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CRANIOLOGICAL STUDY AND SUBSPECIFIC STATUS OF THREE SPECIES OF DORMICE FROM BULGARIA

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ABSTRACT – The craniology of three species of dormice was studied and their subspecific status determined. No intersexual differences were found. For the territory of Bulgaria one subspecies of the fat dormouse - *Myoxus glis minutus* and two subspecies of the forest dormouse - *Dryomys nitedula wingei* and *D. n. robustus* and two subspecies of the hazel dormouse - *Muscardinus a. avellanarius* and *M. a. zeus* are described.

Key words: Morphology, Taxonomy, Systematics, Bulgaria, Myoxidae.

RIASSUNTO – *Studio craniologico e status sottospecifico di tre specie di Mioxidi della Bulgaria* – Tre specie di Mioxidi sono state studiate craniologicamente ed è stato determinato il loro status sottospecifico. Non sono state osservate differenze tra i sessi. Per il territorio della Bulgaria vengono descritte: una sottospecie di Ghiro (*M. glis minutus*), due sottospecie di Driomio (*D. nitedula wingei* e *D. n. robustus)* e due sottospecie di Moscardino *(M. a. avellanarius* e *M. a. zeus*).

Parole chiave: Morfologia, Tassonomia, Sistematica, Bulgaria, Myoxidae.

INTRODUCTION

Dormice in Bulgaria were reported by Kovachev (1925). Three subspecies of the forest dormouse were reported for Bulgaria - *Dryomys nitedula robustus* from the Vitosha mountains (Niethammer & Bohmann, 1950), *D. nitedulu wingei* from the Pirin mountain (Niethammer & Bohmann, 1950) and The West Rhodopi Mountains (Peshev & Mitev, 1979) and *D. nitedula ravijujla* from Vitosha mountain (Paspalev et al., 1951).

Two subspecies of the hazel dormouse have been reported - *Muscardinus avellanarius kroecki*, from the Bitosha mountains (Niethammer & Bohmann, 1950) and *M. avellanarius avellanarius* from the West Rhodopi Mountains (Mitev, 1972).

All the taxa were described by single or very few specimens, while their cranial characteristics were not described. Craniological characteristics of the three species were given by Mitev (1972) from the region of the West Rhodopi Mountains only. The aim of the present work is to give the cranial characteristics of the three species in Bulgaria and on this base to check the validity of the reported subspecies.

MATERIAL

Cranial material from the three species of dormice from the whole territory of Bulgaria was used: *Myoxus glis* - 66 skulls, *Dryomys nitedula* - 104 **skulls,** *Muscardinus avellanarius* - 26 skulls. In the present study 17 cranial characters

were used: 1. condylobasal length; 2. maximum length; 3. zygomatic breadth; 4. mastoid breadth; 5. palate length; 6. interorbital constriction; 7. nasal; 8. maximum breadth of the rostrum; 9. length of parietal + interparietal; 10. length of occipital from foramen magnum; 11. diastema; 12. maxillary tooth row; 13. angular length of the mandible; 14. condylar length of the mandible; 15. lower diastema; 16. mandibular tooth row; 17. nasal (Fig. 1). The results were compared using Student's t-test. Examination of 129 skins showed no significant differences in colouration. That is why this character was not used in the present study. In the text only the reference number for characters given above is used.

'lab. 1 - Main statistical features of some cranial characters of the fat dormouse *M. glis minutus*

