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The Taxonomic Position of Myotis dobsoni (Trouessart, 1879), and some Statistical Data to the Subspecific Examination of Myotis blythi (Tomes, 1857)

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One of the sibling-species pair of the Eurasian bat fauna, *Myotis myotis* (Borkhausen, 1797) and the relatively smaller-sized *Myotis blythi* (Tomes, 1857), (with its European representative: *M. oxygnathus*), caused rather difficult taxonomic problems for a considerable time. The two species belong to the subgenus *Myotis* of the genus *Myotis*, and are morphologically most similar to each other. They agree extensively in habits and are probably frequent in their entire range. Their specific distinctness was unrecognized even by workers as Dobson (1876), Méhely (1900), or Tate (1941). Investigators were usually misled by the fact that the two species occur together in the major part of their respective ranges, the specimens being frequently found together in common quarters. And quite manifestly, the description of a whole series of "species" and "subspecies", relegated to them, can be led back to failures in recognizing the existence of sibling species. In addition, the several research workers could hardly use the earlier, inexact, and superficial descriptions. It occured often that certain subspecies have been assigned to the opposite species at the time of their description. This is what happened, for instance, in the case of *Myotis myotis omari* Thomas, 1905, from Iran, and *Myotis myotis risorius* Cheesman, 1921. Finally, in the description of new forms, one or the other of the "large" European *Myotis* has been referred to for comparison. It could have happened only in this way that Dobson (1873) described *Vespertilio murinoides* in 1873, and then synonymized (1876) *Vespertilio (=Myotis) blythi* Tomes, originating from essentially the same area, with the species *V. myotis*.

Although the taxonomic problem was clarified on the species level principally by the investigations of Miller (1912), Kuzyakin (1935, 1950), Gaisler & Hanák (1956) in Europe, further by Kuzyakin (1935, 1950) in Central Asia and by Harrison & Lewis (1961) in the Middle East in recent times, there still remain open questions concerning the intraspecific categories of the two species. The main obstacle of a final solution is the lack of a uniform survey and comprehensive treatise of the rather incomplete material.

In the present paper, I propose to discuss the taxonomic position of only the smaller forms, examined and measured in the course of my studies, of the sibling pair, therefore chiefly *Myotis murinoides* (Dobson) and *Myotis blythi* (Tomes), as well as the problem of *Myotis oxygnathus* (Monticelli); however, I desist from treating the species *Myotis myotis* and its subspecific forms.

Research material and methods

In 1967, I have studied in the Mammal Collection of the Zoological Survey of India, Calcutta, Dobson's (1873) specimens of *Vespertilio murinoides* (No. 176 a, ad. female, holotype, preserved in alcohol, Chamba, Himachal Pradesh, India, 32°30′, 76°10′; and No. 175 a, sex?, subadult, stuffed specimen, Mussoorie, Uttar Pradesh, India, 30°25′, 78°5′), further the skull of a paratype specimen of *Myotis myotis risorius* Cheesman, originating from Shiraz, Iran.

The animals discussed in the present paper and collected in Yugoslavia (mainly in Dalmatia), the Carpathian Basin (not merely in the Great Hungarian Plains but also in Transylvania and Slovakia), and in Asiatic Turkey (Ulukista, leg. A. Lendl, 1906), are deposited in the Natural History Museum, Budapest.

I have studied in 1958 in the Museum of the Lomonosov University, Moscow, and in the Zoological Institute of the Soviet Academy of Sciences, Leningrad, specimens deriving from Yugoslavia (Eastern Serbia and Montenegro); Crimea (Karadagh: 44°55′, 35°10′); Crete; Caucasus and Azerbaijan (Vladikavkaz: 43°, 44°40′ — Tbilisi: 41°40′, 44°48′ — Kotliarev: 43°35′, 44°5′ — Naltsik: 43°30′, 43°35′ — Sutin Cave, Nagorniy karabah: 39°50′, 46°40′ — Kelehani semahin: 40°40′, 48°45′); Turkmenia (Kizul Imam, Kopet Dagh: 38°25′, 56°15′ — Kurkulab, Kopet Dagh: ?, ? — Bahardeno Cave, Kopet Dagh: 38°25′, 57°22′ — Germab, Transkaspia: ?, ?); Uzbekistan (Kvatinsk Distr., Tien Shan: 40°10′, 67° — Tashkent: 41°20′, 69°15′); Tajikistan (Tacht Bazar, Murgab Basin, Pamir Mts.: 38°5′, 74°); Kirghizia (Frunze, Tien Shan: 42°52′, 74°38′ — Mt. Suleman, Tien Shan: 42°10′, 75°30′); China (Kuldsha, Zungaria: 44°, 81°30′).

I wish to express my gratitude also in this place to the directors and research workers of the above institutions for making possible and furthering my work in every possible way.

The measurement data of the juvenile animals are omitted, as far as possible, from the present elaboration. Concerning the external measurements, I considered only the forearm length. With regard to the cranial measurements, I analyzed only the eight most important ones (condylobasal length, upper toothrow length [$C-M^3$], rostral width at the crowns of the upper canines [$C-C$], rostral width at the outer margin of the upper M^3 molars [M^3-M^3], width of braincase, height of braincase, length of mandible, and length of lower toothrow [$C-M_3$]).

In the case of samples comprising two or more numbers of observations, the range and arithmetic mean of the measurements have been plotted on diagrams; for larger samples, the standard deviation and two standard errors are also given (see Figures 1—5). If the two standard errors covered the standard deviation, the latter was not plotted. In order to make comparable the data of also the single specimens not included in the diagrams, I submit the given and calculated parameters (N = number of observations, Min = smallest value of sample, Max = greatest value of sample, M = arithmetic mean of sample, s^2 = variance, s = standard deviation, s_M = standard error of arithmetic mean $= \pm \frac{s}{\sqrt{N}}$ for all measurements in Tables 1—9. To facilitate evaluations of another nature, I deemed it necessary to give, at the 95 per cent probability level, also the confidence limits of arithmetic means of the samples in the same Tables $\left(\pm t\frac{s}{\sqrt{N}}\right)$. I have also used Student's test for the evaluation of the differences of the means of the diverse populations, and calculated the t values:

$$t = \frac{(M_1 - M_2)\sqrt{\frac{N_1 N_2}{N_1 + N_2}}}{\sqrt{\frac{s_1^2 N_1 - 1 + s_2^2 N_2 - 1}{N_1 + N_2 - 2}}}$$

where M_1, N_1, s_1^2 are the parameters of one sample, and M_2, N_2, s_2^2 those of the other one. The P values of the significance of differences of the means, obtained by the calculated t are shown in Table 10.

