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Marvin D. Coffey
Pullman, Washington

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A STUDY OF SOME ROCKY MOUNTAIN SPOTTED FEVER VECTORS AND THEIR HOSTS IN UTAH⁽¹⁾⁽²⁾

MARVIN D. COFFEY
Pullman, Washington

In Utah, spotted fever has been known in an endemic state since 1908. Although this is true, few workers have been drawn to study the vectors responsible for the transmission of this disease. From 1934 to 1952 there has been an average of 12.3 cases of spotted fever per year in Utah and a 17.5 case fatality average. Published distributional records of ticks which have been implicated as vectors of Rocky Mountain spotted fever in Utah are listed by Cooley (1938 and 1946), Cooley and Kohls (1944), Davis (1941 and 1943), Jellison (1945), Bishop and Trembley (1945), Hunter and Bishop (1911), Kohls and Parker (1948), Stanford (1934), Woodbury and Hardy (1948), and Edmunds (1951). The latter's work is the most recent distributional study. It included, however, a taxonomic and distributional study of all the ticks of Utah.

This study was made with special reference to the tick vectors of spotted fever in Utah, their hosts, and their distribution. Data from the literature is included, with the new records herein reported in order to give a more complete picture.

To the men and institutions who aided this study the author would like to express his sincere appreciation. The study was in part supported by a research grant from the Microbiological Institute of the National Institutes of Health, United States Department of Health, Education, and Welfare. Dr. Vasco M. Tanner, Brigham Young University, made available certain facilities in the department of Zoology and Entomology for the study; Mr. John Wright of the Utah State Department of Health furnished data concerning the incidence and distribution of spotted fever in Utah and Mr. Glen M. Kohls, Rocky Mountain Laboratory, Hamilton, Montana gave assistance in the corroboration and determination of some specimens. Thanks also are due to my co-workers in the collection of many of the specimens, Mr. Dorald M. Allred, The University of Utah, and

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In Utah six species of ticks are found which have been shown to be capable³ or potential⁴ vectors of spotted fever. *Dermacentor andersoni* Stiles is the only tick found in Utah which readily bites man. This tick and *Haemaphysalis leporis-palustris* (Packard), a proven vector in nature, are herein classified as capable. Potential vectors include *Dermacentor parumapertus* Banks, *Dermacentor albipictus* (Packard), *Rhipicephalis sanguineus* (Latreille), and *Ornithodoros parkeri* Cooley. The latter three have never been considered very important in spotted fever transmission, but because of experimental evidence they are included here. *D. parumapertus* similarly has not received much attention, but due to its abundance and its overlapping the range of *D. andersoni* (with some common hosts) in some parts of Utah, it must be considered as an important potential vector.

This study represents over eight hundred collection records (lots) for the State of Utah. It has involved several thousand specimens⁵ taken from forty-nine species of mammals and one species of bird.

The majority of collections represent new geographical distribution areas for both vector and host. Each tick collection has been treated separately, listed from the specific host on which it was found and identified with the county collected in.

The designation, "*Dermacentor sp.*," refers only to nymphs and larvae of that genus. Due to the extreme difficulty in taxonomic separation with regard to some of the immature stages of ticks in the genus *Dermacentor*, specific designation has not been possible.

In the lists shown below, all references to records from the literature are indicated by the author's names and date of publication appearing in parenthesis under county reference. All other records may be considered as new.

(3) By capable is meant those ticks which in nature have been shown to possess the rickettsia and/or are known to transmit the disease.

(4) By potential is meant those ticks which have only been shown experimentally in the laboratory to become infected with or transmit the rickettsia.

(5) These specimens are a part of the parasitic arthropod collection in the Brigham Young University Zoology and Entomology Museum collections.

