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HERPETOFAUNA OF THE SOUTHERN SNAKE RANGE OF NEVADA AND SURROUNDING VALLEYS

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In comparison with other North American deserts, the Great Basin has a depauperate herpetofauna consisting primarily of wide-ranging, habitat-generalist species (Stebbins 1985). Great Basin amphibians and reptiles are often placed into broad groups based on overall geographic distribution of the species, such as northern versus southern (Macey and Papenfuss 1991) or eastern versus western (Hovingh 1997). Many species occur only in the periphery of the Great Basin Desert, where they are restricted to pockets of suitable habitat (Tanner 1978). Although general biogeographic patterns can be seen, the subtle distributional nuances at local levels have yet to be elucidated for many species in the Great Basin (but see Hovingh 1997, Zamudio et al. 1997, Bos and Sites 2001). Distributions remain poorly understood due to the relatively large area encompassed and the scarcity of intensive inventory studies (e.g., Vindum and Arnold 1997). Here we discuss the results of a herpetological survey of the southern Snake Range and surrounding valleys conducted 20–25 May 2000.

The study area is situated in and around the southern Snake Range, including Great Basin National Park, in White Pine County, Nevada, and adjacent Millard County, Utah (Fig. 1). Physiography of the Snake Range is typical of the Basin and Range Province, being characterized by abrupt north–south trending mountains and their associated interconnecting valleys. The Snake Range is among the highest in the Great Basin with peaks exceeding 3000 m in elevation. Snake Valley lies to the east of the Snake Range and was formerly inundated by ancient Lake Bonneville (Mifflin and Wheat 1979, Hovingh 1997). Spring Valley flanks the western face of the Snake Range and is higher in elevation than Snake Valley (~1750 m compared to ~1525 m at low points on the respective valley floors). Spring Valley lies outside the Bonneville Basin but was periodically inundated during the Pleistocene by smaller, isolated pluvial lakes (Mifflin and Wheat 1979, Hovingh 1997).

Survey crews recorded over 400 observations of reptiles and amphibians during the course of this study. Most observations were recorded during visual surveys in appropriate habitat. Several additional observations resulted from driving roads at night and from inspecting beneath natural cover objects. We also attempted to listen for chorusing amphibians in wetland habitats; however, when using this technique, we did not detect any animals. At least one specimen of each species captured was taken as a voucher. These specimens are deposited at the California Academy of Sciences, San Francisco. Crews searched lower and middle elevations (below 2500 m) of 7 montane drainages of the southern Snake Range, concentrating efforts in the riparian zones and adjacent pinyon-juniper woodland of perennial streams draining the eastern slope of the southern Snake Range. We also surveyed various lower-elevation vegetative communities in Snake and Spring valleys.

We divided surveyed areas into 3 valley and 2 montane habitat categories: low desert scrub, sagebrush shrubland, wetland, pinyon-juniper woodland, and montane riparian, respectively. Low desert scrub consists of communities dominated by *Artemisia arbuscula, Atriplex* sp., *Sarcobatus vermiculatus,* and *Distichlis spicata.* This habitat is prevalent at low elevations in Snake Valley. We recorded

