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Travaux du Muséum National d'Histoire Naturelle «Grigore Antipa»	Vol XLIV	pp 443-454	© 2002
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**PIPISTRELLUS KUHLII KUHL, 1819 AND P. PYGMAEUS LEACH,
1825 (CHIROPTERA: VESPERTILIONIDAE) RECENTLY
REPORTED IN THE ROMANIAN VERTEBRATE FAUNA***

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Abstract Two bat species (*Pipistrellus kuhlii* and *P. pygmaeus*) were identified in the Romanian mammal fauna on the occasion of the Workshop of the Netherlands Bat Research Foundation, when we used a bat detector (June 2000) in Cefa locality Bihor County, in western part of the country. The same species were identified in Cloșani locality (Gorj County) in the summers of 2000 and 2001

Résumé. Deux espèces de chauves-souris (*Pipistrellus kuhlii* et *P. pygmaeus*) ont été signalées dans la faune de mammifères de la Roumanie. Ont été rapportés à l'occasion de la réunion pour l'utilisation des Détecteurs pour chauves-souris (Juin 2000) à Cefa (Département Bihor). Les même espèces ont été identifiées dans la localité Cloșani (Département Gorj) pendant l'été 2000 et 2001

Key words. record of bats, identification key, bat detector, ultrasound reception.

During the period 15 - 18.06.2000, within the area of Cefa commune from Bihor County, the Netherlands Bat Research Foundation organized a Bat detector Workshop, coordinated by Herman Limpens. It was attended by the members of the non-governmental organization "Eco-Studia" from Cluj, "Rhinolophus" Speleological Club from Lupeni, specialists of the "Babeș-Bolyai" University from Cluj, from the "Emil Racoviță" Institute of Speleology from Bucharest and from Cluj, "Grigore Antipa" National Museum of Natural History from Bucharest. After classes, within the field activity (near the fish ponds from the surroundings of Cefa commune), Herman Limpens used the bat detector and proved the presence of the following chiropteran species in the area: *Rhinolophus ferrumequinum* (Schreber, 1774), *Eptesicus serotinus* (Schreber, 1774), *Myotis daubentonii* (Kuhl, 1817), *Nyctalus noctula* (Schreber, 1774), *Pipistrellus pipistrellus* (Schreber, 1774), *P. pygmaeus* (Leach, 1825) and *P. kuhlii* (Kuhl, 1817).

By this paper the authors complete the list of the bat species from the Romanian fauna.

From the above list, the last two species (*Pipistrellus kuhlii* and *P. pygmaeus*) are new mentions for the Romanian fauna. After the Workshop finished, the researcher team of Bucharest went to the Speleological Station from Cloșani, Gorj County, from south-east Romania, for a single night, 19th to 20th of June 2000. There, they used detectors of Pettersson – 200 type and identified the following bat species: *Pipistrellus pipistrellus*, *P. kuhlii*, *P. pygmaeus* and *Nyctalus noctula*. FQ 49

It was expected to refund the species *P. kuhlii* and occur the species *P. pygmaeus* in south-western Romania, taking into account their mention in the neighbouring countries. Without any other remarks on the presence of these two species Gheorghiu and col. (2001) reported their presence in the Romanian fauna.

* English translation by Mihaela Barcan Achim.

DISCUSSIONS

Pipistrellus kuhlii Kuhl, 1919.

The first mention of this species was in Transylvania, in the second half of the 19th century, by Eugen Daday, in his papers "*Jeletentes az 1885 ev nyaran vegzett ropterologiai gyujtesek eredmenyeirol es az edelyorsz, muzeum eghylet nevergyujtemenek jekyzeke*" (printed in Cluj, in 1885) and "*Uyadatok Erdely never - faunajanak ismeretehez*" (printed in Budapest, in 1886). In the two papers, Daday reported 14 bat species, (among them being present *Pipistrellus hlui*, then named *Vesperugo kuhlii*) from the following six localities (Fig. 1): Izamezo (Buzaş, Rus commune, Sălaj County), Klausenburg (Cluj-Napoca), Dees (Cluj County), Olah-Laposbanya (Lăpuş, Maramureş County), Semesnye (Mîmăşna, Rus commune, Sălaj County) and Hermannstadt (Sibiu).

