



INTERNATIONAL ASSOCIATION FOR DANUBE RESEARCH

Scientific Report 2021

As in previous years, also in 2021 the IAD activity was focused on limnological studies in the Danube River Basin and dialogue with stakeholders and decision makers to promote nature conservation. With the River Basin Management Plan entering the final stages of preparation, IAD has intensified its efforts to increase awareness on the key role of aquatic biodiversity for ecosystems functionality and the importance of integrating the requirements of nature, water and marine directives in the measures foreseen for the next implementation cycle. Following the gradual decline of COVID restrictions, hybrid or online meetings were combined with “in person” activities, especially for project implementation and teaching. The IAD conference was organized in virtual format in June 2021.

More details about our activities are available on the IAD homepage www.danube-iad.eu

Science – Policy interactions

The interaction with national authorities, the International Commission for the Protection of the Danube Region (ICPDR) and the EU Strategy for the Danube Region (EUSDR) was fostered in 2021. Scientific input was provided to several ICPDR Expert Groups and topics: River Basin Management, Pressures and Measures, Monitoring and Assessment, Hydromorphology, Microbiology, Invasive Alien Species (IAS) and Sturgeon conservation, while dialogue with policy makers was enhanced in particular during the public consultation meetings organized for the finalization of the River Basin Management Plans. The cooperation with ICPDR took place also in the frame of the feasibility study to re-establish fish passage at Iron Gates (We Pass), the launching of a follow-up project looking for solutions to make the Iron Gates dam passable for Danube sturgeons (We Pass 2) and the project aiming to establish ecological corridors for migratory fish species along the Danube River and its main tributaries (MEASURES). The scientific report of the Joint Danube Survey 4, including the results of the analyses performed by many IAD members since the joint expedition in 2019, was finalized and published on the ICPDR website (http://www.danubesurvey.org/jds4/jds4-files/nodes/documents/jds4_scientific_report_20mb.pdf).

In the frame of the EU Strategy for the Danube Region, IAD contributes mostly via the Danube Sturgeon Task Force (DSTF), the Danube network for Invasive Alien Species (DIAS), and the newly established Task Force Danube Landscapes in the frame of EUSDR PA 6. The Danube Landscapes Task Force organized over ten virtual meetings to present its mission statement and key topic draft.

A brochure was issued for EUSDR PA 4 Water Quality promoting measures to enable fish migration in the Danube River Basin and raising public awareness for the sturgeons, the flagship species of the Danube. Projects with contribution of IAD members, funded by the Danube Transnational Program, continued also in 2021, such as: MEASURES, Danube Sediment, Danube Floodplains, IDES, Tid(y)Up, Sava TIES, fostering the implementation of the EUSDR Action Plan.

Project implementation

Projects are a key tool for the implementation of EU environmental policies and nature conservation actions in the Danube Basin. The IAD experts are actively involved in research projects contributing to fill in knowledge gaps in several fields, such as testing methodologies for the assessment of microplastic contamination in river waters, intercalibration of macrozoobenthos analysis, rapid expansion of a small-celled invasive alien algae species along the Central European lotic systems, ecological richness of macrophytes in floodplain water bodies, competition between macrophyte groups in lentic waters, dynamics of vertebrate communities in large Danube floodplains using e-DNA methods, impact of climate change on aquatic communities, ways to mitigate the drought impact on biodiversity of running waters, validation of bioindication methods for sustainable management of intermittent streams, developing adaptive management strategies to mitigate or adapt to climate change effects in rivers, importance of floodplains for landscape ecostabilisation function, floodplain restoration, dynamics in watercourses and floodplain development, developing a procedure for biocoenotic assessment of floodplains, preservation and

consolidation of biodiversity along the Bavarian Danube, impact of land use and flood management on river ecosystem services, investigation of faecal pollution and antimicrobial resistance along the Danube River, sediment management, floodplain restoration, assessment of long term changes of Danube floodplain in Szigetkoz, adaptive water management-land use practice for improving ecosystem services, survey and humane management of invasive alien species, etc. . In Austria, a historical comparison of macrophyte development in the Neusiedler See between 1998 – 2020 was launched. In addition, a network of on-lines profiles for ongoing long-term ecological research was implemented to follow the climate impact in this RAMSAR wetland. Furthermore, a study on macrophyte habitat architecture and benthic-pelagic coupling concerning sustained restoration management in the former Danube River branch “Alte Donau” in Vienna was conducted. In Slovakia, ichthyological monitoring was performed at Gabčíkovo Hydropower Station as a part of long-term assessment of ecological status of this stretch of the Danube, as well as to enable data gathering for restoring fish migration at this dam. In Hungary, a novel technique was developed with support of the IAD members, focused on acoustic and imagery field methods coupled with computational modelling approaches to evaluate hydrodynamic impacts of ship generated waves on river banks. In Ukraine, hydro-ecological surveys of the lower Danube and its delta, as well as the upper Tisza and its tributaries were performed in the frame of several projects. Testing, validating and updating of the application 'Invasive Alien Species in Europe' was conducted in the Lower Danube Region. In 2021, application of the CEEPUS network EcoManAqua was successful and activities will continue with the contribution of several IAD members in 2021/2022.

