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DISTRIBUTION AND TAXONOMIC STATUS OF GENUS *CLETHRIONOMYS* TILESIUS, 1850 (MAMMALIA: RODENTIA) IN NORTH ANATOLIA

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ABSTRACT

This study was carried out to evaluate the uncertain taxonomic status and distribution of *Clethrionomys glareolus ponticus* Thomas, 1906 which belongs to vole mouse recorded from Türkiye, by means of re-examination of the new material.

Skull and skin of the 122 specimens captured from type locality and record areas, and everywhere planned along with the field notes were examined and some observations were recorded.

While the skin and skull were evaluated morphologically, 32 characters taken were evaluated by the biometric methods and findings were compared with the published data. As a result, the subspecies *ponticus* were considered as a valid and different taxon having a continuous distribution in Marmara and Black Sea regions of Türkiye.

INTRODUCTION

Thomas (1906), described *Evotomys ponticus* from Meryemana (Trabzon) as the new species basing on a specimen. Neuhäuser (1936) collected specimens from Abant (Bolu), Karadere (Zonguldak) and Tosya (Kastamonu), examined these specimens with holotype of this species, and concluded them as the subspecies *Clethrionomys glareolus ponticus* Thomas, 1906 .Osborn (1962), Spitzenberger and Steiner (1962), Felten et al. (1971) and Steiner (1972) captured specimens from Uludağ (Bursa), Bürnük-Bektaşağa (Sinop), Akçakoca (Bolu); Biçik (Giresun); Uludağ, Düzce (Bolu) Abant and Biçik, Çat (Rize), respectively. They gave the record localities, and included these specimens to this subspecies.

From above reports, it is understood that there is one species of this genus *Clethrionomys* and also a subspecies of species in Türkiye. Neuhäuser (1936) and Ellerman (1948), who accepted the validity of *ponticus*, merely compared this subspecies with the subspecies *nageri* and *nageri*

and *skomerensis*, respectively. Ognev (1947) compared *punticus* with the species *frater*. Other researchers pointed out the presence of in Türkiye without its comparison with other subspecies of species. At the present time, it is known that there are about 29 subspecies which belong to the species *glareolus* (Viro and Niethammer, 1982). The subspecies *nageri*, *skomerensis*, and the species *frater* known as at the update, the synnonym of *centralis* (Viro and Niethammer, 1982) that were compaıed with *ponticus*, were distributed in Switzerland, England and Central U.S.S.R., respectively. *Prinus* (Bulgaria, Greece), *makedonicus* (Yugoslavia) and *istericus* (Romania, U.S.S.R.) are not only geographic but also neighbouring subspecies with *ponticus*. Although it is necessary to compare them with *ponticus*, it hasn't been made yet. This condition is still a problem needed to be resolved for taxonomy of *ponticus*. Osborn (1962) pointed out that subspecies has a discontinuous distribution in Türkiye, and considered this condition as the representatives of the individuals of taxon which had a widely distribution in Türkiye in the past.

The aim of the present study is to contribute the distribution of this taxon in Türkiye, and to complete the deficiency determined in its taxonomy, by comparing an enormous materials collected from Türkiye with literature.

MATERIAL AND METHOD

The observations, the field notes, the skulls, and the skins of the 122 specimens, 40 of which were from S.U.S. Art. Department of Biology, were used in this study. 5 external measurements were taken freshly, and then prepared in the form of the standard museum specimen. 25 cranial measurements were taken with the caliper and micrometer in the laboratory. Biometrical methods were used for evaluation of the measurements of all the characters, the skins and the skulls of the specimens were examined morphologically, and the results were compared with literature. The measurements of topotypes and specimens from Anatolia were shown in different tables. The specimens of adult female and males were evaluated together because there was statistically no difference between both sexes.

Ognev (1947) reports molars in adults and the old specimens with two roots each, in young specimens rootless. With regard to the height and the length of root M_1, Mazak (1963) gave the age of specimens in day; Tupikova et al. (1968) also in month, rating of the length of oral

root of M^2 to its height. The values given by Mazak (1963) in connection with age could not be applied to Turkish specimens for determination of age completely. The marks of reproduction in some specimens required to be young to Ognev (1947')s data were found out (Kıvanç, 1991). Therefore, in the determination of the age of all the presented specimens, in addition to these authors' data, situation of uterus, testes ad nursing and wearing of teeth were taken into consideration, and thus, the specimens were divided into two groups; adult and young. In comparison only adult specimens were used. The character measurements of the taxa examined were compared, and different ones were determined, then these were also shown in the figures The character measurements of the specimens collected during the field studies were compared with literature, those due and distinct were exhibited at the top of "Diagnostic Characters". The record localities newly determined by means of the field studies and those in literature were plotted on a map, and thus the distribution area of taxon examined was given.

