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Recent range and distribution of dormice (Gliridae, Mammalia) in the Sudetes (Poland)

Jolanta BARTMAŃSKA, Magdalena MOSKA and Tomasz GOTTFRIED

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Abstract. The paper presents updated information on the occurrence of dormice in the Polish Sudetes, based on our 1993-2008 field studies in various parts of the region, and on the results of other studies conducted and published after 1983. The studies confirmed the occurrence of 3 dormice species in the Sudetes: edible dormouse *Glis glis* LINNAEUS, 1766, hazel dormouse *Muscardinus avellanarius* LINNAEUS, 1758, and forest dormouse *Dryomys nitedula* PALLAS, 1778. The edible dormouse occurs in all 5 macroregions of the Polish Sudetes. It is still fairly abundant in the Central and Eastern Sudetes, while it is quite rare in the Western Sudetes. The hazel dormouse is much less common, being slightly more abundant in some ranges of Central Sudetes (Bardzkie and Stołowe Mts, and the Landscape Park of Wałbrzych Sudetes), and Eastern Sudetes (the Złote Mts and the Snieżnik Massif). The occurence of the forest dormouse is limited to the Sudete Foreland (Strzelińskie Hills) and small parts of the Central (Stołowe Mts) and Eastern Sudetes (Złote and Bialskie Mts, Śnieżnik Massif), where all three species co-occur. Not a single locality of the garden dormouse *Eliomys quercinus* LINNAEUS, 1766 was found, which points to its disappearance from the Polish Sudetes.

Key words: Dormice, Sudetes, endangered species.

Jolanta BARTMAŃSKA, Wrocław University, Institute of Zoology, Sienkiewicza 21, PL 50-335 Wrocław, Poland.
E-mail: bajol@biol.uni.wroc.pl
Magdalena MOSKA, Wrocław University of Environmental and Life Sciences, Department of Genetics and Animal Breeding, Kożuchowska 7, PL 51-631 Wrocław, Poland.
Tomasz GOTTFRIED, Polish Society of Wildlife Friends "pro Natura", Podwale 75, PL 50-449 Wrocław, Poland.

I. INTRODUCTION

Four species of dormice occur in Poland, each of a different genus: the edible dormouse *Glis glis* LINNAEUS, 1766, the hazel dormouse *Muscardinus avellanarius* LINNAEUS, 1758, the forest dormouse *Dryomys nitedula* PALLAS, 1778, and the garden dormouse *Eliomys quercinus* LINNAEUS, 1766. All dormouse species are protected in Poland. The edible dormouse, forest dormouse and garden dormouse are included in the Polish Red Book (GŁOWACIŃSKI 2001), the first two species with near threatened (NT) category, the garden dormouse as critically endangered (CR).

The first records concerning the edible dormouse from the Sudetes, come from the 1930s from the Śnieżnik Massif (Eastern Sudetes), by German authors, (PAX 1935, 1937; PRENZEL 1935; MASCHKE 1935 – all after PUCEK & RACZYŃSKI 1983). After World War II (from which time part of the Sudetes belong to Poland), records from the environs of Śnieżnik were provided by HAJDUK and STAWARSKI (1959). During the next 30 years there were no studies on the occurrence of the edible dormouse in the Sudetes. Only in the last two decades has its distribution become the focus of interest. The studies resulted in confirming some of the earlier records and finding new localities of this rare species in various parts of the Sudetes. The edible dormouse was recorded from the Sudete Foreland: in Sobótka (INDYK & KOKUREWICZ 1991), in the Strzelińskie Hills (INDYK & PAWŁOWSKA-INDYK 1994a; WUCZYŃSKI & GARBOWSKI 2000); from the Western Sudete Foreland and the Western Sudetes: in the Izerskie Mts and Izerskie Foothills (BARTMAŃSKA 1994; BARTMAŃSKA et al. 1996), in the Kaczawskie Mts (JURCZYSZYN 1997; BARTMAŃSKA 1999a,b) and in the Karkonosze (BARTMAŃSKA 1993); from the Central Sudetes: in the Sowie Mts (JURCZYSZYN 1997; BARTMAŃSKA & MOSKA 2004a; MOSKA & BARTMAŃSKA 2004), in the Bardzkie Mts (BARTMAŃSKA & MOSKA 2002), in the Stołowe Mts (PIKULSKA & MIKUSEK 1997; MIKUSEK & PIKULSKA 1999; MOSKA & BARTMAŃSKA 2002; PIKULSKA & MIKUSEK 2003, 2005, 2007), and from the Eastern Sudetes: in the Złote Mts (BARTMAŃSKA & MOSKA 2002, 2004b), in the Śnieżnik Massif (WISZNIOWSKA & STEFANIAK 1996; JURCZYSZYN 1997; JURCZYSZYN & WOŁK 1998; PUCEK & JURCZYSZYN 2001; MOSKA & BARTMAŃSKA 2002) and in the Bialskie Mts (MOSKA & BARTMAŃSKA 2002, 2005; MOSKA et al. 2007).

The hazel dormouse occurs especially in the southern and eastern parts of Poland, from the Sudetes to the Lublin Upland. Already in 1912-1939 German zoologists reported its occurrence in the Sudetes, in the Sudete Foreland: in the environs of Strzegom (UTTENDÖRFER 1939; after PUCEK & RACZYŃSKI 1983); in the Western Sudetes in Karkonosze (MILLER 1912, after PUCEK & RACZYŃSKI 1983); in the Central Sudetes: in the Bolkowsko-Wałbrzyskie Foothills, in the Sowie Mts (MERKEL 1933; SCHLOTT 1925 – both after PUCEK & RACZYŃSKI 1983); in the Eastern Sudetes: in the environs of Bystrzyca Kłodzka and in the Śnieżnik Massif (Międzygórze) (PAX 1925; SCHLOTT 1925 – both after PUCEK & RACZYŃSKI 1983). HAJDUK and STAWARSKI (1959), confirmed its presence in the Sudete Foreland (Ślęża Massif), and in the Eastern Sudetes (Śnieżnik Massif). In the 1970s it was recorded from the Western Sudete Foothills and the Western Sudetes: in the Izerskie Foothills, Izerskie Mts and Karkonosze; from the Central Sudetes: in the Kamienne and Sowie Mts; and from the Eastern Sudetes: in the Śnieżnik Massif (CHUDOBA et al. 1973; HAITLINGER 1973; SAŁATA-PIŁACIŃSKA 1977).