The problem of "Vespertilio murinoides"

Dobson (1873) described this species from the NW Himalayas. Since, however, the specific name proved to be preoccupied, Trouessart applied for it the new name *Vespertilio (= Myotis) dobsoni* in 1879. Furthermore, already Thomas (1915) and WROUGHTON (1918) showed that DOBSON's species may in fact be a synonym of *Myotis blythi*. Though with a question-mark, ELLERMAN and MORRISON—SCOTT (1951) list this form, in want of further available information, among the subspecies of *Myotis blythi*. Since I had occasion, in 1967, to study DOBSON's original specimens in the collection of the Zoological Survey of India, Calcutta, I think it were of interest to publish my observations in this regard.

In accordance with the conservation usage prevailing in the last century, the skull of the stuffed specimen was left in the skin (as is the use today with respect to bird skins), but the base of the skull and the occiput have been removed, together with the brain. I exposed the indubitably original skull from the softened skin, and also cleaned it for the sake of taking the necessary measurements. I have not prepared the skull of the type-specimen (preserved in alcohol) from Chamba, but compared its dentition with that of the former one. I have found the basal length of the upper and lower canines of the Chamba specimen to be slightly shorter, but, with respect to the dimmensions and proportions to each other of the upper and lower small premolars, the Chamba and Mussoorie exemplars agree completely.

I deemed it essential to compare *Myotis dobsoni* with *Myotis blythi*, but. in the present circumstances, this was possible only on the basis of photographs made of the skull of a specimen, marked "cotype" (No. 49.8.16.22, Nassenabad) and preserved in the British Museum (Nat. Hist.). For the photographs, I am indebted to Dr. D. JÁNOSSY.

It should be noted here that whereas TOMES (1857) published Nassenabad, India, as the type-locality, THOMAS (1915) wrote Nusserabad with reference to this individual. However, both of these authors considered this specimen the holotype of the species. For some unknown cause, ELLERMAN and MORRISON—SCOTT (1951) list Nasirabad as the locality of the type, but this site lies, on the one hand, at least 600 km. to the SW of the nearest locality of occurence of *M. blythi*, and, on the other, in a climatically and zoogeographically utterly different region, separated by an extensive plain of hot and mostly dry climate from the Himalayas. It is therefore improbable that Nasirabad, Rajputana, could be the type-locality of *M. blythi*.

The narrowness of the anteorbital bridge and the profile of the skull agree on the skull of both specimens. In the Mussoorie exemplar, the anterior palatal incision penetrates less posteriorad and its posterior margin fails to reach the line connecting the posterior alveolar margin of the upper canines. The area occupied by P^2 and P^3 of this animal is shorter than the length of the basic section of the canine, but this appears to be smaller in the cotype of *M. blythi*. In my observation, the basal area of P^2 is smaller, that of P^3 larger, when compared to the basal area of upper canine, in the Mussoorie specimen. P^3 is rather more displaced from the toothrow and is not free—as the case in the cotype—but it is rather wedged between the adjacent teeth. M^3 of the Mussoorie specimen is rather smaller, as compared to the other molars, than that of the exemplar preserved in the British Museum. All these differences do not exceed, however, the limits of specific, or indeed, intrasubspecific variability.

Since Mussoorie, Chamba, Simla (DODSWORTH, 1914), Kashmir, and probably the locality Nassenabad all belong to the climatically and zoogeographically essentially uniform area of the Western Himalayas, it is in all likelihood inhabited by a single form, the nominate one, of *Myotis blythi*. Thus *Vespertilio murinoides* DOBSON, 1873 = *Vespertilio dobsoni* TROUESSART, 1879, are doubtless junior synonyms of *Myotis blythi* (TOMES, 1857).

A comparison of Myotis blythi and Myotis oxygnathus

Unfortunately, I had no occasion to compare directly the animal from Mussoorie and *Myotis oxygnathus*, described by MONTICELLI (1885) from Italy and considered for a long time a junior synonym of *Myotis myotis*, but recently regarded again as a distinct species (MILLER, 1912; ÉHIK, 1924 etc.); for this purpose I had available only my photographs taken of the skull and mandible of the former one, as well as my notes and observations made in Calcutta. The lengthened braincase and the even elevation of the dorsal profile of *M. blythi* from Mussoorie differ from the more rounded braincase and more steeply ascendant frontal region of *oxygnathus*, the antero-posteriorly lengthened M^3 of the former also differs from the shape of M^3 of the majority of *M. oxagnathus* individuals deriving from the Carpathian Basin.

In general, all measurements of the Mussoorie specimen are small and thus it fits among the smallest exemplars from the Carpathian Basin. I have compared it statistically with a rather large material of the latter form. Following SIMPSON et al. (1960), I applied the formula

$$t = \frac{(M-X)\frac{N}{N+1}}{s}$$

where M, N represent the parameters of the comprehensive material, while X equals the measurement of the single individual. The forearm length* ($t=0.075$), the width of braincase ($t=0.99$), the rostral width at the M^3 molars ($t=1.325$) and at the upper C teeth ($t=1.67$) failed to show any essential difference. It is interesting, however, that the mandibular length ($t=2.57$) exhibited, by 1 per cent probability, the upper C—M^3 length ($t=2.06$), the lower C—M_3 length ($t=2.10$) and the height of braincase ($t=2.06$) by probabilities between the 5 and 2 per cent levels, a significant difference against the population in the Carpathian Basin. Besides the great geographical distance, I consider it justified also on the statistical basis that the European form be regarded under the name *Myotis blythi oxygnathus* (MONTICELLI, 1885) as a subspecies of *Myotis blythi*, just as ELLERMAN and MORRISON—SCOTT (1951)—though provisionally and under a question-mark—did, and as was established also by HARRISON and LEWIS (1961).