The mention from Sibiu refers to the bridge of the "Terezian" Orphanage and was considered one of the richest shelters by Daday, in which also there are specimens of "... *Vespertilio murinus*, [*Nyctalus noctula*] and [*Miniopterus treibersu*]", besides those belonging to *P. kuhlii*.

Bielz (1886 and 1888) reported for Sibiu both the four species cited by Daday (1885 and 1886) and other 9 species, previously reported in a list (also for Sibiu) in 1856. Species *P. kuhlii* is cited by Bielz (op. cit.) only from the localities mentioned by Daday.

Mehely (1900) published "Monografia Chiropterum Hungariae", in Budapest, without citing *Pipistrellus kuhlii* from Transylvania, because he didn't find the specimens collected and reported by Daday (1885 and 1886) in the collections of the Museum from Cluj. More than that, Mehely (op. cit) considered that Daday confounded the species *P. kuhlii* with another species. We think that the confusion couldn't be possible because *P. kuhlii* is totally different from the other species of the genus (Fig. 3).

Călinescu (1931), based on Mehely's remarks (1900) didn't include the species *P. kuhlii* among the bats from the Romanian mammal fauna. Dumitrescu and col. (1962 - 1963) had the same opinion, sustained in his wide monograph "Răspândirea chiropterelor în R.P. Română" ("The chiropteran distribution in the Popular Republic of Romania"). Later on, all publications on the bats from the Romanian fauna ignored the species *P. kuhlii*, because the collectings were accidental, indeed. Our attempts to localize the shelters of the species *P. kuhlii*, after the identification of its presence using the detector, were successful. Because we did not occur individuals of *P. kuhlii* in the visited caves and taking into account their small size, we thought that their preferred shelters could be the tree hollows and, especially, the crannies of only 15 - 20 mm from walls or rocks.

Distribution. According to Bauer, (1996) and Horacek and col. (2000) this species is distributed in the Palaearctic, Afro-Tropical region and partial in the Oriental region. In the Palaearctic region it was mentioned from Canary Islands, south of England, France and Iberian Peninsula, Italy, Austria, Switzerland, Germany, the Netherlands, Hungary, Republic of Moldavia, Balkans, the Crimea, the steppe area between Don and Volga, the Caucasus, Turkey, Syria, Lebanon, Israel, Jordan, Saudi Arabia, Kuwait, Oman, Bahrain, Yemen, Irak, Iran, Afghanistan, Turkmenistan, Kazakhstan, Pakistan, east of India, North Africa - from Egypt to Morocco, the sub-Saharan Africa till the Cape Region (Fig. 2).

Observed flying, *P. kuhlii* has a slight larger size than of the species *P. pipistrellus*, but with smaller and narrower wings. In the open habitats, the flight is

