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## Some Observations on the Habits of the Thirteen-Lined Ground Squirrels, *Citellus Tridecemlineatus Tridecemlineatus* (Mitchill) of Iowa

Gow M. Bush  
*State University of Iowa*

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SOME OBSERVATIONS ON THE HABITS OF THE  
THIRTEEN-LINED GROUND SQUIRRELS, *CITEL-  
LUS TRIDECEMPLINEATUS TRIDECEMPLINEATUS*,  
(MITCHILL) OF IOWA

Gow M. BUSH

A number of thirteen-lined ground squirrels, *Citellus tridecemlineatus tridecemlineatus*, Mitchill were collected from September through November at the Golf Course of the State University of Iowa. Their habits were observed both in the field and in the laboratory, and recorded. It is hoped that these data will not only be of interest but will supplement some of the information already available.

Since the discovery of this species which was formerly described as *Sciurus tridecemplineatus*, by Dr. S. L. Mitchill (1821), the animal has been dealt with in random spurts, but recently it has been given comparatively more attention. These investigations have had quite varied interest, the majority of which, however, were in taxonomy and experimental work. Further attention has been given to food habits and control measures, the latter prompted by the suspicion cast upon the animal as a pest in agriculture. Generally the bibliographies refer to ground squirrels indiscriminately, but the attempt here has been to embody references to the thirteen-lined ground squirrel only. The geographical distribution of this species is shown in fig. 1.

Some of the common names by which this animal is known are listed; "Pocket Pin" (probably given the animal because of the erect position it assumes when alarmed), Striped Gopher, Striped Spermophile (from the Greek meaning "seed-loving"), Banded Spermophile, striped Prairie Squirrel, Prairie Spermophile, Federation Ground Squirrel (from the correlation between the number of stripes and the thirteen lines of the American flag, (S. F. Baird, 1859), Striped Ground Squirrel and Thirteen-lined Ground Squirrel. There are probably several other colloquial terms of which the writer is unaware.

The diagnostic characters of the Thirteen-lined Ground Squirrel (fig 2) are described by Howell.<sup>15</sup> It is typically a diurnal rodent being most active between 10:00 A.M. and 1:00 P.M. on moderately warm bright days. This period of activity appears to be altered

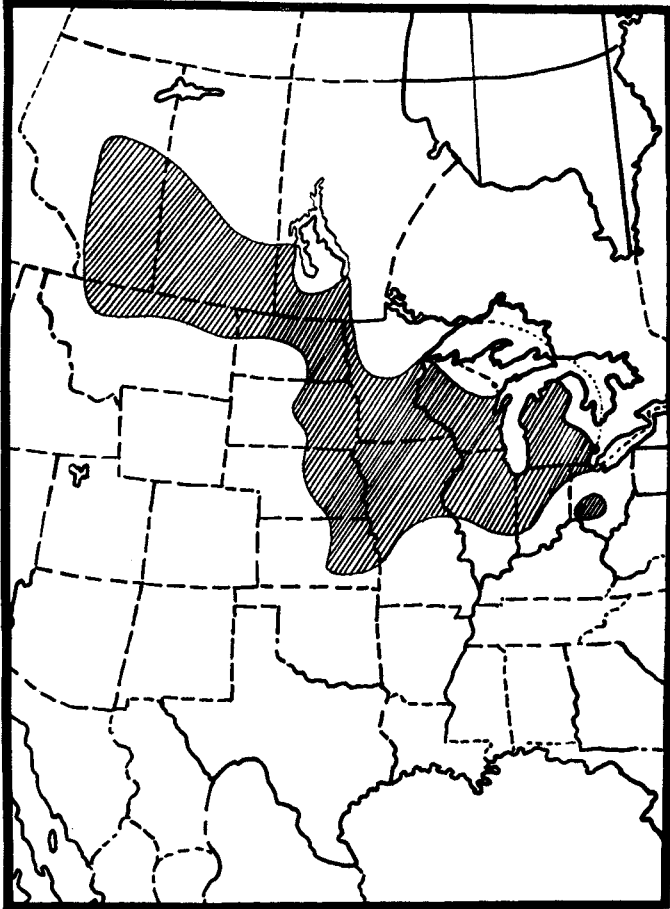


Fig. 1. A Map showing the Geographical Distribution of *Citellus tridecemlineatus tridecemlineatus*, (Mitchill.) (Modified after Howell).

by weather conditions; the number of animals normally seen on the surface are greatly reduced with the advent of cold weather, and only a few of these venture out in the mildest part of the day. The late onset of winter (1938) and the accompanying extended activities of the animals compared with a wide range of hibernation dates, reported by Burnette,<sup>6</sup> Johnson,<sup>18</sup> Wade,<sup>23</sup> and Goslin<sup>13</sup> confirm the importance of temperature changes as a factor influencing the date of hibernation. Johnson<sup>18</sup> described among other things his observation, that the Spermophile does not have a fixed "normal" temperature and that records of over seventy temperature readings taken on ten different individuals range from 33 C to 40.7 C.

