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Session C5: Experiments to Improve Passage Ways for Downstream Migrating Silver Eel

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Field experiment

In an earlier pilot experiment, silver eel under heavy stress escaped upstream.

Is an incoming water stream attractive to downstream migrating silver eel facing obstructions?

Are there other behavioral patterns in eel that can be used for increasing passage efficiency/minimizing water spillage?

Experimental setups (passages) in a low head dam

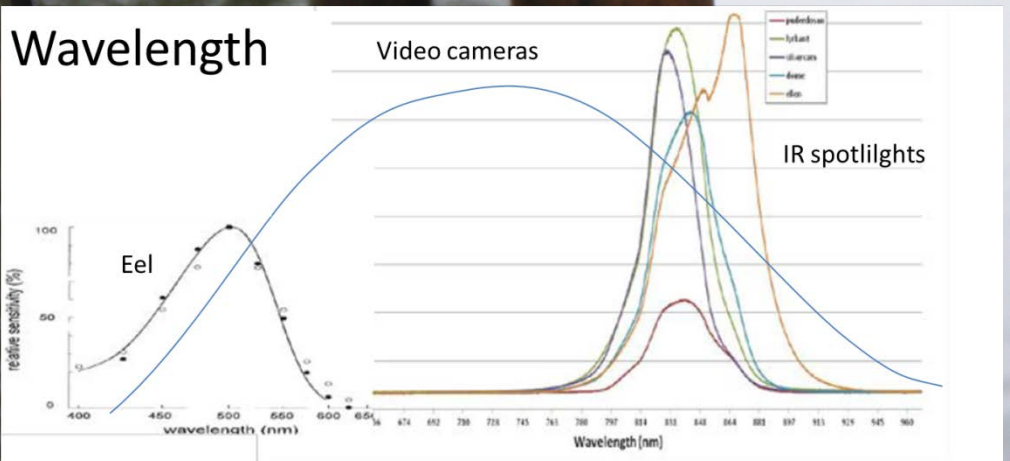
river

Night time observation

Experiments were made during darkness.

Video recordings were used for documentation.

The IR spotligths were not detectable for eel (or for people!) but functional for cameras.



Plain opening, 20 l/s

A plain opening in the dam with moderate downstream flow was used as control.

Four eel were observed near the opening, two of them passed downstream.

Dead end

A dead end opening in the dam.

No eel were observed near this opening or entering it.

Small inflow (5 l/s) and water spray

A small water flow into the dam.

No eel were observed near this opening or entering it.

The flow was deemed too insignificant to base conclusions on.

Large inflow, 150 l/s

A significant water stream into the dam.

25 eel were observed, no one entered.

A few eel explored the plume from 1-2 m distance, then turned away.

It was concluded that an incoming water stream is not attractive to (only lightly) stressed silver eel seeking a passage.

Bypass, 20 l/s

A bypass with a moderate downstream water flow.