Myotis myotis omari THOMAS, 1906, Myotis myotis risorius CHEESMAN, 1921, and Myotis myotis ancilla THOMAS, 1910

Of the three paratype skulls, conserved in the collection in Calcutta, of *M. myotis risorius*, described as a subspecies of the Large Mouse-eared Bat by CHEESMAN (1921), I examined the female (No. 17079) collected on 16 June, 1920, at Shiraz, Iran. I found that though the short and wide M^3 is a *M. myotis* feature, the skull should, owing to the small cranial measurements, still be assigned system-

* It is to be noted here that TATE (1941) gave 52 mm. (p. 547) for the forearm length of *M. dobsoni*, but according to my own measurements that of the two original DOBSON specimens is considerably greater (see Table 1). Accidentally, TATE's (1941) statements concerning *M. dobsoni* and *M. sicarius* (p. 548) are also incorrect, as pointed out in another place (TOPÁL, 1970).

atically to *M. blythi*. The measurements of this specimen, except for the condylobasal length and the mandibular length, are greater than those of the specimens deposited in the British Museum (Nat. Hist.) (Harrison & Lewis, 1961). These authors are utterly right in considering *M. myotis risorius* the junior synonym of *M. blythi omari*, described earlier as *M. myotis omari* from the same region. My own observations also corroborate this inference. Ellerman and Morrison—Scott (1951) relegate them quite erroneously to *M. myotis*, even though Kuzyakin (1935, 1950) had already correctly stated that they cannot be regarded as subspecies of this latter species.

Another supposed subspecies of *M. myotis* indubitably belongs to *M. blythi*, namely *M. myotis ancilla*, described by Thomas in 1910. This fact was also pointed out by Kuzyakin (1950). Besides the original type material published from Shensi as well as the specimens mentioned by Bobrinskoy (1929) from the southern part of the Khingan Range, the Zungarian animal I studied is assignable probably to this subspecies.

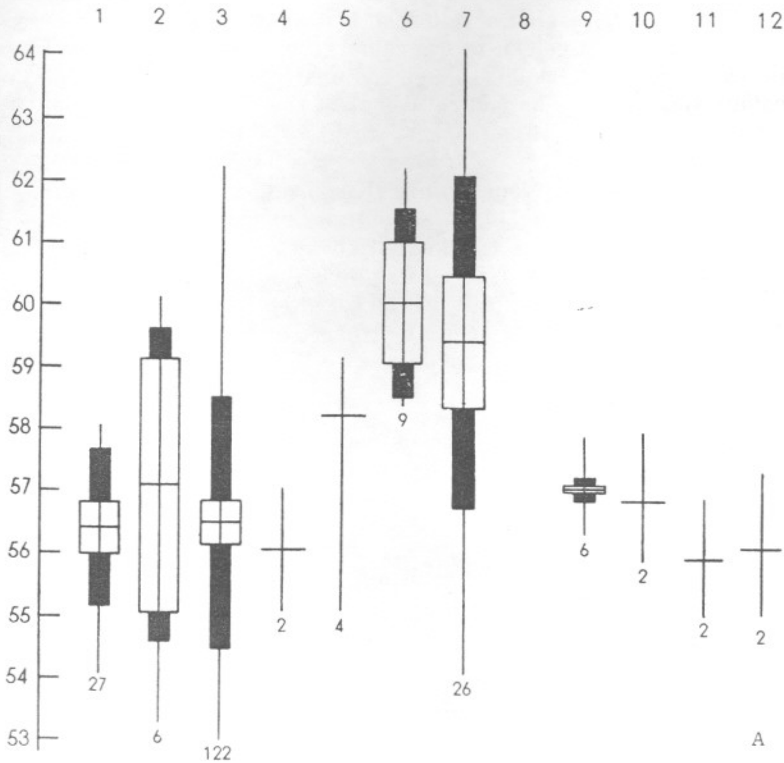

Fig. 1. Graphical comparison of measurements of several Myotis blythi populations. A = forearm length. Vertical line = range of sample; horizontal line = arithmetic mean; empty column = two standard errors of arithmetic mean above and below mean; solid column = standard deviation above and below mean. Scale in mm. 1 = Dalmatia, 2 = Yugoslavia, 3 = Carpathian Basin, 4 = Crimea, 5 = Crete, 6 = Asia Minor, 7 = Caucasus, 8 = Turkmenia, 9 = Kirghizia, 10 = Tajikistan, 11 = Uzbekistan, 12 = India. The figures at the base of the diagrams show the number of specimens

Observations concerning the colouration of the specimens studied

It is only for the sake of completion that I herewith submit my fragmentary observations in this regard. It should be noted that I worked mainly with old materials and thus the possibility of more or less discoloured animals—kept in alcohol for a time—also exists.

The colour of animals originating from the Crimea agreed completely with that shown by specimens from the Carpathian Basin; that is, the slightly darker brown dorsal side and the whitish grey ventral side were characteristic. I found the specimens from Naltsik in the Caucasus wholly agreeing with those from the Carpathian Basin. The colour of the other animals from the Caucasus also conformed, in the colouration of the ventral side, with our population, though the dorsal side of some specimens was slightly lighter—of some conspicuously lighter. The same seems to hold true for exemplars from Azerbaijan, indeed, certain specimens exhibited a light golden brown. The ventral side of the animals originating from the Turkmenian Bahardeno differed from that of both the Caucasian and the European individuals, displaying a yellowish tint. The dorsal side of these specimens excelled by their light golden-brown colour, the same as that of the bats from other localities in the Kopet-Dagh (though these latter were ventrally the same as our *oxygnathus* specimens). The ventral colour of the skin deriving from Germab was also similar, though with a darker dorsal side than in the Kopet-Dagh exemplars.

