

Occurrence of the Northern birch mouse (*Sicista betulina* Pallas, 1779) in the Novohradské hory Mts. – Freiwald region

Výskyt myšivky horské (*Sicista betulina* Pallas, 1779) v oblasti Novohradské hory – Freiwald

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Abstract: Novohradské hory Mts. – Freiwald region is one of the few refuges of the northern birch mouse in Central Europe. Altogether 33 records of the northern birch mouse have been collected from the area during the last twenty years (2003–2022). These, together with 17 previous records from the years 1969 to 2002, make 50 records of the northern birch mouse from the region. Records are unevenly distributed within the area, which is probably the result of different local survey effort and does not show the full picture of the distribution of the species. The species occurs in a wide range of altitudes from 610 m a.s.l. up to 955 m a.s.l. and has been found in various types of habitats including abandoned wetlands, wet meadows, mowed meadows, forest edges, and gardens.

Key words: Freiwald, Gratzten Mountains, Mühlviertel, northern birch mouse, Novohradské hory, occurrence data, *Sicista betulina*, South Bohemian Region, species distribution, Waldviertel.

Abstrakt: Oblast Novohradské hory – Freiwald je jedním z mála refugií výskytu myšivky horské ve střední Evropě. Publikace popisuje 33 záznamů výskytu z této oblasti pocházejících z posledních 20 let, tedy z období 2003–2022. Spolu se 17 dřívějšími již publikovanými záznamy z období 1969 až 2002, bylo v tomto regionu zaznamenáno již 50 jedinců myšivky horské. Záznamy jsou nerovnoměrně rozmístěny v rámci oblasti, což je ale pravděpodobně jen výsledek různého lokálního úsilí a neukazuje celkový obraz výskytu druhu v oblasti. Myšivka byla zaznamenána v nadmořských výškách od 610 m n. m. do 955 m n. m., a to v různém prostředí: v neobhospodařovaných mokřadech, na vlhkých i sečených loukách, při okrajích lesů i v zahradách.

Klíčová slova: Freiwald, Jihočeský kraj, myšivka horská, Mühlviertel, nálezová data, Novohradské hory, *Sicista betulina*, výskyt druhu, Waldviertel.

Introduction

The northern birch mouse, *Sicista betulina* (Pallas, 1779) is one of the rarest mammal species in the Czech Republic and Austria, with a boreo-montane distribution. Its range in the Czech Republic is divided into mutually isolated refuges: the Eastern Sudetes, the Western Carpathians and the trilateral region of the Šumava Mts. / Böhmerwald up to the Novohradské hory Mts. / Freiwald. In Austria, the primary area of their distribution is in the Alps above subalpine altitude and the second area is in the previously mentioned border area between Austria, Bavaria and the Czech Republic.

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The species occurs in extensively managed pastures, wet meadows, moors and sparse forests (Hable & Spitzenberger 1989, Anděra & Gaisler 2019).

The species was detected in the Czech Republic for the first time in 1949 in the Jeseníky Mts. (Kratochvíl & Grulich 1949) and three years later in the Austrian Alps (Hable & Spitzenberger 1989). During the 70 years that the species has been known to exist in the country, only about 200 species occurrence records have been obtained in the Czech Republic. This is due to the scarcity of the species and the low effectiveness of existing monitoring methods. Recent surveys with camera traps in some areas of potential occurrence in Austria confirm that the species is also very rare there (Resch & Blatt 2017, Resch & Resch 2019, 2020, Resch et al. 2021, Resch & Resch 2023).

Mapping of the northern birch mouse occurrence in the Novohradské hory Mts. – Freiwald region further demonstrates how rare the species is. The first record of the species in the region was collected in 1969 on the Czech side (Anděra et al. 1970), and in 2004 on the Austrian side (Engleder et al. 2005) of the border. Altogether, only 20 records have been published so far from the Novohradské hory Mts. – Freiwald region (Anděra et al. 1970, Vohralík et al. 1972, Anděra & Beneš 2002, Anděra & Hanák 2004, Engleder et al. 2005, Mikeš & Lepší 2012, Resch & Blatt 2017, Mikeš 2018). The occurrence of the northern birch mouse in the Novohradské hory Mts. – Freiwald region is the most eastern occurrence in the Bohemian-Bavarian-Austrian population.

