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THE GENUS HESPEROTETTIX IN UTAH
(Orthoptera, Locustidae, Cyrtacanthacrinae)

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I—HESPEROTETTIX IN GENERAL

Hespero = western; *tettix* = grasshopper.

This genus was set up by Scudder in 1876 to include a new species, *viridis*, previously described by Thomas and assigned by him to the genus *Caloptenus*.

Scudder's original description of the genus *Hesperotettix* (4: 262) includes the following:

"Head not very prominent; vertex very narrow between the eyes, with a light median pit; the fastigium broadening considerably in front, declivent, shallowly sulcate in the middle, the sides rounded... The frontal costa equal, scarcely contracted at the extreme summit."

His later description of the genus (11: 55-56) adds:

"Body almost parallel sided, very little enlarged at the metathorax, more or less but not greatly compressed... Pronotum long and slender, the dorsum fully half as long again as broad, the prozona the longer, sometimes half as long again as the motozona... Subgenital plate of male furnished with a prominent, subapical, more or less conical tubercle, the lateral margins of the plate suddenly ampliate at base; furculae always distinctly present as a pair of projecting lobes."

These descriptions point out the more evident features which characterize the genus *Hesperotettix*. It may be added that all the Utah species are decidedly greenish in color, if specimens are not too old and faded, and are marked with a color pattern streaked with white or yellow. Rehn and Hebard (19: 159-160) found species of this genus living on and among rabbit weed, *Isocoma heterophylla*. All of the Utah species are found conspicuously connected with snakeweed, or matchbrush, (*Gutierrezia*). The soil in which this plant grows is good for agricultural usage, but is often too dry for the raising of crops without irrigation. Where crops are grown in or near lands covered with *Gutierrezia*, these crops are often infested with species of *Hesperotettix*, especially *H. viridis* (Thomas).

Three species of the genus are plentiful in Utah. In *H. viridis* (Thomas) the tegminae and wings are fully developed, reaching to the end of the abdomen when folded and at rest. In *H. pacificus*

Scudder and *H. curtipennis* Scudder, the tegminae and wings are vestigial.

In *pacificus* the tegminae are bluntly rounded at the tip and are short, only a third the length of the abdomen or less; in *curtipennis* the tegminae are narrowly rounded or pointed at the tip and more elongate, commonly about half as long as the abdomen, though sometimes a little shorter than this. Three other species or races are said to exist in Utah but are not represented in Utah collections.⁽¹⁾

II—*HESPEROTETTIX VIRIDIS* THOMAS. Pl. I, fig. 1.

1. SYNONYMY:

1. 1872—Thomas, *Caloptenus viridis*, U. S. Geol. Survey Rep. Mont. Adj. Terr., p. 450.
2. 1873—Thomas, *Ommatolampis viridis*, Syn. Acrid. No. Amer., p. 156.
3. 1873—Thomas, *Ommatolampis viridis*, U. S. Geol. Survey Sixth An. Rep. Terr. Mont. Idaho, Wyo. Utah, pp. 724-5.
4. 1875—Scudder, *Ommatolampis viridis*, U. S. Geol. Survey Rep. Terr. 100 Mer., pp. 506-7.
5. 1876—Scudder, U. S. Geol. Survey Bul. Terr. 11, p. 262.
6. 1883—Bruner, U. S. Ent. Com. III. Rep., p. 59.
7. 1897—Scudder, U. S. Nat. Mus. Proc. 20, pp. 55-56.
8. 1897—Lugger, Minn. Agr. Exp. Sta. Bul., pp. 266-267.
9. 1904—Rehn, Acad. Nat. Sci. Phila. Proc., p. 570.
10. 1931—Hebard, Acad. Nat. Sci. Phila. Proc. 83, p. 173.

2. DESCRIPTION:

The description given here is based on more than two hundred specimens collected from June 13 to September 27, from many different localities in Utah, and all from arid lands. The species is rather small in size, slender in form, bright green to greenish brown in color and streamlined with thin whitish or yellowish longitudinal streaks.