In the 1990s, after a long break, faunistic studies in the Sudetes were resumed and the hazel dormouse was recorded from the Sudete Foreland: in Ślęża Massif and Niemczańsko-Strzelińskie Hills (INDYK & KOKUREWICZ 1991; INDYK & PAWŁOWSKA-INDYK 1994a); from the Izerskie Foothills and Izerskie Mts (BARTMAŃSKA 1994), and from the Western Sudetes: in Karkonosze (INDYK & PAWŁOWSKA-INDYK 1994b) and Rudawy Janowickie (NOWAKOWSKI 1994); from the Central Sudetes: in the Stołowe Mts (MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 1997, 2007) and Bardzkie Mts (BARTMAŃSKA & MOSKA 2002); and from the Eastern Sudetes: in the Złote Mts (BARTMAŃSKA & MOSKA 2004b), Śnieżnik Massif and Krowiarki range (WISZNIOWSKA & STEFANIAK 1996) and Bialskie Mts (MOSKA et al. 2007).

The forest dormouse generally occurs in the south and east of Poland (PUCEK 2001a). In 1925-1941, it was recorded by German authors from the Central Sudetes: in the Bystrzyckie Mts (PAX 1937; SCHLOTT 1941 – both after PUCEK & RACZYŃSKI 1983); in the Eastern Sudetes: in the Złote Mts (SCHLOTT 1931, 1941 after PUCEK & RACZYŃSKI 1983), in the Śnieżnik Massif (PAX 1925 after PUCEK & RACZYŃSKI 1983), and in the Bialskie Mts (SCHLOTT 1931 after PUCEK & RACZYŃSKI 1983). In the post-World War II period HAJDUK and STAWARSKI (1959), confirmed its presence in the Central Sudetes: in the Bystrzyckie Mts and in the Eastern Sudetes: in the Złote Mts, Śnieżnik Massif and Bialskie Mts. During the last 25 years it was also found in the Sudete Foreland: in the Strzelińskie Hills (KOSIOR 1996); and in the Central Sudetes: Stołowe (MIKUSEK & PIKUL-

SKA 1999; PIKULSKA & MIKUSEK 2007), and Bardzkie Mts (BARTMAŃSKA & MOSKA 2002); and in the Eastern Sudetes: in the Złote, Śnieżnik Massif and Bialskie Mts (BARTMAŃSKA & MOSKA 2002; MOSKA & BARTMAŃSKA 2005; MOSKA et al. 2007).

The garden dormouse is at present becoming extinct in Poland (PUCEK 2001b). In the 1930s it was recorded only in two localities from the Central Sudetes: in the Kamienne Mts (environs of Mieroszów) and in the Kłodzko Basin (environs of Krosnowice) (PUCEK & RACZYŃSKI 1983).

The objective of this paper is to summarise dormouse records for the entire area of the Polish Sudetes, according to our 1993-2008 field studies. In order to present up-to-date and complete data on the distribution of dormice in the Polish Sudetes, we also included the records of other authors, published after 1983, from which some were also confirmed in this study. The earlier records (concerning years 1912-1983) of dormice from Polish Sudetes are included in the *Atlas of mammals of Poland* (PUCEK & RACZYŃSKI 1983).

II. STUDY AREA

The Sudetes, forming a part of the Czech Massif, extend along the border of Poland with the Czech Republic and Germany. The studies were conducted in the entire area (5 macroregions) of Polish Sudetes (54°04´-51°15´N and 14°40´-17°44´E), including the mesoregions of the Sudete Foreland: Świdnica Plain, Ślęża Massif, Niemczańsko-Strzelińskie Hills; Western Sudete Foothills: Izerskie, Kaczawskie and Wałbrzyskie Foothills; Western Sudetes: Izerskie and Kaczawskie Mts, Jelenia Góra Basin, Karkonosze and Rudawy Janowickie; Central Sudetes: Wałbrzyskie, Kamienne, Sowie, Bardzkie, Stołowe, Bystrzyckie Mts, Kłodzko Basin and Rogówka Hills; and Eastern Sudetes: Złote Mts, Śnieżnik Massif, Krowiarki range, Bialskie and Opawskie Mts (KONDRACKI 1998). A distinct vegetational zonation is marked in the Sudetes. The zones include a submontane zone (up to 500 m a.s.l.), lower mountain zone (deciduous and mixed forests) up to 1000 m a.s.l. and upper mountain zone (coniferous forests) reaching up to 1300 m a.s.l. Even higher, the dwarf pine zone (to 1450 m a.s.l.), and the alpine zone are situated. The forests are irregularly distributed and occupy ca. 30% of the area of the Sudetes.

The dominant tree species is spruce *Picea exelsa*, the proportion of which frequently exceeds 80% (Śnieżnik Massif, Kamienne, Bystrzyckie and Bialskie Mts.) It is accompanied by the pine *Pinus silvestris*, larch *Larix decidua*, fir *Abies alba*, as well as beech *Fagus sylvatica*, oak *Quercus* sp., sycamore maple *Acer pseudoplatanus,* ash *Fraxinus excelsior*, alder *Alnus glutinosa* and birch *Betula verrucosa*.

III. METHODS

In the present paper we used all available sources of data on the occurence of dormice. The main source of data were our own observations conducted from July till October in 1993-2008, including controls of nest boxes (after breeding season) and hunter's high seats, call surveys, hair analysis (according to DZIURDZIK 1978), searching for faeces, traces of feeding and nests. During two periods 1993-1997 and 2004-2006 live-traps for small mammals were also used (under permissions of the Ministry of Nature Conservation no. DOPOg.-4201-04-59/04; DOPOg.-4201-04-5/05). Inquiries from forestry divisions within the forestry districts of the Lower Silesian State Forests were checked in the field. A list of the localities of each species is presented in Tables I-III. The occurence of each species of dormice was plotted on a map with the Universal Transverse Mercator (UTM) grid (10x10km), and the percentage of squares in which the dormice were encountered were counted in relation to all 130 squares covered totally or in part by the Polish Sudetes (Fig. 1). The distribution of the three species of dormice in relation to the ranges and macroregions of Sudetes is presented on Fig. 2.