The valid name in now, the first original name, original author's name and publication, the type locality, distribution, diagnostic characters, comparison discussed with other taxa, number of the examined specimens and distribution records of each taxon examined were given together, respectievly.

Definition of Characteristics measured.

External Characters.

Total length: From the tip of the nose to the tip of the tail (excluding the tail hairs); the tail length: from the base of the tail (not anuse) to the tip of the tail (excluding the tail hairs); the length of the hind-foot: from the base of the heel to claws; the length of the ear: distance from the notch to the tip.

Cranial Characters.

Occipital width: distance between two processes on the lateral sides of occipital bone; the length of the braincase: distance between the upper point of protuberant in interorbital area of the frontal bone and the posterior-most point of occipital bone; occipitonasal length: the least distance between the posterior-most point of occipital bone and the tipest points of nasals; the length of the face-part of braincase: distance between the upper point of protuberant in interorbital area of the frontal bone and the tip points of nasals; nasal length: distance between the

anterior-most point of projectings of nasals to frontal bone; interorbital width: the least interorbital width of frontal bones; basal length: distance between anterior-ventrally most point of foramen magnum and line connected to the posterior-most point of alveolus of the upper incisor; zygomatic width: distance between the most-apart point of zygomatic arches; the length of diastema: distance between the posterior-most point of alveolus of left upper incisor and anterior-most point of alveolus of left M_1; condylobasal length: greatest distance between the anterior-most surface of prexmaxilla and the posterior-most surface of occipital condyles; the height of the braincase (including auditory bullea): distance between the upper-most point of the brain-case and posterior-most point of auditory bullea; the length of the mandible: distance between the condyloid process and the symphysis the width of the nasals: the widest of the nasals; skull height (excluding auditory bullea): distance between the upper-most point of the braincase and the anterior-most point of alveolus of M^3; the length of the incisive foramen: the least distance between the line connected to the anterior-most points of incisive foramen and one connected to its posterior-most points; the length of the alveolus of the right upper molar row; distance between the posterior-most point of alveolus of M^3 and the anterior-most point of alveolus of M_1; the length of the molars: distance between the anterior-most point and the posterior-most point of each molar; the length of the auditory bullea: distance between the apart-most two points from each other of the auditory bullea; the length of the alveolus of the right lower molar row: the least distance between the posterior-most point of the alveolus of M^3 and the anterior-most point of the alveolus of M_1; the width of the braincase: distance between processes of paramastoid.

TAXONOMICAL EVALUATION

Familia Arvicolidae Gray, 1821 (vole rats)

Vole rats would have been included into the subfamilia Microtinae of the familia Muridae and Cricetidae in the old literature. At the present time, since they are rich in species and have specific adaptations, they are examined as a distinct familia, Arvicolidae Gray, 1821. This familia has seven genera (Viro and Niethammer, 1982). *Clethrionomys* of these genera presents in Turkish Mammal Fauna with regard to "Identification Keys to Genus" in literature, as follows:

a) External characters: The pelage on back from red to reddish brown, b) Cranial characters: Zygomatic arches with slightly projecting,

the width of occipitals proceeds 85 % of zygomatic width. Molars in adult with more than one alveolus each, condylobasal length less than 35 mm. c) Dentition: Triangular fields in M_1 protrude pairly into each other, wearing outlines with concave and convex margin, with concave cement, length of upper toothrow usually less than 7 mm.

Genus: *Clethrionomys* Tilesius, 1850

1850. *Clethrionomys* Tilesius, Isis, 2:28. *Mus rutilus* Pallas.

Distribution: Localities found in Türkiye were appeared in Figure 1.

