The Movements of Bats in Hungary

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With the help of banding in the biology of bats, our informations increased by many new data. In spite of the fact, however, that the banded individuals of numerous bat species may be estimated at 70—70.000 both in the United States of America and in Europe, our data are still far from complete with a need for further studies concerning to extend them to as large territories as possible on the one hand and to as many species as feasible on the other. No studies of this kind had been made in Hungary till 1951. At the end of 1951, I began my studies with the help of the Hungarian Natural History Museum. I have published two papers on the results of the first years in 1954 (13, 14). In my present paper, I have summed up the results of my work during the last four years which shed some light on the seasonal and other movements of our home bat species. I wish to thank the very efficient assistance and help of the Directorate of the Hungarian Natural History Museum as also those of dr. J. Hanzák (Praha), dr. I. Grulich (Brno), dr. J. Vachold (Bratislava), J. Gaisler (Praha), dr. V. Hanák (Praha), dr. K. Bauer (Neusiedl am See), dr. Ph. Meran (Graz), and B. Gjulic (Zagreb) in the recapture of, and report on, banded bats, the same as the cooperation of all of my home reporters.

My area of study on the basis of the reports received about the banded bats, includes, within the Basin of the Carpathians, not only the larger part of Hungary, but also portions of Czechoslovakia, Austria, Yugoslavia. So, largely, the zones between Northern Latitudes 45°30', and 49° and those between Eastern Longitudes 16° to 21° belong to this territory. It is partly a plain area, more or less level (80—200 m above sea level), as, for instance, the plains between the Danube and the Tisza, partly hilly (200—400 m), or low and medium mountains (400—1000 m), as the hilly Transdanubium, the Mts Mecsek, Bakony, Vértes, Gerecse, Pilis, Buda, Börzsöny, Mátra, Bükk, and the environments of the Torna Karst, then that of the eastern spurs of the Styrian Alps and a part of the mountains of Varasd. This territory falls between the —5 and 0 isotherms in January, and the ones between 20—25 in July. The main annual temperature fluctuation is 20—25 °C. The main annual precipitation is 500—750 mm.

The greater part of the plain and hilly areas is cultivated. The dominant plant species in the inundation territories of the Plains and the valleys of the mountains are the common oak *(Quercus robur)* frequently mixed with hornbeam *(Carpinus)*. Willow *(Salix)*, white poplar *(Populus alba)*, alder *(Alnus glutinosa)* groves abound along the rivers. Larger forests of pubescent oak *(Quercus pubescens)* are to be found on the rocky slopes of mountainous areas, supplanted by the tanning oak *(Quercus cerris)* on sunny slopes and dry summits. There are spots of lime *(Tilia)* and maple *(Acer)* within our oak forests. Beech *(Fagus silvatica)* dominates on the higher mountain tops and colder slopes.

The Central Mountains of the Transdanubium, the limestone blocks of the Northern Central Mountains, the limestone hills of the Mecsek, and the lime plateau of the Torna Karst abound in caves. The majority of these serve partly as hibernation quarters partly as summer roosts for our cave bats. I will, in the followings, shortly discuss the most important hibernation quarters and summer roosts of the area studied, as far as I have learned them up to now.

The Ördöglyuk Cave of Szoplak lies 23 km NE to Budapest, in the Mts. Pilis. Its elevation a. s. l. is 460 m. Bats reside in it only in the winter, mainly *Myotis oxygnathus* and *Miniopterus schreibersi*. Their quarters are the two rooms in a depth of about 30 m, where the winter temperature is about 3—7 °C. The bats congregate on the ceilings and side walls in the deeper-lying inner room in December and November, whilst in the one nearer to the entrance, in the middle and the end of the winter. It seems that, before the spring migrations, the *Miniopterus* specimens shift again to the inner room. My observations on the 20 March 1954 certainly indicate it. On this day, the *Miniopterus* bats resided in the inner room, segregated into pairs and smaller clusters.

The Pálvölgy Cave lies within the confines of the Capital, 2 km to the west of the Danube, at an elevation of 240 m above sea level. It is a system of large clefts, 900 m long, equipped with electrical lighting and steadily attended by the public. Its temperature fluctuates between 7—9 °C during the year. The cave is the winter quarter of mainly the species *Myotis oxygnathus* and *Rhinolophus hipposideros*, hibernating scattered around at the beginning of the winter. The *Myotis oxynathus* specimens congregate, toward the end of the winter, near one of the hidden exits, where the temperature, depending on that of the outern aerial conditions, may sink even to 0 °C, much lower therefore than in the other parts of the cave. *Myotis oxygnathus* withdraws in the first days of October, *R. hipposideros* at the end of the same month or on the beginning of the next. On the other hand, *R. hipposideros* leave their winter quarters in the spring till the end of March, *M. oxygnathus* till the end of April.

The Solymár Cave is 15 km NW to Budapest. Its elevation above sea level is 340 m. It is a very extensive cave system. Few bats hibernate here in these days, but there must have dwelt here at one time enormous amounts also in the summer as proved by the exceedingly large amount of guano too.

