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Jun 23rd, 2:00 PM - 2:15 PM

## Session E5: The Iron Gate Dams in the Danube River and Their Importance for Endangered Sturgeons

Jürg Bloesch

*Alumnus Eawag-ETHZ Dübendorf CH & IAD, Danube Sturgeon Task Force*

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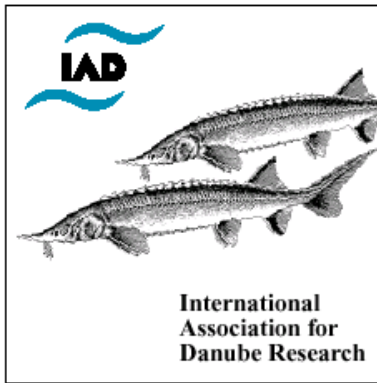


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Bloesch, Jürg, "Session E5: The Iron Gate Dams in the Danube River and Their Importance for Endangered Sturgeons" (2015).  
*International Conference on Engineering and Ecohydrology for Fish Passage*. 33.  
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# The Iron Gate dams in the Danube River and their importance for endangered sturgeons

Jürg Bloesch Alumnus Eawag-ETHZ Dübendorf CH & IAD, Danube Sturgeon Task Force

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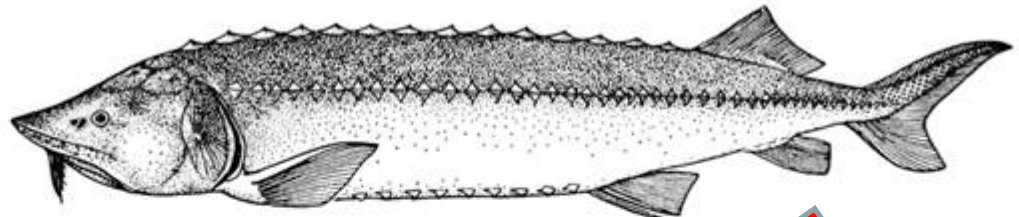




## Aim & Structure of Session

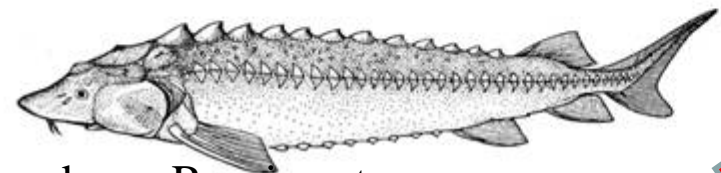
- Provide state-of-the-art knowledge on sturgeon behavior with regard to fish passes for upstream and downstream migration
- Provide ideas and proposals for the needed Feasibility Study to reopen the Iron Gate dams
- E5: Introduction 2 talks – 4 expert talks  
E6: 1 talk – Round Table / Panel discussion

# Status of Danube Sturgeons (2010 IUCN Red List)



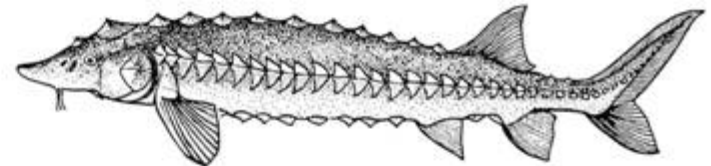
Beluga or Great sturgeon  
*Huso huso* (Tl max 9 m)

**A – Ex/CR**



Danube or Russian sturgeon  
*Acipenser gueldenstaedti* (Tl max 4 m)

**A+P – Ex/CR**



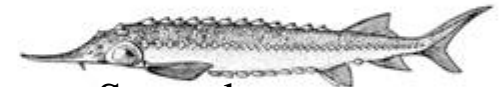
Common or Atlantic sturgeon  
*Acipenser sturio* (Tl max 6 m)

**A – 0/Ex †**



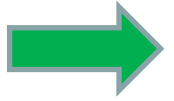
Fringebarbel or Ship sturgeon  
*Acipenser nudiventris* (Tl max 2m)

**P – Ex/CR-Ex? †**



Stellate or Starred sturgeon  
*Acipenser stellatus* (Tl max 1,9 m)

**A – Ex/CR**



Sterlet  
*Acipenser ruthenus* (Tl max 1,5 m)

