

SOME TAXONOMICAL AND BIOLOGICAL CHARACTERISTICS OF *MYOTIS EMARGINATUS* (MAMMALIA: CHIROPTERA) IN TURKEY

İrfan Albayrak*

* University of Kırkkale, Faculty of Science and Arts, Department of Biology, 71450 Yahşihan, Kırkkale, TURKEY. E-mail: iralbayrak@yahoo.com

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ABSTRACT: This study is based on some records and observations concerning *Myotis emarginatus* obtained during the field works carried out between 1977 and 2012. Diagnostic characters, habitat, fur color, measurements and collection localities of the specimens were recorded. Specimens were represented by adult groups and compared to the literature in terms of statistical data, and fur colour and it was concluded that our specimens represented the nominative form, *M. e. emarginatus*.

KEY WORDS: *Myotis emarginatus*, taxonomy, bioecology, Vespertilionidae, Turkey.

Of 5416 mammalian species in the world, 1116 species belong to bats (Wilson and Reeder, 2005). Up to date, it was determined that one species belonging to Megachiroptera and 37 species belonging to Microchiroptera lives in Turkey. One of the these species, *Vespertilio murinus* was recorded by means of faeces, the other one, *Otonycteris hemprichi* was recorded by using sound detector and the remaining was recorded basing on sample. These species are represented by the families of Pteropodidae, Emballonuridae, Rhinolophidae, Vespertilionidae and Molossidae.

Of 407 species belonging to the family Vespertilionidae in the world, 30 species are distributed in Turkey. One of them, *Myotis emarginatus* is distributed in Europe, Northern Africa, İnan and Turkmanistan in Palaearctic Region. Çağlar (1961) gave the first record of *Myotis emarginatus* from Kırklareli Province in Turkish Thrace and stated that Thracian specimens represented the nominate form. Çağlar (1965, 1969) pointed out that *Myotis emarginatus* occurred in Kırklareli. *Myotis emarginatus* was recorded from Konya and Antalya Provinces (Helversen, 1989). Albayrak (1990) has determined *Myotis emarginatus* from Adiyaman, Hatay and Samsun. Albayrak (1993) also pointed out the existing of *Myotis emarginatus* in İzmir and Manisa Provinces and recorded some morphometric values. Obuch (1994) recorded *Myotis emarginatus* from Adiyaman. Benda & Horacek (1998) gave the records of this species from Antalya, Yalova (Yalova was a district of İstanbul before 1995. Howbeit, they showed Yalova in Çanakkale Province by mistake), Hatay, Kırklareli and Kocaeli provinces. Irmak and Sözen (2014) recorded this species from Zonguldak Province (Figure 1).

The purpose of this study is to determine some biological and taxonomical characteristics of *Myotis emarginatus* which has a discontinuous distribution in Turkey.

MATERIAL AND METHOD

This study is based on 70 *Myotis emarginatus* specimens obtained during the field works between 1977 and 2012. Specimens were caught by hand and using

aerial net. Specimens were represented as adult according to Anderson (1917), Menzies (1973) Young (1975) and Baagoe (1977). Weight, 18 external and 19 cranial measurements were taken from each specimen according to Ognev (1928), Harrison (1964) and Çağlar (1968). Compared data were also shown using box-plot. Diagnostic characters, habitat, pelage colour, measurements and collection localities of *Myotis emarginatus* were given. The statistical values of specimens were compared to the literature and an assessment was made in subspecies level. Whether group averages were equal or not was tested by Kruskal-Wallis Anova with significancy values at the probability level of 0.05.

RESULTS

Family Vespertilionidae is represented with 30 species and one of these species is *Myotis emarginatus*, which is represented by the nominate form, *Myotis emarginatus emarginatus*.

Species: *Myotis emarginatus* (Geoffroy, 1806) (Geoffroy's bat)
1806. *Vespertilio emarginatus* Geoffroy, Ann. Mus. Hist. Nat., 8: 198-199.

Type locality: Ardenes, Givet, Charlemont, Fransa
1900. *Myotis emarginatus*, Méhely, Monogr. Chiropt. Hungariae, Budapest, 170-178.