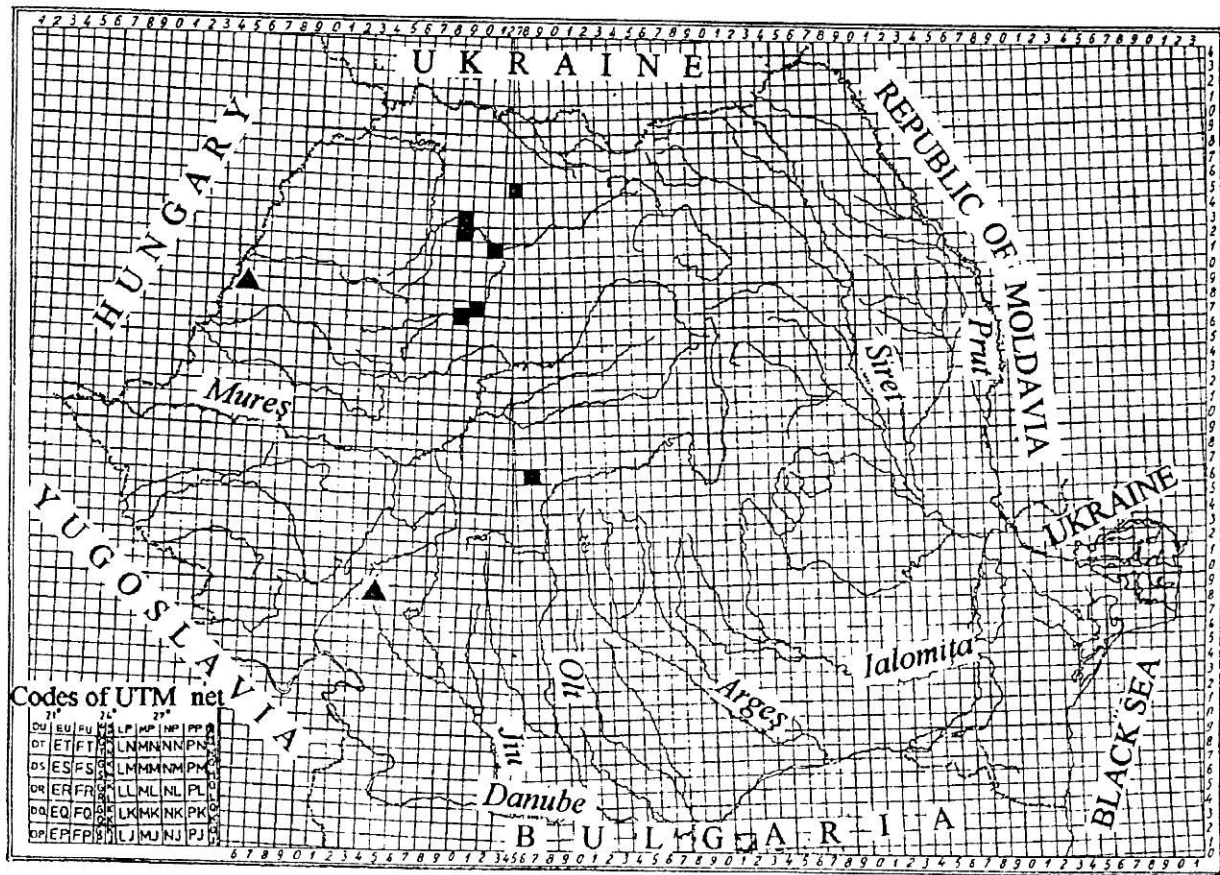


Fig. 1 - Distribution of the species *Pipistrellus kuhli* in Romania: ■ - mentioning points from 1885, ▲ - mentioning points from 2000

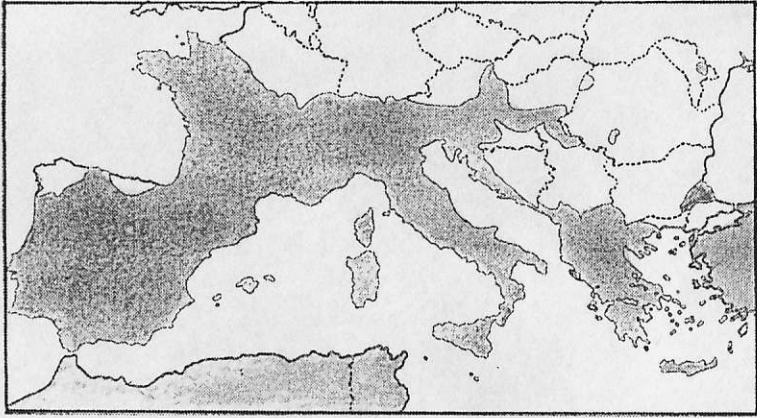


Fig. 2 – Distribution of the species *Pipistrellus kuhlii* in Europe (after Decu et al., 2002).