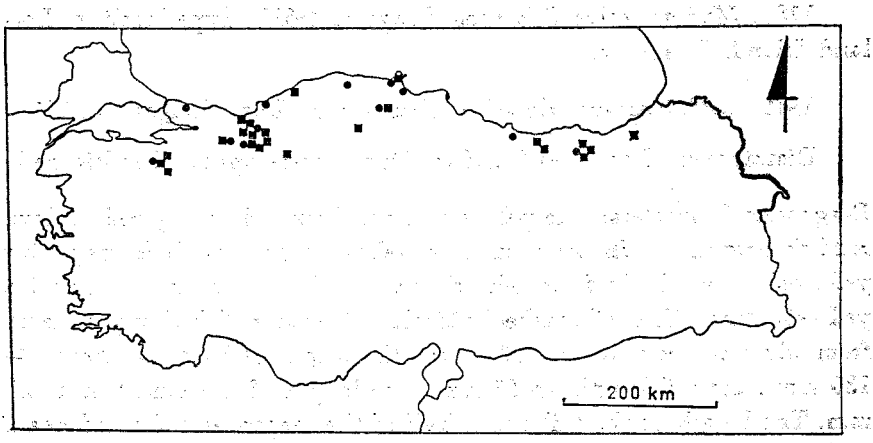

Figure 1. The map showing record localities of *C. glareolus ponticus* in Türkiye.
(■) Record localities in literature,
(●) Report localities from which specimens were captured during present study.

Diagnostic Characters: They are small voles of familia (the length of the body 94–130 mm). The pelage on median line of back usually reddish or red-brown. Ears considerably larger, hind paws with six pads, mammae: 2-2:4 pairs, molars in adults usually with two roots each, wearing outlines about same thickness in both sides of tooth.

Three species of this genus, *C. glareolus* (Schreber, 1780), *C. rutilus* (Pallas, 1779) and *C. rufocanus* (Sundevall, 1846), are known from Europe (Viro and Niethammer, 1982). With regard to diagnostic characters in literature, *C. glareolus* of these species is found in Turkish Mammal Fauna, as follows:

a) External Characters: The pelage on the back relatively brighter red-brown, The ratio of the tail to the body usually more than 38 %, the

tail with tiny hairs and its end with less hairs, b) Cranial Characters: M^3 simplex or normal form.

Neuhäuser (1936), Osborn (1962), Spitzenberger and Steiner (1962), Felten et al. (1971) and Steiner (1972) pointed out presence of a single species, *C. glareolus*, in Türkiye. It can be said that the species *C. glareolus* presents in Türkiye because there are not any reports from Balkans and Caucasia for other species belonging to this genus.

Species *Clethrionomys glareolus* (Schreber, 1780)

1780. *Mus glareolus* Schreber, Saugeth. 4:680. Type locality: Lolland Island, Denmark.

1936 *Clethrionomys glareolus* Neuhäuser, Zeit. Säuget. 11:185.

Distribution: Localities found in Türkiye were appeared in Figure 1.

Diagnostic Charecters: The pelage on back from light rusty red to dark reddish brown, the flanks from light yellowish gray to dark gray with yellowish tinge, belly from whitish gray to brownish dark gray with yellowish tinge. The tail markedly bicolor. The color of the limps changes from white to gray. Weight 20-38 gr., the length of body and head 94-130 mm., the tail length 38–65 mm., the length of the hind-foot 13-21 mm. The length of the tail about half of the length of body and head. Molars in adults with two roots each, enamel folds rounded. The posterior margin of the paletal usually precedes the anterior margin of M^3.

The characters that difference were pointed out and used in Diagnosis Key to species (Viro and Niethammer, 1982) of the genus *Clethrionomys* whose three species are known from Europe were examined in 122 specimens collected from Türkiye and it was investigated that if one another species apart from *C. glareolus* is found in Türkiye. It was determined that the ratio of the tail to the body and the head in all of 82 specimens examined was more than 38 %. This condition seems to be the most valid character which distinguishs *glareolus* from other two species. This ratio has been given to be less than 38 % for both *rutilus* and *rufocanus* (Viro and Niethammer, 1982). The condition of bushy-tigh hairs at the tip of the tail from characters used in identification of *rutilus* (Ellerman, 1948; Viro and Niethammer, 1982) was determined in 19 out of 77 skins examined. At the present time, it was impossible to say anything about the validity of this character since we have not

any comparative materials for *rutilus*. *Rutilus* has one of the most marked diagnostic characters that the condylobasal length is always less than 24 mm. We could measure 38 specimens, and in 17 out of these specimens, it was determined that the end of the tail was in the form of a brush, and the condylobasal length is less than 24 mm in three of 14 specimens (Table 1-2). In conjunction, it appeared that this character can't be strictly diagnostic character for Turkish specimens. It has been reported that there were two notches at the posterior margin of the palate in *rutilus*, smooth in *glareolus* (Viro and Niethammer, 1982). It was determined that there was a notch in 46 out of 58 specimens examined, also smooth in others. But it was shown that these notches weren't consistent with those given in literature (Viro and Niethammer, 1982-Figure 41) (Figure 2). There is a pair notch in the skull figure that Ognev (1947) gave for *rufocanus* in his work. These notches are similar to