CHARACTER	n	litn	M ± m	SD	CV
1	65	32,1 ÷ 37,7	34,7 ± 0,14	1,12	3,22
2	65	34,1 – 40,3	37.0 ± 0,17	1,40	3,78
3	61	19,4 – 24,0	22.2 ± 0.13	0,99	4,45
4	60	12,0 – 14,4	13.2 ± 0,06	0,50	3,78
5	63	14,2 – 16,8	15,4 ± 0,08	0,64	4,18
6	64	4,7 – 5,3	5,0 ± 0,02	0,14	2,82
7	57	11,3 – 13,4	12,5 ± 0,06	0,48	3,85
8	66	7,0 – 8,7	7,7 ● 0,04	0,37	4,81
9	58	13,1 – 15,7	14,5 ± 0,08	0,62	4,28
10	62	4,0 – 5,7	4,9 ± 0,04	0,33	6,76
11	66	8,8 – 11,4	9,9 ± 0,06	0.53	5.34
12	64	5,6 – 7,0	6,5 ± 0,03	0,26	4,00
13	63	17,9 ÷ 21,3	19,7 ± 0,10	0,82	4,16
14	64	19,7 – 22,7	21,1 ± 0,09	0,73	3,45
15	65	5,1 – 6,5	5,7 ± 0,04	0,36	6,27
16	63	6,1 – 7,4	6,9 ± 0,03	0,24	3,48
17	57	3,3 – 4,4	3,9 ± 0,03	0,24	6,18

RESULTS

Intersexual comparison showed no significant differences for the three species, so wc present the data for both sexes together.

For tlie fat dormouse (*Myoxus glis*) we compared the data from the Rhodopi mountains with those coming from tlie remaining parts of the country. Significant differences were not found. Certain differences exist in tlie 6th character (P>0,95) and the 11th character (P>0,98). The only character by which the differences is well expressed is the 4th - P>0,998.

Having in mind the complicated subspecific status of *Dryomys nitedula* we compared tlie specimens from the West Rhodopi mountains with those from other parts of the country (Table 2). Considering characters 4 and 16 the differences between tlie two populations are insignificant. Taking into account all the other characters the differences are of very high significance - P>0,999 (except character 11, where P>0,95).

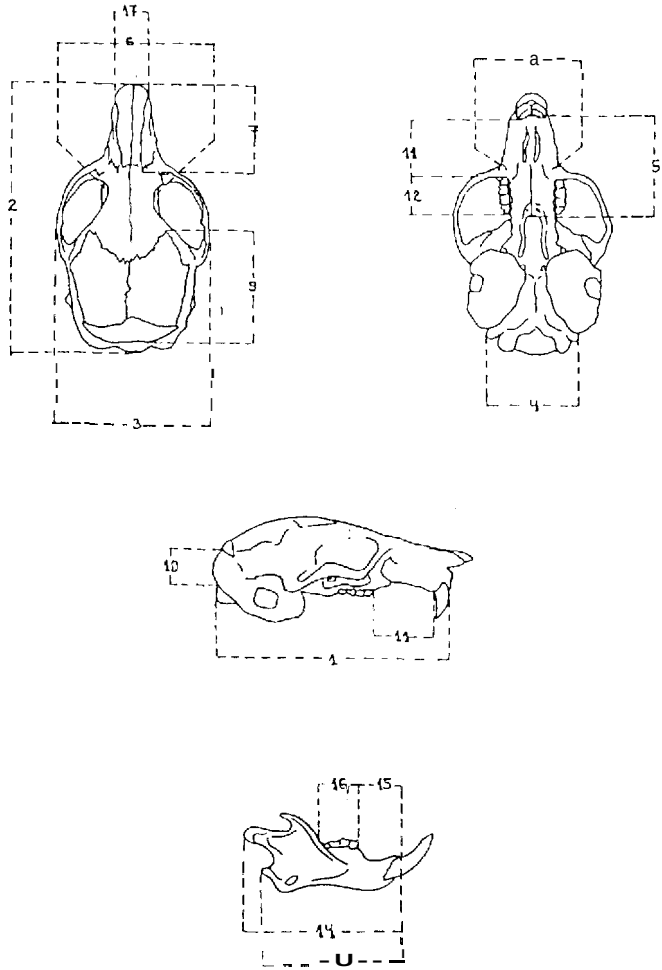

Fig. 1 17 cranial characters used in the study of three species dormice

The hazel dormouse *Muscardinus avellanarius* is well known only from the West Rhodopi mountains (Mitev, 1972). Data on this species from other parts of the country are very scarce. Despite the fact that Mitev (1972) assigned the population from the West Rhodopi mountains to the "avellanarius" subspecies, we compared the material from this population with that from the western parts of the country attributed to *M. a. avellanarius* as well. The result is quite unexpected. For most of the characters the differences are significant (P>0,99), and consequently the subspecific status of these two populations is questioned (Table 4).