The *M. blythi* individual from Frunze, Kirghizia, excelled by its very light, golden brown dorsal side, having, at the same time, a white ventral side; the dorsal part of the bat originating from Tashkent, Uzbekistan, was rather greyish. Concerning the Mussoorie specimen, I noted its greyish-brown colour both above and below, but this might be due also to a later staining or contamination. Finally, I saw a living specimen in a cave near Anantnag, Kashmir, which was strikingly light as compared to our *M. blythi oxygnathus*.

Remarks concerning the os penis of Myotis blythi

A detailed examination from also this point of view of a material sampled from the entire range of *M. blythi* should also be most profitable. For my part, I could study but a few specimens from Asia Minor, beside those coming from the Carpathian Basin (TOPÁL, 1958). The measurements of some of the os penis of the Asia Minor specimens attained those of *M. myotis*, but in essence it stood morphologically closer to the os penis of *M. blythi oxygnathus*.

The statistical analysis of the measurements of the Myotis blythi subspecies

The comparison of a part of the samples taken from the diverse *M. blythi* populations studied here is given, besides Figures 1—5, in Table 10. The P values shown therein, obtained by the calculated t, illustrate rather well the rate of difference from one another of the arithmetic means of the respective samples. Wherever P is greater than 5 per cent, no significant difference can be spoken of. The trends established by the diagrams and the Table may be summarized as follows.

Concerning forearm length (Fig. 1, A) and rostral width at M^3—M^3 (Fig. 3, E) the specimens from the Carpathian Basin, Dalmatia, and from other Yugoslavian regions, are uniform. The mean values of the Dalmatian sample are strikingly low for the other six measurements, and thus rather deviating from the population in the Carpathian Basin. The mean values significantly differ as regards the C—M^3 length (Fig. 2, C) and rostral width at C—C (Fig. 3, D). The few specimens from

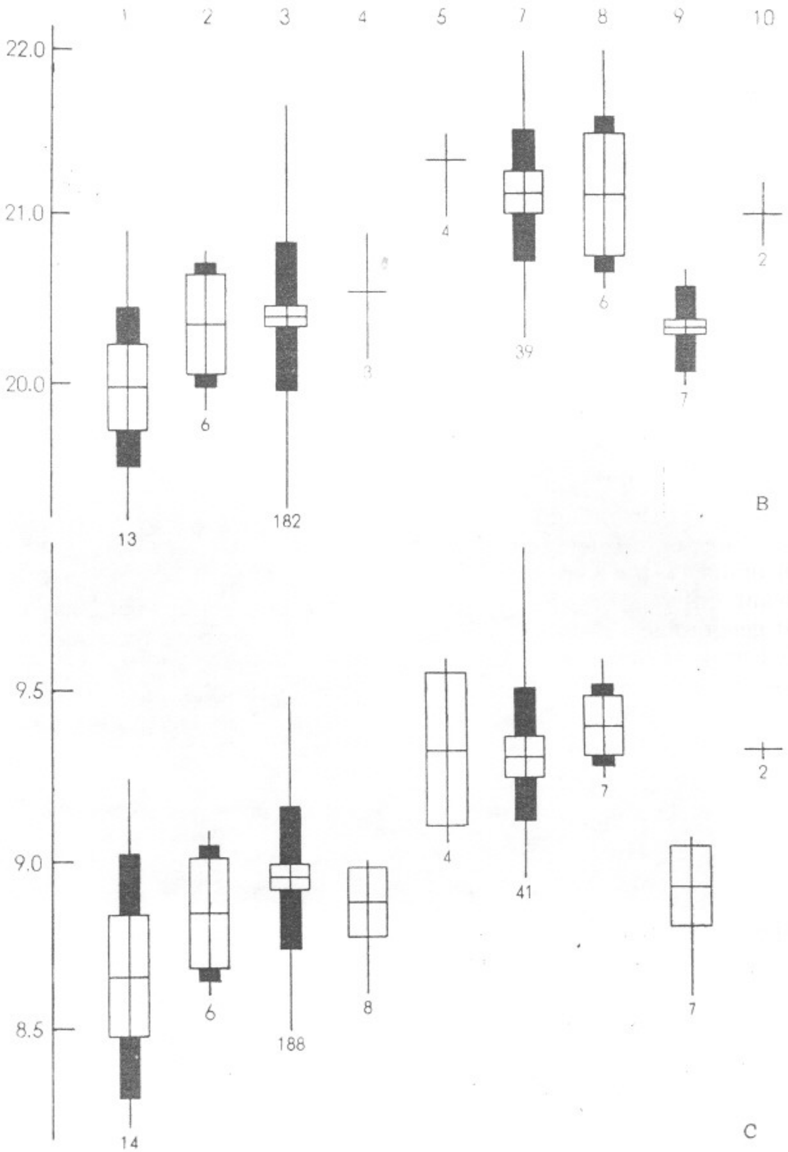

Fig. 2. B = condylobasal length, C = C – M^3 length

Montenegro and Serbia appear to stand nearer to those from the Carpathian Basin than do the Dalmatian ones. And according to the diagrams, the unity of material from Central Europe and the Crimea may in all characteristics be complete.

