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BREEDING OF THE COMMON DORMOUSE (*Muscardinus avellanarius* L.) IN LITHUANIA

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Data on the breeding of *M. avellanarius* were gathered from two sites in Lithuania in 1981-1993 by regular checking of nestboxes and marking the dormice captured. During the study 374 breeding females were captured and 319 litters found. In Lithuania the breeding season occupies nearly the whole summer period, and adult females may have two litters per season. Mean litter size was 3.9 ± 0.1 juveniles ($n=319$) and it depends upon the age of females. The largest litters were detected in May, the smallest in July.

Key words: *Muscardinus avellanarius*, breeding, Lithuania

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Podaci o razmnožavanju *M. avellanarius* prikupljeni su s dva područja u Litvi u razdoblju 1981.-1993. redovitim pregledom kućica i markiranjem uhvaćenih životinja. Tijekom istraživanja uhvaćene su 374 gravidne ženke i pronađeno je 319 legla. U Litvi sezona razmnožavanja traje gotovo cijelo ljeto, a odrasle ženke mogu imati dva okota u sezoni. Srednja veličina legla bila je 3.9 ± 0.1 mladih ($n=319$) i ona ovisi o starosti ženke. Najveća legla zabilježena su u svibnju, a najmanja u srpnju.

Ključne riječi: *Muscardinus avellanarius*, razmnožavanje, Litva

INTRODUCTION

The breeding of the Common dormouse (*Muscardinus avellanarius* L.) is far from being fully elucidated over its whole distribution area, although fragmentary data may be found in a number of publications (KAHMAN & FRISCH, 1950; WACHTENDORF, 1951; SIDOROWICZ, 1959; PIELOWSKI & WASILEWSKI, 1960; LOZAN, 1970; SCHULZE, 1973; GAISLER et al., 1977; AIRAPETJANC, 1983; CATZEFLIS, 1984; MÖCKEL, 1988; SARA et al., 1996 etc.). However, the majority of authors present merely the

size of litter detected. So far, only LIKHACHEV (1966) has written a paper on the breeding of dormice (in the Moscow region).

The use of nestboxes assisting biological investigations of *M. avellanarius* in Lithuania (JUŠKAITIS, 1994, 1995 etc.) enabled the collection of considerable data on the breeding of these animals in two populations. The aim of the present paper is to present and analyze the data obtained.

MATERIALS AND METHODS

Data on the breeding of *M. avellanarius* were collected at site A (Šakiai district, southwest Lithuania) in 1981–1990 and at site B (Moletai district, east Lithuania) in 1984–1993 by regular checking of specially designed nestboxes and marking of dormice captured (JUŠKAITIS, 1994, 1995). All breeding females and litters found in nestboxes were examined. All pregnant females, females with litters, size of litters, sex ratio, weight, age and birth date of juveniles were recorded. The age of juveniles was defined according to the development of external features and body weight (LIKHACHEV, 1971; SLASTIONENKO, 1990).

During the study period 374 breeding females were found and 319 litters.

RESULTS

In Lithuania the breeding process of *M. avellanarius* (from mating to the independence of juveniles of the last litters) takes nearly the whole activity season. In different years the first breeding dormice can be found in nestboxes as early as the end of April or the beginning of May. First litters are usually detected in the first days of June, and in early springs – as early as in the second half of May. The earliest record in Lithuania was May 15, 1989.

In Lithuania we may distinguish two peaks in the birth of young: late May to June (38 % of all litters recorded) and August (44 %), see Fig. 1. In July, 9 % of litters were born, with a similar proportion in September (birth date of juveniles was defined for a total of 315 litters). In separate years breeding seasons of *M. avellanarius* slightly differed. Breeding started early in 1989 and 1990, when about one quarter of litters were born by the second half of May. An abnormally prolonged breeding period was registered in 1986, the year of the Chernobyl Nuclear Power Plant accident, when at site B fully one third of all litters detected throughout the season were born in September. The latest record of the birth of young in Lithuania was September 22, 1986.