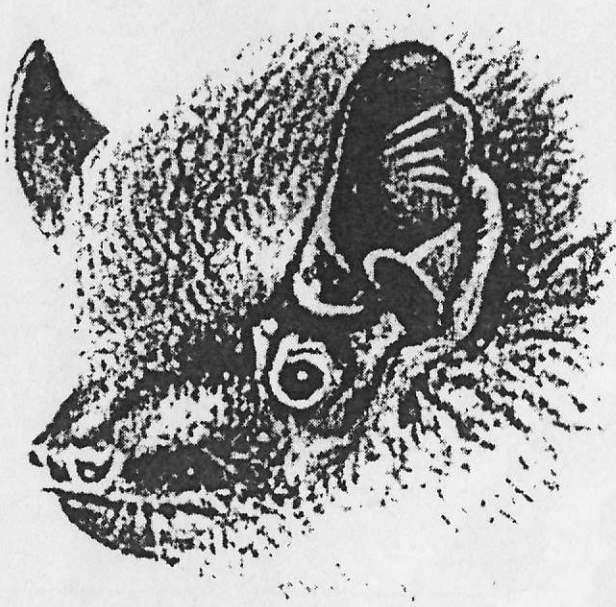


Fig. 3 – Head of *Pipistrellus kuhlii* (after Spagnesi et al., 2000).

slow, without sinuosities. The best frequency for intercepting the ultrasounds with the detector is around 38 kHz – quasi-constant frequency. The received sounds are as follows: pip pop pop pop pip pip pop pop pop (according to Limpens, 2000 – Internet communication). The rhythm resembles that of the rain drops falling on the water surface. The rhythm of the sounds made by the species *P. nathusi* is slower, more regular, with heavy pulsations.

In the close habitats, the medium frequency is principal (FM – qef), in the semi-open ones, the modulated frequency is secondary when it flies near vegetation and buildings, and the quasi-constant frequency is principal (fm – FQC). The same thing occurs when it flies in open habitats, where FQC is long with a lot of Doppler effect.

In order to make easier the identification of genera on the basis of the outer morphology criteria, we present a simplified key, both for the bat species of Europe and for the species of genus *Pipistrellus*.

Identification key of the European bat genera

- 1 (2) Tail half included in uropatagium *Tadarida*
 2 (1) Tail included in uropatagium more than a half or totally 3
 3 (4) Present nasal folds. Ear without tragus *Rhinolophus*
 4 (3) Absent nasal folds. Ear with tragus 5
 5 (6) Ears do not exceed the top of the head; tragus tip white *Mimopterus*
 6 (5) Ears exceed the top of the head; tragus tip is not white 7
 7 (8) Bases of the ears linked on the top of the head 9
 8 (7) Bases of the ears unlinked 11
 9 (10) Ears twice longer than wide *Plecotus*
 10 (9) Ear length equal with their width *Barbastella*
 11 (12) Cone-shaped tragus, with a pointed tip *Myotis*
 12 (11) Tragus is not cone-shaped and nor a pointed tip 13
 13 (14) Only the last caudal vertebra exceeds the uropatagium with 1 mm 17
 14 (13) The last two caudal vertebrae exceed the uropatagium with cu 4 – 5 mm .. 15
 15 (16) Tragus three times shorter than its maximum width. Calcar with a large epiblem, with lateral branch..... *Vespertilio*
 16 (15) Tragus three times longer than its maximum width. Spur with a narrow epiblem, without lateral branch..... *Eptesicus*
 17 (18) Mashroom-like tragus. Body of a great size *Nyctalus*
 18 (17) Tragus longer than wide, with a rounded tip. Body of a small size 19
 19 (20) Tragus wider in the distal half *Hypsugo*
 20 (19) Tragus wider in the proximal half *Pipistrellus*