The Kirghizian specimens approaching with their cranial length measurements the European *M. blythi oxygnathus*, seem to belong to a quite different group and thus possibly represent a distinct subspecies by their rostral width at *C—C* (Fig. 3, D) and the height of the braincase (Fig. 4, G) being definitely greater than the respective values of the European specimens. The mean values of these measurements significantly differ from the European ones (see Table 10). By the evidence

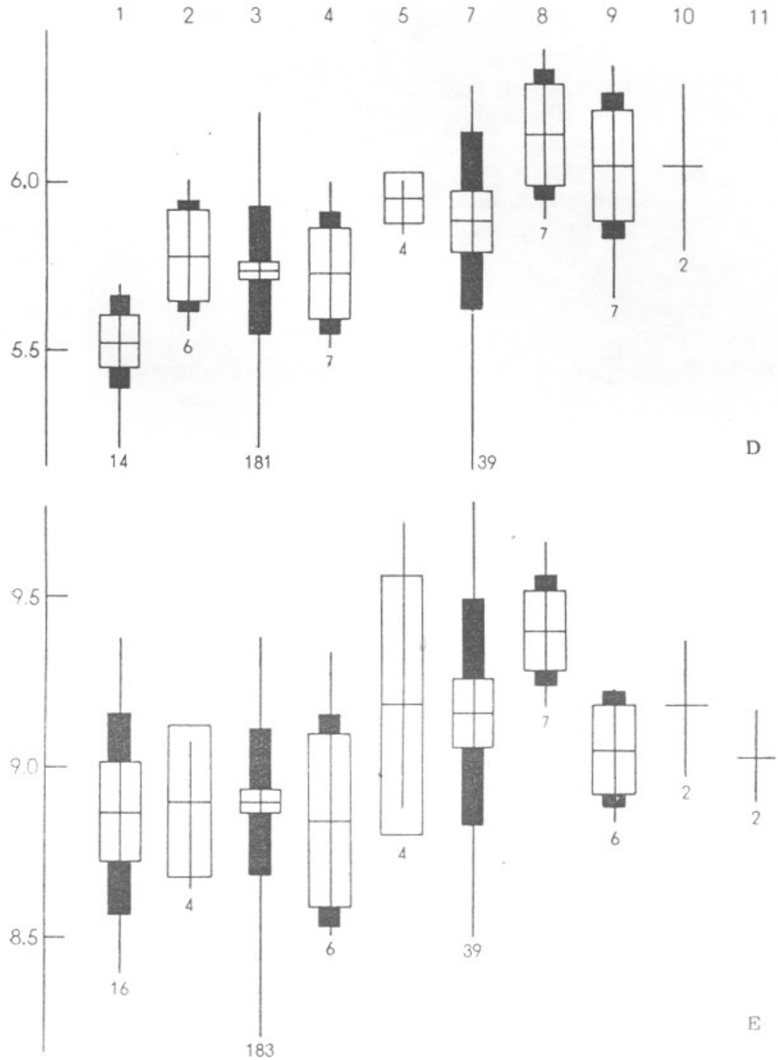

Fig. 3. D = rostral width at outer margin of C – C, E = rostral width at outer margin of $M^3 – M^3$

of the available few data from Uzbekistan and Tajikistan one may infer that these populations may be identical with that from Kirghizia. Even with regard to those measurements in which the latter evince greater values, the Uzbekistan animals remain close to the measurements of the European exemplars.

The measurements of the specimens originating from Crete, the Caucasus and Azerbaijan, as well as those from Turkmenia, are generally bigger than those of both the European and the members of the aforementioned Central Asiatic group. Concerning the height of the braincase, the individuals of the small series from

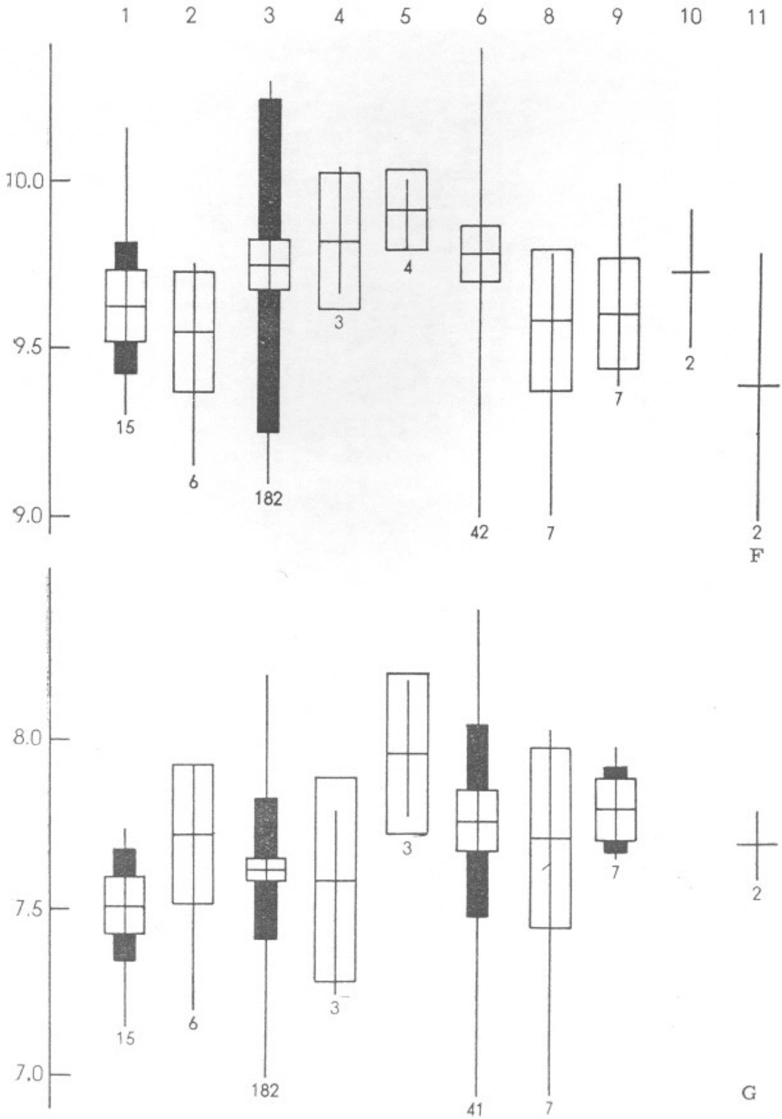

Fig. 4. F = width of braincase, G = height of braincase

Turkmenia agree with the population of the Carpathian Basin. However, the mean of the sample from the Caucasus already significantly differs in this feature (see Table 10) from that of *M. blythi oxygnathus*. It is rather interesting that the Caucasian sample agrees with the Kirghizian in view of the rostral width measurements (Fig. 3, D and E) and the height of the braincase. The mean of *C—C* width of the Caucasian population is significantly smaller than that of the Turkmenian one. The available evidence may also imply that there exist several differing froms in this