The face is noticeably slant, especially in males. Vertex very narrow between the eyes, but expanding quickly and widely immediately in front of the eyes. Sulcation of the vertex conspicuous, but nearly pinched out at the narrowest portion. Frontal costa wider than the narrowest portion of the vertex, sulcate throughout and slightly narrowed immediately below the ocellus. Compound eyes large, twice or more the length of the genal groove and directed distinctly forward at the tip, especially in males.

Pronotum cylindrical above; lateral and median carinae obliterated or nearly so, the median carina striped with a whitish line which arises on the occiput, bordered on each side with blackish, and extending to the tip of the metazone. A whitish line more or less indistinct arises on the margin of the occiput against the compound eye and

(1) Determinations of Utah material has been confirmed by Hebard to whom we are greatly indebted for extensive assistance.

passes along the humeral angle to the metazone and down the humeral angle of the tegmina, this stripe more or less obscure, and in places entirely obliterated in some specimens. Tegminae and wings pellucid and extending to the tip of the abdomen; tegminae streaked longitudinally with thin white lines at the lower edges, the humeral angles and the center, obscure or even obliterated in some individuals apparently older and worn.

Hind femorae elongate and slender, reaching to the tip of the abdomen in females, beyond in males, often tinged with pinkish and often with a pink annulus just above the knee. Hind tibiae with a bluish tinge in most specimens, obscure brownish in some.

It seems apparent that the coloration of this species follows that of the vegetation on and among which it lives. The vegetation is generally green when most of the individuals come to maturity, but fades out to greenish brown and later to brownish as the dry season advances. Specimens are green if captured when they are so young as to show little wear, but are mostly brownish if captured when they are older and much worn. Color evidently fades out on the insects as it does on the vegetation.

Cerci broad at base, narrowing to half the width of the first third, or first half and extending as an elongate cone to the pointed tip. Tubercle of the subanal plate well developed, but scarcely rising above the margin and extending caudad.

3. MEASUREMENTS:

Male:

	mm.
Body length (average for 100 specimens).....	16.70
shortest body in 100 specimens.....	13.00
longest body in 100 specimens.....	20.00
Hind femora (average length for 88 specimens).....	10.00
shortest length for 88 specimens.....	9.00
longest length in 88 specimens.....	12.00
Tegminae (average length of 93 specimens).....	12.50
shortest length in 93 specimens.....	10.00
longest length in 93 specimens.....	15.00

One specimen shows a tegmina length of 7.00 mm.

Female:

	mm.
Body length (average for 100 specimens).....	21.61
shortest body in 100 specimens.....	19.00
longest body in 100 specimens.....	27.00
Hind femora (average length for 98 specimens).....	12.00
shortest length in 98 specimens.....	10.00
longest length in 98 specimens.....	14.00
Tegminae (average length for 65 specimens).....	15.00
shortest length in 65 specimens.....	12.00
longest length in 65 specimens.....	19.00

4. GEOGRAPHICAL DISTRIBUTION:

This species was first known in Colorado, Wyoming and Kansas (1: 450). A year following the original description, that is in 1873, (2: 156) Thomas added Nebraska to the territory in which the species was then known. In 1876 Scudder (4: 262) added Utah and California (5: 506). In 1883, Bruner (8: 59) gave the geographical distribution of the species as "Utah, Colorado, Nebraska, Minnesota, Kansas & C." Scudder added New Mexico, Texas, Arizona, New Jersey, Iowa and Nevada in 1897 (11: 57-59). There is probably some error in regard to New Jersey. In 1908, Bruner (18: 315) recorded "Hab. North America, Southern States, Mexico," which probably covers a little too much territory. Hebard recently finds the species in South Dakota (23: 98), Montana (24: 266), Alberta, Canada (26: 393) in addition to previous records.

This species has been found to be "the most abundant species on the plains of eastern Colorado" (25: 372). It is also numerous in Utah on range lands where species of *Gutierrezia* plants are found and on many dry farms where *Gutierrezia* once thrived.

The present distribution, therefore, may be near correctly stated as Great Plains from Canada to Mexico and westward to California.

