Using iButtons to Determine Nest Absences of Greater Prairie-Chickens

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Introduction

Nesting success is vital to the population stability of the Greater Prairie-chicken (*Tympanuchus cupido pinnata*). During incubation of the eggs, hens must leave the nest to forage, and the nesting success of Prairie-chickens is suspected to be negatively impacted by more frequent and longer hen absences. Monitoring nests to determine timing of nest absences, however, requires technology which can accurately detect these absences.

Objectives

- To determine the effectiveness of iButtons to detect Prairie-chicken hen absences.
- To determine the effectiveness of iButtons to document length of hen absences (quantified by lag times).
- To document the time of day of hen departures from nest.

Methods

We inserted temperature loggers (iButton Thermochrons DS1921G-F5) into several active prairie-chicken nests during the peak nesting season (May and June) of 2011. Our study site was in the eastern Sandhills of Nebraska (Rock and Brown counties). We monitored the nests with solar-powered infrared video cameras to determine if the lower-cost iButtons would record noticeable changes (≥5° F) in nest bowl temperature when video data indicated a hen absence. The video cameras recorded the exact length of hen absences but the iButtons were not as accurate. We calculated average lag times to assess the accuracy of iButtons in recording length of hen absences. A correlation analysis was used to compare absence duration as recorded by iButtons and cameras. Total absences recorded over the span of the study were grouped into daily time periods.

Results

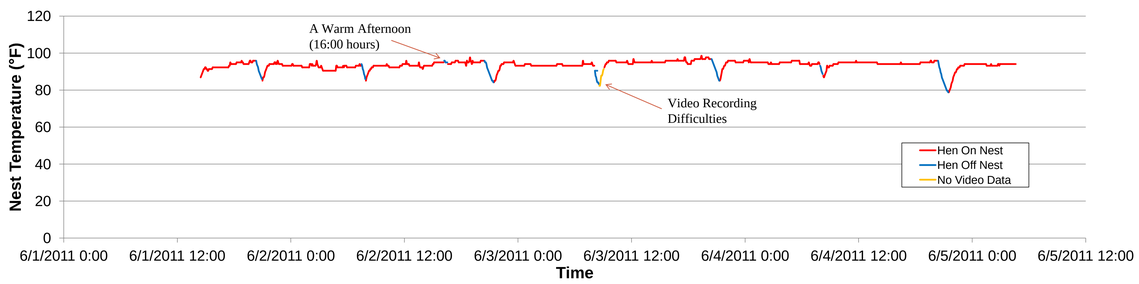

Fig. 1. IButton temperature data for a Greater Prairie-chicken hen (#001, Fig. 2) over an 88-hr. period. Red & blue line colors represent status of hen (on- or off-nest) according to video evidence.

Bird # (iButton Interval)	Average Active Nest Temperature (°F)	Average Lag Time	Average Hen Departure Lag Time	Average Hen Arrival Lag Time	Camera Absences Correctly Identified by iButton
001 (4 min)	92.01	-0:01:22	0:00:23	-0:00:47	8/9
001 (9 min)	91.71	-0:04:12	-0:02:11	-0:05:37	12/13
542 (2 min)	79.98	0:01:54	0:02:50	0:04:44	9/10
542 (10 min)	72.52	0:01:29	-0:04:51	-0:03:23	11/13
362 (3 min)	72.24	--	--	--	2/2
362 (15 min)	70.08	--	--	--	1/2
Average:	--	**-0:01:05**	-0:01:22	-0:02:10	**0.88**

Fig. 2. Temperature/accuracy data from 6 iButtons inserted into 3 different nests. Lag times represent the net number of minutes that an iButton deviated from the actual length of a hen absence. Negative average lag times indicate iButtons recorded too short of absences, while positive times indicate too long of absences were recorded. IButton departure/arrival lag times record hen leaving/arriving nest before (- values) or after (+ values) actual time (video).

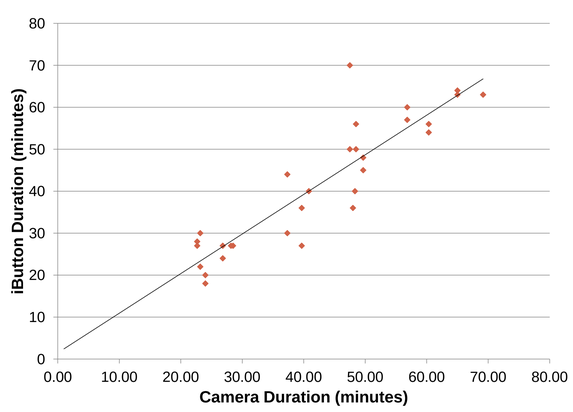

Fig. 3. Comparison of duration of Greater Prairie-chicken nest absences, as measured by iButtons and video cameras.

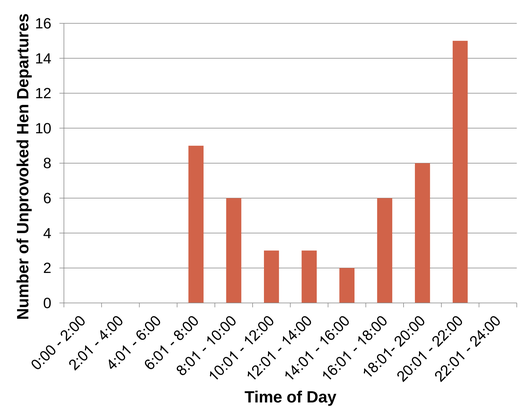

Fig. 4. Frequency of unprovoked Greater Prairie-chicken hen absences (N=52) during 2-hour time periods.

Discussion

Hens generally departed the nest in the early morning and late evening (Fig. 4), and iButtons detected 88% of absences (Fig. 2). The temperature loggers were also accurate in portraying length of absence from nest (1-minute average lag time, Fig. 2; $R^2 = 0.81$, Fig. 3). Proper iButton placement was critical to obtaining the most accurate results. The iButtons placed in the nest of bird #001 were placed well above the nest litter and in between the eggs themselves. As a result, they were nearer to the body heat of the hen (Fig. 2).

Absences that were not detected were usually a consequence of poor iButton placement or of times when ambient air temperature was comparable to nest temperature (warm afternoons). Our video cameras also recorded unique footage of nest predations (bull snake, coyote, and American badger).

Our study suggests that iButtons could be effectively used to monitor hen absences from Prairie-chicken nests in future studies.

Acknowledgments

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