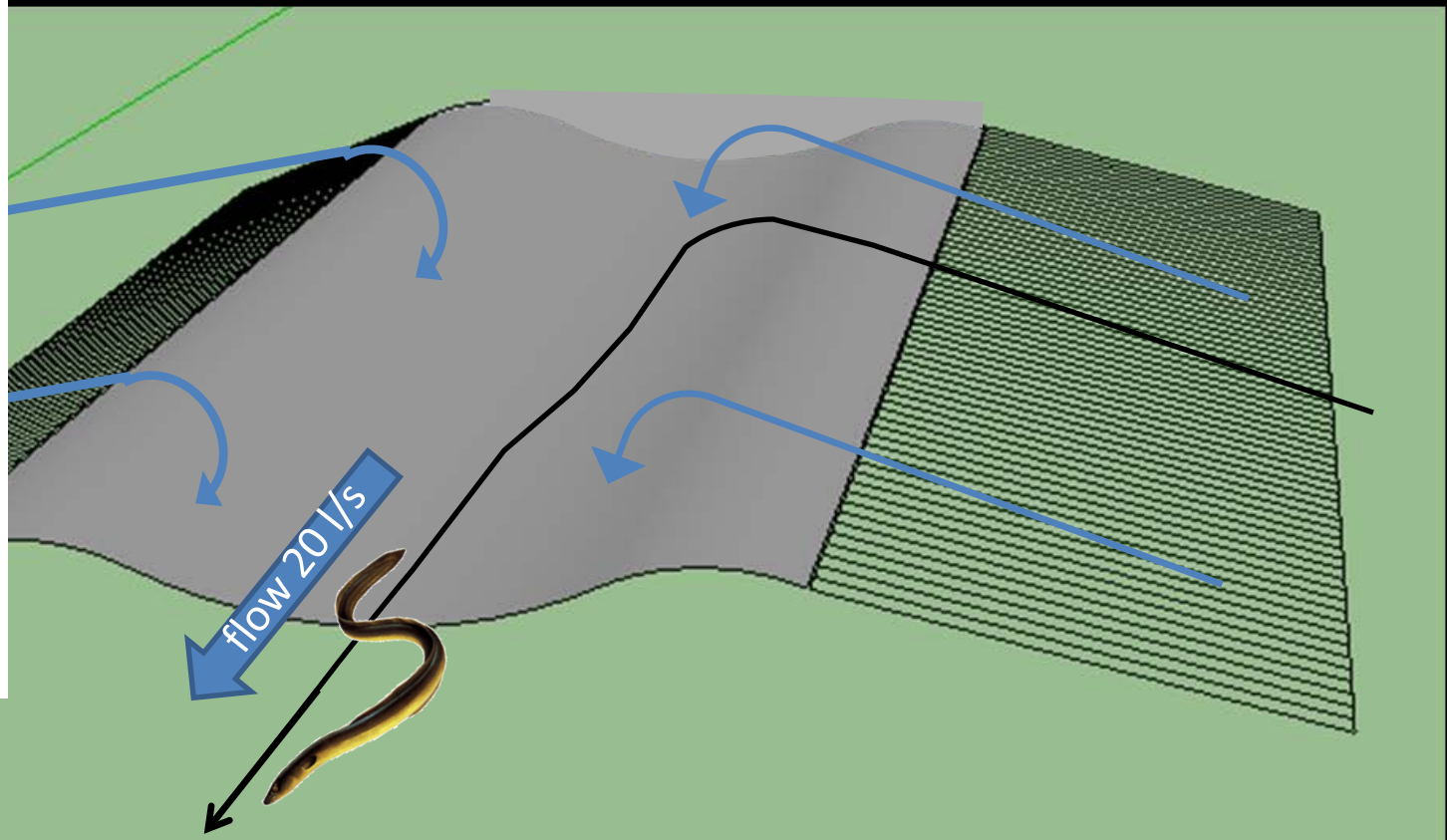
55 eel were observed near this opening and four passed downstream.

M-chute, principle

An M-formed chute extending upstream of a plain opening.

The idéa was to skim off eel and guide them towards the opening in the dam. Thus minmizing water spillage.

The water flow was controlled by shallow ridges at the sides.



76 eel were observed in contact with the chute and two passed downstream.

