AMI-KMNP dataset: Occurrence records of aquatic macroinvertebrate species from a 10-year-long biodiversity survey in SE Hungary

Pál Boda,[1] Arnold Móra,[2] Zoltán Csabai[2*]

[1]Centre for Ecological Research, Institute of Aquatic Ecology, Bem tér 18/c, H4026 Debrecen, Hungary; [2]Department of Hydrobiology, Faculty of Sciences, University of Pécs, Ifjúság útja 6, H7624 Pécs, Hungary

ABSTRACT

We outline a 100% georeferenced dataset of aquatic macroinvertebrate occurrence records collected from the operational area of the Körös-Maros National Park Directorate (SE Hungary) between 2012 and 2021. The species-level dataset includes 25,935 records of 644 taxa from 625 localities of wide variety of freshwater habitats from soda pans to lowland marshes and small watercourses to medium-sized and larger rivers. Four non-biting midge species are reported for the first time from the Hungarian fauna. The dataset is available through the Global Biodiversity Information Facility (GBIF).

INTRODUCTION

Aquatic macroinvertebrates are the most dominant and important members of freshwater communities in terms of both taxon- and functional diversity (Nieto et al. 2017, Wallace and Webster 1996). In Europe, and within this also in Hungary, the intensity of research, the knowledge about their distribution, or the amount of available occurrence records differs for each group of macroinvertebrates. Undoubtedly, we know the most about dragonflies and damselflies, but a lot of data are available on well-known families of aquatic beetles (diving beetles, water scavenger beetles), or even aquatic and semiaquatic bugs, caddisflies, or mayflies, while we only have episodic data on non-biting midges, small leeches, hydroptilid caddisflies or hard-to-identify beetles, like minute moss beetles or long-toed water beetles. It is also relatively rare that almost the entire macroinvertebrate spectrum is processed at species level in a thorough and/or long-term biodiversity study.

The dataset presented in this work is based on such a research series, a 10-year-long study surveying different sub-units within a given area each year. In total, we provide occurrence data of more than 600 species from more than 600 sampling locations in Southeast Hungary, including several unique habitats such as soda pans, salt marshes, and lowland fens.

On the GBIF portal, aquatic macroinvertebrate data representing Hungary are only available as imported from other databases (iNaturalist, BOLD) or as data recorded by foreign institutions (e.g., Trichoptera records based on adults). Therefore, the value of our dataset is also enhanced by the fact that this is the first Hungarian dataset containing significant amount of data provided by Hungarian researchers on the GBIF portal, which will hopefully be followed soon by others from the region, reducing the backwardness of the Eastern European region in this type of data publication.

SUMMARY STATISTICS

This dataset includes 25,935 occurrence records from 625 localities with georeferenced coordinates, representing 644 species-level taxa belonging to 288 genera, 93 families, and 29 orders of aquatic macroinvertebrates. The vast majority of the data (25,379 records; 97.86%) belongs to 628 valid species, from which the identification can be regarded somewhat questionable in three species (59 records, 0.23%), marked as 'cf.' (*Berosus hispanicus*, *Clinotanypus pinguis*, *Parachironomus biannulatus*), due to taxonomical problems or uncertain morphological characteristics. 423 records (1.63%) refer to six 'pair of species' which are difficult or even impossible to separate

Corresponding author: csabai@gamma.ttk.pte.hu

Key words: Darwin Core; GBIF; faunistics; biotic data; first country records.

Citation: Boda P, Móra A, Csabai Z. AMI-KMNP dataset: Occurrence records of aquatic macroinvertebrate species from a 10-year-long biodiversity survey in SE Hungary. *J. Limnol. 2023;82:2118.*

Edited by: Diego Fontaneto, *National Research Council, Water Research Institute (CNR-IRSA), Verbania Pallanza, Italy.*

Received: 15 December 2022.
Accepted: 1 February 2023.