The Abaliget Cave is 12 km NW to Pécs, in the Mts. Mecsek, at an elevation of 220 m above sea level. A brook runs through its length (500 m). The temperature of the cave, in its innermost parts, is generally about 11—12 °C. This cave is the winter residence of mainly *M. oxygnathus, Min. schreibersi* and *R. ferrumequinum*. The bats hibernating here camp scattered about in the inner portions of the cave at the beginning of the winter and in the fall, later gradually clustering near the exit. Of the hibernating species, I have found the *Miniopterus* specimens, — males and gravid females at the same time. — in the cave even at the end of May, which is therefore used also as a summer roost. I think it a noterworthy fact that there were none in July, but that they appeared again in the end of August.

The Pisznice Cave is in the Mts. Gerecse, 44 km NW to Budapest. Its elevation above sea level is 500 m. This cave is used as a summer roost by *Min. schreibersi, M. myotis* and *R. euryale*, and as a winter quarter by *R. hipposideros*. The temperature in the inner parts of the cave was 13,5 °C in the beginning of August.

The Görömbölytapolca Cave lies 6 km to the SW of Miskolc, at an altitude of 140 m above sea level. Several flue-like passages lead from the cave to the open. The length of the cave is less than 30 m. A warm brook runs through it, its temperature being 27 °C. The winter temperature of the cave is, owing to the warm water, around 14—15 °C, and so it is hardly suitable for the hibernation of bats. In the summer, however, there was always a large population resident in it. It will be built into a bathing resort (in the winter of 1955/56), and so this interesting locality will be destroyed.

The church in Pilismarót, built in 1810, elevation 160 m above sea level. The village lies 34 km NW to Budapest. M. Méhely collected *M. myotis* and *M. oxygnathus* specimens here in 1899. During the time of my reserarches, *M. myotis* were in majority over the *M. oxygnathus* specimens. The numerical rate of the two species had changed yearly. It was a striking phenomenon that the *myotis* and the *oxygnathus* specimens roosted always separately from each other in the loft.

Pusztakovácsi is situated 71 km NW to Pécs, at an elevation of 150 m above sea level. There are bats in the loft of the church of the village, built around 1700. There were *Myotis myotis* there in the summer of 1948, but I found only *Eptesicus serotinus* in 1954.

Orgovány is 92 km SE to Budapest. Its elevation is 110 m above sea level. The bats *(Myotis oxygnathus)* roost in the tower of the church during the summer.

My present data relating to the movement of bats, discussed specifically below, were gained by the banding of a large number of animals. From December 1951 till September 1955, I have banded about 13.000 specimens in their winter quarters and about 3.500 specimens in their summer roosts. The precise numerical distribution in the several localities of the indicated species is shown in Table I.

We have migration data of all three home species of the horseshoe bats. This movement is, however, as shown by other authors, very slight.

Concerning the movement of the Greater Horseshoe Bat *(Rhinolophus ferrumequinum)* the specimens banded in the Abaliget Cave give us some information. During the spring migration, the animals travelled to Ürög and Pécs (10 km SE, and 12 km SE). Their summer roost is in a large-sized water channel in the former locality. One female was recaptured 8 March 1955, one male 10 April 1955. The maximal moving distance in the case of Dutch *Rhinolophus ferrumequinum* was 23 km, as reported by Bels (4).

Of the Lesser Horseshoe Bat *(Rhinolophus hipposideros)* banded in the Pálvölgy Cave, one female was recaptured in Alcsut, 26 May 1955, 33 km WSW to its winter quarter. It was re-caught in a cellar. Another female was recaptured in a large wine cellar in Pilisvörösvár, 13 km NW to the Pálvölgy Cave, 18 May 1954. Since we are dealing with females in both cases, we may refer, from the above data, to summer roosts. It is probably due to harrassing during the banding process that two specimens were recaptured 5—6 days later in the free. It could be ascribed also to the same circumstance that I found a male, less than two months after the banding, in the Hárshegy Cave. The distances of these recaptures were 3—5 km, and the vacation of the hibernating quarter happened in all three cases in the winter, that is, in the early spring. Issel (10) also observed, in the case of this species, many similar occurrences. Finally, my last movement data regarding *Rhinolophus hipposideros* concerns a male banded in the Aggtelek Cave, which was recovered in Naprágy (CSR) 8 July 1955, in the church tower. This place is 15 km SSW to its hibernating quarter. The movements of *R. hipposideros* is shown on Table 2. For the sake of comparison concerning my data, I have to mention that Issel (10) observed a 20 km maximal spring movement in this species, whilst Eisentraut (6) denies or allows but for a very slight movement for *R. hipposideros.* Aellen (1) reports a 40 km maximal value.

The Mediterranean Horseshoe Bat *(Rhinolophus euryale)* supplied me with data insofar only that a part at least of the animals roosting in the summer in the Görömbölytapolca Cave retreats into the Várhegy Cave in the winter, 6 km NW to their summer roost. In the 74 m depth of the cave, 3 males and 10 females were found 20 November 1955.

