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DATA ON MORPHOMETRY OF THE ROOT VOLE (*MICROTUS OECONOMUS*) FROM LITHUANIA

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Abstract. Five external morphometric and 23 craniometric characters of 782 Root Vole (*Microtus oeconomus*) individuals trapped in N, NW, C and S Lithuania in 2001–2009 were analysed with respect to sex and age of animals. The body mass of juveniles, subadults and adults was, respectively, 6.5–27.5, 16.5–39.5 and 16.5–77.0 g, body length 52.6–105.2, 73.8–118.6 and 79.2–142.0 mm, and condylobasal skull length 19.4–27.9, 22.2–25.9 and 20.9–29.7 mm. Sexual dimorphism was characteristic mainly of adult voles. Sex-dependent differences in body and skull size were weak in subadult voles and not expressed in juveniles. On average, adult males of *M. oeconomus* were bigger than females. Early matured females were much smaller. The overlap of body and skull measurements in adult, subadult and juvenile voles was very high. Unmistakable assigning of voles to the age group of juveniles was correct when body mass was below 16.5 g and body length below 74 mm, while adults could unmistakably be recognized when their body mass was over 40 g and body length over 120 mm. Body mass and body length values of subadult voles were overlaid by measurements of juveniles and adult individuals. Further, subadults could not be distinguished from any skull measurements. The body mass of *M. oeconomus* was strongly correlated with linear body measurements and with most of the skull measurements in all age groups.
Keywords: *Microtus oeconomus*, morphometry, Lithuania

Introduction

The Root Vole (*Microtus oeconomus*) is one of the species which changed its distribution range in the last decades, shifting it to the north and west over the territory of Lithuania (Balčiauskas *et al*. 2010). In Latvia and Estonia *M. oeconomus* is still not reported. Further north, the distribution range covers Scandinavia, including Finnish coast and Norway (van Apeldoorn 1999; Zorenko 2008).

Data on morphometry of *M. oeconomus* are scarce, especially when talking about Lithuania. For *Fauna of Lithuania*. *Mammals* 18 individuals were measured to describe body features and only 10 individuals to describe craniometry. This book is the only source of such information (Prūsaitė 1988). Average measurements of 23 skull and three pelvic characters were analysed for body mass estimation using bone measurements (Balčiauskas & Balčiauskienė, in press), but the sample was not divided according to animal sex and age. Measurements of pelvic characters were analysed with more details, including differences depending on age/sex categories of voles (Balčiauskienė & Balčiauskas 2009). Raw data on body and skull measurements are available from Niethammer and Krapp (1982). It is quite possible that in relation to the animal trapping rules applicable in the European Union, data on small mammal morphometry will be even less abundant in the future. As Lithuanian laws have not regulated small mammal snap trapping so far, we had an opportunity to collect data on the external morphometry and craniometry of the species.

The aim of the paper is to present data on morphometry of *M. oeconomus* with respect to age and sex of animals.

Material and methods

The morphometric measurements of 782 *M. oeconomus* individuals trapped in north, north-west, central and south Lithuania in 2001–2009 have been analysed. The trapping sites are shown in Fig. 1. Three individuals were trapped in June, 130 in July, 283 in August, 118 in September and 248 in October. Thus, our sample did not include individuals with stunted growth from winter trappings. Sex and age structure of the sample is presented in Table 1. Sex was not identified for 12 individuals; age was not determined for 34 individuals.

Body mass (Q) was determined on the spring or electronic balance to the nearest 0.1 g. Voles were measured to the nearest 0.1 mm, standard measurements of body length (L), tail length (C), hind foot length

Figure 1. Trapping sites of *M. oeconomus* from Lithuania, 2001–2009 (NP – National Park, SNR – Strict Nature Reserve, env. – environs).

Table 1. Sex and age structure of *M. oeconomus* sample, 2001–2009.

