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## SCORPIONS OF UTAH

John D. Johnson<sup>1</sup> and Dorald M. Allred<sup>2</sup>

ABSTRACT.— The 736 scorpions representing nine species collected in Utah, listed in order of greatest to least abundance, are *Vaejovis boreus*, *V. utahensis*, *Anuroctonus phaeodactylus*, *V. confusus*, *Hadrurus spadix*, *V. becki*, *V. wupatkiensis*, *H. arizonensis* and *Centruroides sculpturatus*. *Centruroides sculpturatus*, *H. arizonensis*, *V. becki*, *V. confusus* and *V. wupatkiensis* are reported from Utah for the first time. *Vaejovis boreus* is the most widely distributed of the Utah scorpions. *Vaejovis boreus* and *V. confusus* occur in both the Great Basin and the Colorado River Basin. *Centruroides sculpturatus*, *Hadrurus arizonensis*, *H. spadix*, *V. wupatkiensis*, and *V. utahensis* occur only in the Colorado River Basin, whereas *Anuroctonus phaeodactylus* and *V. becki* are confined to the Great Basin. *Anuroctonus phaeodactylus*, *V. boreus* and *V. confusus* occur from the southern to the northern border of the state.

Both males and females were taken from May through October, with greatest numbers in May, June, and July. Females were taken in greater numbers than males. This may be related to their mating habits during the collecting periods, and does not necessarily indicate other than a 1:1 ratio in normal populations.

Morphological variations associated with distribution were distinguishable in two of the species collected—*Anuroctonus phaeodactylus* and *Vaejovis boreus*. The mean and standard error computed for the carapace, preabdomen, postabdomen, and telson on these two species indicate a significant morphological variation in the size of the preabdomen between the northern and southern populations.

Scorpions first collected from Utah were taken by Stansbury during the late 1840's, but none were named until 1854 (Ewing, 1928). Nothing more was published on scorpions of this region until Banks (1900) listed several species. However, most of Bank's records were of specimens from the Marx collection (now in the U.S. National Museum), which were incorrectly labelled and misidentified (Gertsch and Soleglad, 1966). Although more interest was shown in scorpions since the turn of the century, little published information and pertinent collecting data for Utah are existent. Studies by Stahnke (1950) and Williams (1966) dealt with scorpions of the western United States, but only those by Gertsch and Soleglad (1966) and Gertsch and Allred (1965) refer to Utah taxa.

Although scorpions are occasionally seen in desert areas of the western United States, few systematic studies have been made. Most specimens collected heretofore in Utah have been used for exhibit and teaching in high schools and universities, and their collection data is not existent or available. Specimens from Brigham Young University, supplemented by collections made by the senior author, constitute the basis for this listing of species from Utah, their geographic distribution, seasonal occurrence, and sex ratio, and notes on some morphological variations associated with distribution. Specimens from other institutions, if existent, were not obtainable.

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Dr. Stanley C. Williams, San Francisco State College, verified and/or identified some specimens. Financial assistance was provided, in part, by a Karl G. Maeser Research Award given to Drs. D Elden Beck and Donald M. Allred by the Alumni Association of Brigham Young University, shortly before Dr. Beck's untimely death in August, 1967. The Department of Zoology, Brigham Young University, supplied laboratory space, equipment, supplies, and some transportation.

### Procedures

Scorpions were collected from the eastern part of the Great Basin and western area of the Colorado River Basin within the political boundaries of Utah. The ecology and topography of these basins were described by Durrant (1952), Hayward, Beck, and Tanner (1958), Allred, Beck, and Jorgensen (1963), and Allred (1968) as high, inland plateaus separated by mountain ranges. These mountains begin at the northwest corner of Wyoming and extend southward approximately two-thirds the length of Utah, then westward to the southwest corner of the state. They are among the highest in Utah with elevations from 9,000 to 12,000 ft. Within each of the two basins are lower mountain ranges oriented in north-south directions.

Scorpions already existent in collections had been taken by their collectors principally during daylight hours under rocks and other ground cover. Most of the ones being reported herein were captured at night by use of the ultraviolet light technique described by Honetschlager (1965).

Measurements for comparison and identification were taken in the following manner. The total length is from the anterior tip of the carapace to the posterior tip of the cauda, excluding the telson. The length of the cauda is from the anterior margin of the first caudal segment to the posterior margin of the fifth segment, excluding the telson. The length of the pedipalp is from the proximal end of the femur to the distal end of the fixed finger, excluding the coxa and trochanter. The length of the chela includes the palm and fixed finger as a single unit.

Adult scorpions were identified by use of keys by Ewing (1928), Comstock (1948), Gertsch and Allred (1965), Gertsch and Soleglad (1966), and Williams and Hadley (1967). Specific keys are not available for the identification of immature specimens, but morphological characteristics of most young are so similar to those of the adults that they can be assigned to species.

The mean and standard error ( $\bar{x}$ ,  $s$ ) were computed to determine statistical significance in variation (95 percent level) between different populations.

