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THE CHIGGERS OF UTAH (ACARINA: TROMBICULIDAE)

James M. Brennan¹ and D Elden Beck²

In conjunction with an ectoparasite survey in Utah, numerous lots of larval trombiculid mites were collected. These are the basis for the present and first report on Utah chiggers. Principal collectors were the junior author, who supervised the survey, Dr. Dorald M. Allred, Mr. Merlin Killpack and Mr. Marvin Coffey.

Several records, in addition to those from the survey, were provided by the Rocky Mountain Laboratory, the University of Kansas, and the Dugway Proving Ground. These are indicated parenthetically in the text as RML, KU, and DPG immediately after the pertinent records.

Thirty-eight species, the majority from rodents, are recorded along with condensed collecting data. Eight of these are described as new. A key is given to all species included, and generalized geographic data outside of Utah provided. Acomatacarus sexacis Allred and Beck is reduced to synonomy under A. micheneri Greenberg, and Trombicula imperfecta Brennan and Jones under T. hoplai Loomis.

KEY TO SPECIES

1. Leg segmentation 6-6-6; scutal setae 6; coxa I with 2 setae; sensillae flagelliform ................................. 2
   Leg segmentation 7-7-7; scutal setae 5; coxa I with 1 seta; sensillae flagelliform or expanded ......................... 8
   Leg segmentation 7-6-6; scutal setae 4; coxa I with 1 seta; sensillae expanded ........................................... Walchia americana

2. Tarsi lacking empodia ........................................ Chatia setosa
   Tarsi with empodia .............................................. 3

3. Scutum with anteromedian projection ......................... 4
   Scutum without anteromedian projection ........................ 7

4. Tarsala II expanded distally .................. Acomatacarus arizonensis
   Tarsala II not expanded distally ............................... 5

5. Sensillae branched; no tarsala III .......... Acomatacarus lindsayi
   Sensillae nude; with tarsala III ............................ 6

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³. From 1950 through 1954, the junior author conducted surveys throughout Utah relative to vectors of Rocky Mountain spotted fever and plague. This study was supported in part by a research grant from the National Institutes of Health.
6. One genuala I ........................................ Acomatacarus micheneri
    Two genualae .................................... Acomatacarus hirsutus

7(3). Spiracles and tracheae present; cheliceral blades with
    rows of teeth; coxa III with 1 seta          Whartonia perplexa
    Spiracles and tracheae absent; cheliceral blades with
   teeth confined to tricuspid cap; coxa III multisetose
       ............................................. Shunseennia ochotona

8(1). Sensillae flagelliform ........................................ 9
    Sensillae expanded .................................... 21

9. Palpal tibial claw bifurcate ................................ Trombicula belkini
    Palpal tibial claw trifurcate ....................... 10

10. Subterminala, and genualae II and III lacking
    .............................................. Trombicula hoplai
    Subterminala, and genualae II and III present ........ 11

11. Mastifemoralae, mastitibialae, and mastitarsalae present
    Mastifemoralae and mastitibialae absent, mastitarsalae present or absent .... 12

12. Sensillae nude ........................................ Trombicula californica
    Sensillae branched .................................. 13

13. Galeal seta nude ................................ Trombicula harperi
    Galeal seta branched ................................ Trombicula microti

14(11). Coxa III with 1 seta .................................... 15
    Coxa III with 2 or more setae ............................... 19

15. Parasubterminala lacking ................................ Trombicula doremi n.sp.
    Parasubterminala present ............................ 16

16. Mastitarsalae III present; parasubterminala branched
    Mastitarsalae III absent; parasubterminala nude ............................. 17

17. Three genualae I ........................................ Trombicula kardosi
    Two genualae I ....................................... 18

18. Palpal dorsotibial seta nude ................................ Trombicula potosina
    Palpal dorsotibial seta branched ..................... Trombicula myotis

19(14). Scutum distinctly pentagonal; sensillae basally barbed
    as well as distally branched ........................ Trombicula sargenti
    Scutum not pentagonal; sensillae only distally branched .................. 20

20. First dorsal row with 6 setae ......................... Trombicula montanensis
    First dorsal row with 8 setae ........................ Trombicula arenicola

21(8). Cuticular striae encroach on submerged scutum, forming a definite pattern
    ............................................. Neoschönastia americana
    Scutum not submerged .................................. 22

22. Tibiala III present ...................................... 23
    Tibiala III absent ................................... 27

23. Sternal setae 2-4 ......................................... Euschönastia cordireynus
    Sternal setae 2-2 .................................... 24

24. Subterminala and parasubterminala present ................... 25
    Subterminala and parasubterminala absent .................... 26

25. Genualae II and III present ........................... Euschönastia oregonensis
    Genualae II and III absent .......................... Euschönastia utahensis n.sp.

26. One genuala I, genualae II and III absent
    ............................................. Euschönastia lacerta
    Two genualae I, genualae II and III present
       ............................................. Euschönastia "h" n.sp.

27(22). Subterminala and parasubterminala present ................... 28
    Subterminala and parasubterminala absent
       ............................................. Euschönastia fasolla n.sp.

28. Dorsal setae lanceolate ................................ Euschönastia lanceolata n.sp.
    Dorsal setae not lanceolate .............................. 29

29. Genualae II and III present ..................................... 30
    Genualae II and III absent ................................ 36
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30. Two pairs of humeral setae; spherical when engorged
   .................................................... Euschöngastia rotunda n.sp.
   One pair of humeral setae; not spherical when engorged ...... 31

31. Anterolateral setae of scutum as long as or longer
   than posteralateral setae ........................................ 32
   Anterolateral setae of scutum shorter than posteralateral setae
   ............................................................... 33

32. One genuala I .............................................. Euschöngastia “d” n.sp.
   Two genualae I ................................................ Euschöngastia radfordi

33. Cheliceral bases, scutum, and legs impunctate .............. 34
   Cheliceral bases, scutum, and legs punctate .................... 35

34. Palpal tibial claw usually with 5 prongs; sensillae
   obcordate .............................................. Euschöngastia sciuricola
   Palpal tibial claw with 3 prongs; sensillae spatulate-clavate
   ......................................................... Euschöngastia criceticola

35. One genuala I .............................................. Euschöngastia lanei n.sp.
   Two genualae I ................................................ Euschöngastia obesa n.sp.