Site	Total, N	Out of the total				
		Male	Female	Adults	Sub-adults	Ju-venes
Rusnė env.	509	227	275	259	89	128
Kuršių Nerija NP*	123	59	64	62	38	23
Čepkeliai SNR*	39	19	20	19	18	2
Kamanos SNR	29	16	13	15	1	13
Žagarė RP	28	13	14	16	3	9
Gelgaudiškis env.*	25	7	17	18	3	3
Lipliūnai env.	16	7	9	6	5	5
Viešvilė SNR*	9	4	5	1	5	3
Žemaitija NP	4	2	2	3	1	0
Total	782	354	419	399	163	186

* – partly financed by the Lithuanian State Science and Studies Foundation

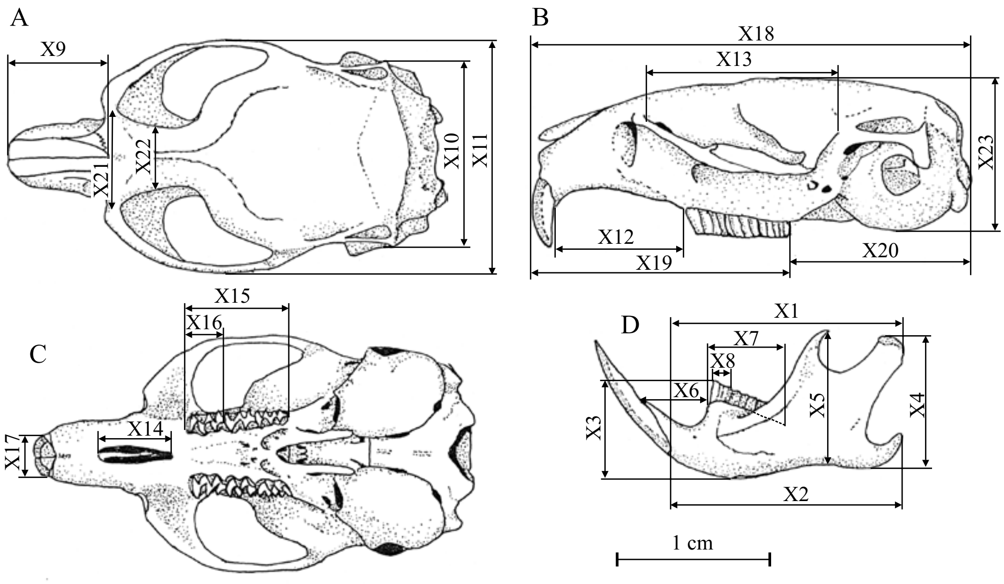

Figure 2. Skull measurements taken: A – dorsal view, B – lateral view, C – ventral view, D – mandible (from Balčiauskas & Balčiauskienė, in press): X1 – total length of mandibula at *processus articularis*, excluding incisors; X2 – length of mandibula excluding incisors; X3 – height of mandibula at, and including, first molar; X4 – maximum height of mandibula, excluding coronoid process; X5 – coronoid height of mandibula; X6 – length of mandibular diastema; X7 – length of mandibular tooth row; X8 – length of lower molar M1; X9 – length of *nasalia*; X10 – breadth of braincase measured in the widest part; X11 – zygomatic skull width; X12 – length of cranial (upper) diastema; X13 – zygomatic arc length; X14 – length of *foramen incisivum*; X15 – length of maxillary toothrow; X16 – length of molar M1; X17 – incisor width across both upper incisors; X18 – condylobasal length; X19 – length of rostrum; X20 – length of the braincase; X21 – interorbital constriction; X22 – postorbital constriction; X23 – height of the braincase.

(P) and ear length (A) being recorded (as in Prūsaitė 1988), then dissected, sexed and aged using standard methods. Based on their reproductive status and an appearance of the sex organs, voles were divided into three age categories: juveniles, subadults and adults. All overwintered and breeding individuals, i.e. males with scrotal testes and lactating or pregnant females, were defined as adults. All individuals that stayed non-breeding during the year of birth (reproductive organs developed, but inactive – small nipples and closed vagina in females, abdominal testes in males) fell into the category of subadults. All individuals without expressed sex attributes (reproductive organs still developing – threadlike vagina or hardly visible testes) were treated as juveniles. The presence and the status of *glandula thymus* (*gl. thymus* involuted in adults, *gl. thymus* disappearing in subadults, *gl. thymus* functioning in juveniles) as well as animal mass were taken into account (Myllymäki 1977; Gliwicz 1996; Prévot-Julliard *et al.* 1999).

The skulls were cleaned by *Dermestes* beetle larvae. 23 skull characters were measured under a binocular with a micrometric eyepiece with an accuracy of 0.1 mm. X1–X17 (Fig. 2) were measured after Lidicker and MacLean (1969) and Niethammer and Krapp (1982), X18–X23 after Kryštufek and Vohralik (2005). Only the characters of the right set of the skull were used.

Basic statistics was calculated with Statistica for Windows software (StatSoft 2004). Differences between estimates (for age and sex groups) were tested using Student's *t* for independent variables.