Collectors of the scorpions reported in this study are indicated by their initials as follows:

BB	B. Bradley	CC	C. Cottam
BM	B. McMorris	CH	C. L. Hayward, et al.
BL	B. R. Lemora	DA	D. M. Allred
BW	B. Weston	DB	D E. Beck

DU	D. Usher	LH	L. Hook
EC	E. Cottam	MD	M. Dumas
FC	F. Camenzind	MK	M. Killpack
FH	F. Harmston	PH	P. Hastings
GH	G. M. Harmston	SD	S. C. Daines
GK	G. F. Knowlton	SO	S. Oliver
HV	H. E. Vokes	VT	V. M. Tanner
JF	J. Finley	WG	W. J. Gertsch
JJ	J. D. Johnson	WR	W. Robertson
JR	J. A. Rowe and C. F. Smith		

KEY TO SCORPIONS OF UTAH AND SOUTHERN NEVADA

1. Middle lamellae of pectine consists of five or fewer irregularly-shaped, rectangular segments (Fig. 1) ..... 2  
 Middle lamellae of pectine consists of six or more regularly-shaped, oval segments (Fig. 2) ..... 3
2. Ridges on fingers of pedipalps black; telson abruptly constricted near base of aculeus (Fig. 3); medioventral margin of moveable finger of chelicera with conspicuous brush of hair on basal part ..... *Anuroctonus phaeodactylus*  
 Ridges on fingers of pedipalps same color as rest of finger; telson not abruptly constricted (Fig. 4); medioventral margin of moveable finger of chelicera with light fringe of hair ..... *Superstitionia donensis*
3. Medioventral margin of moveable finger of chelicera with one or two large, conspicuous, dark teeth (Fig. 5) ..... 4  
 Medioventral margin of moveable finger of chelicera lacks large teeth, but often finely serrate or irregular (Fig. 6) .. 6
4. Medioventral margin of moveable finger of chelicera with two large teeth; telson with subaculear spine (Fig. 7) ..... *Centruroides sculpturatus*  
 Medioventral margin of moveable finger of chelicera with one large tooth; telson lacks subaculear spine (Fig. 4) ..... 5
5. Interocular area of carapace pale, much lighter than dark color of rest of carapace ..... *Hadrurus arizonensis*  
 Interocular area of carapace dark brown or black, same color as rest of carapace ..... *Hadrurus spadix*
6. Palm of pedipalp has prominent, granulose keels; inner margin of fixed finger of pedipalp strongly crenulate (Fig. 8) ..... 7  
 Palm of pedipalp essentially smooth, keels not prominent; inner margin of fixed finger of pedipalp straight or only slightly crenulate (Fig. 9) ..... 8
7. Palm of pedipalp approximately twice as long as wide;

- telson smooth; fixed finger of pedipalp about same length as palm (Fig. 10) ..... *Vaejovis becki*
- Palm of pedipalp less than one and one-half times as long as wide; telson lightly granulate, especially near base; fixed finger of pedipalp shorter than length of palm ..... *Vaejovis boreus*
8. Venter of telson densely covered with long hairs (Fig. 11) ..... *Vaejovis hirsuticauda*
- Telson with only a few long hairs (Fig. 4) ..... 9
9. Palm of pedipalp not over one and one-half times as long as wide ..... *Vaejovis utahensis*
- Palm of pedipalp twice as long as wide ..... 10
10. Venter of telson conspicuously granulate over most of area (Fig. 12) ..... *Vaejovis confusus*
- Venter of telson granulate essentially only at base, and then only lightly so (Fig. 13) ..... *Vaejovis wupatkiensis*

*Anuroctonus phaeodactylus* (Wood)

*Centrurus phaeodactylus* Wood, 1863, Proc. Acad. Nat. Sci. Philadelphia, p. 111; 1863, J. Acad. Nat. Sci. Philadelphia (2)5:372.

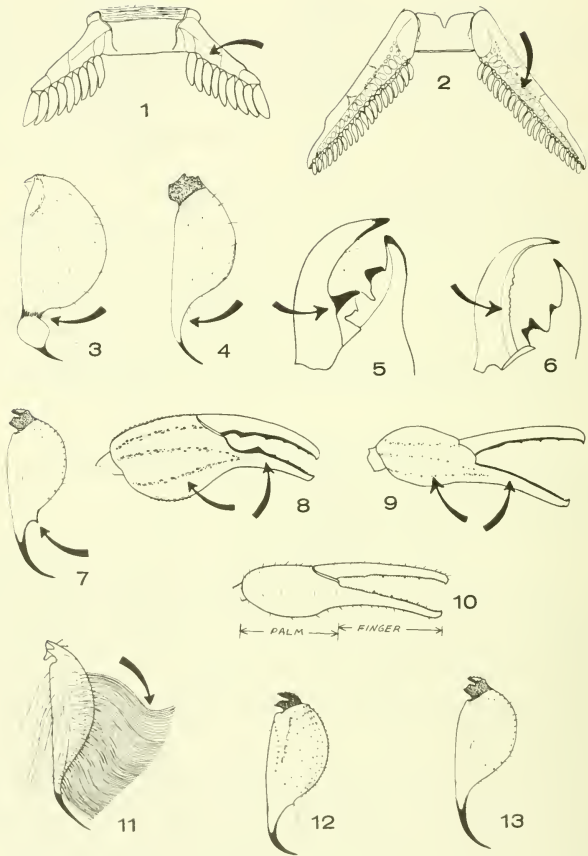
*Anuroctonus phaeodactylus* Pocock, 1902, Biol. Centrali-Americana, Arachnida, Scorpions, Pedipalpi and Solfugae, p. 14.