36(29). Palpal tibial claw with 5 prongs ... Euschöngastia pomerantzi
   Palpal tibial claw with 3 prongs ...... Euschöngastia luteodema

SPECIES RECORDED

TROMBICULA (EUTROMBICULA) BELKINI Gould


Duchesne county: From Citellus leucurus, 23 August 1953, 2
   specimens identified. Emery county: Crotaphytus collaris, no date.
   county: Crotaphytus collaris, 28, June 1950, 8 (KU); Cnemidophorus
   tigris, 28 June 1950, 1 (KU); Gambelia wislizenii, 30 June 1949, 4;
   Uta stansburiana, 7 July 1949, 10; Peromyscus
   truei 14 July 1951, 1. Millard county: Sceloporus gracious, 19
   Utah county: Sceloporus gracious, 19 July 1949, 5.

T. belkini has also been recorded from California, and speci-
mens are on hand from Oregon and Arizona. The species has been
recorded as attacking man in California (Gould, 1950).

TROMBICULA (LEPTOTROMBIDIUM) MYOTIS Ewing

Trombicula myotis Ewing, 1929, p. 294.

Utah county: From Myotis californicus, 4 June 1949, 15
   specimens identified.

This common chigger has also been recorded from Maine,
Pennsylvania, Alberta (Peromyscus), Montana, California, and
Korea. Specimens are on hand from Ontario, New York, Arkansas,
and New Mexico (Sigmodon).

TROMBICULA (LEPTOTROMBIDIUM) POTOSINA Hoffman

Trombicula potosina Hoffman, 1950, p. 151

Beaver county: From Perognathus parvus, 10 July 1952, 1
   specimen identified. Iron county: Neotoma lepida, 4 September
   1951 and 13 August 1953, 22. Millard county: Neotoma lepida, 15
   August 1953, 8. San Juan county: Neotoma sp., 28 August 1953, 3.
   Sanpete county: Microtus longicaudus, 2 August 1951, 10. Tooele

*T. potosina* was described from *Neotoma micropus*, San Luis Potosi, Mexico. The Utah specimens compare favorably with the Hoffman paratypes. Differences are negligible and within the limits of variation. The above data constitute the first records of the species in the United States.

**TROMBICULA (NEOTROMBICULA) CALIFORNICA** Ewing

*Trombicula californica* Ewing, 1942, p. 488.


*T. californica* has also been recorded from California, Montana, and Idaho.

**TROMBICULA (NEOTROMBICULA) HARPERI** Ewing

*Trombicula harperi* Ewing, 1928, p. 79.


*T. harperi* has also been recorded from New York, Main, Pennsylvania, Wyoming, Colorado, Montana, and Idaho. In the Rocky Mountain Laboratory is unrecorded material from Michigan, New Mexico, and Arizona.

**TROMBICULA (NEOTROMBICULA) MICROTI** Ewing

*Trombicula microti* Ewing, 1928, p. 80.


Also recorded from Wyoming, Colorado, New Mexico, Montana, Washington, Oregon, California, Labrador, Vermont, Ontario, Island of St. Lawrence River, Alberta, Eastern Manchuria, and Japan (Hokkaido and Honshu). Unrecorded specimens are in the Rocky Mountain Laboratory from Michigan and Afognak Island, Alaska.
TROMBICULA (MIYATROMBICULA) SARGENTI Brennan

In addition to the type series from *Neotoma* sp., Juab County, 14 October 1951, this species has been reported from nests of *Neotoma lepida*, Juab and Utah Counties, October and November 1951, by Allred and Beck (1953).

TROMBICULA HOPLAI Loomis
*Trombicula (Euschöngastoides) hoplai* Loomis, 1954, p. 924.

Juab County: From *Peromyscus truei*, 4 August 1953, 1 specimen identified (DPG). San Juan County: *Perognathus apache*, 26 August 1953, 5.

This distinctive species has also been recorded from Kansas, Colorado, New Mexico, Texas, and California.

An examination of the type material of *T. hoplai* and *T. imperfecta* by both Dr. Loomis and the senior author has revealed no specific differences.

TROMBICULA ARENICOLA Loomis


Two of the above records are the first to establish the occurrence of *T. arenicola* on reptiles.

The species has also been recorded from Kansas, Colorado, New Mexico, and Alberta.

TROMBICULA MONTANENSIS Brennan
*Trombicula montanensis* Brennan, 1946, p. 441.

Duchesne County: From *Cynomys leucurus*, 21 August 1952, 6 specimens identified.
T. montanensis has also been recorded from Montana, Colorado, Kansas, Nebraska, Oklahoma, and Texas.

**TROMBICULA KARDOSI** Loomis


**GARFIELD COUNTY:** From *Eutamias umbrinus*, 24 September 1952, 1 specimen identified (KU).

*T. kardosi* was described from Kansas. No other distributional records are available.

**EUSCHÖNGASTIA CORDIREMUS** Brennan


**CACHE COUNTY:** From *Peromyscus maniculatus*, 12 June 1953, 1 specimen identified (KU).

Described from Montana. In addition, specimens are on hand from California and Nevada.

**EUSCHÖNGASTIA CRICETICOLA** Brennan


**EMERY COUNTY:** From *Peromyscus maniculatus*, 22 May 1952, 16 specimens identified. **JUAB COUNTY:** *Neotoma lepida*, 13 and 14 October 1951, 45 (RML). **TOOELE COUNTY:** *Peromyscus maniculatus*, 30 October 1950, 13 (DPG). **UTAH COUNTY:** *Peromyscus boylii*, 17 March 1951, 8; *Peromyscus maniculatus*, 15 October 1949, 5; *Dipodomys ordii*, 14 October 1951, 4. **WASHINGTON COUNTY:** *Neotoma lepida*, 19 December 1950, 1; *Peromyscus eremicus*, 15 April 1952, 10. **WAYNE COUNTY:** *Peromyscus maniculatus*, 7 August 1952, 1.