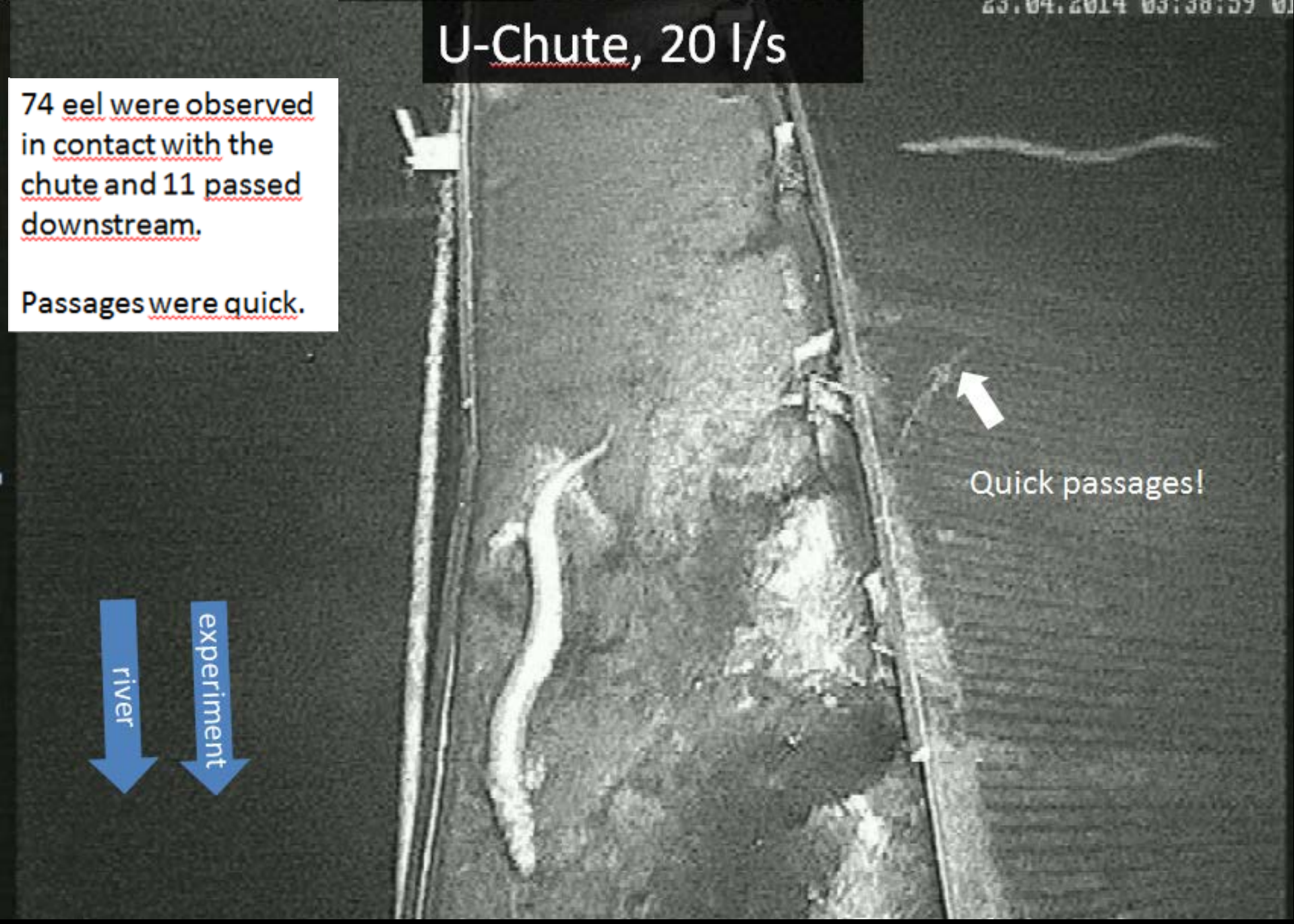
Eels generally hesitated to pass over the shallow (0,2 m) ridges. Instead they turned upstream.

U-Chute, 20 l/s

A U-formed chute extending upstream of a plain opening.

The basic idéa was the same as in the M-chute, but water flow was now controlled by narrow slots in the vertical sides.

There were slots only on one side of the chute.


U-Chute, 20 l/s
74 eel were observed in contact with the chute and 11 passed downstream.
Passages were quick.
Quick passages!
river
experiment

Summing up field experiments

Time	Experiment	Water flow (l/s)	Silver eel interacting/near	Silver eel passing	Conclusion
Fall 2012	Plain opening	20	4	2	control
	Small inflow	5	0	0	no attraction, N/A
	Dead end	0	0	0	no attraction
Spring 2013	Significant inflow	150	25	0	no attraction
	M-chute	20	76	2	aversive reaction
Spring 2014	U-chute	20	74	11	increase vs control!
	Bypass	20	55	4	like control

