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NOTES ON GEOGRAPHIC DISTRIBUTION

Hydroglyphus hamulatus (Gyllenhal, 1813) (Coleoptera, Dytiscidae), a predaceous diving beetle species new to the Czech Republic

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Abstract. We report the occurrence of the predaceous diving beetle *Hydroglyphus hamulatus* (Gyllenhal, 1813) in the Czech Republic. Specimens were collected between 2021 and 2024 at post-mining lakes Most and Milada, with an additional record from 1986. These data raise the number of Czech diving beetles to 127 confirmed and eight questionably present species. The new records likely reflect a recent European migration wave and highlight the conservation value of post-mining lakes, a habitat resembling northern European oligotrophic lakes that are rare in Central Europe.

Keywords. Aquatic beetles, faunistics, first record, Europe, post-mining lakes

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Introduction

The genus *Hydroglyphus* Motschulsky, 1853 is the most speciose genus of small diving beetles in the tribe Bidessini. In total, 92 species are distributed across the Old World and Australia, with the highest diversity in tropical Africa. In the Palaearctic region, the genus is represented by 26 species (Nilsson and Hájek 2026a). However, only three *Hydroglyphus* species occur in Europe (Nilsson and Hájek 2026b), and only one species, *Hydroglyphus geminus* (Fabricius, 1792), has been recorded from the Czech Republic so far.

The Most Basin (also known as the North Bohemian Basin) is a depression filled with Miocene sediments (22–17 million years old) that has been mined for coal since the 17th century. It is among Europe's richest lignite deposits; extraction began in the second half of the 19th century and was dominated by large-scale surface mining. Mining ceased in the late 1990s, and the area has been under reclamation since the early 2000s. Parts of the open pits were flooded, forming several large artificial lakes. These lakes are now used for recreation, water sports, and shipping, and they also provide important habitats for flora and fauna.

An inventory survey of aquatic invertebrates conducted in newly flooded coal-mining pits between 2021 and 2024 revealed small but viable populations of the diving beetle *Hydroglyphus hamulatus* (Gyllenhal, 1813), a predominantly northern European species typically inhabiting the margins of large, shallow lakes (Nilsson and Holmen 1995). Although currently spreading into Central Europe, the species was previously known from the Czech Republic only from a single unpublished specimen accidentally collected in Central Bohemia in 1986. Our new records confirm *H. hamulatus* as a member of the Czech diving beetle fauna.

Material and methods

Study area. Specimens were collected from two anthropogenically created lakes: Jezero Most and Milada. Both studied lakes are post-industrial biotopes with similar habitat characteristics. At the