In Utah, scorpions of this species occur over the entire length, but not the width, of the state. Forty-seven specimens were collected from the Great Basin, but none were found in the Colorado River Basin (Fig. 14, Table 1). Six times as many males as females were collected, mainly because females were seen only at the entrance of their burrows, and their quick movements made capture difficult. This species is also known from California, Colorado, Nevada, Virginia, Baja California, and Guatemala (Pocock, 1902; Gertsch and Allred, 1965).

This species in Utah is surpassed in length only by *Hadrurus arizonensis* and *H. spadix*. It may be distinguished from other species in Utah by its relatively stout appearance, heavy pedipalps bearing short, black fingers, and by a bulbous swelling posterior to the vesicle on the telson in males. On some small males the sting is extended as an evenly-curved spine, and resembles that of the female.

These scorpions typically are burrowing animals that exhibit a high degree of aggregation; they are not randomly distributed as individuals, but occur in scattered colonies in relatively large numbers (Williams, 1966).

The mean and standard error were computed for morphological variations of the carapace, preabdomen, postabdomen and telson for specimens of two groups—those from northern Utah and those from



Figs. 1-13. (1) Pectines with rectangular, middle lamellae; (2) pectines with oval, middle lamellae; (3) telson of *Anuroctonus phaeodactylus*; (4) telson which lacks aculear constriction; (5) ventral view of chelicera with large tooth on moveable finger; (6) ventral view of chelicera with serration in place of large tooth on moveable finger; (7) telson with ventral spine at base of aculeus; (8) pedipalp with crenulated, fixed finger; (9) pedipalp with non-crenulated, fixed finger; (10) pedipalp with designated limitations of palm and fixed finger; (11) telson of *Vaejovis hirsuticauda*; (12) telson with conspicuous granulation; (13) telson which essentially lacks conspicuous granulation.

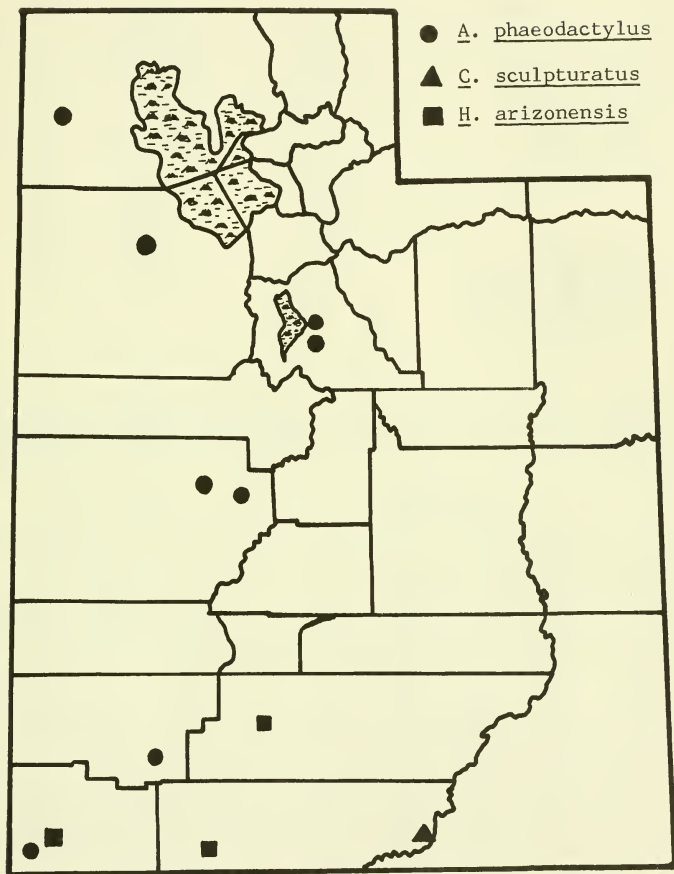


Fig. 14. Distribution of *Anuroctonus phaeodactylus*, *Centruroides sculpturatus* and *Hadrurus arizonensis* in Utah.

southern Utah (Figs. 15-18, Table 2). No significant differences occurred in the lengths of the carapace, postabdomen or telson at the 95 percent level of confidence, but a significant difference in the length of the preabdomen (1.24 mm) was evident between the two populations.

