



Ingenieurbüro
Floecksmühle

Ein Unternehmen der FICHTNER Water & Transportation GmbH

Need for research on fish protection and fish descent in Germany

IKSR-Webinar 16. September 2021

Umwelt
Bundesamt

Ingenieurbüro Floecksmühle GmbH

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Forum Fischschutz und Fischabstieg

=> <http://forum-fischschutz.de>

- ▶ founded in 2012 by the German Environment Agency
- ▶ series of events and cross-interest digital platform



- water management, nature conservation, fishery and shipping representors of the federal states and the government



- energy industry and hydropower associations



- fishery and nature conservation associations



- planning, engineering and offices for hydraulic engineering, fisheries and water ecology



- university science



over 140 institutions with
more than 200 people
participate actively in the
forum

series of events of the „Forum Fischschutz und Fischabstieg“

kick-off event

„Forum fish protection
and fish descent.“
Bonn. 26. April 2012

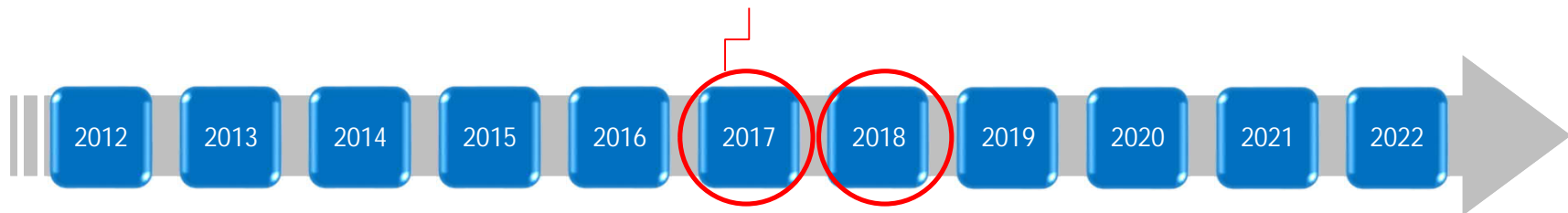
Conference

„fish protection and fish
descent – priorities for the
future“
Bonn, 27. November 2014

Congress

„fish migration and fish
protective measures“
Dessau, 16.-17. Mai 2017

Research Workshops



1. Workshop „Environmental policy
and legal framework – water
framework directive, continuity and
water use“
Bonn. 12.-13. November 2012

2. Workshop „Fish protection
and fish descent at hydraulic
engineering facilities – What is
needed?“
Karlsruhe. 23.-24. Januar 2013