Table 1. Weight (gr), cranial and external measurements (mm) of adult topotypes. Number of specimens (NS), Mean (M), Variation Range (VR) Standard Deviation (SD)

Measurements	NS	M	VR	SD
Total length	5	170.00	152.00—182.00	± 9.44
Body length	5	112.80	106.00—122.00	± 6.61
Tail length	5	57.00	47.00— 65.00	± 7.03
Relative tail length	5	50.00	44.00— 55.00	± 3.93
Length of hind foot	5	19.00	17.00— 20.00	± 2.54
Length of ear	5	14.00	13.00— 15.00	± 0.83
Weight	5	26.60	23.00— 30.00	± 2.88
Length of diastema	5	7.34	7.10— 7.65	± 0.19
Length of alveolus of right upper molar row	5	5.21	5.10— 5.32	± 0.11
Length of alveolus of right lower molar row	5	5.16	4.99— 5.32	± 0.12
M^1 length	5	1.88	1.82— 1.99	± 0.06
M^2 length	5	1.42	1.33— 1.53	± 0.07
M^3 length	5	1.63	1.55— 1.66	± 0.09
M_1 length	5	2.27	2.02— 2.43	± 0.15
M_2 length	5	1.47	1.33— 1.55	± 0.09
M_3 length	4	1.37	1.27— 1.46	± 0.07
Interorbital width	4	4.49	4.32— 4.66	± 0.14
Nasal length	4	7.71	7.32— 7.88	± 0.19
Nasal width	4	3.32	3.21— 3.55	± 0.16
Length of incisiva foramen	4	4.95	4.77— 5.27	± 0.21
Length of auditory bullea	5	6.86	6.35— 7.54	± 0.42
Width of braincase	5	7.21	6.99— 7.54	± 0.22
Skull height (not auditory bullea)	5	6.92	6.66— 7.10	± 0.16
Condylobasal length	4	24.57	24.20— 25.00	± 3.05
Basal length	4	22.90	22.80— 23.60	± 0.34
Occipitonasal length	4	24.97	24.50— 25.40	± 0.25
Occipital width	5	11.49	11.40— 11.60	± 0.08
Zygomatic width	3	13.30	13.20— 13.40	± 0.10
Hight of braincase (with auditory bullea)	5	9.39	9.25— 9.50	± 0.08
Length of braincase	4	14.6	14.40— 13.70	± 0.13
Length of face-part of braincase	4	10.97	10.80— 11.30	± 0.23
Length of mandible	5	14.44	14.00— 14.80	± 0.29

Table 2. Weight (gr), cranial and external measurements (mm) of specimens from Anatolia. Number of specimens (NS), Mean (M), Variation Range (VR), Standard Deviation (SD).

Measurements	NS	M	VR	SD
Total length	72	150.52	134.00—185.00	± 8.48
Body length	72	113.07	94.00—130.00	± 5.36
Tail length	72	49.11	38.00— 58.00	± 4.35
Relative tail length	72	47.19	42.00— 55.00	± 3.96
Length of hind foot	75	19.23	13.00— 21.00	± 6.31
Length of ear	74	12.80	10.00— 16.00	± 3.19
Weight	73	27.49	20.00— 38.00	± 3.83
Length of diestema	58	7.07	6.10— 7.77	± 0.33
Length of alveolus of right upper molar row	49	5.03	4.77— 5.55	± 0.21
Length of alveolus of right lower molar row	57	5.00	4.60— 5.56	± 0.69
M^1 length	58	1.87	1.68— 2.19	± 0.04
M^2 length	59	1.43	1.30— 1.66	± 0.07
M^3 length	57	1.66	1.44— 1.99	± 0.11
M_1 length	58	2.32	2.06— 2.66	± 0.12
M_2 length	53	1.44	1.33— 1.66	± 0.37
M_3 length	57	1.32	1.22— 1.69	± 0.14
Interorbital width	54	4.17	3.94— 4.55	± 0.96
Nasal length	59	7.32	6.88— 7.88	± 0.27
Nasal width	63	3.11	2.77— 3.55	± 0.59
Length of incisiva foramen	53	4.89	4.44— 5.43	± 0.70
Length of auditory bullea	54	6.97	5.88— 7.32	± 0.32
Width of braincase	52	7.30	6.32— 7.89	± 0.30
Skull height (not auditory bullea)	49	6.67	5.77— 7.48	± 0.38
Condylobasal length	51	24.07	22.80— 25.70	± 0.64
Basal length	46	22.86	21.50— 24.00	± 0.66
Occipitonasal length	48	24.66	20.90— 26.30	± 0.88
Occipital width	47	11.56	10.80— 12.20	± 0.39
Zygomatic width	45	13.29	12.30— 14.40	± 0.63
Height of braincase (with auditory bullea)	49	9.21	8.45— 10.00	± 0.36
Length of braincase	45	14.70	13.50— 16.00	± 0.49
Length of face-part of braincase	54	10.32	9.20— 11.80	± 0.50
Length of mandible	57	13.81	12.30— 15.30	± 0.68

