The Prairie Naturalist

Great Plains Natural Science Society

12-2010

SUMMER ACTIVITY PATTERN AND HOME RANGE OF NORTHERN POCKET GOPHERS IN AN ALFALFA FIELD

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The Prairie Naturalist 42(3/4):142–144; 2010

SUMMER ACTIVITY PATTERN AND HOME RANGE OF NORTHERN POCKET GOPHERS IN AN ALFALFA FIELD—Allocation of time for feeding, resting and reproduction in subterranean animals is difficult to determine. Although pocket gophers (*Thomomys* spp.) are among the most widely studied subterranean rodents, there are conflicting reports on activity measurement in these animals. Activity studies have included opening gopher burrows (Tryon 1947), laboratory studies of activity (Vaughan and Hansen 1961), telemetry studies (Anderson and McMahon 1981, Bandoli 1987, and Cameron et al. 1988), and subcutaneously implanted radioactive gold wires (Gettinger 1984). The diversity of techniques reflects the difficulty of generalizing results from different species of pocket gophers in natural and artificial environments. Patton and Brylski (1987) considered alfalfa fields to be food rich environments based on crop density and food availability; therefore, pocket gophers in an alfalfa field should exhibit decreased activity periods because of a reduced search time for food and smaller home range size. Our objective was to measure daily activity patterns of pocket gophers in a food rich environment.

We conducted our study from May 20, 2005 through July 30, 2005 in an irrigated alfalfa field on the Carnahan Ranches, approximately 9.5 km north of the town of Elbert in Elbert County, Colorado. The project followed ASM guidelines (Gannon et al. 2007) and was approved by the Institutional Animal Care and Use Committee at the University of Colorado at Colorado Springs (Approval Number UCCS-04-001).

We live-trapped 6 northern pocket gophers (*Thomomys talpoides*; 2 males and 4 females) in an irrigated alfalfa field May 20 and 21, 2005. All animals were trapped from separate burrow systems that did not overlap other burrow systems. Because of transmitter size, we selected only animals weighing more than 115 g (mean weight 141.6 g, range 119–169 g), and released 1 animal that weighed less than 115 g; the transmitter weighed 3.9 g and no transmitter exceeded 3.3% of the animal's body mass. While in captivity, animals were housed in cages under local environmental light and temperature conditions and food and water were provided *ad libitum*. On May 24 the transmitters (Advanced Telemetry Systems, Isanti, MN, USA) were implanted in the peritoneal cavity of each animal by a veterinarian at Briargate Veterinary Clinic, Colorado Springs, Colorado with isoflurane as an anesthetic. In case of transmitter failure, a passive integrated transponder (PIT) was implanted subcutaneously for future identification. On May 27 each gopher was released back into the burrow where it had been captured. Wilks (1963) and Proulx et al. (1995) stated that empty burrows were quickly occupied by neighboring animals; however, during our study no vacated burrow was inhabited by another gopher.

Underground animal movement was monitored using a receiver and a hand-held three element yagi antenna. The animal was considered to be active when it left the nest. Periods of observation were designed to include every hour of a 24-hr day. We obtained at least 72 hr of observation on each animal. We randomly selected each animal to monitor for 3 to 12 hr. We approached each burrow system very quietly to minimize disturbance. When the animal stopped moving a surveyor's flag was planted at that location based on radio signal strength. We determined the location of each animal's nest (e.g., sleeping area) within the burrow by long periods of inactivity. We marked the location by driving a wooden stake into the ground at that site. If the animal emerged above ground, the investigator remained motionless. It was not unusual to watch the gopher harvest plants (e.g., alfalfa, grasses, *Equisetum*) within reach of the burrow entrance and as far as one meter away from the burrow.

We calculated a minimum convex polygon home range for each animal. Based on the small sizes of the individual home ranges, we used direct measurements taken in the field. We calculated home ranges by dividing the area into triangles using the outermost flags as boundaries. We measured the compass direction and distance in meters from the nest stake for each outermost flag and calculated the area for each triangle. The minimum convex polygon home range represented the total area of all the triangles for each animal (Fig. 1).

Gophers were monitored for a total of 21,744 min (362.4 hr) with an average of 4,324 min (range = 2737–5756 min) per animal. Animals were considered to be active for an average of 703 min (range = 159–1319 min), or 16.2% of the total observation time. While the sample size is small and includes variation in the data, activity peaks occurred from 1400 to 1800 hr and 2400 to 0400 hr (Fig. 2), whereas a period of low activity extended from 0600 to 1000 hr with another possible low period from 2000 to 2200 hr. The average minimum convex polygon home range was 33.0 m^2, and ranged from 12.7 to 61.1 m^2. Female 335 and male 513 were the most active (1319 min or 19.6% and 1101 min or 22.4% of the time, respectively) and had the largest home ranges (61.1 and 45.9 m^2, respectively).