The species has been collected in Utah by Henderson in the following counties: Juab, Kane, Rich, Salt Lake, Summit, Uintah, Wasatch, Washington, and Wayne. In other counties in the state it has been taken as follows: Cache County by King, Harmston, Knowlton, Nye, Stafford and Thatcher; Box Elder County by Janes, Henderson, Knowlton and Smith; Utah County by Henderson, Knowlton, and Thornley; Davis County by Henderson, Knowlton, and Thornley; Grand County by Hammond, Henderson and Knowlton; Duchesne County by Harmston, Stains and Stoffers; Garfield County by Hammond; Emery County by Harmston; Carbon County by Knowlton; Millard County by King, Hanson, Henderson, Sorenson and Thornley.

III—*HESPEROTETTIX PACIFICUS* SCUDDER. Pl. I, fig. 2.

1. SYNONYMY:

1. 1898—Scudder, U. S. Nat. Mus. Proc. XX, pp. 61-62.
2. 1904—Bruner, Col. Agr. Exp. Sta. Bul. 94, p. 63.
3. 1910—Kirby, Syn. Cat. Orth. III, p. 499.

2. DESCRIPTION:

Body sparsely covered with fine short hair extended over head, legs and tegminae; general color brownish to greenish with darker and

lighter marking, brown more prevalent among specimens than green.

Head with median dark patch or stripe, which is penetrated through the center with a white median streak; face very slant.

Vertex sharply narrowed between the apex of the eyes to distinctly less than the width of the frontal costa, and expanding sharply in front to more than the width of the frontal costa; lateral carinae of the fastigium nearly or totally confluent in the narrowest portion with a scarcely elongate sculcus or pit behind the confluence and a shallow but broader sulcation in front.

Frontal costa fairly straight, narrow and rather deeply sulcate for its entire length.

Pronotum dimly striped lengthwise with two lateral and one median whitish and darker stripes, the post-ocular blackish band located between the two lighter lateral stripes, the latter stripes ending at the main transverse incision, but the median, edged with darker, or black continues to the end of the posterior lobe. Pronotum much rounded from one lateral lobe to the other so that lateral and median carinae are scarcely or not at all evident.

Tegminae short, only about one-fifth the length of the abdomen, nearly as broad as long with tip broadly rounded in females, more narrowed and elongate in males. Wings much smaller, only about one-fourth as large as the tegminae. Hind femorae varying in color among specimens from light brown to greenish, outer face darker, little or no tendency to banding on outer face, but slight tendency to banding on upper and inner faces in some specimens. Hind tibiae also varying in color as the hind femorae, with tendency to greenish in most specimens, spines colored as the tibiae and tipped with black. Abdomen brownish or slightly greenish, not much marked with any contrasting color, and with tendency to show median dorsal carina. Cerci broad at base but narrowing quickly from both sides to an elongate tip. Subanal plate of the male with central tubercle arising behind and elevated above the dorsal margin.

3. MEASUREMENTS:

Male:

	mm.
Body length (average for 10 specimens).....	15.10
shortest body in 10 specimens.....	14.00
longest body in 10 specimens.....	16.00
Hind femora (average for 8 specimens).....	8.20
shortest in 8 specimens.....	8.00
longest in 8 specimens.....	9.00
Tegminae (average for 10 specimens).....	3.60
shortest in 10 specimens.....	3.00
longest in 10 specimens.....	4.00

Female:

Body length	(average for 23 specimens).....	20.34
	shortest in 23 specimens.....	18.00
	longest in 23 specimens.....	24.00
Hind femora	(average for 17 specimens).....	11.00
	shortest in 17 specimens.....	9.00
	longest in 17 specimens.....	13.00
Tegminae	(average for 23 specimens).....	5.00
	shortest in 23 specimens.....	4.00
	longest in 23 specimens.....	6.00

4. GEOGRAPHICAL DISTRIBUTION:

Hesperotettix pacificus was described by Scudder from two males and eight females all of which were taken in southern California (11: 62). He says that "Koebele reports it from the Shasta district in Northern California." Utah is apparently the only other state in which the species is known. The Utah collection consists of 11 males and 25 females, all taken in desert regions of the southern portion of the state since 1920. More specific collection data follow: Garfield County, Gardner; Washington County, Rowe; Iron County, Gardner and Hammond; Beaver County, Gardner, Hammond and Tanner; Millard County, Hammond. The species is of no economic importance, although it is probably more abundant and more widespread than the few specimens actually collected would indicate.