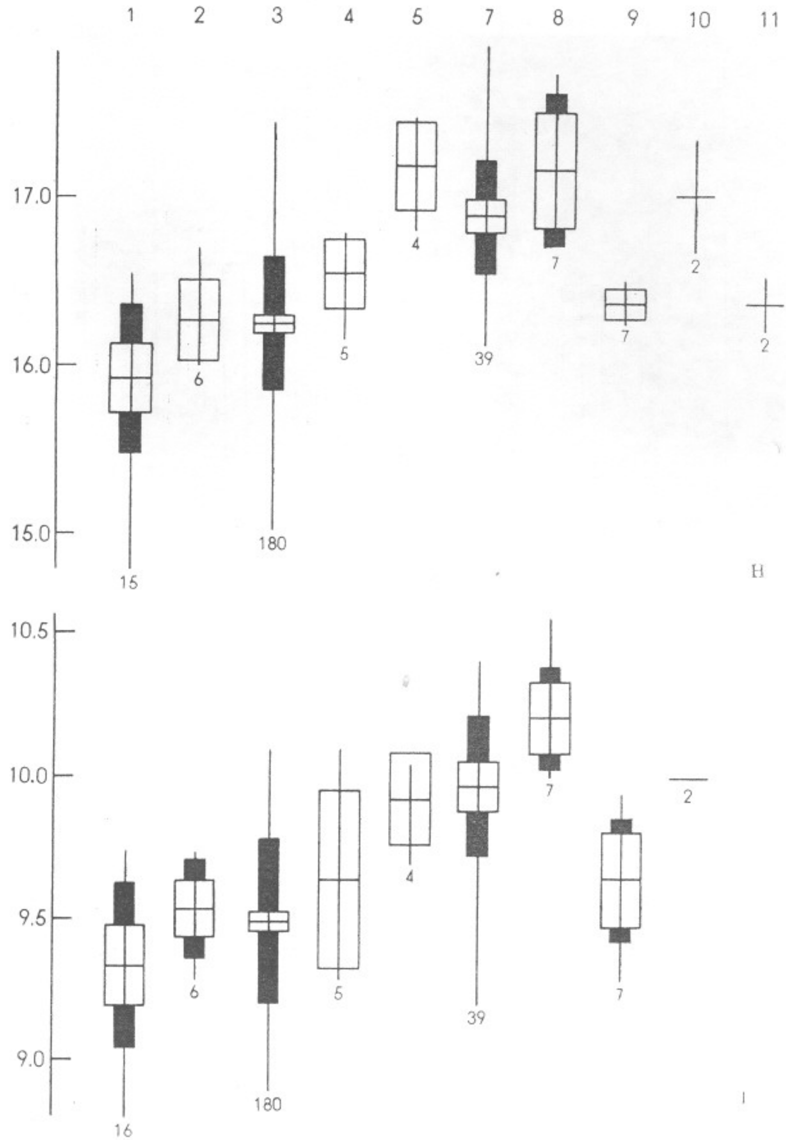

Fig. 5. H = length of mandible, I = $C-M_3$ length

latter group, that is in the area extending from Crete to Iran and Turkmenia. For the time being, however, it were the simplest solution to regard *M. blythi* of this area as a uniform subspecies, identifying it as *M. blythi omari* described from Iran. It is worthy of note that the width of the braincase is the only one among the examined cranial measurements (Fig. 4, F) which shows no difference between the main groups—subspecies—discussed above.

Beside the research material treated above, I studied but very meagre and sporadic materials from other localities. Their comparison with the larger samples can be made with recourse to Tables 1—9.

Results

The present investigations suggest that there exists towards the east, up to the Crimean Peninsula, a population entirely agreeing with *M. blythi oxygnathus* of the Carpathian Basin. The Dalmatian specimens, of strikingly small measurements, refer to the variations in size of this subspecies.

The large-sized form, inhabiting the Caucasus, Gruzia, Azerbaijan, Crete, and Asia Minor can, at least temporarily, be relegated to *M. blythi omari*, though these populations appear to diverge along certain lines from the true *M. blythi omari* ranging in Turkmenia, on the Kopet-Dagh, and in Iran.

The animals living in Uzbekistan, Tajikistan, Kirghizia, that is, in the Tien-Shan and Pamir areas, as well as in the Hindukush region, may probably be identified with *M. blythi blythi* ranging in the Western Himalayas, however, even this group seems to be not wholly uniform. Especially for this area, further observations and collections are needed.

Finally, the name *M. blythi ancilla* should provisionally be maintained for the form living north of Lat. 40 and east of Long. 80. True, the specimens assignable

Table 1.

Length of Forearm

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	27	54.0	58.2	56.36	1.475	1.217	0.234	0.481
Yugoslavia	6	53.3	60.6	57.08	6.274	2.500	1.021	2.624
Carpathian	122	53.0	62.1	57.65	4.104	2.026	0.183	0.363
Crimea	2	55.0	57.0	56.00	—	—	—	—
Crete	4	55.4	59.3	58.15	3.403	1.845	0.922	2.935
Asia Minor	9	58.3	62.1	59.92	2.319	1.523	0.507	1.170
Caucasus	26	54.0	64.0	59.31	7.041	2.654	0.531	1.093
Turkmenia	1	—	—	53.3	—	—	—	—
Kirghizia	6	56.3	57.9	57.08	0.346	0.186	0.007	0.019
Tajikistan	2	55.8	57.9	56.85	—	—	—	—
Uzbekistan	2	55.0	56.9	55.95	—	—	—	—
India	2	54.9	57.3	56.10	—	—	—	—
Zungaria	1	—	—	59.5	—	—	—	—

Table 2.