HOST LIST AND DISTRIBUTION OF ROCKY MOUNTAIN SPOTTED FEVER VECTORS IN UTAH

1. DERMACENTOR ANDERSONI Stiles

HOST	GEOGRAPHIC DISTRI- BUTION BY COUNTY
<i>Erethizon dorsatum</i> :	Daggett, Duchesne, Rich, Sevier,
<i>Lepus americanus</i> :	Uintah, Utah, Wayne.
<i>L. californicus</i> :	Wasatch.
<i>L. townsendii</i> :	Juab, Kane, Utah.
<i>Lynx rufus</i> :	Daggett, Utah, Wasatch.
Man:	Uintah. Cache, Daggett, Duchesne, Gar- field, Grand, Millard, Rich, San Juan, Tooele, Uintah, Utah, Wasatch, Washington.
<i>Odocoileus hemionus</i> :	Sanpete, Utah.
Horse:	Duchesne.
<i>Peromyscus maniculatus</i> :	Utah.
Sheep:	Duchesne, Wasatch.

Edmunds (1948 and 1951) reports this tick as occurring in the following counties: "Box Elder, Cache, Davis, Duchesne, Emery, Garfield, Iron, Kane, Salt Lake, San Juan, Summit, Sanpete, Tooele, Utah, Uintah, Wasatch, Washington, and Wayne. Without indicating collection localities he lists the following hosts for *D. andersoni*: cattle, chipmunks (numerous species), horse, man, pocket gopher, porcupine, rabbits (numerous species)."

2. DERMACENTOR PARUMAPTERTUS Banks

<i>Dipodomys merriami</i> :	Washington.
<i>D. ordii</i> :	Juab.
<i>Lepus californicus</i> :	Beaver, Box Elder, Iron, Juab, Juab (Stanford 1934), Kane (Edmunds 1951), Millard, Sanpete, Sevier, Tooele, Tooele (Edmunds 1951), Utah, San Juan (Edmunds 1951).
<i>L. townsendii</i> :	Wasatch.
<i>Perognathus parvus</i> :	Juab.
<i>Peromyscus maniculatus</i> :	Utah.
<i>Sylvilagus nuttallii</i> :	Utah.
<i>Sylvilagus sp.</i> :	Kane (Edmunds 1951).

3. DERMACENTOR ALBIPICTUS (Packard)

<i>Antilocapra americana</i> :	Daggett (Edmunds 1951).
<i>Cervus canadensis</i> :	Cache.
Horse:	Garfield (Edmunds 1951).
<i>Odocoileus hemionus</i> :	Cache (Edmunds 1951), Millard, Sanpete.

4. DERMACENTOR SP.

<i>Citellus armatus</i> :	Cache, Rich, Summit, Utah Wasatch.
<i>C. lateralis</i> :	Daggett, Duchesne, Kane, Rich, Sanpete, Sevier.
<i>Citellus leucurus</i> :	Box Elder, Kane, Utah, Wayne.
<i>C. variegatus</i> :	Garfield, San Juan, Sanpete, Sevier, Utah, Wayne.
<i>Cynomys leucurus</i> :	Rich.
<i>Cynomys sp.</i> (burrow):	Daggett.
<i>Dipodomys deserti</i> :	Washington.
<i>D. merriami</i> :	Washington.
<i>D. microps</i> :	Box Elder, Juab, Sevier, Utah, Washington,
<i>D. ordii</i> :	Beaver, Box Elder, Daggett, Duchesne, Grand, Juab, Kane, Sevier, Uintah, Utah,
<i>Eutamias dorsalis</i> :	Duchesne, Garfield, Utah.
<i>E. minimus</i> :	Duchesne, Rich, San Juan, Sevier.
<i>E. quadrivittatus</i> :	Daggett, Duchesne, Utah.
<i>Lepus californicus</i> :	Beaver, Box Elder, Garfield, Iron, Juab, Kane, Millard, Uintah, Utah.
<i>L. americanus</i> :	Wasatch.
<i>L. townsendii</i> :	Uintah, Daggett.
<i>Marmota flaviventris</i> :	Cache, Duchesne, Garfield, Utah.
<i>Microdipodops megacephalus</i> :	Beaver.
<i>Microtis longicaudus</i> :	Cache, Daggett, Sanpete.
<i>Microtis sp.</i> :	Rich, Sevier, Wasatch.
<i>Mustela erminea</i> :	Daggett.
Man:	Daggett.
<i>Neotoma cinerea</i> :	Daggett, Tooele.
<i>N. lepida</i> :	Garfield, Kane, Piute, Sanpete.
<i>Oberholseria chlorura</i> (bird)	Box Elder, Tooele.