This species has also been recorded from Montana, Idaho, California, and Alberta.

**EUSCHÖNGASTIA “D”** Gould, new species

*Euschöngastia “d”* Gould, (in press)

**BOX ELDER COUNTY:** From *Lepus californicus*, January 1952, 1 specimen identified (KU). **CACHE COUNTY:** *Peromyscus maniculatus*, 2 July 1953, 1 (KU). **DUCHESNE COUNTY:** *Citellus lateralis*, 5 April 1953, 4. **GARFIELD COUNTY:** *Citellus lateralis*, 19 September 1952, 1 (KU). **TOOELE COUNTY:** *Neotoma lepida*, 7 April 1950, 7; host ?, 29 March 1953, 5. **UTAH COUNTY:** *Dipodomys ordii*, 25 March 1941, 1; *Perognathus parvus*, 12 April 1950, 11; nest of *Bubo virginianus* containing remains of rabbit, 25 May 1951, 10. **WASHINGTON COUNTY:** *Dipodomys merriami*, 23 February 1952, 6; *Perognathus formosus*, 23 February 1952, 4; *Perognathus longimembris*, 17 April 1952, 29.

*E. “d”* was described from California. Additional material from Oregon and Nevada is in the Rocky Mountain Laboratory.

**EUSCHÖNGASTIA “H”** Gould, new species


**SEVIER COUNTY:** From *Citellus lateralis*, 4 August 1952, 8 specimens identified.

This species was described from California. No other records are available.
EUSCHÖNGASTIA LACERTA Brennan

_Euschongastia lacerta_ Brennan, 1948, p. 468.


_E. lacerta_ has been recorded also from California whence it was described from lizards.

EUSCHÖNGASTIA LUTEODEMA Brennan

_Euschongastia luteodema_ Brennan, 1948, p. 470.

CACHE COUNTY: From _Peromyscus maniculatus_, 13 June 2 to July 1953, 6 specimens identified (KU).

Also recorded from Montana, Idaho, and California.

EUSCHÖNGASTIA OREGONENSIS (Ewing)

_Trombicula oregonensis_ Ewing, 1929a, p. 11


_E. oregonensis_ has also been recorded from Oregon, Montana, California, and Alberta. Specimens are on hand from Washington.

EUSCHÖNGASTIA POMERANTZI Brennan and Jones

_Euschongastia pomerantzi_ Brennan and Jones, 1954, p. 171.

GARFIELD COUNTY: From _Eutomias umbrinus_, 18 September 1952, 3 specimens identified (KU).

Described from California, and material is on hand from Nevada.

EUSCHÖNGASTIA RADFORDI Brennan and Jones

_Euschongastia radfordi_ Brennan and Jones, 1954, p. 173.


This species has also been recorded from a large variety of hosts in California, Oregon, Montana, and Idaho.

EUSCHÖNGASTIA SCIURICOLA (Ewing)

_Schöngastia sciuricola_ Ewing, 1925, p. 261.


_E. sciuricola_ has also been recorded from Montana, Idaho, California, and Alberta. A few specimens tentatively referred to this species are from New Mexico.
NEOSCHÖNGASTIA AMERICANA (Hirst)

_Schöngastia americana_ Hirst, 1921, p. 37.

TOOELE COUNTY: From _Amphispiza belli_, 25 October 1953, 3 specimens identified (DPG); _Junco oreganus_, 9 October 1953, 1 (DPG); _Otocoris alpestris_, 16 August 1951, 3 (DPG); _Salpinctes obsoletus_, 27 August and 24 September 1953, 16 (DPG).

This widespread bird species (also known from lizards and rabbits) has also been recorded from "southern states," Texas, California, Virginia, South Carolina, Jamaica, Mexico, and Guatemala. Specimens are on hand from Missouri (_Sylvilagus_). A subspecies, _solomonis_, has been recorded from the Pacific Islands: Bougainville, Guam, Iwo Jima, and Okinawa (Wharton and Hardcastle, 1946).

WALCHIA AMERICANA Ewing

_Walchia americana_ Ewing, 1942, p. 491.

GARFIELD COUNTY: From _Eutamias umbrinus_, 24 September 1952, 1 specimen identified (KU).

_W. americana_ has also been recorded from Florida, Wisconsin, and California. Specimens from Kansas and Oklahoma are in the Rocky Mountain Laboratory.

ACOMATACARUS ARIZONENSIS Ewing

_Acomatacarus arizonensis_ Ewing, 1942, p. 490.


Also recorded from Arizona, California, and Mexico.

ACOMATACARUS HIRSUTUS (Ewing)

_Hannemania hirsuta_ Ewing, 1931, p. 17.

GRAND COUNTY: From _Neotoma_ sp., 10 May 1950, 5 specimens identified.

This species was described from California. No other distributional records are available.

ACOMATACARUS LINSDALEI Brennan and Jones

_Acomatacarus linsdalei_ Brennan and Jones, 1954, p. 160.


In addition, _A. linsdalei_ has been recorded only from California.

ACOMATACARUS MICHENERI Greenberg


_Acomatacarus sexacis_ Allred and Beck, 1953a, p. 87. New synonymy.
BOX ELDER COUNTY: From Neotoma lepida, 18 and 20 June 1952, 23 specimens identified; Sylvilagus sp., 19 June 1952, 10.


GRAND COUNTY: Neotoma lepida, 14 July 1950, 5.

PIUTE COUNTY: Neotoma lepida, 26 June 1952, 5.

TOOELE COUNTY: Neotoma lepida, 9 July 1952, 3 (DPG); Neotoma cinerea, 22 and 27 July 1950, 17.