Licensee PAGEPress, Italy
J. Limnol., 2023; 82(s1):2118
DOI: 10.4081/jlimnol.2023.2118

from each other in certain life stages (*Ablabesmyia monilis/phatta, Chironomus balatonicus/plumosus, Ch. piger/riparius, Helophorus aquaticus/aequalis*, *H. minutus/paraminutus, Ochlerotatus cantans/annulipes*), 32 records (0.12%) belong to five 'species aggregates' (*Chironomus annularius*-Agg., *Ch. luridus*-Agg., *Ch. riparius*-Agg., *Microtendipes chloris*-Agg., *M. pedellus*-Agg.), and further 101 records (0.39%) to five 'species groups' (*Chironomus plumosus*-Gr., *Cladotanytarsus mancus*-Gr., *Diamesa cinerella*-Gr., *Polypedilum scalaenum*-Gr., *Stagnicola palustris* complex).

The distribution of numbers of records and species numbers within each larger group of organisms are summarized in Tab. 1. The largest number of species can be seen in the orders Diptera [227 species, mostly Chironomidae, some Simuliidae (3), Culicidae (3) and Athericidae (2)] and Coleoptera (165), while the largest number of records clearly belongs to Coleoptera (10,145 records), followed by Diptera and Heteroptera (3493 and 3614, respectively).

In descending order, the most frequently recorded species were *Asellus aquaticus* (550 records), *Cloeon dipterum* (448), *Ischnura elegans* (434), *Ilyocoris cimicoides* (420), *Platycnemis pennipes* (378), and *Cymbiodyta marginella* (351 records). In case of mollusks, the most common species was *Planorbarius corneus* (318), while for dipterans *Cricotopus sylvestris* (134), and for caddisflies *Limnephilus flavicornis* (54) is characterized by the highest number of occurrences within its relatives. 226 species are represented by less than five records in the dataset, among them 101 only have a single record.

The dataset contains 1134 records of 24 species protected in Hungary, among them *Stylurus flavipes* (213 records), *Gomphus vulgatissimus* (211 records), and *Argyroneta aquatica* (166 records) were the most common ones. On the other hand, 644 records belonging to 15 non-indigenous, invasive species, from which the most common were *Physella acuta* (197 records) and *Corbicula fluminea* (113 records).

Tab. 1. Number of records and taxa related to higher taxonomic units.

Higher taxonomic unit	Number of records	Number of taxa
Porifera	4	1
Mollusca	2607	52
Annelida/Hirudinea	458	21
Arachnida	166	1
Malacostraca+Branchiopoda	1287	15
Insecta	21413	554
Ephemeroptera	743	29
Odonata	2948	48
Hemiptera	3614	41
Coleoptera	10145	165
Megaloptera	112	2
Neuroptera	1	1
Trichoptera	357	41
Diptera	3493	227
Altogether	25935	644

FORMER PAPERS AND FIRST RECORDS OF SPECIES IN THE HUNGARIAN FAUNA

Although this dataset has never been published as a whole, some parts or even records for some selected species have already appeared in the form of traditional faunistic publications mostly in local journals (Csabai *et al*., 2015a, 2015b; Boda *et al*., 2019; Berchi *et al*., 2018; Farkas and Móra, 2015; Farkas *et al*., 2014; Móra and Farkas, 2015), in popular papers (Boda *et al*., 2016; Farkas *et al*., 2016; Móra *et al*., 2018), and have also been used as substantial data for papers on ecology (Boda *et al*., 2018; Csabai *et al.*, 2020). These previous papers already mentioned several species that we found for the first time in Hungary, they were the followings: *Pontogammarus robustoides*, *Helophorus grandis*, *Berosus* cf. *hispanicus, Chironomus parathummi, Ch. piger, Tanytarsus lactescens, Allocladius arenarius, Limnophyes ninae* and *Tribelos donatoris. Enochrus* cf. *nigritus* was also mentioned by Csabai *et al*. (2015a) as first country records. Although the presence of the latter species in the Hungarian fauna has since been confirmed based on further museum specimens, its records from the area were not included currently in our dataset, because their species affiliation remained still questionable.

