

# Observations of Nocturnal Hunting Behaviour of American Badgers, *Taxidea taxus*, in Southwestern Saskatchewan

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This study describes the nocturnal hunting behaviour of American Badgers (*Taxidea taxus*) in areas inhabited by Richardson's Ground Squirrels (*Urocitellus richardsonii*) in southwestern Saskatchewan. Adult American Badgers searched for prey by zigzagging through clusters of Richardson's Ground Squirrel burrows or by going back and forth between one enlarged Richardson's Ground Squirrel burrow and other adjacent burrows. American Badgers' movements were not random and they were oriented to encounter prey.

**Key Words:** American Badger, *Taxidea taxus*, behaviour, hunting, movements, Richardson's Ground Squirrel, *Urocitellus richardsonii*, *Spermophilus richardsonii*, Saskatchewan.

American Badgers (*Taxidea taxus*) are known for their ability to capture subterranean rodents (Lampe 1976; Murie 1992; Michener 2004). Regardless of season, the most common technique used by American Badgers is excavation (Michener 2004). American Badgers may dig several holes at a site (Lampe 1976; Michener 2004), and they will even plug tunnel openings to confine potential prey (Knopf and Balph 1969; Michener 2004).

Although American Badgers are known to prey on ground squirrels (*Urocitellus* spp.) (Yensen and Sherman 2003), little is known about their hunting movements. Murie (1992) found no obvious spatial pattern to the sequence in which American Badgers dug into the nest burrows of Columbian Ground Squirrels (*Urocitellus columbianus*). On the other hand, Lampe (1976) suggested that American Badgers deliberately dig many holes to intersect the burrows of Plains Pocket Gophers (*Geomys bursarius*).

During a research and control program on Richardson's Ground Squirrels (*Urocitellus richardsonii*) in southwestern Saskatchewan between 2008 and 2010, we found a few American Badgers residing in our study areas. This study describes the nocturnal hunting behaviour of American Badgers in areas inhabited by Richardson's Ground Squirrels.

## Study Area and Methods

The study was carried out near Hazenmore (49°41'N, 107°08'W), in southwestern Saskatchewan (Figure 1). This is an agricultural region located within the Brown soil zone characterized by warm temperatures, lack of moisture, and lack of organic matter. It encompassed mixed grasslands of Crested Wheatgrass (*Agropyron cristatum*), brome (*Bromus* spp.), Slender Wheatgrass (*Elymus trachycaulus*), alfalfa (*Medicago* spp.), and annual crops such as Wheat (*Triticum aestivum*) and Barley (*Hordeum vulgare*). During the last decade, pop-

ulations of Richardson's Ground Squirrels reached high densities (often exceeding 40 adults/ha in spring) (Proulx et al. 2010) due to an extensive drought (Liu et al. 2004).

We identified three adult American Badgers that regularly used grasslands and pastures within our study area. We used 12 × 42 binoculars and a 400 000 candle power search light (Golight, Inc., Culbertson, Nebraska) with a reach of ≤800 m to study American Badger hunting activities. We avoided disturbing the animals with spotlighting by staying >100 m away from them and avoiding centering the light beam on their eyes. We stayed in contact with moving animals by eye shine, and we avoided making loud sounds, walking, or moving the vehicle when an animal was under observation. During some spotlighting sessions, although American Badgers were obviously hunting, we could not see them well enough to describe their hunting movements, and we occasionally lost track of them.

We equipped two of these adult American Badgers with radio-transmitters. We captured an adult female American Badger on 29 September 2008 in a 36 × 36 × 92 cm wire mesh trap (model HD X-large, Duke Traps, West Point, Miss.), and we dorsally implanted a 25-g radio-transmitter with mortality mode, coiled whip antenna, and three-year battery life (model AI-2M, Hohil Systems Ltd., Carp, Ont.) (Proulx and MacKenzie 2012). The adult female American badger inhabited a pasture (31.4 ha)-annual crop (16.2 ha) complex. The pasture encompassed Crested Wheatgrass, brome, and buckbrush (*Ceanothus* spp.). It was bordered by Wheat on one side, and Yellow Mustard (*Sinapis alba*) on the other side.

