

Western Rattlesnake Ecology At Natural Bridges NM, Utah

By Tim B. Graham

Western rattlesnake (*Crotalus viridis*) is common on the Colorado Plateau, but infrequently seen. At Natural Bridges National Monument, these rattlesnakes are encountered often in the residence/visitor center area (R/VC). While only one person has been bitten (dry bite) in the developed area, (the victim apparently was drunk and tried to pick up the snake), the abundance of snakes in the R/VC is perceived as a safety issue. Snakes in the Natural Bridges population are generally very docile, and rarely attack, even when provoked. A young girl stepped on one in the campground in 1991; the snake rattled and crawled away.

The population of rattlesnakes at Natural Bridges appears to be an intergrade between two subspecies of *C. viridis* – the midget faded rattlesnake (*C. v. concolor*), and the prairie rattlesnake (*C. v. viridis*). The venom of *C. v. concolor* is more toxic than other species of *C. v. viridis*, and treatment of bites by *C. v. concolor* is different than for other subspecies (J. Glenn, pers. comm.). Work is continuing to determine the implications of hybridization on management of snake bites in the area.

Explanations for the abundance of snakes in the R/VC are numerous. It was suggested that the residence area was built on a den site. The pseudo-riparian habitat and abundance of food in the housing area have created higher prey densities than native pinon-juniper habitat, perhaps attracting the large numbers of snakes. The possibility that the R/VC was

built in the path of migration routes between summer and winter snake habitat also exists.

Prior to 1983, rattlesnakes found in the R/VC were trapped and taken 3 km outside the Monument for release. A monitoring program was begun in 1983 to assess snake numbers and movements in the R/VC.



Rattlesnake captured at den site April 1991. Bright white marks on back are paint marks used to indicate this individual already had been captured at the den in the past few days. The elongated dark blotch near the tail (actually a number of blotches fused together), can be used to identify this individual year after year. (Photo by Tim Graham)

All snakes encountered there were captured, anesthetized, and marked. Many marking techniques were tried, including sewing colored sequins onto rattles, and painting rattles. The most effective marking technique was found to be a natural one. Snakes have unique blotch patterns on their backs, which allow identification of individuals. From 1984 to 1988, each snake was photocopied (yes, actually stretched out on a xerox machine) to record its blotch patterns. Beginning in 1989, Polaroid photos were taken instead.

In 1988, a radio-tracking study was initiated to document overwintering sites, and movements of *C. viridis* in the R/VC. The accumulated data of snake captures and recaptures since 1983 also were analyzed for patterns of recaptures, numbers of unique individuals, and timing of observations.

Based on capture data from 1983-1988, and the available radio-tracking data, we are beginning to understand the role played by the R/VC in this area's rattlesnake ecology. It was believed the large number of sightings were actually multiple sightings of a few snakes returning year after year. However, data on snake captures and recaptures from 1983 to 1990 do not support this idea. Most snakes are found in the R/VC in only one year; in fact, most individuals are seen only once (Fig. 1). Snakes appear to be moving through the R/VC, perhaps foraging for a few days, then moving on.

We have identified 80 snakes since 1983; 17 were seen only at den sites, 6 were young of a radio-tagged snake, and 9 are known dead (5 road kills, 4 radio-

