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THE GROWTH OF CAPTIVE BRED FIELD MICE (*APODEMUS AGRARIUS*)

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Abstract. The growth of field mice (*Apodemus agrarius*) was investigated using 266 captive bred individuals aged from 16 to 1,233 days. They attained greater body weight and body length than animals in wild populations though skulls were not bigger. The average body weight in the oldest captive bred mice was lower than in medium-aged animals, i.e., growth curve was an arc-shaped. The average body weight and length, and some of skull characters were subjected to sexual dimorphism – males grew larger. The length of the cranial (upper) and lower diastema, length of *nasalia*, zygomatic arc length and zygomatic skull width continued to grow throughout the life of an animal, though growth intensity was higher in the young age. Correlations of skull character measurements with body weight were best in young specimens. The height of the mandibula (at, and including, the first molar), the maximum height of the mandibula (excluding the coronoid process), zygomatic skull width and the length of the cranial (upper) diastema were highly correlated with body weight. In general, correlations in captive mice were weaker than in captive voles with the exception of the coronoid height of the mandibula and the length of the mandibular diastema.
Key words: captive bred field mice, *Apodemus agrarius*, growth, skull, sex-dependent differences

Introduction

Publications concerning striped field mouse (*Apodemus agrarius*) in Lithuania are mainly of ecological and faunal character and deal with the topics of species distribution, abundance and share in small mammal community (Balčiauskas 1990, 2005; Balčiauskas & Juškaitis 1997; Balčiauskas *et al*. 1999; Mažeikytė 2002, 2004). In some years, the species is common in the area where it is found, though its relative abundance is not high, up to 20–25 individuals per 100 trap/nights (Balčiauskas *et al*. 1999). A long-term share of *A*. *agrarius* in a small mammal community was only 2.85% (Balčiauskas 2005).

Some data on the skull measurements of *A*. *agrarius* were presented in the 'Fauna of Lithuania. Mammals' (Prūsaitė 1988). Data on the tooth row length of this species were provided in three more publications (Mazheikyte 2000; Balčiauskienė *et al*. 2002, 2004).

Though many recent foreign publications deal with genetics of *A*. *agrarius,* as well as with phylogenetic relations in the genus *Apodemus* (Martin *et al*. 2000; Fillipucci *et al*. 2002; Velićković 2004; Hoofer *et al*. 2007), there are recent works on the morphometry of this species, too (Demeter & Laázár 1984; Vohralík *et al*. 2002; Kefeliošlu *et al*. 2003; Janžekovič & Kryštufek 2004; Vukićević-Radić *et al*. 2005; Velićković 2006).

The aim of this publication was to describe the growth dynamics of captive bred *A*. *agrarius* (morphological changes in body and skull, and sex-dependent differences).

Material and methods

The cranial growth of *A*. *agrarius* was investigated using captive bred individuals. Mice were grown at the Institute of Ecology (the former Institute of Zoology and Parasitology) in 1967–1975 under the supervision of S. Maldžiūnaitė. Two hundred and sixty six individuals (96 males, 170 females) aged from 16 to 1,233 days were kept in 60 × 120 cm terrariums with four 20 × 20 × 15 cm houses, 2 motion wheels and some refuges in each. Temperature was kept in the range of 10–26.5°C in summer and 9–20°C in winter. Food and water were provided *ad libitum*. The sample of skulls of young mice was collected by killing random specimens of the desired age and that of old mice from naturally dead animals. Skulls were prepared using the boiling procedure and mechanical hand cleaning.

Measurements of skull characters were taken under a binocular with a micrometric eyepiece with an accuracy of up to 0.1 mm. We measured the characters of the right set of skulls; the left set was measured only

in a few cases, when skulls were damaged. The following skull (eight mandibular and nine maxillary) characters of *A. agrarius* were used in our analysis (Lidicker & MacLean 1969; Niethammer & Krapp 1978; Balčiauskienė 2007a, b): total length of mandibula at *processus articularis*, excluding incisors; length of mandibula, excluding incisors; height of mandibula at, and including, the first molar; maximum height of mandibula, excluding coronoid process; coronoid height of mandibula; length of mandibular diastema; length of mandibular tooth row; length of molar M_1; length of *nasalia*; breadth of braincase measured in the widest part; zygomatic skull width; length of cranial (upper) diastema; zygomatic arc length; length of *foramen incisivum*; length of maxillary tooth row; length of molar M^1; incisor width across both upper incisors.

The length of the molar M^1 was measured from the side as coronar length. The lengths of mandibular and maxillary tooth rows were measured as the distance from the anterior edge of the alveolus of the first molar to the posterior edge of the alveolus of the third molar.

Out of 266 captive bred *A. agrarius* skulls, only 145 had intact coronoid height of the mandibula; the retention of other characters was better. Even 264 skulls had the intact height of the mandibula (at, and including, the first molar) also the length of the mandibular diastema and the length of the molar M_1.

A standard statistical approach (mean and standard error, range, Student's *t*-test for comparison of means and Spearman's correlation) was used (StatSoft 2004). To illustrate growth dynamics, smoothed line graphs were drawn using averaged character measurements for age groups arranged in decades (0–9, 10–19 days, etc.). It was previously found (Balčiauskienė 2007a) that box and whisker plots overcrowd the graph and make it less expressive.

Male-female differences in body weight and length were calculated in age groups every 100 days. Correlations between skull character measurements and body weight were calculated using individuals up to 500 days of age (maximum age of wild *A. agrarius*).

