

WEIGHTS OF SUBURBAN RACCOONS IN SOUTHWESTERN OHIO¹

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Abstract. Raccoons (*Procyon lotor*) were collected during a 2 year study in the suburban village of Glendale, Ohio. Weight records (250) were kept on 150 individuals. Non-juvenile males averaged 4.7 kg and females 4.1 kg. Ten juveniles averaged 3.4 kg in November. Mean summer-fall weight increase was 121% for 12 juveniles and 36% for 19-non-juveniles. Mean winter weight loss for 15 racoons was 16%. Male-female differences noted in the pattern of seasonal weight fluctuation were attributed to the events of the annual reproductive cycle. Records for 18 males and 5 females showed that heavier individuals reached sexual maturity at an earlier age. A comparison of data from this study with similar data from other areas of the eastern U.S. suggests a positive correlation of average weight with latitude and a negative correlation with population density.

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In preparation for an extensive winter lethargy period, raccoons in the north-eastern U.S. are known to accumulate a large surplus of subcutaneous fat during summer and autumn months. When regular feeding is resumed in spring, little remains of this fat layer and raccoons are at their yearly weight minimum. This seasonal pattern of weight fluctuation has been documented by Stuewer (1943) in southwestern Michigan and by Mech *et al* (1968) in eastcentral Minnesota. Except for the work of Johnson (1970) in Alabama, there is little detailed information on the weights of raccoon populations farther south. The present study concerns weight data gathered during a 2 year (1973-75) field study of a high-density raccoon population in the suburban village of Glendale in southwestern Ohio.

METHODS AND MATERIALS

Raccoons were captured with the #3 Havahart Live Trap and brought to the laboratory for examination and weighing. They were released the following day at the original site of capture. Ear-tags and toe-clipping methods were used to mark individuals. Traps were placed at semi-permanent locations coinciding with probable

raccoon den sites, travel routes, and feeding areas. During the period 18 March through 30 November 1974, traps were set an average of 19.4 nights/month accumulating 4,857 trap nights. Population density (raccoons/ha) was calculated by averaging estimates derived from 3 different methods as described by Hoffmann and Gottschang (1977).

With 15 April as the median birth date (Sagar 1956), raccoons were classified into juvenile (<1 year), yearling (1-2 years), and adult (>2 years) age categories. In general, males less than 3.9 kg or females less than 3.4 kg were classified as juveniles, males from 3.9-4.8 kg or females from 3.4-4.1 kg as yearlings, and males above 4.8 kg or females above 4.1 kg as adults. When body weight itself was not sufficient to classify these groups (a problem that was especially evident in the fall and winter) the following criteria were used: tooth measurements and wear (Grau *et al* 1970), extrusibility of the os penis (Sanderson 1961), externally measured length of the baculum (Sanderson 1950), size of testis (Sanderson and Nalbandov 1973) in males, and teat appearance in females (Sanderson and Nalbandov 1973). Non-juvenile defines animals of either yearling or adult status. Only one measurement per individual was used in calculations of mean monthly or seasonal weights. Student's *t*-test was used to determine the significance of difference between means. Summer-fall weight gain was calculated using the lightest spring-early summer weight and the heaviest late summer-fall weight for an individual. Winter weight loss was calculated using the heaviest fall and lightest late winter-spring weight.

The 234 ha study area in Glendale, Ohio has been described by Hoffmann and Gottschang (1977). The average yearly length of

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the freeze-free period in this region is 198 days, with the average date of the last spring occurrence of 0 °C temperatures being 10 April and the average date of the first occurrence in the fall on 25 October. Total annual precipitation averages 102 cm, 49 cm of which is snowfall (Local Climatological Data 1975).

RESULTS

Two-hundred and fifty weight records for 150 individual raccoons were collected. Non-juvenile males (58) ranged in weight from 3.5 to 6.7 kg and averaged 4.7 ± 0.1 (SE) kg. Females (81) ranged from 2.2 to 6.2 kg and averaged 4.1 ± 0.1 kg.

Juveniles born in April gained weight at an average rate of approximately 0.5 kg/month until November, at which time they averaged 3.4 kg. The heaviest autumn juvenile weight was obtained on 31 October 1973 for a male weighing 4.5 kg. In 49 days (since previous capture) this young animal gained approximately 35 g/day and had increased his body weight by 62%. The heaviest juvenile female weighed 4.2 kg on 4 November 1974. By November, spring-born juveniles were similar to yearlings in body weight, but these 2 groups were significantly ($P < 0.05$) lighter than adults (see fig. 1).