Results

Before calculations, body mass variation between sampling sites was tested using one-way ANOVA and was found to be insignificant (df = 8, F = 1.73, $p > 0.05$) allowing to use the general (pooled) sample for further analysis.

Body mass and body length of all three age groups of *M. oeconomus* showed a high degree of overlap, especially in the body mass range from 16.5 to 35 g (Fig. 3). The measurements of subadult individuals were partially covered by young individuals in smaller values and by adult individuals in the middle of the value range. Unmistakable assigning to the age group of juveniles was correct when vole body mass was below 16.5 g and body length below 74 mm, and to the group of adults when body mass was over 40 g and body length over 120 mm. There were no body mass or body length values which could unmistakably characterise subadult voles.

The overlay of cranial measurements between age group of voles was also found. We compared changes in the length of the braincase and length of rostral part of skull between young, subadult and adult *M. oeconomus* (Fig. 4). When the length of rostrum <13 mm and the length of the braincase <9 mm, individuals could unmistakably be assigned to juveniles, and when the length of rostrum >14.5 mm and the length of the braincase >10.5 mm, voles could be assigned to adults. A group of subadults could not be distinguished from the two above-mentioned or any other skull measurements.

The juveniles of both sexes of *M. oeconomus* were of the same size, including body mass, body dimensions and cranial measurements. Only two differences were significant, namely, length of mandibular diastema (X6), and postorbital constriction (X22) (Table 2). However, the differences of these two measurements were factually less than 0.1 mm.

The number of significant size differences in subadult *M. oeconomus* was not much bigger than in young voles. On average, subadult males were bigger than subadult females, and this was also noticeable in body size,

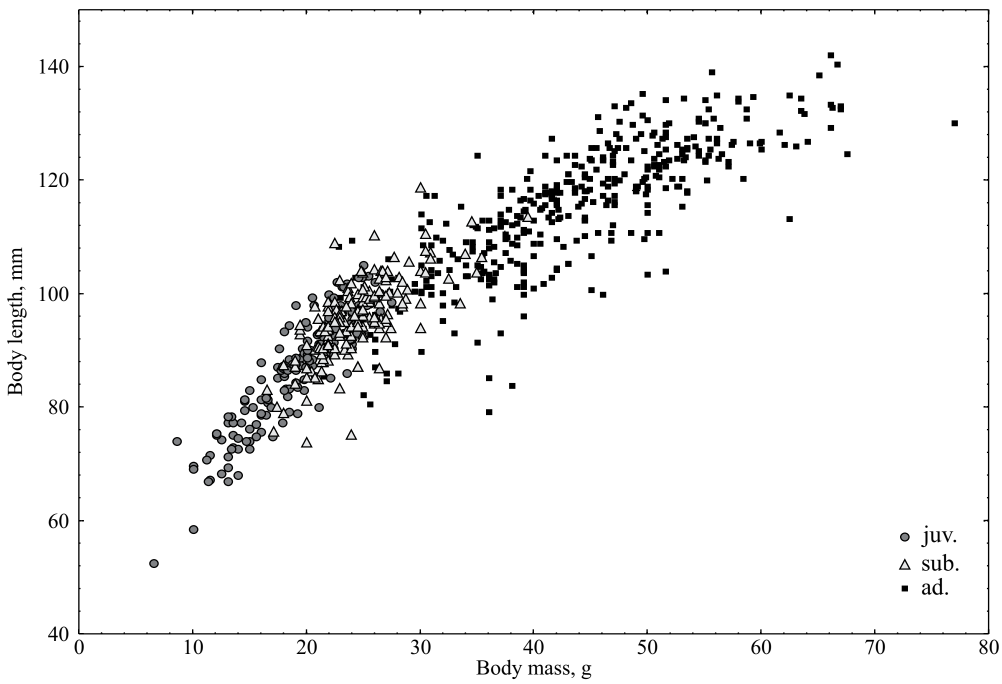

Figure 3. Body mass and body length overlap between age groups of *M. oeconomus*.