Identification key of the species of the genus *Pipistrellus*

- 1 (2) The first upper incisor (I^1) unicuspidate. I^2 very small. Pm^1 insidwards, couldn't be identified from outside. Plagiopatagium with a white margin of 2 mm wide *Pipistrellus kuhlii*
 2 (1) Bifide upper incisors. White margin of the plagiopatagium reduced only at the level of the hind limbs or even absent 3
 3 (4) Imbricate lower incisors. I_2 shorter than the short cuspid of I_1 5
 4 (3) Unimbricate lower incisors. I_2 higher than the small cuspid of I_1 *Pipistrellus nathusi*

- 5 (6) Finger III with the 2nd and 3rd phalanges unequal (Fig. 4B). Recepted frequency of the ultrasounds is of 45 kHz (Fig. 6) *Pipistrellus pipistrellus* (Fig. 5)
- 5 (5) Finger III with the 2nd and 3rd phalanges equal (Fig. 4A). Recepted frequency of the ultrasounds is of 55 kHz (Fig. 7) *Pipistrellus pygmaeus*

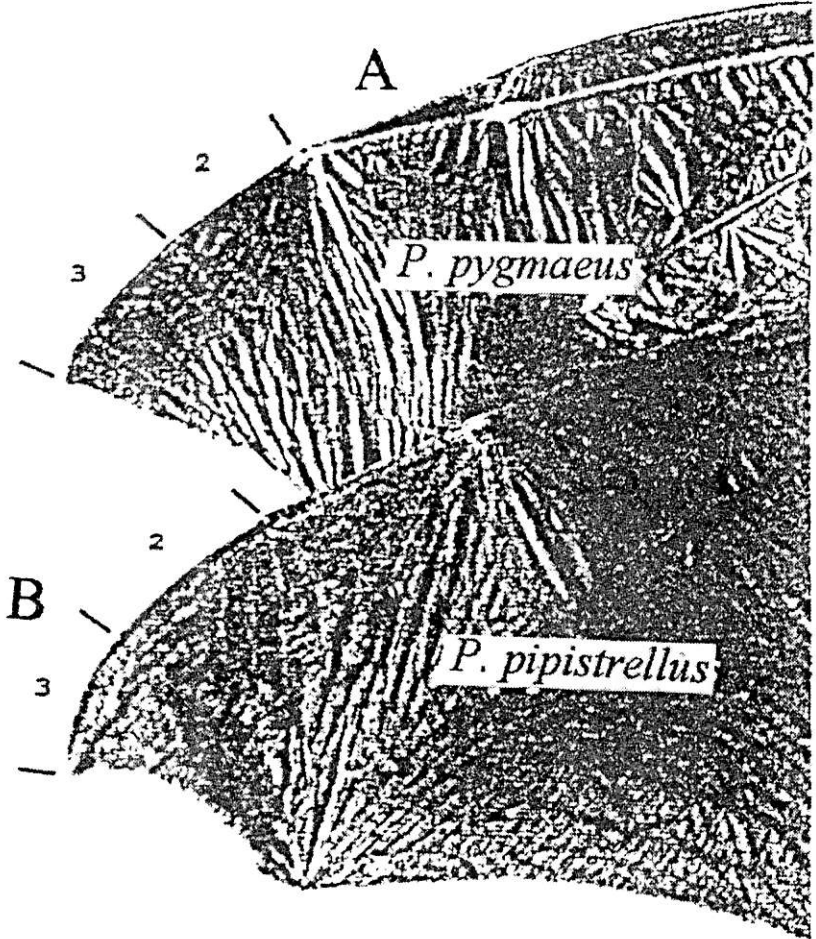


Fig. 4 – Comparison of the wings of *Pipistrellus pygmaeus* (A) with *P. pipistrellus* (B) (after Häussler et al., 2000).