<i>Onychomys leucogaster</i> :	Box Elder.
<i>Ochotona princeps</i> :	Wayne.
<i>Perognathus parvus</i> :	Beaver, Box Elder, Juab, Rich, Sevier, Tooele, Utah.
<i>P. longimembris</i> :	Box Elder, Juab, Sevier, Washington.
<i>P. formosus</i> :	Garfield, Juab.
<i>Perognathus sp.</i> :	Box Elder.
<i>Peromyscus crinitis</i> :	Box Elder, Daggett.
<i>P. eremicus</i> :	Iron, Washington.
<i>P. maniculatus</i> :	Beaver, Box Elder, Cache, Daggett, Duchesne, Garfield, Juab, Kane, Morgan, Piute, Rich, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Wayne.
<i>P. truei</i> :	Beaver, Daggett, Duchesne, Piute, Uintah, Utah, Washington.
<i>Rattus norvegicus</i> :	Utah.
<i>Reithrodontomys megalotis</i> :	Tooele, Utah.
<i>Sciurus aberti</i> :	San Juan.
<i>Sylvilagus sp.</i> :	Wayne, Summit, Kane, Daggett.
<i>S. auduboni</i> :	Daggett, Duchesne, Washington.
<i>S. nuttallii</i> :	Box Elder, Sanpete, Utah.
<i>Thomomys bottae</i> :	Washington.
<i>Zapus princeps</i> :	Daggett, Utah, Wasatch.

5. HAEMAPHYSALIS LEPORIS-PALUSTRIS (Packard)

<i>Citellus variegatus</i> :	Utah.
<i>Lepus californicus</i> :	Beaver, Box Elder, Garfield, Iron, Juab, Millard, Piute, Sevier, Tooele, Utah, Wasatch, Salt Lake (Edmunds 1951).
<i>L. townsendii</i> :	Daggett, Uintah.
<i>Neotoma cinerea</i> :	Duchesne.
<i>Oberholseria chlorura</i> (Bird):	Box Elder, Tooele.
<i>Sylvilagus sp.</i> :	Daggett, Emery, Emery (Ed- munds 1951), Garfield, Grand, Grand (Edmunds 1951), Kane, San Juan, San Juan (Edmunds 1951), Summit, Uintah, Washington.
<i>S. auduboni</i> :	Daggett, Washington.
<i>S. idahoensis</i> :	Washington, Box Elder (Stan- ford 1934).
<i>S. nuttallii</i> :	Grand, Sanpete, Utah, Wasatch.

6. RHIPICEPHALIS SANGUINEUS (Latreille)

Dog: Salt Lake (Edmunds 1951), Salt Lake (Kohls and Parker 1948).

7. ORNITHODOROS PARKERI Cooley

Citellus sp.: Washington, (Davis 1941).
C. lateralis: Wayne (Davis 1941).
Cynomys sp.: Carbon, Emery, Grand, Iron, Uintah (Davis 1941), Daggett (in burrow).
Cynomys leucurus: Uintah.
Gopherus agassizi: Washington (Woodbury and Hardy 1948).

Rocky Mountain spotted fever. *Rickettsia rickettsii* (Wolfback), has been listed from every county in Utah except Piute. The vector, *D. andersoni*, has been reported from twenty-four of the twenty-nine counties in the state. Insufficient collections and the fact that the disease may not always be identified with the place where the tick was picked up, undoubtedly accounts for the four counties from which the disease has been listed but from which the vector has not been reported. It is of interest to note that in Utah, spotted fever is most prevalent in counties where population centers border hillsides or mountainous areas and least prevalent in the desert areas of the Great Basin and Colorado River Basin region in Utah. A study of the distribution of *D. andersoni* shows a direct correlation with these facts. Comparatively few records of the tick are known from the desert areas whereas the tick appears to be rather abundant in the valleys and hillsides along and throughout the mountainous areas of the state.

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