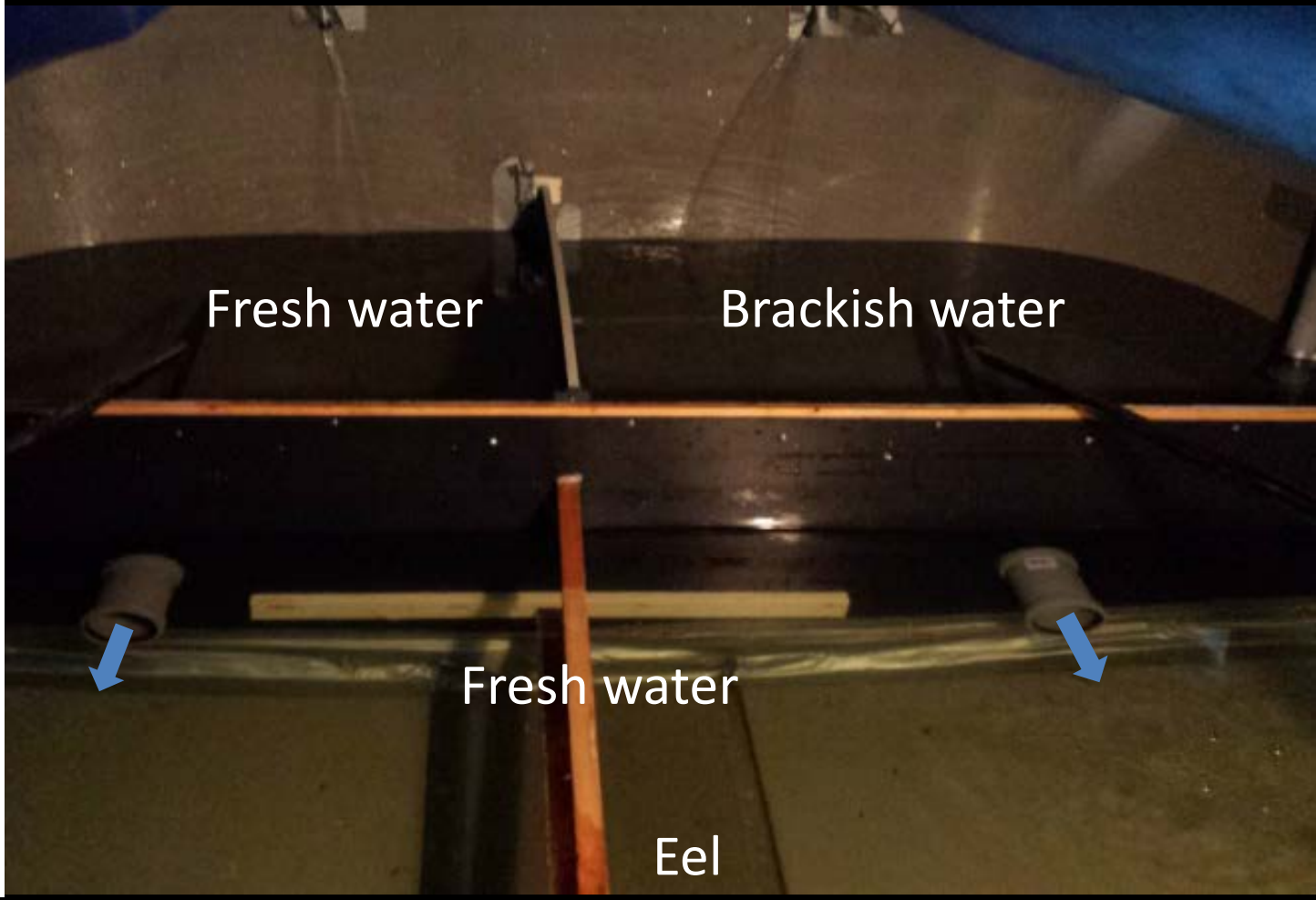
Eel and brackish water

Due to lack of rain, and administrative constraints, field experiments were cut.

An aquarium experiment was made instead.

This tested if silver eel on their way to the sea were attracted tois saline water.

21 eel entered into the compartment with brackish water and 8 into the compartment with fresh water.



Silver eel behavior in experiments

- Numbers correlated to water flow
- Not attraced to incoming water flow, unless severely stressed
- Shunned shallow ridges
- Swimming freely through narrow vertical slots
- Minimized water spillage per eel conceivable
- Attracted to mildly saline water

Acknowledgements

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