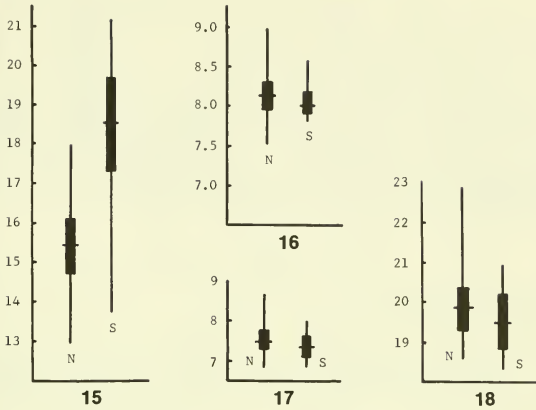
TABLE 1. Collection data for *Anuroctonus phaeodactylus* in Utah.

County and location	Date	No. and sex	Collector
Box Elder, Lucin	7-VII-68	16 m, 1 f	JJ
Iron, Cedar City	4-VI-68	5 m	JJ
Millard, Holden	1-VI-68	1 m	JJ
Clear Lake	3-VI-68	14 m, 3f	JJ
Tooele, Knolls	5-VII-68	1 m	JJ
Utah, Provo	VII-58	1 m	DB
	VIII-58	1 m	DB
	X-67	1 m	GH
	V-28	1 f	DB
Spanish Fork			
Springville	unknown	1 m	JF
Washington, 10 mi S. Shivwits Indian Res. on U.S. Hwy 91	6-VI-68	1 m	JJ

TABLE 2. Length of the carapace, preabdomen, postabdomen, and telson of 20 *Anuroctonus phaeodactylus* from northern Utah and 20 from southern Utah, with computation of the mean and standard error.

	Northern Utah				Southern Utah			
	Car.	Preab.	Postab.	Tel.	Car.	Preab.	Postab.	Tel.
	8.0	16.7	19.3	7.8	8.2	18.8	20.0	8.0
	8.0	15.7	19.9	7.4	8.9	13.7	20.7	7.8
	8.2	16.2	20.0	7.5	8.4	19.9	20.6	7.8
	7.9	17.7	18.6	7.0	8.1	20.7	20.9	8.0
	7.9	13.8	19.5	7.5	7.8	13.9	19.2	7.4
	8.1	15.9	18.8	7.0	7.8	21.2	19.7	6.9
	7.8	15.4	18.8	7.5	7.8	18.6	18.3	7.0
	7.7	15.4	19.1	7.3	8.3	20.9	20.0	7.8
	8.2	17.6	19.2	7.6	7.9	19.7	19.0	7.4
	7.8	13.9	18.6	7.3	8.0	21.1	19.4	7.2
	8.2	14.2	19.2	7.1	7.8	20.8	18.7	7.0
	8.1	16.4	19.3	7.5	8.2	20.6	19.2	7.3
	7.9	18.0	20.0	7.6	8.3	19.8	19.2	6.8
	7.8	15.1	19.0	7.1	8.4	16.0	20.8	7.6
	7.5	14.9	18.7	6.8	7.7	18.7	19.7	7.0
	8.9	17.0	21.4	8.3	7.8	17.8	18.4	6.9
	8.5	13.0	21.7	7.7	8.0	18.5	19.0	7.3
	8.8	13.0	21.7	7.8	8.0	17.0	19.1	7.2
	8.5	12.9	22.9	8.7	7.9	14.0	19.8	7.6
	9.0	14.3	21.0	7.9				
Mean	8.14	15.38	19.81	7.52	8.10	18.51	19.53	7.37
SE	±.19	±.72	±.55	±.21	±.13	±1.17	±.68	±.23





Figs. 15-18. The mean, standard deviation and range of length (in mm) of the (1) preabdomen; (2) carapace; (3) telson; (4) postabdomen of *Anurocrotalus phaeodactylus* from northern and southern Utah.

### *Centruroides sculpturatus* Ewing

*Centruroides sculpturatus* Ewing, 1928, Proc. U.S. Nat. Mus. 73(2730):20-21

Members of the species *Centruroides sculpturatus* occur abundantly throughout southern Arizona (Ewing, 1928), and recent records have noted their occurrence in Puerto Penasco, Sonora, Mexico (Williams and Hadley, 1967). In Utah, two females were collected by D. E. Beck from Hole-in-the-Rock, Kane County, May, 1953 (Fig. 14). This is the only known record of this species in Utah.

These are medium-sized scorpions, comparable in length to those of *Vaejovis boreus*. The base color is yellow to orange-brown, without markings on the body. In general appearance they resemble *V. wupatkiensis*, but are much longer and have a wider preabdomen. The fingers of the chelae are long, but not as narrow and slender as in *V. wupatkiensis*. Members of this species may be distinguished from others in Utah by their relatively long postabdomen and distinct tooth at the base of the vesicle on the telson.

### *Hadrurus arizonensis* Ewing

*Hadrurus hirsutus arizonensis* Ewing, 1928, Proc. U.S. Nat. Mus. 73:8.