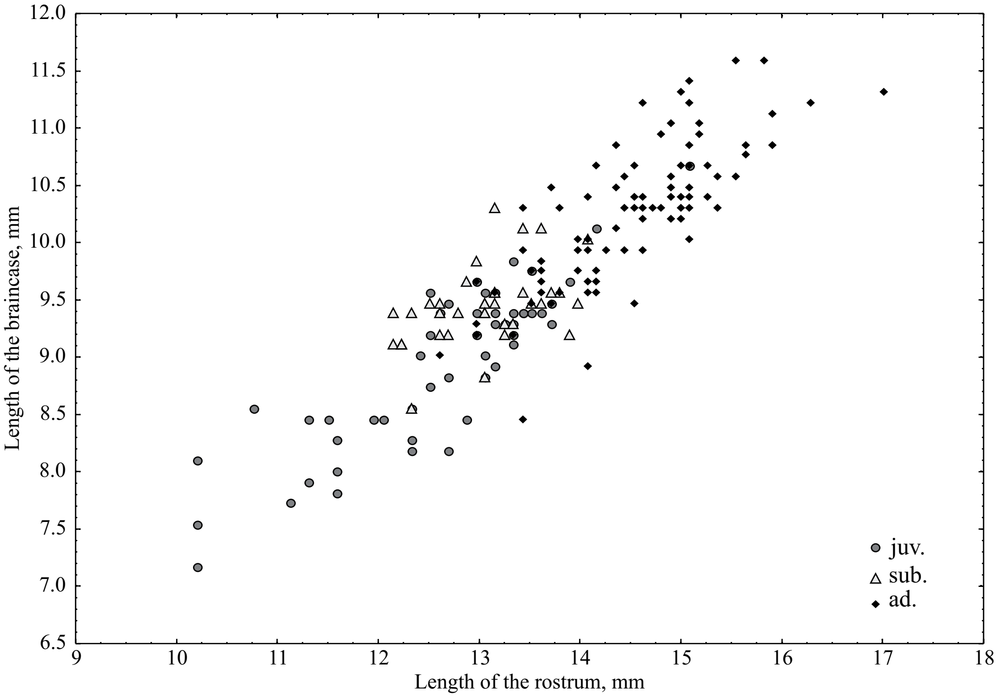

Figure 4. Braincase length and rostrum length overlap between age groups of *M. oeconomus*.

Table 2. Morphometric data of *M. oeconomus* juveniles with differences between males and females indicated.

Character*	Total			Males	Females	Diff, $p <$
	N	avg. ±SE	min–max	avg. ±SE	avg. ±SE	
Q	181	19.3 ± 0.32	6.5–27.5	19.6 ± 0.47	19.1 ± 0.44	NS
L	180	87.2 ± 0.73	52.6–105.2	87.9 ± 1.06	86.9 ± 0.99	NS
C	127	34.7 ± 0.39	22.5–43.4	34.8 ± 0.53	34.6 ± 0.57	NS
P	128	17.4 ± 0.23	7.2–20.4	17.4 ± 0.33	17.5 ± 0.27	NS
A	123	11.3 ± 0.19	6.4–18.1	11.4 ± 0.26	11.2 ± 0.25	NS
X1	144	12.1 ± 0.05	10.3–14.0	12.2 ± 0.07	12.0 ± 0.08	NS
X2	146	12.1 ± 0.06	9.8–13.8	12.1 ± 0.08	12.1 ± 0.09	NS
X3	180	4.9 ± 0.02	4.1–6.3	4.9 ± 0.03	4.9 ± 0.03	NS
X4	142	6.4 ± 0.04	5.3–8.1	6.4 ± 0.05	6.4 ± 0.06	NS
X5	133	6.9 ± 0.04	5.7–8.1	6.9 ± 0.06	6.8 ± 0.05	NS
X6	182	3.5 ± 0.01	3.1–4.2	3.6 ± 0.02	3.5 ± 0.02	0.03
X7	183	5.0 ± 0.02	4.3–5.6	5.0 ± 0.02	5.0 ± 0.02	NS
X8	185	2.5 ± 0.01	2.1–2.9	2.5 ± 0.02	2.5 ± 0.01	NS
X9	160	5.5 ± 0.04	4.2–6.8	5.5 ± 0.05	5.6 ± 0.06	NS
X10	86	10.4 ± 0.03	9.7–11.2	10.4 ± 0.05	10.4 ± 0.05	NS
X11	132	12.3 ± 0.06	9.8–14.9	12.3 ± 0.09	12.3 ± 0.09	NS
X12	175	6.4 ± 0.04	5.2–8.0	6.5 ± 0.05	6.4 ± 0.05	NS
X13	129	7.2 ± 0.05	5.7–8.3	7.2 ± 0.06	7.2 ± 0.07	NS
X14	173	3.8 ± 0.02	2.9–4.8	3.8 ± 0.03	3.8 ± 0.04	NS
X15	182	5.8 ± 0.02	5.1–6.6	5.8 ± 0.03	5.8 ± 0.03	NS
X16	183	2.0 ± 0.01	1.7–2.2	2.0 ± 0.01	2.0 ± 0.01	NS
X17	180	2.3 ± 0.02	1.8–2.9	2.3 ± 0.02	2.4 ± 0.02	NS
X18	56	22.8 ± 0.27	19.4–27.9	22.8 ± 0.39	22.9 ± 0.38	NS
X19	115	12.8 ± 0.09	10.2–15.1	12.9 ± 0.11	12.7 ± 0.13	NS
X20	57	8.9 ± 0.09	7.2–10.7	8.9 ± 0.15	8.9 ± 0.10	NS
X21	121	4.0 ± 0.02	3.4–4.4	4.0 ± 0.02	4.0 ± 0.03	NS
X22	114	3.3 ± 0.01	3.1–3.5	3.3 ± 0.01	3.2 ± 0.01	0.001
X23	58	9.4 ± 0.09	8.1–10.9	9.4 ± 0.13	9.3 ± 0.14	NS