IV—*HESPEROTETTIX CURTIPENNIS* SCUDDER. Pl. I, fig. 3.

1. SYNONYMY:

- 1898—Scudder, U. S. Nat. Mus. Proc. XX, pp. 62-63.
- 1904—Brumer, *H. coloradensis*, Colo. Agr. Exp. Sta. Bul. 94, p. 63.
- 1905—Caudell, U. S. Nat. Mus. Proc. XXVIII, pp. 465-466.
- 1910—Kirby, Syn. Cat. Orth. III, p. 499.
- 1925—Hebard, Acad. Nat. Sci. Phila. Proc. LXXXI, p. 374.
- 1935—Hebard, Amer. Ent. Soc. Trans. LXI, pp. 301-302.

2. DESCRIPTION:

Body sparsely covered with fine, short hair, extended over head, legs and tegminae; general color olive gray or brownish gray to bright green with darker and lighter markings, greenish more prevalent among specimens than brownish.

Head with median dark stripe or patch, sometimes nearly as broad as the summit, and often containing a faint light stripe; face distinctly slant.

Vertex sharply narrowed between the apex of the eyes, to distinctly less than width of the frontal costa, and expanding in front to more than the width of the frontal costa, the edges of the fastigium nearly

confluent at the narrowed point, a scarcely elongate narrow sulcation or pit behind the confluence and a very shallow but broader sulcation in front.

Frontal costa, fairly straight, narrow and rather deeply sulcate for its entire length.

Pronotum distinctly striped lengthwise with one median and two lateral whitish and greenish or lighter and darker stripes, the post-ocular greenish or blackish band located between the two lateral ones

