Evaluation of Intake Rack Solutions for Downstream Fish Passage Using a Large Scale Fish Flume

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EVALUATION OF INTAKE RACK SOLUTIONS FOR DOWNSTREAM FISH PASSAGE USING A LARGE SCALE FISH FLUME

David Aldvén, Olle Calles, Anders Nilsson, Daniel Nyqvist & Mats Billstein

2017-06-20
OUTLINE

Background

Aim

Progress
BACKGROUND

Dams in Sweden
- Ca 2000 hydropower plants
- Vattenfall is the largest hydropower producer
  - 600MW down to <1MW

Hydropower account for ca 50% of the energy production

10% of the hydropower plants account for the regulatory capability in Sweden
BACKGROUND

- European water framework directive
- Implementation in to the Swedish legislation
- National energy agreement
- National Strategy
  - Environment vs energy production
- Environmental quality standards (EQS)
- Focus on connectivity
BACKGROUND

 Proposal to SVC – Swedish Hydropower Centre

 Älvkarleby Laboratories
  Previous focused mainly on dam safety, improved energy production, nuclear and wind

 Ecohydraulics lab
BACKGROUND

Proposal to SVC – Swedish Hydropower Centre

Älvkarleby Laboratories

- Previous focus mainly on dam safety, energy improved production, nuclear and wind

Ecohydraulics lab

- Strong environmental focus
KUNGSRÄNNAN ("THE KING’S FLUME")
KUNGSRÄNNAN

Work in progress...
KUNGSRÄNNAN

β Mimic “large scale” (>10MW) hydropower conditions

β Hydraulics ↔ Biology

β Operational 1 September
KUNGSRÄNNAN

Technical specs.
3+ operational modes
- Flume up to 16 m³/s
- Wide flume (9 m)
- Small flume (4 m), up to 2 m/s
- Elevated flume (2 m³/s at 7 m)
EEL PASSAGE STUDY

β Fill the knowledge gap
 β National guidelines for eel passage based on very few studies

β Is this the “best” solution for both eel and hydropower?

β Which rack opening is “enough”? 
EEL PASSAGE STUDY

- Fill the knowledge gap
- Angled rack
  - 30% angle

- Rack openings
  - 15mm and 30mm
- Vertical   horizontal
EEL PASSAGE STUDY

- Fill the knowledge gap
- Inclined rack
- Rack openings
  - 15mm, 18mm and 30mm
- 30% angle
THE FUTURE

- Further passage studies
  - Atlantic salmon smolts
  - Other downstream solutions (nets etc.)

- Evaluations of biological models
  - IBM, Life-Cycle etc.

- And more...
THANKS FOR LISTENING!