The aim of this article is to publish a list of previously unpublished records of the northern birch mouse in the Novohradské hory Mts. – Freiwald region and to summarize our knowledge of the species in the region.

Study area

The study area presented in this article is the mountain range of the Novohradské hory Mts. – Freiwald, known also as Gratzen Mountains or Gratzener Bergland, on both sides of Czech / Austrian border and its foothills. It is an area surrounded by the towns Dolní Dvořiště (West), Freistadt (South), Weitra (East) and Nové Hradky (North). The area falls into regions Jihočeský kraj (CZ), Mühlviertel (AT) and Waldviertel (AT).

Methods

Occurrence records were obtained using different methods. Some of the records are accidental observations of a live individual or a dead specimen. The others are the results of pilot local studies, which are testing new non-invasive surveying methods: camera-trapping or the use of live pitfall traps.

Each occurrence record consists of date; state; locality; mapping quadrat (KFME grid of 12 x 11,1 km, Ehrendorfer & Hamann 1965); mapping quadrat (ETRS89LAEA, grid of 10 x 10 km, EEA); accuracy of location; coordinates; altitude; habitat; method; author of the record (legit); documentary material; collection; quotation if published and the number of individuals.

Results and discussion

In the last 20 years, the northern birch mouse has been observed 33 times in the region, of which 30 cases have not yet been published.

List of recent records of the northern birch mouse in the Novohradské Mts. – Freiwald region in the period 2003–2022:

27. 5. 2004; AT; Sandl; 7453; 10kmE466N283; exact location; 48°34'0.4"N, 14°38'40.2"E; 900 m a.s.l.; no info; accidental observation; Josef Peneder; photo stored at Jürgen Plass & Thomas Engleder; 1 ind.

5. 6. 2004; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42' 2.4"N, 14°42'49.7"E; 770 m a.s.l.; wetland; accidental observation; Martin Lepší; no documentation; Mikeš & Lepší 2012; 1 ind.

18. 6. 2004; AT; Sandl; 7453; 10kmE466N283; approximately; 48°33'13.7"N, 14°39'6.6"E; 900 m a.s.l.; no info; domestic cat capture; Egon Lego; coll. Landesmuseum in Linz; Engleder et al. 2005; 1 ind.

2006; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'38.3"N, 14°42'40.3"E; 950 m a.s.l.; meadow; accidental observation; Ulrike & Thoren Metz; no documentation; 1 ind. + nest

2009; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'36.5"N, 14°42'34.2"E; 950 m a.s.l.; forest edge; accidental observation; Ulrike & Thoren Metz; no documentation; 1 ind.

2010; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'33.4"N, 14°42'32.7"E; 955 m a.s.l.; meadow; accidental observation; Ulrike & Thoren Metz; no documentation; 1 ind. + nest

10. 6. 2010; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'32.6"N, 14°42'27.8"E; 955 m a.s.l.; garden; accidental find; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

1. 8. 2010; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'31.9"N, 14°42'27.7"E; 955 m a.s.l.; garden; accidental observation; Ulrike & Thoren Metz; photo/video stored at Protect ▪ Natur-, Arten- und Landschaftsschutz (see Fig. 1); 1 ind.

2011; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'34.4"N, 14°42'39.3"E; 945 m a.s.l.; forest edge; accidental observation; Ulrike & Thoren Metz; no documentation; juv. in nest.

15. 7. 2011; border CZ/AT; Pohoří na Šumavě/Stadlberg; 7454; 10kmE466N284; exact location; 48°35'37.4"N, 14°42'30.1"E; 950 m a.s.l.; forest/meadow edge; accidental find; Ulrike & Thoren Metz; photo stored at coll. Protect ▪ Natur-, Arten- und Landschaftsschutz (see Fig. 2); 1 ind.

