

ARTICLES

FIELD OBSERVATIONS OF ELEVEN SPECIES OF SNAKES DURING TWENTY-SIX YEARS AT HAWK MOUNTAIN SANCTUARY, PENNSYLVANIA

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Abstract: Two hundred and thirty-eight opportunistic field observations were reported for 11 snakes species during 1986–2009 at the Hawk Mountain Sanctuary, a 1,100 ha private refuge for birds of prey in eastern Pennsylvania. The Eastern Rat Snake (*Scotophis alleghaniensis*) and the Timber Rattlesnake (*Crotalus horridus*) each comprised nearly 25% of the total number of observations. Snakes were seen during April–November, with most species observed in July. Monthly distribution of total numbers of snakes observed was bimodal as determined by a July depression in observations. Individual species varied with respect to modality of seasonal activity patterns, and these findings as well as those concerning other activities and behaviors noted herein provide comparative data for what can be otherwise locally common even if not often-studied snake species in Pennsylvania.

Introduction

The life histories of many of Pennsylvania's amphibian and reptile species remain poorly understood (Hulse et al., 2001). The need for basic herpetofaunal life history information in Pennsylvania extends to snakes, of which 22 species are found in the state (Meshaka and Collins, 2009). The goal of this study was to provide site-specific data on opportunistic field observations of snakes conducted over a 26 year period (1986–2009) at a large and protected site in the Ridge-and-Valley Province of Pennsylvania and to compare these findings with those from elsewhere in Pennsylvania, to more accurately quantify the sorts of ecological information necessary to make sound management decisions that involve this segment of Pennsylvania's biota.

Materials and Methods

The Hawk Mountain Sanctuary (HMS) is a 1,100-ha privately owned refuge for birds of prey founded in 1934. The sanctuary is located in the Ridge-and-Valley Province in Berks County in eastern Pennsylvania (Figure 1) and serves as a center for worldwide conservation of birds of prey. Consistent with its mission to serve as an observation, research, and education facility, HMS has maintained field observation cards pertaining specifically to snakes since 1986. I examined these cards to determine activity patterns of field-observed snakes on the property.

Results and Discussion

Snake assemblage: Two hundred and thirty-eight individuals of eleven species were seen as early as 16 April and as late as 3 November. The monthly number of species sighted over the season was unimodal, with numbers of species observed increasing until July, after which the numbers of species observed each month decreased until October (Figure 2). Total number of individuals seen each month was distributed in a bimodal pattern with a July depression in otherwise high monthly numbers of observa-



Figure 1. Hawk Mountain Sanctuary overlooks the Kittatinny Ridge, Berks County, Pennsylvania. Photograph by Benjamin Hayes.

tions during May–September (Table 1). Two snake species not previously noted from Berks County (Meshaka and Collins, 2009), the eastern Racer and Eastern Ribbon Snake, are reported here. The Queen Snake (*Regina septemvittata*), Brown Snake (*Storeria dekayi*), and Smooth Earth Snake (*Virginia valeriae*), all reported from Berks County (Meshaka and Collins, 2009), were not represented in the natural history cards.

Agkistrodon contortrix

The Copperhead, with eleven observations, comprised 4.6% of the snake field observations. Individuals were seen as early as 28 May 1997 and as late as 24 August 2007. Highest number of individuals was seen in July, with too few observations to ascertain modality in seasonal activity (Table 1). In Pennsylvania generally, individuals are active during late April through October and into November in the southeastern portion of the state (Hulse et al., 2001). One instance of aggregation was observed atop the Pinnacle on 21 July 1996 at which time four individuals were found together.

Table 1. Monthly distribution of field observations of snakes during 1986–2009 at Hawk Mountain Sanctuary, Berks County, Pennsylvania.

Species	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
<i>Agkistrodon contortrix</i>	0	1	2	6	2	0	0	0	11
<i>Coluber constrictor</i>	0	0	0	1	0	0	1	0	2
<i>Crotalus horridus</i>	0	5	12	13	15	11	2	0	58
<i>Diadophis punctatus</i>	1	5	6	1	19	12	0	1	45
<i>Heterodon platirhinos</i>	1	0	0	0	0	1	0	0	2
<i>Lampropeltis triangulum</i>	0	5	5	1	2	4	2	0	19
<i>Nerodia sipedon</i>	3	13	2	3	4	2	1	0	28
<i>Scotophis alleghaniensis</i>	2	16	16	4	5	15	1	0	59
<i>Storeria occipitomaculata</i>	0	0	2	0	0	0	0	0	2
<i>Thamnophis sauritus</i>	0	0	0	1	0	0	0	0	1
<i>Thamnophis sirtalis</i>	1	2	1	1	0	5	1	0	11
Total	8	47	46	31	47	50	8	1	238

Coluber constrictor

The Eastern Racer, with two observations, comprised 0.8% of the snake field observations. Individuals were seen on 5 July 1997 and 5 October 2005 (Table 1). Although this species could superficially be confused with the Eastern Rat Snake, it is also a species of open fields and shrublands in the northeast (Hulse et al., 2001), a habitat that is limited primarily to the area around the Aco- pian Center.