In spite of the fact that the number of banded Large Mouse-eared Bats *(Myotis myotis)* is rather considerable (see Table 1), I have very scanty data with regard to its movements. We have to take it into consideration, however, that I have banded a relatively few specimens in its winter quarters, and the probability of recaptures of animals banded in their summer roosts is much smaller. It is to be explained by the fact that the animals partaking in their autumn movements are strong and in the best of health, whilst the weakened bats of the long hibernation period are exposed to various dangers in the spring. Mainly climatical factors are to be reckoned with. The other cause of the rarer recaptures of bats banded in the summer is the fact that the winter quarters are generally better hidden than the summer roosts, and these winter camps are only very rarely visited by men. Of the 110 *M. myotis* specimens banded in the Ördöglyuk Cave of Szoplak, none had been recovered in the nearby summer roosts of Pilismarót or the Pisznice Cave, whilst a female banded in the Abaliget Cave in 1954 was recaptured a month after the banding in the village Mosdós, 9 March 1955. This data is scarcely enough to infer on the summer

area of the species. It was not possible yet to reveal, on the basis of reports, the winter quarters of the large mouse-eared bats of Pilismarót. Of the *M. myotis* specimens banded in this locality, we may assume of one specimen only captured in a quarry in Dunabogdány (10 km to the East) 10 March 1954, that it had hibernated. The female recovered in Bercel (41 km NE to Pilismarót) was

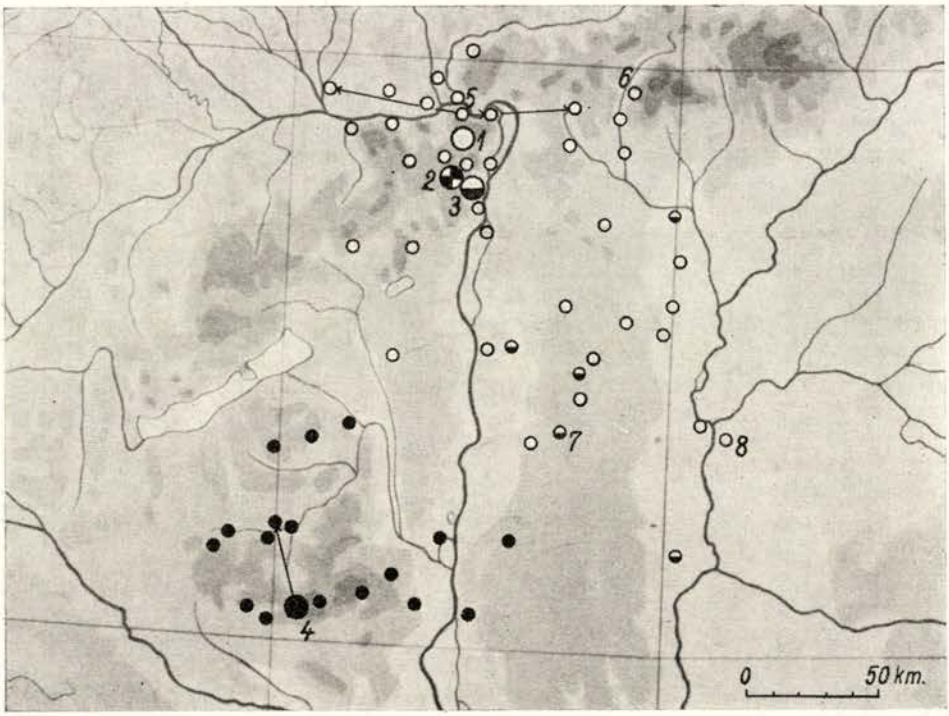

Fig. 1. The spring and autumn movements of *Myotis myotis* and *Myotis oxygnathus*. The large circles refer to winter quarters, to wit: 1. — The Ördöglyuk Cave of Szoplak, 2. — The Solymár Cave, 3. —The Pálvölgy Cave, 4. —The Abaliget Cave. All small circles designate localities outside of caves. The localities of bats banded in the same winter quarters are indicated similarly to the according winter quarters. Arrows connect the localities of *Myotis myotis*. The most important spring and summer localities are designated by numbers : 5. — Pilismarót and Helemba, 6. — Pásztó, 7. — Orgovány, 8. — Szentes.

maybe on its way from its unknown winter quarter to its summer roost toward Pilismarót. It was recaptured in the March of 1954. The specimen recovered in Ógyalla (50 km NWW to Pilismarót) 12 November 1955, shows a movement maybe toward a winter quarter but it may also have been an individual strayer.

Of the *M. myotis* banded in Pilismarót, some were recaptured by G a i s l e r and H a n á k (a mail report) in Helemba (CSR). The two localities are no more than separated by the Danube only (Helemba lies 5 km NW to Pilismarót). It was proved by more than 20 reports that not only did adult speci-

mens banded in 1953/54/55 move to Helemba but quite young specimens banded in Pilismarót 23 June 1955, too, these latter having probably been carried over by their mothers since they had not been able to fly even on 3—8 August 1955 yet. Further researches have to decide whether there is a case of a summer roost used alternatively by the same population.

