



# **43<sup>rd</sup> IAD Conference**

Rivers and Floodplains in the Anthropocene:  
Upcoming Challenges in the Danube River Basin

June 9 – 11, 2021

**– Proceedings –**

Edited by:

Aueninstitut Neuburg/Donau  
Schloss Grünau  
86633 Neuburg/Donau  
Germany  
aueninstitut@ku.de

---

## Preface

Dear Participants of the 43<sup>rd</sup> IAD Conference,

Living in pandemic time it is not easy to organize an international conference. However, such conferences are very important for the scientific community, especially if this community is so diverse regarding countries and topics as IAD is.

This year, IAD celebrates a special event: 65 years since its establishment and its continuous presence in limnological research in the Danube River Basin. For many decades, IAD was among the very few scientific fora ensuring connectivity between the Western and Eastern research teams, facilitating knowledge exchange, as well as joint projects and publications in the region.

The IAD Conference always was a 'jour fixe' to meet colleagues of the IAD family from the entire Danube Basin. However, this year we have to celebrate IAD anniversary in a virtual way, as unfortunately, it is still not possible to meet personally due to the particular situation of our countries, with lockdowns and travel restrictions still in place.

Our hope is that the upcoming event – carried out as an online conference – can at least partly substitute the usual way of meeting and foster active exchanges between the participants.

The number of registered participants, over 100 persons, makes us hopeful! Furthermore, there are 41 presentations (39 oral and 3 posters) which show the wide thematic range on the one hand, and the interest of the scientists working within IAD to present their work on the other hand. Additionally it proves the interest of all of us to listen to the latest scientific developments in aquatic ecology research in the Danube Region.

We hope that this 'special' conference will be successful and interesting for IAD and will represent the transition to normal times in the future!



Cristina Sandu (President of IAD)



Bernd Cyffka (Head of Conference)

## Scientific Committee

- Grigore Baboianu, Romania
- Florian Betz, Germany
- Bernd Cyffka, Germany
- Edith Durisch-Kaiser, Switzerland
- Marion Gelhaus, Germany
- Gertrud Haidvogel, Austria
- Thomas Hein, Austria
- Vera Istvánovics, Hungary
- Georg Janauer, Österreich
- Roumen Kalchev, Bulgaria †
- Vladimír Kováč, Slovakia
- Artem Lyashenko, Ukraine
- Melita Mihaljević, Croatia
- Petr Paril, Czech Republic
- Snežana Radulović, Serbia
- Barbara Stammel, Germany
- Katrin Teubner, Austria
- Ion Toderaş, Moldova

## Organising Committee

- Florian Betz, Aueninstitut Neuburg/ CU Eichstaett-Ingolstadt
- Tim Borgs, Aueninstitut Neuburg/ CU Eichstaett-Ingolstadt
- Bernd Cyffka, Aueninstitut Neuburg/ CU Eichstaett-Ingolstadt
- Marion Gelhaus, Aueninstitut Neuburg/ CU Eichstaett-Ingolstadt
- Thomas Hein, IAD Vice President, Vienna
- Cristina Sandu, IAD President, Bucharest
- Barbara Stammel, Aueninstitut Neuburg/ CU Eichstaett-Ingolstadt
- Katrin Teubner, IAD General Secretary, Vienna
- Michaela Walter-Rückel, Aueninstitut Neuburg/ CU Eichstaett-Ingolstadt