In this dataset we provide the first, previously unpublished records from Hungary for further four chironomid species, *Chernovskiia macrocera*, *Parakiefferiella triquetra*, *Rheosmittia languida*, and *Sympotthastia zavreli*. All these species have been known from the surrounding areas, so their occurrence in the country is not surprising.

DATASET DESCRIPTION

The dataset was structured based on the Darwin Core Standard (Wieczorek *et al.*, 2012). The dataset contains biotic data of various aquatic macroinvertebrate taxa from different types of surface waters of Körös-Maros National Park (Hungary).

Object name: AMI-KMNP dataset: records of aquatic macroinvertebrates from SE Hungary

Data set citation: Boda P, Móra A, Csabai Z (2022): AMI-KMNP dataset: records of aquatic macroinvertebrates from SE Hungary. v1.0. Department of Hydrobiology, University of Pécs. Occurrence dataset. https://doi.org/10.15468/b3ptrm

Character encoding: UTF-8

Format name: csv
Format version: 1.0
Distribution (permanent link): GBIF, https://www.gbif.org/dataset/90d11e31-c18a-49b2-bf29-cb86c48b90d3 , https://doi.org/10.15468/b3ptrm
Date of creation: 14 December 2022
Date of last revision: 21 December 2022
Date of publication: 21 December 2022
Update policy: The dataset at GBIF will be updated irregularly.
Language: English
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Metadata language: English
Metadata managers: Zoltán Csabai (csabai@gamma.ttk.pte.hu), Pál Boda (boda.pal@ecolres.hu)

MANAGEMENT DETAILS

Project title: AMI-KMNP dataset: Occurrence records of aquatic macroinvertebrate species from a 10-year-long biodiversity survey in SE Hungary, GBIF Freshwater
Database managers: Zoltán Csabai, Pál Boda
Temporal coverage: The dataset includes records from the period between 2012 and 2021.
Record basis: Occurrence records
Funding grants: The whole project was initiated and financially supported by the Directorate of the Körös-Maros National Park.

GEOGRAPHIC COVERAGE

Study area: Sampling sites are distributed across the operational area of the Körös-Maros National Park, Hungary (Tab. 2, Fig. 1). Data are georeferenced according to WGS

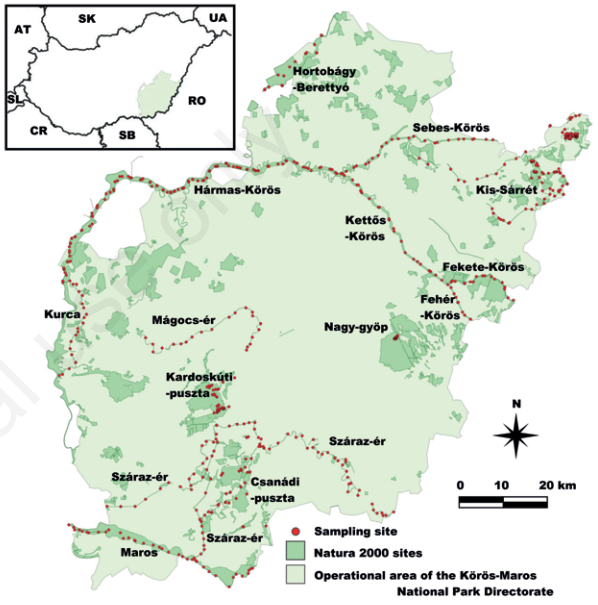

Fig. 1. Schematic map of the 625 localities within the operational area of the Körös-Maros National Park Directorate indicating geographical subunits and Natura 2000 sites.

Tab. 2. Description of the habitats, number of sites, records and taxa related to sampled geographic area subunits (see also Fig. 1).