In Lithuania adult females may produce two litters per year; the first in May–June, the second in August. The interval between the births of two litters is usually two months. Exceptionally, when one litter dies very early, dormice may produce three litters per year. During the study period there were registered 42 cases when

marked females had two litters in the same year (Table 1). However, it is difficult to determine the percent of females breeding twice a year as some litters were not found, being born in natural nests, not in the nestboxes. Cases when females carry or lead the juveniles from a natural nest to a nestbox and vice versa, or from one nestbox to another are not rare. Two litters can be produced in one year by both one-year-olds and older dormice (Table 2). But young one-year-old females which in May weigh only 10–14g appear to breed only once that year, in July or August.

Occasionally in August–September juveniles may be produced by females of 2.5–3 months of age (Table 1) and their numbers usually increase when population density is decreased. Such cases were more frequent at site B than at site A.

The number of juveniles in a litter varied from 1 to 7 (Fig. 2). Litters of 3–5 juveniles were most frequent (84 % of all litters detected). Mean size of the litter was 3.9 ± 0.1 juveniles ($n = 319$). The largest litters were born in May (4.4 ± 0.2 juveniles, $n = 30$) and the smallest in July (3.7 ± 0.2 juveniles, $n = 28$). In other months the mean was close to 3.9 juveniles. Mean litter size depends also upon the age of females: the older the female the larger the litter (Table 2). The first litters of marked females which had two litters contained approximately 3.5 ± 0.2 juveniles, while the second ones 4.3 ± 0.2 juveniles ($n = 28$). Between-year variations in the mean size of litters were insignificant (from 3.4 to 4.4 juveniles, Table 1).

The proportion of breeding adult females in separate years fluctuated from 24 % to 83 % and was inversely proportional to population density in spring. For exam-

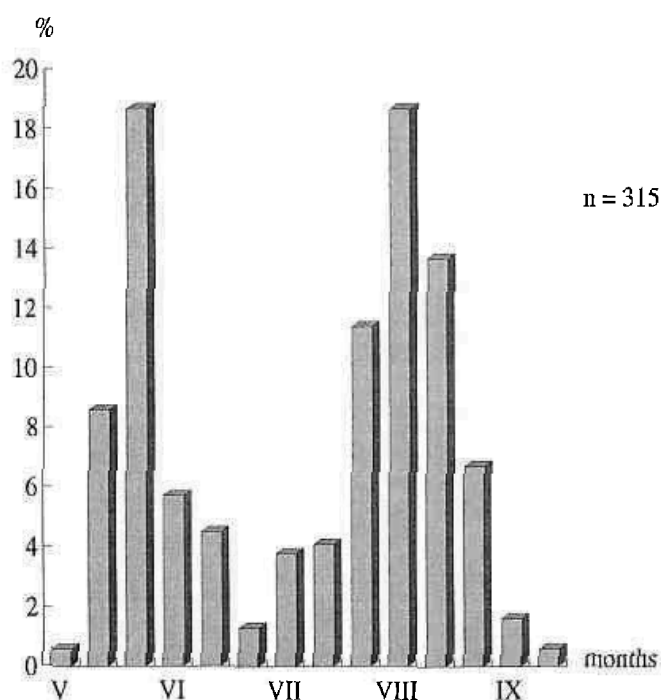


Fig. 1. Birth time of juveniles of *M. avellanarius* in Lithuania (Šakiai and Moletai districts, 1981–1992)

Table 1. Reproduction indices of *Muscardinus avellanarius* in two Lithuanian populations (1984–1992)

