



## Distribution of pygmy field mouse *Apodemus uralensis* (Pallas, 1811) population in Poland: review of the studies and new data

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**Abstract:** Northern and western border of pygmy field mouse *Apodemus uralensis* population area passes through southern Poland. First sites of the species have been discovered in the '50 of the 20th century. Since then, a total of 79 sites has been found. Latest research revise data concerning the occurrence borders of pygmy field mouse. Three out of four newly found stations are located in the western part of the country, north-west from the hitherto known sites of the species.

**Key words:** *Apodemus uralensis*, localities, distribution, Poland

### INTRODUCTION

Pygmy field mouse *Apodemus uralensis* (Pallas, 1811) is one of the hardest to identify rodents in the Muridae family. Morphologically, it most resembles a wood mouse *Apodemus sylvaticus* L. (Kowalski & Ruprecht 1984). It is a palearctic species, which occurrence range spans across central Europe: Czech Republic, Slovakia, eastern Austria, Hungary, Romania, Bulgaria and Ukraine (Storch 1999, Vohralik 2002, Zima & Anděra 1996, Zagorodniuk 2005). The rodent can also be found in the northern regions of Lithuania, in Latvia and Estonia (Storch 1999, Juškaitis 1999). In the European part of pygmy field mouse range the population is unevenly distributed. In central Europe, a clustered population is located in Slovakia (Storch 1999). Outside Europe, its occurrence range reaches out to western Kazakhstan, north-eastern China and Mongolia (Storch 1999). In Carpathian Mountains this mouse can be found up to 1400 m over sea level (Kryštufek et al. 2008). This species prefers dry, unforested and agriculturally-used environments (Glazaczow 1984).

Pygmy field mouse has been included in IUCN Red List of Threatened Species, in the Least Concern category. It is due to the scarce data on species' population (Kryštufek et al. 2008).

In Poland, this species is known from Jaskinia Dużej Sowy fossils, dated back to late holocene (Kowalski 1989). Northern border of the mouse's range passes through southern Poland (Vohralik 2002). However, its exact course is not known. The rodent's occurrence range includes a south-eastern stretch of the country, including highlands of southern Poland and a part of Carpathian Mountains. The highest locality in Poland is 1000 m over sea level (Haitlinger 1990). It is a relatively new species in the countries' mammals' fauna. The oldest contemporary site in Poland is dated back to 1955 (Ruprecht 1983). Since then fragmentary data concerning new stations spread across southern Poland has been found.

The aim of the paper is to analyze the spreading of pygmy field mouse across the country, from the first confirmations of the species to the most recent data, as well as relating Polish area changes to the European span of the species (Storch 1999).