Subspecies: *Myotis emarginatus emarginatus* (Geoffroy, 1806)
1918. *Myotis emarginatus emarginatus*, Bobrinski, Zаметки о летучих мышках добытых Материалы к познанию фауны и флоры России, 15: 17.

Diagnostic characters: There is a very distinct notch on the outer edge of the ear. The wing membrane reaches to the bottom of the outer finger of foot. The pattern of the interfemoral membrane of *M. emarginatus* has densely scattered dots. In 58 specimens, condylobasal length was 14.3 (14.8) 15.5 and mandibul length was 11.5 (11.9) 12.6 mm; in 54 specimens, zygomatic breadth was 9.2 (9.7) 10.3 mm.

Habitat: This species, which usually lives in caves, was found in the high cliffs shaded with leafy forest trees such as linden, beech and elm trees in summer months. In whelping period coinciding with the end of May, a small colony consisting of 15 females was found and in other months of the year only small colonies with 5-6 individuals consisting of males and females were found. In a formerly operated mine on a hillside with pine trees, 200 female individuals were found to have created a breeding colony. There were also colonies of *Rhinolophus ferrumequinum*, *Rhinolophus hipposideros* and *Miniopterus schreibersi* species in that mine. In another small artificial cave where people used to host in a rocky pine forest, a small colony with 30 individuals living sympatricly with *Rhinolophus ferrumequinum* was detected. An embryo or a pup was found with adult females.

Pelage colour: In summer the dorsal colour of *M. emarginatus* varies from somewhat redish gray to brownish gray tinged light henna colour; ventral colour varies from yellowish gray to brownish gray. Hair on dorsal has three colorations; base of hair is brown, middle of hair is yellowish dirty white and tip of hair has general dorsal coloration. Hair on ventral has two colorations; base of hair varies from light brown gray to dark brown gray and tip of hair has general ventral coloration. While the coloration of wing and tail membranes and ears of adults

are gray brown, those of young are either the same with adults or blackish brown.

Measurements: All specimens were females. No statistical significant differences between young and adults were found. Therefore statistical data of young and adults were pooled and given in Table 1.

Karyology: In this species the diploid number was 44, the fundamental number 56, and the number of autosomal arms 52 (Zima & Král, 1984).

Specimen examined. Total number, 60 (53 adult females, 5 juvenile females, 1 male and 1 female infants) from following localities: Adana Province, Karaisalı, 8 (♀♀, 23 May 1985); Adıyaman Province, İndere (Zey) village, 3 (♀♀, 17 May 1977); Hatay Province, Altınözü, Kozkalesi köyü, 4 (♀♀, 25 May 1979); Samsun Province, Kelkaya mahallesi (Asarağaç village), 9 (7 ♀♀, 13 July 1978; 2 ♀♀, 19 June 1980); İzmir Province, Gümüldür, 28 (27 ♀♀, 1 ♂ 10 June 1983); Manisa Province, Demirci, 8 (♀♀, 21 June 1977).

DISCUSSION

Our morphometric data were not compared to those in the literature because of insufficient characteristics given in the original description of *Myotis emarginatus emarginatus*. However, our material were comparable with the nominate form recorded from Holland, Austria, Hungary and Italy by Miller (1912). Besides, there is not any difference between our material and European population in terms of color, measurement and other features.

Recording the measurements of an adult specimen collected from Turkish Thrace, Çağlar (1961) included the Turkish Thrace into the distribution area of nominative subspecies.

Ognev (1928) stated that *M. e. desertorum* had steeper tragus than that of nominative form, and dorsal colour varied from light gray straw yellow to rusty or yellowish gray. *M. e. desertorum* (the specimen from Belucistan) was evaluated as species by Dobson (1865) and as subspecies by Bobrinski (1918). Colour variation of our specimens collected in may and june were not within the colour variation of *M. e. desertorum* specimens collected in june and july given by Ognev (1928) and thus, our specimens appear to be different from *M. e. desertorum*. Diagnostic character given for tragus was not evaluated because of absence of *M. e. desertorum* specimens for the visual examination.