Results

The lifespan of captive bred *A. agrarius* was almost three and a half years; quite a big number of animals survived over two years (Table 1).

In general, irrespective of animal age, the body weight of *A. agrarius* from our sample was 31.9 ± 0.6 g (8.75–57.4 g), while body length was 94.1 ± 0.6 mm (62.6–118.0 mm). The average body weight of *A. agrarius* males was 34.4 ± 1.0 g (8.75–57.4 g), that of females 30.6 ± 0.7 g (8.9–53.5 g), the difference being highly significant (*t*-test, $p < 0.002$). The average body length of *A. agrarius* males was 97.3 ± 0.8 mm (63.2–112.4 mm), that of females 92.3 ± 0.7 mm (62.6–118.0 mm), with the difference significant at $p < 0.001$. In most age periods, males were heavier and larger than females (Table 1), though this difference was not always significant. The highest differences in body weight were found both in the youngest and the oldest animals.

We found that the growth of the body weight and length of captive *A. agrarius* had a form of an arc-shaped

Table 1. Body weight and length of males and females in captive bred *A. agrarius* and the significance of male-female differences (M–F).

Lifespan, days	N (%)	Body weight, g			Body length, mm		
		Males	Females	M–F, *p*	Males	Females	M–F, *p*
<100	40 (15.04)	20.7 ± 2.1	16.4 ± 0.9	<0.03	85.0 ± 3.0	76.8 ± 1.5	<0.01
100–199	26 (9.77)	30.0 ± 1.8	29.6 ± 1.7	NS	95.5 ± 1.1	94.0 ± 1.8	NS
200–299	49 (18.42)	33.2 ± 1.4	29.9 ± 1.1	NS	97.8 ± 1.1	92.4 ± 0.9	<0.001
300–399	27 (10.15)	35.9 ± 1.7	35.4 ± 1.7	NS	100.2 ± 1.5	96.4 ± 0.9	NS
400–499	16 (6.02)	43.2 ± 4.4	37.1 ± 2.8	NS	101.5 ± 2.4	96.8 ± 2.1	NS
500–599	14 (5.26)	39.8 ± 2.5	43.9 ± 4.9	NS	101.4 ± 2.0	100.3 ± 0.8	NS
600–699	32 (12.03)	42.0 ± 2.5	38.4 ± 1.4	NS	103.7 ± 1.4	97.7 ± 1.3	<0.01
700–799	18 (6.77)	42.9 ± 2.2	36.3 ± 1.7	NS	103.1 ± 1.4	98.3 ± 1.8	NS
800–899	6 (2.26)	45.2	31.0 ± 2.1	NS	100.0	100.7 ± 4.3	NS
900–999	5 (1.88)	44.7	26.8 ± 4.7	NS	105.0	92.5 ± 0.9	<0.01
1,000–1,099	15 (5.64)	36.2 ± 2.4	28.7 ± 1.4	<0.01	96.8 ± 2.2	92.0 ± 1.1	<0.05
1,100–1,199	16 (6.01)	35.5 ± 1.5	29.9 ± 1.6	<0.02	97.3 ± 2.1	89.8 ± 2.1	<0.03
>1,200	2 (0.75)	–	16.1 ± 3.0	–	–	89.8 ± 0.9	–

curve. Both parameters continued to grow until 1.5–1.7 years of age, then the average size of older animals became smaller (Fig. 1), with more pronounced fluctuations present in the oldest age period. Fluctuations were also present in the growth curve of skull characters.

The average values of the measured skull characters are given in Table 2. Most of the measurements were not sex-dependent, but seven characters were larger in males, e.g., the coronoid height of the mandibula, length of *nasalia*, breadth of the braincase measured in the widest part, zygomatic skull width, length of the cranial (upper) diastema, length of the maxillary tooth row and the length of the molar M^1.

The growth curves of skull characters may be attributed to several patterns. The first group includes characters which continue to grow throughout the life of the animal, though growth intensity is higher in the young age: the length of the cranial (upper) diastema, length of the mandibular diastema, length of *nasalia*, zygomatic arc length and zygomatic skull width (Fig. 2A). The second group includes skull characters, the growth of which stabilises after a shorter or longer initial phase that lasts about six months (coronoid height of the mandibula, length of the maxillary tooth row and breadth of the braincase measured in the widest part) or even a year (length of the molar M^1, Fig. 2B). The growth of mandibular tooth row length was fully inhibited and character values may even became smaller (Fig. 2C). The growth of the other investigated characters seems to be subjected to unpredictable fluctuations (e.g., the length of the mandibula excluding incisors, Fig. 3).