We also captured an adult male American Badger with a snare pole on 17 May 2010, and we dorsally implanted a radio-transmitter with an antenna stretched subcutaneously along his back (Proulx and MacKenzie 2012). He inhabited a Crested Wheatgrass pasture (24

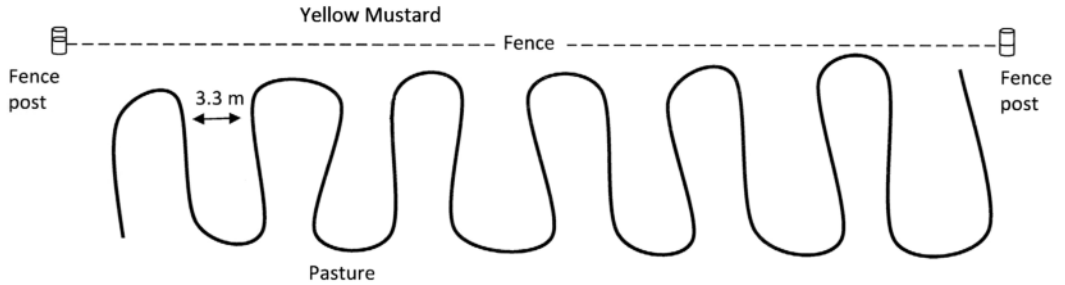


FIGURE 1. Zigzag hunting movements of the adult female American Badger (*Taxidea taxus*) equipped with the radio-transmitter.

ha)-annual crop (104 ha) complex. Crops consisted of Wheat (70%) and seeded alfalfa (30%).

The third adult American Badger was an adult female (she was seen with two kits in summer) without a radio-transmitter. We recognized her on the basis of its appearance, and recurring activities at specific locations within a 129 ha area consisting of summer fallow (12%), and annual crops of alfalfa (5%), Wheat (33%), and Crested Wheatgrass (50%).

We used spotlight observations and radio signals to identify hunting grounds (areas of intense hunting repeatedly used for several days) that we mapped on 1:5000 orthophotos (geometrically corrected aerial photographs; Geomatics Corp, Lethbridge, Alberta) using features such as fence posts, rock piles, and terrain characteristics. The day after each spotlighting session, we visited the areas where the animals had been observed in order to confirm specific locations where they had been active the night before and to record signs of digging. We marked the boundaries of the American Badgers' hunting grounds and determined the number of Richardson's Ground Squirrel burrow entrances/ha. Only entrances that were well opened and without collapsed dirt or vegetation growing in the entrance were counted (Schmutz and Hungle 1989; Finger et al. 2007\*).

## Results

### *Observation sessions and hunting grounds*

We observed the adult female American Badger inhabiting a pasture on 26 and 27 September 2008 with a spotlight, and we captured her and implanted the radio-transmitter on 29 September (Proulx and MacKenzie 2012). We monitored the movements of this adult female during 16 nights from 29 September to 28 November 2008 (she was not active afterwards, when temperatures dropped to  $-20^{\circ}\text{C}$ ), and during irregular night visits from 2 May to 5 July 2009. We collected 1953 minutes of spotlighting observations of this adult female over 18 nights: 2 spotlighting sessions of 60 minutes before the radio-transmitter was implanted and 16 sessions, ranging from 11 to 210 minutes (average 102.1 minutes, SD 54.8), after the radio-transmitter was implanted. The female was observed in four hunting grounds ranging in size from 0.10 to

0.38 ha that had, on average, 1308 (SD 608) Richardson's Ground Squirrel burrow entrances/ha, indicating that Richardson's Ground Squirrel populations were well established.

The second American Badger was an adult male that inhabited another pasture. We spotlighted the adult male eight times, from 25 July to 22 November 2009, but observations were <15 minutes in length because of the hilly topography and high vegetation in the meadow. In spring 2010, the animal was using the same sites as in fall 2009. We captured and equipped the male American Badger with the radio-transmitter in May 2010 (Proulx and MacKenzie 2012). We observed his hunting behaviour with the spotlight from 17 to 23 May and from 11 to 23 June 2010. Five observation sessions ranged from 15 to 70 minutes (average 39 minutes, SD 22.2). Observations occurred in five hunting grounds ranging in size from 0.11 to 0.80 ha and had, on average, 824 (SD 212) Richardson's Ground Squirrel burrow entrances/ha.