## Detailed Conference Programme

<b>Pre-conference events, 8 June 2021 (Tuesday)</b>	
13:00 h	IAD Board Meeting (board members only)
16:00 h	Technical consultation session (testing presentations etc.) (until about 18:00 h)
<b>Conference, 9 June 2021 (Wednesday)</b>	
09:00 h	Welcome speeches: <ul style="list-style-type: none"> <li>– PROF. DR. BERND CYFFKA (Head of Conference)</li> <li>– DR. CRISTINA SANDU (IAD President)</li> <li>– PROF. DR. GABRIELE GIEN (President of CU Eichstaett-Ingolstadt)</li> <li>– PETER VON DER GRÜN (Head of District Neuburg-Schrobenhausen)</li> <li>– PROF. DR. MARTIN GRAMBOW (Bavarian State Ministry of the Environment and Consumer Protection)</li> </ul>
09:55 h	<i>Zoom rules / technical arrangements</i>
10:00 h	Keynote speech: <b>Back to the wilderness – a vision?</b> , Prof. Dr. GREGORY EGGER, Karlsruhe Institute of Technology
10:45 h	<i>Coffee break</i>
11:00 h	<b>Anthropocene/Strategies</b> – Convenor: Bernd Cyffka <ul style="list-style-type: none"> <li>– BLOESCH J. &amp; JANAUER G.: Expert debate: Floodplains and Oxbow Lakes in the context of science, politics and law</li> <li>– IONITA M. et al.: Danube River discharge under climate changes – trends and future projections</li> <li>– KORCK J. et al.: River basin management in transition: The new Bavarian integrated strategy for river development</li> <li>– SCHWARZ U. &amp; LAZOWSKI W.: The Alpine Carpathian River Corridor</li> </ul>
12:20 h	<i>Lunch break – break filler presentation</i>
13:05 h	<b>Floodplain and Floodplain Restoration</b> – Convenor: Barbara Stammel <ul style="list-style-type: none"> <li>– KÜGEL B.: River and Floodplain Restoration on the upper Danube by re-establishing river continuum and ecological flooding</li> <li>– TAMÁS E. et al.: Hydrological indicators of the riverbed incision along the free-flowing Danube River reach from Budapest to Slankamen relevant for the lateral connectivity between the river channel and floodplains</li> <li>– TÓTH P.: Floodplain evaluation matrix (FEM) application for Hungarian section of the Tisza River</li> <li>– ZAMFIR A.G.: Human impact on the Lower Sector of Jiu River Floodplain</li> </ul>
14:25 h	<i>Coffee break</i>
14:40 h	<b>Ecosystem Services</b> – Convenor: Thomas Hein <ul style="list-style-type: none"> <li>– TSCHIKOF M. et al.: Can multi-functionality of floodplains be restored? An analysis of regulative and cultural ecosystem service synergies and trade-offs</li> <li>– PUSCH M.: Ecosystem services of an impounded navigable river (Lahn, Germany)</li> <li>– PEROSA F. et al.: The role of floodplains for flood mitigation and enhancement of ecosystem services in the Danube</li> <li>– NATHO S. et al.: Nutrient retention in the Danube Floodplain National Park – how much lateral connectivity is needed for an observable reduction of nutrient loads?</li> </ul>
16:00 h	<i>Coffee break – Gather Town Instructions</i>
16:15 h	<b>Miscellaneous</b> – Convenor: Florian Betz <ul style="list-style-type: none"> <li>– MOUSAZADEH H.: Content analysis challenges of Danube river basin in the perspective of Anthropocene: A qualitative study</li> <li>– IVANOVA-RADOVANOVA P.: Determining high quality landscapes in support of environmental planning at local and community level</li> </ul>
17:00 h	<b>Gather Town – movies &amp; discussions</b>

<b>Conference, 10 June 2021 (Thursday)</b>	
09:00 h	Keynote speech: <b>The Rhône, a transdisciplinary laboratory of integrative riverine sciences, Prof. Dr. HERVÉ PIÉGAY</b> , University of Lyon
09:45 h	<b>Water Quality</b> – <i>Convenor: Cristina Sandu</i> <ul style="list-style-type: none"> <li>– TEUBNER K. et al.: New Emphasis on Water Clarity as Socio-Ecological Indicator for Urban Water</li> <li>– ĐORĐEVIĆ J. et al.: Genotoxicity assessment of Danube River: in situ and in vitro methods</li> <li>– JOVANOVIĆ MARIĆ J. et al.: Mapping of the microbiological water quality of surface waters in Serbia overlooked by the National monitoring programme</li> <li>– KIRSCHNER A. et al.: Occurrence and spread of human-induced antimicrobial resistance in a large river water system: developing a holistic picture based on the Joint Danube Survey 4 activities</li> </ul>
11:05 h	<i>Coffee break</i>
11:20 h	<b>Makrophytes and Wetland Plants</b> – <i>Convenor: Katrin Teubner</i> <ul style="list-style-type: none"> <li>– OZIMEC S. &amp; ROŽAC V.: A retrospective of ten years of the botanical exploration in Nature Park Kopački Rit (Croatia)</li> <li>– GERM M. et al.: Distribution and abundance of macrophytes in the Ižica River in the years 1996, 2000 and 2016</li> <li>– NOVKOVIĆ M. et al.: Relationship Between Water Quality and Macrophyte Assemblages in Seasonal Wetlands along the Danube River in Serbia</li> <li>– DOROFTEI M. et al.: An alternative in monitoring invasive plant species in wetlands</li> <li>– CVIJANOVIĆ D. et al.: A role of habitat complexity generated by macrophytes and hydromorphological attributes for the recovery of commercial fish stock in the free-flooding Middle Danube wetlands (Serbia)</li> </ul>
13:00 h	<i>Lunch break – break filler presentation</i>
13:45 h	<b>Flood and Flood Risk I</b> – <i>Convenor: Attila Lovas</i> <ul style="list-style-type: none"> <li>– DOBÓ K.: Developments on the protected side</li> <li>– DROBOT R. et al.: Best Operation rules of Stanca-Costesti reservoir on Prut River during exceptional floods</li> <li>– MIHALJEVIĆ M. et al.: Extreme floods of the Danube in 2013 – track changes of the ecological state of the river applying the phytoplankton assemblage index</li> </ul>
14:45 h	<i>Coffee break – Gather Town Instructions</i>
15:00 h	<b>Poster presentation via Gather Town</b> – <i>Convenor: Florian Betz; (10 minutes per poster plus short discussion)</i> <ul style="list-style-type: none"> <li>– KOLLER M. et al.: Non-wild type antibiotic resistant <i>Escherichia coli</i> in the River Danube: a six-year-comparison</li> <li>– LEOPOLD M. et al.: A comprehensive, quantitative study concept on the occurrence and spread of human-induced antibiotic resistance in Lower Austrian rivers</li> <li>– SCHACHNER I. et al.: Extent and origin of fecal pollution in water and biofilms along the Danube River</li> </ul>
16:00 h	<b>General Assembly of IAD, Chair: Cristina Sandu (IAD President) (seperate Zoom link!)</b>