Fig. 5 Head of *Pipistrellus pipistrellus* (after Spagnesi et al., 2000)

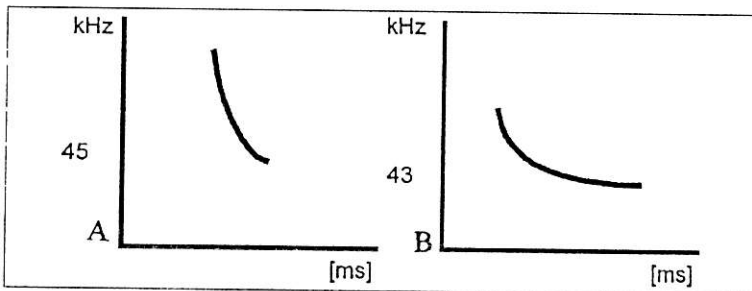


Fig. 6 - Sonograms of the species *Pipistrellus pipistrellus* A - in a half-close habitat, B - in an open habitat (after Limpens et al., 1995).

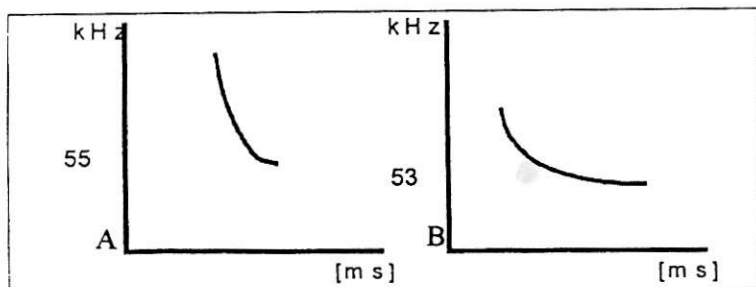


Fig. 7 - Sonagrams of the species *Pipistrellus pygmaeus*: A - in a half-close habitat, B - in a open habitat (after Limpens et al., 1995).

Pipistrellus pygmaeus Leach, 1825.

After 1985, the identification technics and methods of the flying bats improved. Among the new equipments there also are the ultrasounds detectors which allow a comparison of the received ultrasounds of different species. *Pipistrellus pygmaeus* is a reconsidered species after it was synonymized with *P. pipistrellus* for some tens of years; one of the last synonymizations was in Ellerman's and col. paper (1946).

The two species utter ultrasounds with a point of energetic concentration, corresponding to a constant frequency. This is a specific species characteristic, on its basis the specialists considering that there are sister species in the genus *Pipistrellus*. That is why the species *P. pipistrellus* was divided into two groups, just because of the dichotomous frequency "tail": one with FC = 45 kHz and the other with FC = 55 kHz.

Jonnes and col. (1993) demonstrated that the two groups of the species *P. pipistrellus* have a sympatric distribution, and on the basis of the two dichotomous terminal frequencies they represent in fact two different species. Barret and col. (1997) studied the structure of mitochondrial DNA of the two species. The correlation of these structures with the morphological observations (*P. pygmaeus* is smaller than *P. pipistrellus* - according to Barlow and col., 1999) led to the conclusion that the two species are cryptical. From them, *P. pipistrellus* utters ultrasounds with a terminal frequency of 45 kHz, and *P. pygmaeus* - terminal frequency of 55 kHz.

According to Häussler and col., (2000), the forearm of the species *P. pygmaeus* is 29 - 32.8 mm long. The ears and the muzzle are shorter than in *P. pipistrellus*. The thick and silky fur, of a brown-olive colour on the back and grey-yellowish, ventrally. Plagiopatagium with a clear white margin. The distal third of the uropatagium, covered with dense hairs. The cover of the penis is orange, without a pale median stripe. It is mainly a riparian species.

Although sympatric, the two species do not compete each other when they populate the same habitats because *P. pipistrellus* utters ultrasounds of around 45 kHz, frequency which does not allow it to capture moths, they being felt with a frequency of 20 - 25 kHz, while *P. pygmaeus* has a specific signal of 55 kHz - a frequency beyond the sensibility area of moths; this frequency allow it to capture preys which cannot be caught by the other bat species.