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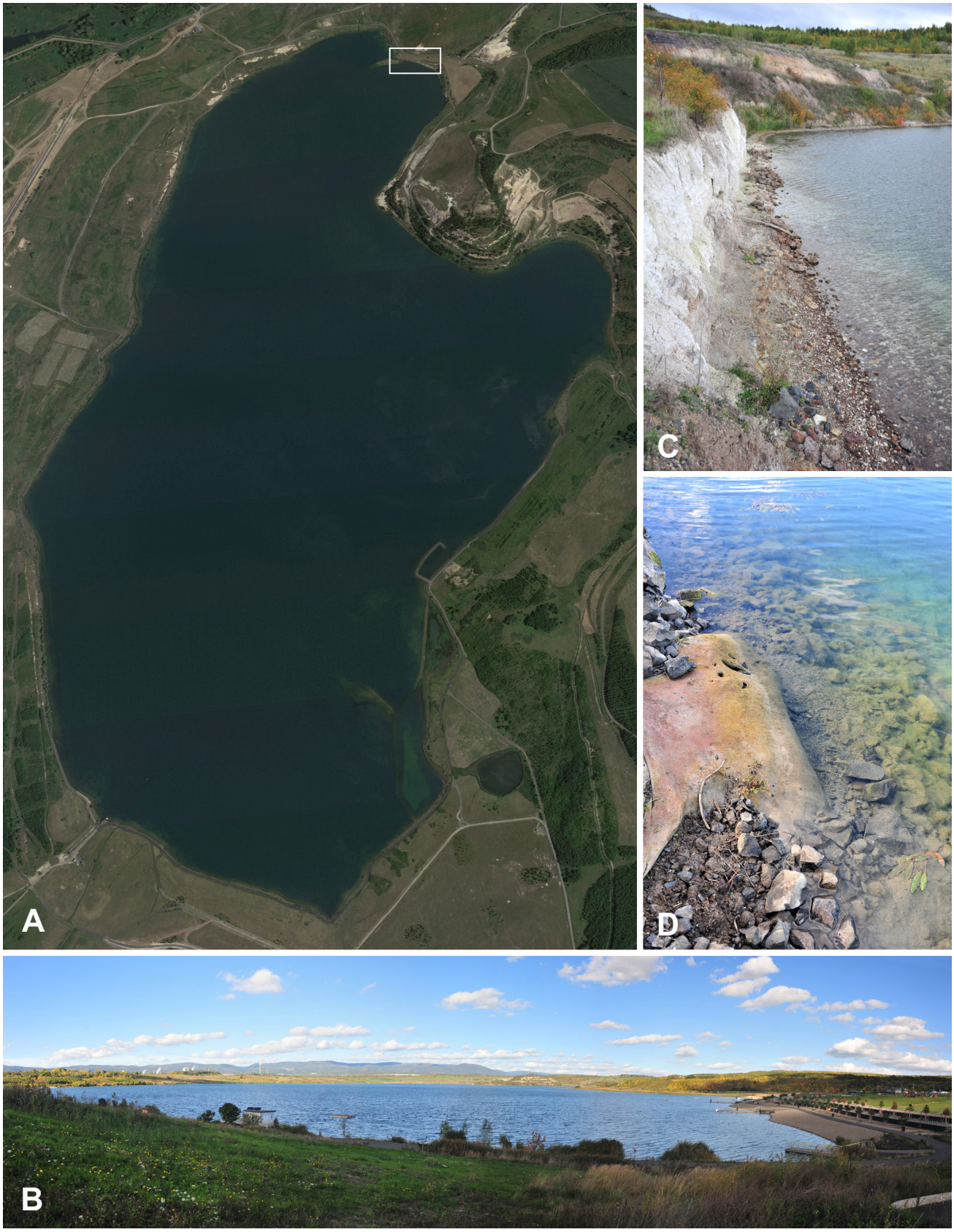

Figure 1. Jezero Most. **A.** Aerial view of the lake, showing the sampling area for *H. hamulatus*; **B.** Panoramic view of the lake from the south bank. **C.** General habitat of *H. hamulatus*. **D.** Detail of the microhabitat.

edge of the lakes, a shallow littoral zone with a dominant inorganic substrate, partly with stones and boulders, is found; clay patches dominate. Along the shore, there is a scattered growth of reeds. Submerged macrophytes are mostly represented by *Myriophyllum* sp. and *Potamogeton* sp. Benthic invertebrate samples were collected using multihabitat kick sampling with a D-frame.

Jezero Most (Figure 1): geographical coordinates: 50°32′13″N, 013°38′40″E. Approximate size: 3 × 1.5 km; flooded area 300.09 ha; volume 70.5 mil. m^3; average depth 23 m; maximum depth 71 m. The lake was filled from the Ohře River between 2008 and 2014. Chemical–physical water parameters are summarised in Table 1.

Milada: geographical coordinates: 50°39′13″N, 013°57′02″E. Approximate size: 3.2 × 0.7 km; flooded area 252.2 ha; volume 35.6 mil. m^3; average depth 15.5 m; maximum depth 24.7 m. The lake was filled between 2001 and 2010 as a mixture of stream, groundwater, and rainwater. Chemical–physical water parameters are summarised in Table 1.

Morphological observations. The material was examined using an Olympus SZX12 stereomicroscope. Habitus photographs were taken using a Canon EOS 550D digital camera with an attached Canon MP-E65mm f/2.8 1–5× macro lens as numerous separate images at different focal planes and afterwards combined using Helicon Focus v. 8.3.5. The male genitalia were studied and illustrated in temporary glycerine mounts using an Olympus BX41 transmitted light microscope with a Canon DS126291 attachment.

Material. Voucher specimens are deposited in the National Museum, Praha, Czech Republic (NMPC); A. Zapriháčová private collection, Teplice, Czech Republic (AZTC); J. Šťastný private collection, Liberec, Czech Republic (JSLC); and M. Straka private collection, Hustopeče, Czech Republic (MSHC). All specimens from private collections are available from the respective authors upon reasonable request.

Table 1. Mean physicochemical parameters measured in the surface and bottom zones (2019–2023).