<b>Conference, 11 June 2021 (Friday)</b>	
09:00 h	<p><b>Flood and Flood Risk II</b> – <i>Convenor: Georg Janauer</i></p> <ul style="list-style-type: none"> <li>– PRÁVETZ T. et al.: Problems with the water conveyance capacity and the possibilities of improving it along the Hungarian Middle Tisza River section based on a pilot area</li> <li>– VIZI D.B.: Floodplain restoration with dyke relocations in the Middle Tisza District, Hungary</li> <li>– KEVE G.: Useful method in fluvial ice monitoring</li> </ul>
10:00 h	<i>Coffee break</i>
10:15 h	<p><b>Aquatic Biota I</b> – <i>Convenor: Teodora Trichkova</i></p> <ul style="list-style-type: none"> <li>– EVTIMOVA V. &amp; FRUMENTO P.: Characterisation of water levels in the Lower Danube River and their association with primary production</li> <li>– EVTIMOVA V. et al.: Mayflies, stoneflies and caddisflies (Arthropoda: Insecta) from the Lower Danube River</li> <li>– MEULENBROEK P. et al.: Fish eDNA survey on the major tributaries of River Danube</li> <li>– PENGAL P. et al.: In search of elusive sterlet (<i>Acipenser ruthenus</i>) in Slovenia</li> </ul>
11:35 h	<i>Coffee break</i>
11:50 h	<p><b>Aquatic Biota II</b> – <i>Convenor: Georg Janauer</i></p> <ul style="list-style-type: none"> <li>– TRICHKOVA T. et al.: Invasive alien species in the Danube River Basin: Results of the JDS4</li> <li>– HROMOVA Y.: Zooplankton of different types of water bodies in the Danube delta</li> <li>– EGRI A. et al.: Beacon lights for the protection of night-swarming mayflies</li> </ul>
12:50 h	Wrap-up of Conference and closing remarks: Cristina Sandu & Bernd Cyffka
13:00 h	End of Conference