The most important projects carried out in 2021 with significant contribution of IAD experts are presented in Annex 1.

Editorial activities and publications

Dissemination of scientific information to experts, policy stakeholders and the wide public is another important part of IAD activity. The IAD Bulletin, Danube News, with two issues published every year, is a key communication tool of the scientific information towards the wide public. The issues published in 2021 (DN 43 and DN 44) are available for download on the IAD website.

The involvement of IAD members in the editorial boards of international projects, peer-reviewed journals and magazines, such as UNESCO Global Water Pathogens Project (GWPP), Water Science and Technology: Water Supply, Auen Magazin (Floodplain Magazine), etc. continued also in 2021.

Numerous book chapters and scientific articles emerging from the research activities carried out in the Danube Basin were published also this year. A selection of the most relevant titles (book chapters, scientific articles and reports) is available in Annex 2 and on the IAD website.

Other activities

Due to covid travel restrictions, most of the conferences and meetings attended by the IAD members in 2021 were organized in online format. In June 2021, the IAD conference was organized by AuenInstitute Neuburg, Germany and was attended virtually by over 100 participants.

IAD members participated also to several scientific forums and conferences to exchange knowledge and disseminate project results to stakeholders, such as the Danube Academies Conference organized by the Bulgarian Academy of Sciences and European Academy of Sciences and Arts (Oct.2021) or the Joint ESENIAS and DIAS Scientific Conference (Dec.2021). A detailed list is presented in Annex 3.

The IAD members are involved also in education activities, such as coordination of PhD programs and master theses in the affiliated universities, environmental education activities and presentations on nature conservation topics during public events. BOKU's Doctoral Programme “Human-River-System in the 21st century continued successfully also in 2021. In the frame of the Danube Landscape Task Force, several training courses were organized for habitat and species mapping, as well as a postgraduate training course for ecologists and landscape planners, targeting organization and implementation projects in municipalities on integrated environmental planning.

Projects

- A quantitative concept to study human-derived antibiotic resistance in rivers along the human wastewater path (RIVAR)
- Adequate management of invasive species in Romania, in accordance with EU Regulation 1143/2014 on the prevention and management of the introduction and spread of invasive alien species
- Aquatic invasive alien species – risk assessment and management, impact on trophic structure and ecosystem functioning, integrated management related to restoration and sustainability of aquatic ecosystems
- Assessment of the contribution of ships to the general microbial faecal pollution levels in the Danube River
- Biological Control of Dreissenid Mussels: Use of novel Eurasian parasites to control North American dreissenid populations
- Biological diversity and ecological status of the Danube River and adjacent wetlands, optimal use of their ecosystem functions and services, sustainable development and achieving good ecological status
- Climatically promoted homogenization of aquatic invertebrates tested on three model lotic systems and historical data
- Christian Doppler Laboratory for Meta Ecosystem Dynamics in Riverine Landscapes (MERI).
- City River - reconnecting town and river
- Conservation of freshwater mussels: a pan-European approach” (CONFREMU)
- Development of methodology and assessment of environmental risks in conditions of water scarcity for safe use of resource potential of hydro ecosystems
- Development of a practical procedure for biocoenotic assessment of floodplains (Bio-Au)
- Development of specific and detailed conservation objectives at the level of protected area for 15 protected areas of the Natura 2000 network in Bulgaria
- Dynamik bei der Gewässer- und Auenentwicklung (Dynamics in watercourse and floodplain development) (Dyn-Au)
- Ecological plasticity of recently spreading Ponto-Caspian fish species in the Danube River Basin
- Educational capacity strengthening for risk management of non-native aquatic species in Western Balkans (Albania, Bosnia and Herzegovina and Montenegro) (RiskMan)
- European network for environmental citizenship (ENEC)
- Facilitating fish migration and conservation at the Iron Gates (We Pass)
- Faecal pollution routes of antibiotic resistance along the whole Danube River
- Follow the Plastic from source to the sea: Tisza-Danube integrated action plan to eliminate plastic pollution of rivers (Tid(y)Up)
- Functioning of vertebrate metacommunities in dynamic riverine landscapes: an innovative approach using eDNA metabarcoding (RIMECO)
- Historical changes in species composition and abundance of aquatic plants in Lake Neusiedl (1998-2020)
- Identification, assessment, sharing and dissemination of best practices for the humane management of invasive alien species (EU IAS Vertebrates)
- Importance and protection of floodplains as an environment for the fulfilment of the landscape ecostabilization function
- Improving water quality by increasing elimination of total nitrogen and organic micropollutants from waste water.
- Improving water quality in the Danube River and its tributaries by integrative floodplain management based on ecosystem services (IDES)
- Increasing understanding of alien species through citizen science: Approaches to citizen science, data management and standards
- Interreg project AT-CZ Lednice – Herrnbaumgarten