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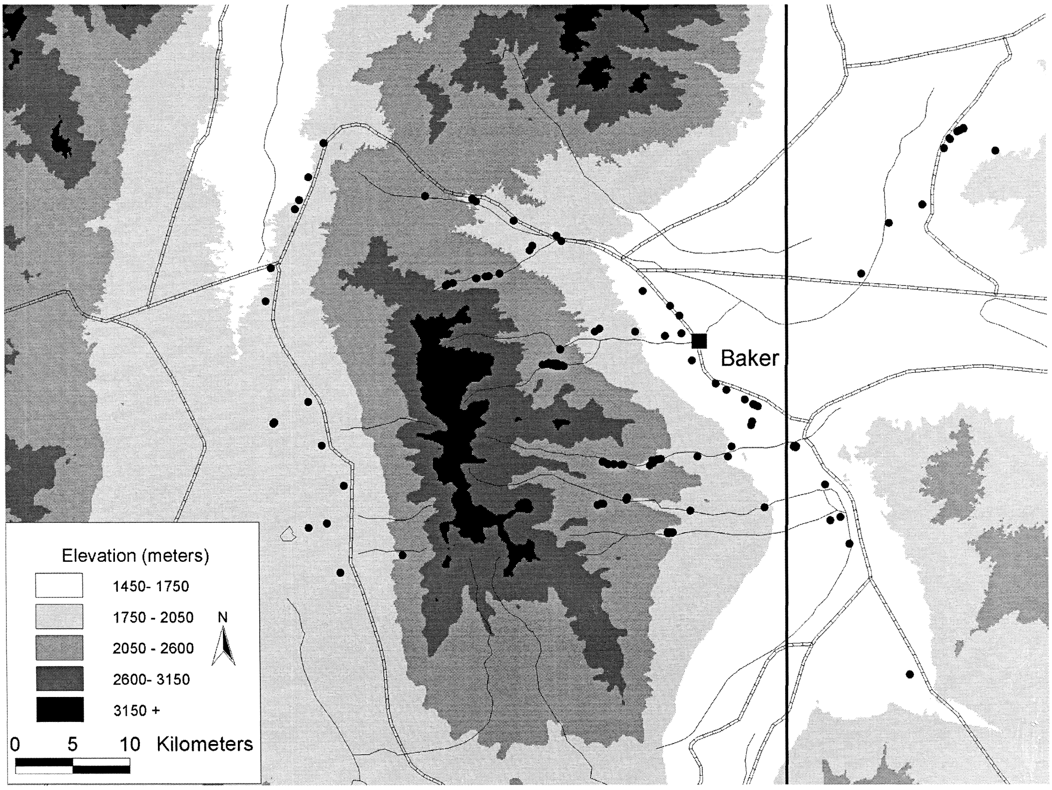

Fig. 1. Map of the southern Snake Range and surrounding valleys. Dots represent reptile and amphibian observation points, thus indicating areas surveyed. Thin lines represent major drainages, thick hatched lines represent roads, and the solid line is the Nevada-Utah state border.

Cnemidophorus tigris, Uta stansburiana, Phrynosoma platyrhinos, Crotaphytus bicinctores, Pituophis catenifer, Masticophis taeniatus, Hypsiglena torquata, Crotalus viridis, and *Spea intermontana* from this habitat (Table 1).

Sagebrush shrubland occurs at higher elevations in Snake Valley and is prevalent on both the floor and lower foothills of Spring Valley. *Artemisia tridentata* typically dominates in this habitat, but other taxa including *A. arbuscula, Atriplex* sp., *Sarcobatus vermiculatus, Ephedra* sp., and various grasses are locally abundant. We observed *Cnemidophorus tigris, Uta stansburiana, Sceloporus graciosus, S. occidentalis, Phrynosoma platyrhinos, P. hernandesi, Crotaphytus bicinctores, Gambelia wislizenii, Pituophis catenifer, Thamnophis elegans, Crotalus viridis,* and *Spea intermontana* in sagebrush shrubland (Table 1).

Several mixosaline wetlands occur in Spring and Snake valleys. These habitats chiefly consist of persistent palustrine emergent wetlands (Cowardin et al. 1978). Wetland complexes in Spring and Snake valleys include permanently flooded, intermittently exposed, semipermanently flooded, seasonally flooded, saturated, and temporarily flooded water regimes. These palustrine wetlands also include open water areas with a mixture of unconsolidated bottom and aquatic bed class wetlands. Open water habitats are generally small and shallow, and they comprise a small portion of the total wetland area. *Juncus* sp., *Scirpus* sp., *Carex* sp., and various grasses characterize these areas. We encountered 2 native species in low-elevation wetlands: *Thamnophis elegans* and *Rana pipiens*. A single introduced species, *R. catesbeiana,* was also seen in wetland habitat (Table 1). Both species of ranid frogs were seen only in low-elevation wetlands.