It is known that internal characters are more reliable than external characters being more susceptible to the errors during applications. Of these internal characters, the condylobasal length, zygomatic breadth, upper toothrow length values were included in the analysis because data of those were almost fully available in all records and thus met statistical assumptions for reliable comparison. European values were quoted from Miller (1912) and Russian values quoted from Ognev (1928). No significant difference was found statistically between our specimens and European specimens, but statistically significant ($P < 0.05$) difference was detected between our specimens and Russian specimens. Despite their less reliability, the data of ear and hindfoot lengths, which were also available from Russia and Turkey and appropriate to examine statistically, showed statistically significant ($P < 0.05$) differences (Figure 2).

As a result it was concluded that Anatolian specimens differ from *M. e. desertorum* and represented the nominate form.

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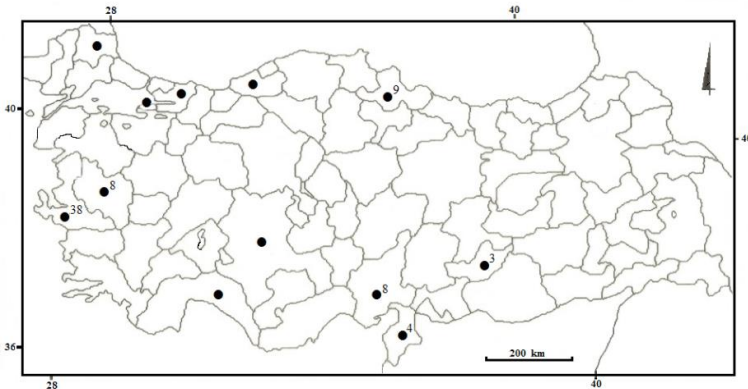


Figure 1. Map of Turkey showing the localities of *Eptesicus serotinus* (•) (Figures indicates the number of the obtained specimens concerning this study).