Increase in body weight in captive bred *A. agrarius* was strongly correlated with increase in body length. In the total sample, the correlation coefficient was $r = 0.80$ ($p < 0.001$); among the animals up to 500 days of age it was even higher ($r = 0.85$, $p < 0.001$). A non-

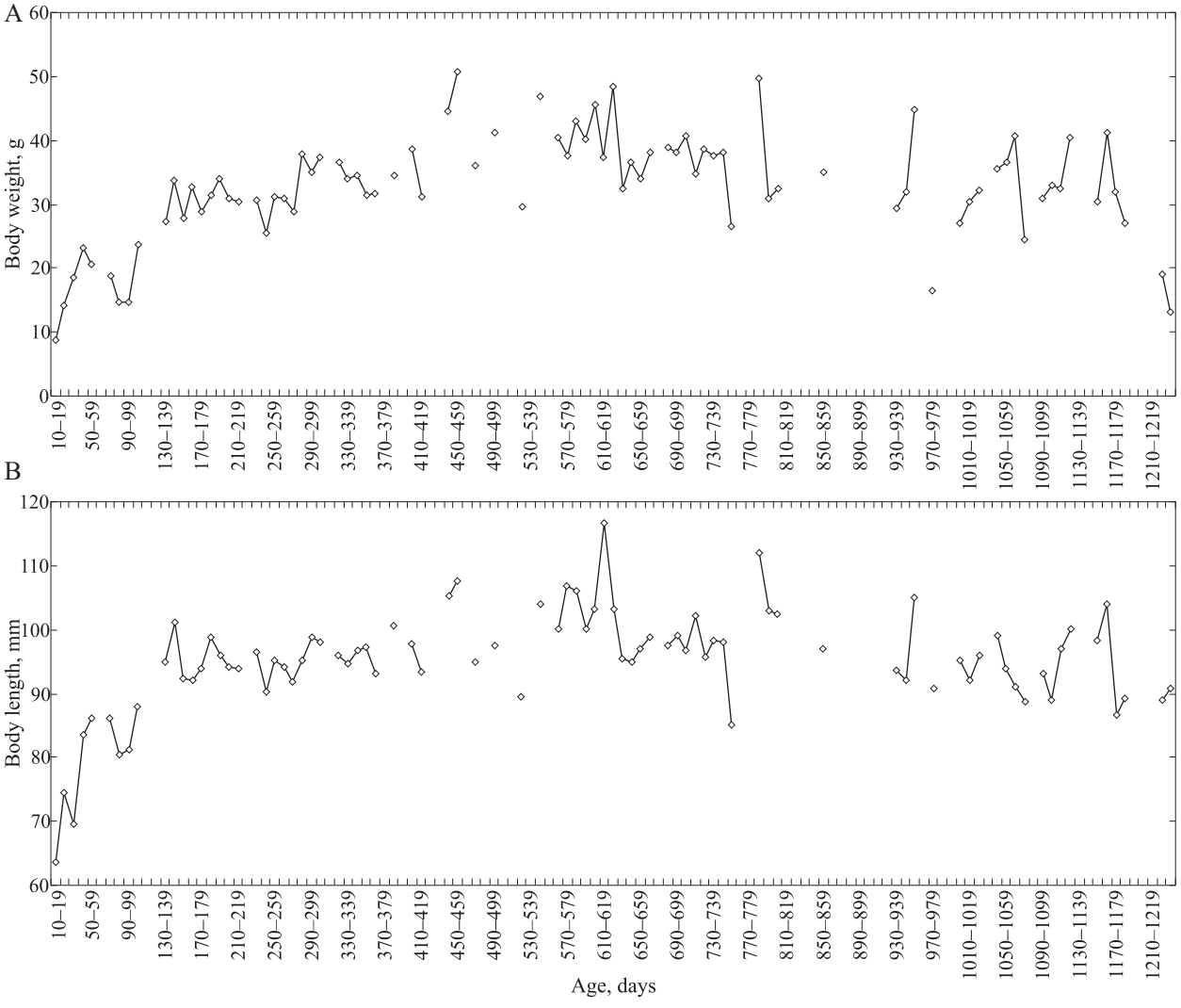

Figure 1. Dynamics of body weight (A) and body length (B) in captive bred *A. agrarius*.

Table 2. Average values (in mm) of mandibular and maxillary characters in captive *A. agrarius* and the significance of male-female differences (M–F).

	Total			Males		Females		M–F, *p*
	N	Avg±SE	Min–max	Avg±SE	Min–max	Avg±SE	Min–max	
X_1	262	10.70 ± 0.03	9.1–12.4	10.77 ± 0.05	9.2–12.0	10.65 ± 0.04	9.1–12.4	NS
X_2	226	10.01 ± 0.03	8.3–11.7	10.11 ± 0.06	8.6–11.6	9.97 ± 0.04	8.3–11.7	NS
X_3	264	3.66 ± 0.02	2.7–4.3	3.66 ± 0.03	2.7–4.2	3.66 ± 0.02	2.8–4.3	NS
X_4	246	5.29 ± 0.02	3.8–6.0	5.33 ± 0.04	4.0–6.0	5.27 ± 0.03	3.8–6.0	NS
X_5	145	5.53 ± 0.03	4.0–6.3	5.62 ± 0.05	4.0–6.2	5.47 ± 0.04	4.4–6.3	<0.03
X_6	264	3.52 ± 0.01	2.8–4.0	3.53 ± 0.02	2.8–4.0	3.51 ± 0.02	2.8–4.0	NS
X_7	260	3.27 ± 0.00	3.0–3.6	3.28 ± 0.01	3.1–3.6	3.26 ± 0.01	3.0–3.6	NS
X_8	264	1.34 ± 0.00	1.2–1.6	1.34 ± 0.01	1.2–1.5	1.34 ± 0.00	1.2–1.6	NS
X^9	227	8.12 ± 0.03	6.2–9.2	8.26 ± 0.05	7.4–9.1	8.05 ± 0.04	6.2–9.2	<0.003
X^{10}	261	10.22 ± 0.02	9.3–11.0	10.29 ± 0.03	9.5–11.0	10.17 ± 0.02	9.3–11.0	<0.001
X^{11}	237	11.04 ± 0.05	8.3–12.6	11.19 ± 0.08	8.7–12.6	10.95 ± 0.06	8.3–12.4	<0.02
X^{12}	263	6.31 ± 0.03	4.5–7.4	6.41 ± 0.04	4.8–7.1	6.26 ± 0.03	4.5–7.4	<0.01
X^{13}	258	6.92 ± 0.03	5.5–7.9	6.96 ± 0.04	5.5–7.8	6.89 ± 0.03	5.5–7.9	NS
X^{14}	246	4.24 ± 0.02	3.2–4.8	4.27 ± 0.03	3.3–4.7	4.22 ± 0.02	3.2–4.8	NS
X^{15}	259	3.67 ± 0.01	3.3–4.0	3.69 ± 0.01	3.3–4.0	3.66 ± 0.01	3.4–3.9	<0.05
X^{16}	263	1.39 ± 0.00	1.2–1.6	1.40 ± 0.01	1.2–1.6	1.38 ± 0.01	1.2–1.6	<0.03
X^{17}	259	1.74 ± 0.01	1.4–1.8	1.74 ± 0.01	1.4–1.8	1.74 ± 0.01	1.4–1.8	NS