* – abbreviation as in Methods

Table 3. Morphometric data of subadult *M. oeconomus* with differences between males and females indicated.

Character*	Total			Males	Females	Diff, *p* <
	N	avg. ±SE	Min–max	avg. ±SE	avg. ±SE	
Q	161	24.5 ± 0.30	16.5–39.5	25.1 ± 0.37	23.6 ± 0.47	0.02
L	159	95.6 ± 0.58	73.8–118.6	96.4 ± 0.71	94.2 ± 0.98	NS
C	87	38.0 ± 0.37	29.5–45.1	38.4 ± 0.38	37.0 ± 0.90	NS
P	88	17.8 ± 0.22	10.0–20.0	17.8 ± 0.28	17.9 ± 0.28	NS
A	86	12.4 ± 0.30	8.7–20.3	12.5 ± 0.37	12.0 ± 0.43	NS
X1	135	12.5 ± 0.04	11.3–13.7	12.5 ± 0.05	12.4 ± 0.07	NS
X2	123	12.6 ± 0.05	11.4–13.9	12.6 ± 0.06	12.5 ± 0.08	NS
X3	158	5.1 ± 0.02	4.3–6.1	5.1 ± 0.03	5.1 ± 0.04	NS
X4	127	6.7 ± 0.03	5.9–7.5	6.7 ± 0.04	6.6 ± 0.05	NS
X5	125	7.2 ± 0.04	5.8–8.3	7.2 ± 0.04	7.1 ± 0.07	NS
X6	157	3.7 ± 0.02	3.2–4.2	3.7 ± 0.02	3.6 ± 0.02	0.04
X7	161	5.1 ± 0.02	4.6–5.7	5.1 ± 0.02	5.1 ± 0.04	NS
X8	162	2.5 ± 0.01	2.2–2.9	2.5 ± 0.01	2.5 ± 0.02	NS
X9	143	5.9 ± 0.03	5.0–7.3	5.9 ± 0.04	5.8 ± 0.06	NS
X10	73	10.5 ± 0.04	9.8–11.2	10.6 ± 0.04	10.4 ± 0.07	0.02
X11	113	12.8 ± 0.04	11.9–14.8	12.9 ± 0.05	12.7 ± 0.05	0.005
X12	153	6.9 ± 0.03	5.8–8.7	6.9 ± 0.04	6.8 ± 0.05	0.04
X13	115	7.6 ± 0.04	6.6–8.6	7.5 ± 0.04	7.6 ± 0.07	NS
X14	140	4.0 ± 0.02	3.2–4.7	4.0 ± 0.03	3.9 ± 0.03	NS
X15	159	6.0 ± 0.02	5.3–6.7	6.0 ± 0.02	5.9 ± 0.03	NS
X16	163	2.0 ± 0.01	1.8–2.4	2.0 ± 0.01	2.0 ± 0.01	NS
X17	153	2.5 ± 0.01	1.8–2.9	2.5 ± 0.02	2.4 ± 0.02	NS
X18	35	23.8 ± 0.14	22.2–25.9	23.9 ± 0.16	23.6 ± 0.27	NS
X19	85	13.3 ± 0.07	12.1–15.5	13.4 ± 0.08	13.1 ± 0.13	NS
X20	40	9.5 ± 0.05	8.6–10.3	9.5 ± 0.05	9.3 ± 0.13	NS
X21	78	4.1 ± 0.02	3.6–4.5	4.1 ± 0.03	4.1 ± 0.05	NS
X22	84	3.3 ± 0.01	3.1–3.5	3.3 ± 0.01	3.3 ± 0.02	NS
X23	41	9.7 ± 0.07	8.8–11.0	9.7 ± 0.09	9.8 ± 0.10	NS

* – abbreviation as in Methods

Table 4. Morphometric data on adult *M. oeconomus* with differences between males and females indicated.

