

Factors That Limit the Northern Copperhead in Northern Pennsylvania

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Introduction:

The Northern Copperhead (*Agkistrodon contortrix mokasen*) is a medium sized stout bodied snake in the family Viperidae, subfamily Crotalinae, which is the same subfamily as the timber rattlesnake (*Crotalus horridus*). The dorsal surface has 12-21 reddish brown hourglass bands which narrow at the midline of the back and widen towards the ventral scales. The background color is paler than the crossbands and ranges from brown to pink. Neonate northern copperheads have a yellow to yellowish green tail used for caudal luring; this coloration darkens with growth (Gloyd and Conant 1990).

Preferred habitat for the northern copperhead is open rocky slopes on the south side of steep inclines (Reinert 1984). They can also be found on wooded hillsides with some open rock and summering in valleys and rocky meadows or powerlines. The annual activity cycle extends from late April through October.

The copperhead has a large range within Pennsylvania. They can be found in scattered populations throughout much of the lower two-thirds of the state. They are not found in the northern tier counties. The present study examines several factors that may be limiting the range of the northern copperhead.



Gravid female copperhead from northeastern Pennsylvania.

Methods:

Several sites were visited along the northeast counties of PA from September 2005 to May 2007. Several confirmed sites were used as well as several new sites. New sites were chosen based on habitat parameters for copperheads. Information, including habitat type, elevation, temperature, humidity, and weather conditions were taken at each visit.

Snakes were caught using hooks and restraining tubes to attain information including sex, length, weight, and scale counts to determine recaptures. Once all the data was collected, it was analyzed using Microsoft Excel, and SPSS.

Results:

A total of 34 copperheads were observed at field sites during this study. Most copperheads were seen in June or July, with a noticeable decline in August and September. Snakes were seen most frequently under partly cloudy conditions. A total of 16 snakes were caught and processed. Females (N=9) were captured more frequently than males (N=7). Males were larger than females in length, weight, and tail length. All copperheads were found on south/southeast facing slopes. Elevations that copperheads were found ranged from 600-1200 feet, with most being seen from 900-1000 feet. The “ideal” condition, which is the averages of all data gathered, that copperheads were observed would be June 21st, at about 2:08 PM. The average temperature would be 26.2 degrees Celsius, and the weather would be partly cloudy. This “ideal” situation was used to rank each outing and rank each site based on standard deviations away from this average. Once sites were weighted based on this model, the carbon county sites were ranked highest, with the northern sites of wyoming and pike counties being ranked the lowest.

Description	Month	TOD	AT	SAT	ST	Weather
Poor (2 S.D.)	Aug. 12	1851.44	36.4	32.7	26.26	4.55
Supoptimal (1 S.D.)	July 17	1609.48	31.3	28.35	24.08	3.73
Optimal (0.5 S.D.)	July 4	1488.49	28.75	26.18	22.99	3.32
Ideal (0 S.D.)	June 21	1367.5	26.2	24	21.9	2.91
Optimal (-0.5 S.D.)	June 8	1246.51	23.65	21.82	20.81	2.5
Supoptimal (-1 S.D.)	May 27	1125.52	21.1	19.65	19.72	2.09
Poor (-2 S.D.)	May 1	883.55	16	15.3	17.54	1.27

Table showing the “ideal” situation copperheads can be found under and standard deviations away from the “ideal”.

Discussion:

Several factors play a role in limiting the copperhead in northern Pennsylvania. Using multiple regression analysis July and October temperatures were found to be highly correlated with site rank. This means that these months are reasons that the copperhead cannot live in northern PA. This could have been for several reasons. First, October temperatures are important for snakes as this is the time of year they return to their denning areas. It would appear that temperatures in the northern areas of the state get too cold too fast for the copperhead. July temperatures are extremely important for copperheads. This is the month of peak activity for non gravid snakes, and this is the month that gravid females gather at open rock to increase their body temperatures for birth in late august/early september. It seems that the northern counties do not have the required temperatures for copperheads in july to gather the thermal energy for giving

birth at the right time. It would take longer to give birth, and with the temperatures dropping sooner in the north these snakes would not survive. Timber rattlesnakes, a close relative of the copperhead can survive in the northern tier counties because they are larger thus making it easier to maintain body temperature. They also have a lower average body temperature by about 3 degrees than copperheads (Brattstrom 1965). By looking at a layout of the July 20 degree isotherm and copperhead distribution in PA there seems to be a connection.

Bibliography:

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- Gloyd, H.K., and R. Conant. 1990. *Snakes of the Agkistrodon Complex*. The Society for the Study of Amphibian and Reptiles, Oxford, Ohio.
- Reinert, H.K. 1984a. Habitat separation between sympatric snake populations. *Ecology* 65: 478-486.