Reproduction indices	1984*	1985	1986	1987	1988	1989	1990	1991	1992	Mean number
Site A										
Number of ♀♀ ad caught	25	41	28	33	27	26	—	—	—	30
% of reproducing ♀♀ ad	68	24	46	58	70	65	—	—	—	55
Number of ♀♀ ad with two litters	?	2	3	5	7	4	—	—	—	4
Number of reproducing ♀♀ juv	—	—	2	—	3	3	—	—	—	1
Number of litters (born in V-VII/VIII-IX)	?/13	5/7	10/8	13/11	13/16	12/10	—	—	—	10/10
Average litter size	3.9	3.8	3.9	4.1	3.9	4.4	—	—	—	4.0
Site B										
Number of ♀♀ ad caught	20	45	32	23	23	30	35	25	23	28
% of reproducing ♀♀ ad	50	44	72	30	78	83	63	72	48	60
Number of ♀♀ ad with two litters	?	4	3	—	4	4	2	—	—	2
Number of reproducing ♀♀ juv	1	1	10	—	11	8	5	4	2	7
Number of litters (born in V-VII/VIII-IX)	?/8	10/15	13/23	4/3	11/21	17/20	15/14	14/8	8/5	12/14
Average litter size	3.5	3.9	3.9	3.4	3.8	3.9	4.1	3.7	4.4	3.8

* incomplete data from spring, 1984

ple, in 1985 at site A when population density in spring was 1.5 individuals per hectare, only 24 % of all females were breeding in nestboxes throughout the season. But when population density in spring was lower than 1 ind/ha, as many as 70–80 % of female were breeding in nestboxes. An exception was 1987 at site B, when population density in spring was low (0.6 ind/ha), only 30 % of females were found breeding in nestboxes. Mean size of the litters was also lowest.

Birth date of juveniles is an important breeding characteristic. Juveniles born in May – July and those born in August – September differ considerably in autumn by the amount of accumulated fat and their rate of survival during hibernation. A characteristic feature of *M. avellanarius* in Lithuania is that about half of juveniles

Table 2. Contribution of separate age groups of *M. avellanarius* females in the breeding process (sites A and B, 1985–1992)

Indices	Age of females				Total n
	one-year-old	two-year-old	3-4-year-old	born in the same year	
Age structure in spring, %	68	26	6	–	418
Breeding cases, %	53	25	7	15	308
Females with 2 litters, %	63	32	5	–	38
Mean size of the litter	3.9 ± 0.1	4.3 ± 0.1	4.3 ± 0.3	3.5 ± 0.2	–
Number of litters, n	136	65	14	41	–

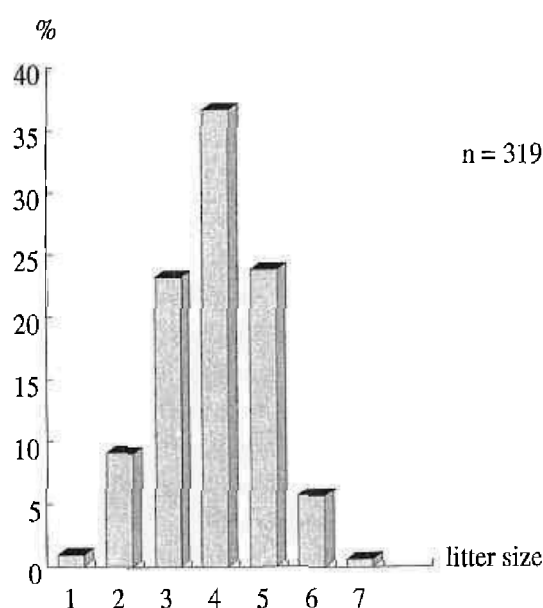


Fig. 2. Litter size of *M. avellanarius* in Lithuania (Šakiai and Moletai districts, 1980–1993)

are born in the first half of summer: 50 % at site A (n = 105) and 46 % at site B (n = 201) (Table 1).

Investigations of demographic structure of *M. avellanarius* populations (JUŠKAITIS, in press) established the contribution of separate age groups of females to the breeding success of populations (Table 2). The greatest contribution is of one-year-old females, due to the abundance of this age group in spring. However, only 53 % of all breeding cases (second litters included) involve 68 % of females, suggesting that some one-year-olds do not take part in the breeding process. The contribution made by older age groups (2- and 3-4-year olds) is proportional to the abundance of these groups.