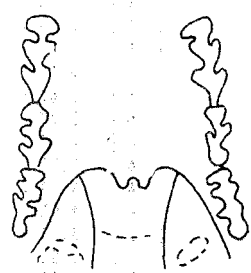

Figure 2. Notch on the posterior margin of palate in *C.g. ponticus*

that of the specimens from Anatolia. Osborn (1962) reported a major part of 63 specimens collected from Anatolia with notch. At the present time, it is impossible to say anything about the validity of these characters because we haven't any comparative materials for *rutilus*

and *rufocanus*. M^3 had been given as simplex or normal form in *glareolus*, normal form always in *rutilus* and simplex form in *rufocanus* (Viro and Niethammer, 1982). Normal form in 71 and simplex form in 12 of 83 specimens examined of *glareolus* were determined. Osborn (1962) reported simplex form in 3 and normal form in 60 of 63 specimens. Spitzenberger and Steiner (1962), Felten et al. (1971) determined simplex form in one of 13 specimens and in 4 or 5 of 25 specimens, respectively. When these results were taken into consideration, it can be said that these characters which are diagnostic for *rutilus* and *rufocanus* can't be strictly diagnostic for *glareolus*.

Clethrionomys glareolus ponticus Thomas, 1906

1906. *Evotomys ponticus* Thomas, Ann. Mag. Nat. Hist. 17:417.

1936. *Clethrionomys glareolus ponticus* Neuhäuser, Zeit. Sauget, 11:139.

Type locality: Sumela (Meryemana), Trabzon, Türkiye.

Distribution: Localities found in Türkiye were appeared in Figure 1.

Diagnostic Characters: The pelage on back dark reddish brown, darkness in red reduces gradually descending on the flanks, where coloration dark gray with pale yellowish tinge. The pelage on the belly more lighter gray and more yellowish tinge than those on back. The tail markedly bicolor, dorsally dark brown, ventrally light gray. The tail covered with tiny hairs, its end with longer hairs and similar to sparse -haired brush. Limps covered with tiny hairs as the tail, their coloration about that of the tail. Topotypes have cobsiderable values with regard to the length of the body and head, the tail length, the relative tail length, interorbital width, the nasal length, the length of the auditory bullea, the skull height (excluding and including the auditory bullea), the basal length of the skull, the length of the face area of braincase (Table 1). The tail usually precedes the half of the length of the body. M^3 is usually in normal form. The posterior margin of the palate is with two notches (Figure 2). The posterior margin of the palate usually precedes the anterior margin of M^3. External and cranial measurements were shown in Table 1.

Specimens examined: Total number, 120 from the following localities: Adapazarı: Hendek, Karadere, 1; Bolu: Abant, Soğuksu, 43; Bursa: Uludağ, 2: İstanbul: Şile, 5; Kastamonu: Küre, 30; Ordu: Ulubey, Çorakdüzü, 13; Sinop: Gerze, 3; Osmaniye, 1; Göktepe, 7; Boyabat,

Bürnük, 7; Trabzon: Maçka, Meryemana (Sümela), 5; Zonguldak: Çatalağzı, 1; Karadere, Fındıklı, 2.

RESULTS AND DISCUSSION

Thomas (1906) described *C.g. ponticus* by basing only on a single specimen not fully adult from Sumela. Color definition that the author had given was consistent with the color of our five topotypes from Sumela. He had given four external and cranial measurements for type. It was found out that 3 out of both external and cranial measurements each are within extremes of our measurements. Author concluded that there was not a cavity at the median zone of the frontal bone. None of our topotypes has such a cavity. The cavity was determined in 3 of 18 young specimens and in 20 of 51 adult specimens from Anatolia. Thomas (1906) suggested the tail, with different coloration ventrally and dorsally, with sparse hairs. The color of the tail of our topotypes was bicolor and with tiny hairs as Thomas (1906) did, also the tip of the tail with longer hair that was similar to a scarce brush. Thomas (1906) said that there was posteriorly a fourth lobe in M^3. Author's definition is consistent with normal form. Our five topotypes were in normal form of M^3. Osborn (1962) pointed out that he had encountered simplex form between his topotypes. Thomas (1906) compared the type with *nageri*, *norvegicus* and *skomerensis* presented at that time. But, it is known that *nageri*, *norvegicus* and *skomerensis* distribute in Switzerland, Sweeden and England at the present time, respectively. Also, there are taxa, that had been described earlier than *ponticus*, that are neighbour with *ponticus* in appearance. Therefore, it is necessary to compare *ponticus* with these adjacent taxa.