Tryon (1947) reported two intervals of peak activity for northern pocket gophers, one immediately after dawn and another in late afternoon, which he correlated with peak activities of non-fossorial rodents. Wilks (1963) reported the plains pocket gopher *(Geomys bursarius)* was most active in the morning in Texas. Gettinger (1984) noted that Botta's pocket gophers *(T. bottae)* in California exhibited peak times of activity between 1600 and 2200 hr. In our study, pocket gophers were active for an average of 16.2% of the time (range 5.6–22.4%), which is similar to *T. bottae* in New Mexico (Bandoli 1987) but less than reported in other studies: 28% and 34% of the time for plains pocket gophers in tall grass prairies (Benedix 1994) and Colorado (Vaughan and Hansen 1961), respectively; 36.3% for Botta's pocket gophers in California (Gettinger 1984), and 47.3% and 52% for northern pocket gophers in Alberta

(Proulx et al. 1995) and Utah (Anderson and MacMahon 1981), respectively. The lower activity periods we detected were likely due to the food-rich environment, which would reduce the search time for food and reduce the home range size. Turner et al. (1973) described home ranges averaging 185.8 m^2 on Black Mesa, a short grass prairie habitat. In studies of *T. bottae*, Gettinger (1984) described an average home range of 107 m^2 in the James San Jacinto Mountain Reserve, California and Bandoli (1987) reported average home ranges of 286.4 m^2 for females and 474.7 m^2 for males in the Pajarito Land Grant, New Mexico. The largest home range (female 335; 61.1 m^2) was located at the edge of the alfalfa field and contained a higher percentage of non-alfalfa plants. This lower density of alfalfa plants was likely responsible for the larger home range. Further, the lower activity periods we detected were the result of reduced search time and home range size.

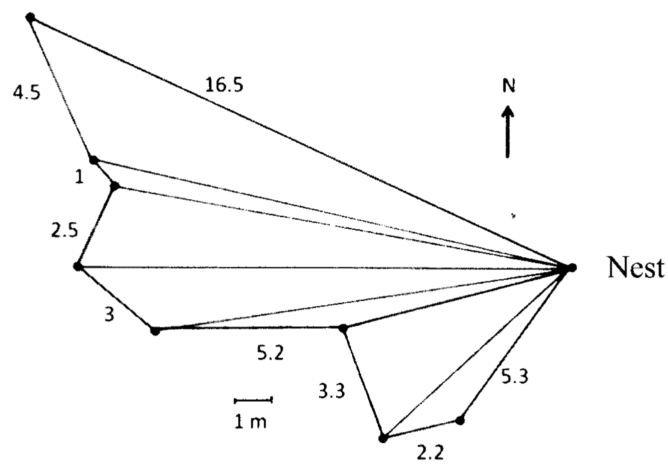

Figure 1. Minimum convex polygon home range of 61.1 m^2 for animal 335. The polygon is the sum of the areas of multiple triangles using the nest as the primary reference point and the outermost points of animal activity.

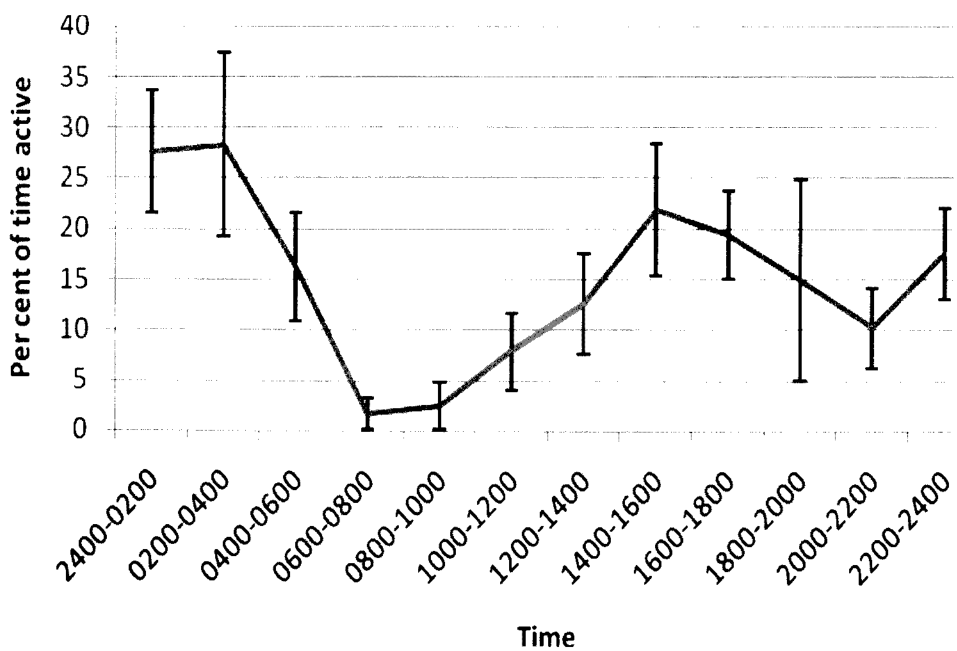

Figure 2. Mean activity pattern for five *Thomomys talpoides* in an alfalfa field in Elbert, Colorado, May–July 2005. Bars indicate standard error.

Financial support was provided by the Biology Department, University of Colorado at Colorado Springs. We thank C. Carnahan of Elbert, Colorado, for permission to work on the Carnahan Ranches and J. Tillman and C. Bowers who assisted with the field work. We also thank two anonymous reviewers for their comments on the manuscript.—*Jon C. Pigage[1] and Helen K. Pigage[2]; [1]Biology Department, University of Colorado at Colorado Springs, 1420 Austin Bluffs Parkway, Colorado Springs, CO 80918, USA; [2]HQ USAFA/DFB, 2355 Faculty Drive, Suite 2P389, USAF Academy, CO 80840-6226, USA; Corresponding author email address: jpigage@uccs.edu.*

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Submitted 13 April 2010. Accepted 29 September 2010. Associate Editor was Christopher S. DePerno.