There were 14 cases of dead litters registered (a total of 49 juveniles), accounting for 4.4 % of all litters detected in nestboxes. Seven of the dead litters had been born in September.

In different litters of *M. avellanarius* (n = 263) all possible sex ratios from 5: 0 to 0: 5 were recorded. Generally, the sex ratio in the offspring was close to 1: 1. The average proportion of males among the young at site A was 52.2 % (n = 387), and at site B – 50.7 % (n = 635), varying in different years from 45 % to 59 %. An exception was 1987 at site B when there was a low proportion of males among the young (18 %), associated with low population density (JUŠKAITIS, 1994).

DISCUSSION

In comparison with other rodents, the breeding potential of *M. avellanarius* is rather limited. Though the size of their litters may reach 9 juveniles, e. g. in Moldova (LOZAN, 1970), most frequently they consist of 3–6 juveniles, and mean litter size is close to 4. Mean litter size of *M. avellanarius* in Lithuania (3.9 juveniles) is intermediate between other parts of the species' distribution area, e. g. 2.9 and 3.6 juveniles in Poland (PIELOWSKI & WASILEWSKI, 1960; SIDOROWICZ, 1959) and 4.9 juveniles in Moldova (LOZAN, 1970), but it is lower compared with other northern parts of the distribution area, e. g. 4.3 juveniles in the Moscow region and 4.6 juveniles in the Tula region (LIKHACHEV, 1966). During the summer *M. avellanarius* may produce two litters, although only in a small proportion of females. In the Tula region second litters made up 28 % of all litters registered in nestboxes, in the Moscow region it was 10 % (LIKHACHEV, 1966) and in Lithuania, 20 % at site A and 9 % at site B. LOZAN (1970) suggested that in Moldova some females may also breed twice per summer, whereas in South Harz such cases are exceptional (SCHULZE, 1973), and in the Alps no records of females breeding twice in a year were obtained (KAHMAN & FRISCH, 1950; WACHTENDORF, 1951).

In Lithuania we observed two distinct peaks in the birth period of juveniles: June and August. In other parts of the distribution area the peaks are less distinct (e. g. Tula region) or there is only one peak (e. g. Moscow region and South Harz; LIKHACHEV, 1966; SCHULZE, 1973).

According to the literature, *M. avellanarius* become sexually mature after hibernation. In the Tula and Moscow regions (LIKHACHEV, 1966) as well as in Switzerland (CATZEFLIS, 1984) single cases were recorded of females breeding in the same year as they were born. In Moldova such cases were not observed (LOZAN, 1970). In Lithuania the breeding of dormice born in the same year is a rather frequent occurrence, especially at site B. LIKHACHEV (1966) suggested that such a phenomenon can be observed only in the years with very good feeding conditions. To our mind, it associates with population density: the females born in the same year join the breeding process when population density is decreased. However, the importance of the feeding factor cannot be neglected.

As already mentioned, the best data so far on *M. avellanarius* breeding have been obtained in the Moscow region (LIKHACHEV, 1966). Comparison of the results obtained there and in Lithuania showed different breeding mechanisms of populations. In the Moscow region the breeding intensity of dormice was lower: approximately 38 % of all females were observed breeding, hence in autumn juveniles comprised only 31 % of the population. Whereas in Lithuania (sites A and B) approximately 55 % and 60 % of females, respectively, breed, and in autumn juveniles make up respectively about 69 % and 74 % of the population. In the Moscow region as many as 82 % of juveniles were born in May – July, whereas in Lithuania only 46–50 %. The juveniles that are born earlier are characterised by greater survival in winter, so eventually the age structure of the spring population of *M. avellanarius* in the Moscow region is very similar to that in Lithuania (JUŠKAITIS, 1994). The breeding process of *M. avellanarius* in the Tula region resembles that in Lithuania.

On the other hand differences, although less distinct, were also observed between the two Lithuanian populations. The breeding process at site A with higher and more stable population density (JUŠKAITIS, 1994) was less variable. Whereas site B was characterised by a greater number of breeding females born in the same year, by a less marked contribution of older dormice (2–4 years of age) to the breeding process, by a lower number of females with two litters and by the breeding season being more prolonged into the autumn.