The males are larger, more energetic and are more commonly seen than the females. The latter factor may account for the predominance of males captured, the ratio being as great as 5:1. Measurements show that the average length for the males is about 281 mm. while that of the females is about 261 mm.

Only a few observations were made on the burrows since de-

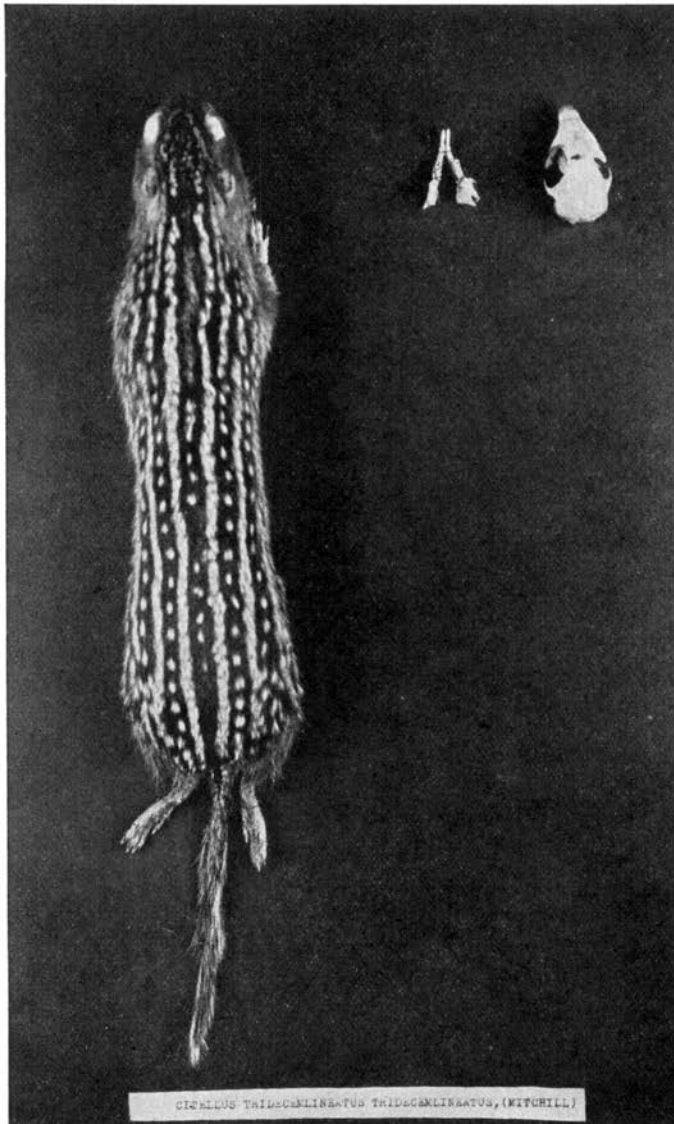


Fig. 2. A Study Skin and Skull of the Thirteen-lined Ground Squirrel. ♂

tailed accounts of this subject are already available. A comparison was made between the distribution on the Golf Course and that in the adjoining fields, the ratio was found to be approximately 5:2. That there is a preference for short grass is indicated by this observation, but considerable numbers were found in high grass, shrubbery and weeds. Frequent presence of people on the Golf Course is an additional disturbing factor to the animals, who construct these tunnels in adjoining fields as accessory places of refuge should the burrows on the course be unattainable. When set upon the animals not only exhibit an incredible speed, but on occasion have been seen to climb in order to escape the approaching enemy. Seen from a distance the escaping animals appear to be suddenly swallowed up by the earth, as they dive into their burrows. The burrows which have a diameter of 4-5 inches are camouflaged only by the surrounding grasses and can be readily seen, except at a distance. As Fitzpatrick<sup>9</sup> has noted, it is curious that such conspicuous burrows should predominate when it seems so obvious that the shrubbery and weeds would provide much more concealment and protection. Usually the burrows into which the animals retreat have only one entrance. This fact was established while collecting, for only three of the entire number of animals escaped by a second burrow opening. The method of collecting consists of flooding the suspected burrow, and seizing the animal by the nape of the neck as it emerges. Certain differences in the nature of the burrows were revealed, as it was necessary to use varying amounts of water to flood out the animals. Some burrows were readily flooded by less than one bucket, while others required greater amounts of water. This is probably due to such factors as differences in kind, porous condition, and depth of the soil.