IV. RESULTS

Edible dormouse

The edible dormouse was found in a total of 47 UTM squares (Fig. 1), which occupies ca. 36% of the total study area.

Among these, the edible dormouse was found in 28 new squares in the mesoregions of Sudete Foreland (Ślęża Massif – XS13, Niemczańsko-Strzelińskie Hills – XS31, XS40, XS41, Otmuchowskie Depression – XR49), Western Sudete Foothills and Western Sudetes (Izerskie Mts. & Izerskie Foothills – WS14, WS15, Karkonosze Mts – WS52, Kaczawskie Mts and Kaczawskie Foothills – WS55, WS66, Bolkowsko-Wałbrzyskie Foothills – WS74, WS83, WS84), Central Sudetes (Kamienne Mts – WS91, Sowie Mts – XS01, XS02, Bardzkie Mts – XR28, XR29, Stołowe Mts – XR08, Bystrzyckie Mts – XR07, and Kłodzko Basin and Rogówka Hills – XR18), and Eastern Sudetes (Złote Mts – XR37, XR38, XR47, Śnieżnik Massif and Krowiarki range – XR27, Bialskie Mts – XR46, Opawskie Mts – XR67, XR77) (Table I; Figs 1, 2).

We confirmed the occurrence of the edible dormouse in 14 UTM squares, in which it had been recorded earlier by other authors: in the Sudete Foreland: Ślęża Massif (XS23, XS24) (INDYK & KOKUREWICZ 1991), Niemczańsko-Strzelińskie Hills (XS22, XS42) (WUCZYŃSKI & GARBOWSKI 2000; INDYK & PAWŁOWSKA-INDYK 1994a); in Western Sudetes and Western Sudetic Foothills: Kaczawskie Mts and Kaczawskie Foothills (WS64, WS65), and Bolkowsko-Wałbrzyskie Foothills (WS73, WS75) (JURCZYSZYN 1997; JURCZYSZYN & WOŁK 1998); in the Central Sudetes: Sowie Mts (XS10, XS11, XR19) (JURCZYSZYN 1997; JURCZYSZYN & WOŁK 1998), Stołowe Mts (WR99) (MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 1997, 2003, 2005, 2007), and Eastern Sudetes: Śnieżnik Massif and Krowiarki range (XR26, XR36) (HAJDUK & STAWARSKI 1959; WISZNIOWSKA & STEFANIAK 1996) (Table I, Figs 1, 2).

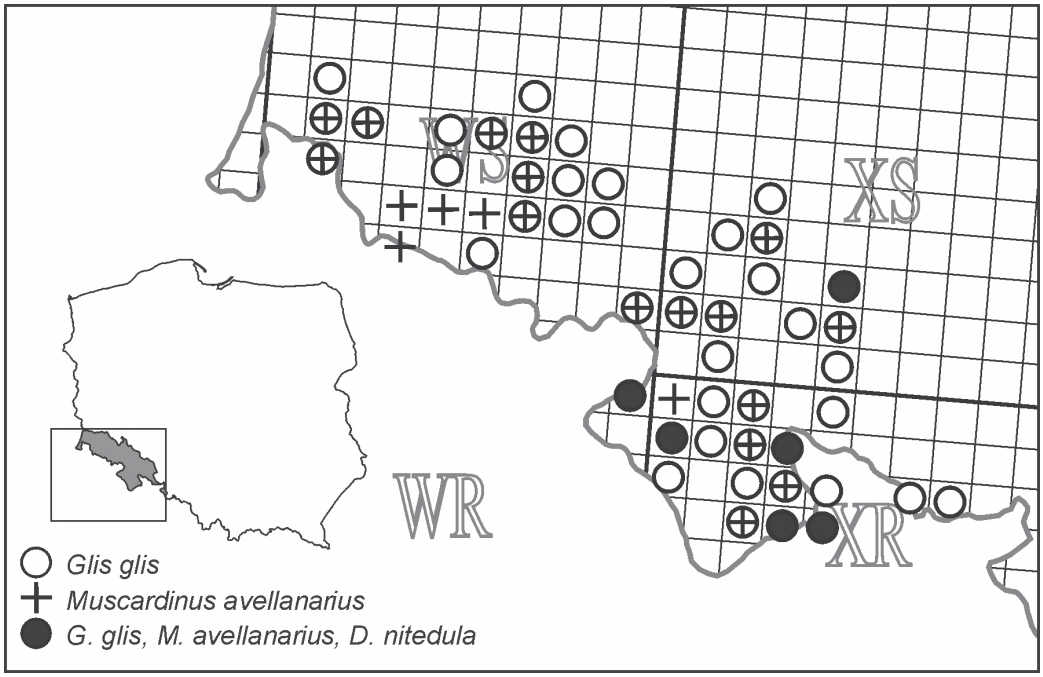

Fig. 1. The distribution of dormice (Gliridae) in the Sudetes, according to UTM squares (WS, WR, XS, XR).