The third American Badger was an adult female without a radio-transmitter. We observed her hunting behaviour with the spotlight in an alfalfa field and a summer fallow during five sessions from 26 to 30 July 2009 and during two sessions on 19 May 2010. We spotted this adult female a total of seven times in three areas of a summer fallow. Observation periods ranged from 10 to 45 minutes (average 24.3 minutes, SD 12.1). Terrain features were scarce, and we subjectively established the borders of the hunting grounds on the basis of clusters of Richardson's Ground Squirrel burrows and American Badger diggings. These hunting grounds were 0.49 ha in size and they had, on average, 161 (SD 110) Richardson's Ground Squirrel burrow entrances/ha.

### *Sinuuous movements*

When hunting, the adult female with the radio-transmitter methodically zigzagged along the pasture side of a fence line that separated the pasture from an annual crop, for distances of up to 150 m, and investigated Richardson's Ground Squirrel burrow entrances (Figure 1). This behaviour was observed during 5 of 18 spotlighting sessions. The female walked with her head down, smelled entrances, and dug small, shallow holes

at or in between burrows (Figure 2). The amplitude of the zigzags and the distance between zigzags varied among sessions but could exceed 3 m (Figure 1). We also observed that this adult female walked in a more or less sinuous manner (i.e., low amplitude and irregular zigzags) among forbs growing along the fence in order to feed on grasshoppers.

We observed the adult male zigzagging between Richardson's Ground Squirrel burrow entrances. This behaviour was observed in 2 of 14 spotlighting sessions. On subsequent mornings, we found newly dug small holes among clusters of Richardson's Ground Squirrel burrow entrances.

We observed the adult female American Badger that did not have a radio-transmitter zigzagging slowly during 3 of 7 spotlighting sessions. She dug several small holes near fence lines and smelled the ground at or enlarged Richardson's Ground Squirrel burrow entrances. We also observed her with a Richardson's Ground Squirrel in her mouth while she was engaged in enlarging a burrow entrance.

#### *Back-and-forth movements*

During two sessions, the adult female with the radio-transmitter went back and forth between Richardson's Ground Squirrel burrow systems. First, we observed the adult female making repetitive, straight-line movements between two Richardson's Ground Squirrel entrances that could be as far as 6 m apart, all the time sniffing the ground. At each hole, the female went down and returned quickly above ground, always moving a significant amount of dirt and widening both entrances.

On another occasion, the adult female moved back and forth between one enlarged Richardson's Ground Squirrel burrow hole and several other burrow entrances. From the enlarged burrow entrance, the female moved straight to another Richardson's Ground Squirrel burrow entrance that was >10 m away, sniffed it, and returned to the enlarged entrance, where she went down and quickly returned above ground to initiate the same type of movement at a second burrow entrance (Figure 3). The adult female did not go back to previous burrow entrances, and she systematically investigated each Richardson's Ground Squirrel burrow entrance in a consecutive manner without missing any of them, always starting from the enlarged hole. During one of these hunting sessions, the adult female carried the head of a Richardson's Ground Squirrel in her mouth.

We observed the adult male display back-and-forth hunting movements in 2 of 14 sessions. The male American Badger had dug out one large hole, from which he investigated several Richardson's Ground Squirrel burrow entrances in a triangular formation, similar to the behaviour we observed with the adult female equipped with the radio-transmitter (Figure 3).

#### **Discussion**

Sinuous hunting movements have been reported in the past for the Ermine (*Mustela erminea*) (Powell



FIGURE 2. The adult female American Badger (*Taxidea taxus*) equipped with the radio-transmitter dug out a series of small, shallow holes while zigzagging along the fence line.

1978) and the Long-tailed Weasel (*Mustela frenata*) (Proulx 2005) as a strategy to increase their chances of encountering prey. In this study, American Badgers zigzagged through clusters of Richardson's Ground Squirrel burrows, i.e., in areas where there are numerous burrow entrances to access prey.