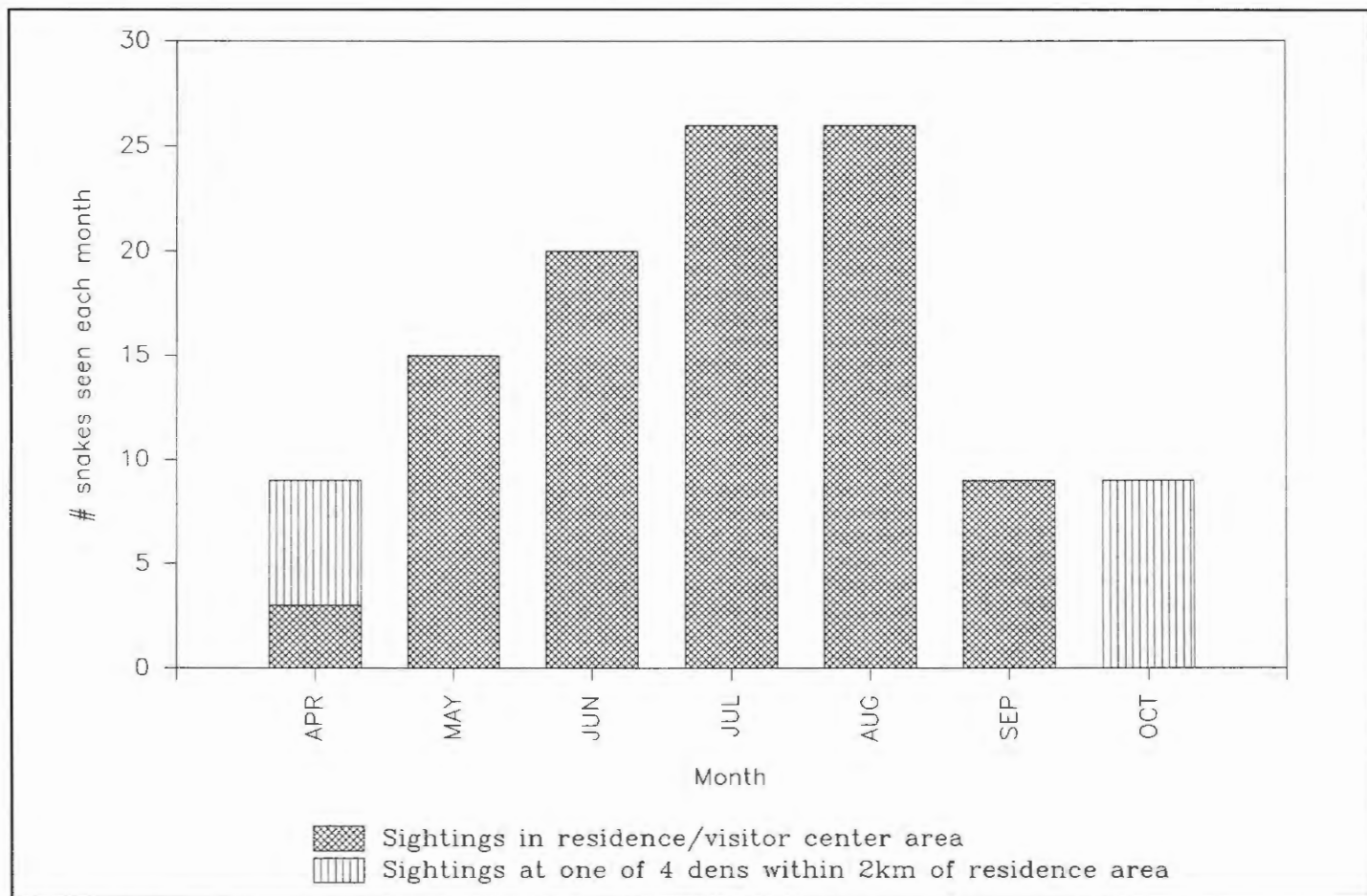


Figure 2. Numbers of snakes located each month, pooled over the years 1983-1990, in the residence/visitor center area and/or den sites.

Rattlesnake Ecology

(Continued from page 10)

tagged snakes). Four overwintering sites have been located, and 17 snakes have been marked at den sites in 2 years. One of those snakes (#42) later showed up at the R/V. In 1991, an additional 65 snakes were identified at two dens.

Small mammals were trapped in the R/V in 1985 and 1988. Comparable trapping also was done in nearby pinon-juniper habitat. Results indicate that mice populations in the R/V are much higher than in surrounding native habitat. However, radio-tracking has shown that at least radio-tagged snakes spend little time in the R/V itself. Most radio-tagged snakes established home ranges outside the R/V, though within 200-300 m of the developed area. Some movement into and out of the R/V has occurred, but these movements are infrequent and do not appear to be consistently related to foraging. These data suggest snakes are not attracted to the R/V because of its high prey densities.

The R/V was built approximately halfway between two westward draining canyons. Den sites are in the upper reaches of these canyons in rocky ledges and outcrops. There probably are many sites suitable for overwintering along the south and southwest facing canyon walls. Movements of radio-tagged snakes indicate that snakes leave the dens and move onto the uplands between canyons to spend the summer. Frequent snake sightings in the R/V are thought to be the result of proximity of the R/V to two areas of quality den sites. Snakes disperse in all directions from both den areas. Snakes heading south from the north dens, and those going north from the south dens, move into/through the R/V, increasing opportunities for encounters. A few snakes remain near the R/V all summer, others pass through and don't return except perhaps



Technician Trevor Persons tracking rattlesnake with implanted radio transmitter at Natural Bridges National Monument. Snakes are located once or twice each day. Body temperature and a suite of micro-habitat characteristics data are collected each time a snake is located. (Photo by Paul Menard)

en route to their dens in autumn. Most snake sightings are in July and August (Fig. 2), which is consistent with snakes dispersing from their dens, eventually reaching the R/V.

Crotalus viridis probably have been moving through the area now occupied by the R/V at Natural Bridges for centuries. Changes in the area as a result of build-

ing and maintaining a residence area do not appear to have influenced snake movements or home range establishment significantly. There is no reason to expect that changes in the residence area character (e.g. removal of domestic landscaping, elimination of unnaturally high densities of small rodents) would affect the numbers of snake encounters in the R/V. However, removing these characteristics of the R/V habitat would provide a good test of the validity of the migration route theory.