Table I

The list of localities of edible dormouse *Glis glis* in the Sudetes

Regions	Mountain range	UTM	Localities and sources of data
Sudete Foreland	Ślęża Massif	XS 13	– Kiełczyn, Skalna – our observation (September 2005)
		XS 23	– Sobótka – INDYK & KOKUREWICZ 1991; – Ślęża Massif, Sulistrowiczki, Domaszew, Oleszańskie Hills – our observation (September 2005)
		XS 24	– Rogów Sobócki – INDYK & KOKUREWICZ 1991; – Ślęża Massif – our observation (September 2005)
	Niemczańsko-Strzelińskie Hills	XS 22	– Krzyżowe Hills – WUCZYŃSKI & GARBOWSKI 2000; – Gilowskie Hills – our observation (September 2005)
		XS 31	– Muszkowicki Beech Wood – our observation (August 2001, 2005)
		XS 40	– Ziębice, Kalinowice – our observation (August 2005)
		XS 41	– Henryków, Jasienica, Romanów, Witosławice, Dobroszów – our observation (August 2005, July 2007)
		XS 42	– Lipowe Hills – INDYK & PAWŁOWSKA-INDYK 1994a; – Dębniki, Gębczyce – our observation (August 2005)
	Otmuchowskie Depression	XR 49	– Głęboka – our observation (August 2005)
Western Sudete Foothills and Western Sudetes	Izerskie Mts and Izerskie Foothills	WS 14	– Miłoszycki Wood – BARTMAŃSKA 1994
		WS 15	– Lubański Big Wood – BARTMAŃSKA 1994
		WS 16	– Platerówka – PAWŁOWSKA-INDYK & INDYK 1996
		WS 25	– Olszyna Leśna – PAWŁOWSKA-INDYK & INDYK 1998
		WS 44	– forest complex near Pokrzywnik – PAWŁOWSKA-INDYK & INDYK 1999
		WS 45	– forest complex near Marczów and Przeździerza – PAWŁOWSKA-INDYK & INDYK 1999
	Karkonosze Mts	WS 52	– forest complex to the south of Kowary – BARTMAŃSKA 1993
	Rudawy Janowickie Mts	WS 63	– Rudawy Janowickie (Lisie Mts) – INDYK & PAWŁOWSKA-INDYK 1994b
	Kaczawskie Mts and Kaczawskie Foothills	WS 55	– forest complexes to the south of Sokołowiec – BARTMAŃSKA 1999a,b
		WS 63	– Ołowiane Mts – PODSADOWSKA (2002)
		WS 64	– Kaczawskie Mts – JURCZYSZYN 1997, JURCZYSZYN & WOŁK 1998; – forest complexes near Janochów, Wojcieszów, Mysłów and Dobków – BARTMAŃSKA 1999a,b; our observation (June 2007)
		WS 65	– forest complexes near Rzeszówek and Sędziszowa – JURCZYSZYN 1997, JURCZYSZYN & WOŁK 1998; – forest complexes near Rzeszówek, Jurczyce and Nowy Kościół and Różana – BARTMAŃSKA 1999a,b; our observation (June 2007)
		WS 66	– Wąwóz Myśliborski, forest complexes to north-east of Leszczyna – BARTMAŃSKA 1999a,b

Table I cont.

Regions	Mountain range	UTM	Localities and sources of data
Western Sudete Foothills and Western Sudetes	Bolkowsko Wałbrzyskie Foothills	WS 73	– the vicinity of Rochowice – JURCZYSZYN 1997, JURCZYSZYN & WOŁK 1998; – forest complexes near Płonina and Wierzchosławice – BARTMAŃSKA 1999a,b
		WS 74	– Bolków Forest District: forest complexes south-west of Pogwizdów and Lipa – BARTMAŃSKA 1999a,b; – forest complexes in the vicinity of Stare and Nowe Rochowice – BARTMAŃSKA 1999a,b; our observation (August 2002, September 2005)
		WS 75	– the vicinity of Leszczyna – JURCZYSZYN 1997, JURCZYSZYN & WOŁK 1998; – forest complexes between Muchów and Nowa Wielka Wieś – BARTMAŃSKA 1999a,b
		WS 83	– Dobromierz Forest District: forest complexes north-west and south-east of Sady Górne – call survey, interview; BARTMAŃSKA 1999a,b
		WS 84	– forest complexes near Sady Dolne, Wolbromek and Kłaczyna – BARTMAŃSKA 1999a,b
Central Sudetes	Kamienne Mts	WS 91	– forest complexes in the vicinity of Głuszyca, Grzmiąca and Rybnica – BARTMAŃSKA & MOSKA 2004a,b; our observation (September 2007)
	Sowie Mts	XS 01	– Kalenica Forest District and Rościszów Forest District: forest complexes in the vicinity of Rzeczka, Jugów, Jugowska Pass – BARTMAŃSKA & MOSKA 2004a,b
		XS 02	– Piskorzów Forest District – BARTMAŃSKA & MOSKA 2004a,b
		XS 10	– Jugów Forest District – JURCZYSZYN 1997, JURCZYSZYN & WOŁK 1998; – Wolibórz, Srebrna Góra – our observation (September 2005)
		XS 11	– Jugów Forest District – JURCZYSZYN 1997, JURCZYSZYN & WOŁK 1998; – Bielawa Forest District: Koci Grzbiet – our observation (August 2004); – Jodłownik, Zległe Mts, Żołędna Mt, Czarcia Mt, Karw Mt – our observation (September 2005)
		XR 19	– Korzyń Mt, Nowa Wieś – JURCZYSZYN 1997, JURCZYSZYN & WOŁK 1998; – forest complexes near Wilcza, Czerwieńczyce, Wojbórz and Bierkowice – BARTMAŃSKA & MOSKA 2002
	Bardzkie Mts	XS 10	– Kortunał Massif, forest complexes near Ždanów – BARTMAŃSKA & MOSKA 2002
		XR19	Garb Golińca north of Bierkowice –BARTMAŃSKA & MOSKA 2002
		XR 28	– Obszerna Mt, Ostra Mt, andPodzamecka Kopa, Podzamecka Pass – BARTMAŃSKA & MOSKA 2002
		XR 29	– Szeroka Mt, Olchówka, Gajnik, Kłodzka Mt Kłapacz – BARTMAŃSKA & MOSKA 2002 – Opolnica Mt – our observation (September 2004)

Table I cont.