Non-juveniles showed a variable but steady weight gain in the spring, summer and fall periods. Adult raccoon weights were found to be maximum in the fall and minimum in the winter or spring (fig. 2). The greatest rate of weight gain in this study was recorded for an adult male who gained 1.0 kg in 18 days in October, an average of 56 g/day.

Differences between juvenile and non-juvenile summer-fall weight increase were significant ($P < 0.05$) with juveniles show-

ing a 121% weight increase and non-juveniles a 36% increase (table 1). There was no significant sex difference in summer-fall weight increase. The mean winter weight loss for 15 raccoons (in all sex and age groups) was 16% and the mean g/day lost was 5.2 (table 1). No significant differences due to sex or age were found.

Body weight was found to be related to sexual maturity. Extrusibility of males (i.e., os penis in immobilized animal can be manually exposed) indicates a physical ability to breed. During the months of April-June, weights of 5 extrusible yearling males were significantly heavier ($P < 0.05$) than 13 non-extrusible individuals. Yearling males generally attained a weight of 4.0 kg or more before becoming extrusible. Five females, first captured as small juveniles in the summer of 1973, were subsequently captured during and after the 1974 January-February breeding season. Only one of these females reared young in 1974. This female weighed 3.7 kg when captured and examined during the 1974 breeding season. The other 4 females averaged 2.5 kg (2.2-2.9 kg).

DISCUSSION

In the northeastern U.S. the average weight of an adult raccoon seldom exceeds 8.0 kg (Seton 1929, Stuewer 1943, Whitney and Underwood 1952). Juveniles in November average 4.5 kg (Hamilton 1936, Stuewer 1943). Average adult weight (4.9 kg) and average juvenile November weight (3.4 kg) were much lower in Glendale. This may be attributed to the effects of latitude and possibly population density.

TABLE 1
Summer-fall weight gain and winter weight loss for raccoons live-trapped in the village of Glendale, southwestern Ohio, 1973-75.

Age-sex	Summer-fall weight gain			Winter weight loss		
	(N)*	g gained/day	% gain	(N)*	g lost/day	% loss
Adult ♂	1	29.9	13.1	2	6.6	16.4
Yearling ♂	5	9.1	37.9	1	1.7	10.7
Juvenile ♂	8	22.4	104.3	3	2.2	7.3
Adult ♀	6	6.7	21.5	4	6.4	20.6
Yearling ♀	7	12.8	54.5	3	5.5	10.1
Juvenile ♀	4	18.4	153.0	2	7.2	29.4

* (N) number of individuals studied.

There apparently is a relationship between weight and latitude for raccoons. For example, in Alabama (latitude 32°N), Johnson (1970) reported weights of 4.3 kg for 227 adult males and 3.6 kg for 174 adult females. In central Illinois (latitude 38°N), Sanderson (1951) found 172 males to average 6.6 kg and 112 females 6.3 kg. My study area at Glendale (38°N) is similar in latitude to Sanderson's study site, although adult raccoon body weights were much lower (see fig. 1). In southwest Michigan (latitude 43°N), Stuewer (1943) reported weights of 6.1 kg for 47 adult males and 5.2 kg for 40 adult females.

Although disease was not detected in

Glendale and food did not seem to be limited, raccoon social pressure was undoubtedly high. A density of 1 raccoon/1.5 ha was estimated in 1973-74; one of the highest densities published to date. The structure of the urban Glendale environment was a factor which further ameliorated social interactions. Large groupings were noted at favored denning sites and feeding areas. For example, a total of 10 different raccoons were captured in the upper level of a garage located about 60 m from the central village business district. Eight different raccoons were captured on the roof of a church where young raccoons were annually born and raised.