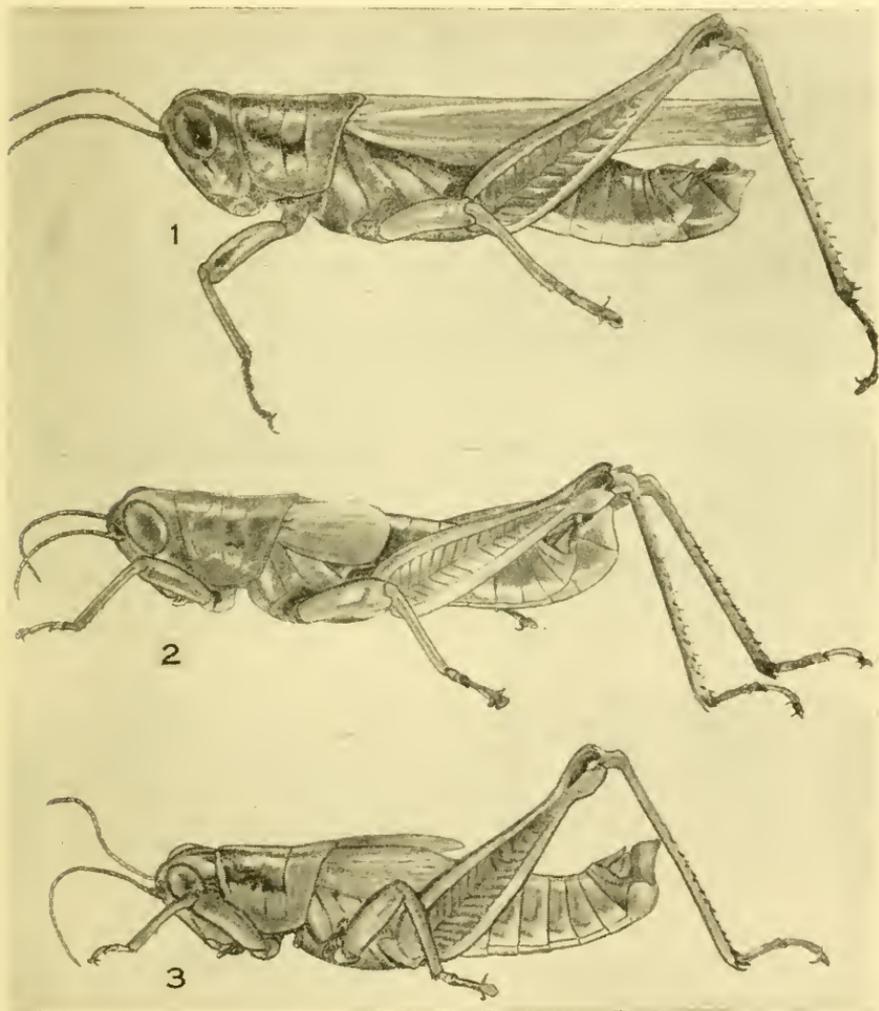


Plate I

Fig. 1. *Hesperotettix viridis* (Thomas); fig. 2. *Hesperotettix pacificus* Scudder; fig. 3. *Hesperotettix curtipennis* Scudder.

terminate with the main transverse incision, but the median stripe, edged with darker color, continues to the tip of the posterior lobe. Median and lateral carinae of the pronotum scarcely visible, the pronotum rounded from side to side. Three transverse incisions well impressed, the posterior most conspicuous, the other two sinuous with the middle incision closer to the one in front than the one behind it. Posterior lobe about three-fourths as long as the anterior and very broadly rounded at the tip.

Tegminae about twice as long as broad, one-third to one-half as long as the abdomen, narrowly tipped, greenish or olivaceous in color; wings nearly as long as the tegminae.

Hind femorae about the same color as the body, the outer face darker or even blackish, inner face lighter, in some specimens slightly ruddy. Hind tibiae green, varying from a slight hue to a brilliant light green, tibial spines whitish or greenish tipped with black. Abdomen yellowish brown to greenish, marked generously with darker patches, and with a rather distinct median carina. Cerci broad at base and tapering from both sides to an elongate tip, the cerci smaller in females. Subanal plate of the male with central tubercle arising behind and elevated above the hind margin.

3. MEASUREMENTS:

Male:

	mm.
Body length (average for 31 specimens).....	15.50
shortest body in 31 specimens.....	13.00
longest body in 31 specimens.....	18.00
Hind femora (average for 26 specimens).....	9.50
shortest femorus in 26 specimens.....	8.00
longest in 26 specimens.....	10.00
Tegminae (average for 31 specimens).....	5.00
shortest in 31 specimens.....	3.00
longest tegmina in 31 specimens.....	7.00

Female:

	mm.
Body length (average for 63 specimens).....	20.33
shortest in 63 specimens.....	15.00
longest in 63 specimens.....	24.00
Hind femora (average for 58 specimens).....	11.00
shortest in 58 specimens.....	10.00
longest in 58 specimens.....	13.00
Tegminae (average for 63 specimens).....	7.00
shortest in 63 specimens.....	5.00
longest in 63 specimens.....	10.00

4. GEOGRAPHICAL DISTRIBUTION:

The original description by Scudder (11: 62) was based on two females taken in Colorado. Caudell obtained two females and one

male a few years later in southern Arizona (15: 465) and described the male of the species from this one specimen. In 1929 Hebard (25: 374) obtained a large series from Colorado and New Mexico to bring the distribution of the species to the three states named. The Utah collection contains 31 males and 63 females collected as follows: Summit, Duchesne, Juab, Millard, Sevier, Piute and Emery Counties by Henderson; Beaver by Henderson and Knowlton; Wayne by Gardner and Henderson; Garfield by Gardner, Hammond and Henderson.

V—OTHER HESPEROTETTIX IN UTAH

H. festivus Scudder. Scudder described this species in 1897 (11: 60) from a single male specimen taken at "Lake Point, Salt Lake" by Packard in 1875, and which Scudder has previously referred to as *H. viridis* Thomas (4: 262). He also referred to this species, one specimen "from Mt. Nebo, Utah, taken in August, and one from Spring Lake" recorded in a paper by Thomas in 1876 (6: 262). A record which Bruner makes of *H. viridis* (Thomas) in Utah in 1883 (8: 58) is also referred to by Scudder as *H. festivus*.