3. Workshop „Protection and
conservation of fish populations –
What is needed?“
Koblenz. 25.-26. April 2013

4. Workshop „Fish protection
and fish descent – objectives,
measures and function control“
Augsburg. 21.-22. Januar 2014

5. Workshop „Key
messages of the forum“
Erfurt. 23. – 24. September
2014

6. Workshop „success factors –
asset management – structural
improvement“
Darmstadt. 20. – 21. September
2016

7. Workshop
„Improvement of the
implementation of
measures“
Dresden, 17.-18. April
2018

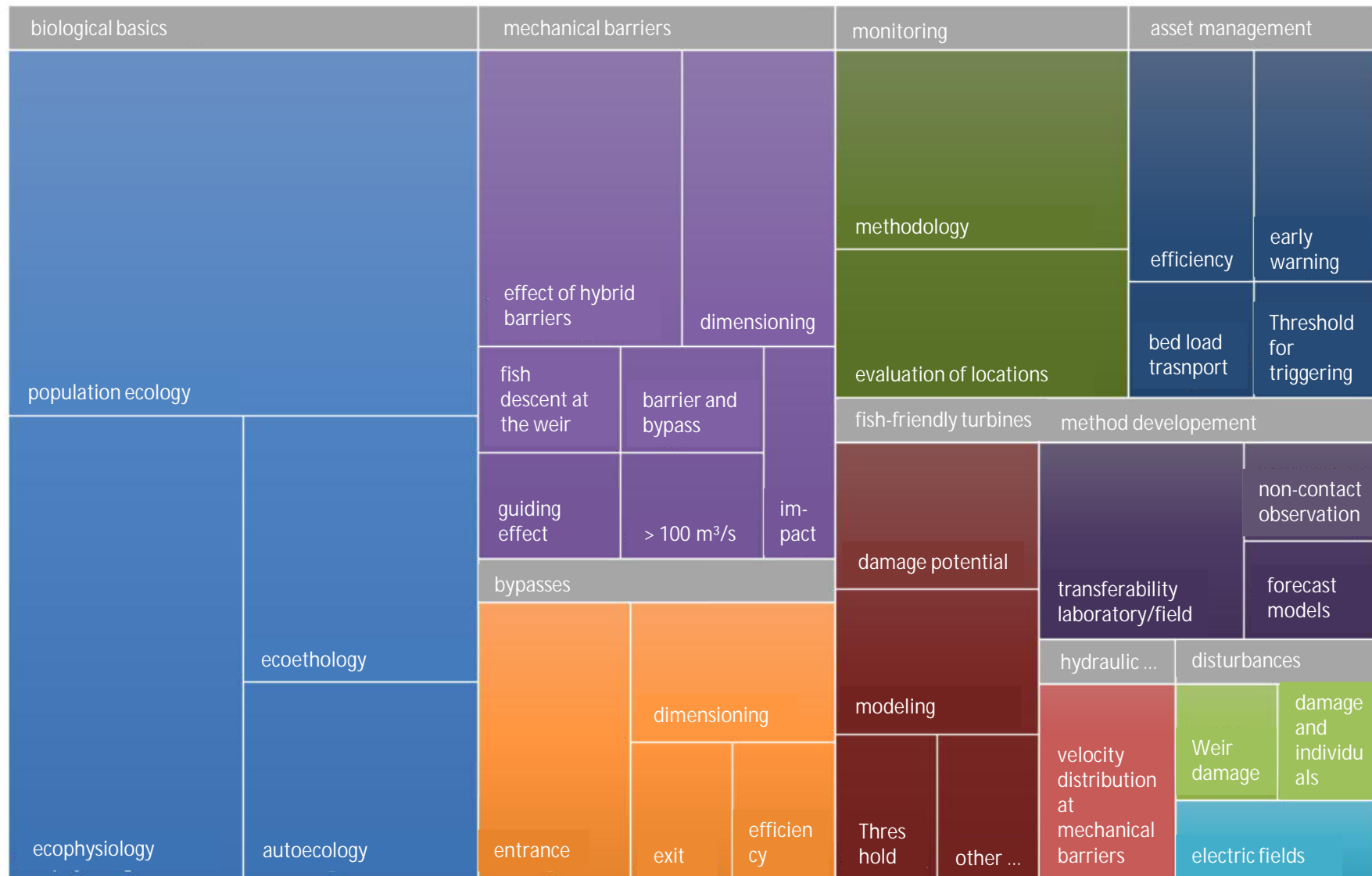
8. Workshop
„Fish protection
objectives, monitoring
and functional control“
Augsburg, 03.-04.
Dezember 2019

research workshops in the forum



- ▶ summary of the research topics from the results of the forum events
- ▶ implementation of the research workshops in coordination with
 - DWA-AG WW 8.1: fish protection and fish descent facilities
 - DWA-AG WW 8.2: function control of fish ladders and descent facilities
 - And other participants from science and research and the steering group
- ▶ consolidation of research topics by DWA AGs and discussion and prioritization at the 7th workshop of the forum
- ▶ publication of the results in the 7th results paper of the forum

research fields and frequency of their mention



research fields and frequency of their mention



biological basics	25
hydrologic-technical basics	3
disturbance of the fish descent	2
protection concept - mechanical barriers	11
protection concept - behavioral barriers	2
protection concept - bypasses	8
protection concept - asset management	6
protection concept - fish-friendly modified turbines	5
monitoring	7
method development	5

research needs: biological basics

autoecology, ecoethology, ecophysiology, population ecology



performance

migration times &
triggers

behaviour on
structures

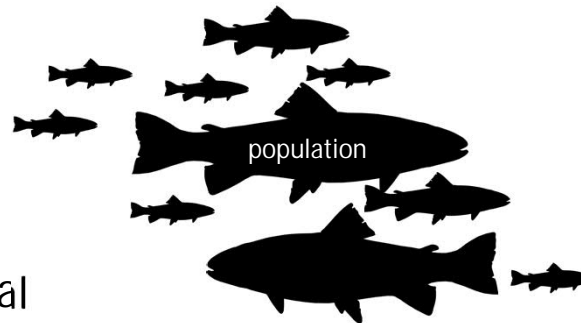


sensitivity to physical
damage

preferred migration
corridors

relevanz of stocking for the
condition of a population

reasonable amount of total
compensation at the project
location (thresholds)



effects of power plant-related
damage at population level

minimum population
sizes

quantification of natural and
anthropogenically induced mortality at
all stages of development

