

# FACTORS LIMITING THE DISTRIBUTION OF THE PRAIRIE RATTLESNAKE

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The prairie rattlesnake *Crotalus viridis viridis* is an important predator of small mammals and birds on the Great Plains of North America. According to Klauber the geographical range of this rattlesnake extends from northern Mexico to southern Canada.<sup>3</sup>

In Canada this subspecies is found in south western Saskatchewan and southern Alberta. Cook has indicated that two population segments occur in Saskatchewan, the first along the South Saskatchewan river and a second along the Frenchman river. These two segments are believed to be joined in Alberta.<sup>2</sup>

The precise reason for the restriction of the prairie rattlesnake to these areas is an interesting ecological problem. The distribution of this snake ends rather abruptly with no concomitant biotic or climatological change.

In 1976 the author began a two year study to determine possible factors which could limit the distribution of this subspecies in Canada. In the course of the study a total of 21 rattlesnake hibernacula in Saskatchewan and Alberta were visited and described. In addition the location and description of 14 hibernacula were obtained from local residents and other investigators.

The major rivers in southern Saskatchewan and Alberta can be divided into two major river systems or drainages: (1) the South Saskatchewan River drainage, including the South Saskatchewan, Red Deer, Bow and Oldman rivers, and (2) the Missouri River drainage, including the Milk and

Frenchman rivers.

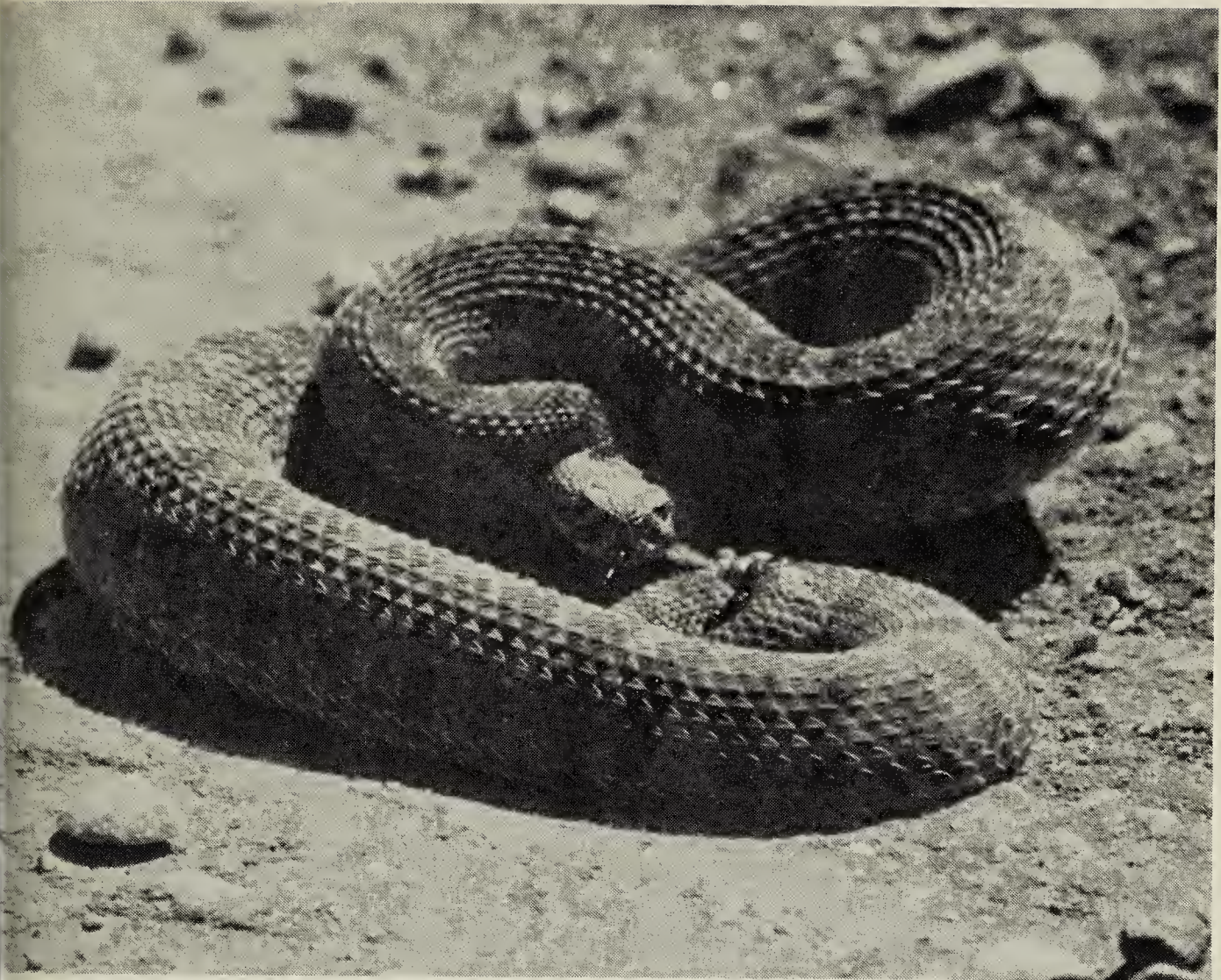
All but one of the 35 hibernacula investigated were located along these drainage systems. The exception was located on a minor drainage between the Milk and South Saskatchewan rivers.