In connection with his description of *H. festivus*, Scudder notes 66 males, 58 females, names four places in Utah and then Los Angeles County, California. How many of these 124 specimens were taken in Utah is not disclosed. In 1904 Bruner (13: 62) records *H. festivus* for Colorado and includes this remark: "Hind femora without red pregenicular annulation or only faint signs of one," which seems to make this character an issue in distinguishing the species. Bruner would say that *H. festivus* must not have pregenicular red annuli. In the same year Rehn (14: 570) took five specimens in Arizona and says, "All five specimens possess reddish pregenicular annuli." Rehn says then, that *H. festivus* must have pregenicular red annuli. In 1906 (16: 400) Rehn and Hebard say they found the species on a "Hillside at Salt Lake City," "Top of Ensign Peak" and "This species was by far the most plentiful of the genus *Hesperotettix* which I found, and individuals were quite common in the sage growing from the foot to the top of Ensign Peak."

Again in 1907, Rehn (17: 73-77) took a male specimen at Tucson, Arizona and remarked, "This individual has the pregenicular annuli very distinct, but shows no traces of the black penciling of the pronotal sulci seen in *H. viridis*." This remark sustains red annuli for *H. festivus* and points out another important character, the absence of "black penciling of the pronotal sulci." Rehn and Hebard found 34 specimens of this supposed species in Arizona in 1908 (19: 393-394)

and remark: "Red pregenicular annuli on all but three specimens which are in, or approach the brownish stage."

We have before us 277 specimens of *H. viridis* (Thos.), 36 specimens of *H. pacificus* Scud. and 99 specimens of *H. curtippennis* Scud. Nearly all of these specimens show at least some trace of pregenicular red annulus and variability is exhibited from this trace through every stage of expression to very distinct. Rehn and Hebard (loc. cit.) hint the true significance of variability in pregenicular annulus. It is probably an age trait, and has no specific importance. We find this to be true also of "black penciling of the pronotal sulci." (Rehn and Hebard (loc. cit.). If species cannot be allowed reasonable variability, they can easily be multiplied in number so that species status would almost coincide with specimen status.

Although we have sought diligently, we cannot find *H. festivus* in Utah unless we partly close our eyes and pick it out somewhat carelessly from *H. viridis*. We note with satisfaction that Hebard recently said (24: 393) "*Festivus* must be considered a race of *viridis*." Evidence here would lead to the conclusion that in Utah, *festivus* is *viridis*.

H. viridis nevadensis Morse.

This supposed species was described by Morse in 1903 (12: 115) from three males and three females found in Nevada. This description is concerned largely with color variations which have little if any significance in discriminating the various species of *Hesperotettix*. Large series of *H. viridis* and *H. curtippennis* both include the variations given by Morse for *H. nevadensis*. Description of structural features mention the tegminae and wings as being "about one and one-third times as long as the exposed part of the abdomen." Morse gives the length of tegminae as 6.3 to 6.7 mm. for the male and 8.5 to 9 mm. for the female. Total length is given as male 16; female 21 mm. In the Utah series of *H. curtippennis* the tegminae length for 31 males varies from 3 mm, the shortest, to 7 mm, the longest, with the average of 5 mm. For females these figures are, shortest 5 mm, longest 10 mm, with average for 63 specimens of 7 mm. Body length of the Utah specimen shows an average of 15.50 mm for males and 20.33 for females. These measurements all coincide closely enough that no margin is left for species difference, so we find no place as yet for the *H. nevadensis* in Utah. Mr. Hebard helpfully gave the author a male and a female of *H. nevadensis* which he took at Kanosh, Utah. We cannot distinguish these from *H. curtippennis*.

H. nevadensis terminus Hebard.

Hebard (21: 163-166) described *H. nevadensis terminus* as a new geographic race, based on a few specimens taken in Utah and Nevada. His description for this race is similar to that of the very short, truncate tegminae of *H. pacificus* and runs very much like a description for it. Hebard (loc. cit.) also finds *H. nevadensis gillette* in Utah (loc. cit.).

The following species and races of *Hesperotettix* are known therefore in Utah:

H. viridis viridis (Thomas)
H. viridis nevadensis Morse
H. viridis gillette Bruner
H. viridis terminus Hebard
H. viridis festivus Scudder
H. pacificus Scudder
H. curtipes Scudder

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