Character*	Total			Males	Females	Diff, *p* <
	N	avg. ±SE	min–max	avg. ±SE	avg. ±SE	
Q	397	43.2 ± 0.51	16.5–77.0	48.3 ± 0.76	40.4 ± 0.60	0.001
L	395	114.9 ± 0.60	79.2–142.0	120.1 ± 0.93	112.0 ± 0.72	0.001
C	243	46.3 ± 0.40	28.1–61.1	49.5 ± 0.65	44.8 ± 0.47	0.001
P	243	18.0 ± 0.16	10.2–21.6	18.5 ± 0.29	17.7 ± 0.19	0.03
A	239	13.9 ± 0.18	9.6–21.2	14.6 ± 0.31	13.6 ± 0.21	0.01
X1	339	13.5 ± 0.04	11.8–15.2	13.8 ± 0.05	13.3 ± 0.05	0.001
X2	334	13.6 ± 0.04	11.9–15.6	14.0 ± 0.06	13.4 ± 0.05	0.001
X3	384	5.6 ± 0.02	4.6–6.7	5.8 ± 0.03	5.6 ± 0.02	0.001
X4	321	7.4 ± 0.03	5.7–8.6	7.6 ± 0.04	7.2 ± 0.03	0.001
X5	293	7.8 ± 0.03	5.7–9.2	8.0 ± 0.04	7.7 ± 0.03	0.001
X6	382	3.8 ± 0.01	3.2–4.3	3.9 ± 0.02	3.8 ± 0.01	0.001
X7	394	5.3 ± 0.01	4.7–6.2	5.3 ± 0.02	5.3 ± 0.02	NS
X8	395	2.6 ± 0.01	2.3–3.0	2.7 ± 0.01	2.6 ± 0.01	0.008
X9	350	6.5 ± 0.03	5.2–8.0	6.7 ± 0.04	6.3 ± 0.03	0.001
X10	153	10.7 ± 0.03	9.8–11.6	10.7 ± 0.05	10.6 ± 0.03	0.02
X11	290	14.3 ± 0.05	10.8–16.7	14.9 ± 0.08	14.0 ± 0.06	0.001
X12	367	7.5 ± 0.03	5.9–8.9	7.8 ± 0.04	7.4 ± 0.03	0.001
X13	266	8.2 ± 0.03	6.3–9.9	8.4 ± 0.05	8.0 ± 0.04	0.001
X14	356	4.4 ± 0.02	3.6–5.2	4.6 ± 0.03	4.4 ± 0.02	0.001
X15	388	6.2 ± 0.01	5.6–7.0	6.3 ± 0.02	6.2 ± 0.02	0.008
X16	396	2.1 ± 0.01	1.7–2.4	2.1 ± 0.01	2.1 ± 0.01	NS
X17	379	2.7 ± 0.01	2.1–3.2	2.8 ± 0.02	2.7 ± 0.01	0.001
X18	91	25.5 ± 0.19	20.9–29.7	26.4 ± 0.33	25.0 ± 0.21	0.001
X19	232	14.5 ± 0.05	11.7–17.0	15.0 ± 0.08	14.2 ± 0.06	0.001
X20	100	10.2 ± 0.07	8.3–11.6	10.7 ± 0.09	10.0 ± 0.07	0.001
X21	218	4.2 ± 0.02	3.3–5.2	4.3 ± 0.03	4.1 ± 0.02	0.001
X22	203	3.3 ± 0.01	2.9–3.9	3.4 ± 0.01	3.3 ± 0.01	0.001
X23	93	9.8 ± 0.07	8.2–11.8	10.1 ± 0.13	9.7 ± 0.08	0.003

* – abbreviation as in Methods

Table 5. Correlation between body mass and cranial measurements in *M. oeconomus* juveniles, subadults and adults (* – $p < 0.05$, ** – $p < 0.01$, *** – $p < 0.001$).