Slump blocks, meander scarp, subterranean water channels and rock outcrops in these drainages supply suitable conditions for hibernation. The presence of deep fissures and subterranean cavities in these structures makes it possible for the rattlesnakes to communally hibernate below the frost line.

In addition to the structure, the orientation of the denning site is also important. The hibernaculum is usually located on a fairly steep south facing slope. This provides maximum solar insolation as well as some protection from the prevailing wind. This favorable microclimate reduces frost penetration and allows the rattlesnakes to be active a longer period of time.

The area surrounding the hibernacula showed a similar consistency. This area can be divided into two separate habitat zones: (1) the river valley complex, and (2) the surrounding prairie.

The topography and vegetation of the river valley complex tends to vary with the location. However, in general they consist of a series of steep erode



prairie rattlesnake

Gary W. Seib

hills surrounded by a mixed variety of grasses, forbs, shrubs and trees. These rather heterogeneous conditions tend to support a high species diversity and biomass of small mammals and birds. The relative abundance of prey species around the hibernaculum is another advantage incurred from this location.

The surrounding plain is typically unbroken short grass prairie. Plant dominants in these areas include Spear Grass, Blue Grama and Wheat Grass. Richardson's ground squirrel is particularly abundant on much of this land.

During the summer many adult rattlesnakes migrate onto the surrounding prairie. They are often observed crossing gravel roads and in field and pastures. Presumably this movement is in search of prey.

The geographical consistency of

structure and surrounding habitat of prairie rattlesnake hibernacula appears to restrict them to the major river drainages. Furthermore, they appear restricted to sections of these drainages where suitable denning sites are available. Availability appears to depend strongly on local topography and geomorphology. For example, the range of the prairie rattlesnake ends abruptly near Leader, Saskatchewan on the South Saskatchewan river; Rolling Hills, Alberta on the Bow river and Jenner, Alberta on the Red Deer river. In all three of these locations there is a coincident change in the topography and structure of the river valley. This strongly suggests that the availability of suitable denning sites may limit the geographical distribution of the prairie rattlesnake.

Studies by Cook, McKenna and

Pendlebury have reached similar conclusions.<sup>2 4 5</sup>

### Geographical Isolation and Speciation

In the New World there are 41 species and 76 subspecies in the family Crotalidae. The state of Texas alone has 15 species in this family. The reason for this great species diversity is a special result of their ecology.

Each species or subspecies is uniquely adapted to its local habitat. In a number of instances more than one species may occupy the same area but little competition occurs because of differences in habitat preference, food supply or activity.

Speciation, *i.e.* the creation of new species and subspecies, is thought to be the result of reproductive isolation of two populations of the same species. If some barrier such as geography prevents the interbreeding of two populations, a new species may develop. Each isolated population adapts independently to its own local environment. This results in morphological changes such as color and size as well as changes in behavior such as reproductive behavior and daily activity.

Rattlesnake populations are ideally suited for this type of speciation for a number of reasons. Communal hibernacula are discrete and often quite widely separated. It is therefore unlikely that much interbreeding occurs between denning populations. For example, Brown and Parker and others have shown the high fidelity of adult snakes to a particular denning site.<sup>1</sup> In addition, the size and means of locomotion of the animal severely restricts the amount of movement possible between dens. These conditions would certainly seem to restrict the amount of interbreeding and thus gene flow between denning populations.

Klauber has divided *Crotalus viridis* into nine subspecies based on morphological criteria such as squamation, coloration, size and body proportion.<sup>3</sup>

The distribution of the prairie rattlesnake in Saskatchewan and Alberta presents an interesting problem. The population segment along the South Saskatchewan river drainage and Missouri river drainage may be somewhat isolated from one another.

The level of gene flow between these population segments or for that matter within each segment is uncertain. Taxonomic and behavior studies are required to clarify the situation.

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<sup>1</sup>BROWN, W. S. and W. S. PARKER, 1970. Movement ecology of *Coluber constrictor* near communal hibernacula. *Copeia* 1976(2):225-242.

<sup>2</sup>COOK, F. R. 1965. Additions to the knowledge of some amphibians and reptiles in Saskatchewan. *Can. Field-Nat.* 79(2):111-120.

<sup>3</sup>KLAUBER, L. M. 1972. Rattlesnakes. University of California Press, Los Angeles. 2 vols. pp. 1-1533.

<sup>4</sup>McKENNA, M. G. and G. Allard. 1976. Rattlesnake Research. *North Dakota Outdoors* 1976:11-13.

<sup>5</sup>PENDLEBURY, G. B. 1977. Distribution and abundance of the prairie rattlesnake *Crotalus viridis viridis* in Canada. *Can. Field-Nat.* 91(2):122-129.