*Hadrurus arizonensis* Stahnke, 1945, Amer. Mus. Novitates, no. 1298, p. 6.

Scorpions of this species are known from Arizona, southern Nevada, southern California, and southward into Sonora, Mexico (Gertsch and Allred, 1965). This is the first time they have been

reported from Utah. Three specimens were collected from the Colorado River Basin area of Utah; none were taken from the Great Basin (Fig. 14, Table 3).

The genus *Hadrurus* contains the largest Utah scorpions. The two species which occur in Utah, *H. arizonensis* and *H. spadix*, are similar in length (up to 100 mm in the adult), and both are covered with red bristles. Specimens of *H. arizonensis* may be distinguished from those of *H. spadix* by their overall lighter coloring and the presence of a yellow interocular space extending from the median eyes to the anterior edge of the carapace.

*Hadrurus spadix* Stahnke

*Hadrurus spadix* Stahnke, 1940, Iowa State College J. Sci. 15:102; 1945, Amer. Mus. Novitates, no. 1298, p. 4.

These animals are known from Nevada, California, and eastern Oregon (Gertsch and Allred, 1965). Eighteen adults and immatures were collected in the Colorado River Basin of Utah. Males and females were taken in a ratio of 1:1 (Fig. 19, Table 4).

Scorpions of this species are structurally similar to those of *H. arizonensis*, and color is the only distinguishing characteristic. Members of *H. spadix* are dark brown, almost black, and lack the yellow interocular space described for those referable to *H. arizonensis*.

TABLE 3. Collection data for *Hadrurus arizonensis* in Utah.

County and location	Date	No. and sex	Collector
Garfield, Calf Creek	X-46	1 f	BL
Kane, Kanab	6-V-66	1 m	SD
Washington, St. George	1920	1 m	VT

TABLE 4. Collection data for *Hadrurus spadix* in Utah.

County and location	Date	No. and sex	Collector
Garfield, North Wash	V-55	2 m	MD
Grand, Arches Nat. Mon.	VIII-50	1 f	DA
Moab	20-VI-68	2 m	JJ
Kane, Hole-in-the-Rock	16-V-53	1 m	DB
San Juan, Navajo Mt.			
Trading Post	2-V-55	1 m, 4 f	DB, CH
Glen Canyon	17-V-68	2 f	BM
Canyonlands Nat. Park (Needles campground)	21-VI-68	1 m, 2 f	JJ
Washington, Zion Nat. Park	7-VII-28	1 f	VT

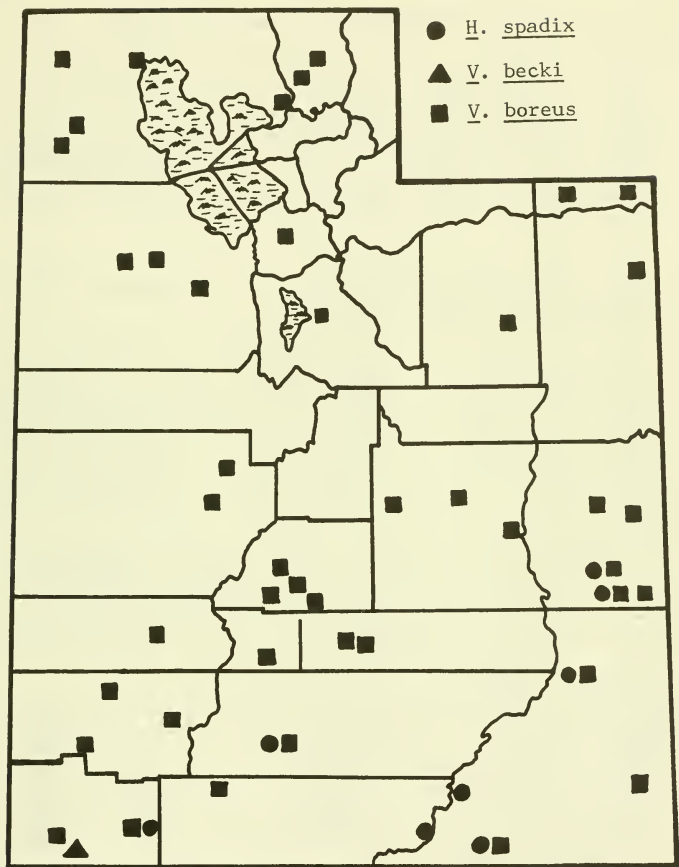


Fig. 19. Distribution of *Hadrurus spadix*, *Vaejovis becki* and *V. boreus* in Utah.

*Vaejovis becki* Gertsch and Allred

*Vaejovis* Koch, 1836; Williams, 1971, Pan-Pacif. Entomol. 47(1):78-79.

*Vaejovis becki* Gertsch and Allred, 1965, Brigham Young Univ. Sci. Bull., Biol. Ser. 5(4):9-11.