research needs: disturbances



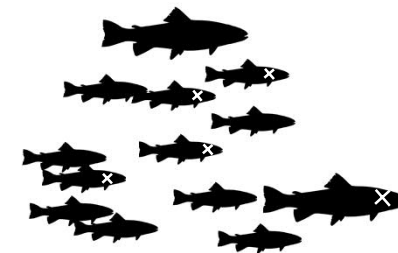
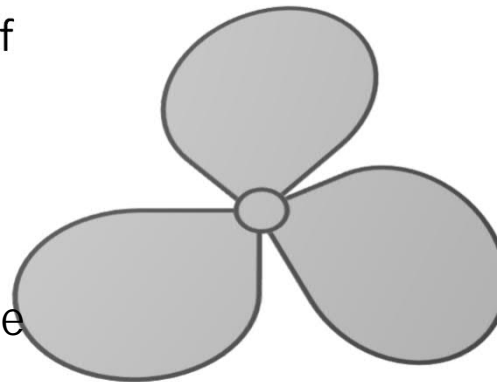
fish damage at weirs



damage to 0+ fish and
individuals < 10 cm

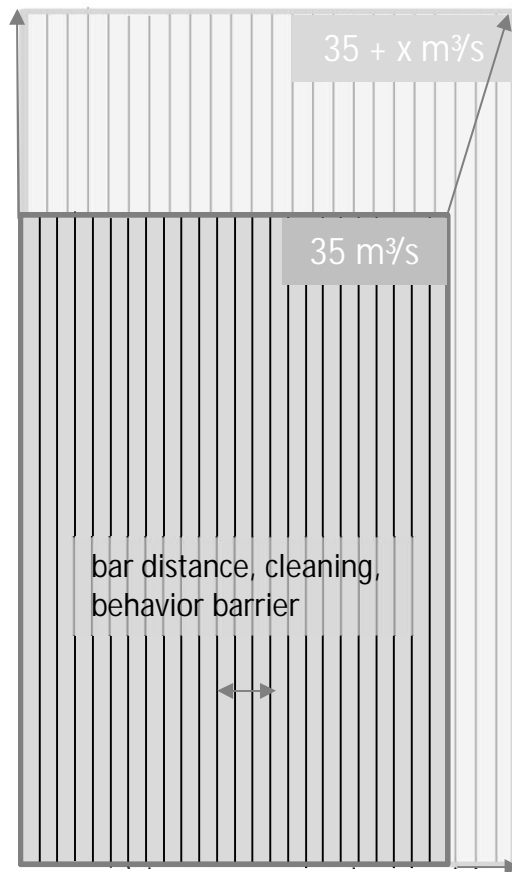
mechanisms of
damage

engine damage rate
modeling



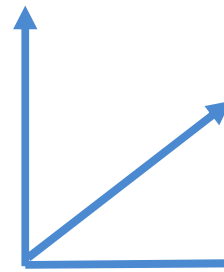
damage rate hydro power
plant > 5 MW

research needs: hydrologic-technical basics and mechanical protection devices



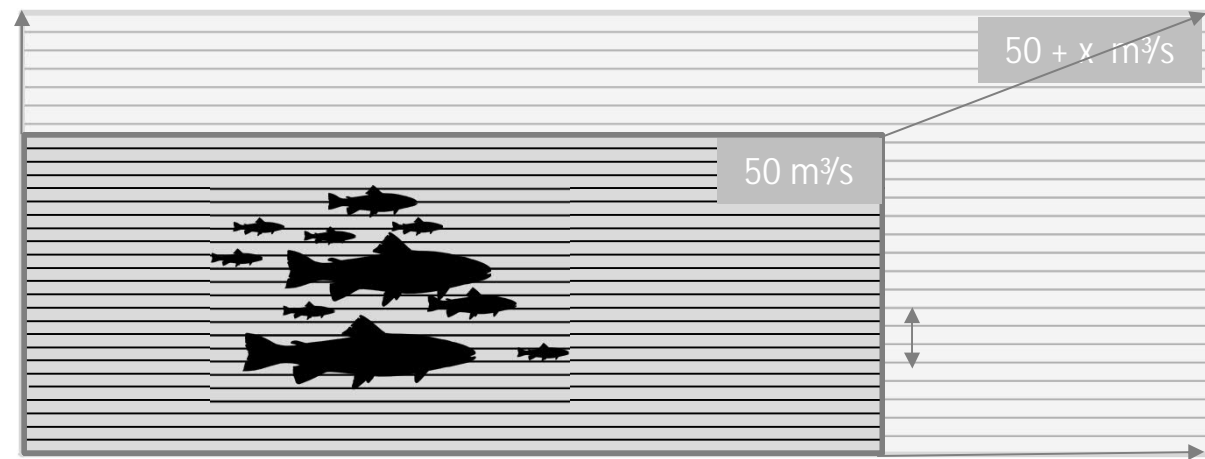
vertical trash rack

speed distribution at
trash racks



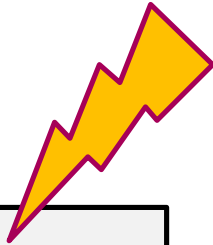
guiding effect of trash
racks

inflow to the trash rack



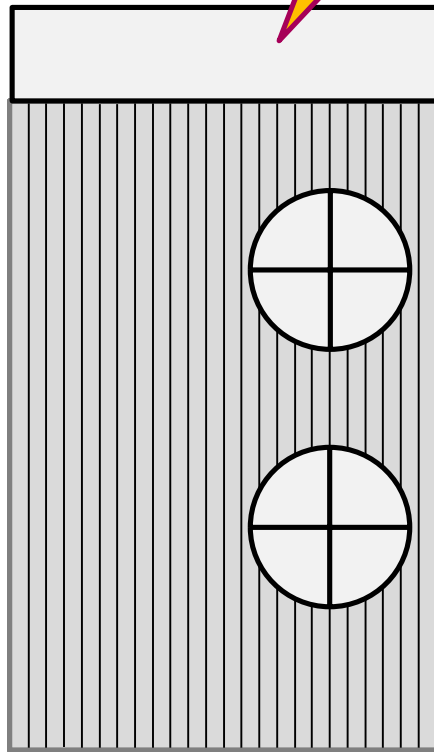
horizontal trash rack

research needs: hydrologic-technical basics and mechanical protection devices

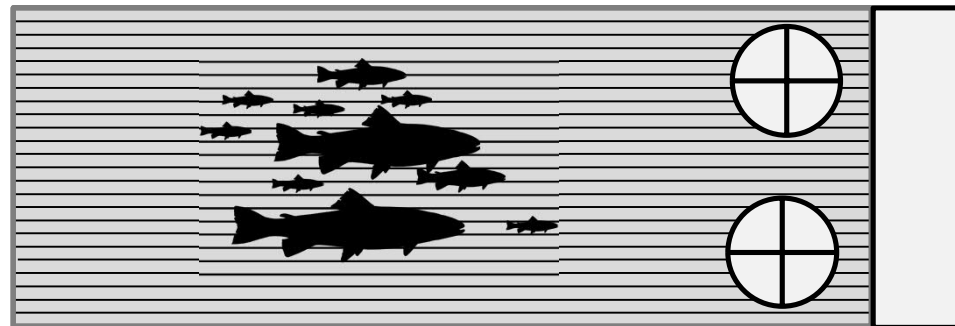


effect of hybrid barriers

bypass: arrangement
entrance
exit
efficiency in conjunction with trash rack size
bar distance



vertical trash rack



horizontal trash rack

research needs: protection concept asset management



- ▶ improve early warning (z.B. improve in situ methods – develop - echosounder, river watcher, IchtyoS-counter, imaging methods etc.)
- ▶ determine thresholds for triggering an action
- ▶ verify efficiency

research needs: protection concept fish-friendly modified turbines



- ▶ evaluation of actual damage rates of modified turbines at stream locations
- ▶ establishment of thresholds above which a turbine can be considered to be fish-friendly



- ▶ carry out function controls and long-term monitoring systematically on representative systems (also pilot systems) for different types of hydro power plants
 - types of hydro power plants
 - protective devices
 - fish regions
- ▶ improve comparability, transferability and acceptance of study results through consortium of all stakeholders and affected parties

research needs: method developement



- ▶ Application and research of sensor fish