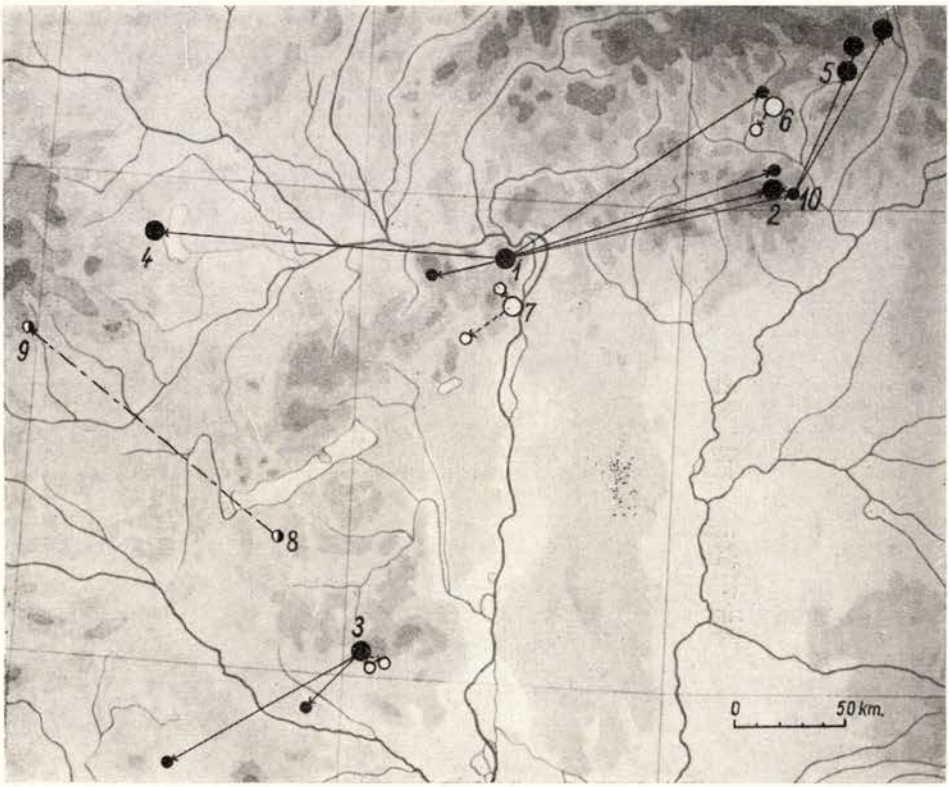

Fig. 2. The movements of *Miniopterus schreibersi*, *Rhinolophus hipposideros*, *R. ferrumequinum* and *Eptesicus serotinus*. The empty large circles are winter quarters of *Rhinolophus hipposideros:* 6. — The Aggtelek Cave, 7. — The Pálvölgy Cave. A broken arrow indicates the summer localities (designated by empty and small circles) of *R. hipposideros* and *R. ferrumequinum*. The large filled-in circles mean the winter quarters of *Miniopterus schreibersi:* 1. — The Ördöglyuk Cave of Szoplak, 2. — The István Cave, 3. — The Abaliget Cave, 4. — Szentmargitbánya, 5. — The Somod Cave. Unbroken arrows show the movements of *Miniopterus* and the small filled-in circles refer to the occurrences outside of caves. The most important: 10. = Görömbölytapolca Cave. — Half filled small circles: 8. — Pusztakovácsi, 9. — Hartl. An arrow with figures indicates the movement of *Eptesicus serotinus*.

I received the largest amount of reports on *Myotis oxygnathus*. Of these, the time of the spring migration of the individuals of this species, their course and rate could be estimated, and, by these facts the situation and extension of their summer resort area. I have also collected data bearing on their straying, autumn movements and changes in hibernating quarters.

There is a difference between the northern and southern *Myotis oxygnathus* populations of the area under examination, with regard to the direction of the spring movement and the situation of the summer localities, yet, even so, one cannot speak of the distinct segregation of these populations.

The time and course of the spring migration is mainly dependent on the climate of the respective year. Besides, on the basis of my data gained up to now, I think it very probable that, concerning the initial dates of the spring movement, there is a difference between the populations of the northern and southern areas depending on the temperature of the respective geographical point. According to the reports received, the beginning of the spring movements may be placed at the first days of April (see Table 2). A quite striking date is the one from 25 February 1953, — which I cannot explain as yet. I received most of the reports in April and May (see Table 2). It was very striking that many animals were found in the first mild days following some cold period. Many of the bats recovered in April—May were in a feeble state, in many cases only the dead animals were found. Some of the recaptured animals, again, were collected on the wing during the daytime. The ones captured in June and July were, without exception, in the best health. The early data relate, in all probability, to animals still under way, and only the later refer to individuals that have already reached their summer hunting grounds.

If we inspect the Map of movements (see Fig. 1.), it will be apparent that banded bats had been found in several localities in certain directions. From the Mts. Pilis and Buda, the *M. oxygnathus* specimens tended mainly towards E, SE, SSE in the spring. These directions may therefore be regarded as chief moving courses. Some specimens were also found in the SW and W. In the North, relatively many banded bats have been recaptured in but a few localities. This is explained by the fact that a regular bat banding activity has been going on in these localities (Pilismarót ; Helemba, CSR). From the Mts. Mecsek (Abaliget Cave), the spring movement takes on a N, E, or NE direction. So the animals of the two relatively close hibernating areas move in very different directions, depending solely on the strict geographical setting, uninfluenced by climatic factors.

It will also be seen from the data that the moving distance is also larger in the so-called main directions. It is 10—158 km in the North, and 12—80 in the South. Their main is 49 and 43, respectively. In the case of northern animals, a moving distance of 60—120 km is a rather frequent occurrence, whilst, in the case of southern individuals, there is hardly one like it. This difference is, to say the least, striking. It is another interesting fact that the largest moving distances almost exclusively refer to female bats. And the observations of the movement of females is especially important if one studies the summer area of the species, since, from the reports made on females, one may, at least in bearing time, infer on smaller or larger "Wochenstube".