Members of this species are known from southern Nevada and adjacent California (Gertsch and Allred, 1965). In Utah, six males

and seven females were taken at St. George, Washington County, 5-VI-1968 (Fig. 19). This is the first time *V. becki* has been reported in Utah.

*Vaejovis becki* closely resembles *V. boreus*, but lacks the characteristic markings and robust, heavily granulated hands of *V. boreus*. The base color is yellow to orange-brown. They may be distinguished from other species in Utah by the presence of a dusky patch enclosing the median eyes, which radiates forward almost to the anterior edge of the carapace. No other markings are present on the body.

*Vaejovis boreus* (Girard)

*Scorpio (Telegonus) boreus* Girard, 1854, in Marcy, Exploration of the Red River of Louisiana in the year 1852, p. 257.

*Vaejovis boreus* Ewing, 1928, Proc. U.S. Nat. Mus. 73(9):12.

*Vaejovis boreus* is known from California, Arizona, Colorado, Wyoming, Idaho, Oregon, Washington, Montana, and North Dakota in the United States, and British Columbia, and Alberta, in Canada (Gertsch and Soleglad, 1966). It is the most common and most widely distributed of all scorpions in Utah. It occurs in both the Great Basin and the Colorado River Basin. In Utah it occurs from the southern to the northern border of the state. Four hundred and one specimens were taken in Utah. Males and females were collected in a ratio of 1:1.9 (Fig. 19, Table 5).

This species is medium-sized, comparable in length to *V. confusus*. It is the fourth largest species in Utah, surpassed in length only by *Hadrurus arizonensis*, *H. spadix*, and *Anuroctonus phaeodactylus*. It may be distinguished from other species in Utah by the characteristic markings on the carapace and preabdomen, and the robust,

Table 5. Collection data for *Vaejovis boreus* in Utah.

County and location	Date	No. and sex	Collector
Beaver, Milford	20-IV-30	1 f	VT
Box Elder, Brigham City	VIII-28	2 f	WR
Grouse Creek foothills	VI-28	1 f	VT
Lucin	19-VI-52	2 f	DB
Locomotive Springs	19-VI-52	1 m	DB
Utah Hwy 70, on Grouse Creek Road	7-VI-68	2 m, 4 f	JJ
Cache, Blacksmith			
Fork Canyon	9-VII-35	1 f	JR, CS
Logan	26-VIII-36	1 f	FH
Daggett, Sheep Creek	VI-26	1 f	EC
Flaming Gorge	28-VI-26	1 f	EC
Duchesne, Roosevelt	5-VII-68	11 m, 12 f	JJ
Emery, Ferron	IX-28	2 f	WR
Buckhorn Canyon	6-IX-53	4 f	VT

TABLE 5. (continued)

Green River	7-IV-46	2 f	GK
	7-V-46	1 f	GK
	6-IX-46	1 m, 5 f	HV
	18-VI-68	11 m, 13 f	JJ
Garfield, North Wash	V-55	3 f	MD
Grand, Arches Nat. Mon.	12-V-48	1 f	DB
	3-V-68	10 m, 70 f	JJ
	20-VI-68	2 m, 20 f	JJ
Moab	10-VII-67	1 f	DU
Cisco	18-VI-68	6 m, 7 f	JJ
Castle Valley	19-VI-68	11 m, 14 f	JJ
Sego	28-IV-68	1 f	BW
Iron, Parowan	31-VIII-29	1 m	VT
Newcastle	5-VI-68	4 m, 5 f	JJ
Lund	5-VI-68	4 m, 5 f	JJ
Kane, Johnson Canyon	30-VIII-53	4 f	VT
Millard, Delta	2-VI-68	2 m, 9 f	JJ
14 mi S Deseret	4-VI-68	3 m, 10 f	JJ
Piute, Kingston	25-VI-52	1 m, 1 f	DB
Salt Lake, Salt Lake	22-VI-30	1 m, 2 f	JR
San Juan, Navajo Mt.			
Trading Post	5-V-55	1 m, 1 f	CH
Canyonlands Nat. Park (Needles campground)	22-VI-68	3 m, 18 f	JJ
Hatch Trading Post	23-VI-68	1 f	JJ
Sevier, Richfield	19-VI-47	1 f	DB
	15-V-40	1 m, 5 f	WG
Sevier Canyon	19-VII-40	1 f	WG
2 mi E Glenwood	30-VI-40	1 f	WG, LH
Fishlake	22-VI-30	1 m	WG
Paradise Valley	10-VIII-52	1 f	MK
Tooele, Skull Valley	19-IV-39	1 f	GK
Desert Range Exp. Sta.	9-XI-50	2 f	DB
Knolls	5-VII-68	1 m, 9 f	JJ
Delle	5-VII-68	6 m, 9 f	JJ
Uinta, Dinosaur Nat. Mon. (Quarry)	21-V-50	2 f	VT
	6-VII-68	19 m, 26 f	JJ
Utah, Provo	XI-28	1 m	VT
Washington, St. George	19-III-31	1 m, 1 f	VT
	29-III-31	2 f	VT
Zion Nat. Park	9-VI-68	3 f	JJ
Wayne, Fruita	17-VII-31	2 f	WG
Torrey	17-VI-38	3 f	DB, VT
	7-VIII-52	1 f	MK

TABLE 6. Length of the carapace, preabdomen, postabdomen, and telson of 20 *Vaejovis boreus* from northern and 20 from southern Utah, with computation of the mean and standard error.