Regions	Mountain range	UTM	Localities and sources of data
Central Sudetes	Stołowe Mts	WR 99	– Karłów, Skały Puchacza, Szczeliniec, Lisia Pass, Radków, National Park of Stołowe Mts – PIKULSKA & MIKUSEK 1997, 2003, 2005, 2007; MIKUSEK & PIKULSKA 1999; – Radków, Skalne Filary – our observation (August 2004)
		XR 08	– Szczytna – MOSKA & BARTMAŃSKA 2002, PIKULSKA & MIKUSEK 2007
	Bystrzyckie Mts	XR 07	– Orlica Forest District MOSKA & BARTMAŃSKA 2002
		XR 08	– Gołębia Mt – MOSKA & BARTMAŃSKA 2002
	Kłodzka Basin and Rogówka Hills	XR18	– Rogówka Hills (Sośnina Mt) – BARTMAŃSKA & MOSKA 2002
		XR 28	– Rogówka Hills (Sarnica Mt) – MOSKA & BARTMAŃSKA 2002
Eastern Sudetes	Złote Mts	XR 28	– Mały Sokolec, Sokolec, Bodak, Chwalisławska Pass, Ptasznik Mt, Leszczynowa Pass, Dzika Valley, Bzowiec, Siniak, Radochowska Cave, Biały Kamień – BARTMAŃSKA & MOSKA 2002, 2004b
		XR 37	– Karpno Mt – BARTMAŃSKA & MOSKA 2004b
		XR 38	– Kopciowa Mt, Jawornik Wielki Mt, Złoty Jar, Różeniec Pass, Orłowiec Mt, Rasztowiec Mt, Wójtowa Mt, Orlówka Mt, Orłowiec Mt, Ciecierza Mt – BARTMAŃSKA & MOSKA 2002, 2004b
		XR 47	– forest complex east of Nowy Gierałtów – BARTMAŃSKA & MOSKA 2002, 2004b
	Śnieżnik Massif	XR 26	– forest complex near Międzygórze – WISZNIOWSKA & STEFANIAK 1996; – Biała Woda – JURCZYSZYN 1997, MOSKA & BARTMAŃSKA 2002
		XR 27	– Trzebieszowice Forest District – MOSKA & BARTMAŃSKA 2002
		XR 36	– Śnieżnik Massif – WISZNIOWSKA & STEFANIAK 1996; – Kletno – MOSKA & BARTMAŃSKA 2002; our observation (August 2007)
	Krowiarki Range	XR 27	– forest complex near Romanowo (Słupiec Mt.) – BARTMAŃSKA & MOSKA 2002; – Różanka – BARTMAŃSKA & MOSKA 2002
		XR 28	– forest complexes to the east of Żelazno – BARTMAŃSKA & MOSKA 2002
	Bialskie Mts	XR 36	– Bolesławów Forest District – MOSKA & BARTMAŃSKA 2002
		XR 37	– Młynowiec – MOSKA & BARTMAŃSKA 2002
		XR 46	– forest complex south of Bielice – MOSKA & BARTMAŃSKA 2002
	Opawskie Mts	XR 67	– Sławniowice – our observation (August 2007)
		XR 77	– Pokrzywna – our observation (August 2007)

Moreover, after 1983 the edible dormouse was recorded from 5 squares by other authors in the Western Sudete Foothills and Western Sudetes: in the Izerskie Foothills (WS16, WS25, WS44, WS45) (PAWŁOWSKA-INDYK & INDYK 1996, 1998, 1999), in the Rudawy Janowickie Mts (WS63) (INDYK & PAWŁOWSKA-INDYK 1994b), and in the Ołowiane Mts (WS63) (PODSADOWSKA 2002).

The edible dormouse was the only dormouse species in 25 squares. These were squares situated in the mesoregions of Sudete Foreland (Ślęża Massif – XS13, XS24, Niemczańsko-Strzelińskie Hills – XS22, XS31, XS40, Otmuchowskie Depression – XR49), Western Sudete Foothills and Western Sudetes (Izerskie Mts – WS16, WS44, WS45, Kaczawskie Mts and Kaczawskie Foothills – on the boundary with Bolkowsko-Wałbrzyskie Foothills – WS66, and on the boundary with Świdnica Plain – WS73, WS74, WS75, WS83, WS84, and Karkonosze WS52); Central Sudetes (Sowie Mts – XS02, XS10, XR19, and Bystrzyckie Mts – XR07, Kłodzko Basin and Rogówka Hills – XR18) and Eastern Sudetes (Złote Mts – XR47, Krowiarki range – XR27 and Opawskie Mts – XR67, XR77). In the remaining 22 squares it co-occurred with the hazel dormouse, from these in 6 also with the forest dormouse (Table I, Figs 1, 2).

Hazel dormouse

The hazel dormouse was found in 27 squares, constituting ca. 21% of the area of the Sudetes. Among these, we yielded new records in 17 squares in Sudete Foreland: Niemczańsko-Strzelińskie Hills (XS41, XS42), the Western Sudetes: in the Izerskie Mts and Izerskie Foothills (WS14, WS15, WS33), Jelenia Góra Basin (WS64), and Kaczawskie Foothills (WS55, WS65); in the Central Sudetes: in the Kamienne Mts (WS91), Sowie Mts (XS01, XS11, WS91) (BARTMAŃSKA & MOSKA 2004a), Bardzkie Mts (XR28, XR29) (BARTMAŃSKA & MOSKA 2002); and in the Eastern Sudetes: in the Złote Mts (XR28, XR38) (BARTMAŃSKA & MOSKA 2002), Śnieżnik Massif (XR26) and in the Bialskie Mts (XR37, XR46) (MOSKA & BARTMAŃSKA 2002; MOSKA et al. 2007) (Table II, Figs 1, 2).

