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Ground squirrel activity during the solar eclipse of August 11, 1999.

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European ground squirrels (*Spermophilus citellus*) in their natural habitat emerge from their burrows ~4 hours after twilight at dawn and disappear ~3 hours before twilight at dusk (Hut et al. 1999). Entrainment of their endogenous circadian rhythm apparently does not require the perception of twilight. They might, however, respond to the small (average 1 log unit) afternoon decrease in light intensity by retreating in darkness underground, thereby generating a secondary lights-off signal used for entrainment of their endogenous circadian clock.

To test whether ground squirrels respond to a decrease in light intensity in this manner, we exploited the solar eclipse of August 11, 1999. At 12:46 local time, the moon covered 99% of the sun above a field population of European ground squirrels near Vienna. Austria (48°18′ N, 16°22′ E) (Millesi et al. 1999). On August 10, 11 and 12, the number of ground squirrels above ground was counted every 5 min in a 1 ha area, from ~06:00 h until ~20:00 h. Light intensity was measured every 10 min. Around the partial solar eclipse, data were recorded every 1 min. Light intensity was $24 \cdot 103–37 \cdot 10^3$ Lux at the appearance of the first ground squirrel above ground, and $20 \cdot 10^3–27 \cdot 10^3$ Lux when the last animal retreated (Fig. 1). Rain suppressed above ground activity, and persistent rain on August 10 precluded data acquisition from 16:20 onwards. The sky was clear during the partial solar eclipse. Light intensity before the eclipse (11:16–11:46) was circa $110 \cdot 10^3$ Lux and dropped to 1039 Lux at 12:46. From 12:16–13:16 on average 16.3 animals were active above ground. This number was similar, and certainly not decreased relative to either the hour before (15.4) or the hour after the eclipse (16.4).

Five ground squirrels were equipped with light-sensitive radio transmitter collars (Hut et al. 1999) on August 9. Their presence above ground during August 10–12 was recorded every 10 min, and every 1 min around the time of the eclipse. Four of these animals were above ground for most (156–160 min, 20 min absence by rain) of a three-hour period around the eclipse. The remaining animal was underground for two brief episodes of 21 and 12 min, very similar to its activity pattern during the rest of the day.

Thus, the animals did not retreat into their burrows in response to the partial solar eclipse, even though light intensity was reduced by two log units, well below levels normally perceived at the end of activity. It is unlikely that the daily afternoon retreat into the burrow is a response to the change in light intensity in European ground squirrels.

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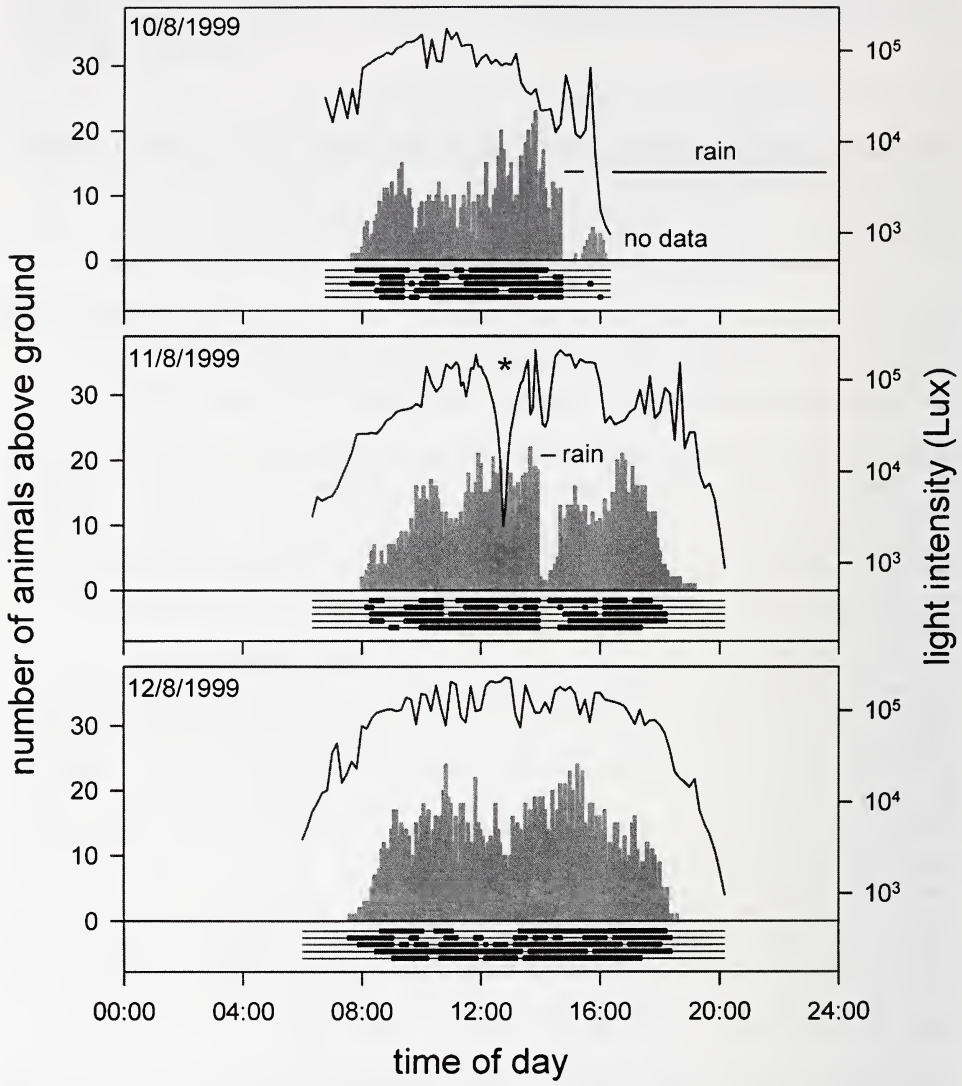

Fig. 1. Number of ground squirrels active above ground and concurrent light intensity (Lux), observed in a 1 ha focal area in a population of European ground squirrels near Vienna, Austria. Bars indicate presence of animals with a radio transmitter above (thick bars) or under (thin bars) ground. * Denotes timing of the partial (99%) solar eclipse at 12:46 local time, on August 11, 1999 (civil twilight dawn 5:07; civil twilight dusk 20:51).

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