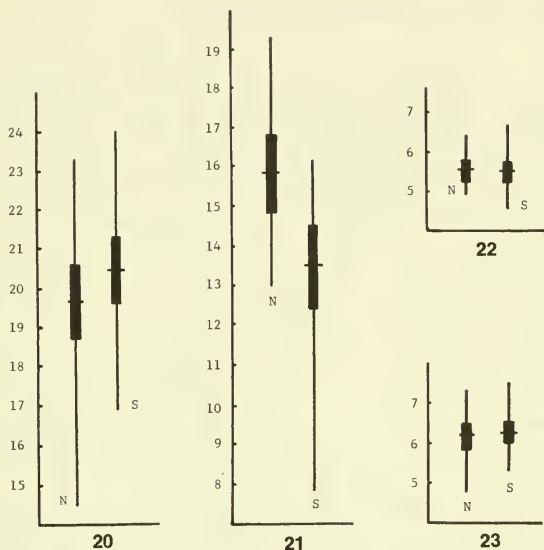
	Northern Utah				Southern Utah			
	Car.	Preab.	Postab.	Tel.	Car.	Preab.	Postab.	Tel.
	4.9	16.4	18.0	6.0	5.0	15.1	19.2	6.0
	4.9	14.5	16.9	5.6	5.3	16.2	19.7	6.0
	6.0	17.0	23.3	7.0	5.7	11.3	21.2	6.2
	4.6	13.9	14.5	4.7	5.6	12.9	20.0	6.9
	5.5	17.7	20.0	6.1	5.6	7.8	19.0	6.1
	6.0	19.1	21.9	6.9	6.4	12.7	24.0	7.5
	6.4	19.4	21.4	6.8	5.9	10.6	22.5	6.7
	5.5	13.8	19.0	6.0	5.3	13.8	21.5	6.3
	5.8	15.5	21.3	6.0	5.7	15.3	21.8	6.3
	5.8	13.0	19.5	6.1	5.7	13.2	22.8	6.7
	5.8	15.2	20.6	6.4	5.2	13.0	19.2	6.0
	5.7	19.0	20.5	6.0	5.2	13.0	19.4	5.9
	4.9	13.8	18.2	5.7	4.5	11.2	17.8	5.2
	5.3	13.5	19.9	6.4	5.3	15.0	21.4	6.3
	5.4	15.0	19.0	5.8	4.9	14.6	19.0	5.7
	6.0	15.6	21.0	6.9	4.9	12.3	13.5	5.7
	5.7	17.9	19.3	6.2	4.8	14.5	16.9	5.2
	5.0	12.0	16.9	5.3	6.7	18.9	22.8	6.9
	5.6	16.8	19.3	6.2	6.7	12.6	22.6	6.6
	6.4	17.7	23.0	7.3	5.8	15.9	20.0	6.1
Mean	5.53	15.84	19.68	6.17	5.51	13.50	20.47	6.22
SE	±.26	±.99	±.97	±.28	±.27	±1.08	±.87	±.26

coarsely granulated pedipalps. The base color is pale yellow. Specimens from northern Utah, when compared with those from southern Utah, were not significantly different at the 95 percent level (Figs. 20-23, Table 6) in the length of the carapace, postabdomen, and telson. However, a significant difference of 0.27 mm in the length of the preabdomen was present between populations.

#### *Vaejovis confusus* Stahnke

*Vaejovis confusus* Stahnke, 1940, Iowa State College J. Sci. 15:101.

This species is known from southern Nevada (Gertsch and Allred, 1965) and southern California (Williams and Hadley, 1967). This is the first time *V. confusus* has been reported from Utah. Twenty-three specimens representing adults and immatures were collected from localities in the Great Basin and the Colorado River Basin. Males and females were taken in a ratio of 1:3.6. This species occurs along the entire length of the state (Fig. 24, Table 7).



Figs. 20-23. The mean, standard deviation and range of length (in mm) of the (1) postabdomen; (2) preabdomen; (3) carapace; (4) telson of the *Vaejovis boreus* from northern and southern Utah.

TABLE 7. Collection data for *Vaejovis confusus* in Utah.