- ▶ method for transferring the findings from laboratory and field tests into practice
- ▶ develop (further) prognostic models (mortality, overall survival rates)

prioritization and indexing criteria

evaluation		criteria				
	index number	biological ecological effect, degree of protection	extent of relevant species spectrum	knowledge gap	range of applications	importance for water management enforcement
high	5	absolutely necessary to derive biol. function criteria	concerns entire species spectrum	low basics	relevant for a large number of systems	concerns a.a.R.d.T (generally recognized rules of technology)
medium	3		concerns individual species of particular importance			concerns scope of discretion
low	1	low relevance for biol. Function, immediate effect	concerns individual species of no particular importance	extensive prior knowledge available	single solution, special case	no specific relevance

prioritization of research topics



priority goals of the research

- ▶ improve the efficiency (effectiveness) of fish protection and fish descent facilities
- ▶ further develop fish protection at facilities beyond the impact of 50 m³/s per trash rack field for fish > 10 cm (more fish-friendly modes of operation and turbine technologies)
- ▶ improvement of prognostic models
- ▶ creation of regulations for construction, dimensioning and operation of fish protection and fish descent facilities
- ▶ improvement of the justification of measures for enforcement

priority avenues of research

1. carry out function controls and monitoring on fish protection and fish descent facilities that have been constructed according to the current state of knowledge
2. continue research
 - a) laboratory research
 - b) field research at the location
 - c) numerical models

→ implementation of measures based on current calculation criteria



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Thank you for your attention!

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