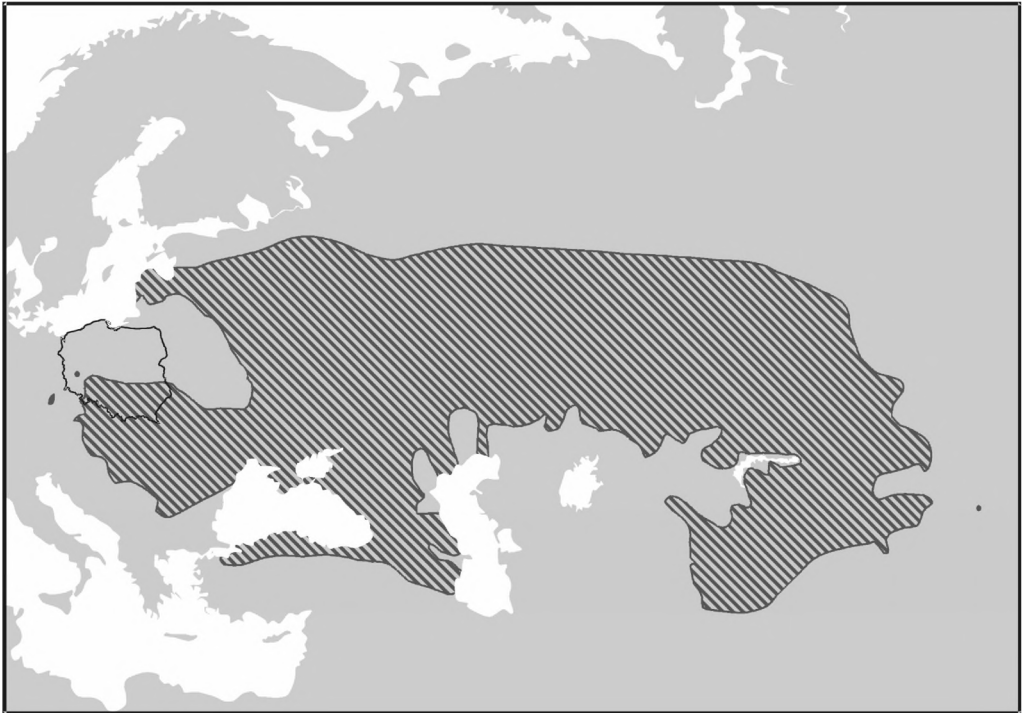


Fig. 1. Geographical dispersion of pygmy field mouse population, based on Kryštufek et al. 2008 and data from own research.

#### MATERIAL AND METHODS

The studies on placement and increase of the pygmy field mouse occurrence area in the country have been based on literature data analysis, as well as research. The research was based on analysis of birds of prey's pellet material (Table 1). Data on confirmed presence of the rodent was analysed in five timeframes: 1955–1960, 1961–1970, 1971–1981, 1982–1992, 1993–2004.

Table 1. Research stations, where pygmy field mouse's (*Apodemus uralensis*) presence has been confirmed.

Geographical localization	Species	Collection date
Siecieborzyce (UTM WT 32)	Barn owl <i>Tyto alba</i>	2004
Legnickie Pole (UTM WS 86)	Long eared owl <i>Asio otus</i>	2002
Środa Śląska (UTM XS 16)	Long eared owl <i>Asio otus</i>	2001
Cisowa Skala (UTM DV 37)	Buzzard <i>Buteo buteo</i>	2002

A geographical localisation (macroregion) has also been added to each station (Kondracki 2000). For each station, there is a UTM (Universal Transverse of Mercator) grid square, with a side of 10 km. The source of information on the mouse's stations has been described as following: C – capture, P – pellets.

Total surface occupied by pygmy field mouse population has been calculated by adding the UTM squares where the species was confirmed. For the percentage of the country's surface occupied by the species' population, inland waters have been excluded from the total surface, amounting to 309 074 km<sup>2</sup>.

Confirmation of the rodent in this study is based on both descriptive features and measurements of skulls (Ruprecht 1979, 1993). The most practically useful taxonomical features are the edge of *os frontale* and *foramen infraorbitale* structure (Cais 1978). Important additions to the morphological criteria are: the shape and size of *formina incisiva* and  $M^1$  crown's width dimensions as well as maxillary tooth-row length (Ruprecht 1979).

## RESULTS

As a result of the study, four new pygmy field mouse sites have been confirmed in the vicinity of cities Siecieborzyce, Legnickie Pole and Środa Śląska, as well as on Cisowa Skała. The first three from the described stations are located in the western part of the country, on the plains. Cisowa Skała station is located in the western end of the Pienińskie Pasma Skalkowe (Fig. 2).

