, covering tailrace area only Antenna 322, covering fish way only Site 4, next power station

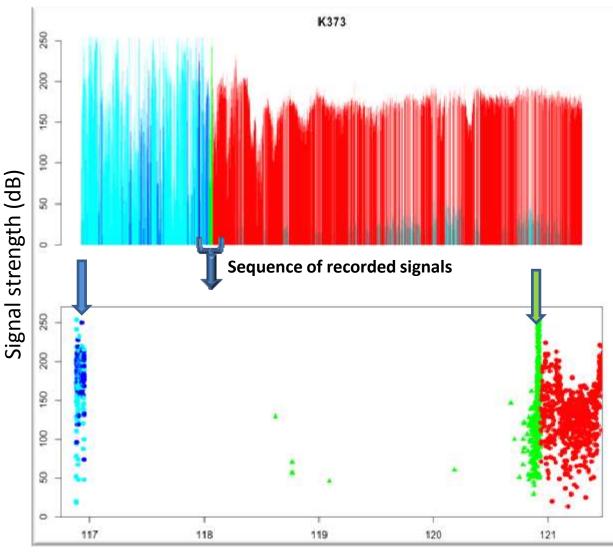
# Site 4

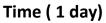


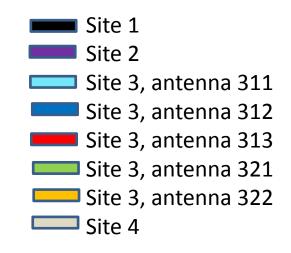
#### Project design for recording loss associated with Gengenbach power station



#### Zoom på 373







Site 1, entrance to unimpounded stretch Site 2, entrance to reservoir Antenna 311, entrance to power station Antenna 312 entrance to turbine intake and fish way Antenna 313, covering tailrace area across river Antenna 321. covering tailrace area only Antenna 322, covering fish way only Site 4, next power station

# How hard can that be??

- 1. The technical solution we decided to use worked very well
- 2. The data analyses must be a combination of R scripts and manual interpretation
- 3. The fact that dead fish do drift in combination with fish being predated and removed can make reliable loss estimates impossible, 2 eel sites.
- 4. Different mathematic models was needed for all 3 power stations to estimate smolt losses
- Communicating results to all stakeholders sometime with conflicting interests can be demanding but is now working well.
- Very hard indeed

# Thank you