Although Neuhäuser (1936) had 3 topotypes and type specimen, she gave only 4 external and 10 cranial measurements of a specimen from Abant, Tosya, Karadere each and type, and she had taken into consideration type as adult. The braincase width from measurements that she gave was not consistent with our topotypes and specimens from Anatolia (Tables 1, 2). The author didn't give definition of her measurements, it was considered that this distinctness could be the result of difference of measuring. It was determined that, with the exception in one of the values of the incisiva foramen given, others were slightly less than those that we had (Tables 1, 2). Neuhäuser (1936) and Osborn (1962) pointed out that the specimens from Trabzon were darker than those from Bolu, and less of coloration difference between adult and young specimens from

Bolu, as a result, they based completely this difference on less and more of the humidity. Spitzenberger and Steiner (1962) reported their specimens from Biçik (Giresun) were darker than those from Bolu. Felten et al. (1971) revealed that it was darker of those from the eastern Black Sea in the specimens captured from Uludağ, Düzce, Abant and Biçik, that it was found darker specimens among those from Düzce as in the specimens from Biçik, and that specimens from Uludağ were paler yellowish red. We compared the pelage of the total 16 eastern specimens, 5 of which were topotypes, 11 of which were from Ulubey (Ordu), with that of the specimens from the west, and actually determined that both back and belly of the pelage was darker as the above authors revealed. It can be said that this darkness is getting gradually lighter and lighter to the west. The specimens nearly as dark as those from the west were found out among the specimens from Trabzon and Ordu. It was concluded that it was paler yellowish red of the color of two skins from Uludağ as Felten et al. (1971) revealed. In general, it can be said that the coloration in the specimens of *ponticus* is getting lighter and lighter gradually from the east to the west.

Ognev (1947) gave external and 14 cranial measurements of a single specimen (not fully adult) from Bakhmora (close to Batum). Although these measurements were of no a fully adult specimen, they were found within extremes of our adult specimens. With regard to the coloration of the pelage and to closeness of the alveolus of M^1 to the alveolus base of the incisors basing on a single specimen, he had concluded that *ponticus* was closely related to *frater*. Spitzenberger and Steiner (1962) captured 17 specimens from Biçik, examined the closeness of the alveolus base of M^1 to the alveolus base of the incisors in these specimens, and reported that this closeness in a young specimen was 0.5 mm., markedly away in others. We could examine 57 specimens, and we have determined that this distance was 1 mm. in 3 young specimens and markedly away in others. However, *frater* which is the synonym of *centralis* is unvalid at the present time, this difference reflects secparation between two taxa, not closely related.

Ellerman (1948) revealed that the width of frontals in 7 specimens consisted of young and type was larger, and the ratio of width of frontals to occipitonasal length was 17 %. It was determined that this ratio was 17.5 % (17-18 %, n: 4) in our topotypes, 16.57 % (15–20 %, n: 48) in adult specimens from Anatolia, 16.72 % (15–20 %, n: 54) in all the adult specimens including topotypes. Since this ratio was 17 %, we inc-