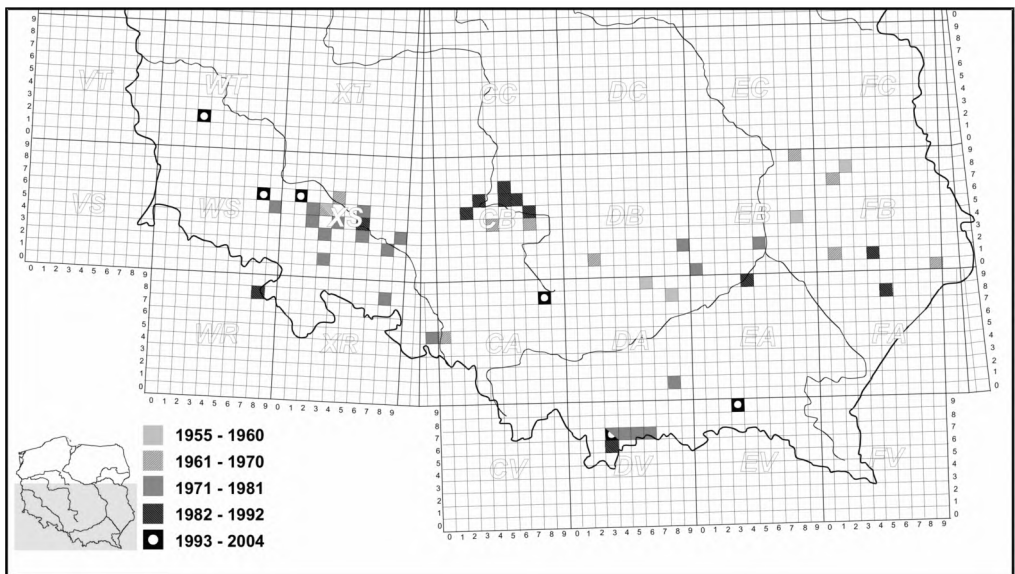


Fig. 2. Pygmy field mouse stations occurrence in Poland, between 1955 and 2004.

Stations from Siecieborzyce, Legnickie Pole and Środa Śląska in western Poland are located in a significant distance from hitherto described ones, in the north-western direction. Siecieborzyce are circa 50 km away from the closest previously known stations.

The number of the mouse derived from pellet material analysis is quite low. In the material from Siecieborzyce a total of 37 barn owl victims have been indicated, from Środa Śląska 5001 long eared owl victims, 416 victims of long eared owl from Legnickie Pole and 237 buzzard victims have been indicated from Cisowa Skała region. In the analysed material, there have been a few pygmy field mouse. In Siecieborzyce, its bone material comprised 2,7% of the material, in Środa Śląska it was 0,2%, and at Cisowa Skała it was 4%.

The rodent does not form a dense population. In Poland, the mouse has been confirmed in 50 UTM squares. The population is spread on an estimated area of 4,800 sq m, which amounts to 1,52% of the counties' total surface. The stations are positioned as islands (Fig. 3). In the majority of the squares, only single sites have been confirmed. Only one square had more than ten confirmations.