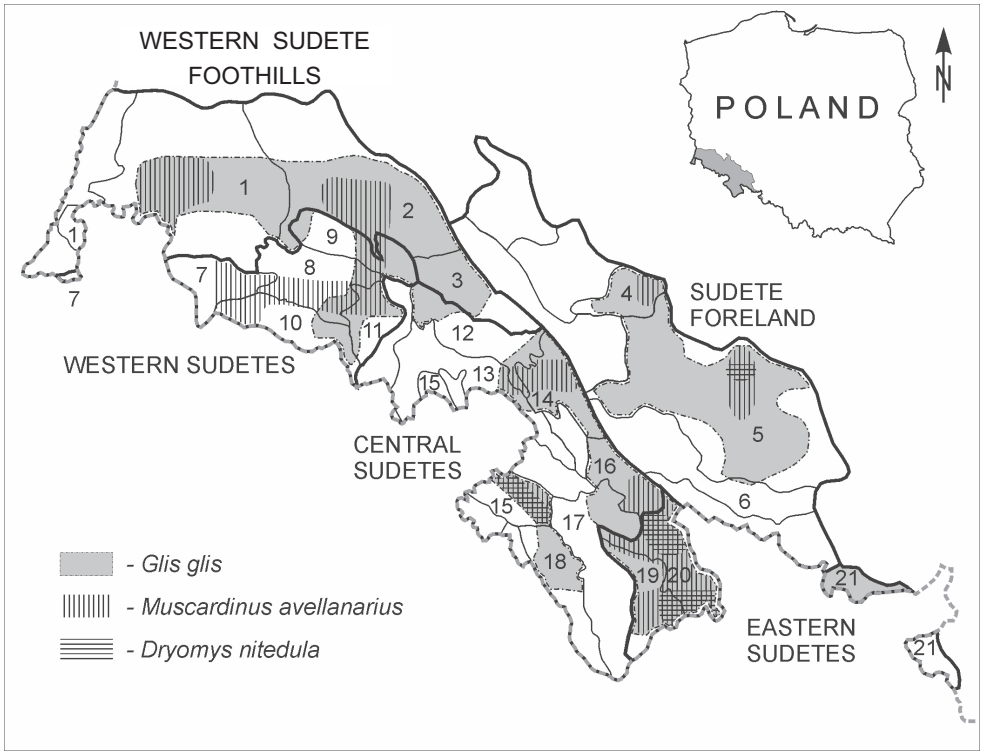

Fig. 2. The distribution of dormice (Gliridae) in Sudetes, according to regions and mountain ranges. 1. Izerskie Foothills, 2. Kaczawskie Foothills, 3. Bolkowsko-Wałbrzyskie Foothills, 4. Ślęża Massif, 5. Niemczańsko-Strzelińskie Hills, 6. Otmuchowskie Depression, 7. Izerskie Mts, 8. Jeleniogórska Basin, 9. Kaczawskie Mts, 10. Karkonosze Mts, 11. Rudawy Janowickie Mts, 12. Wałbrzyskie Mts, 13. Kamienne Mts, 14. Sowie Mts 15. Stołowe Mts, 16. Bardzkie Mts, 17. Kłodzka Basin, 18. Bystrzyckie Mts, 19. Śnieżnik Massif, 20. Złote Mts, 21. Opawskie Mts.

Table II

The list of localities of the hazel dormouse *Muscardinus avellanarius* in the Sudetes

Regions	Mountain Range	UTM	Localities and source of data
Sudete Foreland	Ślęża Massif	XS 23	– Będkowice, Sulistrowiczki – INDYK & KOKUREWICZ 1991
	Niemczańsko-Strzelińskie Hills	XS 41	– Henryków, Jasienica, Romanów, Witosławice – our observation (August 2005)
		XS 42	Gębczyce – our observation (August 2005)
Western Sudete Foothills and Western Sudetes	Izerskie Mts and Izerskie Foothills	WS 14	– Świecie – our observation (August 1996)
		WS 15	– Miłoszycki Wood – BARTMAŃSKA 1993
		WS 25	– Olszyna Dolna – PAWŁOWSKA-INDYK & INDYK 1998
		WS 33	– Rozdroże Izerskie – our observation (August 1996)
	Karkonosze Mts	WS 32	– Szklarska Poręba – INDYK & PAWŁOWSKA-INDYK 1994b
		WS 43	– Podgórzyn Górny, Zachełmie – INDYK & PAWŁOWSKA-INDYK 1994b
		WS 53	– Jagniątków – INDYK & PAWŁOWSKA-INDYK 1994b
	Rudawy Janowickie Mts	WS 63	– Janówka valley, Zamek Bolczów – NOWAKOWSKI 1994
	Jeleniogórska Basin	WS 64	– Maciejowa – our observation (August 1993)
	Kaczawskie Foothills	WS 55	– Radomiłowice – our observation (August 1996)
		WS 65	– Rzeszówek, Nowy Kościół – our observation (August 1996)
Central Sudetes	Kamienne Mts	WS 91	– Głuszyca – our observation (September-October 2005)
	Sowie Mts	XS 01	– Jugów – BARTMAŃSKA & MOSKA 2004a
		XS 11	– Pieszyce – BARTMAŃSKA & MOSKA 2004a
		WS 91	– Sierpnica – BARTMAŃSKA & MOSKA 2004a
	Bardzkie Mts	XR 28	– Laski, Mąkolno – BARTMAŃSKA & MOSKA 2002
		XR 29	– Wojciechowice, Podzamek, Chwalisław – BARTMAŃSKA & MOSKA 2002
	Stołowe Mts	XR 08	– Batorów – PIKULSKA & MIKUSEK 1997, 2007; MIKUSEK & PIKULSKA 1999; – Ciecierzyce – MOSKA & BARTMAŃSKA 2002
		XR 09	– Studzienno – PIKULSKA & MIKUSEK 1997, 2007; MIKUSEK & PIKULSKA 1999
		WR 99	– Karłów, Radków, Czerwona Woda (Wielkie Torfowisko Batorowskie) – PIKULSKA & MIKUSEK 1997, 2007; MIKUSEK & PIKULSKA 1999
Eastern Sudetes	Złote Mts	XR 28	– Ptasznik Mt, Chwalisławska Pass, Sokolec Mt – BARTMAŃSKA & MOSKA 2002
		XR 38	– Złoty Stok – BARTMAŃSKA & MOSKA 2002
	Śnieżnik Massif	XR 26	– Międzygórze – our observation (August 2008)
		XR 36	– Śnieżnik Massif – WISZNIOWSKA & STEFANIAK 1996
	Bialskie Mts	XR 37	– Młynowiec – MOSKA & BARTMAŃSKA 2002; MOSKA et al. 2007
		XR 36	– Nowa Morawa – MOSKA & BARTMAŃSKA 2002, MOSKA et al. 2007
		XR 46	– Bielice – MOSKA & BARTMAŃSKA 2002, MOSKA et al. 2007

The occurrence of the hazel dormouse was confirmed in 2 squares: Stołowe Mts (XR08) (MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 2007), and Śnieżnik Massif (XR36) (HAJDUK & STAWARSKI 1959; WISZNIOWSKA & STEFANIAK 1996) (Table II, Figs 1, 2).