Character	Juveniles	Subadults	Adults
X1	0.66***	0.52***	0.70***
X2	0.73***	0.55***	0.74***
X3	0.60***	0.45***	0.64***
X4	0.72***	0.57***	0.63***
X5	0.80***	0.52***	0.61***
X6	0.21**	0.27***	0.55***
X7	0.64***	0.23**	0.48***
X8	0.67***	0.22**	0.44***
X9	0.63***	0.41***	0.63***
X10	0.54***	0.24***	0.19*
X11	0.72***	0.69***	0.77***
X12	0.76***	0.56***	0.68***
X13	0.64***	0.22*	0.51***
X14	0.62***	0.48***	0.65***
X15	0.74***	0.32***	0.49***
X16	0.49***	0.17*	0.40***
X17	0.64***	0.34***	0.62***
X18	0.65***	0.24^{NS}	0.72***
X19	0.74***	0.53***	0.59***
X20	0.78***	0.46***	0.74***
X21	0.36***	-0.15^{NS}	0.44***
X22	0.30***	0.07^{NS}	0.34***
X23	0.58***	-0.06^{NS}	0.59***

length of mandibular diastema, breadth of braincase, zygomatic skull width and length of cranial (upper) diastema (Table 3).

Sexual dimorphism in adult voles was expressed very well. On average, males were bigger in body mass, body size and in cranial measurements; most of these differences were highly significant (Table 4). The difference in body mass was nearly 8 g, or 16.5% of the male body mass. Difference in body length was 6.7%, in tail length 9.5%, in hind foot length 4%, and in ear length 6.6% of respective male measurements. Most of the cranial measurements in males were 4–7% bigger (Table 4).

The minimum body mass of adult animals was much smaller in females (16.5 g compared to 25.0 g in males). Accordingly, minimum cranial measurements in adult females were also smaller than in adult males.

Body mass and linear body measurements were strongly correlated. The strongest correlations were between body mass and body length (Pearson's $r = 0.91$ in juveniles, $r = 0.73$ in subadults and $r = 0.82$ in adults, all $p < 0.001$), also between body mass and tail length ($r = 0.81$, $r = 0.56$ and $r = 0.71$ respectively, all $p < 0.001$). Body mass was found to correlate with cranial measurements in all age groups of voles, and most of these correlations were strong and significant (Table 5).

Discussion

There are no morphometric data on *M. oeconomus* available for comparison from neighbouring countries. Such data are missing from Poland (Pucek 1984) and Belarus (Savickij *et al*. 2005). Germany (Niethammer & Krapp 1982) and Austria (Spitzenberger *et al*. 2001) are countries far from Lithuania, with a different geographical strain of *M. oeconomus*: subspecies *raticeps* proposed for Lithuania (see Ogniov 1950; Prūsaitė 1988), while subspecies *mehelyi* for Austria, Hungary and Slovakia (Linzey *et al*. 2008).

Some data on *M. oeconomus* craniometry from Poland were presented by Borowski *et al*. (2008). Unfortunately, the paper contains wrong interpretation of relation between body mass and bone measurements (Balčiauskas & Balčiauskienė, in press). The average reported body mass of *M. oeconomus* from Poland was somewhat smaller than in our sample. A possible reason is that Borowski and his colleagues included winter-trapped animals into their sample. We have no proof on the stunted growth of *M. oeconomus* in winter time in Lithuania, but recorded growth depression for other small mammal species – bank vole (*Myodes glareolus*), common vole (*Microtus arvalis*) and yellow-necked mouse (*Apodemus flavicollis*).

Formerly, scarce amount of data on adult *M. oeconomus* from Lithuania (n = 18) were reported as follows: body mass, Q = 43.9 (33.4–57.2) g, body length, L = 114.6 (95.4–137) mm, tail length, C = 45 (38.4–58.4) mm, hind foot length, P = 18.5 (17.2–20.0) mm, and ear length, A = 13.6 (11.9–15.0) mm (Prūsaitė 1988). From our data it is clear that *Fauna of Lithuania* contains pooled data of males and females, which for adult animals are significantly different between sexes. The minimum body parameters of adult females are much smaller than those of males. In Lithuania, females of *M. oeconomus* start breeding when they are of much smaller body mass than males. From the sample of 257 adult females, 8 (3.11%) were under 25 g, 36 (14.01%) under 30 g, and 72 (28.02%) under 35 g. Out of 140 males 2.14% were under 30 g, and 6.43% under 35 g. This phenomenon is known as a defence against inbreeding. While females may start reproduce at the age of three weeks, males mature at two months of age – thus, females are almost always fertilized before their male siblings are able to mate (Bieberich & Olson 2007).