County and location	Date	No. and sex	Collector
Box Elder, Lucin	7-VII-68	2 f	JJ
Grand, Arches Nat. Mon.	20-VI-68	1 m	Unknown
Millard, Holden	1-VI-68	4-f	JJ
Clear Lake	3-VI-68	3 m, 5 f	JJ
San Juan, Canyonlands			
Nat. Park (Tower Ruins)	22-VI-68	1 m, 4 f	JJ
Monument Valley	24-VI-68	1-f	JJ
Utah, Orem	20-V-68	1 f	SO
Washington, St. George	5-VI-68	1 f	JJ

*Vaejovis confusus* closely resembles *V. wupatkiensis* in general appearance, but *V. confusus* is slightly larger and lighter in color. It may be distinguished from other species in Utah by the lack of definite markings on the body, a relatively thick, fifth caudal segment, relatively long pincers on the pedipalps, and a coarsely-granulated, robust telson bearing a short sting.

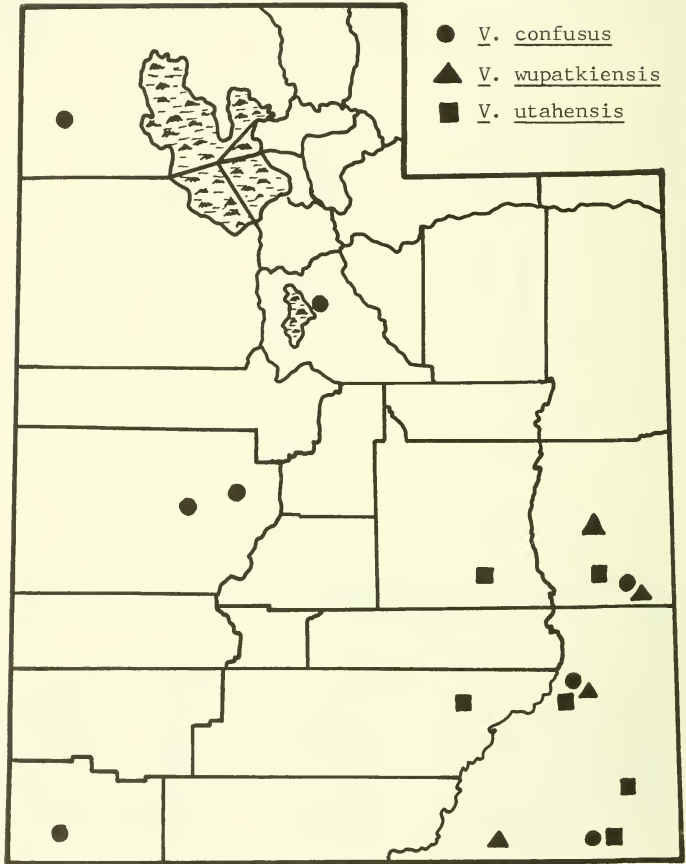


Fig. 24. Distribution of *Vaejovis confusus*, *V. wupatkiensis* and *V. utahensis* in Utah.

*Vaejovis wupatkiensis* Stahnke

*Vaejovis wupatkiensis* Stahnke, 1940, Iowa State College J. Sci. 15:101.

This species is known from northern Arizona, and westward into Nevada and adjacent California (Gertsch and Allred, 1965). This is the first time it has been reported in Utah. The eleven females



were taken only from the Colorado River Basin in Utah (Fig. 24, Table 8).

*Vaejovis wupatkiensis* is a slender scorpion, similar to but smaller than *V. confusus*. It lacks the coarse granulation of the cauda and telson common to *V. confusus*. It may be distinguished from other species in Utah by its uniform yellow to orange-brown color, absence of any markings on the body, long fingers on the pedipalps, and a tubercle or tooth beneath the base of the vesicle on the telson.

TABLE 8. Collection data for *Vaejovis wupatkiensis* in Utah.

County and location	Date	No. and sex	Collector
Grand, Moab	VI-23	2-f	CC
	V-55	5-f	CH
Thompson	3-V-68	1 f	FC
San Juan, Navajo Mt.			
Trading Post	2-V-55	2 f	DB
Canyonlands Nat.			
Park (Tower Ruins)	VI-67	1 f	PH

#### *Vaejovis utahensis* Williams

*Vaejovis utahensis* Williams, 1968, Pan-Pacif. Entomol. 44(4):313-321.

This species was heretofore known only from Bluff, San Juan County, Utah (Williams, 1968). An additional 218 specimens representing adults and immatures were taken from the Colorado River Basin in Utah (Fig. 24, Table 9).

TABLE 9. Collection data for *Vaejovis utahensis* in Utah.

County and location	Date	No. and sex	Collector
Garfield, 35 mi W Dirty Devil River on Utah Hwy 95	25-VI-68	5 f	JJ
Grand, Dead Horse Pt. Road	19-VI-68	25 f	JJ
Emery, 30 mi N Hanksville on Utah Hwy 24	25-VI-68	2 f	JJ
San Juan, Monument Valley	24-VI-68	56 f	JJ
Bluff	23-VI-68	26 f	JJ
Canyonlands Nat. Park (Needles campground)	20-VI-68	50 f	JJ
	10-VI-68	54 f	BB

This species closely resembles *V. boreus*, but may be distinguished from it by the absence of the dusky, transverse bands on the segments of the preabdomen, and the longer, less robust hands of the pedipalps.

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