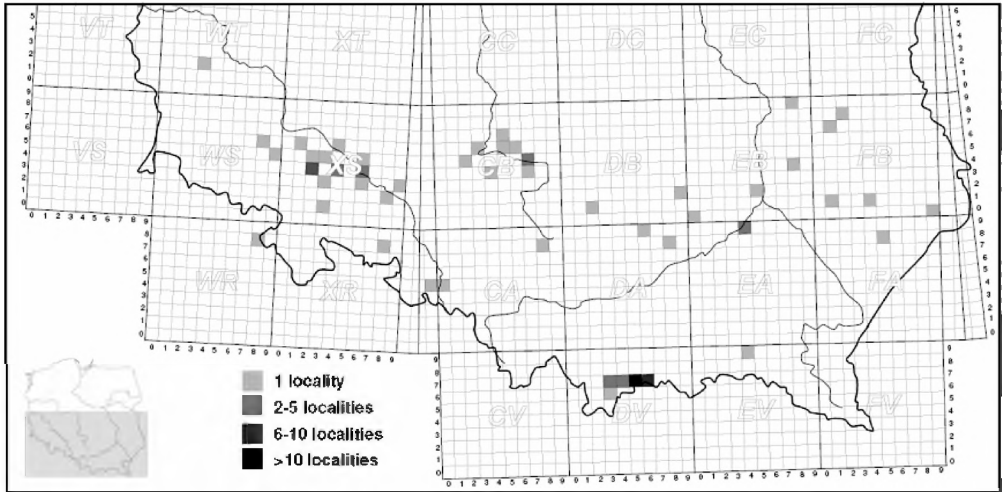


Fig. 3. Number of pygmy field mouse confirmations in UTM squares

#### DISCUSSION

In the period from 1955 to 2009, 79 stations of pygmy field mouse have been indicated. They have been mostly located in the southern parts of Poland (Table 2).

The oldest site of this species in Poland is located on Wyżyna Małopolska. Between 1955 and 1988 consecutive sites have been confirmed, creating a spread population (Ruprecht 1983, Sałata-Piłacińska & Rachowiak 1990, Lesiński 1991). In the same time the sites of the mouse have been confirmed in the south-western part of the country (Nikodem & Ruprecht 1976, Ruprecht 1983, Ziomek 1998). There is a significant probability that this population is joint with a Ukrainian population, which in turn is located in the center of the species' geographical range.

Most stations are located in a highland landscape and in low, warm mountains, such as Pieniny. The rodents' presence has not been confirmed in other mountain ranges, such as Sudety Mountains and Carpathians. A typical lowland region inhabited by pygmy field mouse is located in western Poland.

The dispersion data analysis indicates that geographical range of the species in Poland is wider than expected. The most recent site, confirmed in 2004, is located in the southern part of lubuskie voivodship, outside the previously indicated population's range (Storch 1999). Both the time and spatial dynamics of the rodent's indications are largely a result of researchers' activity. The most sites have been confirmed in the 1970's. After 2000, only five stations have been confirmed. It should be noted, however, that analogous research carried out simultaneously in other parts of the country has not confirmed the presence of the species.

In years 1957–64 Humiński (1964) captured 18 specimens near Wrocław. Meanwhile in places, where pygmy field mouse is numerous, it is frequently indicated in faunistic coverage. In agricultural environment of Morawy this rodent is one of the prevalent species (Heraldová et al. 2007). Intensification of the research often leads to the confirmation of new sites, as it has happened in Lithuania (Juškaitis et al. 2001, Juškaitis 2003).

Exceptions to the country's area range of the rodent are sites located in Pieniny. Haitlinger & Szyszka (1975) captured there 164 specimens. The highest altitude capture locations are 800 m over sea level. This population, along with the stations located in Kotlina Orawsko-Nowotarska is isolated from the rest of the country by forested Beskidy Mountains.

Table 2. Stations of pygmy field mouse in Poland; C – capture, P – owl pellets, -- no data