On the upper foothills and in the canyons of the Snake Range, woodlands of *Pinus monophylla* and *Juniperus osteosperma* replace shrubland communities. Within most eastern

TABLE 1. Number of observations of reptile and amphibian taxa by habitat in the southern Snake Range and surrounding valleys.

	Low desert scrub	Sagebrush shrubland	Pinyon-juniper wetland	Montane woodland	riparian	Total
Person hours searched	32.5	33.5	10.25	51.5	51	178.75
TEIIDAE						
Cnemidophorus tigris	11	5				16
PHRYNOSOMATIDAE						
Uta stansburiana	61	21		21		103
Sceloporus graciosus		41		76	2	119
Sceloporus occidentalis		8		28	1	37
Phrynosoma platyrhinos	16	2				18
Phrynosoma hernandesi		1				1
CROTAPHYTIDAE						
Crotaphytus bicinctores	1	1				2
Gambelia wislizenii		1				1
SCINCIDAE						
Eumeces skiltonianus				7	1	8
COLUBRIDAE						
Pituophis catenifer	9	16		3	2	30
Masticophis taeniatus	2			1	1	4
Hypsiglena torquata	1			1		2
Thamnophis elegans		1	4	4	31	40
VIPERIDAE						
Crotalus viridis	2	4		2	3	11
PELOBATIDAE						
Spea intermontana	3	2				5
RANIDAE						
Rana catesbeiana[a]			1			1
Rana pipiens			8			8
ALL TAXA	106	104	13	142	41	406

[a]Introduced species

slope drainages of the southern Snake Range, these pinyon-juniper woodlands are relatively dense, dominated by *P. monophylla,* and confluent with riparian vegetation along watercourses. We recorded the following species from these pinyon-juniper woodlands: *Sceloporus graciosus, S. occidentalis, Uta stansburiana, Eumeces skiltonianus, Pituophis catenifer, Masticophis taeniatus, Hypsiglena torquata, Thamnophis elegans,* and *Crotalus viridis* (Table 1). Although we recorded *U. stansburiana* from pinyon-juniper woodland habitat, all observations occurred in the open, juniper-dominated woodland of a single montane drainage.

Several perennial streams with well-developed riparian zones dissect the eastern slopes of the southern Snake Range. Riparian plant communities differ substantially between drainages. However, most drainages are dominated by various combinations of *Populus* sp., *Salix* sp., *Betula occidentalis,* and *Prunus virginiana. Abies concolor* is also prominent in higher-elevation riparian communities. We observed *Sceloporus graciosus, S. occidentalis, Eumeces skiltonianus, Pituophis catenifer, Masticophis taeniatus, Thamnophis elegans,* and *Crotalus viridis* in montane riparian areas (Table 1); however, only *T. elegans* appeared concentrated in this habitat. This contrasts with the observed trend among other snake species, which were relatively unrestricted by habitat. No amphibian species were detected in montane riparian habitats.

Species richness is greatest in sagebrush shrubland, followed by low desert scrub and pinyon-juniper woodland. Sagebrush shrubland represents an interface between higher-elevation montane woodland and low-elevation desert communities; most species encountered in the latter habitats were also found in sagebrush shrubland. Xeric-adapted lizard taxa typical of more southern North American deserts, such as *Cnemidophorus tigris, Uta stansburiana,* and *Phrynosoma platyrhinos,* were encountered more frequently in low desert scrub than in any other habitat. Fewer species were clustered in montane habitats. *Eumeces skiltonianus* was observed only at higher elevations, and we encountered *Sceloporus occidentalis* primarily in montane habitats with only isolated observations from rock outcrops at lower elevations in sagebrush shrubland.

Sceloporus graciosus is sympatric with *S. occidentalis* in montane habitats but also occurs extensively in sagebrush shrubland. In areas of sympatry, *S. occidentalis* was encountered only near rock outcrops and in areas with extensive rocky terrain, while *S. graciosus* occupied more varied microhabitats. We frequently observed *Uta stansburiana* in open, juniper-dominated woodland habitat within a single montane drainage; however, this species was not encountered in the relatively dense, pinyon-dominated woodland of other montane drainages surveyed. *Sceloporus graciosus* is sympatric with *U. stansburiana* within the montane drainage occupied by *U. stansburiana,* but it is apparently absent from the floor of Snake Valley, where the latter species was frequently encountered. Morrison and Hall (1999) also observed that *U. stansburiana* is associated with open, juniper-dominated areas within pinyon-juniper woodland at sites in the White-Inyo Range of eastern California.