Note: X_1 – total length of mandibula at processus articularis, excluding incisors; X_2 – length of mandibula, excluding incisors; X_3 – height of mandibula at, and including, the first molar; X_4 – maximum height of mandibula, excluding coronoid process; X_5 – coronoid height of mandibula; X_6 – length of mandibular diastema; X_7 – length of mandibular tooth row; X_8 – length of molar M_1; X^9 – length of nasalia; X^{10} – breadth of braincase measured in the widest part; X^{11} – zygomatic skull width; X^{12} – length of cranial (upper) diastema; X^{13} – zygomatic arc length; X^{14} – length of foramen incisivum; X^{15} – length of maxillary tooth row; X^{16} – length of molar M^1; X^{17} – incisor width across both upper incisors

linear dependence (Fig. 4) shows that the response of body length to increase in body weight is stronger at the beginning of the lifespan.

As more than 70% of body length increase depends on body weight, we calculated correlations between skull characters and body weight (Table 3). The sample size for each age group was the same as shown in Table 1, but due to the loss of separate characters it may be smaller. The strongest correlations were found between skull characters and body weight in young *A. agrarius* up to 100 days of age; later these correlations became weaker (Table 3).

Among skull characters significantly related to body weight until at least 300 days of age were: the coronoid height of the mandibula, length of the mandibula (excluding incisors) and zygomatic skull width.

Some of the investigated mandibular skull characters – the total length of the mandibula at *processus articularis* (excluding incisors), length of the mandibula (excluding incisors), the maximum height of the mandibula (excluding the coronoid process) and maxillary skull characters – the breadth of the braincase measured in the widest part, zygomatic skull width and incisor width across both upper incisors were significantly correlated with body weight until 200 days of age. Later these correlations became less pronounced (Table 3). Two skull characters, the length of the cranial (upper) diastema and zygomatic arc length, were correlated with body weight in the first age group and then in the third group, but correlation was not found in the second age group.

Four skull characters, the length of the mandibular tooth row, length of the molar M_1, length of *foramen incisivum* and the length of the molar M^1 were not related to body weight independently of animal age (Table 3).

Discussion

Haitlinger (1962) pointed out that the lifespan of *A. agrarius* is not longer than 1.5 years in the wild, but the animals live much longer in laboratory conditions