WASHINGTON COUNTY: Neotoma lepida, 13 and 16 July 1953, 2.

The senior author has examined paratypes of both A. micheneri and A. sexacis and has found no differences of specific consequence. The comparative diagnostic characters given by Allred and Beck (1953a) are only the expected variations within different populations. The species was described from Colorado. No other records are available.

CHATIA SETOSA Brennan

Chatia setosa Brennan, 1946a, p. 132.

CACHÉ COUNTY: From Peromyscus maniculatus, 11 and 26 June, 2 July 1953, 14 specimens identified (KU).

C. setosa has also been recorded from Montana, Idaho, Washington, and California.

SHUNSENNIA OCHOTONA (Radford)


Recorded also from Montana and California. Specimens are on hand from Idaho and Nevada.

WHARTONIA PERPLEXA (Brennan)


SAN JUAN COUNTY: From Myotis californicus, 4 May 1951, 2 specimens identified. SALT LAKE COUNTY: Antrozous pallidus, October 1948, 2 (RML).

This bat chigger has also been recorded from Montana and California.

TROMBICULA ALLREDI Brennan and Beck, n. sp.

(Fig. 1, E-H)

Body: Subellipsodial. Length and width of holotype, partly engorged, 546 by 305 microns. Eyes large, 2/2, no ocular plate. Anus at level of fourth row of ventral setae.


Scutum: Shaped as figured, somewhat less than 2 times as wide as long, puncta few, large and distributed as figured. Sensillary bases
at about the level of the posterolateral setae and separated by a little less than the distance from either to its corresponding posterolateral seta. Sensillae flagelliform, sparsely branched on apical half and with minute barbs on basal half. Setae with appressed branches. Scutal measurements of holotype: AW-72, PW-88, SB-25, ASB-29, PSB-21, AP-21, AN-28, AL-29, PL-40, S-64.

Legs: All segments with few, scattered puncta. Leg I coxa, trochanter and basifemur each with a branched seta; telofemur with 5 branched setae; genu with 4 branched setae, 3 long genualae, and a microgenuala; tibia with 8 branched setae, 2 very short, nearly identical, approximate tibialae, and a microtibiala; tarsus with about 20 branched setae, a prominent tarsala, a microtarsala, a subterminala, a branched parsabterminala, and a pretarsala. Leg II coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and a genuala; tibia with 6 branched setae and 2 very short, approximate tibialae; tarsus with about 16 branched setae, a tarsala (longer and thinner than tarsala 1), a microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and a genuala; tibia with 6 branched setae and a tibiala; tarsus with about 12 branched setae and 2 mastitarsala each having 1 or 2 delicate branches basally. All tarsi terminated by a pair of claws with a clawlike empodium between.

Body setae: Dorsal setae 30 to 38 microns in length, the longer ones marginal. They are fairly straight, seemingly stiff, and have appressed branches. Dorsal formula for the holotype: 2-6-6-4-4-2-2. Ventral setae 2-2 (sternals) plus about 36. Those of the posterior rows similar to the dorsal setae.

Type data: Type series all from Neotoma lepida (wood rat), Washington County, Utah. Holotype and 4 paratypes RML No. 33182, Rockville, 13 July 1953; 3 paratypes, No. 33184, Diamond Valley, 16 July 1953; 6 paratypes, No. 31208, 2 miles west of Toquerville, 5 September 1951.

Holotype and some paratypes in the collection of the Rocky Mountain Laboratory. Other paratypes in the Brigham Young University, the United States National Museum, the British Museum (Natural History), the South Australian Museum, and the University of Kansas.

Diagnosis: The branched parasubterminala, 3 genualae I, very small tibialae I and II, and 2 mastitarsalae III distinguish T. allredi n. sp. from other members of the genus.

This species is named for Dr. Dorald M. Allred who collected some of the material on which this paper is based.

TROMBICULA DOREMI, Brennan and Beck. n. sp. (Fig. 1, A-D)

Body: Ellipsoidal. Length and width of holotype, nearly engorged, 520 by 332 microns. Eyes large, 2/2, anterior and posterior
eyes sub-equal in size, no ocular plate. Anus at level of fourth row of ventral seate.

**Gnathosoma:** Cheliveral bases, capitular sternum and femoral plate of palpi with few scattered puncta. Blade of chelicera with tricuspid cap. Setae of capitular sternum heavily branched. Palpal setae: Femoral and genual with many coarse branches, dorsal and lateral tibial nude, ventral tibial with about 10 branches. Palpal claw trifurcate. Palpal tarsus with 7 branched setae and a small tarsala. Galea seta branched.

**Scutum:** Roughly pentagonal about 1 1/2 times wider than long, posterior margin rounded, puncta conspicuous but not numerous. Sensillary bases anterior to the level of the posterolateral setae and separated by less than the distance from either to its corresponding posterolateral seta. Sensillae flagelliform, branched on apical third. Scutal setae thick, plumose. Scutal measurements of holotype: AW-77, PW-88, SB-25, ASB-32, PSB-29, AP-22, AM-35, AL-32, PL-29, S-75.

**Legs:** All leg segments punctate. Setae as follows: Leg I coxa, trochanter and basifemur each with a branched seta; telofemur with 5 branched setae; genu with 4 branched setae, 3 moderately long genualae and a microgenualae; tibia with 8 branched setae, 2 approximate tibiaalae of equal length and form, shorter than the genualae, and a microtibia; tarsus with about 18 branched setae, a large tarsala, microtarsala, a subterminala, no parasternala, and a pretarsala. Leg II coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and a genuala; tibia with 6 branched setae and 2 approximate and identical tibiaalae; tarsus with about 15 branched setae, a tarsala (smaller than tarsala I), a microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and a fairly long genuala; tibia with 6 branched setae and a fairly long tibia; tarsus with about 12 branched setae and 2 mastitarsala each with a few branches basally. All tarsi terminated by a pair of claws and a more slender clawlike empodium between them.