The formerly reported craniometric data on adult *M. oeconomus* from Lithuania were even more scarce (n = 10), namely: zygomatic skull width, X11 = 14.6 (13.8–15.5) mm, length of cranial (upper) diastema, X12 = 8.1 (7.8–9) mm, length of maxillary toothrow, X15 = 6.5 (6–7.1) mm, condylobasal length, X18 = 26.8

(25.3–27.8) mm, interorbital constriction, X21 = 3.7 (3.4–3.8) mm and height of the braincase, X23 = 9.8 (9.4–10) mm (Prūsaitė 1988). Our data originated from a much bigger sample of adult *M. oeconomus*, including voles smaller and bigger than those presented by Prūsaitė (1988), thus, the range of craniometric measures was wider. The fact that most of the sampled voles were trapped in the western and southwestern part of the country is related to history of the spread of the species. It started to spread in Lithuania from southwest 50 years ago, and up to now *M. oeconomus*' share in small mammal communities of Lithuanian regions other than west or southwest is small (Balčiauskas *et al*. 2010).

Our data showed that the difference in body and skull size between sexes is mostly expressed in adult age, while in juvenile and subadult voles these differences are less expressed. Our former study of pelvis morphometry in *M. oeconomus* pointed out the same peculiarity – the most expressed differences in pelvis between males and females were found in adult animals (Balčiauskienė & Balčiauskas 2009). Morphometric and craniometric differences between age groups (males and females pooled) are expressed only in the smallest and in the biggest segments of the full measurement range. Measurements of subadult voles are fully overlaid, giving no possibility to recognize this age group from morphometric and/or craniometric measurements.

Conclusions

According to body size and craniometric characters, unmistakable recognition of juvenile *M. oeconomus* is possible when their body mass is below 16.5 g and body length below 74 mm, while adult voles can be unmistakably recognized when their body mass is over 40 g and body length over 120 mm. The size of subadult animals is overlaid with bigger young individuals from one side and with early-matured adults from the other. Age related differences in body size and craniometric characters of individuals between 16.5 g and 40 g are not clearly expressed.

Sex-dependent differences in body and skull size are well expressed in adult animals, weakly expressed in subadults, and not expressed in juveniles. On average, adult males of *M. oeconomus* are bigger than females, with an exception of early matured females, which are smaller.

The body mass of *M. oeconomus* is strongly correlated with linear body measurements and with most of the skull measurements in all age groups, giving base for regression-based body mass re-calculation.

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Lietuvos pelkinių pelėnų (*Microtus oeconomus*) morfometriniai duomenys

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Santrauka

Išanalizuoti 782 pelkinių pelėnų (*Microtus oeconomus*), sugautų 2001–2009 metais visoje Lietuvoje, išskyrus rytinę dalį, penki kūno ir 23 kaukolės matmenys priklausomai nuo individų lyties ir amžiaus. Jauniklių kūno masė buvo 6,5–27,5 g, lytiškai nesubrendusių – 16,5–39,5 g, suaugusių – 16,5–77,0 g, kūno ilgis, atitinkamai – 52,6–105,2 mm, 73,8–118,6 mm ir 79,2–142,0 mm, kondilobazinis kaukolės ilgis – 19,4–27,9 mm, 22,2–25,9 mm ir 20,9–29,7 mm. Lytinis dimorfizmas yra būdingiausias suaugusiems pelėnams. Lytiškai nesubrendusių patinų ir patelių kūno ir kaukolės dydžiai skyrėsi mažiau, o jauniklių visai nesiskyrė. Suaugę pelkinių pelėnų patinai yra didesni už pateles, o ypač – už anksti subrendusias pateles. Kūno ir kaukolės matmenų persidengimas suaugusių, lytiškai nesubrendusių ir jauniklių pelėnų amžiaus grupėse buvo labai didelis. Jaunikliams galima priskirti tik mažiau nei 16,5 g sveriančius individus, kurių kūno ilgis neviršija 74 mm, o suaugėliams – daugiau nei 40 g sveriančius ir ilgesnius nei 120 mm pelėnus. Lytiškai nesubrendusių individų kūno masės ir ilgio dydžiai persidengia su jauniklių ir suaugusių pelėnų matmenimis, ši grupė neišsiskiria ir pagal kaukolės matmenis. Visų amžiaus grupių *M. oeconomus* kūno ir kaukolės matmenys stipriai ir patikimai koreliuoja su kūno mase.

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