Table 2 shows, concerning *M. oxygnathus*, all data which may serve as a basis for deductions relating to the spring movements and the summer areas of the species. In the followings, I will discuss in some details some few yet important spring and summer localities, that is, the bats recaptured in these places. During my research in Pilismarót (10 km N to the Ördöglyuk Cave of Szoplak), I have recovered, in four years, 30 females and 1 male (besides bandless *M. oxygnathus* specimens), which had formerly been banded by me in the Ördöglyuk Cave of Szoplak. I found a solitary male specimen in the tower of the other

church in the same village. Gaisler and Hanák recaptured 11 females and 1 male in the summer of 1955 in Helemba. I banded these bats also in the Ördöglyuk Cave of Szoplak. Some few specimens of *M. oxygnathus*, banded also in the Ördöglyuk Cave of Szoplak and the Pálvölgy Cave, have been recaptured also in Orgovány (118 km SE to the Ördöglyuk Cave of Szoplak). It is interesting to note that a banded bat had first been reported from this locality in April 1953, therefore this animal has camped in the "Wochenstube" already in April. The female recovered in Pásztó, 12 July 1954, survived the postal shipment and, having been released in Budapest, was found hibernating again in the winter of 1955 in the Ördöglyuk Cave of Szoplak. The female recovered in Szentes (158 km SE to the Ördöglyuk Cave of Szoplak) represents the highest movement data of *M. oxygnathus*. Following the winter of its banding, this specimen hibernated again in the Ördöglyuk Cave of Szoplak, and was recovered in the next fall only. Two female specimens flew from Pilismarót to Helemba. We have already touched upon the connection of the two summer roosts when reporting on *Myotis myotis*.

On the basis of the map (see Fig. 1.), it can be seen that the *Myotis oxygnathus* specimens of the populations hibernating in the North occupy the area of the Danube in the north during the summer, they push forward up to the Mts. Mátra (Pásztó), scatter in the northern parts of the territory between the Danube and the Tisza, but they may also cross the Tisza and will occur also in the eastern parts of the Transdanubium. The summer areas of the bats of the populations in the South (Abaliget) are to be found, on the other hand, in the lower parts of the territory between the Danube and the Tisza, and also in the southeastern districts of the Transdanubium. On this ground, it seems to follow that the summer resorts of *Myotis oxygnathus* are the plains and the low hills.

One may designate the movement as straying when, after the breaking up of the Wochenstube for instance, the bats do not travel to their winter quarters but scatter in their summer roosts or around their hibernating places. In such cases, some male and female specimens will congregate, as I have observed in *M. myotis* and *M. oxygnathus*. The two males and females seen by Vachold on the church loft of Kemence, 15 September 1955, and which I banded in the Ördöglyuk Cave of Szoplak, must have been such straying specimens.

I have but a few data concerning the autumnal movements of *Myotis oxygnathus*. This is due to the fact that I have banded relatively few specimens in various summer roosts. One of the localities had been the church loft in Pilismarót. Thirteen females and seven males shifted from here to the Ördöglyuk Cave of Szoplak in the autumn, and, on the other hand, one male and one female to the Legény Cave, also in the Mts. Pilis and at the same distance. I have banded thirty youngs, unable to fly as yet, of *M. oxygnathus*, 1 July 1954, in Orgovány. Their autumnal movements presented a very interesting picture. One male moved to hibernate to the Ördöglyuk Cave of Szoplak (118 km NNW), another to the Solymár Cave (102 km NNW), and two males and one female to the Abaliget Cave (114 km SW), — and all in the first year of their lives. The scattering of this population in Orgovány is very striking! And a final data for the autumnal movement : 3 of 30 female specimens banded in the Ördöglyuk Cave of Szoplak and found later in the summer in Pilismarót, had been recovered again in the Ördöglyuk, in their hibernation quarters.

In connection with the devotion to the winter quarters of the animals, it transpired that the alteration of the hibernating points occurs more frequently as could be decided from the data of the first years of my experiments. So, 1 male and 4 females moved from the Pálvölgy Cave to the Ördöglyuk Cave. The 2 males and 1 female banded in the Solymár Cave chose also the Ördöglyuk for their winter quarters. Conversely, 4 females banded in the Ördöglyuk Cave of Szoplak hibernated in the Legény Cave (4 km W), 1 female in the Solymár Cave, and 1 female in the Pálvölgy Cave, some year after the banding, whilst 1 female was recovered in the Görömbölytapolca Cave. Later researches will have to decide whether the caves around the Ördöglyuk Cave Szoplak are but temporary roosts preceding the occupation of the final winter quarters.