Parameter	Milada		Most	
	Surface	Bottom	Surface	Bottom
Temperature (°C)	16.4	6.5	15.5	5.0
pH	8.8	7.9	8.5	7.8
Conductivity ($mS \cdot m^{-1}$)	126.7	126.4	67.3	67.2
Total phosphorus ($mg \cdot L^{-1}$)	0.022	0.038	0.013	0.01
Total nitrogen ($mg \cdot L^{-1}$)	0.74	1.1	0.91	1.09
Inorganic nitrogen ($mg \cdot L^{-1}$)	0.13	0.65	0.48	0.72
Organic nitrogen ($mg \cdot L^{-1}$)	0.61	0.45	0.43	0.37
Total organic carbon ($mg \cdot L^{-1}$)	12.4	12.1	5.9	8.6
Chlorides ($mg \cdot L^{-1}$)	66	66	28	28
Sulfates ($mg \cdot L^{-1}$)	311	302	215	211
Oxygen saturation (%)	119	20	107	70
Oxygen dissolved ($mg \cdot L^{-1}$)	11.8	2.4	10.5	8.8
Chlorophyll a (vegetatation season) ($\mu g \cdot L^{-1}$)	4.7		1.9	—
Calcium ($mg \cdot L^{-1}$)	30.4	35	45.1	45.4
Magnesium ($mg \cdot L^{-1}$)	45.3	44.8	26.5	25.6
Total iron ($mg \cdot L^{-1}$)	0.019	0.041	0.015	0.017
Total manganese ($mg \cdot L^{-1}$)	0.007	0.561	0.004	0.038
Total aluminium ($mg \cdot L^{-1}$)	23.2	17.6	20.2	45.4
Chemical oxygen demand ($mg \cdot L^{-1}$)	20.9	19.4	10.4	8.9

Results

***Hydroglyphus hamulatus* (Gyllenhal, 1813)**

Figure 2

New records. CZECH REPUBLIC — Bohemia • Přerov nad Labem; 21.IX.1986; J. Vilímová leg.; 1 spec., JSCL HYHA01 • Most, Jezero Most; 50°33′6″N, 013°39′12″E; 200 m alt.; 20.X.2021; E. Janeček leg.; 2 spec., AZTC HYHA01-02 • same locality; 11.V.2022; E. Janeček leg.; 5 spec., AZTC HYHA03-04, NMPC P5/COL/99999 • same locality; 6.X.2022; J. Hájek leg.; 2 spec., NMPC P5/COL/99999 • same locality; 7.XI.2023; E. Janeček leg.; 1 ♂, MSHC HYHA01• same locality; 15.V.2024; E. Janeček leg.; 11 spec., AZTC HYHA05-15 • Chabařovice, Milada; 50°39′29″N, 013°55′42″E; 145 m alt.; 22.X.2021; E. Janeček leg.; 1 ♀, AZTC HYHA16 • same locality; 26.X.2023; E. Janeček leg.; 1 ♀, NMPC P5/COL/99999 • Ústí nad Labem, Milada; 50°39′0″N, 013°58′20″E; 145 m alt; 26.X.2023; E. Janeček leg., NMPC P5/COL/99999.

Figure 2. *Hydroglyphus hamulatus* (Gyllenhal, 1813). **A.** Adult habitus (2.05 mm). **B.** Median lobe of aedeagus in lateral (a) and ventral (b) view. **C.** Paramere in lateral view. Scale bar: B, C = 0.2 mm.

Identification. Species of *Hydroglyphus* are among the smallest dytiscids in Central Europe; their body length does not exceed 2.5 mm. They can be separated from other genera by the following combination of characters: presence of longitudinal baso-medial striae (= plicae of some authors) on the pronotum, continuing as short striae on the basal part of the elytra; presence of a longitudinal sutural stria on each elytron; and absence of a transverse occipital line on the head.

Hydroglyphus hamulatus differs from the sympatric *H. geminus* by a more elongate habitus, basal elytral striae shorter than the pronotal striae (elytral striae as long as or longer than pronotal striae in *H. geminus*), erect elytral setation (decumbent in *H. geminus*), and colouration: *H. hamulatus* has a dorsal side of the head and pronotum yellow (the posterior part of the head often has a dark stripe), while in *H. geminus,* the head and a large part of the pronotal disc are dark; *H. hamulatus* also has two longitudinal dark stripes on each elytron in addition to the dark sutural line, while in *H. geminus* the longitudinal stripes merge into an irregular central dark spot (Figure 2A; see also Hájek 2009: figures 12, 13). Because elytral colouration is variable in both species, unusually coloured specimens should be identified using the structural characters listed above, or study of male genitalia (Figure 2B, C; see also Nilsson and Holmen 1995: figures 76–81).