15. 7. 2011; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'36.4"N, 14°42'39.6"E; 945 m a.s.l.; wet meadow; accidental observation; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

16. 7. 2011; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'37.2"N, 14°42'33.7"E; 950 m a.s.l.; mowed meadow; accidental find; Ulrike & Thoren Metz; coll. Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

9. 7. 2012; border CZ/AT; Pohoří na Šumavě/Stadlberg; 7454; 10kmE466N284; exact location; 48°35'37.5"N, 14°42'30.1"E; 950 m a.s.l.; forest/meadow edge; accidental find; Ulrike & Thoren Metz; coll. Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

10. 7. 2012; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'32.1"N, 14°42'27.0"E; 955 m a.s.l.; garden; accidental observation; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

27. 9. 2012; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'31.7"N, 14°42'27.4"E; 955 m a.s.l.; garden; accidental find; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

8. 6. 2013; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'32.0"N, 14°42'27.1"E; 955 m a.s.l.; garden; accidental observation; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

7. 7. 2013; CZ; Pohoří na Šumavě; 7454; 10kmE466N284; exact location; 48°35'57.4"N, 14°42'41.2"E; 930 m a.s.l.; meadow/forest edge; accidental observation; Ulrike & Thoren Metz; without documents; 1 ind.

30. 7. 2013; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'28.0"N, 14°42'29.5"E;

955 m a.s.l.; forest; accidental observation; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

2014; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'32.5"N, 14°42'28.4"E; 955 m a.s.l.; garden; accidental find; Ulrike & Thoren Metz; coll. Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

5. 8. 2014; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'36.6"N, 14°42'39.1"E; 945 m a.s.l.; wet meadow; accidental find; Ulrike & Thoren Metz; coll. Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

5. 8. 2015; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'32.3"N, 14°42'27.7"E; 955 m a.s.l.; garden; accidental observation; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz (see Fig. 3); 1 ind.

5. 8. 2016; AT; Leopoldschlag; 7352; 10kmE465N284; exact location; 48°38'2.9"N, 14°29'11.1"E; 615 m a.s.l.; alluvial wetland; camera-trap survey; Stefan Resch & Christine Blatt (Resch & Blatt 2017); photo stored at Resch & Blatt (see Fig. 4); 1 ind.

2. 7. 2017; AT; Stadlberg; 7454; 10kmE466N284; exact location; 48°35'32.0"N, 14°42'26.8"E; 955 m a.s.l.; garden; accidental observation; Ulrike & Thoren Metz; photo stored at Protect ▪ Natur-, Arten- und Landschaftsschutz; 1 ind.

4. 8. 2017; AT; Leopoldschlag; 7352; 10kmE465N284; exact location; 48°37'52.7"N, 14°29'33.6"E; 610 m a.s.l.; alluvial wetland; accidental observation; Julia Kropfberger; no documentation; 1 ind.

3. 6. 2019; CZ; Tichá; 7352; 10kmE465N284; exact location; 48°38'14.5"N, 14°29'21.2"E; 615 m a.s.l.; alluvial wetland; pitfall trap; anonymous (V. Mikeš, pers. comm.); coll. Museum of South Bohemia, České Budějovice; 1 ind.

3. 8. 2021; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42'57.1"N, 14°42'39.8"E; 780 m a.s.l.; wetland; camera-trap survey; Lukáš Poledník; photo stored at ALKA Wildlife; 1 ind.

13. 8. 2021; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42'50.8"N, 14°42'45.6"E; 770 m a.s.l.; wetland; accidental observation; Lukáš & Jindřich Poledník; photo stored at ALKA Wildlife; 1 ind.

26. 8. 2022; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42'54.1"N, 14°42'48.4"E; 775 m a.s.l.; wetland; accidental observation; Kateřina Poledníková; photo stored at ALKA Wildlife (see Fig. 5); 1 juv.

27. 8. 2022; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42'54.1"N, 14°42'48.4"E; 775 m a.s.l.; wetland; pitfall trap; Lukáš Poledník; photo stored at ALKA Wildlife; 1 juv.

7. 9. 2022; CZ; Pohoří na Šumavě; 7354; 10kmE466N284; exact location; 48°36'48.6"N, 14°40'49.8"E; 890 m a.s.l.; wet pond depot; camera-trap survey; Lukáš Poledník; picture stored at ALKA Wildlife; 1 ind.

10. 9. 2022; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42'48.3"N, 14°42'45.6"E; 770 m a.s.l.; wetland; camera-trap survey; Lukáš Poledník; 2 photos stored at ALKA Wildlife; 1 ind.

12. 9. 2022; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42'48.3"N, 14°42'45.6"E; 770 m a.s.l.; wetland; camera-trap survey; Lukáš Poledník; photo stored at ALKA Wildlife; 1 ind.