DISCUSSION

The differences described between the fat dormice from the Rhodopi mountains and other parts of the country (6th character - P>0,95 and the 11th character - P>0,98) are insufficient to separate the two populations as different subspecies.

So we can state that from a taxonomic point of view the population of *M. glis* in Bulgaria belongs to one subspecies *(M glis minutus)*. The cranial characteristics of this species are given in Table 1.

Tab. 2 - Comparison by t-criterion of some cranial characters of *D. nitedula* from the West Rhodopi Mountains and the rest parts of the country.

CHARACTERS	WEST RHODOPI MOUNTAINS			REMAINING PARTS OF THE COUNTRY				
	n	M ± m	SD	n	M ± m	SD	t	P
1	67	23,8 ± 0,09	0,70	32	25,0 ± 0,10	0,59	8,74	0,999
3	67	15,2 ± 0,08	0,62	28	15,7 ± 0,10	0,51	5,75	0,999
4	64	9,6 ± 0,04	0,31	28	9,7 ± 0,05	0,27	0,22	
6	70	3,9 ± 0,02	0,18	32	4,1 ± 0,03	0,15	4,16	0,999
7	67	8,4 ± 0,09	0,73	32	9.0 ± 0,07	0,40	5,96	0,999
11	67	6,3 ± 0,04	0,32	32	6.9 ± 0,04	0,23	1,89	0,95
12	68	3,8 ± 0,02	0,18	32	3,9 ± 0.04	0,25	2,72	0,99
16	70	3,9 ± 0,03	0.22	31	4,0 ± 0,04	0,23	0,51	

As can be seen from Table 2, by most of the characters the differences between the specimens of *D. nitedula* from the West Rhodopi mountains and those from other parts of the country are significant. This allows separation of the two populations into two different subspecies. The one from the Rhodopi mountains is referred to the subspecies *D. nitedula wingei*. Two subspecies - *D. nitedula ravijojla* (Paspalev et al., 1951) from the Vitosha mountains and *D. nitedula robustus* (Niethammer & Bohmann, 1950) from tlie Vitosha mountains, were described from elsewhere in the country. Markov (1964) attributed the latter subspecies to the whole country. To clarify tlie existence of *D. nitedula ravijojla* we compared the specimens from Vitoslia and Ljulin mountains with those from the other parts of the country. No differences were observed between them, so we accept that in tlic territory of Bulgaria there are two subspecies - *D. nitedula wingei*, already mentioned for the West Rhodopi mountains and *D. nitedula robustus* for tlie remaining parts of the country. In 'Table 3 we give the craniological characteristics of *D. n. robustus.*

For the western part of the country we accept tlie nominate form of the hazel dormouse - *M. avellanarius avellanarius* (Table *4)*. In Greece Ondrias (1966) defined tlie subspecies *M. avellanarius zeus*. He also assumed that it was possible that this subspecies could be found in Bulgaria too. This is the nearest possible subspecies so we assume that the population of the hazel dormouse from the West Rhodopi mountains belongs to this subspecies - *M. avellanariw zeus* (Table 5*)*. It is reported for first time from Bulgaria. Finally we can say that two subspecies are found in Bulgaria - *M. avellunarius zeus*, in the Rhodopi mountains and *M. avellanarius avellanarius*, in tlie other part of tlie country. The supposition of Niethammer & Bohmann (1950) for the existence of the subspecies *M. a. kroecki* from Vitosha mountain was not confirmed.

lab. 3 – Main statistical features of some cranial characters of the forest dormouse *D. nitedula robustus*.