luded it to diagnostic characters of *ponticus*. Ellerman (1948) concluded that the tail length preceded the half of the body length. Osborn (1962) also revealed that the greatest length of tail and relative tail length were found in the specimens from Sumela. It was determined that the tail length 47-65 mm (Av: 57 mm, n: 5), the relative tail-length 44-55 % (Av: 50 %) in our topotypes; this condition, 38–58 mm (Av: 49.11, n: 72) and 42–55 % (Av: 47.19 %, n: 72) in the specimens from Anatolia, respectively. These results justify the ones that Ellerman (1948), Osborn (1962) gave. Ellerman (1948) gave 4 external and 4 cranial measurements of 7 the specimens. It was determined that the measurements of the body and the tail were slightly shorter than those measured for our topotypes. Ellerman's specimens were young, and all the measurements he took were within extremes of our specimens (Table 1). He also pointed out that it was necessary to redescribe *ponticus* with adult materials. After we have examined the published data in relation to this subject, we also reached the same result, and therefore compared characters of our topotypes with the published data, and presented all characteristics determined and as diagnostic characters in the section in relation to *ponticus*. Osborn (1962) gave the measurements of topotypes, 3 of which were adult and 11 of which were no fully adult, from British Museum, of the specimens collected from Uludağ, Bektaşağa (Sinop), Bürnük; and those Neuhäuser (1936) and Zimmerman (1950) took, on a table. It was determined that the measurements of Osborn's adult topotypes and specimens collected from other areas were not different from those of our topotypes and specimens from Anatolia, respectively. Osborn (1962) suggested that this subspecies has a discontinuous distribution in Türkiye. Spitzenberger and Steiner (1962) reported that this subspecies is not found in every part of its distribution area or unusually. When subspecies' distribution records are taken into consideration (Figure 1), it can be said that rare or absence of this taxon in its distribution area and its discontonuously distributoin are resulted from requirement of special habitat and from less of the field studies, respectively.

Spitzenberger and Steiner (1962) reported that condylobasal length (25.6 mm) in 3 of 17 specimens from Biçik preceded the largest value (25.2 mm) that was given up to date. It was determined that condylobasal length in 3 of our 54 specimens was more than 25.2 mm (max: 25.7 mm) (Table 2). Authors pointed out that they couldn't capture any specimen from Sumela and Karanlıkmeşe, and that this taxon was found more sparse than other vole rats. When works carried out by both us and others researcher and the published data are taken into consideration,

it can be said that it is very difficult to capture the specimens from type locality at the present time.

Steiner (1972) gave extremes and means of 4 external and 4 cranial measurements of specimens collected from Biçik and Çat. These measurements were consistent with extremes of our specimens from both Sumela and from Anatolia (Tables 1, 2). Steiner (1972) suggested that record locality which belong to *ponticus* at mostly east was Çat and Bakhmaro. Actually, there hasn't been any report yet from the east of Sumela, with the exception of two record localities.

Comparison with *pirinus*

Wolf (1940), when describing *pirinus*, reported that the back of pelage was different from *istericus*, from dorsally lighter yellowish to red-brown, but red dominant, laterally lighter gray, dorsally loosing this color's speciality, the relative wider -red dominant- area formed on the back, ventrally lighter gray white. Ondrias (1966), basing on 4 specimens from Greece, described *pirinus*, his color definition is consistent with that of Wolf (1940)'s. As have been defined in former section, it can be said that both flanks and belly are darker in our topotypes. The upper part of the foot is very light gray in topotypes. It appeared that it is different from *pirinus*. Wolf (1940) also gave 4 external measurements of the 5 specimens (including type). It was concluded that *pirinus* was more smaller than *ponticus* with connected to the length of the body and the tail length (Figure 3). Ondrias (1966) gave 4 external and 9 cranial measurements of the 4 specimens of *pirinus*. We have compared these measurements with those of out topotypes. It was shown that both subspecies were different with regard to the length of the body, the tail length, the length of the diastema, interorbital width, nasal length, condylobasal length, basal length and zygomatic width (Figure 3).

While Niethammer (1968) didn't give any reports of the subspecies about 31 specimens of *Clethrionomys* collected from Greece, he showed extremes and means of 4 external and 4 cranial measurements on a table. We have compared the values on this table with our topotypes, and found out that our specimens were different from those Greece with regard to the length of the body and the tail length, diastema and condylobasal length.