13. 9. 2022; CZ; Staré Hutě; 7254; 10kmE466N285; exact location; 48°42'48.3"N, 14°42'45.6"E; 770 m a.s.l.; wetland; camera-trap survey; Lukáš Poledník; 2 photos stored at ALKA Wildlife (see Fig. 6); 1 ind.



Fig. 1 – Example of recorded Northern birch mouse: accidental observation, Stadlberg, 1. 8. 2010 (photo by Thoren Metz).

Obr. 1 – Příklad zaznamenaného jedince myšivky horské: náhodné pozorování, Stadlberg, 1. 8. 2010 (foto Thoren Metz).



Fig. 2 – Example of recorded Northern birch mouse: accidental find of dead animal, Stadlberg, 15. 7. 2011 (photo by Thoren Metz).

Obr. 2 – Příklad zaznamenaného jedince myšivky horské: nález uhynulého jedince, Stadlberg, 15. 7. 2011 (foto Thoren Metz).



Fig. 3 – Example of recorded Northern birch mouse: accidental capture with hands, Stadlberg, 5. 8. 2015 (photo by Ulrike Metz).

Obr. 3 – Příklad zaznamenaného jedince myšivky horské: náhodný odchyt do rukou, Stadlberg, 5. 8. 2015 (foto Ulrike Metz).



Fig. 4 – Example of recorded Northern birch mouse: camera-trap picture, Leopoldschlag, 5. 8. 2016 (photo by Christine Blatt & Stefan Resch).

Obr. 4 – Příklad zaznamenaného jedince myšivky horské: foto z fotopasti, Leopoldschlag, 5. 8. 2016 (foto Christine Blatt & Stefan Resch).



Fig. 5 – Example of recorded Northern birch mouse: accidental capture with hands, juvenile, Staré Hutě, 26. 8. 2022 (photo by Kateřina Poledníková).

Obr. 5 – Příklad zaznamenaného jedince myšivky horské: náhodný odchyt mláděte do rukou, Staré Hutě, 26. 8. 2022 (foto Kateřina Poledníková).



Fig. 6 – Example of recorded Northern birch mouse: camera-trap picture, Staré Hutě, 13. 9. 2022 (photo by Lukáš Poledník).

Obr. 6 – Příklad zaznamenaného jedince myšivky horské: foto z fotopasti, Staré Hutě, 13. 9. 2022 (foto Lukáš Poledník).

In all, 33 records of the northern birch mouse were collected from the period 2003–2022 from the study area. Together with 17 published records from the years 1969–2002 there are 50 records of the northern birch mouse from the region (Tab. 1, Fig. 7).

Tab. 1 – Overview of all records of the northern birch mouse in Novohradské hory Mts. – Freiwald region.

Tab. 1 – Přehled všech záznamů myšivky horské v oblasti Novohradských hor – Freiwaldu.

Locality / Lokalita	No. records / Počet záznamů	Years / Roky	Source / Zdroj
Staré Hutě	8	2004, 2021, 2022	Mikeš & Lepší 2012, new records
Pohorská Ves, Žofín	9	1969, 1970, 1972, 1973, 1974, 1975, 1976	Anděra et al. 1970, Vohralík et al. 1972, Anděra & Beneš 2002, Anděra & Hanák 2004
Bělá near Malonty	1	1988	Mikeš 2018
Rapotice near Malonty	1	2000	Anděra & Hanák 2004
Dolní Příbrání	3	2000, 2002	Anděra & Hanák 2004
Pohoří na Šumavě / Stadlberg	23	1972, 1993, 1994, 2006, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2017, 2022	Vohralík et al. 1972, Anděra & Beneš 2002, Anděra & Hanák 2004, new records
Sandl	2	2004	Engleder et al. 2005, new record
Leopoldschlag / Tichá	3	2016, 2017, 2019	Resch & Blatt (2017), new records

The time and spatial distribution of the occurrence records is either coincidental or due to the amount of mapping effort. Therefore, it would be misleading to analyse the data in more detail. In addition, absence of records in other localities with suitable habitat does not imply the absence of the species, because no surveys have been conducted.