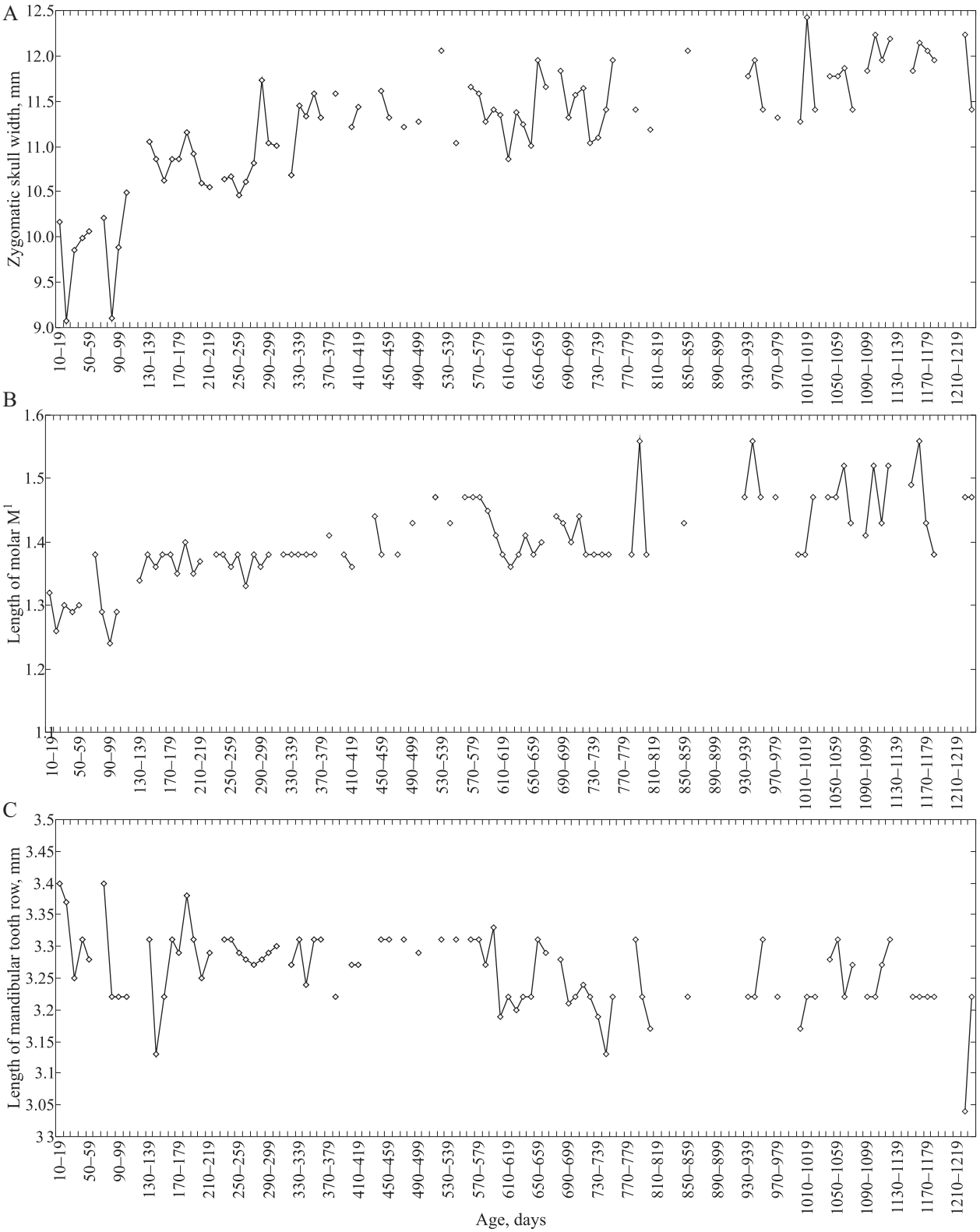

Figure 2. Dynamics of zygomatic skull width (A), length of the molar M^1 (B) and length of the mandibular tooth row (C) in captive bred *A. agrarius*.

due to completely different possibilities of living. In our sample, about 50% of animals lived over 400 days, 35% over 600 days and 16% over 800 days. The maximum body weight in the sample of captive

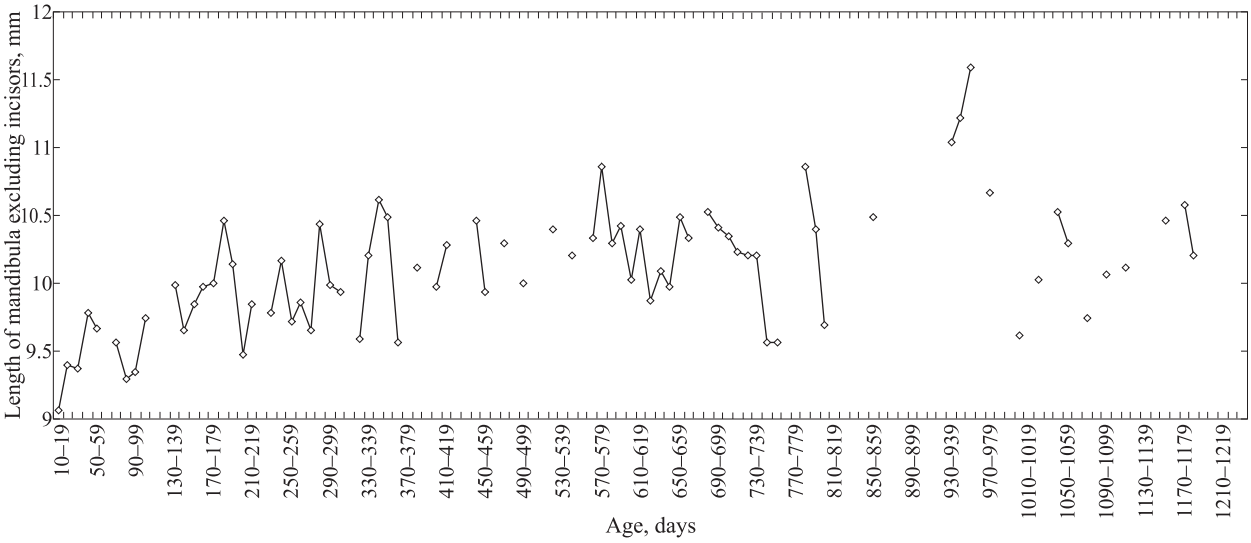

Figure 3. Dynamics of the length of the mandibula (excluding incisors) in captive bred *A. agrarius*.