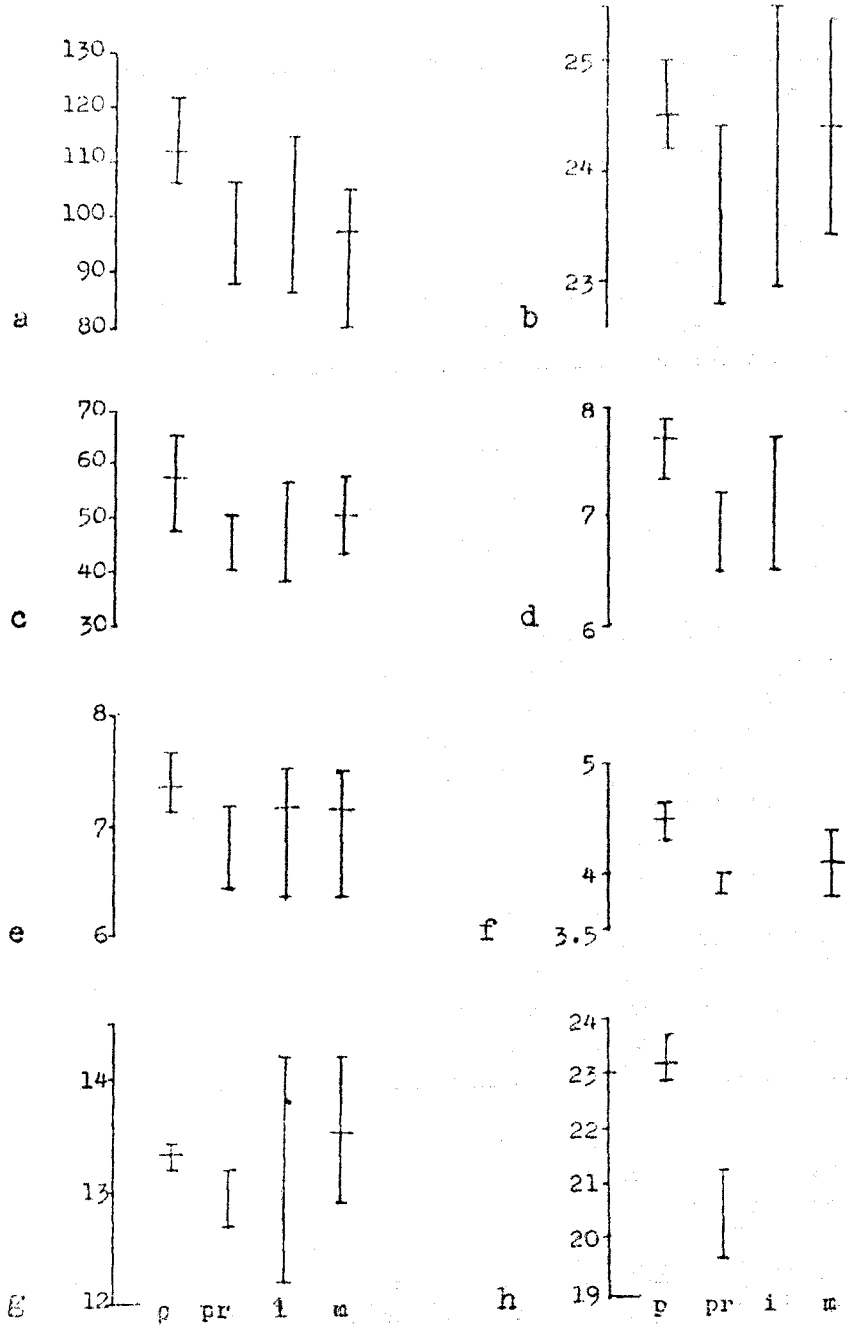

Figure 3 (a-h). Variation range in the subspecies *ponticus* (p), *pirinus* (pr), *istericus* (i) and *makedonicus* (m) with regard to body length (a), Condylobasal length (b), Tail length (c), Nasal length (d), Diastema length (e), Interorbital width (f), Zygomatik width (g), Basal length (h)

Comparison with *makedonicus*

Felten and Storch (1965) described *makedonicus*, their color definition was consistent with out topotypes. They suggested that there was a yellowish tinge in the belly of a single specimen of 23 specimens examined, and that gray-white was dominant in the others. This yellowish tinge in 2 of our topotypes and 80 % of specimens from Anatolia was determined. The authors had given 4 external and 7 cranial measurements of *makedonicus*. We have compared these measurements with our topotypes, and determined that both subspecies were different with regard to the length of the body, the tail length and interorbital width (Figure 4)

Comparison with *istericus*

Miller (1909) described *istericus*, and he determined the pelage dorsally yellowish-reddish brown, laterally brownish-yellow gray, that the color of the belly changed from cream white to yellowish cream, foot with paler white. It can be said that this color definition isn't consistent with that given in the related section for *ponticus* and that both subspecies are different with regard to coloration. Ognev (1947) examined 327 specimens in his work, and pointed out mixing of yellow color with rusty color on the back. This condition was not encountered in our topotypes. Miller (1909) and Ognev (1947) gave 3 external and 5 cranial measurements of type and 327 specimens, respectively. With the exception of Miller (1909)'s two measurements of type, the other was in the extremes of Ognev (1947)'s. Ognev (1947) has not taken another two measurements. Therefore, when we compared our topotypes' measurements with Ognev's, it was observed that both subspecies were different with regard to the length of the body and the tail length (Figure 3). It was found out that mandibular length and the length of the alveolus of the right upper molar row, which didn't take by Ognev, but by Miller, were in the extremes of our topotypes.

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