The data collected is evidence of recent species occurrence in the region. We expect that the species occurs in other un-surveyed suitable habitats in the main mountain massif. In particular, there is a significant difference in the number and extent of northern birch mouse records on the Czech and Austrian sides of the mountain range. While in the South Bohemian part of the Novohradské hory Mts. and its piedmont, species occurrence is documented in a relatively large area from the southwestern to the northeastern edge of the mountain range (area approximately 110 km²). The Austrian localities are concentrated (so far) in three isolated microregions around Leopoldschlag, Sandl and particularly around Stadlberg (90 % of the records), which corresponds to a relatively small area in terms of km². In the future, it is necessary to find out whether this expresses the actual state of occurrence of the species, or whether it merely reflects the different intensity of monitoring on both sides of the mountain range. From a river system point of view, most of the records are in the catchment area of the Vltava River (Moldau), except for one record in Größgstätten (Sandl) and records in Stadlberg which are in the watershed or the Donau (Danube) river catchment.

According to the records, the northern birch mouse in the Novohradské hory Mts. – Freiwald region occurs in a wide range of altitudes from 610 m a.s.l. up to 955 m a.s.l. It has also been found in various types of habitats: abandoned wetlands, wet meadows, mowed meadows, forest edge, and gardens (see Fig. 8–13).

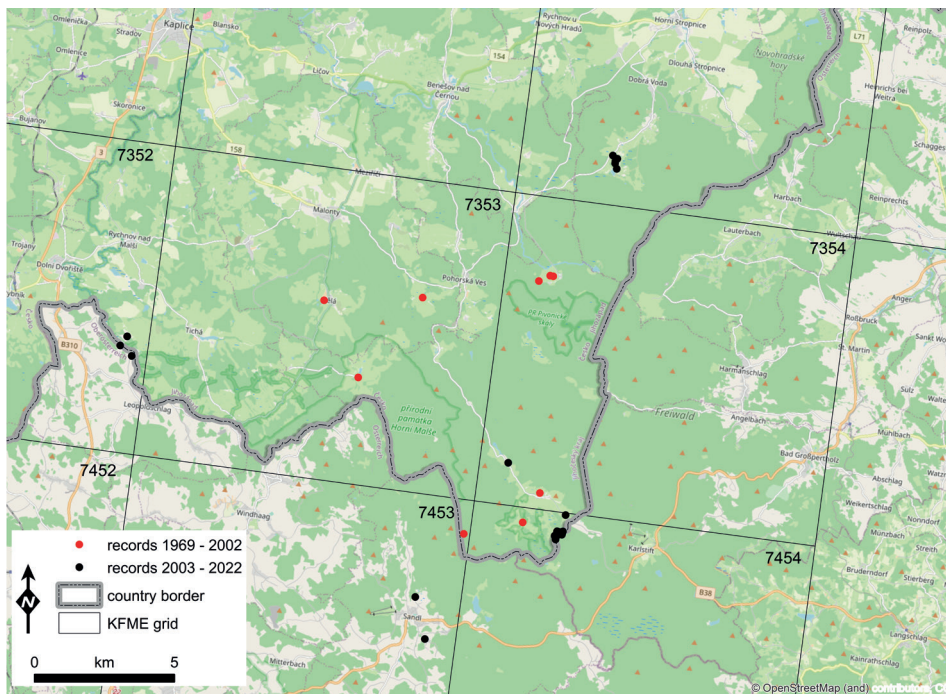


Fig. 7 – Map of all records of Northern birch mouse in Novohradské hory Mts. – Freiwald region in the period 1969–2022.

Obr. 7 – Mapa všech záznamů myšivky horské v Novohradských horách – Freiwaldu v období 1969–2022.

The northern birch mouse is a species listed in Annex IV of the Habitats Directive. In the Red List of Upper Austria, the species is considered critically endangered (Slotta-Bachmayer et al. 2023) and according to Czech legislation the species is a specially protected species in the highly endangered category. Therefore, among other duties, its population status must be evaluated and reported to the EU commission by each EU member at six-year intervals. The difficulty in detecting the presence of the northern birch mouse and poor data availability – a situation that prevails in other EU Member States – has resulted in difficulties conducting a proper evaluation and very inhomogeneous evaluations (Meinig et al. 2015).

Despite a significant increase in the number of records of the species in the study area, the available data does not comprehensively confirm the range, population size, and habitat of the species, or population trends and threats. We can currently only assume that threats to the species are associated with the isolation of local populations, habitat loss and climate change.