We observed notable differences between the lizard assemblages of Snake and Spring valleys (Table 2), despite their being separated by <30 km. We frequently encountered *Uta stansburiana, Phrynosoma platyrhinos,* and *Cnemidophorus tigris* on the floor of Snake Valley. We also observed these species at higher elevations in sagebrush shrubland of Snake Valley, albeit less frequently. Although few individuals were located, we observed *Crotaphytus bicinctores* and *Gambelia wislizenii* only in Snake Valley. In contrast to the comparatively speciose lizard community observed in Snake Valley, only 2 lizard species were found in Spring Valley. We observed a single *P. hernandesi* from the floor of the valley and commonly observed *S. graciosus* at most sites surveyed in Spring Valley. Many taxa seen in big sagebrush–dominated areas of Snake Valley were not found in similar habitat of Spring Valley (Table 2).

In contrast, *Phrynosoma hernandesi* was located only in sagebrush shrubland on the floor of the Spring Valley and was not observed in sagebrush shrubland habitats in Snake Valley. Unsubstantiated reports of a *Phrynosoma* sp. exist from pinyon-juniper woodland on the eastern slope of the southern Snake Range (B. Hamilton personal communication). In addition, fossil records of *Phrynosoma douglasi* (likely *P. hernandesi,* sensu Zamudio et al. 1997) have been found on the eastern slope of the southern Snake Range and from northern Snake Valley (Mead et al. 1989). These records suggest *P. hernandesi* likely occurs on the eastern slope of the southern Snake Range and may also inhabit higher elevations of Snake Valley. Pianka and Parker (1975) noted that *P. hernandesi* and *P. platyrhinos* exhibit a complex distributional pattern at another site in the eastern Great Basin. Interactions between these congeners may also influence their distributions and habitat affinities in the valleys surrounding the southern Snake Range.

Differences between Spring and Snake Valley lizard assemblages cannot be attributed solely to disparity in elevation. All species found in Snake Valley were observed at elevations comparable to, or higher than, the floor of Spring Valley. This is particularly evident with *Uta stansburiana,* which occurs in the montane zone of at least one eastern slope drainage of the southern Snake Range. There are obvious differences in the vegetative communities of Snake and Spring valleys. The floor of Snake Valley is largely covered by open, low desert scrub dominated by *Artemisia arbuscula* and sparsely vegetated halophytic plant communities. Spring Valley lacks the extensive open desert vegetation characteristic of Snake Valley. Instead, the floor of Spring Valley includes large expanses of sagebrush shrubland and dense, comparatively mesic halophytic plant communities. The availability of dense shrub cover afforded by these communities may explain the presence of *Sceloporus graciosus* and *Phrynosoma hernandesi* at low elevations of Spring Valley.

Other dissimilarities exist between these valleys. Hotter and dryer than Spring Valley, Snake Valley is not bordered by a discreet, high-elevation mountain range to the east. Snake Valley contains rocky knolls with considerable topographical relief and is confluent with the remainder of the Bonneville Basin. Spring Valley is a comparatively narrow valley bordered on both sides by high-elevation ranges with a topographically uniform basin

TABLE 2. Presence of reptile and amphibian taxa in the southern Snake Range and surrounding valleys based on survey data.