Management options for dealing with the snakes are limited because of the nature of the problem. The R/V could be fenced to exclude snakes. Certain parts of the R/V have been fenced in the past – the community garden and a children's play area. These areas did remain snakeless most of the time, although occasionally snakes were found in the garden. Trying to exclude snakes from the entire area, while allowing access for vehicles, visitors, and residents, would be expensive, difficult, and most likely ineffective.

Snakes could be relocated if found in the R/V area in an attempt to reduce interactions with people. This would have deleterious effects on the snake population, as relocated snakes would have difficulty finding their dens in the fall and probably would die for lack of adequate shelter. Given the densities of snakes at dens (over 60 individual snakes were identified at a single den in spring 1991), removing snakes from the R/V may not solve the problem. Other snakes are likely to expand their home ranges into the R/V area to occupy vacated home ranges.

Only one person having been bitten during 25 years of human occupation of the area, safety does not seem to be a significant issue at Natural Bridges NM. Given the non-aggressive character of *Crotalus viridis*, vigilance in the R/V probably will prevent most encounters.

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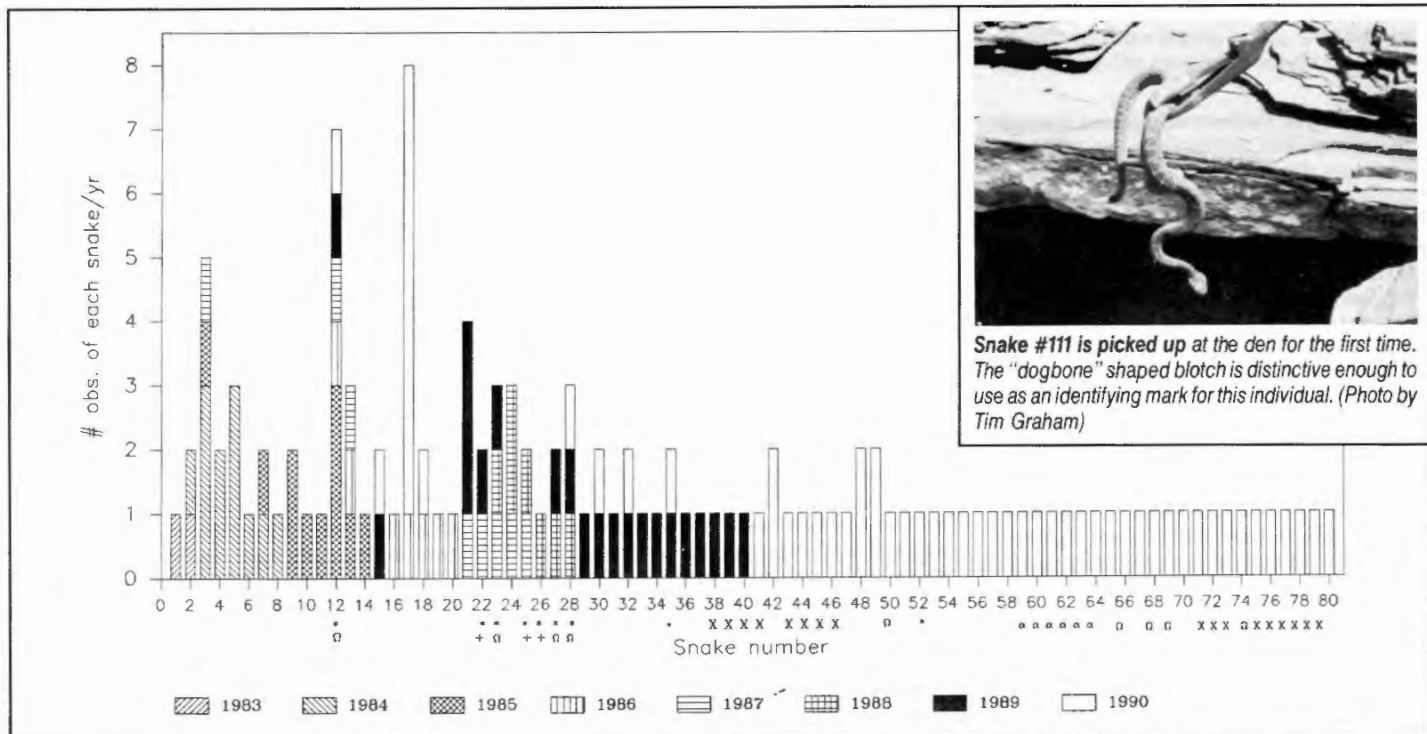


Figure 1. Capture data on 80 *Crotalus viridis* found in the Natural Bridges residence/visitor area, or near dens in the vicinity. Recaptures of the same snake in different years are shown in different patterns, and stacked. Snakes marked with * had radios implanted in 1988, 1989, and/or 1990. Snakes marked with Ω were either found dead (road kills), or died while carrying a radio, those marked with + had radios, but disappeared during the study. Snakes seen only at dens are indicated with X's, the offspring of #12 are marked with α .