The occurrence of the species along the Czech/Austrian border means that there is the need for cross-border cooperation in monitoring and species protection.

The development of a reliable and standardized detection method for the species is necessary in order to perform comparable evaluations of its conservation status and to set up an effective package of measures to protect the species. As previous experience from the neighboring Šumava Mts. region has shown, a very effective method for monitoring the geographical occurrence of the northern birch mouse is the analysis of owl pellets (or food remains), especially of the Tengmalm's owl (*Aegolius funereus*) (Kloubec & Obuch 2003). Similar data is still missing from the Novohradské hory Mts. – Freiwald region, and therefore it would be advisable to focus on this methodology



Fig. 8 – Habitat of Northern birch mouse in Novohradské hory Mts. – Freiwald region: wetland in Staré Hutě (photo by Jindřich Poledník 2021).

Obr. 8 – Prostředí myšivky horské v Novohradských horách: mokřad ve Starých Hutích (foto Jindřich Poledník 2021).



Fig. 9 – Habitat of Northern birch mouse in Novohradské hory Mts. – Freiwald region: wetland in Staré Hutě (photo by Kateřina Poledníková 2021).

Obr. 9 – Prostředí myšivky horské v Novohradských horách: mokřad ve Starých Hutích (foto Kateřina Poledníková 2021).



Fig. 10 – Habitat of Northern birch mouse in Novohradské hory Mts. – Freiwald region: edge of meadow/forest in Pohoří na Šumavě (photo by Kateřina Poledníková 2022).

Obr. 10 – *Prostředí myšivky horské v Novohradských horách: okraj lesa/louky v Pohoří na Šumavě (foto Kateřina Poledníková 2022).*



Fig. 11 – Habitat of Northern birch mouse in Novohradské hory Mts. – Freiwald region: mowed meadow in Stadlberg (photo by Kateřina Poledníková 2022).

Obr. 11 – *Prostředí myšivky horské v Novohradských horách: sečená louka ve Stadlbergu (foto Kateřina Poledníková 2022).*



Fig. 12 – Habitat of Northern birch mouse in Novohradské hory Mts. – Freiwald region: wet meadow in Stadlberg (photo by Kateřina Poledníková 2022).

Obr. 12 – *Prostředí myšivky horské v Novohradských horách: vlhká louka ve Stadlbergu (foto Kateřina Poledníková 2022).*



Fig. 13 – Habitat of Northern birch mouse in Novohradské hory Mts. – Freiwald region: Malše river valley in Leopoldschlag/Tichá locality (photo by Resch 2016).

Obr. 13 – *Prostředí myšivky horské v Novohradských horách: údolí řeky Malše v Tiché/Leopoldschlagu (foto Resch 2016).*

in the future (e.g., by installing nest boxes). Wildlife cameras also appear to be an efficient way to detect the birch mouse (van der Kooij & Møller 2018, Stille et al. 2018, Resch & Resch 2019). However, a standardized approach (for example the number of camera traps per unit area or use of bait) to get comparable data is missing. In addition, wildlife cameras and owl pellet/food remains analysis cannot provide insights into population biology – live captures are invaluable for specific questions and purposes.