The other species yielding the most abundant movement data in the course of my banding experiments was the Long-winged Bat *(Miniopterus schreibersi)*. The experiments shew that one may distinguish between a separate northern and southern population (see Fig. 2). Let us see first the movements of the northern population. The most important wintering quarter in the North is the Ördöglyuk Cave of Szoplak. It was found that the direction of the spring movements of *Miniopterus schreibersi* specimens banded here are not uniform. A part of the population hibernating in the Ördöglyuk moves into the Pisznice Cave in the Mts. Gerecse in the spring. 31 *M. schreibersi* specimens had been recovered here (19 males and 12 females). The cave is 30 km W to the Ördöglyuk Cave of Szoplak. The other, and possibly smaller, part of the *M. schreibersi* specimens move, on the other hand, in a NE, NEE direction during their spring movements. I have to note that the female recaptured in the Lisci dira Cave near Pelsőc, 144 km to the NE, may but conditionally be relegated to the spring migrators. (G r u l i c h, namely, did not yet inform me on the exact date of the recapture. I received his letter reporting the capture in August 1954. One may conclude, therefore, that the animal in question had been found in the summer.) I have observed the migration of 7 females to the summer roost in the Görömbölytapolca Cave, 144 km NEE to the Ördöglyuk Cave of Szoplak. Two females were recovered in the Kecskelyuk Cave 138 km NEE. The change of hibernation quarters plays an important part in the life of also this species. The most important is its occurrence in Szentmargitbánya (Austria) 171 km W to the Ördöglyuk Cave of Szoplak. K. Bauer found 1 male and 2 females here 21 March 1955. The early date refers manifestly to hibernating specimens. I banded the three bats in the Ördöglyuk Cave 1—2—3 years before their recaptures. Similarly, two Miniopterus moved from the Ördöglyuk Cave to the István Cave in Lillafüred 137 km NEE. One of the females banded in the Ördöglyuk Cave in the spring of 1953, hibernated in this same place in January 1954, whilst it was receptured again in the István Cave in January 1955. The case of the other female is very curious indeed. I have banded it in the Ördöglyuk Cave of Szoplak, and it was recaptured in the István Cave 7 February 1954. This specimen has therefore changed its hibernation quarters during hibernation. Two other *Miniopterus* originate also from the Ördöglyuk, found in an artificially excavated earthen cavern, in Kovácspatak, by Vachold 15—16 September 1955. Straying is the best assumption in this case.

Of the specimens banded in the important summer roost of the northern *Miniopterus* population, the Görömbölytapolca Cave, many were recovered in various hibernation quarters, after their autumnal migration. Such localities are Szokoly (85 km NNE), the Jászó Cave (68 km NNE), and the Somod Cave

(60 km NNE). 1—1 specimens, respectively, were found in the first two points, and three in the last named. Besides these places above, the István cave of Lillafüred is also an important hibernation quarter (14 km NWW to the Görömbölytapolca Cave). Four males and two females were reported from this place, in January-February 1955. That the *Miniopterus* specimens residing in the Görömbölytapolca Cave hibernate in the Somod Cave and, conversely, the ones residing there spend the summer in Görömbölytapolca, is shown also by the *Miniopterus* banded by Vachold and recovered by me in Görömbölytapolca. By the way, *Miniopterus* bats banded in Czechoslovakia have been found in the Ördöglyuk Cave of Szoplak, the István cave and the Kecskelyuk Cave too.

The southern population does not intercommunicate with the northern one in our research area. The sole locality of the *Miniopterus* of the southern area known to my is the Abaliget Cave. I have banded bats here mainly in the winter, a part of them in the end of the spring and a few also in the end of August 1954. Of these latter, a specimen was soon recovered on the loft of a sheepfold in Bogdása-Körcsönyepuszta (36 km SW), in the middle of October 1954. One can scarcely speak of migration in this case but rather of the straying of a disturbed animal. A male specimen was recaptured 35 days after its banding, in the Mánfa Cave (12 km E), in the spring of 1954. Another male, banded also in the Abaligeti Cave in May 1954, was too recovered in the above place, June 1955. Both cases represent strayings. The recovery of a male in Hercegovac, Yugoslavia (102 km SW) 30 July 1955, reported by B. G j u l i c, is the most interesting of them all. This animal was probably in its autumnal movement toward its hibernating quarters, the Abaliget Cave. Compared with foreign data, one may arrive at the conclusion that this species is indubitably moving

Table 1.

The numerical distribution in the various collecting localities of bats banded in the period December 1951 — September 1955

	Pálvölgyi Cave	Ördöglyuk Cave of Szoplak	Solymár Cave	Pisznice Cave	Abaliget Cave	Görömbölytapolca Cave	Aggtelek Cave	Pilismarót	Orgovány	Pusztakovácsi	Other localities	Total
R. ferrumequinum	5	—	2	—	158	—	12	—	—	—	7	184
R. hipposideros	126	1	16	12	2	—	98	—	—	—	22	277
R. euryale	—	—	—	59	—	409	—	—	—	—	—	468
M. emarginatus	5	—	—	1	—	71	—	—	—	—	—	77
M. nattereri ...	1	1	—	—	4	—	—	—	—	—	—	6
M. bechsteini ..	—	1	—	—	—	—	—	—	—	—	—	1
M. myotis	3	110	—	110	23	240	2	1647	—	—	10	2145
M. oxygnathus .	679	9073	40	1	1651	75	24	187	33	—	5	11769
M. daubentoni	—	—	—	—	12	—	—	—	—	—	—	12
M. dasycneme .	—	—	—	—	—	—	—	—	—	—	2	2
E. serotinus ...	—	—	—	—	—	—	—	—	—	19	1	20
B. barbastellus .	—	3	—	—	—	—	—	—	—	—	—	3
P. auritus	—	2	—	—	—	—	—	—	—	—	7	10
Min. schreibersi	—	827	—	156	384	422	2	—	—	—	4	1795
Total	819	10018	58	339	2234	1217	138	1834	33	19	58	16769

Table 2.