After 1983 the hazel dormouse was also recorded by other authors in 8 squares from the area of Sudete Foreland: in the Ślęża Massif (XS23) (INDYK & KOKUREWICZ 1991); in the Western Sudete Foothills and Western Sudetes: in the Izerskie Mts (WS25) (PAWŁOWSKA-INDYK & INDYK 1998); in the Karkonosze Mts (WS32, WS43, WS53) (INDYK & PAWŁOWSKA-INDYK 1994b; PAWŁOWSKA-INDYK & INDYK 1999), in the Rudawy Janowickie (WS63) (NOWAKOWSKI 1994); in the Central Sudetes: in the Stołowe Mts (XR09, WR99) (MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 2007) (Table II, Figs 1, 2).

The hazel dormouse was the only recorded dormouse in 5 squares located in the Western Sudetes and Western Sudete Foothills – in the Izerskie Mts: Rozdroże Izerskie (WS33), in the Karkonosze Mts: in Szklarska Poręba, Podgórzyn Górny, Zachełmie and Jagniątków (WS32, WS43, WS53) (INDYK & PAWŁOWSKA-INDYK 1994b; PAWŁOWSKA-INDYK & INDYK 1999), and in Stołowe Mts (XR09) (MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 2007).

As mentioned above, the hazel dormouse co-occurs with the edible dormouse in 22 squares which form ca. 17% of the studied area. The area includes the Sudete Foreland – Ślęża Massif (XS23), Niemczańsko-Strzelińskie Hills (XS41, XS42); Western Sudetes and Western Sudete Foothills – the Izerskie Foothills (WS14, WS15, WS25), Rudawy Janowickie (WS63), Jeleniogórska Basin (WS64), Kaczawskie Mts (WS55, WS65); and central Sudetes – Kamienne Mts (WS91), and Sowie Mts (XS01, XS11, WS91), the Bardzkie Mts (XR28, XR29), Stołowe Mts (XR08, WR99); Eastern Sudetes – Złote Mts (XR28, XR38), Śnieżnik Massif (XR26, XR36), Bialskie Mts (XR36, XR37, XR46), (Table II, Figs 1, 2).

Forest dormouse

The forest dormouse was found in only 6 squares, which amounts to 4,6% of all squares in the territory (Fig. 1). It co-occurred with the edible dormouse and common dormouse at all these sites: in the Sudete Foreland – in the Niemczańsko-Strzelińskie Hills (XS42) (KOSIOR 1996); in the Central Sudetes – in the Stołowe Mts (XR08, WR99) (MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 2007); in the Eastern Sudetes – in the Śnieżnik Massif (XR36) (WISZNIOWSKA & STEFANIAK 1996), in the Złote Mts (XR38) (BARTMAŃSKA & MOSKA 2002), and in the Bialskie Mts (XR36 and XR46), where it had been earlier recorded by SCHLOTT (1931, 1941, both after PUCEK & RACZYŃSKI 1983), and then by HAJDUK & STAWARSKI (1959), we confirmed its occurrence (MOSKA et al. 2007) (Table III, Figs 1, 2).

Table III

The list of localities of the forest dormouse *Dryomys nitedula* in the Sudetes

Regions	Mountain Range	UTM	Localities and source of data
Sudete Foreland	Niemczańsko-Strzelińskie Hills	XS 42	– Gębczyce – KOSIOR 1996
Central Sudetes	Stołowe Mts	XR 08	– Batorów – MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 2007
		WR 99	– Czerwona Woda, Darnków – MIKUSEK & PIKULSKA 1999; PIKULSKA & MIKUSEK 2007
Eastern Sudetes	Złote Mts	XR 38	– Wojtówka – BARTMAŃSKA & MOSKA 2002
	Śnieżnik Massif	XR 36	– Śnieżnik Massif (slope of Żmijowiec) – WISZNIOWSKA & STEFANIAK 1996
	Bialskie Mts	XR 36	– Nowa Morawa – MOSKA & BARTMAŃSKA 2002, MOSKA et al. 2007
		XR 46	– Bielice – MOSKA & BARTMAŃSKA 2002, MOSKA et al. 2007

Garden dormouse

During the study, we did not find any locality of the garden dormouse.

V. DISCUSSION

Dormice occur in all macroregions and mesoregions of the Polish Sudetes, however they are distinctly less common in the Western Sudetes compared to the central and eastern parts. According to our results and the literature published after 1983, dormice were encountered in 52 of 130 UTM squares covering the Polish part of the Sudetes, which encompasses 40% of the area. From these, more than half of all squares with localities of the edible dormouse and hazel dormouse and one of the forest dormouse were established during our 1993-2008 studies, and 18 others were confirmed.

In 25 squares, almost half of the area occupied by dormice, the edible dormouse is the only species representing the family. The frequent occurrence of the edible dormouse in the Sudetes was also indicated by JURCZYSZYN (1997). However, in the western part of the area, in the Izerskie Mts and Izerskie Foothills, its localities are scattered. The species is also absent from the adjacent part of the Western Sudetes in the Czech Republic (ANDĚRA 1995). The current distribution of the edible dormouse may suggest a tendency for the withdrawal of the species from the Western Sudetes, as it was observed in the west and north of Poland (PUCEK & JURCZYSZYN 2001). However, it should be mentioned that in the 80s of the last century, the destruction of large parts of woodstands in the Western Sudetes and the Western Sudete Foothills occurred, followed by their fragmentation into small patches, as a result of industrial pollution and pest gradations. In 1990-2000s, when the region was studied, the damage to the forests was still perceptible. Although the area has been partly afforested, these were largerly young tree stands, not suitable for dormice, thus it should be monitored again for possible recolonization.