	Snake Valley	Spring Valley	Snake Range[b]
Person hours searched	58.75	17.5	102.5
TEIIDAE			
Cnemidophorus tigris	X		
PHRYNOSOMATIDAE			
Uta stansburiana	X		1
Sceloporus graciosus	X	X	6
Sceloporus occidentalis	X		6
Phrynosoma platyrhinos	X		
Phrynosoma hernandesi		X	
CROTAPHYTIDAE			
Crotaphytus bicinctores	X		
Gambelia wislizenii	X		
SCINCIDAE			
Eumeces skiltonianus			3
COLUBRIDAE			
Pituophis catenifer	X	X	3
Masticophis taeniatus	X		1
Hypsiglena torquata	X		1
Thamnophis elegans	X	X	4
VIPERIDAE			
Crotalus viridis	X	X	2
PELOBATIDAE			
Spea intermontana	X	X	
RANIDAE			
Rana catesbeiana[a]	X		
Rana pipiens		X	

[a]Introduced species
[b]Values represent the number of montane drainages (of 7 surveyed) from which each taxon was recorded.

floor, as is typical of valleys in the interior Great Basin. Some interaction of elevation, vegetation, temperature, and moisture likely accounts for the apparent absence of xeric-adapted lizard species, such as *Cnemidophorus tigris, Uta stansburiana,* and *Phrynosoma platyrhinos,* in Spring Valley and their presence in Snake Valley.

Many xeric-adapted taxa are widespread in the lower-elevation Bonneville and Lahontan basins of the eastern and western Great Basin but are restricted in (or absent from) the interior of the Great Basin (Banta 1962, Stebbins 1985). Although data on herpetofaunal distributions in the Snake Range region remain limited, we believe that the observed difference between lizard taxa of Snake and Spring valleys reflects a real difference in lizard community composition. The Snake Range may mark the eastern edge of the high-elevation, interior Great Basin that lacks components of the xeric-adapted herpetofauna typical of southern North American deserts.

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LITERATURE CITED

BANTA, B.H. 1962. Preliminary remarks upon the zoogeography of the lizards inhabiting the Great Basin of the western United States. Wasmann Journal of Biology 20:253–285.

BOS, D.H., AND J.W. SITES, JR. 2001. Phylogeography and conservation genetics of the Columbia spotted frog [*Rana luteiventris*; Amphibia, Ranidae]. Molecular Ecology 10:1499–1513.

COWARDIN, L.M., V. CARTER, F.C. GOLET, AND E.T. LAROE. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service Report. FWS/OBS/-79/31. Washington, DC.

HOVINGH, P. 1997. Amphibians of the eastern Great Basin (Nevada and Utah, USA): a geographical study with paleozoological models and conservation implications. Herpetological Natural History 5:97–134.

MACEY, J.R., AND T.J. PAPENFUSS. 1991. Amphibian and reptile biogeography. Pages 293–303 *in* C.A. Hall, Jr., editor, Natural history of the White-Inyo Range, eastern California. University of California Press, Berkeley.

MEAD, J.I., T.H. HEATON, AND E.M. MEAD. 1989. Late Quaternary reptiles from two caves in the east-central Great Basin. Journal of Herpetology 23:186–189.

MIFFLIN, M.D., AND M.M. WHEAT. 1979. Pluvial lakes and estimated pluvial climates of Nevada. Nevada Bureau of Mines and Geology Bulletin 94:1–57.

MORRISON, M.L., AND L.S. HALL. 1999. Habitat characteristics of reptiles in pinyon-juniper woodland. Great Basin Naturalist 59:288–291.

PIANKA, E.R., AND W.S. PARKER. 1975. Ecology of horned lizards: a review with special reference to *Phrynosoma platyrhinos.* Copeia 1:141–162.

STEBBINS, R.C. 1985. Western reptiles and amphibians. 3rd edition. Houghton Mifflin Company, New York. 336 pp.

TANNER, W.W. 1978. Zoogeography of reptiles and amphibians in the Intermountain Region. *In:* K.T. Harper and J.L. Reveal, editors, Intermountain biogeography: a symposium. Great Basin Naturalist Memoirs 2:43–54.

VINDUM, J.V., AND E.N. ARNOLD. 1997. The northern alligator lizard (*Elgaria coerulea*) from Nevada. Herpetological Review 28:100.

ZAMUDIO, K.R., K.B. JONES, AND R.H. WARD. 1997. Molecular systematics of short-horned lizards: biogeography and taxonomy of a widespread species complex. Systematic Biology 46:284–305.

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