Crotalus horridus

The Timber Rattlesnake (Figure 3), with 58 observa- tions, comprised 24.4 % of the snake field observations. Individuals were seen as early as 11 May 2002 and as late as 27 October 1996. Highest number of individuals was seen in August, with the distribution of observations indicating an unimodal seasonal activity pattern (Table 1). In Pennsylvania generally, this species does not emerge until late April and is active until mid October (Hulse et al., 2001). An individual seen crossing the trail between Pinnacle Summit and the heli-port on 21 July 1996 ap- peared to have just fed. One instance of aggregation was

observed at East Rocks on 26 September 2009 during which two adults were found curled together with two or three young on top of them.

Diadophis punctatus

The Ringneck Snake, with 45 observations, comprised 18.9% of the snake field observations. Individuals were seen as early as 20 April 1996 and as late as 3 November 2008. The highest number of individuals was seen in August (Table 1). The combination of observations from both under cover and in the open precludes determination of modality in seasonal activity from this sample. In Pennsylvania gen- erally, individuals are active from early April until the end of October (Hulse et al., 2001) and exhibit a bimodal seasonal activity pattern, with peaks in late May-June and again in September (Hulse et al., 2001). In western Pennsylvania, individuals were active in all months of the May-September study period with an unimodal seasonal activity peak in June (Meshaka, 2009).

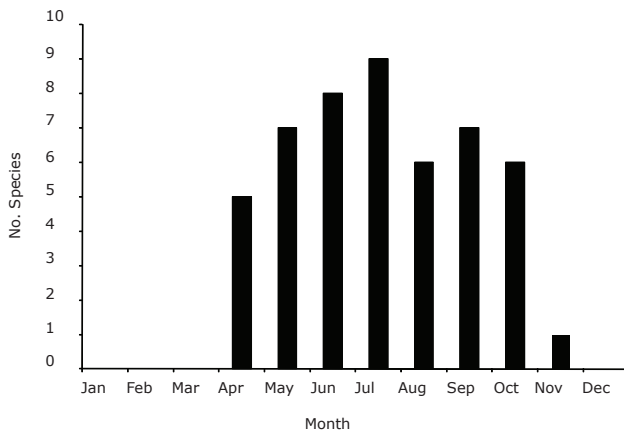


Figure 2. Distribution of the number of snake species observed each month during 1986–2009 at Hawk Mountain Sanctuary, Berks County, Pennsylvania.



Figure 3. The Timber Rattlesnake (*Crotalus horridus*), such as this individual basking, was one of the two most commonly observed snake species during 1986–2009 at Hawk Mountain Sanctuary, Berks County, Pennsylvania. Photograph by Bill Mo- ses.

Two instances of aggregation by the Ringneck Snake were observed at HMS. The first event involved three individuals found together under a brick pile on 6 June 1996. On 27 August 2002, twelve individuals were found under rocks near the pit at North Lookout. Ringneck Snakes have been reported to aggregate in Pennsylvania generally (Hulse et al., 2001) and in western Pennsylvania (Meshaka, 2009). A roadkill was found on Hawk Mountain Road on 19 May 1997.

Heterodon platirhinos

The Eastern Hognose Snake, with two observations, comprised 0.8% of the snake field observations. Individuals were seen on 24 April 1997 and 29 September 1998 (Table 1), the latter of which was a roadkill on Dreherstown Road, near the Pennsylvania Game Commission ponds.

Lampropeltis triangulum

The Milk Snake, with nineteen observations, comprised 8.0% of the snake field observations. Individuals were seen as early as 17 May 1999 and as late as 3 October 2008. Highest numbers of individuals were seen in both May and June, followed by a second peak in September (Table 1). In Pennsylvania generally, individuals are active from mid-April to early October (Hulse et al., 2001). In Pennsylvania, seasonal activity is unimodal and peaks in June (Hulse et al., 2001). In western Pennsylvania, individuals were active in all months of the May-September study period with an unimodal seasonal activity peak in June (Meshaka, 2009).

An individual captured on the Sawmill Road on 1 June 1997 regurgitated a recently eaten Ringneck Snake. Another individual captured in the old intern office on 24 August 2005 regurgitated a live Ringneck Snake and soon thereafter captured it again. To that end, Hulse et al. (2001) determined that in Pennsylvania, Milk Snakes shift their diet ontogenetically from snakes to mammals.

Nerodia sipedon

The Northern Water Snake, with 28 observations, comprised 11.8% of the snake field observations. Individuals were seen as early as 16 April 2002 and as late as 8 October 2003. The highest number of individuals was seen in May, with the distribution of observations having indicated an unimodal seasonal activity pattern (Table 1). In Pennsylvania generally, individuals are active from early March to mid-October, with an unimodal peak in May-June (Hulse et al., 2001). On 29 May 2004, a small individual was observed eating an anuran metamorphosing, which conforms to findings of its diet in Pennsylvania (Hulse et al., 2001).