The movement data of *Myotis oxygnathus*. Localities yielding more specimens designated by specimen numbers. The data concerning changes of winter quarters are omitted from the Table

Sex	Date of banding	Locality of banding	Date of recapture	Locality of recapture	Distance of movement in km	Direction of movement	Specimens
♂	March 9, 1952	Ördöglyuk Cave	April 25, 1952	Budapest	25	SSE.	
♂	March 30, 1952	« «	April 2, 1952	Gánt	53	SW.	
♂	March 30, 1952	« «	April 27, 1952	Újhartyán	68	SSE.	
♂	March 30, 1952	« «	Nov. 3, 1952	Ágasegyháza	110	SSE.	
♂	March 30, 1952	« «	May 24, 1952	Selyp	60	E.	
♂	April 5, 1952	« «	Feb. 25, 1953	Tápiógyörgye	90	SE.	
♂	Feb. 21, 1953	« «	?	Nyergesújfalu	26	W.	
♂	April 5, 1952	« «	April 2, 1953	Kóka	62	SE.	
♂	March 15, 1952	« «	April 26, 1953	Csengőd	115	SSE.	
♂	March 30, 1952	« «	May 1, 1953	Törtel	103	SE.	
♂	April 5, 1952	« «	May 20, 1953	Cegléd	93	SE.	
♂	March 9, 1952	« «	May 17, 1953	Bajna	22	WSW.	
♂	Dec. 11, 1952	« «	May 15, 1953	Hatvan	61	E.	
♂	?	?	June 6, 1953	Csongrád	?	SE.	
♂	No. 7, 1952	Ördöglyuk Cave	July, 1953	Orgovány	118	SSE.	
♂	Feb. 28, 1953	« «	July, 1953	Orgovány	118	SSE.	
♂	Feb. 28, 1953	« «	Aug. 23, 1953	Kicsind (CSR)	23	NW.	
♂	March 9, 1952	« «	Oct. 17, 1953	Szentes	158	SE.	
♂	March 30, 1952	« «	June 21, 1953	Pilismarót	10	N.	
♂	1952, 1953	« «	Summer, 1953	Pilismarót	10	N.	8
♂	Nov. 7, 1952	« «	April 15, 1954	Piliscsaba	12	W.	
♂	March 9, 1952	« «	April 27, 1954	Csepel	38	SSE.	
♂	March 30, 1952	« «	April 26, 1954	Hantos	84	SSW.	
♂	March 15, 1952	« «	April 29, 1954	Abony	100	SE.	
♂	March 20, 1954	« «	April 29, 1954	Vértesacsa	42	SW.	
♂	March 30, 1952	« «	May 1—7, 1954	Pilisvörösvár	10	S.	
♂	April 5, 1952	« «	May 20—23, 1954	Tass	80	S.	
♂	March 21, 1953	« «	May, 1954	Köbölkút (CSR)	31	N.	
♂	March 30, 1952	« «	Summer, 1954	Lajosmizse	91	SE.	
♂	Feb. 28, 1953	« «	July 12, 1954	Pásztó	65	ENE.	
♂	1952—1954	« «	Summer, 1954	Pilismarót	10	N.	20
♂	March 9, 1952	« «	April 10, 1955	Nyergesújfalu	26	W.	
♂	March 30, 1952	« «	May 7, 1955	Békásmegyer	20	SE.	

Sex	Date of banding	Locality of banding	Date of recapture	Locality of recapture	Distance of movement in km	Direction of movement	Specimens
♂	Feb. 28, 1953	Ördöglyuk Cave	May 18, 1955	Dunaszentmiklós	41	W.	
♂	Feb. 28, 1953	« «	July, 1955	Váckisújfalu	38	E.	
♂	Jan. 9, 1954	« «	Sept. 16, 1955	Nána (CSR)	17	NW.	
♂	1953, 1954	« «	Sept. 15, 1955	Kemence (CSR)	33	N.	2
♂	1953, 1954	« «	Sept. 15, 1955	Kemence (CSR)	33	N.	2
♂	1952—1954	« «	Summer, 1955	Helemba (CSR)	15	NNW.	11
♂	Nov. 7, 1952	« «	Aug. 13, 1955	Helemba (CSR)	15	NNW.	
♂	1952, 1953	« «	Summer, 1955	Pilismarót	10	N.	2
♂	Dec. 11, 1952	« «	June 23, 1955	Pilismarót	10	N.	
♂	Feb. 24, 1952	Pálvölgy Cave	April, 1953	Orgovány	94	SSE.	
♂	Feb. 24, 1952	« «	April 12, 1953	Jászberény	70	E.	
♂	Feb. 17, 1952	« «	April, 25, 1953	Kunszentmiklós	56	SSE.	
♂	Feb. 17, 1952	« «	April 12, 1953	Kerekegyháza	73	SE.	
♂	April 12, 1953	« «	July 10, 1953	Balástya	148	SSE.	
♂	Feb. 19, 1954	Abaliget Cave	April 13, 1954	Bátaszék	48	E.	
♂	Feb. 19, 1954	« «	April 26, 1954	Baja	63	E.	
♂	Feb. 19, 1954	« «	April 6, 1954	Almamellék	18	W.	
♂	Feb. 20, 1954	« «	April 22, 1954	Kaposvár	35	NW.	
♂	Feb. 19, 1954	« «	April 24, 1954	Kaposvár	35	NW.	
♂	Feb. 19, 1954	« «	May 23, 1954	Iregszemcse	63	N.	
♂	Feb. 9, 1955	« «	April 2, 1955	Ozora	71	NNE.	
♂	Feb. 9, 1955	« «	April 17, 1955	Szenna	38	NW.	
♂	Feb. 9, 1955	« «	April 14, 1955	Bükkösd	12	WSW.	
♂	Feb. 9, 1955	« «	April 20, 1955	Szilágy	23	E.	
♂	Feb. 9, 1955	« «	April 23, 1955	Grábóc	37	NE	
♂	Feb. 19, 1954	« «	April 25, 1955	Szabadi	23	NNW.	
♂	Feb. 9, 1955	« «	April 26, 1955	Császártöltés	80	NE.	
♂	Feb. 19, 1954	« «	May 3, 1955	Fonó	23	NNW.	
♂	Feb. 9, 1955	« «	May 1, 1955	Tolna	61	NE.	
♂	Feb. 19, 1955	« «	Nov. 8, 1955	Andocs	57	N.	