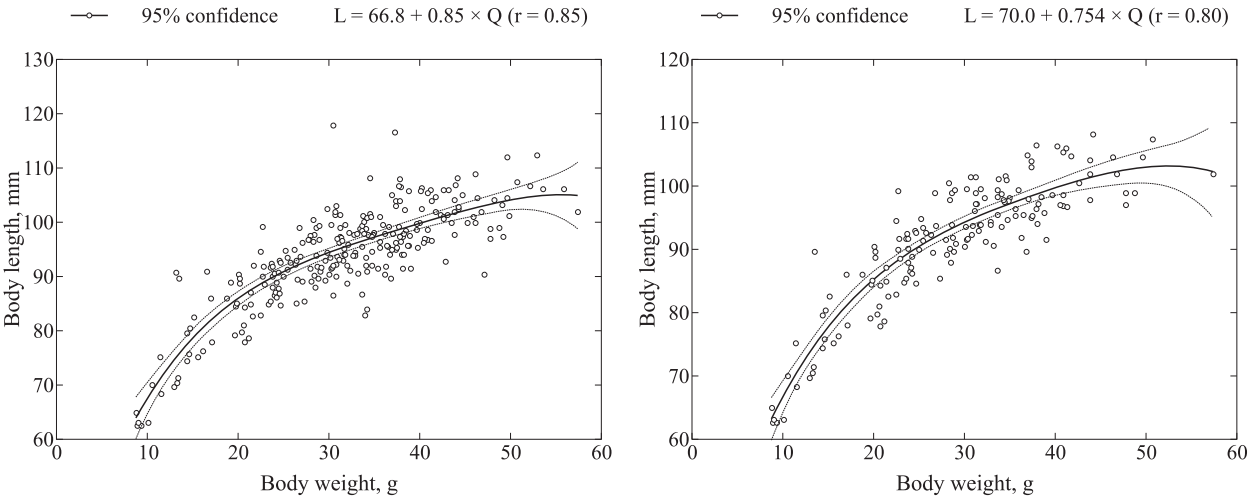

Figure 4. Correlation between body weight and body length in captive bred *A. agrarius* (A – total sample, B – animal age up to 500 days).

bred *A. agrarius* was much over the values found by Adamczewska-Andrzejewska (1973) in the field trapped animals from Poland, Warsaw. For males, she reported the average body weight of 22.12 ± 0.22 g (8.0–36.5 g), body length 86.74 ± 0.34 mm (63.0–114.0 mm); for females the respective values were smaller –18.28 ± 0.28 g (7.0–36.0 g) and 80.73 ± 0.43 mm (58.0–103.0 mm). According to Haitlinger (1962), the average body weight of field trapped *A. agrarius* from southwestern Poland, Wroclaw, was 17.8 g (11.6–27.2 g) at the age of 5 to 10 months and 22.7 g (17.7–29.8 g) at the age over 10 months. The body length values were 90.4 mm (71.6–105.0 mm) and 100.9 mm (81.3–109.6 mm), respectively. The body measurements of *A. agrarius* trapped in Lithuania are in accordance with the above samples: body weight in males was 27.0 g (18.8–37.1 g), body length was 96.4 mm (86.3–114.0 mm), while in females the measurements were 29.1 g (18.5–39.0 g) and 97.6 mm (86.4–107.2 mm), respectively (Prūsaitė 1988).

Captive bred *A. agrarius* from our sample definitely reached higher body weight and length values. The respective differences were highly reliable (*t*-test, $p < 0.001$; recalculated after Adamczewska-Andrzejewska 1973). It was also shown that field specimens in the short-tailed vole (*Microtus agrestis*) are smaller than the captive ones of the same age (Gebczyńska 1964). It is possible that in natural conditions particular body weight is optimal for survival in unfavourable conditions, as it was found in the bank vole (*Clethrionomys glareolus*) (Zejda 1971). We may also suspect that, as the growth in small rodents does not

Table 3. Correlations of mandibular and maxillary characters with body weight in captive bred *A. agrarius* (age up to 500 days).

Skull character	Age, days					
	<100	100–199	200–299	300–399	400–499	0–499
X_1	0.59***	0.62***	0.28	0.22	-0.19	0.54***
X_2	0.64***	0.64***	0.37*	0.16	-0.02	0.56***
X_3	0.54***	0.43*	0.36*	0.09	0.39	0.71***
X_4	0.49**	0.50**	0.27	0.24	0.39	0.72***
X_5	0.75***	0.56*	0.43*	0.26	0.53	0.74***
X_6	0.38*	0.41*	0.42**	0.05	0.06	0.65***
X_7	-0.12	0.05	0.12	0.25	0.18	-0.03
X_8	0.02	0.18	0.20	-0.20	-0.05	0.12
X^9	0.45**	0.24	-0.11	0.07	0.59*	0.61***
X^{10}	0.50***	0.43**	0.31*	-0.03	0.12	0.39***
X^{11}	0.53***	0.57**	0.42**	-0.06	0.25	0.71***
X^{12}	0.50***	0.25	0.49***	0.04	0.12	0.70***
X^{13}	0.37*	0.31	0.44**	0.06	0.26	0.57***
X^{14}	0.23	0.23	0.06	0.27	0.26	0.51***
X^{15}	0.44**	0.41*	0.13	0.23	0.55*	0.53***
X^{16}	0.14	0.26	0.13	0.13	0.09	0.52***
X^{17}	0.34*	0.49**	-0.01	0.47*	0.18	0.59***

*Note: significant correlations are indicated by * – $p < 0.05$, ** – $p < 0.01$, *** – $p < 0.001$; $X_1 – X^{17}$ as in Table 2*

stop, a longer lifespan in captivity results in higher body weight, though some individuals may stop growing in early age independently of how good their environmental conditions are (Lidicker & MacLean 1969).