**Body setae:** Dorsal setae somewhat like the scutal setae, relatively short (21 to 24 microns) and broad, 90 to 100 in irregular rows, humerals not distinguishable from setae of first row. Ventral setae 2-2 (sternals) plus about 50, those posterior to the anus similar to the dorsal setae.

**Type data:** Holotype and 4 paratypes, RML No. 31216, from *Dipodomys merriami* (kangaroo rat), Washington County, Utah, 6 September 1951.

Holotype and 2 paratypes in the collection of the Rocky Mountain Laboratory. One paratype, United States National Museum; one paratype, the British Museum (Natural History).

**Other Material:**
One specimen from *Perognathus longimembris*, Kane County,
Utah, 8 September 1951, is tentatively referred to this species. It differs slightly from the type series in scutal measurements, and in form of the dorsal setae which number about 80.

Diagnosis: *T. doremi* n. sp. appears to be a distinctive species. The absence of a parasubterminala in combination with the palpal vestiture, the form of dorsal setae, tarsala I longer than tarsala II, and the seeming absence of humerals, should be sufficient to distinguish it from other members of the genus.

Although this species is described as having no parasubterminala, it should be noted that there is a branched seta, as long as the subterminala, which may be homologous to a parasubterminala. This seta, however, is not closely associated with the subterminala as in all other species. It is, therefore, both practical and convenient to regard the species as lacking this specialized seta.

**EUSCHÖNGASTIA FASOLLA** Brennan and Beck, n. sp.  
(Fig. 4, A-D)

Body: Length and width of holotype, partially engorged, 300 by 195 microns. Eyes 2/2, the anterior one larger. Anus at about the level of the fifth row of ventral setae.

Gnathosoma: Puncta indicated on cheliceral base, femoral plate of palp and capitular sternum, but not readily discernible in the specimens at hand. Cheliceral blade with tricuspid cap. Seta of capitular sternum with many long branches. Palpal setae as follows: Femoral, very long, densely clothed with long branches; genual, dorso-tibial and ventrotibial each with 10 to 12 long branches; laterotibial nude or forked. Palpal tibial claw trifurcate. Palpal tarsus with a tarsala and 7 branched setae. Galeal seta branched.

Scutum: Roughly trapezoidal, about 2 times wider than long, anterior and posterior margins sinuous, as figured, puncta indicated. Sensillary bases posterior to the level of the posterolateral setae and separated by slightly less than the distance from either to its corresponding posterolateral seta. Conspicuous, inverted, U-shaped fold nearly encompassing each sensillary base. Sensillae obcordate-clavate; anterior surface of head covered with large setules, posterior surface covered with coarse setules except a bare median strip; stem bare. Setae thick, plumose, the anterolaterals and posterolaterals nearly equal in length. Scutal measurements of holotype: AW-55, PW-79, SB-25, ASB-28, PSB-11, AP-24, AM-32, AL-50, PL-49, S-34.

Legs: Puncta discernible on some leg segments, indicated on others. Setae as follows: Two kinds of branched setae, the longer ones densely bristled, the shorter ones more or less pectinate. Leg I coxa, trochanter and basifemur each with a branched setae; telo-femur with 5 branched setae; genu with 4 branched setae, 2 genualae, and a microgenuala; tibia with 7 branched setae, 2 tibialae (the proximal one pointed, the distal one blunt), and a microtibiala; tarsus with about 18 branched setae, a prominent tarsala, a fairly long microtarsala, and a pretarsala, subterminala and parasubterminala absent. Leg II coxa and trochanter each with a branched seta; basi-
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femur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and a small genuala; tibia with 6 branched setae and 2 tibialae (the proximal one pointed, the distal one blunt); tarsus with about 14 branched setae, a long, slender tarsala, a long microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and a small genuala; tibia with 6 branched setae, no tibiala; tarsus with about 10 branched setae. All tarsi terminated by a pair of claws and a slender clawlike empodium between them.

**Body setae:** Dorsal setae about 50, similar to the scutal setae, 34 to 41 microns in length. Dorsal formula for holotype: 2-11-10-8-8-6-2-2. Ventral setae 2-2 (sternals) plus about 46, those posterior to the anus similar to the dorsal setae.

**Type data:** Holotype and 4 paratypes, RML No. 28271, from *Neotoma lepida* (wood rat), Berry Springs, Washington County, Utah, 19 December 1950.

Holotype and 2 paratypes in the collection of the Rocky Mountain Laboratory. One paratype in the United States National Museum, and one paratype in the British Museum (Natural History).

**Diagnosis:** *E. fasolla* n. sp. is apparently related to *E. radfordi* Brennan and Jones which it superficially resembles. The following characters are similar for both species: Scutal shape and measurements, gnathosomal components, form of body setae, 2 kinds of branched leg setae; and 7 branched setae on tibia I. The former species is distinguished from the latter in lacking subterminala and parasubterminala and in the shape of the sensilla. Also, in *E. fasolla* the specialized leg setae differ somewhat in their proportional lengths.

**EUSCHÖNGASTIA LANCEOLATA** Brennan and Beck, n. sp.

(Fig. 3, A-G)

**Body:** Ovoidal. Length and width of holotype, slightly engorged, 302 by 220 microns. Eyes 2/2, the anterior one slightly larger. No ocular plate. Anus at level of fifth row of ventral setae.

**Gnathosoma:** Impunctate. Blade of chelicera with tricuspid cap. Seta of capitular sternum with many long branches. Palpal setae as follows: Femoral heavily branched, genual moderately branched, dorsotibial with 3 to 6 branches, laterotibial with 1 to 3 branches, ventrotibial with 8 to 10 branches. Palpal claw trifurcate. Palpal tarsus with a moderate tarsala and 7 branched setae. Galeal seta strongly branched.