Condylobasal Length

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	13	19.20	20.90	19.99	0.223	0.473	0.131	0.285
Yugoslavia	6	19.85	20.80	20.37	0.137	0.369	0.151	0.388
Carpathian	182	19.25	21.65	20.41	0.193	0.439	0.032	0.064
Crimea	3	20.15	20.90	20.55	0.142	0.377	0.218	0.937
Crete	4	21.00	21.50	21.36	0.084	0.289	0.145	0.460
Asia Minor	—	—	—	—	—	—	—	—
Caucasus	39	20.30	22.05	21.16	0.152	0.390	0.062	0.136
Turkmenia	6	20.60	22.00	21.15	0.215	0.464	0.189	0.487
Kirghizia	7	20.00	20.70	20.35	0.067	0.258	0.025	0.061
Tajikistan	2	20.85	21.20	21.02	—	—	—	—
Uzbekistan	2	20.30	20.30	20.30	—	—	—	—
India	—	—	—	—	—	—	—	—
Zungaria	1	—	—	20.65	—	—	—	—

Table 3.

C—M^3 Length

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	14	8.20	9.25	8.667	0.129	0.360	0.096	0.208
Yugoslavia	6	8.60	9.10	8.849	0.043	0.207	0.084	0.217
Carpathian	188	8.50	9.50	8.953	0.047	0.217	0.016	0.031
Crimea	8	8.60	9.00	8.874	0.023	0.151	0.053	0.126
Crete	4	9.05	9.60	9.325	0.059	0.225	0.113	0.358
Asia Minor	1	—	—	9.20	—	—	—	—
Caucasus	41	8.90	9.90	9.291	0.039	0.197	0.031	0.062
Turkmenia	7	9.25	9.60	9.392	0.015	0.124	0.047	0.114
Kirghizia	7	8.60	9.05	8.900	0.028	0.168	0.063	0.155
Tajikistan	2	9.3	9.35	9.325	—	—	—	—
Uzbekistan	1	—	—	8.85	—	—	—	—
India	1	—	—	8.60	—	—	—	—
Zungaria	1	—	—	9.10	—	—	—	—

to this group approach in measurements *M. blythi omari*, but its subspecific disinctness should be upheld until the investigation of a larger material and its direct comparison with *M. blythi omari* will be possible. The discreteness of the subspecies, however, is justifiable not so much by the enormous geographical distance from the area of *omari* but its separation from the latter one by the range—as far as we know it—of the smaller-sized *M. blythi blythi*.

This rather complex picture is a fine example of mosaic-evolution. The final clarification of the exact range of the several subspecies and the detailed establish-

Table 4.

C—C Width of Rostrum

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	14	5.20	5.70	5.517	0.019	0.137	0.037	0.079
Yugoslavia	6	5.55	6.00	5.773	0.027	0.166	0.068	0.174
Carpathian	181	5.20	6.20	5.723	0.036	0.191	0.014	0.027
Crimea	7	5.50	6.00	5.728	0.033	0.182	0.069	0.169
Crete	4	5.85	6.00	5.949	0.004	0.070	0.035	0.112
Asia Minor	1	—	—	5.90	—	—	—	—
Caucasus	39	5.15	6.30	5.884	0.070	0.264	0.042	0.085
Turkmenia	7	5.90	6.40	6.142	0.038	0.197	0.074	0.182
Kirghizia	7	5.65	6.30	6.050	0.048	0.219	0.083	0.203
Tajikistan	2	5.80	6.30	6.050	—	—	—	—
Uzbekistan	1	—	—	5.80	—	—	—	—
India	1	—	—	5.40	—	—	—	—
Zungaria	1	—	—	6.15	—	—	—	—

Table 5.

M^3—M^3 Width of Rostrum

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	16	8.40	9.40	8.868	0.095	0.308	0.077	0.164
Yugoslavia	4	8.65	9.10	8.912	0.050	0.225	0.112	0.358
Carpathian	183	8.20	9.40	8.907	0.049	0.221	0.016	0.032
Crimea	6	8.50	9.35	8.841	0.105	0.323	0.132	0.339
Crete	4	8.90	9.75	9.200	0.151	0.389	0.195	0.619
Asia Minor	1	—	—	8.90	—	—	—	—
Caucasus	39	8.50	9.80	9.172	0.115	0.339	0.054	0.109
Turkmenia	7	9.20	9.70	9.428	0.023	0.165	0.062	0.152
Kirghizia	6	8.85	9.25	9.075	0.023	0.165	0.067	0.173
Tajikistan	2	9.00	9.40	9.200	—	—	—	—
Uzbekistan	2	8.90	9.20	9.050	—	—	—	—
India	1	—	—	8.60	—	—	—	—
Zungaria	1	—	—	9.50	—	—	—	—

ment of their craniological characteristics can be done only after the study of further and larger research material. In order to understand in detail the evolution, history and the recent range of the species, the study of fossils is also mandatory, though, unfortunately, material in this respect is available only from the Carpathian Basin.

Table 6.

Width of Braincase

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	15	9.30	10.15	9.620	0.040	0.202	0.052	0.111
Yugoslavia	6	9.15	9.75	9.550	0.052	0.229	0.093	0.239
Carpathian	182	9.10	10.30	9.751	0.224	0.050	0.037	0.073
Crimea	3	9.65	10.00	9.800	0.032	0.180	0.104	0.447
Crete	4	9.80	10.05	9.925	0.014	0.119	0.059	0.189
Asia Minor	1	—	—	9.85	—	—	—	—
Caucasus	42	9.00	10.40	9.784	0.273	0.074	0.042	0.085
Turkmenia	7	9.00	9.80	9.578	0.075	0.275	0.104	0.254
Kirghizia	7	9.40	10.00	9.650	0.052	0.229	0.086	0.240
Tajikistan	2	9.50	9.95	9.725	—	—	—	—
Uzbekistan	2	9.00	9.80	9.400	—	—	—	—
India	1	—	—	9.70	—	—	—	—
Zungaria	1	—	—	9.00	—	—	—	—

Table 7.