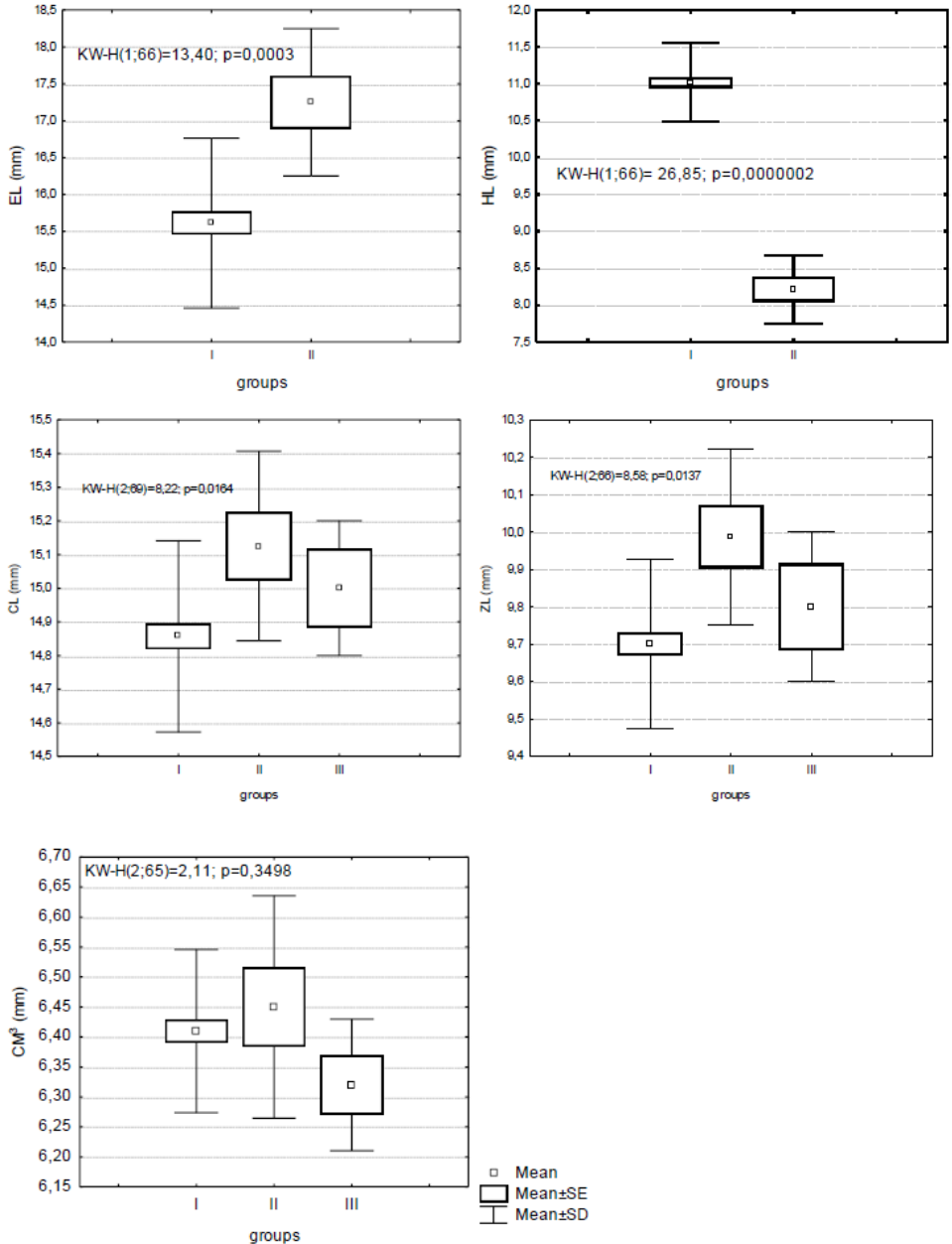


Figure 2. Comparison of some external and cranial measurements of *Myotis emarginatus* from Hungary, Holand and Italy (Miller, 1912); Buhara, Askhabad, Turkmania (Ognev, 1928) and present study. KW: Kruskal-Wallis Anova, I: Turkey (Present study); II=USSR (Ognev, 1928; III=Europa (Miller, 1912).

Table 1. Statistical data on weight external and cranial measurements of adult *Myotis emarginatus*: number of individuals (n), range (r), mean (m), standart deviation (\pm Sd).

Measurements	n	r	m	\pm Sd
Total length	57	86-101	93.8	3.77
Total body length	57	44-62	52.2	3.78
Tail length	57	34-45	39.6	2.34
Hindfoot length	58	10-12	11.0	0.53
Ear length	58	10-18	15.6	1.15
Weight	58	4.5-9.5	7.1	1.16
Tragus length	15	7.5-8.9	8.4	0.41
Forearm length	58	35.4-41.4	38.1	1.31
Tibia length	16	15.7-18.3	17.2	0.61
2nd digit metacarpal length	16	31.1-35.8	33.1	1.27
3rd digit metacarpal length	16	33.8-36.5	35.0	0.77
3rd digit 1st phalanx length	16	13.0-14.8	13.8	0.53
3rd digit 2nd phalanx length	16	10.0-11.4	10.7	0.47
4th digit metacarpal length	16	32.8-36.0	34.4	0.85
4th digit 1st phalanx length	16	9.4-10.8	10.1	0.40
4th digit 2nd phalanx length	16	7.3-8.9	8.1	0.54
5th digit metacarpal length	16	33.7-36.1	34.9	0.79
5th digit 1st phalanx length	16	9.1-10.7	10.0	0.46
5th digit 2nd phalanx length	16	6.4-7.4	6.9	0.37
Greatest skull length	55	15.7-17.0	16.1	0.29
Total skull length	58	15.1-16.5	15.7	0.30
Condylbasal length	58	14.3-15.5	14.8	0.28
Basal length	16	13.4-14.3	13.7	0.26
Palatal length	16	6.3-7.1	6.8	0.24
Rostrum length	16	3.8-4.7	4.1	0.29
Zygomatic breadth	55	9.2-10.3	9.7	0.22
Interorbital breadth	57	3.5-4.0	3.6	0.11
Braincase breadth	15	7.1-7.4	7.3	0.11
Mastoid breadth	55	7.5-9.0	7.9	0.22
Rostral breadth	12	3.9-4.4	4.1	0.14
Infraorbital breadth	15	3.9-4.5	4.1	0.15
Skull height	42	6.8-7.4	7.1	0.16
Maxillary toothrow length	52	6.1-6.7	6.4	0.13
Upper molar length	16	3.4-3.7	3.6	0.09
Tympanic bullae diameter	15	2.3-3.0	2.6	0.18
Mandibular toothrow length	57	6.5-7.2	6.8	0.13
Lower molar length	16	3.9-4.2	4.0	0.08
Mandible length	58	11.5-12.6	11.9	0.27