According to Haitlinger (1962), sexual dimorphism in *A. agrarius* is weakly expressed, appearing mostly in body length and very slightly in body weight or some elements of the skull. In this Haitlinger's data contradict the reports of the later publications. In the Warsaw sample (Adamczewska-Andrzejewska 1973), sexual dimorphism in body weight and length was highly pronounced – in both cases male-female differences were statistically reliable (*t*-test, $p < 0.001$). In 121 field trapped *A. agrarius* from various places in Lithuania, sexual dimorphism was not pronounced: the average body weight in males was 18.98 ± 0.45 g, and in females 18.17 ± 0.67 g, the average body length was 83.16 ± 0.99 and 81.69 ± 1.20 mm, respectively (Balčiauskienė *et al*. 2004). In captive bred *A. agrarius* from our sample, males were heavier and larger than females in most age groups. The highest differences in body weight were found both in the youngest and the oldest animals. Differences in body length were significant in a larger number of age groups. We have no explanation about females being heavier in 500–599 days of age, except that some of them were pregnant (in our opinion) or it was an artefact based on a small sample size (three females).

As the seven skull characters in captive bred *A. agrarius* were sex-dependent (males were larger), we tested if this is confirmed by other authors. We also checked if the skull of captive *A. agrarius* is larger than that in the field population.

On the matter of sexual dimorphism, tooth row length in field trapped *A. agrarius* from Lithuania was analysed and no differences were found (Balčiauskienė *et al.* 2004). It was indicated that tooth row length in *A. agrarius* is subjected to high geographical variability (Balčiauskienė *et al*. 2002, 2004).

In Serbia, among eight investigated skull characters of field trapped *A. agrarius* sexual dimorphism was weakly developed only in the upper diastema (Velićković 2006). The length of *foramen incisivum*, the lengths of both mandibular and maxillary tooth rows and diastemas were significantly larger than in our sample (*t*-test, all respectively $p < 0.001$). This study does not include data on animal body weight or length.

The oldest wild individuals in field trapped *A. agrarius* from Wroclaw (Haitlinger 1962) exceeded our sample in maximum values of length of *nasalia* (average – 8.7 mm, maximum – 9.56 mm) and zygomatic width (average – 12.05 mm, maximum – 12.79 mm), but the maximum values of the upper diastema were smaller (average – 6.61 mm, maximum – 7.11 mm). The average values of the upper diastema (average – 6.56 mm, range 5.4–7.9 mm for males, and 6.36 mm and 5.0–7.8 mm

for females, respectively) in the sample from Warsaw were higher than in captive bred animals from our sample ($p < 0.001$ and $p < 0.01$, respectively). Here, sexual dimorphism in the character is obvious ($p < 0.001$; recalculated after Adamczewska-Andrzejewska 1973). The averages of mandibular and maxillary tooth row lengths, significantly exceeding our sample, were reported from Germany (Niethammer & Krapp 1978). Thus, we have no clear answer, whether the differences in skull measurements in *A. agrarius* depend on geographical variability or were influenced by captivity.

It is known that in *M. agrestis* four cranial dimensions (condylobasal length, basal length, zygomatic width and the depth of the braincase) were larger in laboratory-grown individuals (Gebczyńska 1964). Though, some laboratory specimens in different *Microtus* species had measurements evidently smaller than averages for the given age groups (Gebczyńska 1964; Lidicker & MacLean 1969). This may be the inhibiting effect of laboratory conditions on the development and growth of animals.

Growth irregularities in field trapped *A. agrarius* with the largest fluctuations in body weight and length, as well as in the elements of the visceral skull, were pointed out by Haitlinger (1962). The process of growth of body length takes an irregular course as the age of the animal increases. It is inhibited in certain age periods and becomes more rapid in others. The author also showed that correlations of age were better with body weight than with body length and also in young specimens. Decrease in body weight in older specimens was described by Adamczewska-Andrzejewska (1973).

On captive bred *A. agrarius* we confirmed that the average body weight in the oldest animals was smaller than in the medium-aged specimens, i.e., growth curve was an arc-shaped. Also, correlations of skull character measurements and body weight were best in young specimens, and later they became insignificant. As captive mice lived much longer than the wild ones we restricted our calculations to the group of animals up to 500 days of age. Only three of the measured skull characters (length of *nasalia*, length of the maxillary tooth row and the coronoid height of the mandibula) were correlated with body weight in that age ($r > 0.50$). Many of the measured skull characters showed growth fluctuations of irregular character. Such fluctuations were also observed in wild populations (Haitlinger 1962).

The length of the mandibular tooth row of captive bred *A. agrarius* in our sample show that growth can be fully inhibited and character values may even become smaller. The same character was negatively related to body weight in shrews (Balčiauskas 2004).

Comparison of correlations of body weight with skull characters in captive bred *C. glareolus*, *M. arvalis* and *A. agrarius* indicates that in general correlations in mice were weaker than in voles with the exception of two mandibular measurements – the coronoid height of the mandibula and the length of the mandibular diastema (Fig. 5). The height of the mandibula (at, and including, the first molar), maximum height of the mandibula (excluding the coronoid process), zygomatic skull width and the length of the cranial (upper) diastema were highly correlated with body weight, yielding 50% or more dispersion in mice. The same skull characters were also significantly correlated with body weight in captive bred voles, though these correlations were not the best ones (Balčiauskienė 2007a, b).