Height of Braincase

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	15	7.15	7.75	7.513	0.027	0.165	0.042	0.091
Yugoslavia	6	7.20	7.90	7.658	0.065	0.255	0.104	0.268
Carpathian	182	7.00	8.20	7.634	0.043	0.208	0.015	0.030
Crimea	3	7.25	7.80	7.600	0.092	0.304	0.175	0.755
Crete	3	7.80	8.20	7.983	0.041	0.202	0.116	0.501
Asia Minor	1	—	—	8.00	—	—	—	—
Caucasus	41	6.95	8.40	7.763	0.079	0.288	0.047	0.094
Turkmenia	7	6.95	8.05	7.735	0.129	0.359	0.135	0.332
Kirghizia	7	7.65	8.00	7.805	0.016	0.125	0.047	0.115
Tajikistan	1	—	—	8.15	—	—	—	—
Uzbekistan	2	7.60	7.80	7.700	—	—	—	—
India	1	—	—	7.20	—	—	—	—
Zungaria	1	—	—	7.35	—	—	—	—

Table 8.

Length of Mandible

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	15	14.75	16.55	15.91	0.193	0.439	0.113	0.243
Yugoslavia	6	16.00	16.70	16.26	0.094	0.308	0.125	0.323
Carpathian	180	15.00	17.45	16.24	0.163	0.404	0.030	0.059
Crimea	5	16.15	16.75	16.54	0.060	0.246	0.110	0.305
Crete	4	16.80	17.45	17.16	0.072	0.269	0.134	0.428
Asia Minor	—	—	—	—	—	—	—	—
Caucasus	39	16.10	17.90	16.88	0.113	0.337	0.054	0.109
Turkmenia	7	16.70	17.75	17.17	0.211	0.460	0.174	0.425
Kirghizia	7	16.25	16.50	16.37	0.009	0.095	0.036	0.088
Tajikistan	2	16.70	17.35	17.02	—	—	—	—
Uzbekistan	2	16.20	16.55	16.37	—	—	—	—
India	1	—	—	15.2	—	—	—	—
Zungaria	1	—	—	16.55	—	—	—	—

Table 9.

C—M_3 Length

	N	Min	Max	M	s^2	s	s_M	$\pm t \frac{s}{\sqrt{N}}$
Dalmatia	16	8.80	9.75	9.337	0.079	0.282	0.070	0.150
Yugoslavia	6	9.30	9.70	9.533	0.029	0.172	0.049	0.125
Carpathian	180	8.90	10.10	9.501	0.056	0.237	0.017	0.034
Crimea	5	9.30	10.10	9.640	0.118	0.344	0.154	0.427
Crete	4	9.70	10.05	9.925	0.024	0.155	0.078	0.247
Asia Minor	1	—	—	9.80	—	—	—	—
Caucasus	39	9.20	10.40	9.978	0.061	0.247	0.039	0.499
Turkmenia	7	10.00	10.55	10.207	0.029	0.173	0.065	0.159
Kirghizia	7	9.30	9.95	9.650	0.043	0.208	0.078	0.192
Tajikistan	2	10.00	10.00	10.00	—	—	—	—
Uzbekistan	1	—	—	9.65	—	—	—	—
India	1	—	—	9.00	—	—	—	—
Zungaria	1	—	—	10.00	—	—	—	—

Explanation of Tables 1—9. The measurements of diverse *Myotis blythi* populations. N = number of observations, Min = smallest value of sample, Max = greatest value of sample, M = arithmetic mean of sample, s^2 = variance, s = standard deviation, s_M = $\pm$standard error of arithmetic mean, $t\frac{s}{\sqrt{N}}$ = $\pm$confidence limit, at 95 per cent P, of arithmetic mean

Table 10. The P values of the significance of differences of the means in several *Myotis blythi* populations.

Table 10.

	Measurement	Carpathian Basin	Caucasus
Carpathian Basin	Condylobasal length		0.1%
	$C-M^3$ length		0.1%
	C–C width		0.1% P
	M^3-M^3 width		0.1% P
	Height of braincase		0.1% P
	Mandible length		0.1% P
	$C-M_3$ length		0.1% P
Dalmatia	Condylobasal length	5% P 2%	0.1% P
	$C-M^3$ length	0.1% P	0.1% P
	C–C width	0.1% P	0.1% P
	M^3-M^3 width	60% P 50%	1% P 0.1%
	Height of braincase	5% P 2%	1% P 0.1%
	Mandible length	1% P 0.1%	0.1% P
	$C-M_3$ length	2% P 1%	0.1% P
Crete	Condylobasal length	0.1% P	40% P 30%
	$C-M^3$ length	0.1% P	90% P 80%
	C–C width	5% P 2%	70% P 60%
	M^3-M^3 width	1% P 0.1%	90% P 80%
	Height of braincase	1% P 0.1%	20% P 10%
	Mandible length	0.1% P	20% P 10%
	$C-M_3$ length	0.1% P	30% P 20%
Turkmenia	Condylobasal length	0.1% P	P 90%
	$C-M^3$ length	0.1% P	30% P 20%
	C–C width	0.1% P	2% P 1%
	M^3-M^3 width	0.1% P	10% P 5%
	Height of braincase	30% P 20%	90% P 80%
	Mandible length	0.1% P	10% P 5%
	$C-M_3$ length	0.1% P	10% P 5%
Kirghizia	Condylobasal length	90% P 80%	0.1% P
	$C-M^3$ length	60% P 50%	0.1% P
	C–C width	0.1% P	20% P 10%
	M^3-M^3 width	10% P 5%	50% P 40%
	Height of braincase	0.1% P	80% P 70%
	Mandible length	40% P 30%	0.1% P
	$C-M_3$ length	10% P 5%	1% P 0.1%

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Explanation of Plate I.

1 = palatal view of skull of *Myotis blythi blythi*, DOBSON's specimen from Mussoorie, Uttar Pradesh, India. 2 = lateral view of the same. 3 = buccal view of it's mandible

Plate I.