Subunits	Characteristic habitats	Number of sites	Number of records	Number of taxa
Csanádi puszta	Salt marshes, sodic ponds, flooded saline meadows, small irrigation channels, puddles	26	1558	191
Hortobágy-Berettyó River	Small-sized lowland river	16	288	110
Kardoskút puszta	Soda pans, intermittent artificial ditches, irrigation channels, salt marshes, flooded saline meadows	53	1939	198
Kis-Sárrét	Lowland fens, marshes, artificial irrigation channels, natural lowland watercourses, flooded meadows, dear arms of watercourses, puddles	151	10355	435
Kurca	Temporarily flowing, strongly human-impacted backwater of a lowland river	20	540	102
Mágocs-ér	Lowland small-sized, strongly modified watercourse	21	403	95
Maros River	Medium-sized lowland river	36	471	94
Nagy-gyep	Annually flooded saline marsh	24	893	154
Körös River System	Medium-sized lowland rivers: Hármas-Körös, Kettős-Körös, Fehér-Körös, Fekete-Körös	183	3132	295
Száraz-ér	Natural but strongly modified watercourses	95	6356	311
Altogether		625	25 935	

84 datum. Georeferenced data was measured in the field with the highest possible precision.
Geographical subdivisions: All records are related to Europe; Hungary; Counties of Békés, Jász-Nagykun-Szolnok, and Csongrád-Csanád; Jurisdiction/operational area of the Körös-Maros National Park.
Habitat types: Data are related to various types of waterbodies ranging from the tiny rainwater puddles, intermittent marshes, regularly flooded meadows and soda pans to ponds, lowland marshlands, fens and fishponds, from low-flowing natural and artificial watercourses, irrigation channels to medium-sized and larger rivers. Habitat types characterizing the studied geographical subunits are briefly listed in Tab. 2.
Biogeographic region: All records are originated from the operational area of the Körös-Maros National Park Directorate. Administratively, they are located in the territory of three counties: Békés, Csongrád-Csanád, and Jász-Nagykun-Szolnok. According to the Hungarian landscape unit classification, the entire area is in the Great Hungarian Plain. The entire territory of Hungary belongs to the Pannonian ecoregion.
Country: All records are related to Hungary.
Quality control for geographic data: Reliability of coordinates was checked in Google maps to identify the correctness of sites. Geographic coordinate format, coordinates within county boundaries in the dataset were also double checked.

TAXONOMIC COVERAGE

General description: Dataset contains aquatic macroinvertebrate species records of mollusks (snails and bivalves), leeches, malacostracan crustaceans, water spider, mayflies, dragonflies, damselflies, aquatic and semiaquatic bugs, aquatic beetles, alderflies, sponge flies, caddisflies, black flies, mosquitoes, and non-biting midges.
Taxonomic ranks: Dataset contains species records. Records that cannot be clearly attributed to a species (482 cases from the total of 25,935 records) were assigned as 'Aggregate', 'pair of species', 'species group' and 'species, confer'.
Taxonomic methods: All scientific names are valid and given according to the latest nomenclature. In some cases, well known synonyms are also given in a separate column. All names were checked against the GBIF backbone.
Taxon specialists: Identification for each taxonomic group were made by Hungarian experts. Mollusca: Erika Bódis, Bálint Pernecker; Hirudinea: Judit Fekete, Kristóf Málnás, Arnold Móra; Malacostraca: Balázs József Berta, Péter Borza, Péter Mauchart; Ephemeroptera: Csaba Deák, Odonata: Anna Farkas (observation), Arnold Móra (specimens and observation); Heteroptera: Pál Boda, Coleoptera: Zoltán Csabai (majority), Zoltán Kálmán (Helophoridae), Andor Lőkkös (Hydraenidae); Megaloptera: Arnold Móra; Neuroptera: Arnold Móra, Trichoptera: Arnold Móra; Diptera: Csaba Deák (Simuliidae, Culicidae), Arnold Móra (Chironomidae, Athericidae).
Quality control for taxonomic data: Professional experience of experts was applied as quality controls on dataset. Nomenclature validation was based on the GBIF taxonomic backbone.