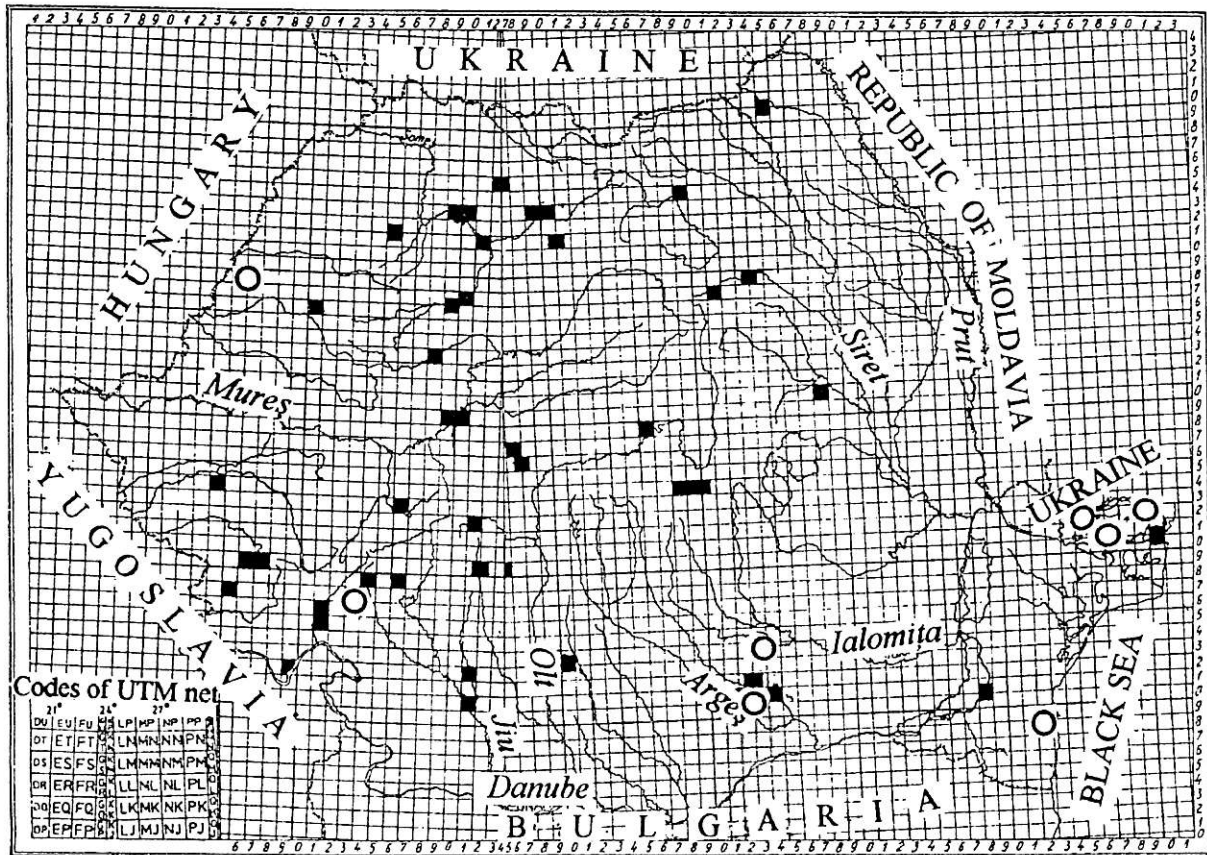


Fig. 8 – The distribution of the species *Pipistrellus pipistrellus* (■) and *P. pygmaeus* (○), in Romania (after Decu et al., 2002).

Its distribution is insufficient known, but till now, it was reported from the western Palearctic region: Scotland, Ireland, Germany, Switzerland, Denmark, Sweden, Czech Republic, Slovakia, north-east of Republic of Moldavia*, Greece, Spain, Portugal. According to Horacek and col., (2000) and Limpens (2000), the mentions of the species were extended to Slovenia, Croatia, Bulgaria and Georgia, on the basis of the identifications made with the ultrasound detector.