Macroregion	Site	UTM square	Year	Number of specimens	C	P	Literature
1	2	3	4	5	6	7	8
Nizina Śląska	Domasław	XS 35	1957	-	+		Humiński 1964
	Domasław	XS 35	1958	-	+		Humiński 1964
	Domasław	XS 35	1964	-	+		Humiński 1964
	Wrocław	XS 46	1965	5	+		Haitlinger & Ruprecht 1967
	Wrocław	XS 46	1967	-		+	Haitlinger & Ruprecht 1967
	Racibórz	CA 05	1969	-		+	Ruprecht 1983
	Wojkowice	XS 44	1972	-	+		Haitlinger 1972
	Galowice	XS 44	1978	60	+		Cais 1978
	Pełcznica	XS 25	1977-81	13		+	Salata-Pilacińska 1994
	Rogów Sobócki	XS 24	1977-81	5		+	Salata-Pilacińska 1994
	Tyniec n. Ślężą	XS 33	1977-81	15		+	Salata-Pilacińska 1994
	Niwnik	XS 63	1977-81	2		+	Salata-Pilacińska 1994
	Marcinkowice	XS 65	1977-81	2		+	Salata-Pilacińska 1994
	Szydłowice	XS 64	1977-81	1		+	Salata-Pilacińska 1994
	Bogacica	BB 95	1977-81	5		+	Salata-Pilacińska 1994
	Popielów	XS 93	1977-81	1		+	Salata-Pilacińska 1994
	Lewin Brzeski	XS 82	1977-81	3		+	Salata-Pilacińska 1994
	Biała	XR 88	1977-81	1		+	Salata-Pilacińska 1994
	Sobótka	XS 24	1977-81	8		+	Salata-Pilacińska 1994
Oława	XS 64	1982-84	3		+	Gramsz 1991	
Legnickie Pole	WS 86	2001	-		+	data from this paper	
Środa Śląska	XS 16	2001	7		+	data from this paper	
Wał Trzebnicki	Siecieborzyce	WT 32	2004	-		+	data from this paper
Nizina Południowo-Wielkopolska	Siemkowice	CB 57	1983-88	1		+	Lesiński 1991
Wzniesienia Południowomazowieckie	Pajęczno	CB 66	1983-88	11		+	Lesiński 1991
Przedgórze Sudeckie	Żelowice	XS 31	1977	-	+		Ruprecht 1983
	Targoszyn	WS 95	1977-81	1		+	Salata-Pilacińska 1994

1	2	3	4	5	6	7	8
Sudety Środkowe	Czerwna	WR 88	1989	-	+		Haitlinger 2006
Wyżyna Woźnicko-Wieluńska	Danków	CB 44	1969	-		+	Ruprecht 1983
	Działoszyn	CB 56	1983-88	9		+	Lesiński 1991
	Pątnów	CB 36	1983-88	3		+	Lesiński 1991
	Praszka	CB 25	1983-88	6		+	Lesiński 1991
Wyżyna Śląska	Niegowonice	CA 88	1996-01	1		+	Draus 2003
Niecka Nidziańska	Krzyżanowice	DA 69	1955	-		+	Ruprecht 1983
	Chotel Czerwony	DA 88	1955	-		+	Ruprecht 1983
	Szydłów	EB 00	1975-76	1		+	Salata-Pilacińska & Rachowiak 1990
Wyżyna Kielecka	Makoszyn	DB 92	1975-77	2		+	Salata-Pilacińska & Rachowiak 1990
Wyżyna Przedborska	Mykanów	CB 74	1969	-		+	Ruprecht 1983
	Chlewice	DB 21	1969	-		+	Ruprecht 1983
	Brzeźnica	CB 75	1983-88	-		+	Lesiński 1991
	Dworszowice Kościelne	CB 75	1983-88	1		+	Lesiński 1991
Wyżyna Lubelska	Urzędów	EB 84	1957	-		+	Ruprecht 1983
	Luszczów	FB 28	1960	-	+		Nikodem & Ruprecht 1976
	Markuszów	EB 89	1961-62	-		+	Nikodem & Ruprecht 1976
	Lublin	FB 17	1962-63	-	+		Nikodem & Ruprecht 1976
	Frampol	FB 11	1964	-		+	Nikodem & Ruprecht 1976
	Szczebrzeszyn	FB 41	1986-90	1		+	Ziomek 1998
Wyżyna Wołyńska	Żulice	FB 90	1964	-		+	Nikodem & Ruprecht 1976
Kotlina Sandomierska	Zawichost	EB 52	1975-77	3		+	Salata-Pilacińska & Rachowiak 1990
	Skopanie Fabryczne	EA 49	1989	1	+		Haitlinger 2008
	Huta Różaniecka	FA 58	1985	1	+		Haitlinger 2008
Pogórze Środkowobeskidzkie	Paleśnica	DA 81	1978	-	+		Cais 1978
Beskidy Środkowe	Bodaki	EV 39	2007	4	+		Haitlinger 2008