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Literature

- Anděra M. & Beneš B. (2002): Atlas rozšíření savců v České republice. Předběžná verze. IV. Hlodavci (Rodentia) – část 2. Myšovití (Muridae), myšivkovití (Zapodidae). – Národní muzeum, Praha, 116 p.
- Anděra M. & Gaisler J. (2019): Savci České republiky: popis, rozšíření, ekologie, ochrana. – Academia, Praha, 286 p.
- Anděra M. & Hanák V. (2004): Savci (Mammalia): výsledky výzkumu 1957–2004. – In: Papáček M. (ed.), Biota Novohradských hor: modelové taxony, společenstva a biotopy, pp. 227–247, Jihočeská univerzita, České Budějovice.
- Anděra M., Vohralík V. & Zbytovský P. (1970): Ein Fund der Birkenmaus (*Sicista betulina* Pall., 1779) im Bergzug Novohradské hory. – Zoologické listy 19(3): 247–248.
- Ehrendorfer F. & Hamann U. (1965): Vorschläge zu einer floristischen Kartierung von Mitteleuropa. – Berichte der Deutschen Botanischen Gesellschaft 78(1): 35–50.
- Engleder T., Lego E. & Plass J. (2005): Aktuelles zur Birkenmaus (*Sicista betulina* Pallas 1779) in der Dreiländerregion Tschechien / Deutschland / Österreich. – Beitr. Naturk. Oberösterreichs 14: 19–25.
- Hable V. E. & Spitzenberger F. (1989): Die Birkenmaus, *Sicista betulina* Pallas, 1779 (Mammalia, Rodentia) in Österreich. – Mitt. Abt. Zool. Landesmus. Joanneum 43: 3–22.
- Kloubec B. & Obuch J. (2003): Rozšíření drobných savců na Šumavě na základě analýzy potravy sýce rousného (*Aegolius funereus*). – Silva Gabreta 9: 183–200.
- Kooij J. van der & Møller J. D. (2018): Bjørkemus *Sicista betulina* i Frostviken, Sverige: videreutvikling av påvisningsmetoder. – Naturformidling van der Kooij, Slattum, 95 p.
- Kratochvíl J. & Grulich I. (1949): Příspěvek k poznání savčí zvěře Jeseníků I. – Přírodovědecký sborník Ostravského kraje 10: 1–20.
- Meinig H., Schulz B. & Kraft R. (2015): Die Waldbirkenmaus (*Sicista betulina*) bringt Säugetierkundler an die Grenzen. Wie geht man mit Verantwortungen und EU-Verpflichtungen bei nicht erfassbaren Arten um? – Natur und Landschaft 90(5): 214–223.
- Mikeš V. (2018): Nové nálezy myšivky horské (*Sicista betulina*) v jižních Čechách a perspektivy zjišťování jejího výskytu (Rodentia: Dipodidae). – Lynx, n. s. -(Praha) 49: 247–252.
- Mikeš V. & Lepší M. (2012): Pozorování myšivky horské *Sicista betulina* (Mammalia: Rodentia: Dipodidae) v severní části Novohradských hor. – Sborník Jihočeského muzea v Českých Budějovicích, Přírodní vědy 52: 236–237.
- Resch S. & Blatt C. (2017): Die Birkenmaus (*Sicista betulina*) im Mühlviertel – Erstnachweis im Leonfelder Hochland. – Öko-L 39(1): 11–12.
- Resch S. & Resch C. (2019): Neue Nachweise der schwer erfassbaren Waldbirkenmaus (*Sicista betulina* PALLAS, 1779) mit Wildtierkameras im Nationalpark Gesäuse. – Joannea Zoologie 17: 11–22.
- Resch S. & Resch C. (2020): Wildtierkameras und künstliche Quartiere zur Erhebung von Kleinsäuger-Präsenzdaten am Beispiel montaner Lebensräume. – Mitteilungen Haus der Natur 26: 55–62.

- Resch S. & Resch C. (2023): Die Waldbirkenmaus *Sicista betulina* (Pallas 1779). – In: J. Plass (ed.), Atlas der Säugetiere Oberösterreichs, pp. 481–485, Denisia 45, Linz.
- Resch C., Resch S. & Mätzler A. (2021): Die Waldbirkenmaus (*Sicista betulina* Pallas, 1779) in Vorarlberg. – inatura – Forschung online 81: 7.
- Slotta-Bachmayer L., Habenicht G., Reiter G., Resch C. & Resch S. (2023): Rote Liste der Säugetiere Oberösterreichs. – In: J. Plass (ed.), Atlas der Säugetiere Oberösterreichs, pp. 195–215, Denisia 45, Linz.
- Stille D., Kraft R. & Luding H. (2018): Die Waldbirkenmaus (*Sicista betulina*) im Bayerischen Wald – FFH-Monitoring einer schwer erfassbaren Kleinsäugerart mit Hilfe von Wildkameras. – Anliegen Natur 40(2): 63–68.
- Vohralík V., Hanák V. & Anděra M. (1972): Savci Novohradských hor. – Lynx, n. s. (Praha) 13: 66–84.
- Wettstein O. von (1965): Die erste Birkenmaus (*Sicista betulina* Pallas, 1779) Österreichs. – Zeitschrift für Säugetierkunde 30: 254–255.

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