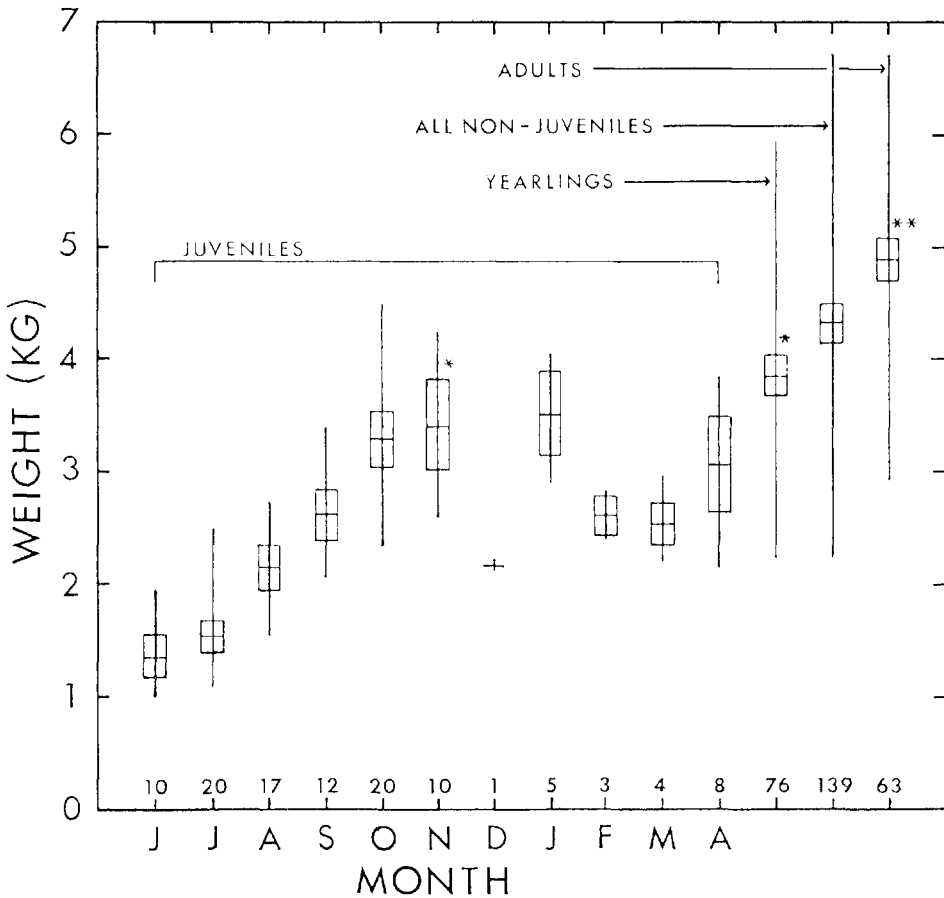


FIGURE 1. Mean monthly weights for juveniles and mean annual weights of yearlings, non-juveniles, and adults. Numbers above the horizontal axis represent sample size (horizontal lines=means, open bars=95% confidence intervals, vertical lines=ranges). In October and November, juveniles (*) were similar to yearlings (*) in body weight, but these two groups were significantly lighter than adults (**).

The seasonal weight pattern in Glendale, Ohio, Michigan (Stuewer 1943, fig. 18), and Alabama (Johnson 1970, fig. 19), differ in the rate of summer-fall weight increase. Adult raccoons in Glendale, experiencing a milder winter, show less of a weight gain throughout the summer and fall and consequently less of a weight loss over the winter than those in Michigan (fig. 2). The seasonal weight pattern of raccoons in Alabama showed little gain in this warmer and more constant climate.

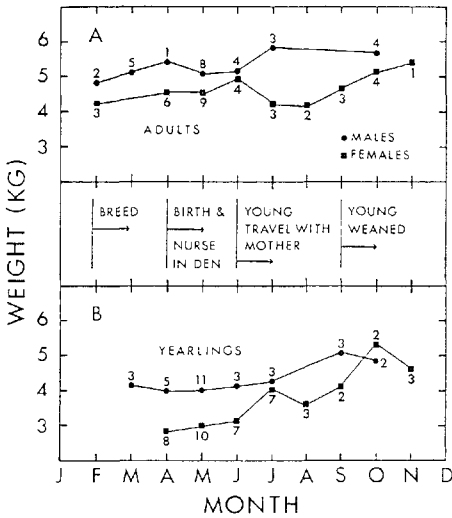


FIG. 2. Mean monthly weight variation for adult (A) and yearling (B) raccoons from Glendale, southwestern Ohio, 1973-75. Number above circles and squares represent sample sizes. Schedule of reproductive events according to Hoffmann (1976).

The close approximation of male-female weights during the spring and early summer may be attributed to the onset of the annual reproductive cycle. Specifically, adult male aggression and breeding activities during this period may cause weight loss or a delay of weight gain. For immature yearling males in Glendale, a much steadier weight progression was recorded in the spring and early summer (fig. 2b). The winter weight loss of 16% was much less than in 2 populations studied farther north. In Minnesota, Mech *et al* (1968) found that non-juveniles commonly lost as much as 50% of their weight over the winter period. In Michigan, a 50% weight loss was also reported (Stuewer 1943).

In general, adult females do not gain weight as rapidly as adult males during the summer because of nursing and caring for young. Since young are weaned by late August and early September (Hoffmann 1976), the adult male-female weight difference decreases in the fall.

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