It should be stressed that the percent of breeding females recorded both by LIKHACHEV (1966) and JUŠKAITIS (1994) is minimal due to the reason already mentioned, namely that some females breed in natural nests and are not found. Theoretical calculations based on autumnal population density, autumnal percent of juveniles in the population, mean litter size and actual number of breeding cases registered showed that about 70 % of all breeding cases occurred in nest boxes. In separate years this number fluctuated from 40–50 % to 90–100 %. Notwithstanding that, there was a direct relationship between the percent of breeding females recorded in nest-boxes and proportion of juveniles in the autumnal population (JUŠKAITIS, 1994).

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SUMMARY

**Breeding of the common dormouse
(*Muscardinus avellanarius* L.) in Lithuania**

R. Juškaitis

Data on the breeding of *M. avellanarius* were gathered from two sites in Lithuania (Šakiai and Moletai districts) in 1981–1993 by regular checking of nestboxes and

marking the dormice captured. During the study 374 breeding females were captured and 319 litters found. In Lithuania the breeding season occupies nearly the whole summer period. The first breeding dormice were detected in late April. The birth date of 315 litters was determined, with the earliest being May 15, 1989 and latest September 22, 1986. Two clear birth peaks were distinguished: end-May-June (38 % of all litters) and August (44 %). Early breeding was recorded in 1989 and 1990 when about 25 % of all litters were born by the second half of May. Abnormally prolonged breeding was registered in 1986 at one site. In Lithuania adult females may have two litters per season: the first in May – June, the second in August. Second litters formed 9–20 % of all litters found in nestboxes. All figures are minimal as a proportion of litters were not found, being born in natural nests not in nestboxes. In some years, young can be produced in August – September by females of 2.5–3 months age, this may be related to population density. Litter size varied from 1 to 7, 84 % of litters comprising 3–5 juveniles. Mean litter size was 3.9 ± 0.1 juveniles ($n=319$). The largest litters were detected in May, the smallest in July. Mean size of the litters depends upon the age of females.

SAŽETAK

Razmnožavanje puha orašara (*Muscardinus avellanarius* L.) u Litvi

R. Juškaitis

Podaci o razmnožavanju *M. avellanarius* prikupljeni su s dva područja u Litvi (okrug Šakiai i Moletai) u razdoblju 1981.–1993. redovitim pregledom kućica i markiranjem uhvaćenih životinja. Tijekom istraživanja uhvaćene su 374 gravidne ženke i pronađeno je 319 legla. U Litvi sezona razmnožavanja traje gotovo cijelo ljeto. Početak razmnožavanja zabilježen je kasno u travnju. Određeno je vrijeme okota za 315 legla, najranije 15. svibnja 1989., a najkasnije 22. rujna 1986. Jasno su se mogla razlučiti dva »vrha« (peak) u vremenu okota: kraj svibnja-lipanj (38% svih legla) i kolovoz (44%). Rana legla zabilježena su 1989. i 1990. kad se oko 25% svih legla okotilo do druge polovice svibnja. Abnormalno prolongirano razmnožavanje zabilježeno je 1986. na jednom lokalitetu. U Litvi odrasle ženke mogu imati dva okota u sezoni: prvi u svibnju – lipnju, drugi u kolovozu. Drugi okot činio je 9–20% svih legla nađenih u kućicama. Dio legla nije nađen, jer je do okota došlo u prirodnim gnijezdima a ne u kućicama. U nekim godinama mlade može u kolovozu – rujnu okotiti ženka stara 2.5–3 mjeseca, što bi moglo biti u vezi s gustoćom populacije. Veličina legla varirala je od 1 do 7, 84% legla koja su sadržavala 3–5 mladih. Srednja veličina legla bila je 3.9 ± 0.1 mladih ($n=319$). Najveća legla zabilježena su u svibnju, a najmanja u srpnju. Srednja veličina legla ovisi o starosti ženke.