On the contrary, the Central and Eastern Sudetes (Kaczawskie Mts, Złote Mts, and Bialskie Mts, Śnieżnik Massif) hold some areas where the edible dormouse is distinctly more abundant and more frequent. During our study, on many occasions a few individuals were seen at once, which indicates considerable abundance; it is also known to local people suggesting that the species is common. A continuous array of its localities runs along the main ranges of the Sudetes, extending from north-west to south-east, i.e. from the Kaczawskie Foothils through the Kaczawskie Mts, Sowie Mts, Bardzkie Mts, Złote Mts, Bialskie Mts, and the Śnieżnik Massif, and is continued in the Czech Jeseník (ANDĚRA 1995). To the south, another parallel belt of localities includes the Stołowe, Bystrzyckie and Orlickie Mts. ANDĚRA (1995) listed numerous records of the edible dormouse from the Czech Jeseník, and also from the environs of the Śnieżnik Massif, Orlickie Mts and Karkonosze but not further to the west. In the Sudetic Foreland two groups of localities in the east (Ślęża Massif and Strzelińskie Hills) inhabited by the edible dormouse seem to be isolated from other parts of its range in the Sudetes, which may be a result of deforestation of the area lying between them.

The edible dormouse is found in various kinds of forest, but is more abundant in beech and mixed stands than in spruce stands. It was encountered in small forest patches as well as on margins of large complexes, especially where there are nest boxes. ADAMIK & KRÁL (2008) state that among the three species the edible dormouse to the greatest extent destroys eggs and chicks of small passerine birds, especially tits, and then nests in boxes and even reproduces there successfully. We frequently observed the edible dormouse in nest boxes, but we never encountered juveniles there. However, we observed females nurishing offspring in tree holes, abandoned buildings and even in rarely visited hunter's high seats. When not disturbed, they do not mind the presence of humans and shelter in buildings and ruins in afforested areas and also in caves. Though the first records of the edible dormouse in the Sudetes come from the early 20th century, (PUCEK & RACZYŃSKI 1983), it is impossible to known how the distribution and population dynamics changed in the past because of the scarcity and lack of continuity of studies.

During our field study in the Sudetes the hazel dormouse was much less frequently encountered. Like the edible dormouse, it is reported from all the macroregions, however, the area occupied by this species in the Sudetes seems to be fragmented. Usually there was only one locality per square. In spite of using life-traps for small mammals, we found it always only in nest boxes in various kinds of tree stands, and usually single individuals or pairs were observed. It was more frequent only in the Bardzkie Mts, Złote Mts and Stołowe Mts, as well as in the Landscape Park of Wałbrzych Sudetes and the Śnieżnik Massif.

In contrast, in the Czech part of the Sudetes, especially along the Polish boundary in Central and Eastern Sudetes, the hazel dormouse is the most abundant and a widespread dormouse in various types of forest, except for pure pine stands and old spruce monocultures (ANDĚRA 1995).

The forest dormouse was only exceptionally observed in the Sudetes, and currently is known from six localities in the Sudetes, each one in a different UTM square. These localities are situated in the Central Sudetes (Stołowe Mts; MIKUSEK & PIKULSKa 1999; PIKULSKA & MIKUSEK 2007) and Eastern Sudetes (Złote and Bialskie Mts, Śnieżnik Massif; WISZNIOWSKA & STEFANIAK 1996; BARTMAŃSKA & MOSKA 2002; MOSKA & BARTMAŃSKA 2002; MOSKA et al. 2007), where single individuals were observed in nest boxes in spruce stands, and also in the Sudete Foreland (Niemczańsko-Strzelińskie Hills; KOSIOR 1996). In Europe, the westernmost locality of the forest dormouse is in the Central Sudetes (Stołowe Mts WR99; MIKUSEK & PIKULSKA 1999). The localities in the Bystrzyckie Mts, described by SCHLOTT (1941 after PUCEK & RACZYŃSKI 1983) and by HAJDUK & STAWARSKI (1959), have not been confirmed to date. The forest dormouse has not been recorded from the Polish side of the Orlickie Mts. Also in the Czech Sudetes it is rare and limited mostly to their Eastern part, and was recorded only from the Orlickie Mts, Czech Jesenik and Opawskie Mts (ANDĚRA 1995). The small number of forest dormouse localities may indicate that in the Sudetes it is a receding species, limited in its occurrence to the eastern and southern part of the Polish Sudetes. Thus a change in its current conservation category from near threatened (NT) to vulnerable (VU) should be considered. Also the hazel dormouse, which seems to be more rare and less abundant than the edible dormouse, deserves special protection, perhaps as a least concern (LC) category species.

Regarding the garden dormouse, it was recorded in the 1930s, in the two localities from the Central Sudetes: in the Kamienne Mts (environs of Mieroszów) and in the Kłodzko Basin (environs of Krosnowice) (PUCEK & RACZYŃSKI 1983), and it was not observed in the Sudetes again. It was also not recorded in the Czech part of the Sudetes (ANDĚRA 1995; FILIPUCCI 1999). This strongly suggests that the garden dormouse has disseapeared from the Polish Sudetes.

As arboreal mammals, dormice are principally threatened by loss of habitats through deforestation and fragmentation of the old forest stands. For example, in the Sudete Foreland, which is heavily deforested, they probably occur only in the areas where large forest complexes persist, such as the Sobótka Massif (which is still inhabited by edible dormouse and hazel dormouse), and Niemczańsko-Strzelińskie Hills (where also forest dormouse co-exists).

For the same reasons, deforestation and human impact there are no reports of the occurrence of dormice in the close vicinity of urban agglomerations such as Wałbrzych, Kamienna Góra and Kłodzko. However, there is also lack of records from other potentially suitable territories of Sudetes, which may be a result of insufficient surveys, and should be completed.

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