over large areas in our territory, even if we miss such enormous migrating distances as given by Aellen (1) in the case of Swiss specimens. It is a more striking fact that a change of quarters of such proportions occur also during hibernation.

Disregarding typical cave bats, I have banded only *Eptesicus serotinus* in any numbers. A young female banded in Pusztakovácsi, 6 July 1954, was recovered in the village Hartl, Eastern Styria (145 km NW to Pusztakovácsi) 11 August 1955, flying into an open room. *Eptesicus serotinus* is one of the species about the movements of which we have scarcely any data up to now. And though we cannot, in the present case, speak of either a spring or autumnal movement but probably a simple transmigration only, one may still assert that *Eptesicus serotinus* is to be relegated to the migrating bats.

Summary

In the present paper, I have summed up the results received hitherto of my bat banding experiments made from December 1951 till September 1955, concerning the migrations, that is, movements of bats banded in Hungary. My research area was the plain, hilly or mountainous territory situated in the center of the Carpathian Basin. The main part of this territory is a cultivated area, its hilly regions covered by forests. The caves of the limestone hills and mountains serve as principally winter quarters and summer roosts for the cave bats of the area studied. I have shortly discussed the most important summer and winter research localities and their populations. My data were obtained by the banding of 16769 bats. The number of various bat species recaptured in smaller or greater distances from the points of banding is 247, referring in its majority to *Myotis oxygnathus* (see Table 1). Data were received from the following bat species: *Rhinolophus hipposideros, R. ferrumequinum, R. euryale, Myotis myotis, M. oxygnathus, Miniopterus schreibersi* and *Eptesicus serotinus*. The Horseshoe bats move the slightest. The maximal spring movement of *R. hipposideros* was 33 km, that of *R. ferrumequinum* 12 km (see Table 2). I received but a few data from *Myotis myotis*. I have almost no data at all regarding the winter quarters of populations banded in the summer. In this territory, *Myotis oxygnathus* is a common and important species, yielding the majority of my data with regard to its spring movements and, consequently, its summer areas (see Table 2, Fig. 1.). This species decidedly clings to the plain and hilly regions, its summer resorts being therefore cultivated areas. The maximal distance of the spring movement of *Myotis oxygnathus* is 158 km. I obtained less data on the movements of *Miniopterus schreibersi*. In the case of this species, northern and southern populations were to be distinguished, manifestly unconnected in our territory. (see Fig. 2.) My data of *Eptesicus serotinus* is the first which refers to a movement of such dimensions.

The other results of my researches will be dealt with in another paper. I am of the opinion that the continuation of my researches is desirable since our results up to now cannot be regarded as final or, with regard at least to the great majority of our bat species, they need further completion and elucidation.

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Миграция летучих мышей в Венгрии

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(Резюме)

Автором было проведено с конца 1954 г. до 1955 г. при содействии Музея Естествоведения Венгерского Национального Музея кольцевание свыше 16 700 летучих мышей различных видов (таблица 1.). В своей статье он сообщает полученные до сих пор результаты о миграции летучих мышей на основании анализа данных 247 животных, обнаруженных в течение 4 лет на более или менее большом расстоянии от места кольцевания. После изложения самых важных зимних и летних мест нахождения и краткого описания популяции последних, автор рассматривает отдельные виды летучих мышей. Экземпляры видов *Rhinolophus* проявляют миграцию небольшой степени (рисунок 2.). Относительно места перезимовки кольцеванных летом экземпляров вида *Myotis myotis* почти не имеется данных. Больше всего данных было собрано о перемещении остроухой ночницы (*Myotis oxygnathus*), являющейся чаще всего встречающимся видом на исследованной территории. Этот вид придерживается летом равнинных местностей и плоского холмогорья, и является следовательно обитателем культурных областей. (Таблица 2., рис. 1.) У вида обыкновенный длиннокрыл (*Miniopterus schreibersi*) можно было различать северные и южные популяции (рисунок 2.), которые не имеют сношения между собой. Данные о миграции вида *Eptesicus serotinus* являются первыми, указывающими на миграцию данного вида в таком размере.