In habitus, dorsal colouration, and striation, *H. hamulatus* closely resembles the third European species, *H. signatellus* (Klug, 1834). The two species can be separated by the punctation and setation of the dorsal surface: in *H. hamulatus* it is much denser and coarser, with erect setae, whereas in *H. signatellus* it is sparser and finer, with decumbent setae (see Biström 1986; Hájek and Brancucci 2011: figure 12). Both species are also strictly allopatric: *H. hamulatus* occurs in Northern and Central Europe, while *H. signatellus* reaches only the southernmost parts of Europe.

Distribution. A Palaearctic species, in Europe, *Hydroglyphus hamulatus* is concentrated in regions adjacent to the Baltic Sea, especially northern Germany and Poland, the Baltic states, and southern Scandinavia (Nilsson and Holmen 1995). It was recently recorded in the Netherlands (Colijn 2019), and the Czech records reported here represent the species' southernmost occurrence (Figure 3). The eastern limits of its range remain poorly known; published records extend from north-western Ukraine

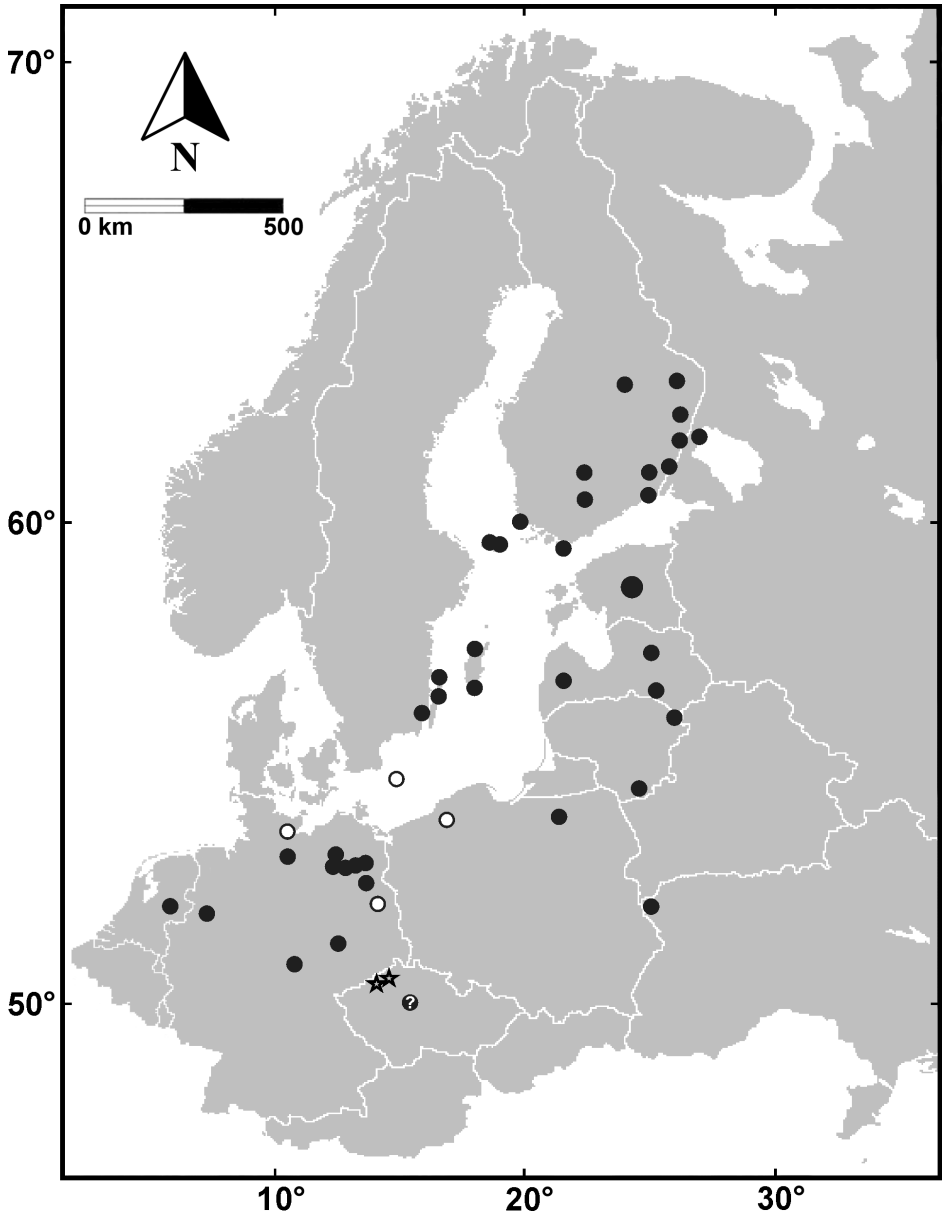

Figure 3. European distribution of *Hydroglyphus hamulatus* based on published records and recent observations. White circles indicate historical records (before 1961); black dots indicate recent records (after 1960); a large dot denotes a country-level record with imprecise locality; asterisks mark recent findings in northern Bohemia.

(Dyadichko 2010) through Russian Perm Region (Zaitzev 1953) and Tuva Republic (Kuzhuget et al. 2013) to Mongolia (Prokin et al. 2020).

Discussion

Hydroglyphus hamulatus is predominantly northern European species. It was widespread in northern Germany until the 1930s; later, the species disappeared and reappeared in a large number of sites around 2000 (Hendrich and Brauns 2004). In 2014 it was recorded for the first time in Westfalia (Kerkering and Hannig 2014) and in 2017 in Thuringia (Foster and Foster 2017). Under ideal conditions, large aggregations of the species involving hundreds of individuals can still be observed in north-eastern Germany today (Hendrich in litt.). The nearest known recent sites of this species are in Werbeliner See, south of Delitzch, about 140 km far from the Czech sites (Hornig 2020). Those above-mentioned records represent a recent migration wave, which may explain the species' unexpected appearance in the Netherlands in 2019 (recreational lake Bussloo; Colijn 2019) and its occurrence in the Czech Republic since 2021. The colonisation mechanism remains unclear, but *H. hamulatus* likely disperses both actively (as a strong flyer) and passively, for example, via aeroplankton drift, allowing it to cross distances of hundreds of kilometres. Additional potential vectors include waterfowl and possibly human activities (e.g. transport by heavy machinery). In this context, the single historical record from Central