It has been reported by Johnson<sup>18</sup> that in winter, the thirteen-lined ground squirrel closes up its burrow and this plug may extend for considerable distance into the burrow.

The animal assumes an erect posture when startled (fig. 3), and maintains it until too closely approached, when it scurries quickly to its burrow. Under these conditions if food is being stored in the cheek pouches, it is immediately ejected. From the shelter of its burrow it protrudes its head at intervals until it is safe to venture out. It was noted that the sound which usually accompanies excitement, and which Bailey describes as "a rapid bird-like trill or trembling whistle, a long drawn-out chur-r-r-r-r in a high key," is often heard under other conditions, and it is here suggested that it may have less function as a warning signal than is commonly

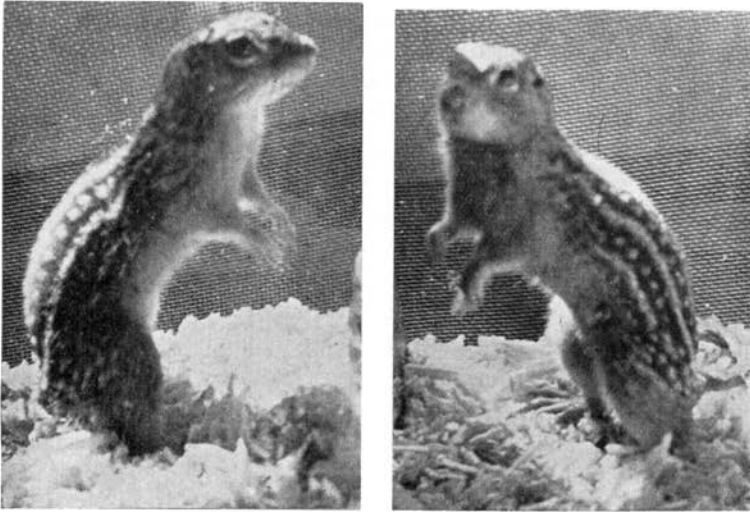


Fig. 3. The characteristic attitude assumed by the animal when startled. (2 views.)

supposed. In the laboratory such factors as lack of food or water, or even quarters that are too confined or other uncomfortable conditions frequently cause the animal to give forth its trill. It is further suggested that this characteristic note may be as much a defensive feature in startling or frightening an advancing enemy, or an alarm signal, as much as one of warning. Signs of resentment and anger are often expressed by low guttural growls. Fewer voice sounds are heard in the laboratory than in the field. In the alarmed state, nervous, jerky movements of the body and tail are seen and the hairs of the latter are spread.

Contrary to the observations of Fitzpatrick,<sup>9</sup> it was found that not only are they pugnacious, but under certain conditions, cannibalistic as well. While being carried from the field to the laboratory in portable cages, the males constantly fought among themselves. The victims of these savage attacks were not only killed and mangled, but some were partially eaten. The attacks appear to be made in the neck and abdominal regions. Cannibalism was noted on three occasions, but after having been separated and transferred to laboratory cages, this tendency soon disappeared. Since food was withheld for some time and no ill results followed, it was concluded that cannibalism is not a hunger factor, but probably is brought on by extended periods of congestion and excitement.

Nocturnal activity is not infrequently seen in animals in captivity. Usually this consists principally in trying to gnaw out of

their cages. To study how the animals could eat through the wire enclosure, a light screen box was used. The ground squirrel was seen to support itself by the claws inserted in the meshes of the wire, then to grasp the strand with the teeth and violently tug again and again until the strand broke. Another method used was to grasp the strands with the teeth and claws, and then to pull with the entire body until each strand in turn was broken, the animal dropping to the floor of the enclosure each time, as the wire snapped. Contrary to what might be expected, the animal did not make one concerted effort to break through. Instead, the gnawing and pulling was repeated at intervals extending over as much as three days, until a hole large enough to effect escape had been made. When transferred to a stronger cage, though persistent attempts were made, escape was ineffective. When together in a cage, the animals exhibit a strong tendency to huddle, especially to sleep, contrary to the idea commonly held about the behavior of these in the field. The apparent change in behavior may be due to the fact that the warmth normally provided by the burrow is no longer available. Even when given burrowing facilities in the laboratory, the animals tended to crowd into two or three burrows instead of seeking individual ones. When isolated, the ground squirrel seeks a corner of the cage and spends the major portion of its time sleeping. At this time the animal may be observed in many postures and the conditions under which these are assumed noted. The most typical of these occurs when the animal curls up, tucking its nose between its hind legs (fig. 4). They become ac-