**Scutum:** Impunctate. Roughly hexagonal, with sinuous posterior margin, as figured. More than 2 times wider than long. Sensillary bases distinctly posterior to level of posterolateral setae and separated by about the distance from either to its corresponding posterolateral seta. An inverted U-shaped fold anterior to each sensillary base. Sensilla pyriform; anterior surface of head sparsely covered with long, slender setules; posterior surface (except for a narrow, bare,
median strip on apical half) with short, coarse setules which on the basal third appear to be 2 to 4-toothed; stem with small setules decreasing in size basally. Setae thick, plumose. Scutal measurements of the holotype: AW-63, PW-88, SB-28, ASB-24, PSB-10, AP-18, AM-31, AL-32, PL-46, S-35.

Legs: Impunctate. Leg I coxa, trochanter and basifemur each with a branched seta; telofemur with 5 branched setae; genu with 4 branched setae, 2 short genualae, and a microgenuala; tibia with 7 branched setae, 2 short tibialae (the distal one slightly thicker and more blunt), and a microtibia; tarsus with about 18 branched setae, a tarsala, a microtarsala, a subterminala, a parasubterminala, and a pretarsala. Leg II coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and a short genuala; tibia with 6 branched setae and 2 short tibialae, tarsus with about 14 branched setae, a long, slender tarsala, a microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and a short genuala; tibia with 6 branched setae, no tibiala; tarsus with about 12 branched setae. All tarsi terminated by a pair of lateral claws with slender clawlike empodium between.

Body setae: Dorsal setae more than 50, of two forms, several similar to the scutal setae, the majority narrow-lanceolate with short barbs as figured. The setae, similar to the scutal setae, are not constant in number or position, but are always present in the midportion of the first row, sometimes of the second row, and a few may be scattered at random except in the posteriormost rows. All the remaining setae are of the lanceolate form. Dorsal formula of holotype: 2-14-14-11-8-6-2-2. Ventral setae mostly of the usual form, sometimes a few stray setae of the lanceolate form near the margins, 2-2 (sternals) plus about 40, those posterior to the anus similar to the scutal setae.

Type data: Holotype and 11 paratypes, RML No. 28268, from *Peromyscus eremicus* (western desert mouse). Grafton, Washington County, Utah, 17 December 1950; 10 paratypes, No. 28270, same host, county, and state, Berry Springs, 19 December 1950; 1 paratype, from *Neotoma lepida*, same county and state, Rockville, 18 December 1950.

Holotype and some paratypes deposited in the collection of the Rocky Mountain Laboratory. Other paratypes distributed to the United States National Museum, the British Museum (Natural History), the Brigham Young University, the South Australian Museum, the University of Kansas, and Dr. Charles D. Radford.

Diagnosis: The two distinct forms of the dorsal setae in combination with subterminala and parasubterminala, and genuala III will distinguish *E. lanceolata* n. sp. from other members of the genus.

**EUSCHÖNGASTIA LANEI** Brennan and Beck, n. sp.  
(Fig. 2, A-D)

Body: Subovate. Length and width of holotype, slightly en-
gorged, 305 by 202 microns. Eyes 2/2, the anterior larger. Anus at about the level of the fifth row of ventral setae.

Gnathosoma: Puncta few, indistinct, but definitely present on cheliceral bases, capitular sternum, and femoral plate of palp. Cheliceral blade with tricuspid cap. Setae of capitular sternum with many long branches. Palpal setae: Femoral heavily branched, genual and ventrotibial moderately branched, dorsotibial with few branches, laterotibial nude or with 1 or 2 branches. Claw trifurcate. Palpal tarsus with 6 branched setae and a tarsala. Galeal seta with about 6 strong branches.

Scutum: Puncta few and indistinct. A little more than 2 times wider than long, anterior and posterior margins sinuous, as figured. Sensillary bases at about the level of the posterolateral setae and separated by about the distance from either to its corresponding posterolateral seta. A cuticular fold anterior to each sensillary base. Sensillae obcordate to pyriform; anterior surface of head covered with long setules; posterior surface with short, broad setules except for a bare median strip; setules decreasing in length as they continue part way down the stem. Setae thick, plumose. Scutal measurements of holotype: AW-65, PW-84, SB-29, ASB-19, PSB-13, AP-19, AM-32, AL-30, PL-50, S-29.

Legs: Few indistinct puncta on all segments. Leg I coxa, trochanter and basifemur each with a branched seta; telofemur with 5 branched setae; genu with 5 branched setae, a long genuala, and a microgenuala; tibia with 7 branched setae; 2 subequal tibialae (the distal one more blunt), and a microtibiala; tarsus with about 18 branched setae; a tarsala, a microtarsala, a subterminala, a parabase of the tarsala, and a pretarsala. Leg II coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and a small genuala; tibia with 6 branched setae and 2 small tibialae; tarsus with about 14 branched setae, a long, slender tarsala, a microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and a very short genuala; tibia with 6 branched setae, no tibiala; tarsus with about 14 branched setae. All tarsi terminated by a pair of lateral claws with a longer clawlike empodium between.

Body setae: Dorsal setae similar to the scutal setae, 28 to 42 microns long, decreasing in length from anterior to posterior rows. Dorsal formula for the holotype: 2-13-14-11-8+4-2. Ventral setae 2-2 (sternals) plus about 46, those posterior to the anus similar to the dorsal setae.

Type data: Holotype and 9 paratypes, RML No. 31172, from Reithrodontomys megalotis (desert harvest mouse), Lucin, Box Elder County, Utah, 10 October 1952; 20 paratypes, Nos. 31176, 31183, 31184, from Peromyscus maniculatus, same location, 10 and 11 October 1952; 5 paratypes, No. 31188, P. maniculatus, Jensen, Uintah County, Utah, 8 November 1952.
Holotype and some paratypes deposited in the collection of the Rocky Mountain Laboratory. Other paratypes distributed to the Brigham Young University, the United States National Museum, the British Museum (Natural History), the South Australian Museum, the University of Kansas, and Dr. Charles D. Radford.

**Diagnosis:** *E. lanei* is distinguished from *E. cricetica* Brennan by the presence of puncta and only 1 genula I.

This species is named for a friend, Paul R. Lane, Evanston, Illinois.