Bohemia (1986), previously considered improbable, appears credible: the species probably reached the Czech Republic repeatedly but failed to establish because suitable habitats were scarce.

Hydroglyphus hamulatus mainly inhabits the margins of larger and shallow lakes, often on calcareous merl (Nilsson and Holmen 1995). Pakulnicka et al. (2015) showed that the presence of *H. hamulatus* was correlated with conductivity, sulfate concentration, and dissolved oxygen. The species therefore prefers clean lakes with a high dissolved oxygen content, a mineral substrate, and sparse or no vegetation (Hendrich and Brauns 2004; Pakulnicka et al. 2015; Višinskienė and Arbačiauskas 2018). This species is often found in water-filled pits left after lignite mining (J. Gebert pers. comm.). This is also consistent with our data, when both locations were created by the flooding of a surface lignite mine.

Large, clean oligotrophic lakes are rare in the Czech Republic and are almost always linked to human activities. Historically, such habitats were represented mainly by fishponds, but most are now managed for intensive fish production and are therefore unsuitable for diving beetles (see e.g. Hájek 2004). Today, comparable conditions occur only locally in flooded sandpits or stone quarries and, most importantly, in post-mining lignite pits. The latter introduce a new type of freshwater habitat to Czech landscape that resembles northern European lakes, as reflected by the occurrence of *H. hamulatus*. We assume that if sufficient water quality is maintained in the mentioned water bodies, the species will become a permanent part of the fauna of the Czech Republic and it is possible that it will spread to another localities of a similar type.

Based on the IUCN criteria B2ac(i) we propose listing *Hydroglyphus hamulatus* on the Red List of threatened species of the Czech Republic as Endangered.

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Additional information

Conflict of interest
The authors declare that no competing interests exist.

Ethical statement
No ethical statement is reported.

Use of artificial intelligence (AI)
The authors accept full responsibility for the content of the manuscript, including the disclosure of any use of AI. No AI tools were used in the preparation of this manuscript.

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Author contributions
Conceptualisation: MS, JH. Data curation: MS, AZ, EJ, JŠ, JH. Formal analysis: MS, JH. Funding acquisition: MS. Investigation: AZ, EJ. Methodology: AZ, EJ. Visualisation: JH. Writing – original draft: MS. Writing – review and editing: MS, AZ, EJ, JŠ, JH.

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Data availability
All data that support the findings of this study are available in the main text.

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