# Table of Contents

Preface.....	I
Scientific Committee .....	II
Organising. Committee.....	III
Detailed Conference Programme.....	IV
BLOESCH J. & JANAUER G.: Expert debate: Floodplains and Oxbow Lakes in the context of science, politics and law.....	1
IONITA M. et al.: Danube River discharge under climate changes - trends and future projections .....	2
KORCK J. et al.: River basin management in transition: The new Bavarian integrated strategy for river development .....	3
SCHWARZ U. & LAZOWSKI W.: The Alpine Carpathian River Corridor.....	4
KÜGEL B.: River and Floodplain Restoration on the upper Danube by re-establishing river continuum and ecological flooding.....	5
TAMÁS E. et al.: Hydrological indicators of the riverbed incision along the free-flowing Danube River reach from Budapest to Slankamen relevant for the lateral connectivity between the river channel and floodplains .....	6
TÓTH P.: Floodplain evaluation matrix (FEM) application for Hungarian section of the Tisza River .....	7
ZAMFIR A.G.: Human impact on the Lower Sector of Jiu River Floodplain.....	8
TSCHIKOF M. et al.: Can multi-functionality of floodplains be restored? An analysis of regulative and cultural ecosystem service synergies and trade-offs .....	9
PUSCH M.: Ecosystem services of an impounded navigable river (Lahn, Germany).....	10
PEROSA F. et al.: The role of floodplains for flood mitigation and enhancement of ecosystem services in the Danube .....	12
NATHO S. et al.: Nutrient retention in the Danube Floodplain National Park – how much lateral connectivity is needed for an observable reduction of nutrient loads? .....	13
MOUSAZADEH H.: Content analysis challenges of Danube river basin in the perspective of Anthropocene: A qualitative study .....	14
IVANOVA-RADOVANOVA P.: Determining high quality landscapes in support of environmental planning at local and community level.....	15
TEUBNER K. et al.: New Emphasis on Water Clarity as Socio-Ecological Indicator for Urban Water.....	16
ĐORĐEVIĆ J. et al.: Genotoxicity assessment of Danube River: <i>in situ</i> and <i>in vitro</i> methods .....	18
JOVANOVIĆ MARIĆ J. et al.: Mapping of the microbiological water quality of surface waters in Serbia overlooked by the National monitoring programme .....	19
KIRSCHNER A. et al.: Occurrence and spread of human-induced antimicrobial resistance in a large river water system: developing a holistic picture based on the Joint Danube Survey 4 activities.....	20
OZIMEC S. & ROŽAC V.: A retrospective of ten years of the botanical exploration in Nature Park Kopački Rit (Croatia) .....	21
GERM M. et al.: Distribution and abundance of macrophytes in the Ižica River in the years 1996, 2000 and 2016.....	22



# Can multi-functionality of floodplains be restored? An analysis of regulative and cultural ecosystem service synergies and trade-offs

Martin TSCHIKOF<sup>a,b,\*</sup>, Andrea FUNK<sup>a,b</sup>, Barbara GRÜNER<sup>a</sup>, Kerstin BÖCK<sup>a</sup>, Elisabeth BONDAR-KUNZE<sup>a,b</sup>, Stephanie NATHO<sup>c</sup>, Thomas HEIN<sup>a,b</sup>

<sup>a</sup> Institute of Hydrobiology and Aquatic Ecosystem Management, University of Natural Resources and Life Sciences, Vienna, Austria

<sup>b</sup> WasserCluster Lunz, Lunz am See, Austria

<sup>c</sup> Institute of Environmental Science and Geography, University of Potsdam, Potsdam, Germany

\* Corresponding author: [martin.tschikof@boku.ac.at](mailto:martin.tschikof@boku.ac.at)

Floodplains are hotspots of productivity and biodiversity and recognised to fulfil vital ecosystem functions and services. Restoration measures of the decoupled Danube floodplains east of Vienna aim to re-establish multiple functions, i.e. ensure navigation, preserve and restore unique fluvial and riparian habitats and revitalize natural processes. Side arms are proposed to be reconnected and embankments and groins to be removed.

We evaluated how a given programme of measures may impact the quantity and diversity of relevant ecosystem services (ES) and therefore, the overall multi-functionality compared to the actual situation. Therefore, regulating ecosystem services (RES), including nutrient retention (nitrate nitrogen and total phosphorus) and habitat provisioning were modelled and predicted using multivariate regression models and the potential of cultural ecosystem services (CES) was assessed by mapping recreational activities. We analysed quantitative (e.g. spatial extent, amount of nutrients) and qualitative (e.g. biodiversity, nature experience) changes of ES, as well as potential synergies and trade-offs.

Our results show clear synergies, especially for RES (habitat for the rheotopic community and nutrient retention) and the qualitative CES of nature experience. Those have a weak and local trade-off with the quantitative availability of opportunities for recreation and the provisioning of habitat for the stagnotopic community. However, stagnotopic habitats will be still widely preserved after restoration and beta-biodiversity in the floodplain is predicted to increase. Overall, our results show that the restoration measures have a high potential to increase the multi-functionality of the system, in particular by fostering the potential habitat for endangered rheotopic species, nutrient retention and qualitative CES.

**Key words:** River-floodplain-system, river restoration, ecosystem services, nutrient retention, red list species, recreation