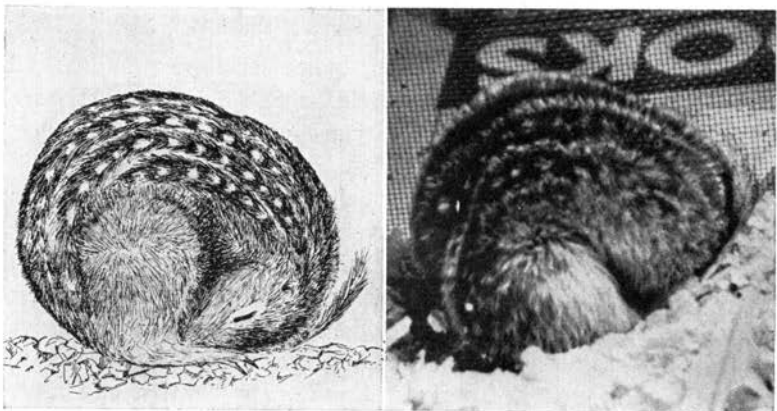


Fig. 4. The position of the Thirteen-lined ground Squirrel when asleep.  
A. Drawing to show how the body is supported by the dorsal part of the head in front and the hind legs behind.  
B. Photograph.

customed to most noises of the laboratory, though particularly responsive and fearful of objects which come in contact with the cage. That most noises do not bother them is evidenced by their sound sleep.

Special studies were made on the burrowing procedure in both the field and laboratory. However, problems arose which prevented accurate or complete observations in the field. The process here described was observed in the laboratory. Two boxes were constructed, whose dimensions were  $2\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$  ft., and these were provided with screen sides. Into the first sand was put to a depth of about one foot. Burrowing started almost immediately. Each step in the process could be easily noted due to the nature of the medium, and the persistent efforts of the animal to dig the tunnel. Another box was filled with moist clay and soil and allowed to harden sufficiently, so that digging would be difficult and the repeated efforts required would permit accurate and detailed observations. The act is typically that of a scraping progression. Both hind feet are placed sufficiently far apart to lend adequate support to the body for the active task of digging with the forelimbs. The manus of each is curved medio-caudally in a gouging or scratching manner. These are now alternately brought down hard on the soil in rapid succession. The rhythm is occasionally broken as the animal shifts its body, to one side and then the other in order to pack the wall of the burrow more firmly. In the sand the animal can also be seen to retreat and dive into the potential hole, coming up again some distance farther on, much like a porpoise in the sea. The head is brought up in such a manner as to suggest its use in packing the roof of the burrow, when made in a firmer medium such as the clay and soil provided in the other case. The dirt is thrown back under the belly, and as it accumulates, the hind legs are alternately brought forward and the soil is thinly scattered by powerful backward kicks. This part of the burrowing act accounts for the absence of dirt about a burrow.

#### SUMMARY

1. The period of greatest activity is between 10:00 A.M. and 1:00 P.M. on moderately warm, bright days.
2. The males are larger, more energetic, and are seen more frequently than are the females.
3. Lower temperatures tend to reduce activity; higher temperatures tend to increase it.
4. High grass areas harbor fewer burrows than low grass areas.
5. The animal characteristically assumes an erect posture, when



- startled, and the hairs of its tail may be seen to spread broadly out.
6. It is suggested that the trill commonly associated with excitement may have less significance as warning signal than has been commonly supposed. It may be other than this an alarm or defense response.
  7. The animals are pugnacious, and that cannibalism, when exhibited, is not due to lack of food, but probably results from congested conditions or unusual excitement.
  8. The conditions of the laboratory may be conducive to nocturnal habits, as well as a greater tendency towards gregariousness.
  9. Studies made on the burrowing activities disclose the following sequence of events: (1) alternate digging strokes in a scraping manner by the forelimbs in rapid succession throw dirt beneath the body, (2) removal of accumulated dirt by strong backward kicks of the hind legs, and (3) smoothing of the burrow is accomplished by lateral-forward wriggling thrusts for the sides, upward and forward thrusts of the head inside the burrow (for the roof), and the act of digging itself for the floor.

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DEPARTMENT OF ZOOLOGY,  
STATE UNIVERSITY OF IOWA,  
IOWA CITY, IOWA.