1	2	3	4	5	6	7	8
Obniżenie Orawsko-Podhalańskie	Wąwóz Sobczański	DV 57	1972	-	+		Haitlinger 1972
	Góra Obłaźnia	DV 57	1972	3	+		Haitlinger 1972
	Góra Podskalnia	DV 57	1972	-	+		Haitlinger 1972
	Kotłowy Potok	DV 57	1972	-	+		Haitlinger 1972
	Polana Podłazie	DV 57	1972	-	+		Haitlinger 1972
	Wyżni Łazek	DV 57	1972	-	+		Haitlinger 1972
	Dolina Grajcarka	DV 67	1972	2	+		Haitlinger 1972
	Wąwóz Homole,	DV 67	1972	-	+		Haitlinger 1972
	Przełom Białki	DV 37	1975	-	+		Haitlinger & Szyszka 1975
	Dursztyn	DV 47	1975	3	+		Haitlinger & Szyszka 1975
	Falsztyn	DV 47	1975	1	+		Haitlinger & Szyszka 1975
	Krempachy	DV 47	1975	-	+		Haitlinger & Szyszka 1975
	Zielone Skalki	DV 47	1975	12	+		Haitlinger & Szyszka 1975
	Góra Goła	DV 57	1975	-	+		Haitlinger & Szyszka 1975
	Pulsztyn	DV 57	1975	-	+		Haitlinger & Szyszka 1975
	Trzy Korony	DV 57	1975	-	+		Haitlinger & Szyszka 1975
	Góra Macelowa	DV 57	1975	-	+		Haitlinger & Szyszka 1975
	Podłazce	DV 57	1975	-	+		Haitlinger & Szyszka 1975
	Biała Woda	DV 67	1975	-	+		Haitlinger & Szyszka 1975
	Wąwóz Homole	DV 67	1975	-	+		Haitlinger & Szyszka 1975
	Jaworki	DV 67	1975	-	+		Haitlinger & Szyszka 1975
	Zaskalskie	DV 67	1975	-	+		Haitlinger & Szyszka 1975
	Białka	DV 37	1978	4	+		Cais 1978
Czorsztyn	DV 57	1978	1	+		Cais 1978	
Brzegi	DV 36	1988	1	+		Haitlinger 1990	
Cisowa Skala	DV 37	2002	-	-		data from this paper	

The stations from Pieniny might be connected to the Slovakian population. However, expansion of the species from the westernmost Pienińskie Pasmo Skalkowe is unlikely due to moist, marsh biotopes located in the center of Orawa. The station from Cisowa Skala aforementioned in this publication is located in the same UTM square, in which the species was confirmed in the 1970s (Haitlinger & Szyszka 1975).

Pieniny Mountains population's large size can probably be attributed to the environmental conditions found there, such as meadows with siccophile vegetation. Contemporary studies carried out in the Slovakian part of Pieniny Mountains, where pygmy field mouse was frequently captured, support that (Čisláková et al. 2004).

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## STRESZCZENIE

**[Rozmieszczenie populacji myszy zielnej *Apodemus uralensis* (Pallas, 1811) w Polsce: przegląd wiedzy i nowe dane]**

Mysz zielna jest gatunkiem zasiedlającym wyspowo południową część Polski. W latach 2001-04 w wyniku oznaczeń materiału kostnego z wypławek stwierdzono cztery stanowiska gatunku. Trzy z nich zlokalizowane są w północnej części Niziny Śląskiej na terenie województw: dolnośląskiego i lubuskiego. W sumie na obszarze Polski stwierdzono dotychczas 79 stanowisk z największym skupieniem w Pieninach. Nowo opisane stanowiska znajdują się poza dotychczas znanym arealem gatunku. Stwierdzenie stanowisk myszy zielnej w znacznej odległości od dotychczasowych lokalizacji wskazuje na większy obszar arealu zajmowanego przez ten gatunek w Polsce, niż to dotychczas wykazywano.

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