Observed on the fly, it appears smaller than *P. kuhlii*, *P. pygmaeus* being the smallest bat of Europe. It has relatively long and narrow wings. For feeding, it does not often go in open places. Near the canopy and vegetation it has a chaotic flight.

Identified with the ultrasound detector, the rhythm of sounds is alert, resembling the clapping or the rain drops falling on the water surface. In close habitats FM is important, and the evasiconstant frequency – secondary (Fm – fqc). In the open habitats evasiconstant frequency is important with a tonal quality and a perceptible Doppler effect (fm – FQC). Social calls (e.g. of breeding) are received with a frequency of 18 – 25 kHz, the sound being the syllable “trick”, three times repeated. The signal is well received in the “tail” of the constant frequency (FQC), between 54 – 57 kHz and it sounds like: pip pop pip pop plip pip pip pop pop pop (according to Limpens 2000, Internet communication).

On the Romanian territory, the species *P. pygmaeus* was mentioned near the locality Cefa (Bihor County), at an altitude of about 100 m. The fish pond complex from there is a very good habitat for feeding several bat species, among them being also identified *P. pygmaeus*. Their refuges are the atticks and the tree hollows from the forest which borders the lake complex west and northwards. In locality Cloșani (Gorj County), at the altitude of about 450 m, the individuals of this species were observed flying near the trees of the orchards and the forest belt, the vegetation along the fences and the roofs of the houses from the same locality. Near locality Motru Sec (Gorj County), placed at the same altitude, individuals of *P. pygmaeus* were observed flying along the river with the same name, during the following periods: 19 – 20.06.2000, 22 – 29.07.2000, 19 – 26.08.2000 and 14.07 – 24.08.2001. On 26th of May 2002 they were identified by the ultrasound detector near Snagov Lake, at 35 km north of Bucharest, Hcrăstrău Park – Bucharest, the Danube Delta (Letea forest, Maliuc and Băclăneștii Mari Lake) and Hagieni forest - Dobrogea.

Conclusions PL 60 ?

PJ 25

After more than a century, the presence of the species *Pipistrellus kuhlii* was reconfirmed in the Romanian fauna, reconsidering Daday's mention (1885) and the range of the species extended northwards.

On the basis of DNA study and its correlation with the morphological features, the species *P. pygmaeus* was removed from the synonymization with *P. pipistrellus*, the range and refuges of the first species remaining to be specified, within the conditions of the statute of sister species and of a sympatric distribution of the two species.

By mentioning their presence, the species *P. kuhlii* and *P. pygameus* complete the list of the chiropteran species from the Romanian fauna, from 28 to 30.

* In a tree hollow from the flooding area of Nistru, a colony of about 100 individuals of *P. pygmaeus* was identified (after Sergiu Andreev, personal communication)

PIPISTRELLUS KUHLLII KUHL, 1819 ȘI *P. PYGMAEUS* LEACH, 1825
(CHIROPTERA: VESPERTILIONIDAE) SPECII RECENT SEMNALATE ÎN FAUNA
DE VERTEBRATE A ROMÂNIEI

REZUMAT

Două din speciile aparținând genului *Pipistrellus* (*P. kuhlii* și *P. pygmaeus*) sunt semnalări noi pentru fauna de vertebrate a României. Materialul a fost identificat cu ajutorul detectorului de ultrasunete, model Pettersson 200.

Pentru o corectă identificare a liheșilor în zbor sunt notate cele mai bune frecvențe de recepționat ultrasunetele și detaliile în modificările datorate zborului, în habitate diferite. Sonagrammele speciilor *P. pipistrellus* și *P. pygmaeus* sunt ilustrate comparativ. În lucrare există o cheie simplificată pentru determinarea genurilor de liheci europeni și alta pentru determinarea speciilor genului *Pipistrellus*. Prin adăugarea acestor două specii la lista celor raportate din fauna României, numărul lor a crescut de la 28 la 30.

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Received May 10, 2002

Accepted May 30, 2002

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