CHARACTER	N	LIM	M ± m	SD	CV
1	32	23,8 ÷ 26,3	25,0 ± 0,20	0,59	2,36
2	33	24,9 ÷ 28,4	26,6 ± 0,15	0,87	3,27
3	28	15,0 ÷ 17,0	15,7 ± 0,10	0,15	3,25
4	28	9,1 ÷ 10,1	9,7 ± 0,05	0,27	2,78
5	32	9,4 ÷ 10,6	9,8 ± 0,06	0,37	3,78
6	32	3,8 ÷ 4,5	4,1 ± 0,03	0,15	3,64
7	32	8,3 ÷ 9,9	9,0 ± 0,07	0,40	4,42
8	32	4,9 ÷ 6,0	5,2 ± 0,04	0,23	4,38
9	29	11,0 ÷ 12,3	11,7 ± 0,06	0,37	3,16
10	32	3,2 ÷ 4,1	3,7 ± 0,03	0,16	4,38
11	32	6,4 ÷ 7,4	6,9 ± 0,04	0,23	3,31
12	32	3,4 ÷ 4,6	3,9 ± 0,04	0,25	6,45
13	32	11,0 ÷ 14,4	12,3 ± 0,10	0,57	4,63
14	32	12,7 ÷ 15,4	13,7 ± 0,09	0,50	3,65
15	32	3,9 ÷ 4,8	4,3 ± 0,04	0,24	5,62
16	31	3,6 ÷ 4,6	4,0 ± 0,04	0,23	5,75
17	29	2,7 ÷ 3,1	2,9 ± 0,01	0,09	3,10

Tab. 4 – Main statistical features of some cranial characters of the hazel dormouse *M. a. avellanarius*.

CHARACTER	N	LIM	M ± m	SD	CV
1	9	20,9 ÷ 22,2	21,4 ± 0,14	0,42	1,96
2	10	21,3 ÷ 23,1	22,4 ± 0,17	0,55	2,44
3	9	12,4 ÷ 14,0	13,2 ± 0,14	0,43	3,24
4	5	7,9 ÷ 8,2	8,0 ± 0.05	0,11	1,37
5	10	8,4 ÷ 9,2	8.9 ± 0,07	0,22	2,4
6	10	3,2 ÷ 3,6	3,5 ± 0,04	0,14	4,12
7	10	7.0 ÷ 8,0	7,4 ± 0.08	0,27	3.64
8	10	3,6 ÷ 4,1	3,8 ± 0,05	0,15	3,98
9	10	10,0 ÷ 10,9	10,5 ± 0,08	0,26	2,52
10	9	2,6 ÷ 3,1	3,0 ± 0,09	0,26	8,71
11	10	5,9 ÷ 6,8	6,2 ± 0,08	0,25	4.03
12	10	4,3 ÷ 4,9	4,5 ± 0,07	0,22	4.90
13	10	10,0 ÷ 12,3	10,9 ± 0,23	0,74	6,78
14	10	11,9 ÷ 13,0	12,3 ± 0,11	0,37	3,00
15	10	3,1 ÷ 4,0	3,8 ± 0,08	0,26	6,84
16	10	4,0 ÷ 4,6	4,3 ± 0,06	0,20	4,65
17	10	2,0 ÷ 2,4	2,2 ± 0,04	0.15	6.81

Tab. 5 – Comparison by t-criterion of some cranial characters of *M. avellanarius* from the West Rhodopi Mountains and the rest parts of the country.

CHARACTERS	WEST RHODOPI MOUNTAINS			REMAINING PARTS OF THE COUNTRY				
	n	M ± m	SD	n	M ± m	SD	t	P
1	16	20,8 ± 0,11	0,46	9	21,4 ± 0,14	0,42	3,31	0,998
3	16	13,0 ± 0,07	0,27	9	13,2 ± 0,14	0,23	0,59	
4	16	7,9 ± 0.05	0,18	5	8,0 ± 0,05	0,11	0,99	
6	13	3,3 ± 0.02	0,10	10	3,5 ± 0,04	0,14	3,56	0,998
7	16	6,9 ± 0.14	0,56	10	7,4 ± 0,08	0,27	3,04	0,99
11	16	5,8 ± 0,06	0,24	10	6,2 ± 0,08	0,25	4,10	0,999
12	16	4,6 ● 0,05	0,18	10	4,5 ± 0,07	0,22	2,61	
16	16	4,5 ± 0,03	0,13	10	4,3 ● 0,06	0,20	3,13	0.99

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