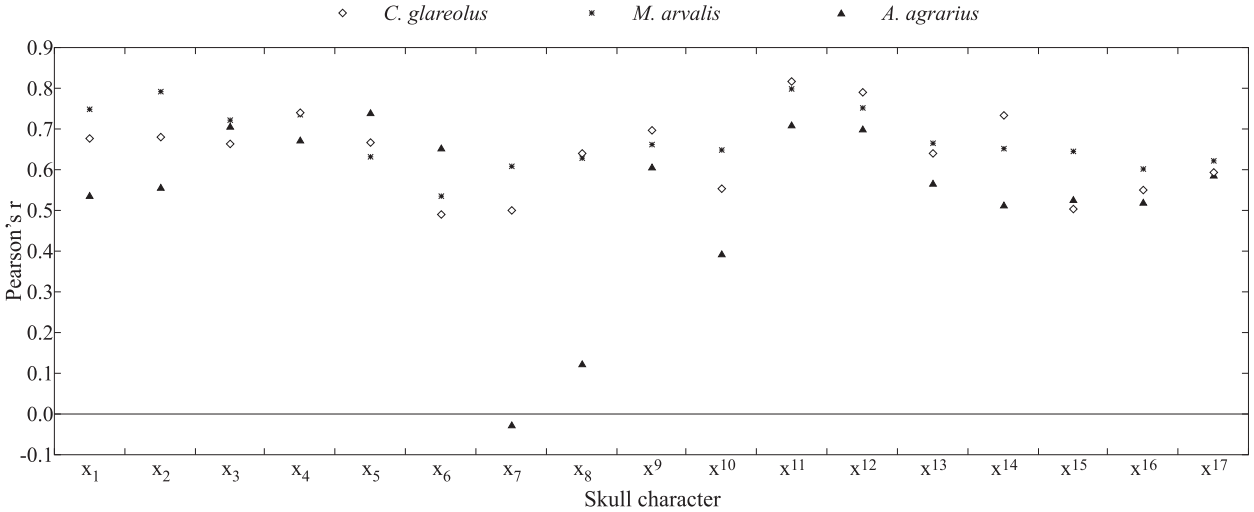

Figure 5. Correlations of body weight and skull characters in captive bred bank vole (*C. glareolus*), common vole (*M. arvalis*) (from Balčiauskienė 2007a, b) and *A. agrarius* (age up to 500 days). $X_1 – X^{17}$ as in Table 2.

Conclusions

Captive bred *A. agrarius* attained higher body weight and length than animals in wild populations, but their skulls were not larger.

The average body weight in the oldest animals of captive bred *A. agrarius* was smaller than in the medium-aged, i.e., growth curve was an arc-shaped.

The average body weight and length, and a number of skull characters (coronoid height of the mandibula, length of *nasalia*, breadth of the braincase measured in the widest part, zygomatic skull width, length of the cranial (upper) diastema, length of the maxillary tooth row and the length of the molar M^1) in captive *A. agrarius* were subjected to sexual dimorphism – males grew larger.

The length of the cranial (upper) diastema, length of the mandibular diastema, length of *nasalia*, zygomatic arc length and zygomatic skull width continued to grow throughout the life of *A. agrarius*, though growth intensity was higher in the young age. The measurements of the coronoid height of the mandibula, length of the maxillary tooth row and the breadth of the braincase measured in the widest part stabilised after about six months, the length of the molar M^1 in about a year. The growth of the length of the mandibular tooth row was fully inhibited and character values became smaller with age. The growth of the other characters measured was subjected to unpredictable fluctuations.

Correlations of skull character measurements with body weight in captive *A. agrarius* were best in young specimens. The height of the mandibula (at, and including, the first molar), the maximum height of the mandibula (excluding the coronoid process), zygomatic skull width and the length of the cranial (upper) diastema were highly correlated with body weight.

In general, correlations in captive bred mice were weaker than in captive voles with the exception of the coronoid height of the mandibula and the length of the mandibular diastema.

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Nelaisvėje laikomų dirvinių pelių (*Apodemus agrarius*) augimas

L. Balčiauskienė

Santrauka

Nelaisvėje 16–1233 dienas auginant 266 dirvines peles (*Apodemus agrarius*) nustatyta, kad jos užaugo didesnės ir sunkesnės, negu gamtoje sugaunamos pelės, tačiau jų kaukolės matmenys nebuvo didesni. Seniausių (2,5–3 metų) nelaisvėje užaugintų pelių svorio vidurkis buvo mažesnis nei vidutinio amžiaus (1,5–1,7 metų) pelių, t. y., augimo kreivė buvo lanko formos. Lytinis dimorfizmas buvo būdingas kūno svoriui, ilgiui ir kai kuriems kaukolės požymiams (patinai didesni už pateles). Viršutinio ir apatinio žandikaulių diastemos ilgiai, nosikaulių ilgis, skruosto lanko ilgis ir skruostų plotis visą laiką didėjo, tačiau jų augimas buvo intensyvesnis jauname amžiuje. Visiškai neaugo apatinio žandikaulio dantų eilės ilgis. Kaukolės matmenys su kūno svoriu geriausiai koreliavo jaunoms dirvinėms pelėms. Stipriausiai su kūno svoriu koreliavo *A*. *agrarius* apatinio žandikaulio aukštis, didžiausias apatinio žandikaulio aukštis be vainikinės ataugos, skruostų plotis ir viršutinio žandikaulio diastemos ilgis (determinacijos koeficientas siekė 50% ir daugiau). Kaukolės matmenų koreliacijos su kūno svoriu pelėms buvo silpnesnės negu nelaisvėje augintiems pelėnams, išskyrus žandikaulio aukštį ties vainikine atauga ir apatinio žandikaulio diastemos ilgį.

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