**P – Vu/Vu-declining in MD**



**Population trend IUCN 2014**



# The Endangered Sturgeon Problem

Not a single cause-effect relationship

<b>Common ecological needs/ biological traits</b>	<b>Threats by human impacts/pressures</b>
long life cycle, late puberty, spawners complex age structure	over-fishing, by-catch, poaching, illegal caviar trade, diminished populations ( <i>poor legislation</i> )
<b>reproduction in fresh water, migration triggered by high flow</b>	<b>migration disrupted by dams/weirs, no reproduction (<i>hydropower, navigation</i>)</b>
spawning sites, homing fidelity success unpredictable	habitat destruction ( <i>flood control, navigation, new infrastructure</i> )
spawning: site morphology, flow regime and water quality	habitat destruction ( <i>flood control, navigation, pollution – new emerging pollutants</i> )

# Action Plan for the Conservation of Sturgeons (Acipenseridae) in the Danube River Basin

**Aim: to close the natural Sturgeon life-cycle**

**→ needs joint and simultaneous actions in the Upper, Middle and Lower Danube**





# Case example, Lower Danube: Melioration of Danube Navigation

DANUBE I: Calarasi – Braila (rkm 375–175)

Sill in Bala Branch may disrupt sturgeon migration

IN EXECUTION PHASE – Alternatives planned

DANUBE II: RO-BG stretch (rkm 845 – 375)

Planned technical constructions may impact sturgeon habitats

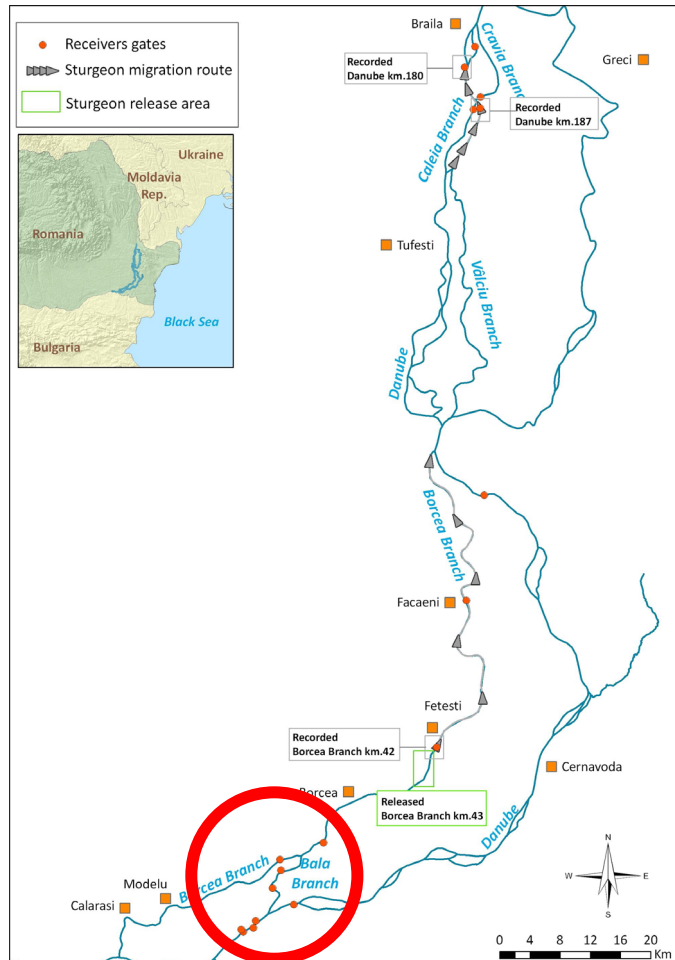
IN DESIGN PHASE







# Recent Research: sturgeon migration – tagging



## Bala Branch:

Migration route of beluga  
no. 2S18

From: Alin M. Bâdiliță,  
György Deák, Carmen G.  
Nicolae, Ștefan  
Diaconescu, AACL  
BIOFLUX 2013.