Scotophis alleghaniensis

The Eastern Rat Snake (Figure 4), with 59 observations, comprised 24.8% of the snake field observations. Individuals were seen as early as 21 April 2006 and as late as 2 October 2002. Highest number of individuals was seen in May and June, followed by a second peak in September (Table



Figure 4. The Eastern Rat Snake (*Scotophis alleghaniensis*), such as this individual eating an Eastern Chipmunk, was one of the two most commonly observed snake species during 1986–2009 at Hawk Mountain Sanctuary, Berks County, Pennsylvania. Photograph by Mary Linkevich.

1). In Pennsylvania generally, individuals are active from late April to mid-October, especially during May–September (Hulse et al., 2001). In western Pennsylvania, individuals of *S. spiloides* were active in all months of the May-September study period, and unimodal seasonal activity peaked in June; however, for males in that study, seasonal activity was bimodal with a peak in June followed by a smaller peak in August (Meshaka, 2009). Activity of the Eastern Rat Snake occurred both on the ground and above the ground on man-made structures as well as in trees and bushes (Figure 5), a pattern likewise shared by *Scotophis* in Pennsylvania generally (Hulse et al., 2001). Monthly distribution of arboreality roughly approximated that of general activity (Table 1) at HMS. On 18 June 2007, an individual was observed on the road to the shed eating an Eastern Chipmunk (*Tamias striatus*) (Figure 4). This mammalian prey item fits within the dietary range of *Scotophis* in Pennsylvania generally (Hulse et al., 2001). On 31 August 2001, an individual was observed climbing a tree along the escarpment trail with a food bulge.

Three instances of copulation or courting were recorded for the Eastern Rat Snake at HMS. On 11 May 2003, two individuals were seen coiled together in a tree. On 31 May 2002, a pair of snakes was seen in copula for one hour at Schaumbach's Tavern. On 15 June 2007, three individual snakes were seen together near the information pavilion, two of which were in copula. These dates conform to findings by Hulse et al. (2001) that in Pennsylvania mating generally occurs during May-June. The single observation of a roadkilled Eastern Rat Snake took place on 12 May 1996 on Hawk Mountain Road between the Hill House and the Visitor Center.

Storeria occipitomaculata

The Redbelly Snake, with two observations, comprised 0.8% of the snake field observations (Table 1). Both individuals were seen together on 1 June 1995.

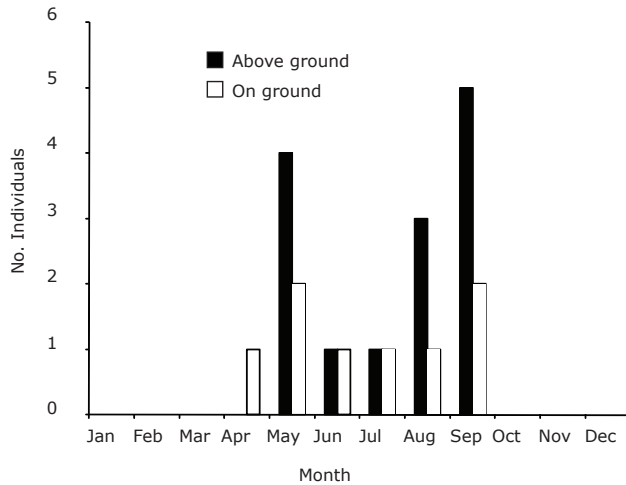


Figure 5. Monthly distribution of the number of Eastern Rat Snakes (*Scotophis alleghaniensis*) found on structures above the ground and found on the ground during 1986–2009 at Hawk Mountain Sanctuary, Berks County, Pennsylvania.

Thamnophis sauritus

The Eastern Ribbon Snake, with one observation, comprised 0.4% of the snake field observations (Table 1). The single individual was seen on 5 July 2001.

Thamnophis sirtalis

The Common Garter Snake, with eleven observations, comprised 4.6% of the snake field observations. Individuals were seen as early as 19 April 1994 and as late as 19 October 2005. The greatest number of individuals was seen in September, with too few observations to ascertain modality in its seasonal activity (Table 1). In Pennsylvania generally, individuals are active throughout the year but most activity generally begins in mid to late March and ends in late October or early November (Hulse et al., 2001). At a residential site in south-central Pennsylvania, individuals were active during April–October of the May–December study period, and seasonal activity was unimodal with a peak in July (Meshaka, 2008). At a park in south-central Pennsylvania, individuals were active in all months of the May–September study period with bimodal peaks in seasonal activity in

May–June and in September (Meshaka, 2008). In western Pennsylvania, individuals were active in all months of the May–September study period, and unimodal seasonal activity peaked in June (Meshaka, 2009).

Summary

The anecdotal data amassed in this report provide site-specific refinements to life history phenomena of several locally common or at least easily observable species for which even basic life history data in Pennsylvania are lacking. The less frequently encountered snakes reported here, as well as those regionally present but undetected during this study, raise the question of their status with respect to their rarity or absence being actual or an artifact of sampling technique. In this regard, protected places with a research culture, such as HMS, provide the necessary conditions to answer questions built upon field research.

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