SAMPLING METHODS

The dataset also contains records derived from samples taken using quantitative and qualitative sampling methods. In most cases, we used qualitative methods, which were as follows, in descending order according to the frequency of their application: i) Pond netting: sweeping with a 1,5 m-long-handled pond net (mesh size 1 or 0.5 mm) just above the substrate, on the water surface, and among the submerged or emergent vegetation). ii) In flowing waters "kick and sweep" technique was applied (standing backwards to the direction of the flow, stirring up the sediment by kicking, and sweeping with the net). iii) Several organisms were captured by manual picking from surface of submerged stones, woodstocks, and other submerged objects. iv) Floating chironomid pupal exuviae were collected from the water surface and floating debris using a hand-net and a plastic tray. v) In case of species that were identifiable in situ during the fieldwork (dragonflies, large snails, bivalves, beetles, bugs, spiders), observational records were also taken into consideration (based on visual perception and/or photographs taken). vi) In some cases, mostly in fens and marshes, to capture larger diving beetles more effectively, baited bottle traps were also used. All above mentioned sampling methods were combined in according to the nature of the habitats, and samplings were performed by three up to six persons simultaneously for at least 30 minutes/site, usually longer, ensuring that as many species as possible are found. As quantitative techniques, vii) in medium-sized rivers deep water dredging was performed using a triangle-shaped, serrated dredge sampling device with a 1 m long 0.5 mm mesh-sized bag. Using a motorboat, the device was towed the same distance in the upstream direction on the bottom of the river at each site. viii) In case of larger rivers, dragonfly exuviae were collected along a 20-meter-long stretch of the riverbank. The riverside ground and the vegetation were searched intensively for the exuviae in an area of the bank 5-10 meter in width (depending on the bank characteristics). ix) In case of a soda pan, quantitative sampling was performed using a close-and-harvest method. We closed an area with a bottomless, half-meter-diameter barrel, and all the animals found inside captured with a pond net.

PRESERVATION METHODS

The sorted and identified individuals are preserved in 70% ethanol. Specimens are housed in the collection of the Department of Hydrobiology, University of Pécs. Majority of the specimens are stored in small vials filled with ethanol, separated according to higher taxonomic units but all individuals from the same sample together, while chironomid exuviae and larvae are slide-mounted in Euparal.

DATA AVAILABILITY

AMI-KMNP dataset is available at GBIF: https://doi.org/10.15468/b3ptrm under the licence CC BY-NC 4.0

ACKNOWLEDGEMENTS

This 10-year-long study was initiated and financially supported by the Körös-Maros National Park Directorate, we are particularly grateful to its managers and employees for their continuous support, especially to Viktória Bota-Rómer, Tibor Danyik, Péter Bánfi, Dr. László Tirják and all the rangers responsible for the studied area. The authors' thanks also go to every colleague who facilitated our work in the field (Zoltán Kálmán, András Kálmán, Réka Boda, Péter Mauchart, Bálint Pernecker, Balázs J. Berta, Anna Farkas, Tibor Danyik, Bernadett Boóz, Tamás Bozóki, Endre Bajka, József Szekeres, Ádám Mészáros, Eszter Garaj, Anita Tárnyik, Júlia Szeles), in the laboratory (Éva Tihanyi-Horváth, Balázs J. Berta), or contributed to the identification of the material (names listed in 'taxonomic specialists' subchapter above). Author's thanks to GBIF and ECA IPT related colleagues (Marie Grosjean, Cecilie Svenningsen, Dag Endresen, Dimitri Brosens) for facilitating the uploading of data onto GBIF and publishing via ECA IPT.

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