**EUSCHÖNGASTIA OBESA** Brennan and Beck, n. sp. (Fig. 2, E-H)

**Body:** Broad ellipsoidal to subquadrato when engorged, Length and width of holotype, engorged, 680 by 525 microns. Eyes 2/2, sub-equal. Anus at about the level of the fifth row of ventral setae.

**Gnathosoma:** Cheliceral bases, capitular sternum, and femoral plate of palp lightly punctate. Cheliceral blade with tricuspid cap. Setae of capitular sternum with many long branches. Palpal setae: Femoral heavily branched, genual moderately branched, dorsotibial with 6 to 8 branches, laterotibial with 1 or 2 branches, ventrotibial moderately branched. Palpal claw trifurcate. Palpal tarsus with 7 branched setae and a conspicuous tarsala. Galeal seta with about 8 branches.

**Scutum:** Roughly hexagonal, a little more than 2 times wider than long, puncta few and indistinct. Sensillary bases posterior to the level of the posterolateral setae and separated by considerably more than the distance from either to its corresponding posterolateral seta. A cuticular fold anterior to each sensillary base. Sensillae pyriform; the anterior surface of the head with long setules; the posterior surface with shorter, coarse setules and a bare median strip; setules decrease in size part way down the stem, basal portion of stem bare. Setae thick, densely clothed with semi-appressed barbs. Scutal measurements of holotype: AW-84, PW-110, SB-44, ASB-29, PSB-18, AP-20, AM-39, AL-38, PL-57, S-39.

**Legs:** All segments with few puncta, not easily discerned on all specimens. Leg I coxa, trochanter and basifemur each with a branched seta; telofemur with 5 branched setae; genu with 4 branched setae, 2 long genualae, and a microgenuala; tibia with 7 branched setae, 2 moderately long tibialae (the distal one more blunt), and a microtibiala; tarsus with about 18 branched setae, a thick and relatively short tarsala, a microtarsala, a subterminala, a parasubterminala, and a pretarsala. Leg II coxa and trochanter each with a branched set; basifemur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and a genuala; tibia with 6 branched setae and 2 short tibialae; tarsus with about 14 branched setae, a long, slender tarsala, a microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched set; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and a short genuala; tibia with 6 branched...
setae, no tibiala; tarsus with about 14 branched setae. All tarsi terminated by a pair of claws and a longer clawlike empodium between them.

**Body setae:** Dorsal setae similar to the scutal setae but barbs not so appressed; 38 to 54 microns long, decreasing in length from anterior to posterior rows. Dorsal formula for the holotype: 2-12-12-12-8-6-4-2. Ventral setae 2-2 (sternals) plus about 50, those posterior to the anus similar to the dorsal setae.

**Type data:** Holotype and 9 paratypes, RML No. 31212, from *Peromyscus maniculatus* (a white-footed mouse), Torrey, Wayne County, Utah, 7 August 1952; 10 paratypes, No. 31173, same data; 20 paratypes, Nos. 31175, 31182, and 31192, same host, Cedar Valley, Utah County, Utah, 1 November 1952.

Holotype and some paratypes deposited in the collection of the Rocky Mountain Laboratory. Other paratypes distributed to the Brigham Young University, the United States National Museum, the British Museum (Natural History), the South Australian Museum, the University of Kansas, and Dr. Charles D. Radford.

Other material referred to this species: Four specimens (having fewer dorsal setae) off *Cynomys leucurus*, Duchesne County, Utah, 21 August 1952. One specimen off *Perognathus formosus*, Fish Springs, Utah, 14 July 1951.

**Diagnosis:** *E. obesa* n. sp. is closely related to *E. criceticola* Brennan from which it differs principally in the presence of puncta, and in its different shape and larger size when engorged.

**EUSCHÖNGASTIA ROTUNDA** Brennan and Beck, n. sp.

(Fig. 2, I-L)

**Body:** Nearly spherical when engorged. Holotype, engorged, 650 by 567 microns. Eyes 2/2. Anus at about the level of the fifth row of ventral setae.

**Gnathosoma:** Cheliceral bases, capitular sternum and femoral plate of palp punctate. Blade of chelicera with tricuspid cap. All palpal setae, except the nude laterotibial, heavily to moderately branched. Palpal claw trifurcate. Palpal tarsus with 7 branched setae and a fairly long tarsala. Galeal seta strongly branched.

**Scutum:** Roughly hexagonal, about 3 times wider than long, puncta few and inconspicuous. Sensillary bases posterior to the level of posterolateral setae and separated by the distance from either to its corresponding posterolateral seta. An indistinct fold anterior to each sensillary base. Sensillae pyriform; anterior surface of head covered with long setules, posterior surface with coarse, shorter setules, sparsely distributed in mid-apical region; stems bare. Setae thick, plumose. Scutal measurements of holotype: AW-91, PW-124, SB-42, ASB-36, PSB-16, AP-24, AMI-38, AL-37, PL-67, S-39.

**Legs:** All segments punctate. Leg I coxa, trochanter and basifemur each with a branched seta; telofemur with 5 branched setae; genu with 4 branched setae, 2 long genualae, and a microgenuala;
tibia with 7 branched setae, 2 long, nearly identical tibialae and a rather long microtibialae and a prominent tarsala and a microtarsala, a subterminala and parasubterminala, and a pretarsala. Leg II coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and a long genuala; tibia with 6 branched setae and 2 long tibialae; tarsus with about 16 branched setae, a tarsala (a little longer than tarsala I), a microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and a fairly long genuala; tibia with 6 branched setae, no tibia; tarsus with about 14 branched setae. All tarsi terminated by a pair of claws with a slender clawlike empodium between.

Body setae: Dorsal setae about 80, 40 to 55 microns long, similar to the scutal setae in form, in irregular rows. Humerals, 2 pairs. Ventral setae 2-2 (terninals) plus about 60, those posterior to the anus similar to the dorsal setae.