## Iron Gate II, downstream:

Spawning migration, sturgeon  
abundance & behavior  
downstream of HP-currents

Radu Suci





# State-of-the-art (swimming performance)

Fish/Sturgeons cannot overcome flow velocities  
>1.5-1.7 m/s

Critical flow velocity (m/s)	Burst flow velocity (m/s)	Species	Source
0.5-0.7	0.8-2.5	Sturgeons (rapid and slow flow in fish pass)	Webber et al. (2007)
ca. 1.5	<2.5	Sturgeons	Wiesner & Jungwirth (2007)
0.8-1.5	---	Sturgeons	Reinartz (2002)
1.5-1.7	---	All fish (finding entrance of fish passes)	Own experience based on literature

**Bottom sill:** Measured flow velocities: 0.1 – 1.0 m/s (INCDPM)

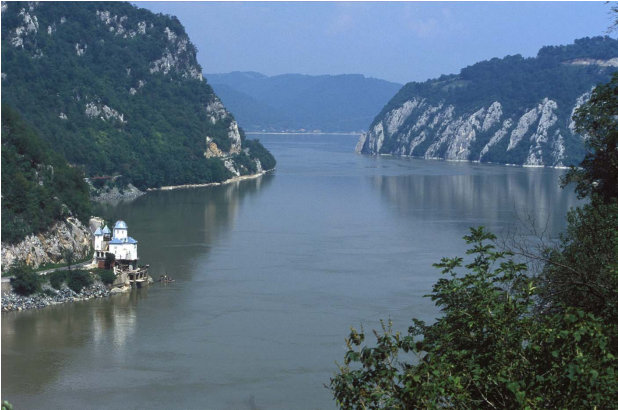
**Bottom sill area:** Modelled reference near bottom 0.7 – 0.9 m/s

**Model BOKU Vienna:** sill III 1.3 – 2.2 m/s; full sill (abandoned) 2.4 – 3.5 m/s

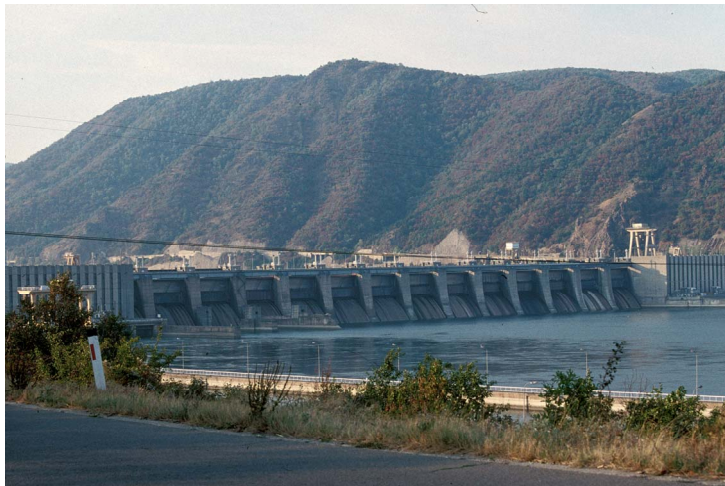
Reference: IAD-Report 2013



# Hydropower: Iron Gate dams I and II



Iron Gate gorge (Reservoir)



Iron Gate dam I (1972, rkm 943)



Iron Gate dams II (1984, rkm 842) & ship locks



## Hydropower: Iron Gate dams I and II

- Highest priority in SAP (2005) & Program „Sturgeon 2020“ (DSTF)
- Reopening will provide >800 rkm with potential spawning habitats
- Extremely complex situation: will need up to 8 fish pass facilities
- Believers & non-believers: science must provide a sound basis (Feasibility Study)



# Structure of Session

- Jürg Bloesch – Introduction I: Overview Danube sturgeons
- Wilco de Bruijne – Introduction II: Iron Gate dams
- Dmitrii S. Pavlov et al. – Behavior of sturgeons
- Mike Parsley – Case study Columbia River
- Boyd Kynard – Sturgeon upstream passage
- Steve Amaral – Sturgeon downstream passage
  
- Radu Suciu et al. – Sturgeon monitoring Danube
- Panel / Round Table Discussion



## Panel: IG Problems / FS Tasks

- FP design (alternatives) for sturgeons?
- FP dimensions for sturgeons?
- FP entrance: ramp, attractive current
- “Fish friendly” turbines
- FP success control & subsequent upgrade
  
- Behavior of sturgeons downstream and upstream of the dams? (Ethohydraulics; different species)
- Flow velocities sturgeons can overcome?
- 2D and 3D hydraulic/hydrological modelling vs. flow measurements
- Monitoring of sturgeon migration (Telemetry)