- Interreg project AT-HU Agrinatur
- Interreg SK-AT City-Nature
- Invasive alien species: improvement of understanding and communication
- Making the Iron Gate Dams passable for Danube Sturgeon - WePass 2
- Managing and restoring aquatic ecological corridors for migrating fish species in the Danube River basin (MEASURES)
- Masterplan for Preservation and Consolidation of Biodiversity along the Bavarian Danube
- Mechanisms of biodiversity formation of fish and other aquatic organisms in ecotone zones of river systems as a basis for developing conservation principles of the native species in the context of intensification of the invasion of alien species
- Monitoring of the state of aquatic ecosystems in the zone of impact, restoration and operation of deep-sea passage (based on hydrobiological indicators)
- NAT SALMO Protect the native trout - Recovery of the trout *Salmo macrostigma*
- Patterns of aquatic plant occurrence in the upper Danube reach in Baden-Württemberg (Germany)
- Potential threats to environmental and economic sustainability in the Danube and Black Sea region: Danube River as invasive alien species corridor
- Predicting future trends in health-related microbiological water quality of rivers in a vastly changing world (FUTURE DANUBE)
- Presence of SARS-CoV-2 RNA in the Danube River in Serbia
- Preserving Sava River Basin Habitats through Transnational Management of Invasive Alien Species (Sava TIES)
- Protecting the environment and reducing the risk of adverse events and natural disasters. Development of national system for early detection and warning of invasive alien species in Bulgaria
- Reducing the flood risk through floodplain restoration along the Danube River and tributaries (DanubeFloodplain)
- Securing biodiversity, functional integrity and ecosystem services in DRYing rivER networks (DRYVER)
- State and perspectives of citizen science for invasive alien species in Bulgaria
- Support instrument for decision making in POP management. Case study: Mures Catchment Area (SIDPOP)
- The European aquatic animal tracking network (ETN) – sturgeon telemetry
- Strategic planning of revitalization projects in Switzerland:
 - Improving the data basis: e.g., by developing concepts for cross-project comparisons of river restoration measures at the national scale.
 - Investigating and developing restoration measures: e.g., by improving our understanding of the interplay between structure and function of restored river systems.
 - Supporting a sustainable management of river systems: e.g., by contributing to solutions to reconcile conservation and exploitation of river systems.
- Stream drying and biodiversity of running waters: the impact of natural conditions and anthropogenic alterations
- Validation of bioindication methods as tools for sustainable management of intermittent streams in Central European region, their transfer into the practice

Scientific publications

Book chapters

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Conferences, workshops, events

- 43rd IAD Conference ‘Rivers and Floodplains in the Anthropocene: Upcoming Challenges in the Danube River Basin’, 9–11.06.2021, Neuburg, Germany, online. Book of abstracts available at: https://edoc.ku.de/id/eprint/28094/1/IAD_Conference_Proceedings.pdf
- 11th Danube Academies Conference (DAC 2021) “Climate change and climate control”, 22.10.2021, online. Abstract book available at: https://www.danube-iad.eu/newsitems/docs/2021_DAC_Book%20of%20Abstracts.pdf
- Joint ESENIAS and DIAS Scientific Conference and 10th ESENIAS Workshop ‘Ten years of cooperation and networking on invasive alien species in East and South Europe’, 7–9.12.2021, online
- Workshop on Plastics from source to sea: an integrated action plan to eliminate plastic pollution, Ruse, Bulgaria, 22.10.2021.
- Black Sea, Steppic & Continental (East) Regional Workshop (fully covering Bulgaria and Romania), 23–24.03.2021, online
- 5th Balkan Scientific Conference on Biology, Plovdiv, Bulgaria, 15–16.04.2021
- Sava TIES 3rd Training. Preserving Sava River Basin Habitats through Transnational Management of Invasive Alien Species (Sava TIES), 24.02.2021, online.
- 14th Steering Group Meeting Priority Area 6 EU Strategy for the Danube Region, 13.07.2021, online
- 16th Steering Group Meeting Priority Area 6 EU Strategy for the Danube Region, 11.11.2021, online
- Der montierte Fluss: Donaunarrative in Text, Film und Fotografie. Tübingen, 04.-06.11.2021
- Perspektiven der Fischgemeinschaften großer Tieflandflüsse. Brandenburgische Akademie „Schloss Criewen“. 22.11.2021, hybrid.
- A Global History of Dams. 30.09.2021-01.10.2021, online
- Große Exkursion Wien-München: zwei europäische Metropolen im Vergleich, 12.03.2021, online.
- Danube Landscape Task Force conference. In cooperation with the government of Upper Austria, EUSDR PA 6 and PA 10. 24.06.2021. St. Georgen an der Gusen, Austria.
- Danube Landscape Task Force conference. In cooperation with City of Novi Sad, University of Novi Sad Faculty of Sciences, EUSDR PA 6. 15.10.2021. Novi Sad, Serbia.