Type data: Holotype and 9 paratypes, RML No. 31174, from Ochotona princeps (pika, cony), Geyser Pass, San Juan County, Utah, 1 July 1952.

Holotype and some paratypes in the collection of the Rocky Mountain Laboratory. Other paratypes in the United States National Museum, the British Museum (Natural History), the South Australian Museum, and the University of Kansas.

Diagnosis: E. rotunda n. sp. is related to E. criceticola Brennan from which it is separated by the presence of puncta, its subspherical form when engorged, 2 pairs of humeral setae, greater number of and irregular arrangement of dorsal setae, and larger specialized leg setae and their different proportional lengths.

EUSCHÖNGASTIA UTAHENSIS Brennan and Beck, n. sp. (Fig. 4, E.H)

Body: Subellipsoid, Length and width of holotype, nearly engorged, 443 by 258 microns. Eyes of moderate size, 2/2, no plate. Anus at level of about fifth row of ventral setae.

Gnathosoma: Cheliceral bases, capitular sternum, and femoral plate of palp punctate. Cheliceral blade with tricuspid cap. Setae of capitular sternum with several long branches. Palpal setae as follows: Femoral with about 6 branches, genual with about 4 branches, dorsotibial with 2 or 3 branches, laterotibial nude or forked, ventrotibial with 2 or 3 branches. Palpal tibial claw trifurcate. Palpal tarsus with a small tarsala and 5 branched setae. Galeal seta nude.

Scutum: Roughly trapezoidal. Few puncta. Little more than 1½ times wider than long. Sensillary bases anterior to level of posterolateral setae and separated by about the distance from either to its corresponding posterolateral seta. A fold anterior to each sensillary base. Sensillae oblongellate-clavate; the head with few long setules, evenly distributed on the anterior surface, but absent from
median area of posterior surface; setules progressively decrease in length as they continue somewhat more than halfway down the stem. Setae with semi-appressed barbs. Scutal measurements of holotype: AW-50, PW-66, SB-23, ASB-20, PSB-15, AP-29, AM-26, AL-20, PL-33, S-37.

Legs: All segments with puncta. Leg I coxa trochanter, and basifemur each with a branched seta; telofemur with 5 branched setae; genu with 4 branched setae, 2 long genualae, and a micro-genualae; tibia with 8 branched setae, 2 tibialae (the distal one thick and blunt, the proximal one thinner and pointed), and a microtibialae; tarsus with about 18 branched setae, a tarsala, a microtarsala, a subterminala, a parasubterminala, and a pretarsala. Leg II coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 4 branched setae; genu with 3 branched setae and no genuala; tibia with 6 branched setae and 2 small tibialae; tarsus with about 14 branched setae, a slender tarsala, a microtarsala, and a pretarsala. Leg III coxa and trochanter each with a branched seta; basifemur with 2 branched setae; telofemur with 3 branched setae; genu with 3 branched setae and no genuala; tibia with 6 branched setae and a tibialae; tarsus with about 10 branched setae. All tarsi terminated by a pair of claws with a more slender clawlike em-podium between them.

Body setae: Dorsal setae similar to the scutal setae, 22 to 30 microns in length. Dorsal formula: 2-8-6-6-6-2-2. Ventral setae 2-2 (sternals) plus about 26, those posterior to the anus similar to the dorsal setae.

Type data: Holotype and 3 paratypes, RML No. 30161, from Neotoma lepida (wood rat), Fish Springs, Juab County, Utah, 14 July 1951.

Holotype and a paratype in the collection of the Rocky Mountain Laboratory. One paratype in the United States National Museum and one in the British Museum (Natural History).

Diagnosis: E. utahensis n. sp. is suggestive of E. lacerta Brennan but differs in the dorsal formula, and in having a subterminala and a parasubterminala, and 2 genualae I (1 genuala I in the latter).

SUMMARY

In this first report on the chiggers of Utah, 38 species, of which 8 are described as new, are recorded. The new species, all from rodents are: Trombicula allredi, T. doreni, Euschongastia fasolla, E. lanceolata, E. lanei, E. obesa, E. rotunda, and E. utahensis.

A key and collecting data are given for the species included.

Acomatacarus sexacis Allred and Beck is synonymized under A. micheneri Greenberg, and Trombicula imperfecta Brennan and Jones under T. hoplai Loomis.

Trombicula potosina Hoffman, a Mexican species, is recorded for the first time in the United States.
LITERATURE CITED


ADDENDUM

The publication by Gould of the paper cited above as in press and the discovery of another species in Utah too late for inclusion in the key necessitate these further notes.

The complete Gould reference:

Species listed by code in key and text:

The additional and thirty-ninth species recorded from Utah:

In the key, this species runs to Euschöngastia hoffmannae (“h” n.sp.) from which it is easily distinguished by 2 pairs of humeral setae, and punctate scutum, cheliceral bases and legs.
Fig. 1. A-D. *Trombicula doremi*, n.sp. A. Scutum. B-D. Specialized setae of legs I to III, proportional lengths indicated. E-H. *Trombicula allredi*, n.sp. E. Scutum. F-H. Specialized setae of legs I to III, proportional lengths indicated.
Fig. 2. Scutum and specialized setae of legs I to III, small figures indicating proportional lengths. A-D. Euschöngastia lanei, n.sp. E-H. Euschöngastia obesa, n. sp. I-L. Euschöngastia rotunda, n.sp.
Fig. 3. *Euschongastia lanceolata*, n.sp. A. Dorsum. B. Scutum; posterior surface of sensilla, left, anterior surface, right. C. Dorsal seta, lanceolate form. D. Dorsal seta, scutal setal form. E-G. Specialized setae of legs I to III, proportional lengths indicated.
Fig. 4. Scutum and specialized leg setae of legs I to III, figures show proportional lengths. A-D. *Euschõngastia fasolla*, n.sp. E-H. *Euschõngastia utahensis*, n.sp.