These were not random movements. They were spatially located to encounter prey. American Badgers are known to make a series of shallow "exploratory" excavations to detect the presence of Plains Pocket Gophers (Lampe 1976). This is exactly what American Badgers did in search of Richardson's Ground Squirrels, i.e., they dug small holes, and they sometimes enlarged burrows to capture the resident Richardson's Ground Squirrel(s).

The burrow systems of Richardson's Ground Squirrels may consist of many tunnels and chambers (Michener 2002, 2012\*), so American Badgers need to dig exploratory holes to find their prey. Olfactory or auditory clues, or both, are likely used to identify occupied nest burrows (Murie 1992). The systematic search for Richardson's Ground Squirrels from above ground would certainly be necessary when Richardson's Ground Squirrels enter hibernation and block their tunnels with soil plugs (see Michener 2012\*).

Back-and-forth movements have not been described in the past (e.g., Michener 2004), and it is unlikely that

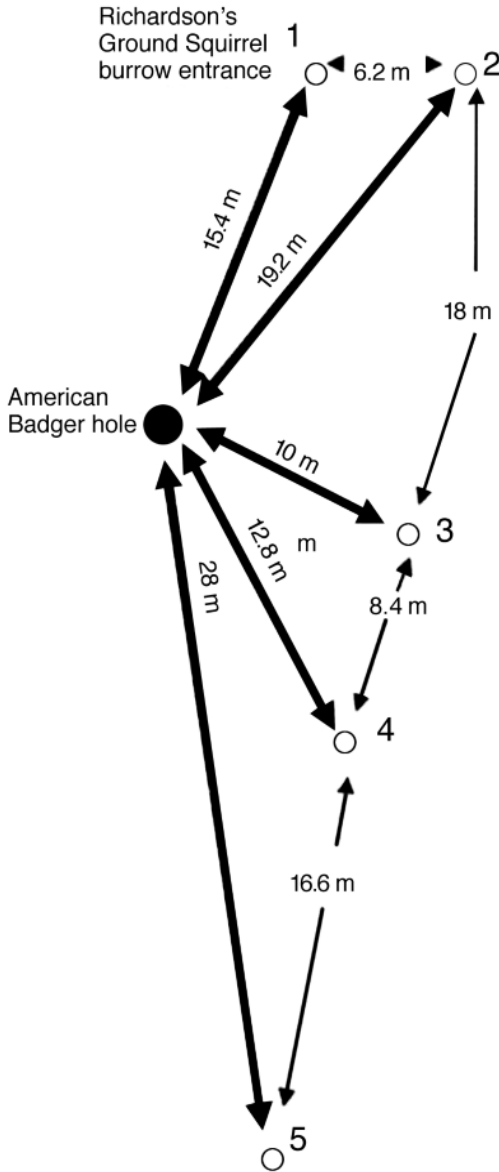


FIGURE 3. Back-and-forth hunting movements of the adult female American Badger (*Taxidea taxus*) equipped with the radio-transmitter. Arrows indicate the movement pattern of the American Badger between the hole she had enlarged (large filled circle) and the five Richardson's Ground Squirrel entrances (open circles).

someone could surmise their existence without witnessing American Badgers in action. However, because Richardson's Ground Squirrels may use a series of different underground chambers within the same area (Michener 2012\*) and yearlings may establish them-

selves near their natal home area (Michener and Michener 1973), the use of back-and-forth movements by American Badgers appears to be a suitable strategy to determine which chambers within a burrow system, or which adjacent burrow systems, are occupied by prey. Back-and-forth movements were not performed at random. They were carried out in areas where there were many Richardson's Ground Squirrel burrow entrances and therefore offered easy access to an underground tunnel network.

Favreau (2006) pointed out that animals with no knowledge of resource distributions may be most successful at finding resources by moving in a random walk (Bovet and Benhamou 1988). As cognitive ability increases, non-random movement patterns should develop if such movements will increase foraging success. The use of oriented movements such as zigzag and back-and-forth movements among clusters of Richardson's Ground Squirrel burrows indicates that American Badgers recognize these habitat patches as favourable for the detection of prey.

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